Introduction: Iliac crest bone graft (ICBG) remains the gold standard for autologous bone grafting. IBCG harvesting can lead to persistent postsurgical pain (PPSP), devastating and difficult to treat (Brull 1992). Local anesthetics administration may reduce this risk (Singh 2007). PPSP trials typically report heterogeneous outcomes, making classical frequentist meta-analysis in our Cochrane review in print (Andreae 2012) challenging. To overcome this limitation, we developed a Bayesian model on regional anesthesia for the prevention of persistent pain after ICBG harvesting. We pooled dichotomous and continuous pain outcomes at varying follow up intervals.

Methods: Methods were detailed in our systematic review for the Cochrane Collaboration in print (Andreae 2012).

Search: Briefly, we searched the Cochrane Central, PubMed, EMBASE and CINAHL (1966 to April 2012) without any language restriction using a combination of free text and controlled vocabulary. We searched conference abstracts by hand.

Selection: We included randomized and non-randomized controlled clinical trials with pain outcomes at least 12 weeks postoperatively. Included studies compared local or regional anesthesia versus conventional analgesia for chronic pain after ICBG harvest.

Data extraction: We assessed trial quality and extracted pain outcome, including information on adverse events.

Bayesian model: We developed a longitudinal Bayesian model in OpenBUGS with three time points to estimate the posterior distribution of the odds ratio of chronic pain six months after surgery. Figure 1 illustrates the Bayesian process. We assume a linear time dependence of the odds ratios from one follow up to the next.

Results: We identified 4 controlled clinical trials, three of them RCTs, studying local anesthetics or regional anesthesia for the prevention of persistent pain after ICBG harvesting (Table 1). Data from a total of 123 patients with continuous or dichotomous pain outcomes at 12 weeks, three, six and 12 months after harvesting were included (Figure 2) (Table 2).

Our evidence synthesis suggests that local anesthetics prevent persistent pain at the donor site six months after ICBG harvesting in about every second patient treated (NNT is 1.96; 95% credible interval (1.26, 12.3). The Bayes Factor for a one-sided hypothesis test is 75, suggesting very high confidence in the results. The methodological quality of the included studies was intermediate. Adverse effects were not studied systematically and reported sparsely.
<table>
<thead>
<tr>
<th>Study ID</th>
<th>Follow up Interval</th>
<th>Study Design</th>
<th>Outcome reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gündeş 2000</td>
<td>12 weeks</td>
<td>RCT</td>
<td>responder data</td>
</tr>
<tr>
<td>Brull 1992</td>
<td>6 months</td>
<td>observational trial with historic controls</td>
<td>responder data</td>
</tr>
<tr>
<td>Singh 2007</td>
<td>4.7 years</td>
<td>RCT</td>
<td>responder data</td>
</tr>
<tr>
<td>Blumenthal 2005</td>
<td>3 months</td>
<td>RCT</td>
<td>responder data estimated from VAS</td>
</tr>
</tbody>
</table>
Discussion: Local anesthetics may prevent persistent pain at the donor site after ICBG harvesting in about every second patient treated, (NNT is 2). Our innovation is the development of a novel Bayesian model for responder meta-analysis of dichotomous and continuous pain outcome data with variable follow up intervals ranging from three to twelve months.

Funding: CTSA Grant UL1 RR025750.

References:

Andreae. Cochrane Database of Systematic Reviews in print.


A2

COMPARISON OF ANALGESIC EFFECTIVENESS OF COMBINED INTRAPERITONEAL INSTILLATION AND PERIPORTAL INFILTRATION OF BUPIVACAINE WITH INTRAPERITONEAL INSTILLATION OR PERIPORTAL INFILTRATION ALONE AFTER LAPAROSCOPIC CHOLECYSTECTOMY
Anesthesiology and Critical Care, Surgery, BP Koirala Institute of Health Sciences (BPKIHS), Dharan, Nepal

Introduction: Acute pain after laparoscopic cholecystectomy is complex in nature. Though postsurgical perportal infiltration and intraperitoneal instillation of local anesthetics have been reported to provide effective analgesia following laparoscopic cholecystectomy, they are yet not standardized. Further, such reports are typically lacking from community based resource constrained settings. Therefore, the present study compared the effectiveness of combination of intraperitoneal instillation and periportal infiltration of bupivacaine with either of the techniques alone in such a setting.

Materials and method: With institutional ethical approval, 90 adult patients undergoing elective laparoscopic cholecystectomy under general anesthesia were randomized prospectively into 3 groups. Patients in group PI (n=30) received periportal infiltration with 10 ml of 0.25% bupivacaine, patients in group II (n=30) received intraperitoneal instillation of 20 ml of 0.5% bupivacaine, and patients in group C (n=30) received combination of periportal infiltration with 10 ml of 0.25% bupivacaine and intra peritoneal instillation of 20 ml of 0.5% bupivacaine just prior to closing of the surgical ports. Surgery was accomplished using the 4-port standard technique in all the patients. Time to first postoperative analgesic requirement in min, 24 hour postoperative analgesic (injection tramadol in mg) requirement and pain Visual Analogue Score (VAS) taken at ½ h, 1 h, 4 h, 8 h, 12 h and 24 h after the surgery were the main outcome variables.

Results: The mean duration of analgesia of 356±96.87 min with a median duration of 450 min (Inter Quartile Range: 195-510) in group C was significantly longer (p< 0.001) than 180.67±112.76 min with a median duration of 195 min (Inter Quartile Range: 60-270) in group II and 64.5±54.76 min with a median duration of 30 min (Inter Quartile Range: 30-76.25) in group PI. Overall, the VAS recorded was the least (less than 3 at all time points except 24 h) in group C followed by II and PI respectively. The mean 24 h postoperative analgesic (injection tramadol in mg) requirement in group C was almost one third less than that in group PI (116.67±27.33mg versus 173.33±25.37mg, p< 0.001) and almost one fifth less than in group II (116.67±27.33mg versus 148.33±20.69mg, p< 0.001).

Discussion: In a community based resource-constrained setting with limited analgesic options (both due to unavailability and legal restrictions), the present study has shown clinically superior analgesia during the first few crucial postoperative hours with the combination of simple intra-peritoneal instillation and periportal infiltration of easily available bupivacaine compared to either of the techniques alone. The lower pain VAS and less analgesic requirement during first 24 h (which may translate to earlier discharge) further imply regular use of the combined technique in such settings.

References:


THE EFFECT OF OUTPATIENT KETAMINE INFUSIONS ON PATIENT HEMODYNAMICS, LEVEL OF SEDATION AND PAIN

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Objectives and background: Ketamine, an NMDA receptor antagonist, helps reduce severe debilitating neuropathic pain in patients unresponsive to conventional treatment. Potential ketamine side effects include sedation, hallucinations, hypertension and tachycardia. There have been no published studies to date examining these side effects in outpatient ketamine infusions. Our goals are to determine 1) the safety of outpatient ketamine infusions and 2) the effect of ketamine infusions on pain.

Methods: With IRB approval, we reviewed the vital signs, sedation assessment and pain scores of 46 patients diagnosed with severe chronic neuropathic pain. Each patient underwent 3 consecutive days of 4 hour ketamine infusions. Ketamine doses ranged from 0.2 mg/kg/hr to 1.2 mg/kg/hr for a total of 4 hours. Vital signs and Sedation-Agitation Scale (SAS) scores were recorded at baseline, every 15 minutes during the infusion. Pre-infusion and post infusion pain scores were obtained each day. Chi square was used to evaluate the association between dose and largest increase and decrease in the above variables. A paired t-test was used to examine changes in pain scores over time.

Results: A total of 138 ketamine infusions were administered to 46 patients. The total dose of ketamine infused ranged from 36 mg to 510 mg. The vast majority of patients showed small (< 20%) changes in hemodynamic, respiratory rate, oxygenation, and hemoglobin parameters. 40 patients showed SBP increases of less than 20% from baseline and 32 showed SBP increases of less than 10% from baseline. There was a strong association between ketamine dose and highest SBP increase (p < 0.01). An increase of greater than 20% from baseline was seen in 6 patients, 3 of which were in the highest dose group (>0.9 mg/kg/hr). Increased HR was associated with higher doses (p< 0.05). Patients in the highest dose range had a maximum HR increase of 20% or more. However, across all dose ranges, 78% of patients experienced less than 10% increase above baseline and 84% (36 patients) had less than 20% increase. All patients had a baseline SAS score of 4 (calm, cooperative). The lowest SAS score for all patients during the infusions was 3 (sedated, easily arousable). Pain scores decreased from 6.5 ± 2.4 on Day 1 pre-infusion to 3.1 ± 2.2 on Day 3 post-infusion. The 95% confidence interval was 2.8 to 4.1 points on the pain scale (p< .0001).

Conclusions: We examined the safety profile of outpatient ketamine infusions with respect to hemodynamic changes, respiratory rate, oxygenation and level of sedation over a wide range of ketamine doses. There was little deviation from baseline in the majority of our patients. Increased SBP and HR were associated with higher ketamine doses. RR and oxygen saturation were not significantly
altered during the infusions. Although patients were sedated they were easily arousable and returned to pre-infusion baseline sedation level upon discharge. There was a significant decrease in pain on Day 3. Continuous 4 hour infusions of ketamine at subanesthetic doses significantly decreased pain scores and may be safely administered to outpatients for management of severe chronic neuropathic pain.

A4
NITROUS OXIDE ADDED AT THE END OF ANESTHESIA DECREASES EARLY POSTOPERATIVE PAIN
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Introduction: Nitrous oxide (N2O) analgesic mechanism of action is not clearly understood. Recently, an analysis of ENIGMA trial suggested that N2O may have a preventive analgesic effect.(1) We investigated if adding N2O at the end of anesthesia to fasten recovery after isoflurane anesthesia has influence on postoperative pain.

Material and methods: After obtaining IRB approval and informed consents, 82 women, ASA PS I-III, scheduled for laparoscopic assisted vaginal hysterectomy were randomized into two groups according to carrier gas: GO2 - air in 30% oxygen (n=42) and GN2O - the same mixture until last 30 minutes of the surgery when 70% N2O and 30% oxygen was used (n=40). Anesthesia was maintained with isoflurane ~ 1MAC. Pain VAS score and total amount of postoperative opioids were recorded at 2h and 24 hours postoperatively. Diclofenac was given immediately after surgery. For severe pain (VAS >40 mm) meperidine was given. Data were analyzed using Chi-Square and Mann-Whitney test.

Results: There were no significant differences between two groups for age, BMI, duration of anesthesia and surgery, and intraoperative fentanyl use. G N2O patients received on average N2O for 27.1±10.1 minutes, woke up 3.8 minutes faster (p=0.01), had less pain at 2 hours (VAS 38.1±14.6 vs 47.4±15.2 mm, p=0.008) and received less meperidine (82.5 vs 100%, p=0.005). There was not difference in pain at 24 hours between groups (VAS 13.2±12.4 vs 13.0±13.0 mm, p=0.86).

Discussion: Adding N2O at the end of anesthesia hastened recovery time, decreased pain at 2 hours postoperatively and number of patients who needed meperidine postoperatively.


Funding: This work was partly supported by the Croatian Ministry of Science, Education and Sport; research project “Predictive Models in Health Care” No. 108-0982560-0257.

A5
THE ROLE OF VERY LONG TERM CONTINUOUS PERIPHERAL NERVE CATHETERS IN THE TREATMENT OF CHRONIC WOUND PAIN
Introduction: Every year in the U.S., more than 6.5 million people develop chronic skin ulcers caused by pressure, venous stasis, or diabetes mellitus. These wounds cause significant suffering, affecting patients’ health, socialization, body image, level of independence, and pose a large financial burden to our nation's health care. While narcotics have traditionally provided an effective means of controlling these patients' pain, they also produce multiple side effects, possess addictive properties, and have a deleterious impact on society in general. Our case involves the use of a continuous peripheral nerve catheter (CPNC) in the treatment of chronic pressure ulcers and displays not only how CPNCs provide an effective alternative to narcotic use in these patients, but also explains how these catheters may directly affect the healing of the wound itself.

Material and methods/results: A 51 year old female with diabetes mellitus and peripheral vascular disease has a 7 year history of complicated, non-healing foot ulcers. For 6.5 years, her pain was treated with high dose opioids, from which she developed narcotic tolerance and opioid induced hyperalgesia. This analgesic regimen provided marginal pain relief, poor visit compliance, and an inability to function independently. We placed and maintained an infra-gluteal sciatic CPNC with continuous infusion (2 mL/hr 0.2% ropivicaine) and patient controlled boluses (10 mL every 90 min) from May 2011 - January 2012. During this period, she came in once a week for dressing changes and debridements, during which time her catheter was bolused with 2% Lidocaine, effectively providing surgical analgesia in a clinical setting. Over these eight months, her compliance with wound care visits, independence, and quality of life vastly improved, and her ulcers healed completely. Complications included one skin catheter site infection, treated with outpatient antibiotics and removal of the catheter, and 10 episodes catheter dislodgment, requiring replacement. Overall, compliance, pain relief, and quality of life improved drastically.

Discussion: CPNCs provide highly effective analgesia and facilitate patient compliance while avoiding the problems associated with long term opioid use. The impact of CPNCs may not be limited to simply wound pain control, however. CPNCs have the theoretical benefits of increased tissue perfusion and oxygenation through sympathectomy induced vasodilation (1), allow for the anti-inflammatory effects of local anesthetics to facilitate the wound entering the proliferative phase (2), and may attenuate resulting pain sequelae, including phantom limb syndrome (if an amputation is required) (3). Research on these topics is currently lacking, but opportunities for further studies are endless. Given the favorable risk / benefit of regional anesthetic techniques, its theoretical advantages, its ease of use in the outpatient setting, and our ever-growing population of patients with chronic non-healing wounds, we not only advocate further research in this promising field, but also the increased use of these catheters in clinical practice.

References:


COMPARISON OF THREE BLOCKS REGIMENS FOR POSTOPERATIVE ANALGESIA IN AMBULATORY SHOULDER SURGERY: A DOUBLE-BLINDED PROSPECTIVE RANDOMISED PILOT STUDY

Meggie Raymond, M.D.¹, Étienne De Médicis¹, Jean-Pierre Tétrault¹, Véronique Gagnon¹, Marie-Hélène Masse¹, Frédéric Balg², Stéphane Ricard², Frédéric Mior¹

¹Department of Anesthesiology, ²Department of Orthopedic Surgery, CHUS - Université de Sherbrooke, Sherbrooke, QC, Canada

Introduction: Both subacromial (SA) and interscalene (IS) blocks have been advocated for shoulder surgery¹,². We designed a double-blinded prospective randomised study to compare the efficacy of a single preoperative interscalene block versus postoperative subacromial block and their combination. All patients received a continuous subacromial block for 48 hours.

Material and methods: After written consent and ethics committee approval, 60 patients were prospectively randomised and followed for 48 hours postoperatively. Patients were distributed in three groups (Table 1). All surgeries were done under general anesthesia.

<table>
<thead>
<tr>
<th>Group</th>
<th>Interscalene</th>
<th>Subacromial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bolus 30 ml</td>
<td>Bolus 10 ml</td>
</tr>
<tr>
<td>1</td>
<td>Bupivacaine 0,5% + epinephrine 1 :200 000</td>
<td>NaCl 0,9% (placebo)</td>
</tr>
<tr>
<td>2</td>
<td>Bupivacaine 0,5% + epinephrine 1 :200 000</td>
<td>Bupivacaine 0,5%</td>
</tr>
<tr>
<td>3</td>
<td>NaCl 0,9% + epinephrine 1 :200 000 (placebo)</td>
<td>Bupivacaine 0,5%</td>
</tr>
</tbody>
</table>

[Table 1 Regimens for Postoperative Pain Control]

The primary outcome was morphine consumption at 48h. Secondary outcomes, among others, included: morphine consumption at 0, 12 and 24h, peroperative fentanyl quantity, pain on a visual analog scale (VAS) in the 48 postoperative hours, level of satisfaction and presence of postoperative nausea and vomiting (PONV). Chi square, Fisher exact, Kruskal-Wallis and Mann-Whitney tests were used where it was appropriated, with the Bonferroni correction when needed.

Results: There was a statistically significant difference in the morphine consumption between the three groups (Figure 1).
There was no statistically significant difference in the narcotic consumption at 48h. Pain scores were lower in the PACU (p < 0.001) and at 24 hours (p = 0.020) in the groups with the IS block (Figure 2).
PONV were also reduced in the groups with the interscalene block: in the day surgery unit, 32% of patients had PONV in group 1, 10% in group 2 and 60% in group 3 (p=0.003) (p=0.007 group 2 versus 3). In the subsequent 48 hours, there was 25% of PONV in group 1, 0% in group 2 and 35% in group 3 (p=0.019) (p=0.016 group 2 versus 3). There were no differences in the fentanyl quantity peroperatively and patients median score of satisfaction were about 90% in all groups (p = 0.674).

Discussion: There was no difference at 48h in the narcotic consumption. However, pain scores, narcotic consumption at 12 and 24h postoperative and PONV were lower in patients receiving a preoperative interscalene block instead of a postoperative subacromial block only in ambulatory shoulder surgery. The effect of the single interscalene injection on pain score and morphine consumption lasted 24 hours postoperatively.

Reference:


Funding: Internal funding. There are no conflicts of interest or support that may cause bias in the study.
Introduction: The estimated incidence of pain following thoracotomy is between 30-50%. There are limited data regarding long-term pain outcomes of video assisted thoracic surgery (VATS) compared with thoracotomy. In an interim analysis of an ongoing prospective, cohort study of chronic postsurgical pain (Analgesic Outcome Study [AOS]), we examine the impact of surgical approach on the development of new chronic pain.

Materials and methods: Institutional review board approval was granted. Written informed consent was obtained from all patients. The thoracic surgery cohort was used for the present study. Consecutive adult patients undergoing VATS and thoracotomy at a large, tertiary care university hospital were prospectively enrolled (3/2010-7/2012). Exclusion criteria were inability to provide informed consent, pregnancy, prisoner status, and metastatic disease. Patients were phenotyped prior to surgery using validated questionnaires, including measures of pain intensity (Brief Pain Inventory) and neuropathic pain (PainDETECT). Patients were contacted by phone at 1- and 3-months after surgery to repeat portions of the preoperative phenotype.

Data were analyzed using SPSS Version 18. The primary outcome measure was the incidence of new chronic pain development in each cohort (VATS and thoracotomy), defined as the proportion of patients who reported pain at the surgical site in the past week on the BPI at their 3-month postoperative follow-up phone call. The composite surgical site pain intensity score and neuropathic pain descriptors were secondary outcomes.

Results: To date, 198 of the 273 thoracic surgery patients approached (72.5%) have agreed to participate in the study. 16 thoracotomy and 5 VATS patients reported preoperative pain and were excluded from the analysis of new chronic post-surgical pain. Retention rates at 1- and 3-months are 87% and 85% respectively. The incidence of chronic pain was higher in thoracotomy patients at 1- and 3-months compared to VATS patients (Table 1, RR [95% CI] 1.8 [1.3-2.4] and 2.2 [1.3-3.7], respectively). The composite pain intensity score and neuropathic pain intensity were not different between the surgical approaches in patients reporting new pain. Sex did not modify or confound the development of pain; however, women reported greater pain intensity at 1- and 3-months, as well as significantly higher neuropathic pain scores (Table 2).

<table>
<thead>
<tr>
<th></th>
<th>Month 1 Incidence</th>
<th>Month 1 Composite</th>
<th>Month 1 Neuropathic</th>
<th>Month 3 Incidence</th>
<th>Month 3 Composite</th>
<th>Month 3 Neuropathic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>pain</td>
<td>pain (0-10)</td>
<td>pain score</td>
<td>pain</td>
<td>pain (0-10)</td>
<td>pain score</td>
</tr>
<tr>
<td>Thoracotomy</td>
<td>31/44 (70.5%)</td>
<td>3.65 (1.54)</td>
<td>8.35 (5.92)</td>
<td>18/37 (48.6%)</td>
<td>2.63 (1.60)</td>
<td>8.44 (6.91)</td>
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<tr>
<td>VATS</td>
<td>35/88 (39.8%)</td>
<td>2.79 (1.95)</td>
<td>7.34 (5.03)</td>
<td>17/76 (22.4%)</td>
<td>2.18 (1.42)</td>
<td>6.94 (6.45)</td>
</tr>
</tbody>
</table>
Discussion: These results suggest that the use of minimally invasive surgery can decrease the incidence of post-surgical pain, at least at one and three months following surgery. Women reporting new pain described higher pain intensity and more neuropathic pain, suggesting the need for sex-specific prevention and treatment algorithms.

Funding: University of Michigan Department of Anesthesiology; NIH T-35 Short Term Training Grant for Medical Students.

A8
EFFICACY AND SAFETY OF TANEZUMAB VERSUS PLACEBO AND OXYCODONE IN ADULTS WITH HIP OR KNEE OSTEOARTHRITIS PAIN (NCT00985621)

Egilius L. H. Spierings, M.D., Ph.D., James Fidelholtz, Gernot Wolfram, Michael D. Smith, Mark T. Brown, Christine R. West

Introduction: This randomized, double-blind study evaluated the efficacy, tolerability, and safety of the nerve growth factor antibody tanezumab for treatment of hip or knee osteoarthritis (OA) pain versus placebo and oxycodone.

Material and methods: Patients with moderate to severe hip or knee OA pain, received up to two intravenous doses of tanezumab (10 or 5 mg every 8 weeks), oxycodone controlled release (CR) (10-40
mg every 12 hours), or placebo, after prior pain medication washout. Primary endpoint was change from baseline to Week 8 in Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) Pain score. Other endpoints included: change from baseline in WOMAC Physical Function and Patient's Global Assessment (PGA) of OA and percentage of patients with improvement in WOMAC Pain score from baseline to Week 8. Efficacy of tanezumab versus placebo was compared in the intent-to-treat population (ITT; patients receiving ≥1 injection), whereas tanezumab versus oxycodone and oxycodone versus placebo were evaluated in the modified intent-to-treat population (mITT; all ITT patients with Week 8 visit or discontinued on or before an FDA-imposed clinical hold). Safety was also assessed.

Results: Due to the clinical hold, the study was not fully enrolled and only 610 of 800 planned patients received ≥1 injection. At Week 8, both tanezumab groups demonstrated significant improvements in WOMAC Pain, Physical Function, and PGA versus placebo and oxycodone ($P \leq 0.018$; Figure 1); oxycodone was not statistically significantly different from placebo ($P \geq 0.700$). More tanezumab-treated patients had ≥30%, ≥50%, ≥70%, and ≥90% improvement in WOMAC Pain score than with oxycodone ($P \leq 0.010$ for all except ≥30% and ≥90% responses for tanezumab 10 mg; Figure 2); differences between oxycodone and placebo were not significant. Overall adverse event (AE) rate was higher with oxycodone than with tanezumab or placebo (Table 1). AE rates and types reported for tanezumab-treated patients were similar to previous tanezumab studies. Incidence of serious AEs was similar among treatments. Two patients in the tanezumab 10 mg group were reported to have osteonecrosis (2/150; 1.3%) and underwent total joint replacement (TJR); however, an external adjudication committee did not confirm osteonecrosis in either case, instead diagnosing one patient with rapidly progressive OA and the other with normal progression of OA. Four additional patients (one each in the tanezumab 10 mg, tanezumab 5 mg, oxycodone, and placebo groups) underwent TJR.

Discussion: Treatment with tanezumab 5 or 10 mg resulted in superior analgesic efficacy compared to placebo and oxycodone CR, indicating that tanezumab is efficacious in the treatment of OA pain.

[Figure 1.]
[Figure 2.]

*\( p < 0.05;  \) **\( p \leq 0.01 \) versus oxycodone CR

<table>
<thead>
<tr>
<th></th>
<th>Placebo (n = 141)</th>
<th>Tanezumab 5 mg (n = 161)</th>
<th>Tanezumab 10 mg (n = 150)</th>
<th>Oxycodone CR 10-40 mg q12hr (n = 158)</th>
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<td>Patients with</td>
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Patients discontinued due to adverse events

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<th>2 (1.2)</th>
<th>4 (2.7)</th>
<th>16 (10.1)</th>
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Patients with serious adverse events

<table>
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<th>4 (2.5)</th>
<th>3 (2.0)</th>
<th>4 (2.5)</th>
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</table>

(Table 1. Summary of adverse events)

A9
CORRELATING PREOPERATIVE COMPUTED TOMOGRAPHY SCANS TO LOSS OF RESISTANCE TECHNIQUE FOR PREDICTION OF EPIDURAL SPACE DEPTH
Jose Soliz, M.D.¹, Rodolfo Gebhardt², Alyssa Kosturakis¹, Ashley Smallwood³

¹Anesthesiology and Perioperative Medicine, ²Pain Medicine, M.D. Anderson Cancer Center, ³Medical School, University of Texas Health Science Center, Houston, TX, USA

Introduction: Epidural analgesia is a commonly used technique to provide analgesia for major abdominal and thoracic surgery. An effective epidural requires the medical professional to accurately identify the epidural space, typically using a blind technique. Patient characteristics such as weight, BMI, ethnicity, and gender have been used to approximate the depth of epidural space prior to epidural placement with varying success.[1][2] Preoperative computed tomography scans are commonly performed on our patients as part of the cancer workup and surveillance. We aim to correlate depth of epidural space measured from preoperative CT scans with the measured loss of resistance technique used for epidural placement.

Materials and methods: After approval from the Institutional Review Board (University of Texas MD Anderson Cancer Center, Houston, TX), we reviewed the records of 210 patients between the age of 18 and 70 who had a thoracic epidural placed for major abdominal or thoracic surgery and had a preoperative CT scan. Demographic data such as age, weight, height, BMI, gender, and ethnicity were collected. The epidural placement data including thoracic epidural level, LOR, midline or paramedian approach was collected. Each patient’s preoperative CT scan was reviewed and the skin to epidural space was measured. All measurements were made by the same physician.

Results: LOR is positively correlated with measured depth of epidural space from CT (Spearman correlation coefficient = 0.71, p value < 0.0001) (Figure 1). Using the Wilcoxon signed rank test, the difference between LOR and depth of epidural space from CT is significantly different from the zero (p value < 0.0001) which suggests that LOR is larger than the depth of epidural space measured from CT. In addition, Depth of epidural space from CT is positively correlated with weight (Spearman correlation coefficient = 0.78, p value < 0.0001), height (Spearman correlation coefficient = 0.38, p value < 0.0001), and BMI (correlation coefficient = 0.76, p value < 0.0001).
Discussion: The results of this study indicate that preoperative CT scan measurements of epidural space depth positively correlated with LOR depth. However analysis suggest the LOR will be greater than the CT scan measured depth. All CT scan measurements were made from sagittal views of a patient lying flat where the angle from skin to epidural space is 90 degrees. Any angle ($\alpha$) in the needle insertion will add depth to the LOR as compared to a straight perpendicular approach. This may account for the difference. The use of CT scans measurements for approximating the epidural space depth prior to epidural placement can be a useful tool to the anesthesia provider.

References:

1. Segal S, Beach M, Eappen S. A multivariate model to predict the distance from the skin to the epidural space in an obstetric population. Reg Anes 1996: (21) 451-455


Funding: This is an unfunded study.
Background and purpose: To characterize clinically meaningful improvements in pain and limitation of key Activities of Daily Living (ADLs) after primary or revision total hip arthroplasty (THA)

Methods: We analyzed prospectively collected data from the Mayo Clinic Total Joint Registry to study clinically meaningful improvements in index hip pain severity and limitation in seven key ADLs (walking, climbing stairs, putting on shoes/socks, picking up objects, getting in/out of car, rising from a chair and sitting), from preoperative to 2- and 5-year post-THA.

Results: The primary THA cohort consisted of 6,168 responders preoperatively, 5,707 at 2- and 3,289 at 5-years. Revision THA cohort consisted of 2,063 responders preoperatively, 2,682 at 2- and 1,627 at 5-years. In primary THA cohort, clinically meaningful pain reduction to mild or no hip pain at 2-years was reported by 94% with moderate and 91% with severe preoperative pain; respective proportions were 91% and 89% for 5-years follow-up. For revision THA, respective proportions were 84% and 77% at 2-years and 80% and 78% at 5-years. In primary THA cohort, up to 4% with moderate and 17% with severe preoperative ADL limitation reported severe limitation in the respective activity 2-years post-primary THA; at 5-years, the respective proportions were, up to 7% and 20%. Respective proportions for revision THA were up to 10% and 26% at 2-years and 13% and 30% at 5-years.

Conclusion: This study provides comprehensive data for clinically meaningful improvements in pain and key 7 ADLs, which can help patients set realistic goals for improvements after THA.
up (n=3), duplicate patient (n=2), and non-malignant pain as the indication (n=9). This left 29 patients for data analysis. Patients first received a diagnostic SHP block then proceeded to SHP neurolysis. A successful procedure was pre-defined as ≥ 50% pain relief persisting for at least 1-month after the neurolysis.

Results: Twenty-nine patients underwent SHP neurolysis. Tables 1 and 2 outline data by demographics and outcomes. Of note, older patients (mean age of 58.9 years, p< 0.04) were noted to have statistically significant positive outcomes. Patients with bladder cancer were 11.4 times more likely to respond to SHP neurolysis (p< 0.036) than other patients. No case of colorectal cancer responded positively to SHP neurolysis (p< 0.04).
### Table 1: Demographic and clinical characteristics of study subjects (N=29)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender, count (%)</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>10 (34.5%)</td>
</tr>
<tr>
<td>Female</td>
<td>19 (65.5%)</td>
</tr>
<tr>
<td><strong>Type of Cancer</strong></td>
<td></td>
</tr>
<tr>
<td>Colon</td>
<td>7 (24.1%)</td>
</tr>
<tr>
<td>Rectal</td>
<td>3 (10.3%)</td>
</tr>
<tr>
<td>Stomach/endometrial</td>
<td>4 (13.8%)</td>
</tr>
<tr>
<td>Cervical</td>
<td>5 (17.2%)</td>
</tr>
<tr>
<td>Ovarian</td>
<td>1 (3.3%)</td>
</tr>
<tr>
<td>Stadler</td>
<td>6 (20.7%)</td>
</tr>
<tr>
<td>Other</td>
<td>7 (24.1%)</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td></td>
</tr>
<tr>
<td>≤ 6 months</td>
<td>6 (20.7%)</td>
</tr>
<tr>
<td>&gt; 6 months</td>
<td>23 (79.3%)</td>
</tr>
<tr>
<td><strong>Stage</strong></td>
<td></td>
</tr>
<tr>
<td>Early (Stage I-II)</td>
<td>10 (34.5%)</td>
</tr>
<tr>
<td>Late (Stage III)</td>
<td>19 (65.5%)</td>
</tr>
<tr>
<td><strong>Metastasis</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>17 (58.6%)</td>
</tr>
<tr>
<td>No</td>
<td>12 (41.4%)</td>
</tr>
<tr>
<td><strong>Daily Epidid Dose</strong></td>
<td></td>
</tr>
<tr>
<td>&lt;180 oral morphine equivalents</td>
<td>12 (41.4%)</td>
</tr>
<tr>
<td>≥180 oral</td>
<td>17 (58.6%)</td>
</tr>
<tr>
<td><strong>Baseline pain score (0-10)</strong></td>
<td></td>
</tr>
<tr>
<td>Mean (standard deviation)</td>
<td>6.9 (2.2)</td>
</tr>
<tr>
<td><strong>Pain Location</strong></td>
<td></td>
</tr>
<tr>
<td>Facial</td>
<td>7 (24.1%)</td>
</tr>
<tr>
<td>Low abdominal</td>
<td>5 (17.2%)</td>
</tr>
<tr>
<td>Perineal/ testis</td>
<td>1 (3.3%)</td>
</tr>
<tr>
<td>Multiple</td>
<td>5 (17.2%)</td>
</tr>
<tr>
<td><strong>Pain Quality</strong></td>
<td></td>
</tr>
<tr>
<td>Receptor</td>
<td>15 (51.7%)</td>
</tr>
<tr>
<td>Mixed</td>
<td>14 (48.3%)</td>
</tr>
<tr>
<td>Neuropathic Only</td>
<td>4 (13.8%)</td>
</tr>
<tr>
<td><strong>Diagnosis Approach</strong></td>
<td></td>
</tr>
<tr>
<td>Single Transversal</td>
<td>8 (27.6%)</td>
</tr>
<tr>
<td>Single Extradural</td>
<td>7 (24.1%)</td>
</tr>
<tr>
<td>Double-Needle</td>
<td>4 (13.8%)</td>
</tr>
<tr>
<td><strong>Neuropsyche Site</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>4 (13.8%)</td>
</tr>
<tr>
<td>No</td>
<td>25 (86.2%)</td>
</tr>
<tr>
<td><strong>Block Volume mean (range)</strong></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>15.0 (5.20)</td>
</tr>
<tr>
<td><strong>Neuropsyche Timing</strong></td>
<td></td>
</tr>
<tr>
<td>Immediate</td>
<td>24 (82.8%)</td>
</tr>
<tr>
<td>Delayed</td>
<td>5 (17.2%)</td>
</tr>
<tr>
<td><strong>Neuropsyche Volume mean (range)</strong></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>15.3 (5.29)</td>
</tr>
<tr>
<td><strong>Neuropsyche Approach</strong></td>
<td></td>
</tr>
<tr>
<td>Single Transversal</td>
<td>17 (58.6%)</td>
</tr>
<tr>
<td>Single Extradural</td>
<td>8 (27.6%)</td>
</tr>
<tr>
<td>Double-Needle</td>
<td>4 (13.8%)</td>
</tr>
<tr>
<td><strong>Outcome of ≥ 50% relief</strong></td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>20 (69.0%)</td>
</tr>
<tr>
<td>Positive</td>
<td>9 (31.0%)</td>
</tr>
</tbody>
</table>
Discussion: We attempted to identify clinical and demographic characteristics associated with a successful outcome in patients undergoing SHP neurolysis for cancer-related pain. Overall, 15 of the 29 patients (51.7%) had a positive outcome as defined by the parameters of this study. The variables found
to be associated with a positive outcome included older age (P = 0.05) and the presence of bladder cancer (P = 0.04). The presence of colorectal cancer was correlated with a negative outcome (P = 0.04).

The presence of bladder cancer was found to correlate to a positive outcome. Until now, there has been no prior study examining the effectiveness of neurolysis stratified based on specific organ tumors. Older patients were also found to have a greater likelihood of experiencing a positive outcome. This relationship has not been previously reported for neurolysis, though it has been shown with regard to older cancer patients' responsiveness to opioids.

Overall, the results of our study show that SHP neurolysis can provide significant prolonged pain relief in patients suffering from cancer-related pelvic pain. Future studies should be performed in a prospective manner, allowing for a more complete and standardized collection of data.

A12
EFFICACY OF PARALLEL VERSUS PERPENDICULAR NEEDLE PLACEMENT TECHNIQUE FOR LUMBAR RADIOFREQUENCY ABLATION FOR TREATMENT OF LUMBAR FACET ARTHROPATHY

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Department of Anesthesiology and Pain Medicine, UCLA Medical Center, UCLA Pain Management Center, Santa Monica, CA, USA

Introduction: Lumbar facet arthropathy is a challenging pain condition that affects up to 15% of patients with chronic low back pain.1 Radiofrequency ablation of the medial branch nerves that innervate the facet joints has been demonstrated to relieve pain in a significant number of patients who have lumbar facet arthropathy.2-5 Two different needle placement techniques have been used to target the medial branch nerves: parallel or perpendicular placement.6,7 This retrospective study attempts to determine if there is a difference in efficacy and outcome between parallel or perpendicular needle placement techniques.

Materials and methods: A retrospective chart review was performed on patients who underwent radiofrequency ablation of the lumbar medial branch nerves from January 2009 to December 2011. The primary outcome measure was the change in pain score as measured by the Visual Numerical Score from post-procedure compared to baseline. Secondary outcome measures included: post-procedure improvement in physical functioning, adverse events, and time to return of pain.

Results: Six hundred and fourteen subjects underwent radiofrequency ablation of the lumbar medial branch nerves during the specified time period. There was no statistically significant difference between groups for change in post-procedure pain score from baseline (p = 0.50). There was no difference between groups for time to return of pain (p = 0.56) or subjective improvement in physical functioning (p = 0.19). Interestingly, the adverse event of neuritis was found to occur more frequently in the parallel group, which was statistically significantly different than the perpendicular group (p = 0.025).

Discussion: This study showed that there was no significant difference in the change of pain score from post-procedure to baseline between the parallel and perpendicular needle placement technique groups. There was also no difference between groups for reported improvement in physical functioning and
time to return of pain. However, the incidence of neuritis was significantly higher in the parallel needle placement group. Further prospective, randomized-controlled clinical trials evaluating the efficacy of needle placement technique for radiofrequency ablation of the lumbar medial branch nerves are warranted.

References:


painful peripheral neuropathy with small fiber involvement (SF-NeP) that is not painful diabetic neuropathy, post-herpetic neuralgia, human immunodeficiency virus-related NeP, etc.

Material and methods: The objective of this study was to characterize pain, health utility, sleep, function, anxiety, depression, and medication utilization in the United States (US) among SF-NeP subjects. This observational, cross-sectional study enrolled 100 SF-NeP subjects recruited during routine visits from general practitioner and specialist sites. Subjects completed a one-time questionnaire; investigators completed a case report form based on 6-month retrospective chart review. The subject questionnaire included the Brief Pain Inventory-Short Form (BPI-SF), EuroQol 5-dimensions (EQ-5D), Medical Outcomes Study (MOS) Sleep Scale, and the Hospital Anxiety and Depression Scale (HADS). The BPI-SF Pain Severity Index score was used to stratify subjects by pain severity using cut-off points established in previous research: mild (0-3), moderate (4-6), and severe (7-10).

Results: Subjects' mean age was 63.5 years, 53% were female, and 16% were employed for pay. The mean BPI-SF pain severity index score was 5.2 (0-10 scale), with 43% and 33% classified as having moderate and severe pain, respectively. The most common comorbidities included sleep disturbance/insomnia (37%), anxiety (34%), and depressive symptoms (33%). 72% of subjects had at least one comorbidity, with an average of 3.3 comorbidities per subject. The mean number of comorbidities increased with greater pain severity (mild: 2.2, moderate: 3.5, severe: 3.7; p = 0.0239). Mean BPI-SF pain-interference index was 5.0 (0-10 scale) with significantly greater interference reported among subjects with greater pain severity (mild: 2.1, moderate: 5.0, severe: 7.1; p < 0.0001). Mean EQ-5D health state utility was 0.59 (-0.11-1; US scale) and declined significantly across pain severity (mild: 0.80, moderate: 0.61, severe: 0.42; p< 0.0001). Mean MOS Sleep Disturbance score was 47.5, and MOS Sleep Problems Index score was 45.1 (0-100 scales, higher scores indicate poorer sleep). These scores were significantly higher (i.e., worse) among subjects with greater pain severity (p< 0.0001). Mean HADS Anxiety and Depression scores were 8.3 and 7.3, respectively (0-21 scale; lower scores indicate less anxiety or depression). Subjects reporting greater pain severity reported significantly higher scores on the HADS Anxiety (p=0.0005) and Depression (p=0.0002) scales. 85% of subjects were prescribed at least one NeP medication, and 20% were prescribed three or more NeP medications. The top three medications classes prescribed were: antiepileptics (52%), strong short-acting opioids (27%), and long acting opioids (20%).

Discussion: SF-NeP subjects exhibited high levels of pain and pain-interference with function, poor health utility, as well as sleep disturbance, depression, and anxiety. Burden increased with pain severity. Medication utilization in SF-NeP was highly prevalent.

A14

CORRELATION BETWEEN CONCORDANT PRESSURE PARESTHESIA DURING INTERLAMINAR LUMBAR EPIDURAL STEROID INJECTIONS AND IMMEDIATE PAIN RELIEF

Kenneth D. Candido1,2, Nebojsa Nick Knezevic , M.D.1,2, Maunak V. Rana1,2, Vinaya Puppala1, Jonathan Kamerlink1, Lalida Chupatanakul1

1Anesthesiology and Pain Management, Advocate Illinois Masonic Medical Center, 2Anesthesiology, University of Illinois, Chicago, IL, USA
Background and objectives: One of the most commonly performed interventional pain management procedures in the United States is lumbar epidural injection (LESI). Our hypothesis was that a pressure paresthesia occurring during the LESI in the same distribution of the radicular pain will give prognostic information. The use of lidocaine in the injected solution may also be an indicator of proper achievement of medication target, thus increasing the likelihood of an improved outcome toward pain resolution.

Methods: One hundred consenting adult patients undergoing LESI for radicular low back pain were prospectively assigned randomly, in single-blind fashion, to one of two groups: Group I (50 patients) - got LESI using midline (MIL) approach, and Group II (50 patients) - got LESI using parasagittal interlaminar (PIL) approach. The patients were asked to confirm whether pressure paresthesia was in distribution of “usual and customary pain” or it was distinct from “usual and customary pain”. They were also asked to grade a pressure paresthesia on the scale from 0 to 3 (0= no paresthesia, 1=mild, 2=moderate and 3= severe paresthesia) ipsilaterally and contralaterally. The pain scores (on the 11-point numeric rating scale [NRS] were recording at rest and during movement 20 minutes before and 20 minutes after procedure. Statistical analysis was performed using SPSS software (SPSS 15.0, Chicago, IL). A p value less than 0.05 was considered to be statistically significant.

Results: There was no statistically significant difference between these two groups with respect to age, gender, height, weight or duration of symptoms (p>0.05) (Table 1). Most of the patients with PIL approach had pressure paresthesia in the distribution of usual and customary pain (88%), and only 38% of patients from MIL group (p<0.001) (Table 2). Most of the patients from PIL group felt moderate to severe paresthesia ipsilaterally (36 out of 50), and only three patients had no paresthesia. However, in the MIL group most of the patients had either no paresthesia or mild paresthesia (35 out of 50), and only five of them had severe paresthesia. The difference between these two groups was highly statistically significant (p<0.0001) (Table 2). In the PIL group 84% of patients, and 52% in the MIL group did not have contralateral paresthesia (p=0.008) (Table 2). Our results also showed correlation between pressure paresthesia occurring during the LESI in the same distribution of the radicular pain with immediate pain relief p=0.033.

Table 1. Demographic Characteristics of Patients

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Midline</th>
<th>Parasagittal</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>50±14</td>
<td>47±14</td>
<td>0.346</td>
</tr>
<tr>
<td>Gender Male/Female</td>
<td>22/28</td>
<td>24/26</td>
<td>0.557</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>164±25</td>
<td>168±9</td>
<td>0.218</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>78±20</td>
<td>84±20</td>
<td>0.164</td>
</tr>
<tr>
<td>Duration of Symptoms</td>
<td>17±24</td>
<td>12±21</td>
<td>0.119</td>
</tr>
</tbody>
</table>

(Table 1)
Table 2. Pressure Paresthesia during LESI

<table>
<thead>
<tr>
<th>Pressure Paresthesia</th>
<th>Midline</th>
<th>Parasagittal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution of “usual and customary pain”</td>
<td>19</td>
<td>44</td>
</tr>
<tr>
<td>Distribution distinct from “usual and customary pain”</td>
<td>31</td>
<td>6</td>
</tr>
<tr>
<td><em>p value &lt; 0.001</em></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**IPSILATERAL**

<table>
<thead>
<tr>
<th></th>
<th>Midline</th>
<th>Parasagittal</th>
</tr>
</thead>
<tbody>
<tr>
<td>No paresthesia</td>
<td>25</td>
<td>3</td>
</tr>
<tr>
<td>Mild paresthesia</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Moderate paresthesia</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td>Severe paresthesia</td>
<td>5</td>
<td>21</td>
</tr>
<tr>
<td><em>p value &lt; 0.001</em></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CONTRALATERAL**

<table>
<thead>
<tr>
<th></th>
<th>Midline</th>
<th>Parasagittal</th>
</tr>
</thead>
<tbody>
<tr>
<td>No paresthesia</td>
<td>26</td>
<td>42</td>
</tr>
<tr>
<td>Mild paresthesia</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Moderate paresthesia</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>Severe paresthesia</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td><em>p value = 0.008</em></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conclusion: Pressure paresthesia occurring during the LESI in the same distribution of the radicular pain and could be used as an indicator of proper achievement of medication target, thus increasing the likelihood of an improved outcome toward pain resolution.
Background and objectives: Lumbar epidural steroid injections (LESI) are one of the most commonly performed interventional pain management procedures in the United States, even though there are very limited evidence for efficacy, especially, for long-term improvement in pain and functionality. Midline interlaminar (MIL) and parasagittal (PIL) approach for LESI are two accepted treatments in the conservative care of low back pain with radiculopathy secondary to lumbar disk disease. However, there is no much data regarding the long-term pain improvement, everyday functionality and quality of life after LESI. The purpose of this study is to evaluate the effect of two different approaches (midline and parasagittal) of interlaminar LESI on long-term pain relief and quality of life improvement.

Methods: After Advocate Healthcare IRB approval of the protocol, written informed consent was obtained from 84 adult patients scheduled to undergo LESI for radicular low back pain. All patients received 120 mg (2mL) of methylprednisolone acetate along with 1mL of normal saline solution and 1mL of lidocaine 1%. This was a single-blinded randomized study. The patients were randomly assigned to one of two groups, based on the approach: group I (42 patients) - got LESI using midline (MIL) approach, and Group II (42 patients) - got LESI using parasagittal interlaminar (PIL) approach. All patients were followed up for six months. All patients completed the Oswestry Low Back Pain questionnaire before injection and monthly up to six months after injections. This questionnaire has been designed to give the information how the patients' back pain has affected their ability to manage in everyday life. The sections concern impairments like pain, and abilities like personal care, lifting, walking, sitting, standing, sleeping, social life, sex life and traveling. Statistical analysis was performed using SPSS software (SPSS 15.0, Chicago, IL). A p value less than 0.05 was considered to be statistically significant.

Results: Our results showed that there was no difference between these two groups with respect to age, gender, height, weight or duration of symptoms (Table 1).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Midline</th>
<th>Parasagittal</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>51±2</td>
<td>49±2</td>
<td>0.494</td>
</tr>
<tr>
<td>Gender Female/Male</td>
<td>25/17</td>
<td>23/19</td>
<td>0.516</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>164±5</td>
<td>168±2</td>
<td>0.352</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>77±3</td>
<td>83±3</td>
<td>0.106</td>
</tr>
<tr>
<td>Duration of Symptoms (months)</td>
<td>12±3</td>
<td>14±4</td>
<td>0.728</td>
</tr>
</tbody>
</table>
There was also no difference in the basal Oswestry Low Back Pain (OLBP) score between the PIL and MIL group (20.42±1.24 vs. 19.29±1.51). Both groups showed improvement in their everyday activities and quality of life up to four months (Figure 1).

At the six month the OLBP score was significantly lower in the parasagittal group (p=0.045) showing better quality of life and everyday functionality than in midline group. The patients from midline group received the second LESI 5.08±.0.73 weeks, and patients from parasagittal group 11.26±2.46 weeks after the first injection (p=0.029).

Conclusion: Even though both groups of patients had improvement in their quality of life and everyday functionality, our results have showed that parasagittal approach was more effective in the long-term pain relief and quality of life improvement than the midline approach in patients with unilateral lumbosacral radiculopathic pain.
RADIOFREQUENCY ABLATION FOR FACET ARTHROPATHY: INFLUENCES AND OUTCOMES

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Objectives: To determine the association between age and:

1. The sensory stimulation required for Radiofrequency Ablation (RFA)
2. Time between RFA treatments, as an indication of the Duration of efficacy of RFA.
3. Visual Analogue Scale (VAS) score.
4. The voltage used for each RFA.
5. RFA treatments for either sex.

Background data: RFA is an effective but temporary management of lumbar facet pain. Repeated RFA treatments are an effective long-term palliative management of lumbar facet pain. Adequate coagulation of the target nerves can be achieved by carefully placing the electrode in correct position as judged radiologically.

Methods: We reviewed the records of 47 patients who had presented to our Pain Clinic between August 2002 and Sept 2009, and underwent two or more RFA treatments. The patients ranged from 38 to 92 years, with a mean of 56.5 +/- 12.2. As per our Pain Clinic Protocol, the patients call when they have a recurrence of pain to previous baseline, and are scheduled within two weeks for a repeat RFA.

Results:

1. Age Associations

There was no significant association between age and VAS score, but it appears that a higher voltage may be required with increasing age (r=0.34, p=0.020) for L4 at baseline. The other two baseline voltages had positive correlations with age, but these were not statistically significant (r=0.21, p=0.163 and r=0.18, p=0.250, for L3 and L5, respectively).

2. VAS

The average VAS score ranged from 6.0 to 7.2, but there was no statistical difference by RFA number (RMANOVA p=0.375) or by Wilcoxon signed rank tests.

3. Voltages

All the voltages increased at between one or two of the first four treatments, but then the voltages administered remained statistically constant.

4. Time between Treatments
The average times between treatments ranged from 18 to 47 weeks, but there was no statistically significant difference with increasing age by RMANOVA (p=0.959) or by Wilcoxon signed rank tests.

5. Sex Associations

No statistically significant difference for RFA treatments was observed with aging in either sex.

Conclusions: Our results show that the voltage required for RFA may increase with increasing age. The voltage increase was statistically significant for L4, and had a positive correlation, though not statistically significant for L3 and L5. Also, a higher sensory stimulation is required for repeat RFA. However, there was no significant difference in the VAS or the duration of efficacy/time between treatments with increasing age. No statistically significant difference for either sex was observed with increasing age.
A17
INCREASING THE NaCL CONCENTRATION OF THE PREINJECTED SOLUTION ENHANCES LESION SIZE

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¹Institute for Pain Diagnostics and Care, Ohio Valley General Hospital, McKees Rocks, ²Department of Physical Therapy, Duquesne University, Pittsburgh, PA, USA

Introduction: Radiofrequency (RF) is used to treat facet joint pain. Because pain reduction requires the ablation of small nerves, manipulating RF delivery to augment lesion size has been investigated. Manipulating the duration of RF application, electrode temperature, and tip size are known to alter lesion size, and recently it was demonstrated that pre-injecting 0.9% NaCl increases lesion size.¹ It is
unknown if other concentrations of NaCl would increase the size of lesions produced. The purpose of the study was to examine the effects of increasing NaCl concentration on monopolar RF lesions.

Materials and methods: Monopolar RF at 80° C for 90 seconds was performed with ex vivo chicken samples. Eleven groups, each with 10 samples, were used. Seven groups were used to investigate the preinjection (0.74 mL) of different NaCl concentrations (0.7%, 0.9%, 3%, 8%, 13%, 18%, or 23.4%). 1% lidocaine in 0.7% NaCl, and two nonionic fluids (water and D5W) were also investigated. The final group received no fluid preinjection. The horizontal diameter (Dh), vertical diameter (Dv), maximal effective radius (Mer) and distal radius (T) of the lesion from the tip of the electrode were each measured in millimeters. Shape (Dh/Dv) and overall surface area (\(\pi/4[Dh \times Dv]\)) were calculated. Impedance and power values were measured.

Results: When compared to no fluid injection, preinjection of D5W, but not water, increased the mean area of lesion by 57% (p=0.012; Fig. 1A). This increase was primarily confined to the Dh parameter, which was increased by 47% (p< 0.001; Fig. 1B). Water also increased mean Dh over no fluid by 35% (p=0.012), and both D5W and water significantly increased mean Mer, but not T, by 57% (p=0.002) and 50% (p=0.020), respectively.

The addition of NaCl to preinjected fluid alters mean lesion attributes beyond that observed with nonionic fluids. 0.7% NaCl increased the mean area of lesion over that seen with preinjected water by 29% (p=0.012), and this increase enlarged as NaCl concentrations were elevated. Preinjection of 23.4% NaCl produced a 154% (p< 0.001) increase over water in mean area lesioned and this area was larger than that produced by any other concentration examined (p=0.002 - p< 0.001) except 18%. Similar increases in Dh and Dv were observed with higher concentrations of NaCl, with less profound increases noted in Mer and T. Mean T was extended by a full 1.9 mm over the mean T produced by water (0.45mm; 95% CI = 0.19-0.71).

Increasing the NaCl concentration to 0.7% and above resulted in a significant reduction in the impedance and an increase in the power (watts) output (Fig. 2).

Discussion: Preinjected fluid increases RF lesion size, and increasing NaCl concentration significantly augments this effect. In part, NaCl may produce larger lesions as a result of reduced impedance and increased power. Preinjected fluid strategies with increasing NaCl concentrations should be considered when enhanced lesions are desired and warranted.
**Figure 1**: Mean Calculated and Measured Lesion Parameters for Control and NaCl Solutions

**Panel A**: Symbols represent the mean calculated lesion parameter measurements for each fluid condition. Dv/Dv indicates the shape of the coagulation zone. Dv/Dv is plotted as a ratio and calculated area is plotted as mm². The coefficient of variation is plotted above each mean area measurement.

**Panel B**: Symbols represent the mean lesion parameter measurements for each fluid condition. Lesion measurements are plotted in millimeters. Mer represents maximal effective radius.

[Figure 1A and 1B]
Figure 2: On the top portion of the figure, bars represent the average power (watts) measured across all time points for each fluid condition. On the lower portion of the figure, bars represent the average percent change in impedance from after fluid injection across all time points for each fluid condition. * indicates significant difference from water. † indicates significant difference from dextrose. ‡ indicates significant difference from lidocaine.
THE EFFECTS OF THE PREINJECTION OF FLUID ON TIME TO OPTIMAL LESION WITH MONOPOLAR RADIOFREQUENCY

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Introduction: The clinical recommendation for the duration of radiofrequency (RF) delivery has been based on research using a no fluid study design. When no fluid is preinjected, the majority of lesion growth occurs during the first 30 seconds with maximal size achieved by 90 seconds. Because preinjecting fluids of diverse compositions differentially increases RF lesion size relative to no fluid, we suspected preinjecting the same compositions might also differentially influence the growth of the lesion over a set time cycle. The purpose of this study was to determine the influence of preinjecting fluids of different compositions on the relationship between duration of RF and lesion size.

Materials and methods: Monopolar RF lesioning at 80°C for 180 seconds was performed in ex vivo chicken samples without fluid preinjection (control) or with 0.74 mL of fluid preinjected (n = 10 per group). The preinjected fluids were water, 6% hydroxyethyl starch (HES), 1% lidocaine in 0.7% NaCl, 0.7% NaCl, 3% NaCl, 8% NaCl, and 23.4% NaCl. The horizontal diameter (Dh), vertical diameter (Dv), effective radius (Er) and distal radius (T) of the lesion from the tip of the electrode were each measured in millimeters at 10 second time intervals. The overall surface area (pi/4*[Dh*Dv]) and efficiency index (surface area/lesion time) were calculated. The optimal RF duration for each parameter was determined by locating the first time point in the lesion cycle where the measurement was not significantly different from the largest obtained measurement. Alpha was 0.05.

Results: Although the largest surface area of lesion for all groups occurred at 180 seconds, the average size of lesion associated with each fluid group was 31-124% larger than that observed in the no fluid condition (p< 0.001). Regardless of group, the size of the lesion occurring at 180 seconds did not differ from that produced at 90 seconds (Fig. 1), but did differ from the lesions produced at 80 seconds or lower (p< 0.042-0.001). While the development of optimal RF duration for Er and Dh occurred at 90-100 seconds for all groups, Dv and T occurred at 10 seconds after 80°C was achieved. The rate of change in lesion size differed between the groups. The preinjection of any fluid resulted in improved efficiency indices in comparison to the no fluid group (Fig. 2; p< 0.001). Increasing the NaCl concentration to 0.7% and above (p< 0.001) resulted in an improvement in the mean lesion cycle efficiency index by 102% to 252%. When comparing 0.7% NaCl to 0.7% NaCl combined with lidocaine, lidocaine decreased the rate of lesion growth over time (Figs. 1 and 2).

Discussion: Regardless of the pre-injected fluid or lesion attribute, maximum lesion size occurs within the first 100 seconds. However, the preinjection of fluid improves the efficiency index, allowing the ablation of a defined area in a shorter period of time.
Optimal Radiofrequency Lesion Time Duration

Statistically maximum mean surface area achieved for lidocaine (the presumed standard injectate), NaCl concentrations 3% and above reached the maximum surface area achieved with lidocaine by at least the 10 sec time point.

Time of significant difference from largest lesion, $p=0.042$

Figure 1: Plot of lesion surface area for each condition over the RF duration cycle. The maximum lesion occurred at 180 seconds for all the groups. The dotted vertical black line indicates the first statistically significant difference from the largest lesion within a group. For all time points to the right of this line (90 to 180 secs) no differences exist in surface area measurements within a specific group.

[Figure 1]
Figure 2: Plot of the efficiency index (surface area/time point for each group) over the lesion cycle. A higher value indicates a greater area of coagulation during that portion of the time cycle.

Last time point where all of the NaCl concentrations 3% and above differ significantly (p<0.001) from the mean efficiency index produced with lidocaine (the presumed standard injectate).
A ROLE IN PAIN CLINICS FOR MEDICATION MONITORING, GENETIC ADDICTION RISK ASSESSMENT AND KB220Z ACTIVATION OF DOPAMINERGIC REWARD CIRCUITRY


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Introduction: Resting state functional abnormalities of the orbitofrontal cortex with impairments that could negatively impact decision-making and inhibitory control were found in heroin-dependent individuals following withdrawal. Zijlstra et al. found opiate-dependent subjects, compared to controls, had lower baseline D2R availability in the left caudate nucleus and D2R availability in the putamen correlated negatively with years of opiate use. They also demonstrated higher dopamine release after cue-exposure in the right putamen. DA release was positively correlated with chronic craving and anhedonia. Treatment strategies that monitor for addiction risk, compliance and drug abuse during active treatment coupled with increased D2Rs may be an approach to prevent relapse and opiate addiction.

Methods: With IRB approval of Beijing Medical School and PATH Foundation NY, New York, to this aim: we evaluated the role of KB220Z on reward circuitry in a triple blinded - randomized placebo controlled cross-over study of five heroin addicts undergoing protracted abstinence [average 16.9 months]. After a literature review we conducted a pilot study for genetic severity in nine heroin dependent patients (HDP) and calculated the percentage prevalence of eight prominent risk alleles to
provide an arbitrary severity score. These scores were converted to a fraction and represented as a Genetic Addiction Risk Score (GARS). Comprehensive Analysis of Reported Drugs (CARD) was used retrospectively to evaluate for both compliance and drug abuse during addiction recovery across six eastern states.

Results: We report that one-hour post administration compared to placebo KB220Z; induced a BOLD activation of caudate-accumbens dopaminergic pathways, reduced the higher dopaminergic activity in the putamen (figure 1) and in ten subjects three brain regions of interest (ROIs) were found to be activated from resting state ($P < 0.05$). Using GARS it was determined that 67% of the Chinese HDP were at moderate-to-high risk for addictive behavior, 56% carried the DRD2 A1 allele (5/9) and HDP entering residential treatment carry at least one risk allele (100%). Based on 11406 specimens from 5,703 patients using CARD, we found that 71% of recovering addicts did not comply with their prescription medications and 51% of the addicts were not abstinent. In Opiate Treatment Programs whereas 82.3% of patients were compliant only 52.9% were abstinent, as measured by the last urine sample.

![Figure 1.](image-url)

Discussion: These fMRI results tied to earlier qEEG results suggest a putative anti-craving/anti-relapse role for KB220Z by direct or indirect dopaminergic interaction. We will report on a subsequent analysis utilizing GARS and the Addiction Severity Index - Multimedia Version (ASI-MV) and Screener and Opioid Assessment for Patients with Pain (SOAPP) in pain clinics to evaluate genetic risk for Reward Deficiency Syndrome (RDS) in patients presenting with pain, with and without associated RDS behaviors. Based on these, other published data and required new studies, we are proposing a
novel neuro-therapeutic approach incorporating; genotyping pain patients at entry for opiate addiction risk, monitoring for compliance and abuse with CARD and pharmacogenomic support with KB220Z (D2 agonist) to increase “dopamine sensitivity.

A20
EFFICACY AND SAFETY OF ORAL TAPENTADOL EXTENDED RELEASE (ER) FOR THE MANAGEMENT OF MODERATE TO SEVERE, CHRONIC MALIGNANT TUMOR-RELATED PAIN

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Introduction: This randomized-withdrawal, double-blind phase 3 study (NCT00472303; approved by Ethics Committee) evaluated the efficacy and safety of tapentadol ER, a centrally-acting analgesic with 2 mechanisms of action (µ-opioid receptor agonism and norepinephrine reuptake inhibition), compared with morphine controlled release (CR) or placebo in patients with moderate to severe, chronic malignant tumor-related pain.

Methods: Eligible patients (pain intensity score ≥5 [0-10 NRS]) were randomized (2:1) and titrated to their optimal dose (balancing pain relief and tolerability) of tapentadol ER (100-250 mg bid) or morphine sulfate CR (40-100 mg bid) during a 2-week titration period. Patients rated their current pain intensity (NRS) twice daily. Morphine sulfate immediate release 10mg was permitted as needed as rescue medication during the study. Patients completing the titration period with a mean pain intensity score < 5 and mean rescue medication use of ≤20mg/day during the last 3 days of titration continued to a 4-week maintenance period; patients who received morphine CR during titration continued taking morphine CR and those who received tapentadol ER were re-randomized (1:1) to tapentadol ER or placebo bid. Response during maintenance (primary efficacy endpoint) was defined as having: 1) completed ≥28 days, 2) a mean pain intensity score < 5 during maintenance, and 3) used an average of ≤20mg/day of rescue medication during maintenance. Response at the end of titration was defined similarly, with pain intensity and rescue medication averages based on the last 3 days of titration. Treatment-emergent adverse events (TEAEs) were documented.

Results: Of 622 patients screened, 504 were randomized and treated in the titration period and 327 were re-randomized and treated in the maintenance period. Median modal daily doses of tapentadol ER and morphine CR were 300mg and 120mg, respectively. The responder rate during maintenance was 61.9% (65/105) in the tapentadol ER group and 49.5% (55/111) in the placebo group (odds ratio, 2.02 [95% confidence interval [CI], 1.12-3.65]; P=0.02, logistic regression adjusting for baseline and pooled centers). Based on responder rates at the end of titration, tapentadol ER (76.0% [174/229]) demonstrated non-inferior efficacy compared with morphine CR (83.0% [83/100]) in the per-protocol population. The lower limit of the 95% CI for the between-groups difference (−15.5%) was within the prespecified 20% non-inferiority margin. TEAE incidences during titration were 50.0% for tapentadol ER (n=338) and 63.9% for morphine CR (n=158); numerical differences were noted for gastrointestinal TEAEs (tapentadol ER, 29.6%; morphine CR, 46.8%). During maintenance, TEAEs were reported by 56.3%, 62.3%, and 62.4% of patients in the placebo (n=112), tapentadol ER (n=106), and morphine CR
groups (n=109), respectively.

Discussion: Tapentadol ER (100-250mg bid) was efficacious for managing moderate to severe, chronic cancer-related pain. During titration, the analgesic efficacy of tapentadol ER was non-inferior to that of morphine sulfate CR (40-100mg bid) and tapentadol ER was associated with better gastrointestinal tolerability. The ratio of modal doses for tapentadol ER to morphine CR was consistent with previously observed equipotency ratios.¹

Reference: ¹Steigerwald et al. ASRA 2011, abstract A027.

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A21
ANALGESIC EFFICACY OF KETOPROFEN VS IBUPROFEN AND DICLOFENAC: A SYSTEMATIC REVIEW OF THE LITERATURE AND META-ANALYSIS

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Introduction: The management of mild-to-moderate pain has traditionally been based on the use of non-steroidal anti-inflammatory drugs (NSAIDs) and the synthetic non-opioid analgesic paracetamol (acetaminophen), both of which are effective, widely recommended, and extensively used. The published placebo-controlled randomised clinical trials (RCTs) do not allow direct comparisons of the various NSAIDs, but meta-analyses can be considered a valid tool to make indirect comparisons demonstrating similar (but not identical) drug efficacy.

The aim of this systematic review of the literature and meta-analysis of randomised controlled trials (RCTs) was to compare the efficacy of orally administered ketoprofen vs ibuprofen and/or diclofenac, that are the most used NSAIDs in the last 30 years. These NSAIDs were chosen because they are the most frequently prescribed for treating pain, and the outcomes were chosen because seem to be the most clinically relevant for these.

Methods: The literature was systematically reviewed and search was restricted to randomised clinical trials comparing the efficacy of oral ketoprofen (50-200 mg/day) vs ibuprofen (600-1800 mg/day) or diclofenac (75-150 mg/day) published until June 2011 in the Medline, Cochrane Central and Embase databases. The study selection was made independently by two rheumatologists in accordance with the Cochrane Collaboration guidelines.

Results: A total of 13 RCTs involving 898 patients met the inclusion criteria: eight ketoprofen vs ibuprofen and five comparing ketoprofen vs diclofenac. Nine of the 13 RCTs included 544 patients with systemic rheumatic diseases such as RA, OA, ankylosing spondylitis (AS), low back pain or painful shoulder. The difference in efficacy between ketoprofen and ibuprofen/diclofenac was statistically significant (0.459, 95% CI 0.33-0.58; P=0.00) at all point-estimates of the mean weighted size effect (Fig 1).
Concerning the estimated efficacy outcomes, ketoprofen was superior to ibuprofen/diclofenac in all of the 13 RCTs, reaching a statistically significant difference ($P < 0.05$) in nine studies. The test of heterogeneity for the efficacy outcome was not statistically significant ($\chi^2 = 18.07$, df = 12, $P =$…

**Figure 1:** the size effect of ketoprofen and ibuprofen/diclofenac.

[Fig. 1]
0.1136), meaning that it was not different across the studies, guaranteeing, in this way, that the compared trials are homogeneous and the meta-analysis results reliable and valid.

Taken together, the results of this meta-analysis showed that the effect of therapeutic doses of ketoprofen was strongly greater than the effect of therapeutic doses of ibuprofen or diclofenac.

Conclusion: Findings of this meta-analysis support strong recommendation that the efficacy of orally administered ketoprofen in relieving moderate-severe rheumatic pain and in improving functional status and general conditions is significantly better than that of diclofenac/ibuprofen.

A22
EFFECT OF A118G POLYMORPHISM ON OPIOID DEPENDENCE
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Introduction: Dependence to opiates is a persistent and progressive syndrome. Genetic factors in its etiology are associated with pathophysiologic mechanisms on reward pathways. There are several neurotransmitters and receptors on reward pathways. The opiate receptor mediates the action of opioid and the A118G polymorphism is candidate gene for studies of opiate dependence. The aim of our study was to examine whether µ-opiate receptor gene (OPRM1) polymorphism was associated with opioid dependence in Turkish population.

Material and methods: 103 opioid dependents were included in the study to evaluate the association of variants with dependence. 83 healthy volunteers with similar demographic features were included as a control group. Ten milliliters of peripheral blood was collected in a sterile EDTA container via venipuncture from each subject to determine A118G gene polymorphisms by Polymerase chain reaction-restriction fragment length polymorphism.

Results: A statistically significant difference (p=0.027) was observed on genotype frequencies between dependent (32.0%) and control group (16.9%). G allele in Dependent Group was 16.1% and 8.4% in Control Group. The difference between groups was significant p=0.040.

Discussion: In conclusion, there was a significant association between OPRM1 A118G gene polymorphisms and opioid dependence. However, further studies with combination of several SNP are required for clinical management of opioid dependent patients.

References:


A23

RATE OF CROSSOVER TO PROBLEMATIC OPIOID USE AND ASSOCIATED COSTS AMONG OPIATE ANALGESIC-TREATED CHRONIC PAIN (NON-CANCER) PATIENTS WITHIN A COMMERCIALLY INSURED POPULATION

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Introduction: The incidence of ICD-9 diagnosed opioid dependence among opioid analgesic treated (OAT-CP) chronic pain patients ranges between 3-5% but may be as high as 50% when considering factors indicative of problematic opioid use. The purpose of this study was to estimate the incidence of problematic opioid use among a commercially insured OAT-CP patient population using proxies of problematic opioid use and opioid addiction diagnosis codes.

Materials and methods: Aetna enrollees (2009-2011) with ≥3 medical claims with a primary diagnoses of chronic pain and/or lower back pain, osteoarthritis or diabetic peripheral neuropathy over 3 months and 90+ days supply of opioids were selected. Patients were required to be continuously eligible for 6-months prior to and 12 months following the index event (diagnosis code/first opioid prescription). The final sample (n=4,254) was grouped according to problematic opioid use status: opioid addiction diagnoses present (addiction), problematic opioid use present (POU) (presence of either multiple opioid prescribers and/or rapid opioid dose escalation), or reference group (no addiction). We report the percentage of patients identified as “crossing over” to addiction or problematic opioid use as determined by group affiliation (addiction and POU groups), describe and compare across groups using ANOVA and independent sample t-tests on pre-and post-index values for demographics, risk factors (for addiction), comorbidities, healthcare service utilization and costs.

Results: The rate of cross-over to problematic opioid use was 44%. Of the 4,254 patients comprising the study sample, 2364 (55.6%) were in the no addiction group, 1654 (38.8%) in the POU group, and 236 (5.5%) in the addiction group. The addiction group was the youngest (42.1 years) and the no addiction group the oldest (48.6 years) (F(2,4252)=59.80 p< .001). Compared to the no addiction group, the addiction group had significantly more opioid fills during the pre-period (F(2,4252)=11.38, p< .05), and both the addiction group and POU groups had a significantly greater number of opioid fills in the post-period (F(2,4252)=95.18, p< .001). The POU group had a greater number of total prescription medication fills than both comparator groups (F(2,4252)=11.68, p< .001). A statistically significant main effect was seen for hospital admissions (F(2,4252)=18.60, p< .001), with the POU group utilizing more hospital admissions than the no addiction group (p< .001). Finally, the number of physician visits differed between groups (F(2,4252)=22.51, p< .001) with the addiction group and POU group utilizing more than the no addiction group.

Discussion: The rate of OAT-CP patients diagnosed with opioid dependence confirm previous findings (≤ 5%), however; over a third of the study sample evidenced problematic opioid use. While the POU group was similar to the no addiction group in the pre-period, it behaved analogous to the addiction
group during the post-period. Illness and service utilization indicators were significantly higher for the addiction and POU groups compared to the no addiction group, while the POU group had the highest total cost of care. Broadening the criteria for identifying problematic opioid use may have value to health plans and providers interested in improving outcomes and containing costs among this population.

A24

COSTS OF CARE FOR BACK AND NECK PAIN IN A PREDOMINANTLY RURAL INSURED EMPLOYEE POPULATION

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Introduction: Using data from employees of predominantly rural electrical cooperatives, to determine the economic burden of back and/or neck pain with or without neuropathic features.

Materials and methods: A large employee benefits trust provided HIPAA-compliant, de-identified medical and pharmacy claims data covering 01/2007-09/2011. The sample contained 51,125 employees with an average of 3.35 years of claims eligibility. Claims for the relevant diagnoses were identified and organized into episodes classified as either: 1) back and/or neck pain with neurologic or radiating pain (b/n neuro) or back and/or neck pain with no neurologic or radiating pain (b/n). A new treatment episode began the date on which an employee had ≥1 qualifying pain-related claims (the "index claim") before and after ≥6 months had passed without a qualifying pain claim. For comparison purposes, a group of random index claims was selected from the file (allowing an employee to appear once). All cost analyses excluded claims related to cancer diagnoses. Incurred claims costs (the allowed amounts adjusted for inflation to January 2012) for each type of episode were aggregated for the one year interval starting with index claim. To assess the relative magnitude of the back and/or neck pain claims costs, expected claims costs for similar employees without back and/or neck pain were modeled and compared with incurred claims costs. Modeling used the RAND Health Insurance Experiment methodology, which accounts for the cost of large low probability claims. For each claim group (b/n neuro, b/n, and random), we estimated the expected medical and pharmacy costs based on two different models: age and gender only; and age/gender, prior claims costs, and AHRQ CCS comorbidities from the year preceding the index date.

Results: A total of 4,920 b/n neuro new treatment episodes occurred among 4,032 employees (mean age 46.7; 69% male; incidence rate 1.6%/yr.) and 12,318 b/n episodes occurred among 9,051 employees (mean age 45.9; 70% male; incidence rate 5.8%/yr.). The random claimant group included 37,171 treatment dates for the same number of employees (mean age 45.9; 73% male). In the first year, average estimated medical costs were $17,538 for b/n neuro, $15,042 for b/n and $9,522 for the random treatment group. Average pharmacy costs were, respectively, $1,792, $1,904 and $1,586. Estimated medical costs based on age and gender were $7,908 for b/n neuro, $7,677 for the b/n, and $7,985 for the random group. Estimated pharmaceutical costs were $1,452, $1,396 and $1,405, respectively. Estimated medical costs based on the more comprehensive models were $9,828 for b/n neuro, $9,567 for the b/n, and $8,112 for the random group. Estimated pharmaceutical costs were $1,662 for the b/n neuro, $1,786 for the b/n, and $1,510 for the random group.
Discussion: Compared to the costs of care for employees without pain-related diagnoses, the first-year medical costs associated with back and/or neck pain were much higher than expected. First-year pharmacy costs were only modestly higher than expected. In a rural population, care for pain-related conditions, especially with neuropathic involvement, imposes a relatively large economic burden.

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A25
RISK OF OPIOID SHOPPING BEHAVIOR: A COMPARISON OF TWO OPIOIDS IN A LARGE NATIONWIDE PRESCRIPTION DATABASE

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Introduction: In recent years, opioid abuse and diversion have been highlighted as public health concerns, and increasing efforts are underway to understand the magnitude and nature of the problem. Obtaining opioid prescriptions from multiple prescribers and pharmacies, known as doctor and pharmacy shopping, are believed to be indicators of opioid abuse and diversion. Tapentadol, a recently approved opioid, has both an opioid and a non-opioid mechanism of action. This could make it less likely to be abused than traditional opioids. The purpose of this study was to compare the risk of shopping behavior between tapentadol immediate release (IR) and oxycodone IR.

Materials and methods: Retrospective cohort study using the IMS LRx database, which covers 65% of all retail dispensings in the US including cash transactions. Opioid-naive subjects who filled a prescription for tapentadol or oxycodone from 07/2009-12/2010 were followed for 1 year from the date of the first dispensing (index date). Tapentadol and oxycodone subjects were matched by zip code of the pharmacy dispensing the opioid, specialty of prescriber, age of subject, and index date. The main outcomes were (a) the proportion of subjects who developed shopping behavior, defined as a subject having opioid prescriptions written by ≥1 prescriber with ≥1 day of overlap and filled at ≥3 pharmacies, and (b) the proportion of subjects who developed heavy shopping behavior, defined by having ≥5 shopping episodes during the 1 year follow-up. Conditional logistic regression models were built to compare the risk of shopping behavior adjusted by gender and prior benzodiazepine use.

Results: A total of 112,821 subjects were exposed to oxycodone, 42,940 to tapentadol. Shopping behavior was seen in 0.8% of the subjects in the oxycodone group and in 0.2% of the subjects in the tapentadol group, for an adjusted odds ratio (OR) of 3.6 (95% CI, 2.9 to 4.5). Heavy shopping behavior was also higher in the oxycodone group (0.07%) than in the tapentadol group (0.01%). The adjusted risk of heavy shopping was 6.9 (95% CI, 2.5 to 16.3). Among shoppers, the mean number of events (± Standard Deviation) was 2.1± 2.6 in the oxycodone group and 1.8 ± 1.9 in the tapentadol group. In the oxycodone group, 28.0% of the shopping events involved exclusively oxycodone, but in the tapentadol group, 0.6% of the shopping events involved exclusively tapentadol. In the oxycodone group, 11.1% of the shopping events did not include oxycodone, but in the tapentadol group, 69.1% of the shopping events did not include tapentadol.

Discussion: The risk of shopping behavior, including heavy shopping, was substantially lower with
tapentadol than with oxycodone. Subjects exposed to tapentadol were less likely to shop, developed shopping behavior later, and had fewer shopping episodes than oxycodone subjects. This study is an observational study and its findings should ideally be confirmed with a randomized controlled trial. The lower risk of shopping behavior of tapentadol may be due to its dual mechanism of action and relatively low affinity for the mu receptor.

Funding: Janssen Scientific Affairs, LLC.

A26

A RANDOMIZED, PLACEBO-CONTROLLED TRIAL OF INTRADISCAL BIACUPLASTY (IDB) FOR TREATMENT OF DISCOGENIC LOWER BACK PAIN

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Introduction: Low back pain (LBP) is one of the most common causes of disability in western civilization, affecting approximately 80% of Americans at some point in their life [1-2]. Discogenic pain, arising from the internal disruption of the intervertebral discs, accounts for the majority of chronic LBP cases [3]. A more recently developed minimally invasive procedure, referred to as intradiscal biacuplasty (IDB), involves the use of two cooled radiofrequency (RF) electrodes placed on the postero-lateral aspect of the intervertebral annulus fibrosus, to ablating neo-innervated area acting as a potential pain generator. Although the available evidence for IDB is positive and suggests to benefit patients with chronic discogenic back pain, these studies are limited to small, uncontrolled case series [4-8].

Materials and methods: This study is the first to compare the effects of IDB treatment to that of placebo in a double-blinded randomized controlled fashion. Follow-ups were conducted at 1-, 3- and 6-months. Patients and research coordinators were blinded to randomization. 64 subjects were enrolled and 59 were treated: 29 randomized to IDB and 30 to Sham. All subjects had a history of chronic low back pain for longer than 6-months. Two cooled radiofrequency (RF) electrodes placed in a bipolar manner in affected discs to ablate the nociceptive fibers of the annulus fibrosus. The sham procedure was identical to the active treatment except probes were inserted into the subcutaneous tissue and stopped short of entering disc space and RF energy was not actively delivered.

Results: The primary outcome measures were improvements of physical function, reduction of pain and disability, and decrease opioid medication usage. Patients in the IDB group exhibited statistically significant improvements in physical function (p=0.029), decreased pain (p=0.006), and disability (p=0.037) at 6-months follow-up as compared to patients who received sham treatment. IDB patients reported 16mg morphine equivalent reduction in daily intake of opioids at 6-months; however, the results were not statistically different from sham group (p=0.264).

Discussion: The results suggest that the IDB is clinically effective in decreasing pain and disability, as well as improving physical function in patients with lumbar discogenic pain. Such benefit cannot be attributed to placebo. IDB should be recommended to properly selected patients with chronic discogenic low back pain. (Clinicaltrials.gov number, NCT00750191.)
ASSESSMENT OF CHRONIC TRIGEMINAL NEUROPATHIC PAIN BY THE OROFACIAL OPERANT TEST IN RATS

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Introduction: Classical behavioral tests in orofacial pain research measure reflexive responses rather than pain. To overcome the problem, an orofacial operant test has recently been developed and used for assessing acute orofacial pain. However, its usefulness in studying chronic trigeminal neuropathic pain remains unclear.

Methods and materials: We created a chronic constrictive nerve injury rat model of pain (CCI) by ligation of the infraorbital nerve (ION), and applied the orofacial operant test to assess behavioral responses to mechanical and cold stimulation in these rats (N=7). Animals were trained to voluntarily contact their facial region to a mechanical or a cold stimulation module in order to access sweetened milk as a positive reward (Figure 1).

Results: In comparison with sham group (N=7), ION-CCI rats displayed aversive behaviors to innocuous mechanical stimuli, as indicated by a significant decrease in both contact time and the numbers of long contact events. For cold stimulation, ION-CCI rats displayed aversive behaviors to both innocuous (17 °C) and noxious cold temperatures (12 °C and 5 °C), as indicated by a significant decrease in both contact time and the numbers of long contact events at the cooling temperatures. The decreases of the contact time and numbers in ION-CCI rats were partially abolished by morphine.

Discussion: Our orofacial operant test demonstrates mechanical allodynia, cold allodynia, and hyperalgesia in rats with chronic trigeminal nerve injury. The neuropathic pain in our rats was partially alleviated by morphine. Thus, orofacial operant test provides a novel and useful behavioral assessment...
method for preclinical studies of chronic trigeminal neuropathic pain.

References:


Financial: This work was supported by NIH grant DE018661 to J.G.G
A) Diagram of orofacial operant behavioral test system.

B) Side view and settings of the feeding/detecting room.

C) Mechanical (left panel) and thermal (right) modules.

D) A rat shown drinking milk while its orofacial regions were contacting the stimulating filaments. The bending force of the filaments shown to be linearly proportion to the distance of displacement (right panel).

E) Two sample traces show recordings of drinking behavior of a sham rat (upper trace) and a rat following infraorbital nerve ligation (ION-CCI, lower trace).

A28

IS THERE A CHONDROPROTECTIVE EFFECT OF AUTOLOGOUS PROTEASE INHIBITOR CONCENTRATE (APIC) IN AN OSTEOARTHRITIS (OA) RABBIT MODEL? A PILOT STUDY

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Introduction: Osteoarthritis (OA) is the most common cause of joint pain and disability in the US. Alpha-2-macroglobulin (A2M) is a naturally-occurring plasma glycoprotein that functions throughout multiple tissues and extracellular spaces as a protease inhibitor but does not normally reach high levels within the intra-articular joint space. A2M is believed to modulate cartilage catabolism by its ability to bait, trap and clear various MMPs and may modulate immune responses via a binding site for growth factors and cytokines. We have previously demonstrated that A2M can be concentrated from peripheral blood to supraphysiological concentrations in APIC, which is chondroprotective in in vitro models of cartilage catabolism. We tested the hypotheses that intra-articular administration of APIC in a rabbit model of post-traumatic arthritis will attenuate progression of cartilage damage.

Methods: New Zealand White rabbits underwent a blood draw that was immediately processed to produce an Autologous Protease Inhibitor Concentrate (APIC). Transection of the anterior cruciate ligament (ACL) was performed to accelerate OA development. The rabbits were divided into two groups. The treatment group (N=6) was administered 3 autologous doses of APIC at 1, 4 and 14 days post-surgery while the control group (N=6) received no treatment post-surgery. Rabbits also received sham surgery on the contralateral knee. At the end of 6 weeks animals were sacrificed and knees were processed and analyzed for gross and histologic pathology. Cartilage pathology was evaluated by macroscopic and histologic examination of the femoral condyles and tibial plateaus using the OARSI grading scale. Macroscopic OARSI grading is reported as the average of each rabbit's cumulative total
knee score relative to the A2M in APIC treatment. Histopathology scoring for Sarafin-O staining, Structure, Chondrocyte Density, and Cluster Formation scores are the summation of OARSI scores for the groups rabbits relative to A2M in the APIC treatment.

Results: Macroscopic evaluation of the femur and tibia demonstrated that application of APIC reduced cartilage degradation by 53.2% compared to untreated controls ($p = 0.0086$) (Fig 1A). The concentration of a-2-Macroglobulin (A2M) in the APIC varied from 5 - 65 mg/ml. There was a dose-dependent correlation between higher concentrations of A2M in the APIC and decreased OARSI total knee score on the macroscopic evaluation ($r^2=0.55$). With the exception of one rabbit, there was also a dose-dependent therapeutic benefit to APIC treatment observed in sum OARSI histopathology evaluations of Sarafin-O staining ($r^2=0.73$), Structure ($r^2=0.76$), Chondrocyte density ($r^2=0.50$), and Cluster Formation ($r^2=0.97$) (Fig 2).

Conclusions: This pilot study suggests that 3 injections of APIC starting 24 hours after the intra-articular injury may prevent cartilage catabolism in an animal model of OA, and may provide chondroprotective effects following injury. This activity may be explained by the increased concentration of A2M in APIC over its physiologic concentration in blood. An autologous preparation with a high concentration of A2M was effective in preventing the development of OA in an animal model following an ACL tear. The results of this study suggest that this preparation may be effective in OA. Investigation in humans appears warranted.

A29
CEREBROLYSIN, A COMBINATION OF NEUROTROPHIC FACTORS AND ACTIVE PEPTIDE FRAGMENTS FOR THE TREATMENT OF NEUROPATHIC PAIN AND SPINAL CORD DYSFUNCTION. AN EXPERIMENTAL STUDY IN RATS
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Introduction: Neuropathic pain is associated with abnormal sensations and/or pain induced by non-painful stimuli, i.e., allodynia. The symptoms include burning or cold sensation, pinching of pins and needles like feeling, numbness, aching or itching. Roughly 10 % American and European populations are suffering from neuropathic pain with 50% populations experience sever pain. Spinal cord injury (SCI), multiple sclerosis (MS), ischemic stroke, uncontrolled diabetes and other metabolic diseases, herpes zoster and HIV-infections, malignancies or immune related disorders could induce neuropathic like pain syndrome. So far, no suitable therapy exists to treat these neuropathic pain syndromes. Our laboratory developed suitable neuropathic pain models in rats and explored novel potential therapeutic strategies using Cerebrolysin (Ever Neuro Pharma, Austria) to treat some aspects of neuropathic pain induced spinal cord dysfunctions (1,2).

Material and methods: Neuropathic pain in rats was developed by constrictions of L-5 spinal sensory nerves for 2 to 10 weeks period (1). In one group of rats, saline and in other group of animals Cerebrolysin (2.5 ml/kg, i.v.) was administered once daily after 2 weeks until sacrifice (4, 6, 8 and 10
weeks) (2). After each time point, the spinal cord tissue was processed for morphological examination for albumin, glial fibrillary acidic protein (GFAP), myelin basic protein (MBP) and heat shock proteins (HSP 72kD) using immunohistochemistry. Normal histopathology of the cord was done using Nissl staining according to standard protocol.

Results: Saline treated rats showed marked leakage of albumin from 2 weeks until 8 weeks progressively and then slightly declined after 10 weeks in the ipsilateral cord segment L4 and L6. The contralateral side of the cord also showed mild albumin leakage at these time periods. Leakage of albumin demonstrates breakdown of the blood-spinal cord barrier (BSCB) and thus, activation of GFAP and HSP expression paralleled with albumin leakage. The MBP immunostaining was decreased progressively. Neural damages closely corresponded with albumin leakage in both ipsilateral and contralateral cord. Cerebrolysin treatment significantly attenuated BSCB disruption to albumin and reduced neuronal damages as well as upregulation of HSP and GFAP expressions. The MBP immunostaining was restored.

Discussion: These observations clearly suggest that cerebrolysin that is a mixture of several neuropathic factors and active peptide fragments actively protect spinal cord dysfunction after chronic neuropathic pain induced neurodegeneration. It would be interesting to see whether cerebrolysin treatment also attenuated behavioral dysfunction in neuropathic pain in our model, a feature currently being examine din our laboratory.

References:


Funding: Swedish Medical Research Council (nr 2710 HSS), Stockholm, Sweden, Alexander von Humboldt Foundation, Bonn, Germany, Ever NeuroPharma, Austria
evaluation of patient response to treatment.

Health assessment surveys are a common tool in the evaluation of physical well-being and the impact of pain on quality of life. Commonly used questionnaires, each described in Table 1, illustrate that activity level is an important denominator in the evaluation of a patient's quality of life.

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Description</th>
<th>Sample Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF36</td>
<td>Patient physical and mental ability to function in daily life</td>
<td>Does your current health limit you in doing: Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?</td>
</tr>
<tr>
<td>Oswestry Disability Index</td>
<td>Evaluation of pain impact on ability to walk, sit stand, and sleep</td>
<td>Walking: Pain prevents me from walking more the 2 kilometers</td>
</tr>
<tr>
<td>EQ5D Questionnaire</td>
<td>Assessment of ability to walk and perform common daily activities</td>
<td>Mobility: I have no problems in walking about</td>
</tr>
<tr>
<td>Roland-Morris Disability Questionnaire</td>
<td>Evaluation of pain impact on health status and movement</td>
<td>Because of my back: I lie down to rest more often</td>
</tr>
<tr>
<td>Brief Pain Inventory Questionnaire</td>
<td>Rating of pain impact on general activity, walking ability, sleep, social function, etc.</td>
<td>Rate pain impact on general activity: 0 (no interference) to 10 (complete interference)</td>
</tr>
</tbody>
</table>

[Table 1. Common Health Assessment Surveys]

A study by Buchser et al. demonstrated that activity levels increase in low back pain patients after spinal cord stimulation (SCS) therapy and that objective measures of ambulatory data recorder (ADR) physical activity can be calculated from accelerometer recordings and that these quantifications change over time.

Materials and methods: The RestoreSensor™ implantable neurostimulator (Medtronic, Inc., Minneapolis, MN) was designed to automatically collect information on patient activity. A 3-axis accelerometer contained in the device detects six patient positions: upright, upright+mobile, lying front, lying back, lying right, and lying left. The AdaptiveStim Diary enables physicians to find out how patient movement and activity evolves over time. The Position Trend (Figure 1) reports the average amount of time a patient spends in the lying, upright, transition zone, and mobile positions/activities per day. The Resting Trend (Figure 2) reports the average number of position changes when lying
down per day. AdaptiveStim Diary reports trend data from the last four programming sessions.
Average number of position changes when lying/day:

- 50
- 48
- 44
- 40

[Figure 2. Resting Trend]
Discussion: Pain often impacts a patient's activity level. Health assessment surveys are a common tool used to evaluate physical and mental well-being and the effect of pain on quality of life. All patients do not react to pain in the same way. Consequently, relying on subjective patient perception alone is not always enough for clinicians to evaluate therapy effectiveness.

The Medtronic RestoreSensor neurostimulator records patient positions and activity levels between clinician visits. Through this recording diary, clinicians have access to objective data on activity changes and resting trends that can be used as another patient evaluation measure.

References:


A31

SPINAL CORD STIMULATION AMPLITUDE VARIES SIGNIFICANTLY WITH CHANGES IN BODY POSITION: RESULTS OF THE RESTORESENSOR STUDY

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Introduction: Position-related changes in paresthesia thresholds have been recognized as a problem that can affect therapeutic outcomes of spinal cord stimulation (SCS) therapy.¹² Paresthesia threshold variation (perceptual, therapeutic, and discomfort) with body position has been estimated theoretically by computer modeling and measured acutely in-clinic. Current modeling and published summary data indicates that patients typically prefer lower stimulation amplitudes when lying down versus upright.

The RestoreSensor™ neurostimulator with optional position-adaptive stimulation(AdaptiveStim™, Medtronic, Inc., Minneapolis, MN) automatically adjusts stimulation amplitude based on patient's position as detected by a tri-axial accelerometer located inside the device. This report describes and summarizes stimulation amplitude variation with position, as experienced in the daily lives of patients receiving automatic position-adaptive stimulation in the study.

Materials and methods: Seventy-nine patients (ages 27-85 years; 32 men; 47 women) indicated for SCS therapy for the treatment of trunk and/or limb pain were enrolled in this prospective, multicenter, randomized, crossover, IRB-approved study after a successful screening trial. Patients were implanted with a RestoreSensor neurostimulator with percutaneous leads.

Stimulation amplitudes were established during initialization of position-adaptive stimulation for up to 6 positions: upright, supine, lying right, lying left, prone, as well as upright and mobile. These amplitudes could be adjusted, as needed, by the patient during the course of the 6-week position-
Stimulation amplitudes for different positions at the end of therapy within the position-adaptive stimulation arm were analyzed as a relative percent of the amplitude for the upright position. Relative percentages from all of the active programs were averaged for each position for each patient. A non-parametric repeated measures method (Friedman's test) was applied to assess the differences in relative percentage in amplitude for the positions.

Results: Seventy-one patients completed the position-adaptive stimulation phase of the study and were included in the analysis. The supine position had the lowest average stimulation amplitude (mean 85%, SD 20%) relative to upright. The mobile position had the highest average stimulation amplitude (mean 107%, SD 19%) relative to upright. There were statistically significant differences between the relative percentages of stimulation amplitudes for different positions compared to the upright position (Friedman's test, p< 0.001). Specifically, the stimulation amplitudes for mobile, supine, lying right, and lying left relative to upright were all significantly different from 100% (Wilcoxon signed rank test, p-values < 0.05) (Figure 1).

Discussion: Patients in the study preferred different stimulation amplitudes for different positions, with the lowest average stimulation amplitude occurring in the supine position and the highest average
stimulation amplitude occurring in the mobile position. These results are consistent with, and augment, published data based on acute in-clinic measurements.

References:


Funding: The RestoreSensor study was funded by Medtronic, Inc., Minneapolis, MN.

AUTOMATIC POSITION-ADAPTIVE SPINAL CORD STIMULATION: ADVANTAGES AND CLINICAL BENEFITS REPORTED IN THE RESTORESENSOR STUDY

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Introduction: Improvements in patient quality of life from spinal cord stimulation (SCS) therapy have been reported in large-scale single and multicenter studies.

Patient and physician assessments of the benefits of a novel position-adaptive stimulation feature were among the endpoints of the prospective, randomized, IRB-approved RestoreSensor study. Improvements in the functional measures studied could potentially lead to further quality of life gains.

Materials and methods: Study participants at 10 centers were implanted with the RestoreSensor™ neurostimulator (Medtronic, Inc, Minneapolis, MN), with the optional position-adaptive stimulation feature, AdaptiveStim™. Patients were randomized to receive 6 weeks of spinal cord stimulation with either conventional manual programming or position-adaptive stimulation, followed by a crossover to the opposite treatment arm for an additional 6 weeks.

At the final follow-up visit, patients answered questions, in written, open-ended responses, about their perceived benefits of position-adaptive stimulation compared with manual programming adjustments. They were also asked which type of programming adjustment they preferred and whether they intended to use position-adaptive stimulation in the future. All answers were recorded independently by patients without physician interactions. Physicians also assessed the clinical benefits of position adaptive stimulation for individual patients at the final follow-up visit.

Results:

Patient Assessment of Clinical Benefits

Out of 76 patients implanted, a total of 71 (average age 52.4 years; 58% female) provided written responses to questions about position-adaptive stimulation. Most patients reported improvements as
shown in Table 1 (patients could report multiple improvements). Six patients (8.5%) indicated no improvement using position-adaptive stimulation compared with conventional manual programming.

<table>
<thead>
<tr>
<th>Improvement in:</th>
<th>n</th>
<th>Percentage % (N=71)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comfort during position change</td>
<td>57</td>
<td>80.3</td>
</tr>
<tr>
<td>Activity</td>
<td>49</td>
<td>69.0</td>
</tr>
<tr>
<td>Control of therapy</td>
<td>41</td>
<td>57.8</td>
</tr>
<tr>
<td>Sleep</td>
<td>34</td>
<td>47.9</td>
</tr>
<tr>
<td>Other improvements</td>
<td>13</td>
<td>18.3</td>
</tr>
</tbody>
</table>

[Table 1. Patient Reported Improvements]

Patient Programming Preferences

When asked to compare position-adaptive stimulation with conventional manual programming, 87.3% (N=62) of patients preferred position-adaptive stimulation. After study completion, 90.1% (N=64) of patients intended to leave position-adaptive stimulation ON all or most of the time, or turn it ON/OFF as needed.

Physician Assessment of Clinical Benefits

Physicians reported that position-adaptive stimulation provided added clinical benefit for 88.7% of patients (N=63).

Adverse Events

Adverse events were comparable to those reported in other studies of the therapy, and adverse events associated with stimulation did not differ between the study arms.

Discussion: Most patients reported one or more advantages of position-adaptive neurostimulation, preferred position-adaptive stimulation over conventional manual programming, and intended to continue using the feature after study completion. Physician assessment corroborated the patient-reported benefits.

Funding: The RestoreSensor study was funded by Medtronic, Inc., Minneapolis, MN.

A33

NOVEL CLINICAL TRIAL DESIGN TO STUDY THE BENEFITS OF A POSITION-ADAPTIVE
SPINAL CORD STIMULATION FEATURE

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Introduction: A rigorous and practical study design was needed to demonstrate the safety and efficacy of a position-adaptive stimulation feature of a new neurostimulator. Patient benefits of the new feature could include added convenience and/or improved pain relief. Because it was desirable that improvements in one domain not occur at the expense of the other, a dual-primary efficacy objective was developed to assess both domains simultaneously.

Materials and methods: Patients representative of the general population eligible for spinal cord stimulation therapy at 10 centers in the US were enrolled in the prospective, open-label, crossover, IRB-approved study. Patients were implanted with the RestoreSensor neurostimulator (Medtronic, Inc., Minneapolis, MN) and were randomized to either 6 weeks of position-adaptive stimulation with the position-adaptive feature known as AdaptiveStim™ or conventional manual programming adjustment alone. Crossover occurred at week 6 and was followed by 6 additional weeks of therapy in the opposite treatment arm (Figure 1). Because the position-adaptive stimulation feature could be enabled or disabled by clinicians, patients could serve as their own controls.

The study design enabled patients to experience each stimulation adjustment paradigm separately, and to directly compare their efficacy. Adverse event profiles could also be compared. Separate 5-point Likert scales were developed to compare pain relief and convenience with the position-adaptive stimulation feature turned off vs. on. The 2 scales were cross-tabulated for assessment of the primary efficacy outcome, which was improved pain relief with no loss of convenience or improved

[Figure 1. Study Design]
convenience with no loss of pain relief. No minimum pain score or demonstrated need for stimulation adjustment during position change was required for enrollment in the study, assuring study generalizability.

Results: Overall, 64 of 74 patients (86.5%) reported success (represented by the shaded area in Table 1) when using position-adaptive stimulation compared with using only manual adjustments. This statistically exceeded the pre-stated minimum success threshold of 25% (p< 0.001). Results did not differ by randomization sequence (p=0.326, Fisher's Exact test).

<table>
<thead>
<tr>
<th>With position-adaptive stimulation Off compared with Off</th>
<th>Much worse pain relief</th>
<th>Somewhat worse pain relief</th>
<th>No difference in pain relief</th>
<th>Somewhat better pain relief</th>
<th>Much better pain relief</th>
<th>Missing due to reasons other than infection</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Much less convenient</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Somewhat less convenient</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>No difference in convenience</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td></td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>Somewhat more convenient</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>7</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>Much more convenient</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>16</td>
<td>34</td>
<td>51</td>
</tr>
<tr>
<td>Missing due to reasons other than infection</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>16</td>
<td>34</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>23</td>
<td>40</td>
<td>3</td>
<td>74</td>
</tr>
</tbody>
</table>

[Table 1. Primary Efficacy Results]

Discussion: The random assignment of treatment sequence and within-patient crossover design enabled robust comparison of position-adaptive stimulation with manual programming for pain relief and convenience. The results were unambiguous and easy to interpret. Improved pain relief and/or convenience were further supported by patient comments and other (including objective) measures.

The study design successfully managed uncertainty about the benefits of position-adaptive stimulation, enabling assessments which could not have been accomplished reliably or economically with a parallel group design.

Funding: The RestoreSensor study was funded by Medtronic Inc., Minneapolis, MN.
RESULTS OF THE RESTORESENSOR STUDY: ASSESSMENT OF DEVICE PROGRAMMING FOR POSITION-ADAPTIVE SPINAL CORD STIMULATION

Lynn Webster1, David Schultz2, Eric Panken3, Mark Sun, PhD3

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Introduction: Position-related changes in neurostimulation intensity can result in episodes of overstimulation or understimulation. Frequent manual therapy adjustments to compensate for changes can be burdensome for patients and may decrease their overall satisfaction with spinal cord stimulation (SCS) therapy. A position-adaptive stimulation feature may reduce the need for frequent manual adjustments.

Materials and methods: Study participants with chronic trunk and/or leg pain were implanted with the RestoreSensor™ neurostimulator (Medtronic, Inc., Minneapolis, MN), with the optional position-adaptive stimulation feature, AdaptiveStim™. In this prospective, open-label, randomized, crossover, IRB-approved study, patients spent 6 weeks in a conventional manual programming phase, and 6 weeks in the position-adaptive stimulation phase.

Orientation of the device to the patient's body position and position-specific therapy setup were required. After device orientation, clinicians and patients were surveyed on ease of the procedure using a 5-point Likert scale. Position-specific therapy setup and parameter information was collected from programming reports.

During position-adaptive stimulation, patients could further fine tune stimulation amplitude. All adjustments made with the patient programmer during the study were recorded in the patient programmer memory. Button presses were defined as the number of times that a patient actually clicked on the patient programmer while changing the therapy parameters.

Results:

Ease of Set-up

All 76 implanted patients underwent initial device orientation prior to the use of position-adaptive stimulation. Fifty (65.8%) of the patients reported that moving between the various positions during the orientation process was easy or very easy. Clinicians who conducted the orientation reported that the process was easy or very easy in most cases (N=66, 86.8%).

Initialization of Position-Specific Therapy

Programming reports for position-specific therapy setup were available for 74 patients. Analysis found that 25 (33.8%) patients used the position-specific therapy for 6 positions; 29 (39.2%) for 5 positions; 14 (18.9%) for 4 positions; 1 (1.4%) for 3 positions; 3 (4.1%) for 2 positions; and 2 (2.8%) for 1 position (Figure 1).
Patient Programming Burden

Compared to manual programming, automatic position-adaptive stimulation resulted in a statistically significant 41% reduction in the mean number of button presses for amplitude per day, $p = 0.002$ (Figure 2).
Use of Default Parameters

Most patients used the default nominal settings for position-adaptive stimulation. Throughout the study, 54 (71%) patients used the default transition times; 59 (77.6%) used the default mobility rate; 67 (88.2%) used the default position range for the upright position; and 64 (84.2%) used the default position range for lying down.

Discussion: In the RestoreSensor study, clinicians reported that programming to initialize position-adaptive stimulation was easy or very easy in most cases. In addition, the number of button presses was significantly decreased for the position-adaptive stimulation arm compared with the manual programming arm.

Funding: The RestoreSensor study was funded by Medtronic, Inc., Minneapolis, MN.

A35
RESULTS OF SECONDARY PAIN MEDICATIONS TO IMPROVE PAIN OUTCOMES VIA THE PROMETRA® PROGRAMMABLE INFUSION PUMP

Thomas L. Yearwood, M.D.
Introduction: Morphine has long been considered the gold-standard in intrathecal therapy for chronic pain and is generally the first drug that is used upon implantation of an implantable pump. Treatment with drugs other than morphine often occurs when patients fail to get adequate pain relief from acceptable dosages of morphine or experience intolerable side-effects. Many of these secondary drugs, such as hydromorphone, fentanyl, and ziconotide, have been shown to be successful intrathecal analgesics and are widely accepted.¹

Clinical trials recently concluded on the Prometra® System (Flowonix Medical, Inc., Mt. Olive, NJ), which is now FDA-approved for delivery of Infumorph®. The pivotal trial was designed for the use of morphine. However, some patients were switched to drugs other than morphine at some point during the trial due to inadequate pain relief or intolerable side-effects.

Methods: The study was a prospective, multi-center, open-label evaluation of the Prometra System in administering morphine for the treatment of chronic pain. Patients included in this study fell within the appropriate guidelines for intrathecal therapy². The primary endpoint was accuracy of drug delivery. Efficacy and safety data were also collected.

Data were analyzed for subjects who switched to an alternative drug(s) for inadequate pain relief.

Results: One-hundred-ten patients were enrolled. Seventeen (15%) switched to non-FDA approved medications that are within the community standard of care, as described in various Consensus Statements¹-³ (“off-label secondary drugs”). Ten (9%) switched due to inadequate pain relief; seven (6%) switched due to morphine side-effects. Results are presented for the ten subjects who switched due to inadequate pain relief.

Refill data for these ten subjects indicate no difference in accuracy between delivery of morphine and off-label secondary drugs.

Efficacy scores were compared between study baseline, last follow-up on morphine, and last follow-up on off-label secondary drug(s). There were no significant changes in pain between any of the time-points considered.

No unexpected AEs were observed, and none of the events reported were related to the off-label secondary drugs.

Four of these subjects eventually requested that the pump system be explanted due to continued lack of pain relief. Three subjects expired during the study (unrelated to the intrathecal therapy). Two subjects eventually switched back to morphine after failing to receive improved pain relief with off-label secondary drugs. One patient continued with the off-label therapy, even after the conclusion of the study.

Conclusions: Despite a successful trial of morphine prior to implantation, 9% of subjects did not receive adequate pain relief from morphine. Results do not show an improvement in pain relief after switching to off-label secondary drugs, despite their acceptance as successful intrathecal analgesics. The majority of these patients failed to receive adequate pain relief to the extent that they either requested permanent explantation of the system or they switched back to morphine. While this is, of course, a small cohort, these data may indicate that some patients will not receive significant pain relief
from intrathecal therapy, regardless of the drug being delivered.

Funding: This study was sponsored and funded by Flowonix Medical.

A36

PTSD AND DEPRESSION DIAGNOSES DO NOT CORRELATE WITH PAIN OR INTERFERENCE SCORES ON INITIAL SURVEY

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Introduction: Accurate assessment is of vital importance to determine the effectiveness of pain therapies. An ongoing assessment of pain clinic effectiveness is vital. A previous evaluation of pain assessments in 2011 revealed inadequate pain assessment data to determine pertinent outcomes. New assessment forms introduced in September 2011 include the Brief Pain Inventory (BPI) and Patient Health Questionnaire (PHQ)-9. We hypothesized that a diagnosis of PTSD or depression would result in higher scores for pain and interference assessments.

Methods: Assessment forms completed since September 2011 were reviewed. Incomplete forms were excluded. BPI pain and interference scores, diagnosis of PTSD and/or depression, number of pain medicines prescribed, and morphine equivalent daily opioid dose were collected. BPI pain and interference scores were compared between patients with a diagnosis of PTSD or depression and those without either diagnosis using a student's T-test.

<table>
<thead>
<tr>
<th>PTSD</th>
<th>Pain</th>
<th>Interference</th>
<th>PHQ-9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>26.7</td>
<td>48.3</td>
<td>17.0</td>
</tr>
<tr>
<td>Negative</td>
<td>25.1</td>
<td>45.8</td>
<td>11.3</td>
</tr>
<tr>
<td>p-value</td>
<td>0.23</td>
<td>0.39</td>
<td>1.1x10⁻⁵</td>
</tr>
</tbody>
</table>
Results: 163 charts were reviewed of which 138 were included in the analysis (see Flowchart). There was not a statistically significant difference in pain or interference scores for patients with a diagnosis of PTSD or depression compared to those without either diagnosis. The average PHQ-9 score for patients without a diagnosis of PTSD or depression was 11.3, consistent with moderate depression (Table 2).

Discussion: A diagnosis of PTSD and depression did not result in an increase in baseline pain or interference scores for new patients. This is in contrast to previously published data. This may be due to under diagnosis of depression in referred patients. We suggest that formal assessment for PTSD and depression in chronic pain patients may improve pain and interference scores. Further prospective research will be needed to test this hypothesis.

References:


Funding: There was no funding through grants, manufacturer, or third-party.
Introduction: Pain is one of the most common and most feared symptoms associated with cancer. Estimates of its incidence range from 25-80% in cancer patients. However, these incidence rates often focus on a specific cancer or a specific cancer stage. Current assessments of cancer pain do not further delineate severity of the pain or national scope of this problem. No data exists to date on the national incidence of cancer pain or the rates of admission with pain as the primary diagnosis.

Methods: Our study used data from the 2009 Nationwide Inpatient Sample (NIS). The NIS is the largest all-payer inpatient care database in the United States consisting of a stratified sample of 1,050 hospitals in 44 states. Each hospitalization in the NIS includes multiple data elements including a primary diagnosis listed as DX1 and up to 24 secondary diagnoses, listed as DX2 through DX25. All diagnoses are identified via the International Classification of Diseases, 9th edition (ICD-9) coding.

The NIS 2009 database was reviewed to identify all hospitalized patients with pain as the primary diagnosis. After abstraction, data were stratified based on pain type into categories of Spinal Pain, Head/Facial Pain, GI/GU Pain, Neuropathic Pain, Extremity Pain, Cancer Pain and Miscellaneous. The patient population was further stratified to only include those with a concomitant cancer diagnosis listed at DX2 through DX5, in order to limit admissions to pain diagnosis associated with an oncologic diagnosis.

Data were collected on demographics, including age, gender, primary insurance and admission type which were summarized using descriptive statistics. Linear and logistic regressions were performed to identify predictors of cost, length of stay and mortality.

Results: There were an estimated 273,935 patients admitted with an ICD-9 cancer diagnosis at DX2 through DX5. Of these, 5767 hospitalizations had a primary pain diagnosis, accounting for 2.1% of all cancer admissions. On average, patients were 61 years old and 54.4% were female. The majority (54.9%) were emergency admissions to the hospital and 43.4% used Medicare as the primary payer. Overall, 64% of patients were admitted with a Cancer Pain diagnosis (ICD-9 338.3). In the multivariate analysis, costs were positively associated with age, number of co-morbidities, female sex, death during hospitalization and a diagnosis of spine pain. Length of stay was significantly positively associated with age, number of co-morbidities, death during hospitalization and spine pain. Mortality was positively associated with age, cancer pain diagnosis (ICD-9 338.3), specific NIS primary payers (Medicare, private payer and other), length of stay and total charges.

Discussion: Pain is a significant source of morbidity in patients with cancer resulting in 2.1% of admissions in cancer patients nationally. Primary diagnosis of pain in patients with cancer results in increased costs, length of stay, and morbidity. Average length of stay was 4.53 days for these admissions in 2009. Spine pain is the single diagnosis category with the highest association with charges. Use of the cancer pain ICD-9 code is associated with the highest mortality associated with these admissions.
REMIFENTANYL AND REGIONAL BLOCK FOR LIP AND CLEFT PALATE

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Introduction: Descriptive study on the use of Remifentanil and regional block in pediatric anesthesia. This drug was used in all and regional block, was applied to children who had been programmed for surgery due to Lip and Cleft Palate (LCBP). Remifentanil is currently used in the pediatric community, due to its rapid outcome and short duration.

The purpose of this study is to demonstrate the high effectiveness of Reminfentanil associated with the blockade of the regional peripheral palate and post-surgery analgesia.

Material and methods: We conducted an investigation to a group of 46 children, ranging from 3 months to 1 1/2 years old, with LCBP, which were scheduled at the San Gabriel Hospital, from January to June 2012. In the initial phase, all patients went to a bilateral Vomeriam Colgaje and Plastial Lip (3m) and then for a Push Back and Plastial Lip (7m). These procedures were approved by the Ethical and Teaching Committee of the Hospital.

Remifentanil (Farmedical Corporacion) stability, along with IOT characteristics and post surgery anesthesia were evaluated. Pre-medication practice, using Midazolam (0.5 mg via oral), ten minutes before the surgery was administered. General anesthesia, using propofol 2 mg/kg IV, Reminfetanil 2 ug/Kg (2 min) was used. OTI was performed and then it was administered Paracetamol 40 mg / Kg RV. An esfeno palatine y naso palatine blockade with Bupivacaina (0,25 %) with epinefrina. Dexamentasona 1 - 2 mg IV antihemetic profilaxis. General anesthesia was maintained with infusion of Remifentanil (0,2 ug / Kg / min) and Isoflurano (0,8 %) and by a CMV -under standard monitoring of NIBP, Sat O2 %. et CO2, ECG.

During the post surgery phase, the medical team evaluated the analgesic quality, along with the use of analgesics during the first twelve hours of the postsurgery.

Results: The OTI was conducted with no difficulty and, in none of the cases, NMBA was utilized. The induction with Isoflurano and Remifentanil disseminated in a two-minute-period, showed that the patients, FC diminished in an estimated 30%, without reaching critical values that required the use of atropine. After the blockade of the palate and the maintenance of the Remifentanil infusion, the hemodynamics stability was maintained within the normal limits during the entire period of the procedure. Eight minutes before the procedure conclusion, the Remifentanil infusion was suspended. During the immediate post surgery phase, 77% of the patients did not show to be in pain and only 33% of them reported minor to moderate pain (cheops), in which cases Ketorolac IV was used.

Discussion: Remifentanyl offers a noticeable advantage and hemodynamics stability during the LCBP surgery, which is also associated to a regional blockade of the infraorbital nerve, nasopalatine nerve and ant.med.post palatine nerve bilateral.

References:

Hemodynamic differences between propofol-remifentanil and sevoflurane anesthesia for repair of cleft...
ANXIETY AND DEPRESSION AMONG PATIENTS WITH CHRONIC PAIN IN SAUDI ARABIA

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Introduction: Chronic pain is pain that persists beyond the time required to cure the lesion; it is continuous and recurrent (1). In West anxiety associate chronic pain with incidence rates 15 - 40 % (2); while depression episodes found in 42% (3).

We study presence and significance of anxiety and depression in chronic pain patients in Saudi Arabia versus controls, the relation to pain intensity, age, gender, and location of pain; and compare it to Western result.

Method and materials: 350 participants of both genders, aged 18-75 years, included.

175 patients attending three outpatient clinics (i.e.; pain management, neurosurgery and rheumatology) at Dammam Medical Complex in Saudi Arabia for chronic pain lasting for at least three months as defined by International Association of Study of Pain. The remaining half served as a control group.

The two groups were administered a validated Hospital Anxiety and Depression Scale to assess anxiety and depression caused by chronic pain. Numerical Rating Scale was administered to rate pain intensity among patients. All statistical analysis was performed using SPSS.

Results: The high anxiety score on HAD reported by 34.1% of patients compared to 13.1% of control group was significantly correlated with chronic pain analyzed by using T-tests and Chi-square (p<0.001). High depression score reported by 14.9% of patients compared to 7.4% of control group was significant using T-test (p=0.012), but did not reach significance using Chi-square (p=0.08). Pain intensity rated by NRS was significantly correlated with high score on both anxiety (p=0.031) and depression (p=0.001). Women reported higher anxiety (34.3%) and depression (11.8%) than men (13.8% and 10.5% respectively). Gender difference in score was statistically significant (p< 0.001).

Significantly older patients scored lower on anxiety and depression, as measured on HAD score. The mean anxiety score was highest among patients with skeletal osteoarthritic pain, followed by neck pain and headache, and least among patients with back pain. Mean depression score was highest among patients with neck pain and headache, compared to both skeletal osteoarthritic pain and back pain patients. There was no significant difference in pain location.

Discussion: Our national study of chronic pain patients showed anxiety occurrence of 34% that fall within the range of the Western incidence (15 - 40 %), but less occurrence of depression 14.9 % compared to 42 % in West. There is direct relationship of intensity of pain and occurrence of anxiety.
and/or depression in all studies; but significant inverse relation to age in ours.

Conclusion: The findings indicate that in Saudi patients, pain was found to be significantly associated with anxiety and depression and more pronounced in young persons and women. A correlation was found between the level of both anxiety and depression with the pain intensity regardless of pain source.

References:

1) The complex interplay between pain intensity, depression, anxiety and catastrophising with respect to quality of life and disability Disability and Rehabilitation, 2009; 31(19): 1605-1613.


A40
CRANIOCERVICAL ARTERIAL DISSECTION: MORE THAN JUST A PAIN IN THE NECK?
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Background and objective: The purpose of this study is to shed light on a potential correlation between craniocervical arterial dissection related strokes and cervical pain.

Craniocervical arterial dissection (CCAD) is an important cause of ischemic stroke in a relatively young patient. A dissection may occur spontaneously or due to trauma causing an intimal tear or rupture of the vasa vasorum which may ultimately lead to an intramural hematoma. The etiology of dissection is likely multifactorial, involving environmental and intrinsic factors. The clinical diagnosis of carotid artery dissection can be challenging, with common presentations including cervical pain, partial Horner’s syndrome, cranial nerve palsies, or cerebral ischemia.

In this study, the diagnosis of CCAD was based on both clinical evidence of craniocervical arterial dissection (focal neurological deficits) and at least one of the following suggestive imaging findings on CTA, MRA or Conventional Angiography.

The goal of the study was to see whether patient who presented with cervical pain in the setting of craniocervical arterial dissection were more likely to develop strokes.

Results: 26 patients fulfilled our clinical and neuroradiological criteria for CCAD. From the total of 26 patients, 15 patients presented with strokes (57.6%) and 3 patients had TIA (11.5%). The strokes were in the posterior circulation in 90% (9/10) and in the anterior circulation in 10% (1/10).
13 of our 26 cases (50%) presented with cervical pain alone with no other neurologic deficits and 20 patients (76.9%) presented with pain and or headache.

Of the 15 patients who developed strokes secondary to CCAD, 10 of them (10/15, 66.6%) presented initially with cervical pain and/or HA and 5 strokes (5/13, 38%) occurred in patients who complained of cervical pain alone. 5 strokes (5/13, 38%) occurred in patients who did not complain of any cervical pain or headache.

If we analyze our data from a different perspective, 5 out of the 13 patients (38%) who had primarily cervical pain as their presenting symptom were found to have strokes, while 10 of the 20 patients (50%) who had pain and/or HA developed strokes subsequently.

Conclusion: Although it is well known that pain maybe a hallmark of dissection, the correlation between pain and development of strokes secondary to dissections has not been well described. In our study, 66.6% of strokes were noted to have occurred in patients who presented initially with cervical pain and/or headaches. Patients who presented with pain and or headaches were associated with strokes in almost 50%. Cervical pain with or without headaches must be considered as a premonitory symptoms for strokes in patients with CCAD.

A41

BYPOLAR RADIOFREQUENCY THERMOCOAGULATION DENERVATION AS A NOVEL TREATMENT OF THORAXIC ZYGAPOPHYSIAL JOINT COMPLEX PAIN SYNDROME: A PILOT STUDY

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1Anesthesia, University of Toronto, Toronto, 2Anesthesia, University of Ottawa, Ottawa, 3Anesthesia, Critical Care and Pain Medicine, Northern Ontario HSC, Sudbury, 4Anesthesia, Sunnybrook HSC/University of Toronto, Toronto, ON, Canada, 5Medical School, All Saints Medical School, Chicago, IL, USA, 6Health Science, University of Western Ontario, London, ON, Canada

Introduction: Thoracic Zygapophysial joint pain Syndrome is a complex pain disorder affecting patients with axial biomechanical thoracic pain, with limited understanding in diagnoses and treatment due to lack of research and perceived lower prevalence Unfortunately prevalence studies are lacking complicated by non validated diagnostic methodology, provocative tests and physical examination findings with interpersonal differences, pain history of suggestive bias and insensitive imaging radiological testing. Although self evident but not well investigated, the most common standard method to diagnose the Thoracic Zygapophysial joints as a pain generator is the dual diagnostic prognostic nerve block of the dorsal medial branches, at the respective thoracic level inervating the thoracic facets joints, mimecking the same� algorithm well validated and evidenced in Lumbar and Cervical Zygapophysial Joint Pain 1Unfortunately its validity remains unproven, coupled to anatomical variances requiring different technical approaches and end point targets of poor quality control. Similarly highly successful long term treatments remains technically challenging and clinicly unsettled.

Aim of the study: This pilot Study will:

a) Assess the efficacy of Bypolar RF in treating thoracic Zygapophysial Joint pain by optimizing the denervation results and
b) Stimulate further research in this challenging and complex pain disorder.

Methods: Twenty patients were selected for this prospective case series pilot study, with presumptive diagnoses of Thoracic Zygapophysial joint Complex pain Syndrome, by history, physical examination, provocative physical diagnostic testing and demonstration of reproducible pain relief, (more than 80% reduction in verbal pain scoring), after dual local anesthetic nerve blocks at the anatomical target, of dorsal medial branches described by Dr Chua and Dr Bogduk, at the correspondent Thoracic facet joints. All patients under informed consent and Byplanar flouroscopy guidance went through out, Bypolar Radiofrequency denervation by the DIROS Thecnological Standards, targeting the anatomical thoracic dorsal medial branches validated by Chua et al.(3) and keeping the 2 probes, via Diros Neddles around 10 mm to produce a substantial rectangular lesion to denervated the antomical targets. Assessment of Pain Scores, opioide and adjuvants comsumption, and functional rating index, pre and 3,6,12 months Post procedures were analized.

Results: Successful denervation by Bypolar RF was associated with the significant reduction in pain pattern, pain scores and significant reduction in medications.

Most patients exhibited excellent results (>75% reduction in VAS pain scores, and significant reduction in opioids consumption and functional improvement.

Discussion: This pilot study is the first step in suggesting the benefits of Bypolar RF denervation of Thoracic Zygapophysial joint, can significantly reduce pain scores VAS, opioids and adjuvant consumption, and improved functional quality of life predictors in selected patients suffering Thoracic Zygapophysial joint complex pain disorders. This favourable results is due to the advantageous optimization in size and shape of Bypolar lesions where large lesions are needed to create strip lesions side by side, reducing the gaps, when targeting anatomical challenging and variants, heterogenous areas such Thoracic and Sacral sites. Randomized control trials are needed to further assess its efficacy, in addition to future research focusing in refining electrodes geometry, and lesions protocols.

Materials and methods: After institutional ethics approval, we conducted a cadaver and clinical study.

In 2 prone cadavers, a 2-5 MHz convex transducer was placed in a parasagittal-oblique plane. A 19G SonixGPS needle was inserted out-of-plane using the needle guidance technology (Fig 1). When the tip was close to the ligamentum flavum, a 22G 127mm Quineck needle was advanced in a needle-through needle technique and colored dye injected. The spinal needles were left in situ. 16 injections between T2/3 and L4/5, bilaterally, were completed. An anatomist carried out a post-procedural dissection. The primary endpoint was the successful insertion of the needle tip and dye into the neuraxial space.

For the clinical phase, 11 patients undergoing knee or hip arthroplasty were enrolled after written informed consent. Using sterile technique, the L3/4 and L4/5 areas were scanned in a sitting flexed position and ultrasound-guided needle insertion was carried out using the same technique used in the cadaver phase. Return of cerebrospinal fluid was taken as the primary end point. Local anesthetic was administered via the spinal needle and the patient managed in the usual manner. Procedure time, needle depth, angle, number of skin punctures and redirections were recorded. Patients subsequently completed a satisfaction questionnaire.

Results: In the cadaver study, dissection revealed successful needle and dye placement in the neuraxial space in 100% of attempts (Fig 2.). There was good visualization of spinal sonoanatomy. The SonixGPS™ allowed needle guidance to the target with minimal redirections in all 16 attempts.
In the clinical study, (7 female, 4 male; mean [SD] age 66.9 [14.3] years; body mass index 27.1, [2.8]) underwent real-time ultrasound-guided spinal injection. 100% of the procedures were successful and all required a single skin puncture. 7/11 cases required some needle redirection. Mean [SD] procedural time was 9.2[2.9]min. The US image was good to excellent in all cases. All patients found the technique acceptable and would elect to have an ultrasound-guided neuraxial technique again if offered.

![Cadaver dissection showing injected dye](image)

Fig 2.

Discussion: SonixGPS™ needle guidance technology facilitated performance of real-time ultrasound-guided spinal injections in cadavers and patients, with accuracy and reproducibility. The needle guidance technology overcame problems of poor needle tip visibility at steep insertion angles.

References:

PLATELET RICH PLASMA-INDUCED CARTILAGE CATABOLISM IS INHIBITED BY AUTOLOGOUS PLATELET INTEGRATED CONCENTRATE (APIC)

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Introduction: The pathology of osteoarthritis is known to involve the upregulation of inflammatory mediators and catabolic factors such as matrix metalloproteases (MMPs). Alpha-2-macroglobulin (A2M) is a naturally-occurring plasma glycoprotein that functions throughout multiple tissues and extracellular spaces as a protease inhibitor but does not normally reach high levels within the intra-articular joint space. A2M is believed to modulate the systemic inflammatory response by its ability to bait, trap and clear various MMPs and cytokines. We attempted to test the hypothesis that the addition of proinflammatory cytokines or Platelet-rich Plasma (PRP) that stimulate cartilage degradation will be inhibited by A2M in a Bovine Cartilage Explant (BCE) model.

Material and methods: We utilized an in vitro cartilage degradation assay using Bovine Cartilage Explants (BCE) in culture media. BCE was treated with or without PRP or the combination of TNFa and IL-1b in the presence or absence of APIC or purified A2M. We measured cartilage catabolism following 2 days in culture by proteoglycan release via the presence of sulfated glycosaminoglycan (sGAG) in the media.

Results: Cartilage degradation in 100mg BCE was induced by addition of 333µl PRP in 1ml culture medium which led to an increase of sGAG between 2 - 8 fold dependant on the source of BCE and PRP preparation. Addition of blood or APIC to BCE cultures did not increase sGAG release. PRP-induced cartilage catabolism could be completely inhibited with addition of 333µl APIC or with 200µg/ml of purified human A2M. We also show that inhibition is possible in a concentration dependent manner.

Cartilage catabolism can also be induced with addition of pro-inflammatory cytokines TNFa (20ng/ml), IL-1b (2ng/ml), or the combination of the two cytokines. Treatment of BCE cultures with TNFa and IL-1b resulted in a 2-3 fold increase in sGAG into the media over 2 days. Addition of a 333µl of APIC completely inhibited cartilage catabolism induced by TNFa, IL-1b, and the combination of TNFa and IL-1b. The chondroprotective effects of APIC were dose dependent.

Discussion: Osteoarthritis (OA) is characterized by progressive degeneration of articular cartilage. BCE cultures represent a useful model for studying therapeutics in OA. This study demonstrates the chondroprotective effects of APIC from known OA mediators, including pro-inflammatory cytokines and PRP. This activity can be explained by the 5 - 10 fold increased concentration of alpha-2-macroglobulin (A2M) in APIC over its concentration in blood. A2M is a known inhibitor of cartilage degradation and could be a useful inhibitor of OA. This improved understanding of cartilage biology and metabolism should lead to clinical trials of APIC in humans.

INTRAVENOUS PARECOXIB PROVIDES SIMILAR ANALGESIC EFFICACY TO A SINGLE SHOT SCIATIC NERVE BLOCK AFTER TOTAL KNEE ARTHROPLASTY WHEN COMBINED WITH A CONTINUOUS FEMORAL NERVE BLOCK

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Background: Continuous femoral nerve blockade has become an accepted modality in the management of pain after total knee arthroplasty, however posterior knee pain can be problematic and often requires additional forms of analgesia. This study compared the use of parental parecoxib to single shot sciatic block for this purpose.

Material and method: After ethics review board approval, adults undergoing total knee arthroplasty were randomly allocated to 3 groups; Group 1 (Gr-F+S) had a single shot sciatic nerve block with 0.25% bupivacaine 25 ml in addition to continuous femoral analgesia (CFA) (0.125% bupivacaine 7 ml/hr), Group 2 (Gr-F+P) received parenteral parecoxib 40 mg q 12 hrs with CFA and Group 3 (Gr-F) had only CFA. Assessment was performed at 0, 6, 12, 24 hour after surgery and included NRS (numerical rating score) at rest, morphine use, time to first analgesic dose and side effects.

Result: Seventy-eight patients were enrolled with 26 participants in each of the 3 groups. Morphine requirements in the first 24 hours were significantly increased in Gr-F (17 ± 12 mg) when compared to Gr-F+S (10 ± 7 mg) and Gr-F+P (9 ±5 mg). (p< 0.001). Time to first analgesic dose was shorter in Gr-F (3±2 hr) than Gr-F+S (6±2 hr) and Gr-F+P (6±2 hr). There were no inter-group differences in pain NRS, side effects or patient satisfaction.

Conclusion: Parental parecoxib had similar analgesic efficacy to single shot sciatic nerve block as an adjunct to continuous femoral nerve blockade after total knee arthroplasty.

DOES LUMBAR EPIDURAL ANALGESIA HAVE BENEFIT EFFECTS TO SHORT-TERM SURGICAL OUTCOMES IN PATIENTS UNDERGOING LAPAROSCOPIC COLORECTAL SURGERY? A RETROSPECTIVE STUDY

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Department of Anesthesiology, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand

Introduction: Although the benefits of laparoscopic colorectal surgery(LCS) has been known as many aspects such as shortening postoperative length of stay (LOS), promoting of resumption normal bowel habit as well as reducing postoperative narcotic requirement and so on, Senagore et al additionally suggested that thoracic epidural analgesia (TEA) can enhance the benefits in regards to...
reduce postoperative pain and shorten length of hospital stay in patients undergoing laparoscopic colorectal surgery but the sample size were only 5-18 cases. LCS has been increasingly performed in our hospital over a couple of years ago and the anesthetic caregivers usually perform lumbar epidural analgesia(LEA) combined general anesthesia(GA) instead of TEA because of easier technique and our familiarity. To date, the comparison of the short-term surgical outcomes after LEA has not much been reported. This study aims to evaluate the short-term surgical outcomes after LEA compared to GA alone in patients undergoing LCS.

Material and method: A retrospective analysis of hospital records was performed in 94 patients underwent LCS between November 2009 and January 2012. Operative details, passage of flatus or stool, tolerance of normal diet, postoperative requirement of narcotics and postoperative LOS were analyzed.

Results: A 19-patients were excluded, The remaining 75 patients were analyzed in this study (15 GAE, 60GA). There was no statistically significant difference regarding demographic data, operating time, body mass index or American Society of Anesthesiologists class (I-III) distribution. Time to first resumption of normal diet was significantly shorter in the GAE group (93.5 +/- 45.3 minutes; GA 119 +/- 45.7 minutes; P=0.02). Time to discontinuation of intravenous narcotics was statistically significant shorter in the GAE group (1.3 +/- 5.1 hr.; GA 42.8 +/- 55.5 hr.; P=0.005). Postoperative LOS was similar in both groups (GAE 7.4 +/- 6.0 d; GA 6.8 +/- 3.1 d; P=0.592). There were no significant differences in any adverse effects between both groups.

Conclusion: Our result has been clearly demonstrated that LEA has significantly benefit effects to short-term surgical outcomes in terms of enhancing earlier tolerance of normal diet and reducing postoperative intravenous narcotic requirement. Moreover it might also enhance earlier tolerance of liquid diet. We recommend further prospective studies with more sample size required to approve this precisely.

References:


Funding: The authors declare no conflict of interest. This study was completely funded by internal departmental funding.
DOES THE ADDITION OF PHENYLEPHRINE TO PROPHYLACTIC IV EPHEDRINE FURTHER REDUCE THE INCIDENCE OF HYPOTENSION FROM INTRATHECAL ROPIVACAINE FOR C/S?

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Anesthesia, UMDNJ-Robert Wood Johnson University Hospital, New Brunswick, NJ, USA

Introduction: The use of prophylactic IV ephedrine is effective for prevention of hypotension from spinal anesthesia for cesarean section (C/S) when compared with lactated Ringer's solution (LR) alone. Objective: This study was designed to determine whether the addition of phenylephrine to prophylactic IV ephedrine further reduces the incidence of hypotension from intrathecal ropivacaine for C/S.

Methods: Following IRB approval and informed consent, 96 parturients scheduled for elective C/S with CSE were studied. In all patients, the epidural space was located at L4-5 or L3-4 interspace using epidural needle in lateral decubitus position. The epidural catheter was inserted immediately following administration of 10 mg ropivacaine with 100 mcg epinephrine and 25 mcg fentanyl intrathecally. The patients were randomized into 3 groups: GI (n=35) received IV 2L LR prior to induction of spinal anesthesia, GII (n=31), received IV 1L LR and upon the spinal injection, received IV ephedrine 30 mg for 15 min, GIII (n=30) received IV ephedrine 30mg for 15 min and IV phenylephrine 100 mcg. Immediately after the spinal induction, the patients were positioned supine with left uterine displacement. BP was measured with automatic BP device every 2 min for the duration of the surgery. Hypotension was defined as a systolic BP (SBP) < 100 mm Hg and < 80% of the baseline BP. Hypotension was treated with IV ephedrine 5 mg every 2 min. Values are mean ± SD. P value < 0.05 was considered significant.

Results:
Conclusions: The addition of phenylephrine to IV prophylactic ephedrine did not further reduce the incidence of hypotension from intrathecal ropivacaine for C/S. The IV administration of phenylephrine with ephedrine was associated with higher incidence of vomiting.

### Table 1

<table>
<thead>
<tr>
<th></th>
<th>GI IV LR</th>
<th>GI II IV Eph</th>
<th>GI III IV Eph+Phynl</th>
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<td>178 ± 40</td>
<td>169 ± 37</td>
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<td>66 ± 16</td>
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<td>63 ± 3</td>
</tr>
<tr>
<td><strong>Pain Intensity (%)</strong></td>
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<td>15(48)</td>
<td>17(67)</td>
</tr>
<tr>
<td><strong>Efficacy (n/1(comfort),%)</strong></td>
<td>33(94)</td>
<td>29(94)</td>
<td>29 (97)</td>
</tr>
<tr>
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<td>1(3)</td>
<td>1(3)</td>
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</tr>
<tr>
<td><strong>Nausea (%)</strong></td>
<td>15(43)</td>
<td>10(32)</td>
<td>13(43)</td>
</tr>
<tr>
<td><strong>Nausea Rx(%)</strong></td>
<td>10(29)</td>
<td>10(32)</td>
<td>8(27)</td>
</tr>
<tr>
<td><strong>Vomiting (%)</strong></td>
<td>3(9)</td>
<td>9(29)</td>
<td>16(53)*</td>
</tr>
<tr>
<td><strong>Hypotension</strong></td>
<td>16(48)**</td>
<td>4(13)</td>
<td>5(16.7)</td>
</tr>
<tr>
<td><strong>Hypotension Rx (IV ephedrine boluses)</strong></td>
<td>13(37)</td>
<td>8(19)</td>
<td>5(16.7)</td>
</tr>
<tr>
<td><strong>APGAR 1 min</strong></td>
<td>8.3 ± 0.8</td>
<td>8.5 ± 0.7</td>
<td>8.7 ± 0.6</td>
</tr>
<tr>
<td><strong>APGAR 5min+7</strong></td>
<td>3(9)</td>
<td>3(9.7)</td>
<td>3(10)</td>
</tr>
<tr>
<td><strong>Overall Satisf.</strong></td>
<td>9.7 ± 0.6</td>
<td>9.8 ± 0.5</td>
<td>9.6 ± 0.9</td>
</tr>
</tbody>
</table>

*III>I, p<0.04, **I<II&III, p<0.02.

Conclusions: The addition of phenylephrine to IV prophylactic ephedrine did not further reduce the incidence of hypotension from intrathecal ropivacaine for C/S. The IV administration of phenylephrine with ephedrine was associated with higher incidence of vomiting.

A47

EPIDURAL-FENTANYL-INDUCED PURITIS: SELF-ADMINISTERED VERSUS NURSE-ADMINISTERED INTRAVENOUS NALOXONE

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Introduction: Epidural-PCA fentanyl for post cesarean section pain provides excellent analgesia but is sometimes associated with pruritus which may be distressing to patients. Intravenous naloxone resulted in a prompt relief of the symptoms. Such patients have been treated by a floor nurse with incremental doses of intravenous 0.04 mg naloxone.
Objective: To determine whether patient-administered intravenous naloxone enhanced patient control and decreased the need for hospital staff intervention.

Methods: The study included 194 women scheduled for elective cesarean section under epidural lidocaine 2%, fentanyl 5 mcg/ml and epinephrine 5 mcg/ml and no parental opioids. In the post-anesthesia care unit, patients received epidural-PCA fentanyl-ropivacaine-epinephrine and were randomized to one of two groups. Group I: (n=96) received patient-administered intravenous naloxone via PCA device (Abbott Life-Care, Abbott Laboratories, Chicago, IL). Group I patients could receive naloxone intravenous patient controlled dose of 0.04 mg (5 ml) and a lockout time interval of 5 min. Group II: (n=98) upon request from a floor nurse were able to receive intravenous naloxone 0.04 mg bolus dose every 5 min. Patients were evaluated at 1, 2, and 4 hrs, then every 4 hrs or sooner, if needed, for a total of 24 hrs for the following: fentanyl and naloxone total doses, fentanyl side effects, VAS pain scores, itching score, overall satisfaction and satisfaction from naloxone treatment, change in the infusion rate as needed and administration of additional boluses of fentanyl, level of consciousness and respiratory rate and depth. Incidence and type of side effects: pruritus, nausea, sedation and urinary retention (once urethral catheter had been removed postoperatively) were assessed by using a 10-point scale.

Results: There were no differences among the groups with respect to age, height, weight, parity, pain and itching scores, incidence of sedation, nausea, or vomiting, overall satisfaction and satisfaction from itching treatments. Group I patients were more likely to complain of itching (79.2% vs. 74.5% of the control), were more likely to receive naloxone treatment (70.3% vs. 37.8% for controls; P< 0.0001), used more naloxone in 24 hrs (0.35 mg vs. 0.18 mg for the controls) and received more boluses of fentanyl (5.7 ml vs. 5.3 ml for the controls). However, the total fentanyl administered was comparable between the groups (429.4 mcg vs. 417.9 mcg for controls).

Conclusion: Patient-administered intravenous naloxone enhanced patient control of treatment of epidural fentanyl-induced itching and decreased the need for hospital staff intervention. The greater amount of naloxone used by the self-administered group is strongly suggestive of the need to treat itching in patients who receive epidural-PCA fentanyl for post cesarean section pain. We believe that giving these patients the ability to administer naloxone on-demand makes them more aware of itching that otherwise might go untreated.

A48

CSE FOR CESAREAN SECTION: GERTIE MARX VERSUS PENCAN SPINAL NEEDLES

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Introduction: PENCAN spinal needle along with ESPOCAN epidural needles are used routinely for combined spinal-epidural anesthesia for cesarean delivery. However, we frequently encountered difficulty piercing the dura forcing us to switch to epidural block. We compared Gertie Marx spinal needle with PENCAN needle to determine which one is preferred to be applied for our obstetric patients.
Methods: Following IRB approval & informed consent, 124 ASA I-II parturients, who requested neuraxial block for C/S, were included. The epidural space was located with ESPOCAN 18 gauge epidural “Braun” needle (B. Braun Medical Inc.) at L4-5 or L3-4 interspace with loss of resistance to air tech using midline approach in lateral or sitting flexed position. Patients were then randomized to one of two groups. Group I: 59 had a 25 gauge PENCAN spinal needle placed in the subarachnoid space. Group II: 65 had a 26 gauge Gertie Marx spinal needle (IMD Inc. USA) placed in the subarachnoid space. Patients received intrathecally 10 mg isobaric bupivacaine with 25 mcg fentanyl and 100 mcg epinephrine. When the dura could not be pierced by the spinal needle the epidural needle was rotated 45 degree at a time for further attempts. If still unsuccessful, the spinal needle removed and epidural block was applied. All pts had a 19g Arrow FlexTip plus (Arrow international Inc.) open-end tip catheter placed 4 cm in the epidural space. An investigator recorded patient's height, weight, parity, patient's position, the distance of epidural space from the skin, technical problems, paresthesia and pain upon insertion of the spinal needle, time to incision, difficulty with catheter insertion, post-dural-puncture- headache, transient radicular irritability, duration of procedure and overall satisfaction from the technique use. Values are mean±SD, p< 0.05 considered significant.

Results: Groups did not differ in age, weight, height or parity, the distance of epidural space from the skin, duration of surgery, previous neuraxial block, the need to rotate or reinsert the epidural needle, the efficacy of the block, side effects from the block, difficulty with cath insertion, the sensory level overall satisfaction, or the APGAR score. Time to incision was 33 ± 8 and 24 ± 6 min for Group I and II respectively (p= 0.0001). Time to T6 was 6 ± 4 and 2.6 ± 2 min for Group I & II respectively (p= 0.0001).

<table>
<thead>
<tr>
<th>Lateral Position</th>
<th>PENCAN n=59</th>
<th>Gertie Marx n=65</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spinal needle problem</td>
<td>55 (98)</td>
<td>48 (80)</td>
<td>0.002</td>
</tr>
<tr>
<td>Leg jolt upon needle insertion</td>
<td>34 (58)</td>
<td>19 (29)</td>
<td>0.001</td>
</tr>
<tr>
<td>Paresthesia upon needle insertion (0-10)</td>
<td>24 (41)</td>
<td>10 (16)</td>
<td>0.001</td>
</tr>
<tr>
<td>Sedation (0-10)</td>
<td>3 ± 3.8</td>
<td>1.4 ± 3</td>
<td>0.02</td>
</tr>
<tr>
<td>Tured dura with successful block</td>
<td>36 (61)</td>
<td>56 (88)</td>
<td>0.001</td>
</tr>
<tr>
<td>Switched to epidural</td>
<td>23 (39)</td>
<td>0 (13)</td>
<td>0.001</td>
</tr>
<tr>
<td>Sedation (0-10)</td>
<td>0.1 ± 0.5</td>
<td>33 ± 3.9</td>
<td>0.0001</td>
</tr>
<tr>
<td>Overall Satisfaction (0-10)</td>
<td>9.3 ± 1.1</td>
<td>9.6 ± 1.3</td>
<td>0.09</td>
</tr>
</tbody>
</table>

[Table 1]
Conclusion: Application of PENCAN spinal needle when compared to Gertie Marx needle for C/S had less success piercing the dura, caused more paresthesia and pain during insertion, prolonged time to incision and required switch to epidural block more often.

A49

RADIOFREQUENCY ABLATION OF GENICULAR NERVES FOR THE TREATMENT OF CHRONIC KNEE OSTEOARTHRITIS

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Introduction: Radiofrequency ablation (RFA) was first demonstrated by Choi (1) to be an effective therapy in the treatment of patients with chronic knee osteoarthritis pain. However, there have been no follow up studies about genicular nerve RFA to confirm its efficacy. There also have been no studies evaluating its use in patients that continue to have pain after total knee arthroplasty (TKA). We present two cases of successful RFA of the genicular nerves in patients with chronic knee osteoarthritis, which included one person with chronic knee pain after TKA.

Materials and methods: The first patient was a 29 year old woman with Ehlers-Danlos syndrome, right knee osteoarthritis, and previous right knee arthroscopic ligament repair that caused chronic knee pain. She had two previous diagnostic genicular nerve blocks performed using 0.25% bupivacaine that each provided greater than 80% pain relief for two weeks.

The second patient was a 52 year old woman with osteoarthritis and persistent knee pain after bilateral knee replacements. She had one previous diagnostic genicular nerve block performed on each knee using 0.25% bupivacaine that provided 100% pain relief in both knees for one day.

The procedures for both patients utilized identical methodology. The patient was placed in supine position and fluoroscopy was used to visualize the knee joint anteroposteriorly. The landmarks used for the superior medial (SM) and superior lateral (SL) genicular nerves were the connection of the femoral shaft with the medial and lateral epicondyles. The landmark for the inferior medial (IM) genicular nerve was the medial aspect of the tibia at the shaft-epicondyle intersection. The skin was anesthetized with 1% lidocaine and a 20 gauge RFL 100 mm insulated needle with a 5 mm active tip was advanced towards each of these locations until the lateral view confirmed that the needle tips were at the posterior one-third of the femur and tibia. Sensory stimulation at 50 Hz was performed to confirm correct needle position followed by motor stimulation at 2 Hz to confirm the absence of muscle fasciculation. Lidocaine was injected to anesthetize the nerves and RFA was then performed at 80 degrees Celsius for 180 seconds in the lesion mode.

Results: Both patients experienced 100% pain relief immediately after the procedure. At 4 week follow-up, the 29 year old female reported 80% pain relief that was ongoing. At 4 week follow-up, the 52 year old female reported 100% pain relief in the left knee and 75% relief in the right knee. No complications were identified.
Discussion: Greater than 12% of the American population experiences pain and functional limitations from chronic knee osteoarthritis (2). In addition, Liu (3) provides evidence that 53% of people continue to have knee pain after undergoing TKA. Osteoarthritic knee pain was successfully treated in our two patients with genicular nerve RFA providing additional evidence of its utility in the management of this disease. Furthermore, we propose that this procedure is effective for treating persistent pain after TKA.


[References]

A50
A COMPARATIVE STUDY BETWEEN COOLED RADIOFREQUENCY VS MULTIELECTRODE THERMAL RADIOFREQUENCY FOR TREATMENT OF SACROILIAC JOINT PAIN
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Introduction: Chronic low back pain may be caused by dysfunction or disease affecting the sacroiliac joint (SIJ). Sometimes pain originating at the SIJ involves the low back, hips, buttocks, and thighs, mimicking discogenic or radicular low back pain and potentially leading to misdiagnosis and lumbar surgery. Strong ligaments encase each SIJ and affect stability; in case of damage to the ligaments, the joint may experience excessive mobility, resulting in inflammation, alteration of the articular capsule and disruption of surrounding nerves. Common causes of SIJ alteration are represented by degenerative disease, injury or traumatic event or repetitive trauma. Various studies have described radiofrequency denervation of SIJ. This controlled prospective study compares cooled radiofrequency denervation with RF thermal ablation of the posterior sensory nerves of the SIJ by an innovative multi-electrode radiofrequency probe and evaluates their effects on pain, analgesic use, disability, and satisfaction of patients suffering with chronic SIJ pain.

Methods: After Institutional Review Board approval was obtained, 19 patients with SIJ pain, confirmed by a local anesthetic joint block, were enrolled in the study; patients were randomly assigned to one of the two study groups by a computer generated list. 10 patients underwent cooled RF of S1-S3 lateral branches and of the primary L5 dorsal ramus (SInergy™) and 9 patients underwent multielectrode thermal RF (Simplicity III™) of S1-S3 lateral branches plus conventional monopolar lesioning at the
primary L5 dorsal ramus. Procedure time have been recorded. Patients were evaluated after the 1st, 3rd, 6th month postoperatively: pain was evaluated using a numerical rating scale score (NRS) of 0-10 (0 been no pain and 10 being excruciating pain), their physical function with the Oswestry Disability Index (ODI), analgesic intake and satisfaction(with actual pain level and the RF procedure) with ordinal responses. Comparisons were made using unpaired and paired t-tests and the graphs were generated using Sigma Plot (Systat Software Inc, Chicago, IL) computer program.

Results: Procedure time resulted shorter in the group undergoing multielectrode thermal RF. After the 1st, 3rd, 6th month postprocedure, both groups reported significant reductions of NRS, ODI and analgesic intake (p > 0.05). Differences between the two study group were not significant (p < 0.05). Complications were minimal. Patients in the Simplicity study group resulted more satisfied with the procedure, due to shorter time of procedure and less discomfort during needle insertion (p > 0.05).

Conclusions: Both radiofrequency techniques are effective and safe procedure. Multielectrode thermal RF (Simplicity III™) technique may offer an improvement as patients experienced minimal pain and discomfort during the procedure due to insertion of a single probe without introducer and a shorter procedure time.

Bibliography:


A51

PERIOPERATIVE SYSTEMIC MAGNESIUM TO MINIMIZE POSTOPERATIVE PAIN: A META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS

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Background: Systemic magnesium has been used to minimize postoperative pain with conflicting results by clinical studies. It remains unknown if the administration of perioperative systemic magnesium can minimize postoperative pain following general anesthesia. The objective of the current investigation was to evaluate the effect of systemic magnesium on postoperative pain outcomes.

Methods: We followed the PRISMA statement guidelines. A wide search was performed to identify randomized controlled trials that evaluated the effects of systemic magnesium on postoperative pain outcomes in surgical procedures performed under general anesthesia. Meta-analysis was performed using a random-effect model. Publication bias was evaluated by examining the presence of asymmetric funnel plots using Egger's regression.

Results: Twenty randomized clinical trials with 1257 subjects were included. The standard mean difference (95% CI) of the combined effects favored magnesium over control for pain at rest (≤ 4 h, -0.82 (-1.19 to -0.45), 24 h, -0.66 (-1.15 to -0.16)) and with movement (≤ 4 h, -0.31 (-0.63 to -0.005),
24h -0.71(-1.28 to -0.13)). Opioid consumption was largely decreased in the systemic magnesium group compared to control, -2.00 (-2.58 to -1.42). Publication bias was not present in any analysis. Significant heterogeneity was present, but it could be partially explained by the intraoperative compared to the intraoperative and postoperative administration of magnesium. None of the studies reported clinical toxicity related to toxic serum levels of magnesium.

Conclusion: Systemic administration of perioperative magnesium reduces postoperative pain and opioid consumption. Magnesium administration should be considered as a strategy to mitigate postoperative pain in surgical patients.

PERCUTANEOUS SPLANCHNIC NERVE RADIOFREQUENCY ABLATION IN VISCERAL PAIN: A CASE SERIES

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Introduction: Chronic abdominal pain has proven difficult to manage successfully.1 Use of epidural differential diagnostic nerve blocks can be helpful in establishing visceral etiology in some cases of intractable abdominal pain. Depending on patient response, celiac and splanchnic nerve blocks can then be attempted for temporary relief and confirmation of a visceral etiology. Long-term alleviation of pain may be obtained with chemical neurolysis, but is typically relegated to patients with underlying malignancy.2 For patients with chronic non-cancer pain, radiofrequency ablation of the splanchnic nerve offers an attractive alternative. However, percutaneous splanchnic nerve radiofrequency ablation [pSN-RFA] has been described in a limited number of publications and remains anecdotal. This case series helps support the utility of this treatment modality in chronic non-cancer related visceral abdominal pain.

Methods: Three subjects with chronic abdominal pain underwent a diagnostic epidural differential nerve block between 2009 and 2011 according to a pre-set algorithm. They demonstrated an appropriate response and subsequently received a splanchnic nerve block. Those who experienced improvement were offered pSN-RFA. Inclusion criteria for pSN-RFA cohort study were: refractory non-cancer pain of predominantly visceral origin as determined by differential nerve block. Exclusion criteria were: addiction disorder, and severe untreated depression. Patients were followed for up to 6 months post-pSN-RFA. After obtaining patient consent, their records were reviewed. Data collected included demographics (age, gender), objective measures (amount of oral and IT opioids consumed), and subjective measures (pain scores).

Results: Upon differential epidural block, three subjects were identified to have predominantly visceral abdominal pain and subsequently received a splanchnic nerve block. They temporarily experienced >50% relief from bilateral splanchnic nerve blocks at T12. They underwent bilateral pSN-RFA at T12; indications included intractable chronic pancreatitis pain (n=1) and dysfunctional chronic abdominal pain (n=2). In this patient population, average age was 25, and two were female. Pain intensity score at baseline was VAS 6 ± 0.8 and one week post-procedure VAS 2.2 ± 2.7. This is a difference of ΔVAS 4.2 ± 2.8. Post-procedure Patients also notably required a decreased amount of oral and IT opioids. An average of 5 months lapsed before patients sought further treatment. Adverse effects attributed to pSN-
RFA included soreness at needle entry sites.

Discussion: Splanchnic nerve RFA led to statistically significant decreased pain scores, without major complications. Though this comprises only a small case series, these results are encouraging and demonstrate utility for pSN-RFA as a potential long-term management tool. Larger studies need to be conducted to further elucidate pSN-RFA outcomes, but this procedure may be considered as a viable alternative to the more traditional approach of celiac plexus block for non-cancer related pain.

References:


A53
FACTORS THAT MIGHT IMPACT INTRATHecal OPIOIDs DOSE ESCALATION: A LONGITudINAL STUDY

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Introduction: Intraspinal drug delivery (IDD) systems have become an accepted modality to administer opioid medications for the management of chronic intractable non-cancer related pain. Tolerance leading to opioids dose escalation over time is well known and accepted for oral opioid regimen. However, this is not well documented for intrathecal opioid therapy. The aim of our study was to evaluate the intrathecal opiates dosage requirements of a group of patients with IDD at the Cleveland Clinic pain management department to demonstrate the dose escalation over time and determine the specific factors that might influence dose escalation.

Materials and methods: After IRB approval, the electronic medical records of patients who received IDD implants for chronic non-cancer related pain between1998-2010 were reviewed. One hundred forty patients who had documented follow up for at least 2 years were identified. Twenty-five patients were excluded due to switching IDD medication to non-opioids or lack of complete data. Opioids other than morphine were converted to morphine equivalent dose. Various potential factors impacting on dose escalation such as demographic data, etiology and associated co-morbidities were analyzed. SPSS 18 was used for data analysis.

Results: Total of 115 patients was eligible for data analysis. Mean age of the patients was 53.15± 14.3 (range: 20-85) years. There was no correlation between age and dose escalation (p< 0.05). Mean duration of the IDD was 5.7 ± 2.6 years (range:2-14 years) with mean initial morphine equivalent daily dose of 2.52 ± 5.64 mg and mean final daily dose of 7.2 ± 14.1 mg. A hundred and one patients (87%) required dose escalation with mean of 366.78 ± 698% over 5.7 years. Initial pain visual analogue score (VAS) improved from 6.78 ± 1.85 to 5.76 ± 2.43. There was no correlation between number of comorbidities and dose escalation. However, the number of comorbidities was directly correlated with
final VAS (p=0.02). Neuropathic pain correlated directly with dose escalation (p=0.01). Smoking had significant correlation with final VAS (p= 0.004) and ITP opioid dose escalation (p=0.01). Dose escalation was the highest if ITP duration was more than 5 years (486 ± 857.2%) and lowest between 3-5 years (253.8 ± 455%). Among the etiologies, failed back surgery syndrome (FBSS) was associated with the highest rate of escalation (412.03 ±733.3%) followed by CRPS (309.7 ±337.65%). Spinal stenosis and spasticity were associated with the lowest rate of escalation 281.11 ±426.68% and 157.7 ± 451.13% respectively.

Discussion: IDD of opioids required dose escalation in the majority of patients as expected but pain VAS was improved. Several factors impacted the rate of dose escalation; namely the presence of neuropathic pain, FBSS, CRPS and smoking. Spasticity and spinal stenosis required the least dose escalation over time.

Conclusion: This study showed that the etiology of chronic pain and comorbid conditions affect opioid dose escalation in IDD. The impact of these factors as well as the value of the adding adjuvant intrathecal drugs like bupivacaine, clonidine and ziconotide in attenuating the rate of dose escalation should be studied in prospective clinical trials.

A54
TEMPOROMANDIBULAR PAIN AND PSYCHIATRIC EVALUATION: FOR WHICH PATIENT AND WHEN?
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¹Department of Physical Medicine and Rehabilitation, ²Department of Consultation Liaison Psychiatry, Istanbul University, Istanbul Faculty of Medicine, Istanbul, Turkey

Introduction: Psychiatric conditions may cause to temporomandibular joint (TMJ) complaints or TMJ disorder may trigger psychiatric problems. Psychiatric evaluation is important in both conditions. The aim of this study is to determine both psychiatric risk factors and indications for clinician's request for psychiatric evaluation in patients with TMJ pain and dysfunction.

Material and methods: 273 patients, who were presented to multidisciplinary outpatient clinic of TME diagnosis and treatment unite and followed up for temporomandibular pain and dysfunction pre-diagnosis, were included in this trial. Patients were classified in 3 sub-groups: patients with myofacial pain alone (group-1), patients with TMJ disorder alone (group-2), and patients with TMJ disorder and also myofacial pain (group-3). All patients were examined by standard TMJ examination and were applied Hospital Anxiety Depression (HAD) scale in order to determine psychopathology risk.

Results: According to univariate analysis, risk factors for patients with confirmed anxiety and/or depression were being female (p=0.005), existence of myofacial pain (p=0.01), effects of stress on complaints (p=0.005) and insufficient social support (p< 0.001). According to regression analysis, presence of psychopathology was increased 3.7 times by being female, 3.5 times by insufficient social support and 1.2 times by myofacial pain.

Discussion: Female patients, patients with deficient social support systems and patients with myofacial pain alone or patients with myofacial pain accompanying to existing TMJ disorder among TMD
patients are considered as patients groups with psychiatric risks. During treatment plan for TMJ patients having these risk factors, existence of psychopathology should be considered in addition to musculoskeletal pathologies.

References:


Funding: This research is supported by Istanbul University Scientific Research Projects Unit.

A55
TREATMENT OPTIONS FOR PERSISTENT PAIN IN PATIENTS WITH CHIARI MALFORMATION: A SIXTEEN-YEAR RETROSPECTIVE ANALYSIS
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Introduction: Arnold-Chiari malformation (ACM), 3-5 mm herniation of cerebellar tonsils below the level of the foramen magnum is often associated with syringomyelia. Signs and symptoms of ACM are headache, dizziness, tinnitus, ataxia, dysphagia, weakness, and numbness due to foramen magnum compression, central cord, or cerebellar syndrome. Following posterior fossa decompression (PFD), many patients develop persistent, severe refractory pain of the head and neck as well as a variety of neuropathies.

Material and methods: Following IRB approval, we retrospectively analyzed a database of all patients diagnosed with ACM who were evaluated in the outpatient pain clinic over a period of 16 years (1996 to 2012). Data reviewed included: diagnosis of ACM with or without syringomyelia, initial and presenting symptoms upon referral to pain clinic, radiographic findings, type of operation(s), and specific treatment in pain clinic. Patients were first divided into 2 groups: those whose symptoms improved following PFD and those whose symptoms did not improve. The patients were then divided into 3 treatment groups: medical management, interventional procedures, and infusions for treatment of refractory pain. Those groups were then divided into those who reported symptom improvement and those who did not.

Results: 42 patients out of 497 (8%) with known ACM status post decompression were referred to the outpatient pain clinic for refractory headache. Of those 42 patients, 18 (43%) reported improvement of symptoms following PFD greater than 1 week (mean duration 17.7 months), 19 (45%) reported no improvement in symptoms following PFD, and 5 (12%) reported neither. Of the 9 (21%) patients who were treated in the pain clinic with medical management only (including methadone, short-acting opioids, muscle relaxants, anticonvulsants, and tricyclic antidepressants), 3 (33%) reported improvement and 3 (33%) reported no improvement. Of the 21 (50%) patients receiving interventional therapy, 13 (62%) reported improvement and 6 (29%) reported no improvement. Procedures included
14 occipital nerve blocks, 7 trigger point injections, a supraorbital nerve block, caudal epidural steroid injection, and cervical facet radiofrequency ablation. Of the 15 (36%) patients who received intravenous lidocaine or ketamine infusions, 11 (73%) reported improvement in symptoms and 4 (27%) reported no improvement in symptoms. Five of the 42 (12%) patients did not follow up in pain clinic after the initial visit, and treatment result was unable to be determined. Six of the 42 (14%) patients were referred for post-dural puncture headaches and received relief following epidural blood patch.

Discussion: Our retrospective data analysis demonstrates that for patients with severe, refractory pain related to ACM, medical management alone does not improve pain. However, a combination of interventional therapy and more importantly, intravenous infusions play a greater role in the treatment of ACM status post PFD and refractory post-surgical pain, suggesting a central sensitization component of the syndrome. Specifically, intravenous ketamine and lidocaine infusions, occipital nerve blocks, and trigger point injections may improve VAS scores with minimal side effects. Further controlled studies are needed.


A56

FAILED BACK SURGERY SYNDROME IS PREDICTED WITH GREATER SENSITIVITY USING MACHINE ALGORITHMS

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Introduction: Lumbar laminectomy/fusion for axial low back pain produces limited improvement in pain and quality of life in a significant number of patients (1). Predictors of failed back surgery syndrome (FBSS) may include many preoperative factors each with a weak association (1,2). Machine learning algorithms (MA) are useful in analyzing large multidimensional databases such as electronic medical records to identify associative factors and predict outcomes. Often MA's outperform logistic regression with regards to outcomes based upon accuracy of the given model (3). Using MA's to analyze preoperative datasets of lumbar fusion patients may identify new factors, or strengthen known associations with FBSS and improve our ability to identify future successful surgical candidates.

Materials & methods: We performed a retrospective analysis of 471 patients who had lumbar fusion at our institution. Of these, 154 now carry the diagnosis of FBSS: at > 6 months postoperative, their pain is equal to or greater than preoperatively. Our dataset included whole-document text from which the MA's extract predictive information using natural language processing. Following univariate descriptions of discrete features, we tested multiple classifiers (boosted decision tree, k-nearest neighbors, rule induction, and logistic regression algorithms) using a 40-30-30 training-validation-testing split of our sample. Text data was parsed and clustered based upon FBSS status for inclusion into classifiers. Classifier performance was evaluated using area under the receiver operating curve (ROC; a measure of sensitivity), cumulative lift (a measure of model effectiveness), and misclassification rate.
Results: Univariate analysis suggested differences in FBSS status according to ethnicity (p=0.02), age (p=0.02), weight at the time of surgery (p=0.045), weight at follow-up (p=0.01), and pain at 5-month follow-up (p=0.01). Overall, the boosted decision tree demonstrated the greatest accuracy with a ROC of 0.771, followed by the k-nearest neighbor (0.614), logistic regression (0.5) and rule induction (0.393). Similar results were found for cumulative lift, with gradient boosting (1.77) outperforming k-nearest neighbor (1.42), logistic regression (1) and rule induction (0). Misclassification rates ranged from 18% (boosted decision tree) to 44% (rule induction methods). Text clusters carried high-levels of worth with regards to model development.

Discussion: Machine learning classifiers offer potential for improved accuracy over logistic-regression in predicting FBSS. Natural language processing of raw clinical documents may offer additional features for inclusion into classification algorithms. Future efforts will attempt to create multiple matrices for text elements within the same sample, and automate access to text elements.

References:


Funding: From University of Florida Department of Anesthesiology, Division of Pain Medicine.

A57
STUMP NEUROMA PAIN, ULTRASOUND GUIDED CRYOABLATION

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Objective: Phantom limb pain and stump pain frequently occur after limb amputation, and stump neuromas play an important role in generation of the pain. The purpose of this case series is to evaluate the importance of real-time high-resolution sonographic guidance to enhance the accuracy and effects of cryo nerve ablation procedure for painful stump neuromas.

Subjects and methods: In this prospective study, cryo nerve ablation was performed on 5 patients by means of high-resolution sonographically guided.

Results: During treatment all patients had marked improvement in terms of reduction of pain measured with a visual analog scale. All of the subjects were pain free after one treatments. At 6-month follow-up evaluation, all patients assessed their present pain quantity at the level of 1 to 2 out of 10 score. All patients reported almost unnoticeable pain.
Conclusion: This is a very small sample to obtain a conclusion. The high-resolution sonographically
guided cryoablation procedure has the potential to provide better outcome than other documented	
treatments. Sonographically guided cryoablation should be included in the management of chronic	
stump pain.

In this presentation we will present the ultrasound picture and short movie.

A58
BOTOX: THE PHANTOM’S LAST HOPE?
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In this case study we present a 37 year old right-handed Caucasian male with past medical history
significant for phantom limb pain in the right above knee amputation (AKA) site following remote trauma more than 20 years ago.

Patient described a chronic constant sharp, lancinating pain and spasms in the AKA stump and a
sensation that the foot is still there. When the patient initially established care with us, his pain was poorly controlled on acetaminophen / oxycodone (percocet) 10/325 0.5 tablet PO Q4 hours and Lyrica 100mg PO TID.

Over the course of the duration of the pain he had tried and failed: amitriptyline, gabapentin, pregabalin, lidocaine cream and capsacin, baclofen, trigger point injections, hyponotic therapy, acupunctures and Calmare®.

Patient denied any allergies and in terms of the social history, he was highly functional individual who ambulates with crutches, with no history of smoking, alcohol, or illicit drug use. Family history was noncontributory and review of systems was within normal limits.

Physical exam revealed a young slightly overweight white male in no significant distress whose vital signs were within normal limits. Patient was alert and oriented to person, place, and time. His speech was fluent and clear. Cranial nerves II-XII were within normal limits. Patient had a right sided AKA and this was diffusely tender especially over the stump. Power was 5/5 in the bilateral upper limbs and left lower limb with no atrophy and normal tone. Coordination was intact.

As he had tried and failed multiple pain therapies with minimal to no relief we decided to treat his pain as as case of Phantom Limb Pain with dystonia and since botulinum toxin has been used for dystonia with high success rate we proceeded to inject the right AKA stump. At total of 100 units of BOTOX® (onabotulinumtoxinA, Allergan, Inc.) was injected in the lateral region of the AKA stump with 10 units injected deeper in the most tender area.

That day the patient tolerated the procedure well and within the coming few days he had reached the maximal benefit of 80% relief. The relief has persisted over the past 2-3 months although it has
currently dropped to a 50% improvement from his baseline pain. As with all dystonia patients, botulinum toxin's effects last around three months hence the patient is due to follow up with us this month.

We felt this observation was very interesting in that while many pain control modalities have failed, botox improved his pain by 80%. We hope to be able to document in the final study whether the patient had become less reliant on the use of crutches and whether he was able to decrease the daily dose of acetaminophen / oxycodone (percocet).

A59

EFFECTIVENESS OF TAPENTADOL PROLONGED RELEASE (PR) VERSUS A COMBINATION OF TAPENTADOL PR AND PREGABALIN FOR MANAGING SEVERE, CHRONIC LOW BACK PAIN WITH A NEUROPATHIC COMPONENT

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Introduction: Severe low back pain with a neuropathic component is often managed with a combination of strong opioids and co-analgesics (eg, anticonvulsants),1 which improve analgesic efficacy but may be associated with poor tolerability and related discontinuations.2 The effectiveness of tapentadol PR for managing severe, chronic low back pain with or without a neuropathic pain component has been demonstrated.3 This double-blind phase 3b study (NCT01352741; approved by Ethics Committee) evaluated the effectiveness and tolerability of tapentadol PR monotherapy versus tapentadol PR/pregabalin combination therapy for managing severe, chronic low back pain with a neuropathic component.

Methods: At baseline, patients were required to have a painDETECT “unclear” or “positive” rating and an average pain intensity ≥6 (11-point NRS-3 [average 3-day pain intensity]). All eligible patients were titrated to tapentadol PR 300mg/day over 3 weeks. At randomization, those patients with ≥1-point decrease in NRS-3 from baseline and an average NRS-3 score ≥4 were randomized to target doses of tapentadol PR (500mg/day) or a combination of tapentadol PR (300mg/day) and pregabalin (300mg/day) during an 8-week comparative period. The primary endpoint was a comparison of the change from randomization to the end of the comparative period in NRS-3 for tapentadol PR monotherapy versus tapentadol PR/pregabalin combination therapy (non-inferiority testing). Treatment-emergent adverse events (TEAEs) were documented.

Results: In the per-protocol population (n=288), the analgesic effectiveness of tapentadol PR monotherapy was non-inferior to that of tapentadol PR/pregabalin combination based on the change in NRS-3 from randomization to final evaluation (last observation carried forward; least-squares mean difference [95% CI], −0.066 [−0.57, 0.43]; P < 0.0001, indicating non-inferiority). Pain intensity decreased over time (Table). The most common TEAEs (≥5.0%) during the comparative period for tapentadol PR monotherapy (n=154) and tapentadol PR/pregabalin combination (n=159), respectively, were dizziness (11.0% vs 17.6%), somnolence (8.4% vs 11.9%), hyperhidrosis (11.7% vs 6.3%), nausea (10.4% vs 9.4%), fatigue (8.4% vs 10.1%), constipation (7.1% vs 5.0%), headache (6.5% vs 8.2%), vomiting (5.8% vs 3.1%), and dry mouth (3.9% vs 5.0%). In the monotherapy and combination groups, respectively, 7.1% and 6.3% of patients discontinued double-blind treatment because of
TEAEs; an additional 12.3% and 11.3% of patients discontinued double-blind treatment and continued in an open-label pickup arm.

Discussion: Tapentadol PR monotherapy (500mg/day) and a combination of tapentadol PR/pregabalin (300/300mg/day) showed comparable reductions in pain intensity with fewer central nervous system-related TEAEs in the monotherapy arm. The favorable effectiveness and tolerability profile suggest that monotherapy with tapentadol PR, with its 2 mechanisms of action, is a viable treatment option in patients with severe low back pain with a neuropathic component.

References:

1 Varrassi et al. CHANGE PAIN Physician Survey; EFIC 2009.


Funding: Grünenthal GmbH.

| Table. NRS-3 Pain Intensity Scores for Overall Low Back Pain (Last Observation Carried Forward) |
|---------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------|
| Treatment | Mean (SD) baseline pain intensity | Mean (SD) randomization pain intensity | Mean (SD) final pain intensity | Mean (SD) change in pain intensity from randomization to final evaluation |
| Tapentadol PR (n = 139) | 8.5 (1.01) | 5.8 (1.34) | 4.2 (2.55) | −1.6 (2.52) |
| Tapentadol PR/pregabalin (n = 149) | 8.4 (1.03) | 5.9 (1.27) | 4.2 (2.53) | −1.7 (2.48) |

P<0.0001.

A60

EPIDURAL BLOOD PATCH IN A PATIENT WITH TARLOV CYSTS
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Introduction: Tarlov cysts have an incidence of 5% in the general population, are mostly asymptomatic, and are typically detected as incidental findings on MRI. We present a patient whose dural puncture headache/CSF leak from a ruptured Tarlov cyst was successfully treated with an epidural blood patch, the first such report.

Case presentation: A 28-y.o. female with history of scoliosis and ovarian cyst rupture presented with severe postural headache without any apparent cause. Over the course of a month, her frontal headache had progressed to worsening pain radiating to the occipital region. Pain was exacerbated by sitting up/standing but resolved when supine. Thorough neurologic examination failed to reveal any abnormalities. Initial treatment by her primary-care provider with fluid replacement combined with acetaminophen, butalbital, and caffeine had failed to stem her symptoms. After transfer to our institution, an MRI of her spine revealed multiple perineural cysts at the S1-S2 levels with extrathecal fluid signal intensity at the S1-S2 level concerning for possible tear and CSF leak from the 1-cm perineural cyst at this level. Anesthesia Pain Service was consulted for possible blood-patch therapy. Due to the cysts' location and CSF collection, epidural blood patch under fluoroscopy was performed. The vertebral bodies of L5 and the sacrum were identified, and a standard 17-gauge, 3½ inch Touhy needle was positioned to the posterior lamina of L4. The needle was directed in a caudal retrograde fashion and advanced into the epidural space at L5-S1 using loss of resistance technique and fluoroscopic guidance towards the S1-S2 region on the right. Radio-contrast material was injected and adequate spread was noted at S1-S2 level. Sterile autologous blood (20 mL) was then delivered slowly. Immediately afterward, patient noted significant relief of headache. She was discharged the following day with complete headache resolution.

Discussion: Epidural blood patch therapy for CSF leak from a dural tear resulting from a ruptured Tarlov cyst is a safe and effective treatment option and has been successfully employed for other causes of CSF leak. Epidural blood patch forms a clot over the meningeal tear, prevents further CSF leak, and allows the meningeal rent to heal. Typically, 10-20 mL of autologous blood is aseptically injected into the epidural space at or near the interspace at which the meningeal puncture is located. Our patient had MRI evidence of intracranial hypotension. The location of the dural tear and presence of other cysts in that area led us to pursue a retrograde approach rather than the standard epidural blood patch technique. Caudal approach was also considered but due to increased risk of infection was not undertaken. Individual circumstances should dictate the approach pursued in future application of blood patch treatment for postural headache as a result of dural tear from a ruptured Tarlov cyst.

References:


SUPER-SELECTIVE SCALP BLOCK DURING PROLONGED AWAKE CRANIOTOMIES: EFFECTIVE DURATION, PATIENT COMFORT, AND CLINICAL VALUE

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Introduction: Scalp block, using the infiltration technique has been used for years in awake brain surgeries. The limitation of this technique is a short, 2 to 6-hour duration. We have developed a new technique of the super-selective scalp block and evaluated its effectiveness in patients undergoing awake craniotomies lasting more than 10 hours. To our knowledge this is the first report of evaluating the effectiveness of the super-selective scalp block in awake craniotomies lasting more than 10 hours.

Materials and methods: After obtaining Institutional Review Board approval we reviewed surgical, anesthesia, and medical records of patients undergoing awake craniotomies lasting more than 10 hours. The super-selective scalp block technique used during procedures consisted of a bolus injection, rather than infiltration, of 0.5% Ropivacaine (2-4 mg/kg) with epinephrine 1:200,000. Ropivacaine was injected in a direct vicinity of the small diameter nerves innervating the scalp. This form of anatomically guided injections aims at increasing the concentration of a local anesthetic close to the small nerves. Duration of the block was evaluated by assessing patient's comfort during awake craniotomies, and using a visual analog scale in the 24-hour period after Ropivacaine injection.

Results: There were 37 patients in our study (18 females and 19 males). All patients had MRI-confirmed insular tumors and required awake intraoperative mapping and monitoring of speech and motor functions. The average age was 37 years old (range 19-61). The average duration of the surgery was 12 hours (range 10-17 hours). In 20 patients the OR time ranged from 10-11 hours; in 11 patients from 12-14 hours; in 6 patients more than 14 hours. The average duration of awake intraoperative neurological monitoring was 159 minutes (range 30-420 minutes). In all patients the super-selective scalp block provided complete scalp analgesia during the entire procedure. The analgesic effects also extended into the postoperative period, as measured by low pain scores and low usage of pain medications in the first 24 hours after surgery.

Discussion: Super-selective scalp block provides excellent and prolonged scalp analgesia during awake craniotomies lasting more than 10 hours. This is in contrast to the traditional infiltration scalp block that lasts only 2-6 hours, and if the procedure extends beyond that, it would require reinjection of the local anesthetic. Complete analgesia resulting from the super-selective scalp block eliminates the need for sedatives and opioids during neurological testing. Fully awake patients provide better feedback during neurological testing, which allows for earlier detection of any signs of intraoperative neurologic compromise. The super-selective scalp block offers an extended duration of scalp analgesia and warrants further investigations in awake and conventional craniotomies because of its potential to provide a better postoperative pain control.

References:


Funding: This study was funded using departmental resources.
COMPARISON OF THE EFFICACY OF TWO TECHNIQUES FOR PIRIFORMIS MUSCLE INJECTION: ULTRASOUND-GUIDED VERSUS NERVE-STIMULATOR WITH FLUOROSCOPIC GUIDANCE

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Introduction: Piriformis syndrome is a source of low back pain that often goes undiagnosed in many patients in the United States. Injection of the piriformis muscle with a local anesthetic/corticosteroid mixture has shown efficacy in treating this condition, when conservative therapy fails. The use of fluoroscopic guidance, nerve stimulation, electromyelogram, and anatomic landmarks are traditional methods for performing this injection; however, ultrasound imaging has recently been utilized for performing this procedure. Although studies exist that describe and validate the ultrasound technique, no studies compare the techniques with respect to short-term and long-term outcomes. In this study, our primary objective was to determine if a difference existed between a fluoroscopic-guided technique and ultrasound-guided technique with respect to pain and function. A secondary objective was to compare the two techniques with respect to procedural characteristics.

Material and methods: After obtaining our institution's IRB approval, we recruited 28 patients with piriformis syndrome who had failed conservative therapy and randomized them into two arms for injection of the piriformis muscle: (1) nerve-stimulator with fluoroscopic guidance and (2) ultrasound guidance. We collected data to include numerical rating scale (NRS) pain levels, Multidimensional Pain Inventory (MPI) questionnaires, and Patient's Global Impression of Change (PGIC) prior to the procedure, 1-2 weeks post-procedure, and 3 months post-procedure. Additionally, we collected data regarding performance of the procedure to include imaging time, needling time, and total performance time.

Results: A total of 25 patients (11 in fluoroscopy group; 14 in ultrasound group) completed the study (3 were lost to follow-up). No differences were detected between the two study groups at any interval with respect to NRS (P = 0.749). No differences existed between the two study groups with respect to 12 of the 13 scales of the MPI. The only difference existed with the Outdoor Work scale, but this was with a very weak power. No differences existed between the two groups with respect to the PGIC nor the procedural characteristics.
[Piriformis Injection with Fluoroscopic Guidance]
Conclusion: No differences between nerve stimulation with fluoroscopy and ultrasound techniques for performing piriformis muscle injections exist with respect to the primary outcome measure (NRS) nor with respect to secondary outcome measures (MPI, PGIC, block characteristics).

References:


Funding: All funding was from Naval Medical Center, Portsmouth, Virginia. No sources of outside
funding were used for this study.

A63
POSTOPERATIVE PAIN CONTINUES TO BE UNDERMANAGED
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[Figure 1]
Introduction: Postoperative pain can have a significant effect on patient recovery. A survey conducted a decade ago suggested postoperative pain was a significant problem and frequently undermanaged.\textsuperscript{1} Since then, there have been greater awareness and emphasis on pain management accompanied by the publication of the ASA pain management guidelines and the development of new analgesics and delivery systems.\textsuperscript{2} The objective of this study was to characterize the postoperative pain experience, assess patient perceptions about postoperative pain and pain medications, side effects associated with analgesics as well as patient satisfaction with pain management.

Methods: IRB approval was obtained. Based on the methodology of the previous survey\textsuperscript{1}, we interviewed patients via telephone who had surgery within the past 5 years from the date of the interview. The sample was based on US census information in terms of geography, age of household head, income and size. The interviewers asked a predetermined list of questions, modified from a survey used previously\textsuperscript{1}, about the location of the surgery and postoperative pain management. Patients were also asked about the presence and severity of pain (verbal categorical scale), the medications received, adverse effects, and satisfaction with pain medications after surgery while still in the hospital and up to 2 weeks after discharge. Percentages were calculated on the basis of the total number of patients who answered each question. Data were analyzed with descriptive statistics. Regression analyses were performed to explore factors associated with the degree of worst postoperative pain. A $p$ value< 0.05 was declared significant.

Results: A total of 300 patients were interviewed, with 48.7% in-patients and 51.3% outpatients; 35% male and 65% female. Over 85% of patients reported having pain after surgery, with over 75% of patients reporting that their pain was moderate, severe or extreme (Figure 1). Side effects from pain medications were reported by 79% of patients (Figure 2) and the majority appear to be related to opioids. Anxiousness about postoperative pain and presence of preoperative pain were strongly predictive of postoperative pain severity ($p< 0.0001$, $p< 0.0032$, respectively). Not surprising, worse pain levels were predictive of poor patient satisfaction ($p< 0.0001$).

Conclusions: Postoperative pain remains undermanaged and this has not changed since a similar survey a decade ago. Most patients experience moderate, severe or extreme pain during their postoperative recovery. Side effects, many of which may be related to opioids, are common. Poor patient satisfaction is associated with worse pain levels. These findings are especially relevant with increasing attention to pain management and new reimbursement criteria based on patient satisfaction in the hospital setting. Greater clinical adoption of multimodal therapy, including novel non-opioid analgesics, could potentially minimize opioid related side effects and therefore improve postoperative pain management.

References:


References:


A64

2-CHLOROPROCAINE IS A SAFE AND EFFECTIVE LOCAL ANESTHETIC WHEN USED FOR
Introduction: 2-Chloropaine (2-CP) is not widely used for spinal anesthesia because of the concerns about its potential neurotoxicity. 2-CP is not FDA approved for spinal anesthesia and its use is considered "off-label." The objective of this study is to retrospectively review the perioperative records of all patients who received spinal anesthesia with 2-CP over a 4 year period (n=480) at New York Presbyterian Hospital - Columbia University Medical Center and to analyze its efficacy and to review its safety.

Materials and methods: After IRB approval, the hospital records of all patients who received 2-CP spinal anesthesia at our institution from January 2008 through December 2011 were retrospectively reviewed (n=480). Data from intraoperative anesthesia records and post-anesthesia care unit (PACU) records were collected by three reviewers and were recorded manually. Endpoints included patient's age, gender, ASA class, height, weight, the surgical procedure, surgical position, spinal 2-CP dose and adjuvant drugs added, time of injection, surgical start and end times, vasopressors given, intravenous fluid administered, time of first recorded pain medication given in the PACU, side effects, complications, and discharge time.

Statistical analysis was done with Statview TM program (SAS Institute Cary, NC). T-test was used for relationship between dose of 2-CP given and surgery time/time to first pain medication/time to discharge, with \( P < 0.05 \) accepted as significant.

Results: During this 4-year period, 480 patients received 2-CP for spinal anesthesia, and of these 144 were ASA 1, 269 ASA class 2, 56 ASA class 3 and there was 1 ASA class 4. There were 241 female and 239 male patients (mean height 66.7 ± 5.3 inches; mean weight male 189 lbs., female 164lbs). Most patients had ambulatory procedures, including 408 orthopedic, 32 gynecologic, 27 genitourinary, and 13 general surgery. There were 393 surgeries performed in supine position (82%), 51 in lithotomy position (11%), 24 in prone position (5%), 13 in the lateral decubitus position (2%).

Duration of surgery was 46 ± 21 minutes and 56 ± 27 for the 50 mg 2-CP dose and 60mg 2-CP dose respectively. Duration of time from spinal to requesting 1st dose of analgesic was 161 min. ± 68 min. and 172 min. ± 61min for the 50mg and the 60mg 2-CP dose respectively.

The complications including nausea and vomiting in 35 patients (7.3%), itching in 35 patients (7.3%) and 5 patients experienced “other” complications. Of the 5 with other complications, 3 were shivering, 1 bradycardia requiring treatment with glycopyrrolate, and 1 experienced hypotension with a SBP in the 60's.

The doses of 2-CP, intrathecal fentanyl, and intravenous fentanyl were all greater in patients with itching (\( p < 0.05 \)).

Discussion: Of the 480 records reviewed, none revealed any neurological complications. More common, less severe complications include itching, nausea, and others are described. A limitation of this study includes lack of follow-up with patients after discharge from the post anesthesia care unit. 2-CP appears to be a safe and reliable anesthetic when used intrathecally for procedures lasting less than
A PROSPECTIVE CLINICAL STUDY TO EVALUATE THE EFFICACY OF OBTURATOR NEUROLYSIS WITH 6% PHENOL FOR ADDUCTOR MUSCLE SPASTICITY

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Introduction: Spasticity is a syndrome associated with a persistent increase in involuntary reflex activity of a muscle in response to stretch. Adductor muscle spasticity is a common complication of spinal cord and brain injury. It needs to be treated if it interferes with activities of daily living and self care. Obturator neurolytic blockade is a cost effective option to treat spasticity of adductor muscles. In this study, we assessed the efficacy of interadductor approach in alleviating the spasticity.

Material and methods: Obturator neurolysis using interadductor approach with the patient supine with 8-10 ml 6% phenol was given in twenty spastic patients. Before neurolytic application, a prognostic obturator nerve block was performed, under the guidance of a peripheral nerve stimulator (Stimuplex, B. Braun). Neurolytic blockade was planned in the patients who had atleast a 10 decrease in Modified Ashworth Scale and a 20 improvement in range of motion. Technical evaluation included number of attempted needle insertions, time to accurate location of the nerve, depth of needle insertion and success rate. Pain, spasticity, hip abduction range of motion (ROM), number of spasms, gait and hygiene were evaluated using various scales at 1st hour, 24th hour, end of the first week and in the first, second and third months following the intervention. The patients were also evaluated for dysesthesia, injection pain and skin injury, neuritis or any other complication in the follow up period.

Results: The success rate was 100%. Average depth of needle insertion was 2.91 ± 0.32 cm. All parameters improved significantly. The spasticity, range of motion and frequency of spasms improved at all time intervals from the baseline. There was significant improvement in pain as evident by the VAS scores with maximum decrease in the 1st week. The maximum improvement in hygiene was noticed at 1st month. Functionally, only three subjects were ambulatory. There was improvement in the gait score after neurolysis which was statistically significant at 1st week, 1st, 2nd & 3rd month. There was no significance noticed between various time intervals reflecting the effect to be persistent upto 3rd month. Inspection of gait after the injection revealed decreased scissoring of hips, improved balance and gait speed. Only two patients developed dysesthesia.

Discussion: The functional improvement in our study outlived the duration of relief of spasticity as evident by increased range of motion which persisted longer than adductor spasm. Interadductor approach is a safe, effective and accurate approach to obturator nerve to relieve spasticity. Obturator neurolysis provides cost benefit relation, high margin of safety. It provides a better quality of life for patients by reducing adductor spasm and maximizes functional benefits of the rehabilitation programme. References: Akkaya T, Unlu E, Alptekin A, Gumus HI, Umay E, Cakci A. Neurolytic phenol blockade of the obturator nerve for severe adductor spasticity. Acta Anaesthesiol Scand 2010;54:79-85.

Funding: No funding received. This study was granted approval by Institutional review board.
A RANDOMISED CONTROLLED TRIAL TO EVALUATE THE EFFICACY OF GABAPENTINOIDS ON POSTOPERATIVE PAIN AND ANALGESIC CONSUMPTION IN ABDOMINAL HYSTERECTOMY

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Introduction: Pregabalin is a potent ligand for alpha-2-delta subunit of voltage-gated calcium channels in the central nervous system that exhibits potent anticonvulsant, analgesic and anxiolytic activity. The pharmacological activity of pregabalin is similar to gabapentin, and shows possible advantages. We investigated its analgesic efficacy in patients experiencing acute pain after abdominal hysterectomy and compared it with gabapentin and placebo.

Material and methods: Ninety women undergoing abdominal hysterectomy were allocated by means of sealed opaque envelopes into three groups to receive pregabalin 300 mg (Group P), gabapentin 900 mg (Group G) or a matching placebo (Group C), n=30. The study drug was administered orally 1-2 hours preoperatively and no other sedative premedication given. Postoperative analgesia was administered at VAS>3 with intramuscular diclofenac sodium 1mg/kg. If the score did not decrease to desired level, analgesia was supplemented with titrating tramadol 10 mg intravenously every five minutes till score decreased to desired level. The primary outcome was analgesic consumption over 24 hours. Pain scores and the time interval between end of surgery and patients first request for analgesic were considered as secondary outcomes.

Results: The diclofenac consumption was statistically significant among pregabalin and control groups (p< 0.001), gabapentin and control groups(p< 0.001), however pregabalin and gabapentin groups were comparable. Moreover, the consumption of tramadol was statistically significant amongst all groups. Patients in pregabalin and gabapentin group had reduced pain scores, both, at rest and on cough in the first hour of recovery. However, they were subsequently similar in all groups. Time to first request for analgesia was longer in pregabalin group followed by gabapentin and control group. There was no difference in the incidence of side effects between pregabalin and gabapentin groups.

Discussion: The 300 mg dose of pregabalin used in our study was considered on the basis of previous studies. Moreover, the antihyperalgesic effects of pregabalin have been observed at dosages 2-4 fold lower than that of gabapentin in neuropathic pain. Based on this fact, we could consider a dose of gabapentin between 600 mg to 1200mg. This justified the equipotent doses of pregabalin and gabapentin used in the present study. Time to first request for analgesia was longest in pregabalin group followed by gabapentin and control group. There was no difference in the incidence of side effects between pregabalin and gabapentin groups.

To conclude, a single dose of 300 mg pregabalin given 1-2 hours prior to surgery is superior to 900 mg gabapentin and placebo after abdominal hysterectomy.

References:


A67
RADIATION REDUCTION AS A FUNCTION OF ULTRASOUND USE IN CHRONIC PAIN PROCEDURES
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Introduction: The use of ultrasound-guided procedures (USGP) in the field of anesthesia has mostly been limited to the acute setting in the field of regional anesthesia. However, USGP and techniques have been gaining increasing favor in the field of chronic pain in lieu of fluoroscopy and x-ray for a wide variety of procedures. In addition to the decreased cost, ease of set up, and portability, when used properly ultrasound can possibly reduce the amount of fluoroscopy used during a procedure thus reducing the amount of radiation.

Materials and methods: Dosimeter data gathered from two chronic pain practitioners was analyzed using comparative statistics.

Results: Our results show the following:

1) An immediate reduction in radiation exposure on ultrasound implementation
2) A significant reduction in radiation exposure during the time of US use
3) Maximum radiation exposure reduction in later months of ultrasound use; presumably after acclimation

Discussion: In the age of ALARA (As Low As Reasonably Allowable) radiation exposure and given the average per person radiation exposure due to medical imaging has increased 590% over the past 25 years, it is our aim to encourage more research to support our data and ultimately reduce the amount of radiation exposure of both practitioner and patient.

A68
LONG-TERM EFFICACY OF ZICONOTIDE COMBINATION INTRATHecal THERAPY FOR NON-CANCER PAIN: A CASE SERIES
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Introduction: Ziconotide is a relatively novel non-opioid intrathecal (IT) analgesic that blocks N-type calcium channels in the dorsal horn of the spinal cord, inhibiting the release of excitatory
neurotransmitters and limiting pain signals from reaching the brain. Ziconotide is one of two agents approved by the FDA for use in intrathecal drug delivery systems (IDDS). Its efficacy as monotherapy in IDDS has been elucidated in several clinical trials; however, clinically it is often used in combination with other IT analgesics due to its limited efficacy as a monotherapy. The purpose of this retrospective case series is to add evidence to the current literature regarding the use of ziconotide as combination IT therapy in chronic non-cancer pain patients.

Methods: This is a retrospective analysis of 15 patients implanted with an IDDS and consecutively trialed with IT ziconotide. Institutional Board Review approval [UHCMC IRB#06-11-13] was obtained prior to beginning our analysis. Ziconotide was initiated primarily for insufficient pain relief with other IT agents, and in one case due to intolerance to opioids. All patients underwent a trial prior to adding ziconotide to their IDDS. Passing was defined as greater than 50 percent pain relief without significant adverse events (AE) with single IT injections of ziconotide 2, 4 or 6 mcg. Patients were followed for a minimum of 12 months postimplant, and data were collected at 0 (preimplant), 3, 6 and 12 months. Data included demographics (age, gender), objective measures (amount of oral opioids and IT agents administered), and subjective measures (pain scores).

Results: In our study group, indications for implantation of IDDS included post-laminectomy syndrome (n=11), complex regional pain syndrome (n=2), intractable neuropathic pain (n=1), and severe osteoporosis with foraminal stenosis and spondylolisthesis (n=1). AE attributed to ziconotide administration included confusion/alter mental status (n=6), dizziness/lightheadedness (n=4), nausea/gastrointestinal upset (n=2), lower extremity weakness (n=2), syncope (n=1), and dyspnea (n=1). Four patients (26.7%) failed the ziconotide trial. Seven (46.7%) patients had ziconotide added to their IDDS, but eventually developed AE and subsequently had ziconotide removed. Mean ziconotide dose at which AE were experienced was 4.51 mcg/day with a range of 1.13-13.6 mcg/day. One (7%) patient continued ziconotide throughout the follow-up but never achieved adequate pain control despite continued dose escalation. Finally, only three (20%) patients achieved adequate pain control without significant AE; one of whom had ziconotide added to IDDS upon its initiation.

Discussion: Ziconotide did not provide adequate pain relief and/or was not tolerated by 12 of the 15 (80%) patients. Based on our findings, the addition of ziconotide does not seem to benefit patients with pain found to be refractory to combination IT therapy. The pathophysiology behind these patients' pain is complex and the efficacy of ziconotide does not appear to be great enough to improve pain control without the development of AE. Future prospective studies are needed to verify this observation.

References:
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Background: The management of amputations engenders public attention and research dollars far in excess of its epidemiological burden. Postamputation pain (PAP) is widely considered to be one of the most challenging among all pain conditions to treat, as is evidenced by the plethora of trials that continue to be conducted. A large part of its intractability stems from the myriad pathophysiological mechanisms that can result in PAP. Whereas mechanism-based pain treatment is generally considered to be superior to etiologic-based therapy, the obstacles involved in identifying the predominant mechanism can become nearly insurmountable for a condition as phenotypically and pathogenetically disparate as PAP. The purpose of this review is therefore to provide an evidence-based framework from which to evaluate therapies and guide treatment for PAP.

Materials and methods: A Medline search was conducted through the period 1970-August 2012 using postamputation pain and treatment, phantom limb pain, residual limb pain, stump pain, and amputation. Articles describing treatment related to amputees were selected and studied. Articles were reviewed for data on epidemiology, mechanism and treatment. Treatments were categorized by injection therapy, pharmacotherapy, complementary and alternative medicine, surgical therapy and preventative therapy.

Results: Fifty articles in English were identified. The references lists of these articles were also studied. Of these articles, 5 were reviews, 7 were retrospective studies, case reports or case series, 38 were prospective clinical trials involving one or more therapeutic interventions for the treatment of postamputation pain. The prospective clinical trials included 11 studies of injection therapy, 11 studies of pharmacotherapy, 8 of complementary and alternative therapy, 3 of surgical therapy and 5 of prevention. These studies were limited by small sample size, variation in methodology and lack of long-term efficacy and safety outcomes. However, there were trends toward short to medium term efficacy with peripheral botulinum toxin injections and pulsed radiofrequency ablation for RLP, pharmacotherapies including ketamine, morphine, gabapentin for established PAP. Mirror therapy is a beneficial, safe and cost-effective treatment modality for PAP. Neuromodulation using implanted deep brain stimulation, spinal cord stimulation and motor cortex stimulation have been shown to have variable efficacy for patients with refractory PLP. Evidence for novel therapies such as transcranial magnetic stimulation is limited to case reports. Studies on preventing the development of PAP using epidural catheters or peripheral nerve blocks perioperatively for patients undergoing amputation have conflicting data from various studies.

Conclusion: Postamputation pain remains a highly prevalent condition for patients undergoing amputations. Treatment must be multimodal and mechanism-based in nature taking into consideration supraspinal, spinal, peripheral mechanisms for postamputation pain. Additional studies are required to demonstrate long term efficacy and safety of treatments for patients with postamputation pain. Further investigation into the mechanisms and development of PAP is needed to provide an evidence base for the development of novel methods as well as to guide current treatment approaches.

A70

TOPIC CAPSAICIN FOR TREATMENT OF HIV-ASSOCIATED POLYNEUROPATHY

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56 patients suffering from HIV-associated distal sensory polyneuropathy (DSP) have been treated in the HIV-Outpatient Department of the University Hospital in Muenster (n=52 male, n=4 female). The mean age was 52 ± 9 years (r=35-72 years), HIV-infection lasted since laboratory diagnosis 14 ± 9 years (r=4-26 years), the mean CD4+-cell count was 842 ± 632/ml (mv ±1sd), HIV-viral load was not detectable in plasma in 53 patients. 52 patients were treated with HAART containing different medications. HIV-DSP lasted since 4 ± 4 years (mv ±1sd), all patients had typical signs and symptoms of DSP. Nerve conduction velocities were abnormal in 38 patients. 37 patients had a pre-treatment containing pregabalin (75-450 mg), gabapentin (100-1500 mg), duloxetine (30-120 mg), amitriptyline (25-100 mg), opioids and NSRA. 15 patients have been treated by using a combination therapy consisting of antiepileptics and thymoleptics. No patient had been treated using the maximal dosage of antiepileptics or thymoleptics mainly due to side effects like fatigue and erectile dysfunction. High dosed capsaicin patch was applied treating the feet using 2-4 patches. Neuropathic pain was evaluated by a conventional visual analogue scale before therapy and 12 weeks later. The patients were also asked for their impression of pain reduction, improvement of night sleep and reduction of conventional pain medication. Visual analogue scale showed a significant reduction for symptoms of painful HIV-associated DSP from 7.6 ± 1.1 to 4.4 ± 2.1 (p<0.01). 46 patients reported a significant reduction of neuropathic pain according to their opinion, 35 reported an improvement of night sleep and 25 reported a reduction of accompanying conventional pain medication. For treatment of painful HIV-DSP high dose capsaicin patch represents a new option which is especially suited for HIV-infected patients as no interactions with HAART and none of the typical side effects of antiepileptic and antidepressive medication must be considered. Therefore the high dosed capsaicin patch is of outstanding therapeutic value and should be taken as first therapeutic option for treatment of painful HIV-DSP.

A71

A COHORT PERIOPERATIVE REVIEW OF PAIN CARE MEASURES IN CHILDREN FOLLOWING PECTUS EXCAVATUM REPAIR

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¹University of Minnesota, ²Department of Anesthesia, University of Minnesota, ³Department of Anesthesia, ⁴Department of Pediatric Surgery, Amplatz Children's Hospital, Minneapolis, MN, USA

Background: Children and adolescents with the pectus excavatum deformity are often treated surgically. The procedure is invasive and surgery in most instances has been done with general anesthesia along with the parenteral administration of both opioids and NSAIDS during the postoperative period for pain control. Because other modalities of anesthesia care may be an option, we elected to do a retrospective cohort review of our children and adolescents before embarking on newer approaches to anesthesia care for this group of patients.

Methods: After IRB approval, a retrospective cohort review was conducted of patients 18 years of age and younger who underwent pectus excavatum surgery between January 2008 thru December 2011. A total of 54 patients were studied for anesthesia care and pain control following pectus excavatum repair. Medication related side effects (nausea, vomiting, constipation) were noted. Effective control of pain was determined by noting the recorded VAS pain scores (1= no pain; 10= severe pain). Drugs (NSAIDS and opioids) used for pain control included ketorolac (i.v.), fentanyl, morphine or hydromorphone (i.v.), and oral narcotics included hydrocodone, oxycodone, or oxycontin. The total parenteral narcotic consumed during the hospital stay was standardized to fentanyl dose equivalent in mcg/kg using a standard opioid conversion formula. The duration of hospitalization and readmission
Results: The mean± SD age of the patients was 14.9± 2.2 years, their weight was 63±6.9 kg. Majority were male (42/54). In all patients GETA with maintenance primarily via an inhalational agent and opioids was used. Twenty-four patients underwent Nuss repair, 26 Modified Ravitch, and 2 the Ravitch repair. The intraoperative opioid used was fentanyl along with the NSAID ketorolac (0.5 mg/kg). This was followed by the addition of hydromorphone in the PACU along with an additional dose of ketorolac (0.25 mg/kg). Postoperatively on the ward the patients were controlled with a morphine PCA. This was weaned to oxycodone, Tylenol T3 and/or codeine along with Flexeril. Table 1 shows the opioid consumption during the intraoperative and postoperative period. The mean ± SD pain scores were 4.6± 1.4, 2.9±1.3, 2.4 ± 1.05 and 3.2±0.05 on POD# 1,2,3 and 4 respectively. Constipation occurred in 46 of 54 patients (85.2%) and 27% had either post op nausea and/or vomiting. Urinary retention occurred in 15% and post-op respiratory infection was noted in 3%. Two patients needed to be re-admitted, 1 for chest pain, and another for a mucus plug which required emergency bronchoscopic removal. The length of stay in the hospital was 3.9±1.2 days.

<table>
<thead>
<tr>
<th>Location</th>
<th>Fentanyl consumption</th>
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<tbody>
<tr>
<td>O.R.</td>
<td>4.68 ± 0.73 mcg/kg</td>
</tr>
<tr>
<td>PACU</td>
<td>1.80±1.1 mcg/kg</td>
</tr>
<tr>
<td>Ward</td>
<td>44.2±3.8 mcg/kg</td>
</tr>
<tr>
<td>Total Stay</td>
<td>50.5±4.1 mcg/kg</td>
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</table>

[Opioid consumption during pectus repair]

Conclusion: This cohort review will serve as a standard of comparison for any future changes in care strategies for these children and adolescents needing pectus repair. Such strategies should aim at improved pain control with lower rates of constipation and nausea±vomiting and hopefully reduced length of hospital stay following pectus repair.

A72

SPHENOPALATINE GANGLION ALCOHOL NEUROLYSIS IN THE MANAGEMENT OF CRANIOFACIAL PAIN IN 53 PROCEDURES

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Introduction

These last few years, a number of interventional-minimally-invasive techniques have been used to manage sphenopalatine-involved pain. We propose an alternate to existing treatment of facial pain with alcohol neurolysis of the sphenopalatine (SPN) ganglion.
Materials and method: Thirty-eight patients were included in this retrospective study. A total of 53 SPN were performed using absolute alcohol. IRB approval was obtained. The SPN was considered to be effective when pain relief was equal to or greater than 50% lasting for at least one week. Mean pain relief period following procedure was noted. In case of recurring pain duration and intensity of pain were noted. All procedures were performed ambulatory under local anesthesia and CT guidance.

Results:
Mean duration of facial pain before procedure was 6.1 years. Thirty-six out of the 53 performed SPN were successful. Overall mean duration of pain relief was 8.7 months after SPN. In 27% of the successful cases no recurrence of pain occurred. In 26/36 successful SPN, recurring pain occurred with a mean duration of 5.4 months after initial procedure. Success rate of SPN depending on pain type are as follows: atypical facial pain 85.7% (p< 0.05); Cluster Headache: 83.3% (P< 0.05), Trigeminal Neuralgia 50% (p< 0.05), compression by neoplasm: 100% (p< 0.05).

Conclusion:
CT guided alcohol SPN is a safe and effective treatment of refractory chronic craniofacial pain syndromes especially in cases of cluster headaches, atypical facial pain and trigeminal neuralgia.

A73

STELLATE GANGLION BLOCKADE VERSUS RADIOFREQUENCY NEUROLYSIS IN THE MANAGEMENT OF REFRACTORY CPRS OF THE UPPER LIMB

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¹I4S Laboratory, ²I4S Laboratory and University Hospital, University of Franche-Comté, Besançon, France

Purpose:
To retrospectively compare stellate ganglion block (SDB) and radiofrequency neurolysis (RF) in the management of complex regional pain syndrome of the upper limb (CRPS).

Method and materials:
61 patients were included in this retrospective study between 2000 and 2010. All patients suffered from CRPS. 29 patients underwent SGB and 32 underwent R. CT guidance was used. The procedure was considered to be effective when pain relief was equal to or greater than 50% lasting for at least two years. Mean duration of pain prior procedure as well as mean duration of pain relief in case of failure were noted.

Results:
Thirty-five women (57.3%) and 26 men (42.7%) with a mean age of 48.4 years were included in the study. Statistical analysis showed significant results in favor of RF with an odds ratio of 7.32 (Fisher
exact test). A total of 21/32 RF procedures (65.6%) were a success, compared to 6/29 successful procedures (20.6%) in the stellate ganglion blockade group (p=0.001).

Conclusion: RF of the stellate ganglion is a safe and more effective treatment of chronic refractory CRPS of the upper limb than stellate ganglion blockade.

A74
THE USE OF ULTRASOUND TO MEASURE THE DEPTH OF THORACIC EPIDURAL SPACE
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University of Massachusetts Medical School, Worcester, MA, USA

Introduction: The use of Ultrasound to aid in regional blocks has increased in recent years as a result in improvement in ultrasound technology. There has been many studies to evaluate the use of ultrasound to measure the depth of the epidural space in the lumbar region1-9,10,11,12. This study looked at the epidural space in the thoracic space to evaluate the possibility to visualize the thoracic spine anatomy and the possibility to measure the depth of the epidural space and it’s correlation with the actual depth by the Loss of resistance technique.

Methods: After approval or the IRB at the Umass Medical school and a written consent was obtained, 29 patients were enrolled in the study. Exclusion criteria included pregnancy, prisoners, patients with an absolute contra-indication to thoracic epidural.

Ultrasound scan technique: we used a curvilinear 2-5 MHz probe both longitudinal para-median and transverse scan were done before the placement of epidural catheter. The puncture point was determined by the two planes. The depth of the epidural space was measured using the built-in calipers. The ultrasound depth UD was also measured in the transverse view.

The epidural catheter was placed using the standard technique at the Umass Medical center.

Assessment of the catheter function was based on the technique, response to test dose and pain control on post operative day number one.

Statistical analysis included the distributional characteristics of the measures, pearson correlation analysis and general linear model. Difference by gender groups were evaluated using student's t-test.

Results: Mean Ultrasound Distance UD values were 4.22cm ± 0.82 and, Actual distance AD were 5.59 cm, ±1.29 with Pearson correlation coefficient between AD and Ultrasound Longitudinal USL, Ultrasound Short axis USS were 0.637 and 0.566 respectively.

The mean number of attempts were 1.96 ± 1. The number of attempts were defined as the number of skin puncture points by a single provider or the number of providers attempting in the same insertion point.

The use of the ultrasound was able to identify the depth of the thoracic epidural space in 24/29 cases
(83 %) of the cases.

The catheter was considered at least partially functioning in 26/29 patients. (20 functioning, 6 partially functioning 89.65 %).

Conclusion: The Ultrasound scanning can be used to measure the depth of the thoracic epidural space with good correlation.

A75
AGE NOT A FACTOR IN DETERMINING CONSERVATIVE TREATMENT MODALITY FOR PATIENTS WITH LUMBAR SPINAL STENOSIS, HERNIATED NUCLEUS PULPOSUS, AND DEGENERATIVE DISC DISEASE
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Division of Pain Management, Department of Anesthesiology, UMDNJ-New Jersey Medical School, Newark, NJ, USA

Introduction: Although the lack of age-effect on long-term response to conservative therapy has been previously reported in lumbar spinal stenosis (LSS)\(^1\), its role in herniated nucleus pulposus (HNP) and degenerative disc disease (DDD) is unknown. This retrospective chart review aims to determine the influence of age on effectiveness of physical therapy (PT) and subsequent epidural steroid injections (ESI) in patients with these conditions.

Materials and methods: After IRB approval, 42 patients with LSS, 25 with HNP, and 24 with DDD who received PT and subsequent ESI were identified by reviewing randomly-selected charts from 2009-2011. “Relief” was defined as significant improvement compared to baseline. “No relief” was defined as minimal/non-existent improvement or if symptoms worsened. “Short-term” was defined as less than six-weeks; “long-term” as six-or-more weeks. Data was partitioned by decade of life. Chi-square tests were used to analyze data. P-value < .05 was concerned as significant.

Results: In LSS, there was a significant difference in short-term relief to PT (p=.009) with 22% < 70 years-old & 0% aged 70-and-above finding relief. No significance was found for age-effect on: long-term relief with PT in LSS; short- or long-term relief with ESI in LSS; and short- or long-term relief with PT or subsequent ESI in both HNP and DDD (Tables 1-3).

Discussion: To our knowledge, our study is the first to reveal an age-effect on short-term response to PT in LSS. While Koc et al. found equal effectiveness in LSS with ESI and PT, no age-effect was studied.\(^2\) Takdoro et al. examined patients with LSS only above age 70.\(^3\) Our findings also agree with Amundsen et al.\(^1\) that there is no effect of age on long-term response in LSS.

In conclusion, our findings suggest that there is no effect of age on long-term response to either PT or subsequent ESI in LSS, HNP, and DDD. Therefore we believe that age is not a factor in determining whether patients should receive PT or ESI.

References:


<table>
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<th></th>
<th>% of Patients in group &quot;Age &lt;70 yrs&quot;</th>
<th>% of Patients in group &quot;Age 70 yrs and above&quot;</th>
<th>Statistically significant difference between &quot;Age &lt;70 yrs&quot; vs. &quot;Age 70 yrs and above&quot;?</th>
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<tr>
<td><strong>Spinal Stenosis</strong></td>
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<tr>
<td>Short-Term Relief with</td>
<td>22% (4 of 18 pts)</td>
<td>0% (0 of 28 pts)</td>
<td>Yes; p = .009</td>
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<td>PT</td>
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<tr>
<td>Long-Term Relief with</td>
<td>11% (2 of 18 pts)</td>
<td>0% (0 of 28 pts)</td>
<td>No; p = .07</td>
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<td>Short-Term Relief with</td>
<td>80% (12 of 15 pts)</td>
<td>81% (22 of 27 pts)</td>
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<td>Subsequent ESI</td>
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<td>Long-Term Relief with</td>
<td>47% (7 of 15 pts)</td>
<td>63% (17 of 27 pts)</td>
<td>No; p = .31</td>
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*Table 1. Spinal Stenosis*

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<tr>
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<th>% of Patients in group &quot;Age &lt;70 yrs&quot;</th>
<th>% of Patients in group &quot;Age 70 yrs and above&quot;</th>
<th>Statistically significant difference between &quot;Age &lt;70 yrs&quot; vs. &quot;Age 70 yrs and above&quot;?</th>
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<td><strong>Herniated Nucleus Pulposus</strong></td>
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<tr>
<td>Short-Term Relief with</td>
<td>17% (5 of 30 pts)</td>
<td>0% (0 of 5 pts)</td>
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<tr>
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<tr>
<td>Long-Term Relief with</td>
<td>13% (4 of 30 pts)</td>
<td>0% (0 of 5 pts)</td>
<td>No; p = .39</td>
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<tr>
<td>Short-Term Relief with</td>
<td>81% (17 of 21 pts)</td>
<td>100% (4 of 4 pts)</td>
<td>No; p = .34</td>
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<tr>
<td>Long-Term Relief with</td>
<td>67% (14 of 21 pts)</td>
<td>100% (4 of 4 pts)</td>
<td>No; p = .17</td>
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<td>Subsequent ESI</td>
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*Table 2. Herniated Nucleus Pulposus*
### Table 3. Degenerative Disc Disease

<table>
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<th>Degenerative Disc Disease</th>
<th>% of Patients in group &quot;Age&lt;70 yrs&quot;</th>
<th>% of Patients in group &quot;Age 70 yrs and above&quot;</th>
<th>Statistically significant difference between &quot;Age&lt;70 yrs&quot; vs &quot;Age 70 yrs and above&quot;?</th>
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<tr>
<td>Short-Term Relief with PT</td>
<td>24% (4 of 17 pts)</td>
<td>0% (0 of 11 pts)</td>
<td>No; p = .08</td>
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<td>Long-Term Relief with PT</td>
<td>12% (2 of 17 pts)</td>
<td>0% (0 of 11 pts)</td>
<td>No; p = .24</td>
</tr>
<tr>
<td>Short-Term Relief with Subsequent ESI</td>
<td>64% (9 of 14 pts)</td>
<td>60% (6 of 10 pts)</td>
<td>No; p = .83</td>
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<td>Long-Term Relief with Subsequent ESI</td>
<td>43% (6 of 14 pts)</td>
<td>30% (3 of 10 pts)</td>
<td>No; p = .52</td>
</tr>
</tbody>
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MIDLINE AND LATERAL PARASAGITTAL APPROACHES DURING INTERLAMINAR LUMBAR EPIDURAL STEROID INJECTIONS ARE EFFECTIVE IN REDUCING PAIN AND IMPROVING EVERYDAY FUNCTIONALITY

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1Anesthesiology and Pain Management, Advocate Illinois Masonic Medical Center, 2Anesthesiology, University of Illinois, Chicago, IL, USA

Background and objectives: Lumbar epidural injection of corticosteroids (LESI) is one of the most commonly performed interventional pain management procedures in the United States. Midline interlaminar (MIL) and transforaminal (TF) LESI are two accepted treatments in the conservative care of low back pain with radiculopathy secondary to lumbar disk disease. The purpose of this study was to compare two different approaches (midline and parasagittal) during interlaminar lumbar epidural steroid injection (LESI).

Methods: After IRB approval we included 84 patients with history of unilateral lumbosacral radiculopathic pain, undergoing LESI. We included patients with lumbar disk disease including disk herniations, bulging discs, and degenerated discs, where at least 50% of the disk height was preserved respective to contiguous levels (based on MRI findings). This was a single-blinded randomized study. Every patient received the same medication (120 mg (2mL) of methylprednisolone acetate along with 1mL of normal saline solution and 1mL of lidocaine 1%), but they were randomly assigned to one of
two groups, based on the approach: group I (42 patients) - got LESI using midline (MIL) approach, and Group II (42 patients) - got LESI using parasagittal interlaminar (PIL) approach. The pain scores (on the 11-point numeric rating scale [NRS]) were recording at rest and during movement 20 minute before procedure, and on days 1, 7, 14, 21 and 28 after the injection. All patients completed the Oswestry Low Back Pain questionnaire before injection and on days 1, 7, 14, 21 and 28 after injections. This questionnaire has been designed to give the information how the patients' back pain has affected their ability to manage in everyday life. Statistical analysis was performed using SPSS software (SPSS 15.0, Chicago, IL). A p value less than 0.05 was considered to be statistically significant.

Results: There was no difference between these two groups with respect to age, gender, height, weight or duration of symptoms. The average pain score on the 11-point Numeric Rating Scale (NRS) before injection was 4.5±0.45 at rest and 7.0±0.36 during movement in the MIL group, and 4.9±0.47 at rest and 7.3±0.37 during movement in the PIL group. LESI (both approaches MIL and PIL) clinically and statistically significantly reduced unilateral lumbosacral radiculopathic pain at rest and during movement (Figure 1). However, the improvement over the time was better in the PIL group. Statistical significance for NRS at rest was 0.029 in the PIL group, and 0.039 in the MIL group. Statistical significance for NRS during movement was 0.003 in the PIL group (p< 0.001 highly statistically significant), and 0.027 in the MIL group. Both groups showed improvement in their everyday activities and quality of life (Figure 2).
Figure 1
Conclusion: Even though both groups of patients had significant improvement, the parasagittal approach was slightly more effective than the midline approach in targeting low back pain with radiculopathy secondary to lumbar disk disease.

A77
NIFLUMIC ACID ATTENUATES DIABETES-INDUCED TACTILE ALLODYNYA IN MICE
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Introduction: Only a few experimental studies have demonstrated the effectiveness of some cyclooxygenase-2 (COX-2) inhibitors for neuropathic pain in diabetic animals. In this study we investigated the usefulness of one such COX-2 inhibitor, niflumic acid, for treatment of established diabetic neuropathic pain in mice.

Material and methods: Diabetes was induced in Swiss Albino mice by a single intraperitoneal injection of streptozotocin (STZ, 200 mg/kg, n=14). Age matched non-diabetic mice served as control group(n=5). To evaluate the effects of niflumic acid in diabetic neuropathy, STZ-injected mice received niflumic acid 20 mg/kg/8h p.o. from day 14 to day 21 after STZ injection (n=7). On day 21, diabetic mice with threshold of less than 0.1 g in the von Frey test were considered to be developing
tactile allodynia and used in the experiments.

Results: Von Frey threshold values were significantly lower in untreated diabetic mice (n=7) compared to control group (one-way ANOVA, n=5). Oral administration of niflumic acid (20 mg/kg/8h p.o. for 7 days) significantly raised the lowered von Frey test threshold in diabetic mice (one-way ANOVA, n=7).

Discussion: We have demonstrated the effectiveness of niflumic acid for amelioration of established allodynia in mice with diabetes. These results suggest that niflumic acid shows promise as a drug for treatment of diabetic neuropathic pain.


A78

PHYSICAL THERAPY IN CANCER RELATED VS NON-CANCER TRISMUS AND PAIN

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Trismus and pain may be caused by several factors including those related with cancer and non-cancer disorders. The purpose of this study was to explore the effectiveness of physical therapy in cancer related vs. non-cancer trismus and pain. Thirty trismus patients who had undergone radiotherapy due to a tumor in the maxillary or nasopharyngeal region (cancer group) and 65 trismus patients with various underlying causes (non-cancer group) were enrolled. Fifteen sessions of physical therapy have been applied to both temporomandibular joint regions of the patients. Patients performed active manual stretching and relaxation exercises with the company of a physiotherapist after each physical therapy session. Although maximal mouth opening (changing from 17.7±5.4 to 27.4±6.9 mm in non-cancer group and from 10.5±5.6 to 12.8±6.9 mm in cancer group) and visual analogue pain scale (VAS) values (changing from 58.4±21.5 to 41.8±22.4 mm in non-cancer group and from 68.3±25.7 to 60.3±25.7 mm in cancer group) showed significant improvements in both groups at the end of the physical therapy program (p=0.00); the difference was significantly higher in the non-cancer group (p=0.00). Post-treatment patient global self-assessment was found to be significantly higher in the non-cancer group when compared with the cancer group (p=0.005). In summary, combined physical therapy and exercise program appears to be effective in the treatment in both cancer related and non-cancer trismus. But clinical relevance of the results is doubtful and far from satisfying in the patients with cancer related trismus and pain.
TREATMENT OF SYMPATHETIC MEDIATED PAIN IN COMPLEX REGIONAL PAIN SYNDROME BY PERIPHERAL NERVE BLOCKS

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Introduction: We hypothesized CRPS patients who received early intervention with a peripheral nerve block (PNB) of an upper or lower distal extremity would have a significant improvement of pain, reduction in edema and or sudomotor response.

Methods: After University of Nebraska Medical Center (UNMC) Internal Review Board approval, a retrospective chart review was performed. All patients seen at the UNMC Pain Clinic within the last six years who underwent peripheral nerve blockade (PNB) (CPT code 64450) were identified. Data collected included diagnosis of CRPS I or II, improvement in pain score, improvement in function (defined as increase range of motion) and improvement in sympathetic changes (decreased edema and normalization of skin color change or temperature).

Results: Forty-three patients were identified with CRPS over six years. Of the 43 patients with CRPS, the percentage of some form of improvement was similar among patients with CRPS I [71%, (22 of 31)] and patients with CRPS II, [75%, (9 of 12; p=1.00)].
Discussion: Chronic regional pain syndrome (CRPS) is a clinical diagnosis with a broad array of symptoms that often follow an initiating event or immobilization. CRPS symptoms include pain, edema, and changes in sudomotor response or skin blood flow. While regional anesthesia blocks sensory and motor nerves it has been reported that sympathetic nerves are blocked as well. Studies have shown that early sympathetic treatment leads to improved prognosis for CRPS that has a sympathetic mediated pain component. Thus, our findings may indicate that use of PNB in CRPS early in the diagnosis may lead to improvement of pain as interpreted by patients. Improved prognosis, however, was not studied in our review. In this retrospective review, 71% of our patients had some form of improvement while 60% of these patients had improvement in all three measured categories: pain relief, range of motion, and sympathetic changes following PNB. This is consistent with previous studies which showed improved pain and range of motion and improved pain and decreased
sympathetic dysfunction\textsuperscript{(5)} with stellate ganglion blockade. Prospective validation of PNB as primary initial therapy for CRPS is required.

References:


A80

A REVIEW OF ULTRASOUND-GUIDED INTRATHecal PUMP REFILL

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Introduction: Ultrasound guidance is becoming widely accepted in many areas of regional anesthesia and pain medicine [1]. As the number of patients being placed on intrathecal pump increases due to the variety of pathologies being treated, the number of refills will increase accordingly [2]. Despite the ease and relative safety of pump refills, there can still be severe consequences of a peri-pump refill [3]. This review will highlight cases from our practice and review current literature on the use of the ultrasound during implanted pump refills.

Materials and method: Three patients in the office setting were consented for participation in the recording and use of ultrasound guidance for intrathecal pump refill. The patients ages ranges from twenties to eighties, and were all female. They differed in body habitus, pathology, and type of medications used. One of the patient also had a history of difficult pump refills due to rotation of pump.
[NeedlePath]
Literature search was conducted through PubMed and internet search engine Google using the terms “ultrasound,” “guided,” “intrathecal pump,” “refill,” and “complications.” The returned results included few comparison studies, case reports, and case-series, and not all were published with indexed journals.

Results: Slobasky published in 2007 a series of 33 pump refills using the ultrasound technique [4]. In this report, the patients were with an average weight of 212 lbs and average height of 68 inches. This report does suggest that patient comfort and satisfaction as an important end-point in the advocacy of ultrasound guided pump refills. It also highlighted the ease of teaching ultrasound guided technique to other practitioners.

Shankar then presented a case report of difficult access to an intrathecal pump that was successfully refilled using an ultrasound guided technique [5]. Though the incidence of peri-pump refills is low, the consequences can be detrimental [3].

Gofeld then utilized a cadaver to compare efficacy and number of attempts needed to correctly fill the pump comparing with and without the use of ultrasound guidance [6]. More experiments can then be used to help identify the role of ultrasound use for pump refills to understand its efficacy and reduction
of morbidity.

Discussion: The use of ultrasound guidance for intrathecal pump refills can be of usefulness in any patient, particularly those that are difficult to access. However, even on patients that can be accessed using the template technique, ultrasound can be helpful in providing further confirmation of an appropriate intra pump refill, increasing patient satisfaction and improving efficiency of pump refills.

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THE IMPACT OF CENTRALIZED PAIN ON THE ANALGESIC RESPONSE TO FIRST DIAGNOSTIC MEDIAL BRANCH BLOCK

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Introduction: Pre-procedural prediction for facet intervention response is nearly impossible. A potential explanation for the variance observed could be augmented central nervous system pain processing or “centralized” pain, as is seen in conditions like fibromyalgia (FM). We hypothesized that pain that is more central in nature would be less responsive to a peripheral intervention. The present study investigates the potential impact of a centralized pain phenotype on response to a first diagnostic medial branch block (MBB).

Methods: Patients status-post first diagnostic MBBs using 0.5% bupivacaine (cervical and lumbar, N=187) at the University of Michigan's Back & Pain Center were included in this retrospective study. The American College of Rheumatology (ACR) survey criteria for FM is a validated self-report measure consisting of widespread body pain and comorbid symptoms (e.g. trouble thinking, fatigue, etc.) that was used as a surrogate for centralized pain (Score 0-31). Patients were categorized as FM positive or FM negative using the described scoring [1] for between group analyses of responsiveness to MBB. Pre-procedural and post-procedural pain scores (0-10 NRS) were recorded from nursing notes (30-min post-MBB) and patient-completed pain diaries (1-, 2-, 4-, 6-, 12-, and 24-hrs post-MBB) to determine changes in pain. Data were entered into the APOLO Electronic Data Capture system and analyzed using R 2.15.0. A linear mixed model was used to study longitudinal effects of the MBB procedure on pain responses and the role of FM-based measures and gender. Institutional Review
Board approval was obtained.

Results: FM status was associated with an increase in pre-procedural pain severity with every unit increase in the FM score leading to a 0.18 increase in pain on average (p=0.0027). FM negative female patients experienced a highly significant pain reduction of -3.59 on average within the subject 30-min after the MBB (p< 0.0001). However, binary categorization of FM status (FM+/FM-) was not significantly associated with a difference in immediate post-MBB pain relief.

The difference between the longitudinal response to pain over time (pain diaries) varied significantly by FM status (p=0.0005). FM negative patients showed a deeper decline in pain scores followed by gradual return to baseline pain scores (Figure 1). This recovery was not present in the FM+ group with the difference between the middle and final part of the response curve being a mere 0.11 with p=0.66. Pain scores in FM negative patients were lower than in FM positive patients by -1.07 (SE=0.37) on average (p=0.005). Gender was not a significant factor (p=0.65).

Discussion: Despite reporting higher preprocedural pain scores, patients with centralized pain (as measured by ACR survey criteria for FM) showed a blunted initial response to MBB, a peripheral intervention, with a diminished response over the 24-hrs post-MBB. Prospective studies are needed to better understand the impact of centralized pain on MBB and facet outcomes.


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POSTOPERATIVE ANALGESIC CONSUMPTION AND PAIN SCORES DIFFER BETWEEN OPIOID TOLERANT AND NAIVE PATIENTS WITH SCIATIC NERVE BLOCKADE FOLLOWING FOOT AND ANKLE SURGERY

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Introduction: Sciatic nerve blockade (SNB) is part of multimodal analgesia for foot and ankle surgery. Higher postoperative pain scores and morphine consumption with regional anesthesia were reported in
chronic opioid consuming patients. Inadequate analgesia in opioid tolerant patients is challenging and pain control includes opioid escalation and rotation, non-steroidal anti-inflammatory agents, gabapentinoids, and regional anesthesia. This report compares pain scores and opioid analgesic use with SNB in opioid naïve (ON) and tolerant (OT) patients after lower extremity surgery.

Material and methods: This prospective cohort study observed perioperative pain scores and opioid requirements for foot and ankle surgery. Following institutional review board approval, patients reported total opioid use and maximum pain scores for 24 hours preceding surgery. Intra-operative anesthesia and opioid administration were not standardized. Postoperative continuous SNB and saphenous nerve blocks were placed using combined ultrasound and nerve stimulator techniques respectively injecting 100 mg and 50 mg 0.5% ropivacaine and catheter infusion of 0.25% bupivacaine at 6 - 10 ml/hr. One hour and 24 hour pain scores and 24 hour total opioid converted to intravenous mg morphine equivalents (ME) were recorded.

Results: 70 patients were similar for mean ASA class, age, and body mass index. OT patients were younger than ON patients (48.3 vs 55.7 yrs). Preoperative pain scores were greater in OT females (7.1 vs 6) and OT males used greater amounts of preoperative opioids (51.5 vs 26 mg). OT patients received more intraoperative opioids (40 mg vs 26.6 mg). One hour pain scores were higher in OT females (3.5 vs 1.1). 24 hour pain scores were elevated in OT patients (5.3 vs 3.7) and they received more opioids in that time interval (163.3 vs 49.7 mg). OT females received more opioid than OT males (194.3 vs 143 mg).

Discussion: The results suggest OT patients require greater amounts of opioid intra-operatively and in the first 24 hours following surgery even with SNB and report elevated 24 hour pain scores compared to ON patients. This was reported in the setting of leg amputation and stump neuroma. Regional anesthesia as part of the analgesic regimen reduces the amount of postoperative opioid requirements but in the OT patient mechanisms of tolerance, sensitization, hyper-algesia and psychological factors influence the pain response and do not eliminate the need for continued opioid administration. Maintenance or escalation of opioid therapy and opioid sparing medications may be required during the immediate postoperative period in order to achieve pain control. This study is limited by the lack of uniformity of intraoperative anesthesia and peripheral nerve catheter misplacement or dislodgement leads to elevated delayed pain scores in 40% of patients. Further studies into these factors will improve analgesia for all patients.

Conclusion: OT patients receive higher intraoperative doses of opioid analgesics and have higher 24 hour postoperative pain scores and opioid requirements than ON even with SNB.

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THE EFFECT OF VAPOCOOLANT SPRAY ON PAIN DUE TO VENIPUNCTURE IN ADULTS: A RANDOMIZED, BLINDED, PLACEBO-CONTROLLED TRIAL

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Introduction: Painful diagnostic or therapeutic procedures are commonly performed in the emergency department (ED). Previous investigations indicate that practitioners frequently do not provide adequate anesthesia for painful medical procedures. Patients indicate they would like to receive local anesthesia prior to a painful procedure, but often it is not offered. Topical anesthetics have been recommended as a method to decrease a patient's procedural pain. This study determines that a topical vapocoolant spray is effective and safe in adults undergoing venipuncture in the ED.

Materials and methods: Prospective blinded randomized controlled efficacy and safety trial of vapocoolant spray on pain in adults (≥ 21 years) undergoing venipuncture in the ED at a large urban tertiary care hospital. Adults were randomized to normal saline placebo spray or vapocoolant spray (Gebauer's Pain Ease®, 1,1,1,3,3 pentafluoropropane and 1,1,1,2 tetrafluoroethane) prior to venipuncture. Numeric rating scales (NRS) (1 to 10) were obtained after the spray was given and following venipuncture. Assessment and photographs of the venipuncture site were done pre and post application of both sprays. Vital signs and side effects were documented.

Results: Assessment including photographs revealed no pallor, redness, or other abnormalities at the site of the spray and post venipuncture. Only three minor complaints were noted; two with vapocoolant “felt cold” and “felt burning sensation” and one with saline spray “felt cold and wet”. All resolved quickly. There were no significant differences in vital signs between the sprays.

Saline (NS) Placebo Spray vs. Vapocoolant (V): Age (years) 51.5 (NS) 53 (V), Gender (M/F)54%/46% (NS), 38%/62% (V), Ethnicity - African American 58% (NS) 66% (V), Ethnicity - Caucasian 42% (NS) 34% (V). Post Venipuncture Pain on Numeric Rating Scale 4.72 (NS) 1.76 V) (p< 0.001).

Discussion: Vapocoolant is effective and safe for treatment of the acute pain of venipuncture in ED patients with a significant (p< 0.001) decrease of 3 in mean NRS compared with NS (4.7 saline to 1.7 vapocoolant) and was well tolerated. There were no visible abnormalities at the site post application of the spray. Following application of the spray and prior to venipuncture, there was no significant difference in mean NRS between the sprays with a mean NRS < 1 for either spray, indicating that appropriate application of the vapocoolant spray was not painful or uncomfortable.

References:


Funding: Financial support to cover the cost of the trial, vapocoolant and placebo spray was provided by the Gebauer Company. The company did not influence the conduct or reporting of this trial.

A84

EFFECTS OF AQUATIC THERAPY VERSUS CONVENTIONAL LAND-BASED EXERCISE ON PAIN RELIEF IN RHEUMATOID ARTHRITIS

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Background and goal: Rheumatoid arthritis (RA), a chronic, systemic, inflammatory, progressive disease, with joint synovitis as its main manifestation, is painful. Although, physical exercise can relieve pain, improve functional ability, quality of life and physical and emotional health status in RA, due to their fear of overstraining themselves or pain exacerbations, people with rheumatoid arthritis tend to avoid physical activity. Hydrotherapy as a model of physical activity can be an effective multidimensional approach which is safe and low cost to palliate the symptoms of musculoskeletal diseases and motivate individuals with this kind of problem to participate in. This study has been designed to investigate the effects of hydrotherapy versus land-based exercises on pain relief in Rheumatoid Arthritis patients.

Material and method: In this randomized, controlled, clinical trial, 46 women with Rheumatoid Arthritis were allocated into 2 groups, randomly: land-based exercises and hydrotherapy. The severity of pain was assessed in all the participants by the use of McGill Melzac Questionnaire at the baseline as well as demographic data and information regarding symptoms and impacts of disease. Then, each group was assigned to perform the specific, structured 6 week physical activity program, 3 times per week and every session 45 minutes. Both programs included different parts every session: warming up, some special strengthening and stretching exercises and cooling down which were specified for each group. After 6 weeks the severity of pain was reassessed in all participants.

Results: There were not any significant statistical differences in severity of pain between two groups at the baseline. After 6 week physical activity program, the severity of pain has been decreased in hydrotherapy and land-based groups with significant statistical differences (p=0.008 and p=0.04, respectively). Considerably, the hydrotherapy group showed more decline in their level of pain rather than land-based group at the second assessment(p< 0.05).

Conclusion: The results of this study has shown that physical activity both in aquatic and non-aquatic environment can be effective to reduce pain in RA patients. Furthermore, according to water properties, hydrotherapy seems to be more effective to palliate the pain in rheumatoid arthritis.

A85

FLUOROSCOPICALLY-GUIDED EPIDURAL FIBRIN GLUE BLOOD PATCH AS DEFINITIVE THERAPY FOR PERSISTENT CEREBROSPINAL FLUID LEAK: A CASE STUDY
Introduction: Historically, direct application of morphine to the spinal cord producing spinally mediated analgesia first appeared in the mid-1970s. The utilization of intrathecal drug delivery systems (IDDS) provides continuous drug delivery in close proximity to the spinal cord. Intrathecal drug delivery systems (IDDS) are used to deliver opioids and adjuvants for intractable pain as well as baclofen for spasticity and rigidity in patients with spinal cord injuries. IDDS vary from simple percutaneous catheters to totally implantable and programmable infusion pumps. Implanted systems have gained in popularity for long-term infusions, both in cancer pain states with long survival times and in nonmalignant pain states. These systems provide for a broad range of delivery rates and modes, and hence flexibility. As with any surgical procedure and intervention, IDDS have several risks which include: bleeding, infection, seroma formation, equipment malfunction, neurologic damage, and persistent cerebrospinal fluid (CSF) leakage. Infection is usually localized; however, epidural or intrathecal sepsis is disastrous and requires the removal of all hardware and administration of systemic antibiotics. A case of delayed persistent CSF leakage following intrathecal pump implantation, seroma formation, and subsequent drainage is presented here.

Case study: A sixty two year old male presented with progressive upper and more pronounced lower extremity tremors secondary to an unknown etiology. He underwent an intrathecal baclofen test dose with significant improvement in his lower extremity spasticity. Two weeks following the test dose, an intrathecal pump with baclofen was placed without complication and his symptoms improved greatly. One year after intrathecal pump implantation, the patient noted swelling and pain over the catheter site as well as a new-onset positional headache. The patient was evaluated and underwent magnetic resonance imaging. A seroma was identified adjacent to the catheter at the right lumbar region. Two weeks later, an ultrasound-guided aspiration of the lumbar seroma was performed showing clear, slightly yellow-tinged fluid that was confirmed to be CSF. The patient underwent an epidural blood patch and this improved his symptoms for several days after which time his symptoms returned. Two weeks later, he underwent fluoroscopically-guided L2-3 interlaminar epidural fibrin glue blood patch. Ten milliliters of fibrin glue additive in combination with two milliliters of autologous blood (total volume of twelve milliliters) was administered to the point that the patient had a mild pressure paresthesia. The patient has had complete resolution of the CSF leak following the procedure.

Discussion: While IDDS has been shown to greatly improve the quality of life for many patients suffering from spasticity or severe pain, it comes with inherent risks. There is a paucity of literature showing the use of a fibrin glue blood patch as definitive treatment for persistent CSF leak.

References:


OPIOIDS UTILIZATION IN COMMERCIAL INSURED PATIENTS WITH DIABETIC PERIPHERAL NEUROPATHY PAIN USING A CLAIMS-BASED SOFTWARE ANALYTIC TOOL
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Introduction: Peripheral neuropathy is a common complication in 30-50% of diabetic patients, contributing up to 27% of direct healthcare costs for diabetes management. Approximately 11-26% of these patients develop chronic pain. Practice guidelines recommend the use of long-acting opioids, as a part of a multimodal treatment plan in the event that approved first-line agents (e.g., pregabalin) provide inadequate analgesia. The objective of this analysis is to describe real-world utilization of long-acting opioids (LAOs) and chronic short-acting opioids (SAOs) in patients with diabetic peripheral neuropathy (DPN) pain.

Material and methods: The Chronic Opioid Medication Use Evaluation (MUE) software was used to analyze retrospective pharmacy claims from the 2009-2010 MarketScan Commercial Claims Database of over 40 million enrollees. DPN pain was defined as ≥2 ICD-9-CM diagnosis code for diabetic peripheral neuropathy (250.6X or 357.2) per quarter in at least two quarters in 2009, followed by ≥1 concomitant claim for a LAO and/or chronic SAO therapy (i.e., ≥ 60 days of continuous therapy with a SAO) during the analysis period (1/1/2010-12/31/2010). Various utilization measures were assessed including average day's supply, average daily dose (ADD), daily average consumption (DACON), opioid rotation defined as change in therapy within the same formulation group (e.g., LAO to another LAO), opioid switching defined as switch from one opioid molecule and/or formulation to another (e.g., chronic SAO to LAO), and acetaminophen (APAP) and concomitant GI medication use.

Results: A total of 2,494 unique DPN pain patients (mean age=55 years) with 29,420 claims for a LAO and/or chronic SAO were identified. Chronic use of a SAO was observed for 65% of these patients; of them, 79% had no concurrent LAO claim (minimum 60-day overlap). Among concomitant LAO and chronic SAO users, morphine CR/ER/SR was most commonly used in combination with a chronic SAO (30%). The most frequently filled LAOs were oxycodone CR (26%), fentanyl transdermal (26%), and morphine CR/ER/SR (24%), with an average day's supply of 28.2, 32.1 and 30.2 days, respectively. The ADD for oxycodone CR and morphine CR/ER/SR was 121.6mg and 126.6mg, while the DACONs were 2.9 and 2.6, respectively. Among the DPN pain sample, switching of opioid therapy was observed for 33% of patients, while opioid rotation was observed commonly in the chronic SAO users (27%). Concomitant use of prescription GI medications with or after opioid therapy was evident for 20% of LAO users and 23% of chronic SAO users. The ADD between 3.1-4.0 gm/day and ≥4.0 gm/day of APAP was observed for 4.8% and 1.5% of chronic SAO users. Additionally, 9.4% of DPN pain patients filled prescriptions at ≥2 pharmacies, and 3.4% filled prescriptions at 3+ pharmacies.

Discussion: This study presents a snapshot of real-world opioid use among patients with diabetic peripheral neuropathy pain. Areas for improvement such as APAP overload, chronic use of SAOs and high DACONs were identified for this patient group. Drug utilization trend provides an overview of the current management practices which may assist providers in developing targeted quality improvement efforts, and facilitate long-term monitoring for treatment with opioids.

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A COMPARISON OF OPIOID UTILIZATION PATTERNS AND AREAS FOR QUALITY IMPROVEMENT IN A MEDICAID AND COMMERCIAL POPULATION

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Introduction: The rapid increase in opioid use in the US coupled with the challenge of appropriate and effective treatment of pain drives the need for improved understanding of patterns of opioid utilization. The objective of this analysis is to demonstrate the utility of a Medication Use Evaluation Tool in assessing real-world utilization of long acting opioids (LAOs) and chronic short acting opioids (SAOs) and identifying related areas for improvement in the management of the commercial and Medicaid populations.

Material and methods: This analysis was performed using the Chronic Opioid Medication Use Evaluation (MUE) software, designed to analyze retrospective pharmacy claims data. Commercial data included pharmacy claims contributed by 37 plans representing 24.1 million lives. Medicaid data was from one state covering 600,000 lives. Patients selected had ≥1 claim for a LAO and/or chronic SAO (i.e. evidence of ≥60 days of continuous therapy with a SAO) from July 1, 2008 to June 30, 2009. Analyzed measures included: most frequently utilized opioids, daily average consumption (DACON), potential markers for misuse such as number of patients with ≥2 prescribers and number of patients filling at ≥2 pharmacies, percentage of patients with concomitant GI medication usage, percentage of patients with >3.1gm/day acetaminophen (APAP).

Results: A total of 10,681 and 25,788 patients with a claim for a LAO and/or chronic SAO were identified from the Medicaid and commercial samples, respectively. Among chronic SAO users, 91% (n=5,147) in the Medicaid sample, and 85% (n=11,730) in the commercial sample had no concomitant LAO claim (minimum 60-day overlap). The most commonly prescribed LAOs for Medicaid and commercial patients, respectively, were morphine CR/ER/SR (33% and 21%), fentanyl transdermal (26% and 23%), and oxycodone CR (18% and 36%). The DACONs for both morphine CR/ER/SR (2.3, 2.4) and oxycodone CR (2.6, 2.8) in the Medicaid and commercial samples, respectively, were above the recommended daily use. There was a higher percentage of Medicaid than commercial patients with ≥2 unique prescribers for LAO and/or chronic SAO (42.1% vs. 26.6%). Additionally, 31% of Medicaid patients filled prescriptions at ≥2 pharmacies, and 4.2% filled prescriptions at 4+ pharmacies. Average daily doses between 3.1-4.0 gm/day of APAP in chronic SAO users were observed for 5.8% and 4.9% of commercial and Medicaid enrollees, respectively. Concomitant use of prescription GI medications with or after opioid therapy was evident for 13% and 11% LAO patients, and 18% and 19% chronic SAO patients in the commercial and Medicaid sample, respectively.

Discussion: In this analysis of opioid utilization in the commercial and Medicaid populations, areas of further investigation and potential improvement were identified. Tools such as the Opioid MUE can be used by health plans to better understand treatment-use patterns and support targeted education efforts for providers and patients, and facilitate long-term monitoring of practice patterns and quality of care.

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HEALTHCARE SERVICE UTILIZATION AND COSTS AMONG CHRONIC PAIN PATIENTS IDENTIFIED WITH PROBLEMATIC OPIOID USE IN A COMMERCIAL HEALTH PLAN

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Purpose: This study compared healthcare service utilization and costs between patients with opioid abuse and/or addiction, patients displaying evidence of problematic opioid use and a reference group.

Materials & methods: Aetna enrollees (2009-2011) with ≥3 medical claims with a primary diagnoses of chronic pain and/or lower back pain, osteoarthritis or diabetic peripheral neuropathy over 3-months and 90+ days supply of opioids were selected for this analysis. Patients were required to be continuously eligible for 6-months prior to and 12 months following the index event (diagnosis code/first opioid prescription). The sample was grouped according to problematic opioid use status: opioid addiction diagnoses present (addiction), problematic opioid use present (POU) (presence of multiple opioid prescribers and/or rapid opioid dose escalation), reference group (no addiction). OLS regression compared groups on healthcare service utilization and cost change scores between the annualized 6-month pre-period and the 12 month post-period with alpha level set at p< .05.

Results: Of the 4,254 patients comprising the study sample (mean age 47.4) 2364 (56%) were in the no addiction group, 1654 (39%) in the POU group, and 236 (5%) in the addiction group. In the 12 month post-period, there were significant differences on 14/15 measured service utilization and cost variables, with the no addiction group showing the lowest values. The POU group and the addiction group had higher healthcare service utilization and costs in the post-period compared with the no addiction group on: mean number of opioid fills (20.4, 21.4 vs 16.5, p< .001), mean number of inpatient hospital visits (0.95, 0.64 vs 0.41, p< .001), and mean emergency room (ER) visits (0.11, 0.31 vs 0.04, p< .001). This increase in utilization was reflected in higher total costs for the two groups of problematic opioid use compared to the no addiction group ($39,631, $29,101 vs $26,717 , p=.001). OLS models of change in service utilization and costs from pre- to post-periods revealed that the addiction group incurred significantly higher prescription costs ($796, p=.009), higher ER costs ($449, p=.039), and more physician office visits (1.43, p=.025) and associated costs ($1,147, p=.040) compared to the no addiction group. Additionally, the POU group incurred significantly more prescription fills (5.2, p< .001) and associated costs ($444, p=.002), ER admissions (0.18, p< .001) and associated costs ($477, p< .001), inpatient admissions (0.48, p< .001), days (0.59, p< .001), and associated costs ($8,203, p< .001), physician office visits (1.37, p< .001) and associated costs ($1,017, p< .001), total medical costs ($12,288, p< .001), and total healthcare costs ($12,731, p< .001)compared to the no addiction group.

Discussion: While the incidence of diagnosed opioid addiction was similar to previously reported studies, patients displaying potentially problematic opioid use made up 38% of the sample and used more services and had the highest healthcare spending. These results suggest that focusing on the diagnosis of addiction underestimates the impact of problematic opioid use on health care service utilization costs.
ANESTHESIOLOGY FACULTY AND RESIDENT PERSPECTIVES ON EVALUATION AND MANAGEMENT OF ACUTE AND CHRONIC PAIN PATIENTS

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Treatment of acute and chronic pain patients widely varies within the medical community. Anesthesiology faculty and resident physicians often evaluate and treat acute and chronic pain very differently. Our study involved a one page questionnaire with 15 questions regarding evaluation and management of acute and chronic pain patients. Faculty and resident physicians from our Department of Anesthesiology were asked to fill out this questionnaire after written consent. The survey included questions grouped into sections regarding treatment of acute and chronic pain, reliability of specific patient complaints, and the decision for the clinician to refer to an Interventional Pain Physician. The answer choices for each question were all defined in the survey and included: postoperative pain, acute pain, chronic pain, and cancer pain. Each question was multiple choice and requested only one of the above answers per question. A total of 53 surveys were returned, and these surveys were then separated into those that were in-training (residents and fellows) and faculty. Our study primarily focused upon similarities and differences in thought processes between Anesthesiology faculty and those that were in-training regarding acute and chronic pain patients. 13 of the 53 surveys were returned from faculty physicians, while the remaining 40 surveys were returned from residents and fellows. Based upon the answers to each question, most faculty and in-training physicians from our Department of Anesthesiology felt more comfortable treating postoperative and acute pain. Both groups of physicians felt that chronic pain patients were more difficult to interact with and treat. Faculty physicians tended to use more objective data such as vital signs and activity level for treating chronic pain patients when compared to residents and fellows. In conclusion, there were more similarities than differences in medical thought processes between faculty and in-training physicians regarding evaluation and management of acute and chronic pain patients. Improving education and maturation of medical decision-making in pain patients may ultimately lead to better patient care and significant quality improvements.

THE EFFICACY AND TOLERABILITY OF TAPENTADOL IMMEDIATE RELEASE (IR) VERSUS OXYCODONE IR FOR MODERATE TO SEVERE, ACUTE LOW BACK PAIN WITH RADICULAR LEG PAIN

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Introduction: This phase III study (NCT00986180) evaluated efficacy and tolerability of tapentadol IR versus oxycodone IR for moderate-to-severe, acute low back pain (LBP) with radicular leg pain.

Materials and methods: Patients (≥18 years) with acute LBP (intensity ≥5; 11-point NRS) with radicular leg pain were randomized to flexible dosing with tapentadol IR (50, 75, or 100 mg) or oxycodone HCl IR (5, 10, or 15 mg) every 4-6 hours as needed for 10 days. Patients recorded pain intensity twice-daily. The primary efficacy endpoint was sum of pain intensity differences (SPID) over...
120 hours (SPID_{120}; starting at first study dose); tapentadol IR was considered non-inferior to oxycodone IR when the upper bound of the 95% CI for the least-squares mean difference was < 120. SPID over 2, 3, and 10 days and 30% and 50% responder rates were evaluated. Treatment-emergent adverse events (TEAEs) were recorded. Patients were recruited from clinical practices; IRB approvals and patient written consents were obtained.

Results: Least-squares mean of SPID_{120} was 264.6 for tapentadol IR (n=287) and 264.0 for oxycodone IR (n=298; 95% CI, −32.1, 30.9). SPID at 2, 3, and 10 days, and 30% and 50% responder rates at 3, 5, and 10 days were similar between treatment groups. TEAEs (≥10%) with tapentadol IR (n=321) versus oxycodone IR (n=324) included vomiting (15.9% vs 24.7%), nausea (15.9% vs 20.7%), and dizziness (11.8% vs 10.5%).

Conclusions: Using a flexible-dosing regimen, tapentadol IR was non-inferior to oxycodone IR for relief of acute LBP, with a more favorable gastrointestinal tolerability profile.

A91
DETERMINING MORPHINE REQUIREMENT POST CS WITH AND WITHOUT TAP BLOCK A RETROSPECTIVE CHART REVIEW

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The purpose of this study was to assess the analgesic efficacy of an US-guided TAP block for post caesarian section analgesia. In our institution we routinely use bupivacaine and fentanyl, instead of duramorph for spinal anesthesia due to inadequate post operative monitoring and staffing issues. With continuing drug shortages, anesthesiologists should be able to use alternative medications and techniques. Duramorph being the gold standard, if it is not available, we hypothesized that an US-guided TAP block performed after Caesarean delivery would reduce patient-controlled analgesia (PCA) morphine consumption in the first 24 h after surgery.

Method: With IRB approval we conducted a retrospective chart review of 43 ASA II parturients, age > 18 years, undergoing scheduled C-section distributed into 2 groups: PCA Group (N=20) and PCA + TAP Group (N=23). All parturients had spinal anesthesia with hyperbaric 0.75% bupivacaine 12mg and fentanyl 15µg. TAP group received 20cc of Bupivacaine 0.2% on each side of the abdominal wall upon arrival to the recovery room. Post-operative analgesia consisted of morphine PCA and ketorolac 30mg IV as required. The primary outcome measure was total PCA morphine requirement 24 h after surgery.

Results: The mean (SD) of morphine for the TAP and nonTAP groups were 34.35 (8.15) and 50.10 (17.36), respectively. The p-value from the t-test was 0.00097.

Discussion: In summary, this trial demonstrates the analgesic efficacy of the US-guided TAP block after Caesarean delivery. We believe that the block should be considered in all women undergoing Caesarean delivery who have not received long-acting neuraxial opioids.
CASE SERIES OF METHYLENE BLUE INJECTIONS FOR THE TREATMENT OF ZYGAPOPHYSIAL AND SACROILIAC JOINT PAIN: RESULTS OF 5 CASES

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Introduction: Shealy is credited with the use of radiofrequency ablation (RFA) for denervation of the lumbar zygapophysial (L-Z) joint in the mid-1970's. Today lumbar, thoracic, and cervical zygapophysial and sacroiliac (SI) joint pain are routinely treated with RFA (1,2,3). Peng described the use of methylene blue (MB) injection for discogenic pain; MB may work through direct neurotoxicity or inhibition of nitric oxide synthesis (4,5,6). We present a retrospective case series of five patients with zygapophysial or SI joint pain where MB used as an alternative to RFA.

Materials and methods: This retrospective case series of five patients who received MB for the chemical neurolysis of medial or/lateral branch's for zygapophysial or SI joint pain. MB was chosen for a variety of reasons. Patient one and two had unfavorable results with RFA. Patient three had unfavorable results with RFA and additionally subsequently three months of relief with dextrose prolotherapy. Patient four had MB as an alternative because technical malfunction of the RFA machine; the reason could not be determined for patient five. All of the MB blocks were done under fluoroscopic guidance and performed in the same manner as diagnostic medial and lateral branch blocks but with care to consider the medication as neurotoxic in relation to spinal nerves. 1cc of 0.05% final concentration MB was injected per nerve.

Results: Four of the five patients had lasting pain relief. Patient one (SI joint pain) has reported eight months of reported relief. Patient two (L-Z joint pain) had six months of reported relief. Patient three (thoracic zygapophysial joint pain) has had six months of pain relief so far (ongoing). Patient four (L-Z joint pain) had relief for one year and had recently had the procedure repeated (ongoing). Patient five (L-Z and SI joint pain) had no relief and follow up is scheduled. Two of five patients reported bluish tint in the urine in the next 24 hours, and one patient reported 5 days of initial increased pain before resolution. There were no other side effects/complications.

Discussion: RFA has become the standard long term interventional treatment of refractory pain of the L-Z and SI joint, however challenges to efficient treatment remain in some cases. Chemical neurolysis has potential to achieve technical success in these refractory cases of spine pain possibly due to spread over a broader area; for this same reason the procedure should be performed carefully under fluoroscopic guidance. Further prospective studies should be performed.

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A93

ASSESSMENT OF NEUROPATHIC PAIN DURING A 17-WEEK, DOUBLE-BLIND, PLACEBO-CONTROLLED, TRIAL OF PREGABALIN IN PATIENTS WITH SPINAL CORD INJURY

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Introduction: A previous trial of pregabalin has demonstrated efficacy for the treatment of neuropathic pain associated with spinal cord injury (SCI), based on analysis of daily patient pain diaries. The current trial further examines the effects of pregabalin on pain associated with SCI using a variety of subjective and quantitative neuropathic pain assessment tools.

Methods: This was a 17-week randomized, double-blind, placebo-controlled trial of pregabalin (150-600 mg/d) for the management of below-level central neuropathic pain in patients with C2-T12 level of injury, complete or incomplete (pregabalin n=112; placebo n=108). Primary endpoint was Duration Adjusted Average Change (DAAC) in pain, a weighted average of change from baseline in mean pain scores based on treatment duration. Additionally, pain associated with SCI was evaluated using the modified Brief Pain Inventory 10-item (mBPI-10), Quantitative Assessment of Neuropathic Pain (QANeP), and Neuropathic Pain Symptom Inventory (NPSI) assessment tools.

Results: Median treatment duration was 119 days and the average pregabalin dose was 357.0 mg/day. Pregabalin treatment was associated with improved DAAC in pain over the full treatment period (difference from placebo= -0.59; p=0.003). Treatment with pregabalin also resulted in a statistically significant improvement in mBPI-10 total score at endpoint (difference from placebo= -0.55; p=0.044). Improvements in all QANeP items, except “temporal summation for below the neurological lesion level pain”, were also evident for pregabalin at endpoint. In addition, treatment with pregabalin resulted in improvements in 9 of 10 individual items of the NPSI at endpoint compared to placebo. Common treatment-related adverse events among patients receiving pregabalin were somnolence, dizziness, edema, dry mouth, fatigue, and blurred vision.

Discussion: These findings indicate that pregabalin is effective at reducing neuropathic pain associated with SCI.

Funding: Funded by Pfizer Inc. This study was approved by an Institutional Review Board or Independent Ethics Committee at each investigational center, and patients provided written informed consent prior to participation. This study was conducted in compliance with the Declaration of Helsinki and all International Conference on Harmonization Good Clinical Practice Guidelines, and is registered on Clinicaltrials.gov (NCT00407745).
Introduction: Prescription opioid analgesics play an important role in the management of moderate to severe pain. An unintended consequence of these agents is the nonmedical use of prescription pain relievers. In 2008, nonmedical use of pain relievers among persons aged 12 years or older was second only to marijuana in the U.S.¹ We describe the rates of abuse, misuse, and diversion of tapentadol immediate release [Nucynta®, CII], for the 18 months following launch in 2009.

Materials and methods: The RADARS® System² measures rates of abuse, misuse and diversion throughout the U.S. Data from the Drug Diversion, Survey of Key Informants (SKIP), Poison Center, and Opioid Treatment Programs were analyzed to compare rates for tapentadol with other opioid analgesics from June 2009 through December 2010, utilizing both per 100,000 population (POP) and per 1,000 Unique Recipients of Dispensed Drug (URDD) as denominators.

Results: Based on data from the SKIP program from June 2009 to December 2010, non-medical use rates for tapentadol fluctuated between 0 and 0.572 per 1,000 people who filled a prescription (URDD) and 0 and 0.015 per 100,000 population (POP), reflecting non-significant changes over time (p=0.816 and p=0.867, respectively). Data from Poison Centers, Outpatient Treatment Programs, and Drug Diversion programs also showed similar non-significant trends in population and exposure rates (all p-values >0.05) during the observation period.

Discussion: Since product launch, rates of abuse, misuse, and diversion of Nucynta have been low; however, continued monitoring of trends in the data are warranted.

References:


Funding: This analysis was funded by Janssen Scientific Affairs, LLC.
TRENDS IN NON-MEDICAL USE OF NUCYNTA BY COLLEGE STUDENTS

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Introduction: Prescription opioid analgesics play an important role in the management of moderate to severe pain. An unintended consequence of these agents is nonmedical use. In 2008, the prevalence of nonmedical use of pain relievers among persons aged 12 yr or older was second only to marijuana in the U.S.¹ We describe the rates and methods of non-medical use of tapentadol immediate release [Nucynta®, CII] among college students following FDA approval in 2009.

Materials and methods: The RADARS³ System College Survey Program is an online questionnaire collecting data from approximately 2000 self-identified college-aged students throughout the US administered during the spring, summer, and fall terms. Responses were analyzed for trends in the rate and method of non-medical use of tapentadol compared with other opioid analgesics from June 2009 through March 2011.

Results: Non-medical use of tapentadol was highest in 4Q2009 (0.66 per 1,000 people who filled a prescription) and significantly decreased in the 4 subsequent survey periods (p≤0.001). Similarly, non-medical use per 100,000 population rate was highest in 4Q2009 (0.013 per 100,000 population) and decreased, although not significantly to 0.004 in 1Q2011 (p=0.22). The primary method of nonmedical use of tapentadol among college students is oral/transmucosal (78%) followed by inhalation and injection.

Discussion: Since launch, rates of non-medical use of Nucynta by college students were low and are decreasing over time. The initial levels of reported non-medical use may represent a brief period of experimentation after introduction.

References:


Funding: This analysis was funded by Janssen Scientific Affairs, LLC.
Introduction: One of the major sources of chronic post-surgical pain (CPSP) is pain that persists after inguinal hernia, which is estimated to affect between 10% and 35% of patients. One biological drug class that has not been critically evaluated in this context is tumor necrosis factor-alpha (TNF-α) inhibitors. The pre-emptive administration of TNF inhibitors has been shown to dramatically reduce both nerve injury and pain-related behaviors in animal models of neuropathic pain. In an attempt to shed light on the problem of CPSP, we conducted a multi-center, randomized, placebo-controlled study with 3 main objectives:

1) to determine the epidemiology of chronic post-herniorrhaphy pain;
2) to identify factors associated with the development of CPSP; and
3) to determine whether the preemptive administration of TNF inhibitors can reduce acute postoperative pain and prevent CPSP.

Methods: After IRB approval and informed consent, seventy-six subjects were randomized 1-2 weeks before surgery via a computer-generated randomization table. Group I received 50 mg of etanercept subcutaneously approximately 90 minutes before the anticipated start time of surgery, while patients in group II received 1 ml of saline. All subjects received open inguinal hernia repair with mesh under either general anesthesia or monitored anesthetic care. The primary outcome measure was the average pain score in the 24-hour interval post-procedure. Secondary outcome measures were time to first request for an analgesic in the PACU, average PACU pain score as recorded by the PACU nurse, PACU analgesic requirements in intravenous morphine equivalents, and oral analgesic use in the first 24 hours.

Results: A total of 188 patients were screened for enrollment, with 95 being randomized and 77 being treated. There were no significant demographic or clinical differences between treatment groups. The average time to the first request for an analgesic was 108 minutes in the etanercept group vs. 86 in the saline group (p=0.21). Mean PACU pain scores were 2.4 for etanercept patients and 2.6 in those who received saline (p=0.71). The etanercept group required less opioids in the PACU than patients who received placebo (3.5 vs. 5.7 IV mg MS0 equivalent; p=0.15). The average 24-hour pain score in those who received etanercept was slightly lower than in placebo patients (mean 3.3 (SD 1.9) vs. 3.9 (SD 2.3); p=0.22), with the largest difference observed during the first 6 hours (mean 3.7 (SD 2.2) vs. 4.6 (SD 2.5); p=0.09. Mean pain scores were not significantly different at 1-month (mean etanercept 0.66 (SD 1.2) vs. 0.89 (SD 1.3); p=0.43) or at any other time points.
Discussion: While some benefits did seem to derive from the preemptive use of etanercept, these effects were small and transient. Subjects who received etanercept experienced slightly lower pain scores in the first 6 hours after surgery (mean 3.7 vs. 4.6; p=0.08), and required less analgesic medications (4.0 vs. 5.8; p=0.03). There are several possible explanations for our less than auspicious findings. Studies conducted in animals and chronic pain patients generally involve multiple doses, and primary outcomes measured at follow-up visits performed more than 24 hours after drug administration.

EFFECT OF RADIOFREQUENCY AND COMPARISON WITH SURGICAL SYMPATHICOTOMY IN PALMAR HYPERHIDROSIS

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Background: Hyperhidrosis is the disorder of excessive sweating in certain regions of the body.
Mechanisms behind hyperhidrosis is multiple, however over stimulation of the sympathetic nervous system leading to lack of feedback of peripheral thermoreceptors seems to be the prominent mechanism. Treatment of hyperhidrosis is into surgical and nonsurgical. Hyperhidrosis is a usually treated with surgical sympathectomy. Radiofrequency (RF) therapy uses electromagnetic energy, which is deposited in or near nerve tissue. RF therapy is minimal invasive, low cost, usually outpatient and is easy to administer.

Objectives: RF has been successfully used in sympatholysis. We thus tested the primary hypothesis that RF is independently associated with decreased palmar hyperhidrosis and compared it with surgical sympathectomy patients.

Study Design: Retrospective observational cohort study.

Setting: Department of Anesthesiology and Thoracic surgery, Gulhane Military Medical Academy, Ankara.

Methods: We included all the patients undergoing treatment for hyperhidrosis between March 2010, and April 2012. Patients who received either surgical sympathectomy or radiofrequency ablation for palmar hyperhidrosis were included and analyzed. Outcomes studied included complications, success of the procedure, patients satisfaction (yes/ no) with their procedure and compensatory hyperhidrosis.

Results: There were 94 patients who met our criteria; of which 46 (49%) had surgical sympathectomy and 48 (51%) had Radiofrequency performed. Radiofrequency had a success rate of 75% in treating hyperhidrosis; however, was found to be statistically lower than surgical sympathectomy (95%) (p=0.005). The groups were similar inpatient satisfaction (p=0.259) and compensatory hyperhidrosis (p=0.774). Limitations: Retrospective study.

Conclusion: This is the first clinical study evaluating the role of radiofrequency ablation and comparing it with surgical treatment option in palmar hyperhidrosis. Radiofrequency significantly decreased the hyperhidrosis, however had lower success rate than surgical sympathectomy.

A98
THE USAGE OF US GUIDED TAP AND RECTUS SHEATH BLOCKADE IN POSTOPERATIVE PAIN MANAGEMENT OF ABDOMINOPLASTY
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Introduction: Regional blockades of the abdominal region were begun to use for many abdominal surgeries at the last decade. By this approach postoperative patient comfort can be provided in a better way. TAP and rectus sheath blockades are the two samples of these blockade techniques. In this study we observed the affects of these two techniques combination on the patient comfort and mobilisation times at abdominoplasty cases.

Materials and methods: 12 female abdominoplasty patients who were operated between 2010-2011 were divided to two groups randomly. Group 1 patients (n=6) were underwent TAP and Rectus sheat
blockade with bupivacaine preoperatively and the control group (n=6) was not. Static and dynamic VAS scores at 0, 2, 6, 12, 24 hours, mobilisation times and additional analgesic usages were observed postoperatively.

Results: Static and dynamic VAS scores were significantly higher at the control group for the first 12 hours (p score was between 0,004 and 0,015 for static VAS scores and between 0,002 and 0,026 for dynamic VAS scores). For the next 12 hours static VAS scores were statistically insignificant but the dynamic scores were higher at the control group up to the 24 hours. (p< 0,065 and p< 0,004) Assessment of the PCA usage and the mobilisation times were significantly higher at the control group for 24 hours ( p< 0,015 and p< 0,002).

Conclusion: TAP and rectus sheath blockade provides effective postoperative pain management in abdominoplasty patients. It not only increases patient comfort but also enables early mobilisation of the patients.

A99

ULTRASOUND-GUIDED INFRACLAVICULAR AND TAP BLOCKAGE FOR POSTOPERATIVE ANALGESIA IN CASES WITH COMMINUTED HUMERUS FRACTURE

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Introduction: Infraclavicular brachial plexus blockage is one of the analgesia methods preferred for postoperative analgesia at upper extremity surgeries. Ultrasound (US)-guided transversus abdominis plane (TAP) blockage is an easy and effective regional anesthesia technique for postoperative analgesia with low complication rates. Although TAP is performed particularly at abdominal surgeries, it has commonly been used for iliac graft procedures recently. We aimed to share our experiences about US-guided TAP and infraclavicular blockage for postoperative analgesia at 5 cases series of humerus comminuted fractures requiring open osteosinesthesis.

Material and method: Open osteosinesthesis was performed to our 5 adult, ASA-1 patients after bone grafts were obtained from the iliac crest. Operations were performed under standart general anesthesia, using propofole, placement of LMA after fentanil induction, and sevoflurane/N2O for maintaining the anesthesia. For postoperative analgesia, US-guided infraclavicular brachial plexus blockage (20 ml of 0.25 % bupivacaine) was applied for humerus fracture, and US-guided TAP blockage (20 ml of 0.25 % bupivacaine) was applied for iliac crest grafting.

Visual analog scale (VAS) scores of the patients were checked at 0th, 2nd, 6th, 12th, and 24th hours for upper extremity and iliac crest seperately; in addition nausia-vomiting and additional analgesic use were screened retrospectively at all patients.

Results: Blockages were performed successfully at all patients. Intramuscular 75 mg of diclofenac sodium was given to 3 patients because they had 12th hour VAS scores over 4. Remaining 2 patients didn't need any additional analgesia for postoperative 24 hours and their VAS scores for arm (humerus) and iliac crest remained 3 or lower. No patient needed opioids in 24 hours.

Discussion: In the absence of regional anesthesia, opioid use is the most common analgesia method in
orthopedic surgeries. Respiratory depression, and nausea-vomiting are the common problems occurring due to opioid use. US-guided regional anesthesia techniques have been preferred more commonly for postoperative analgesia at orthopedic surgeries.

As a result, we preferred regional anesthesia methods to opioids for postoperative analgesia at cases with comminuted humerus fracture; and we are in the opinion that US-guided infraclavicular blockage and TAP blockage provides effective analgesia.

References:


A100

EFFICACY OF PRE-OPERATIVE ORAL GABAPENTIN IN DECREASING POST-OPERATIVE PAIN IN PATIENTS UNDERGOING LOWER LIMB SURGERY UNDER SUBARACHNOID BLOCK (SAB)

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Introduction: Gabapentin has been used successfully as a non-opioid analgesic adjuvant for postoperative pain management. We hypothesized that gabapentin might be a useful adjuvant for postoperative analgesia in patients undergoing lower extremity surgery under SAB.

Method: Ninety male patients undergoing lower extremity surgery under SAB were randomly divided into three equal groups to receive drug orally one hour prior to surgery.

Group I: gabapentin 1200 mg.

Group II: gabapentin 600 mg.

Group III: placebo.

LP was done with 23G Quinccke's spinal needle and 2.5 mL of 0.5% heavy bupivacaine was administered intrathecally. Patients were monitored at 0, 1, 3, 5, 8, 12 and 24 hours for assessment of pain and side effects. Patients having pain score ≥ 5 received rescue analgesia in the form of intravenous tramadol 0.5 mg kg⁻¹. If pain score persisted at ≥ 5 after ten minutes, 0.25 mg kg⁻¹ tramadol was repeated.
Results: Pain scores at zero hour were statistically significantly lower in patients receiving 1200 mg of gabapentin (group I) when compared with the other two groups. The total rescue analgesia (tramadol) requirement over the study period was also at the minimum in patients receiving 1200 mg of gabapentin as compared to patients receiving 600 mg of gabapentin or placebo. However, sedation scores were significantly higher in patients receiving gabapentin 1200 mg or 600 mg than placebo.

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<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
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<tr>
<td>Pain (Visual analogue score) at 0 hour</td>
<td>5.57 ± 0.86</td>
<td>6.23 ± 1.01</td>
<td>6.50 ± 1.10</td>
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<tr>
<td>Total rescue analgesia (Tramadol in mg) requirement</td>
<td>132.66 ± 51.20</td>
<td>207.33 ± 67.21</td>
<td>209.83 ± 63.21</td>
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Discussion: There is considerable evidence in support of the role of gabapentin in preemptive analgesia, in patients undergoing surgery under general anaesthesia. However, not much work has been done to determine the role of gabapentin in spinal anaesthesia. In this study we observe that preoperative gabapentin, when administered one hour prior to surgery in a dose of 1200 mg, decreases postoperative pain scores at zero hour and the rescue analgesia requirement significantly over a period of 24 hours in patients undergoing lower limb surgery under spinal anaesthesia. The decreased need for rescue analgesia with gabapentin 1200 mg could be explained by the prevention or reduction of the development of central neuronal hypersensitivity induced by surgical procedure when gabapentin was given in a dose of 1200 mg. Gabapentin blocks the excitatory amino acid and neuropeptide transmitters that induce central sensitization, enabling more direct treatment of injury-induced sensory hypersensitivity.

References:


Funding: Provided by the Pt.BDS PGIMS Rohtak.

A101
LOW DOSE CONTINUOUS SPINAL ANESTHESIA FOR HIGH RISK CASES - A CASE SERIES
Punam Raghove, M.D.¹, Karampal Singh¹, Sushila Taxak¹, Vikas Raghove², Anju Ghai¹
Introduction: Elderly patients with comorbidities pose a difficult situation for anesthesiologist. Both general and regional anesthesia is associated with side effects in geriatric patients. Although regional anesthesia has many benefits over general anesthesia, hemodynamic stability may be impaired and can lead to myocardial ischemia. Hypotension is more common, and also more hazardous, in elderly patients, as they may have decreased physiological reserve and compromised blood supply to various vital organs. Rapid infusion of large amounts of IV fluid and ephedrine used to counter excessive fall in blood pressure, may be detrimental to patients with cardiac dysfunction. A smaller dose of local anesthetic reduces the severity and incidence of hypotension during spinal anesthesia but single shot spinal anesthesia may not provide adequate anesthesia for the duration of surgery. In such situation, CSA is very useful technique. CSA, by enabling the reduction and fractionation of the induction dose through a catheter, reduces the hemodynamic effects of SA.

Methods: We used CSA technique in 15 patients. 10 patients were having fracture of femur, 2 patients were for total knee replacement and 3 patients were scheduled for open prostatectomy. Patients were of age group 65-95 years. 5 patients were having cardiac disease (previous MI) and rest were suffering from COPD. Informed consent was taken from all patients. LP was done in L3-4 interspace with 18G epidural touhy needle and epidural catheter was threaded into the subarachnoid space up to a distance of 3-5 cm. 1 ml of 0.5% of hyperbaric bupivacaine was injected through catheter initially and bupivacaine was administered again in doses of 0.2 ml when there was a recession in level or if there is patient discomfort. In all the patients the catheters were removed at the end of surgery. Routine monitoring included pulse oximetry, ECG and noninvasive blood pressure measurement (NIBP).

Result: CSA technique was successful in all patients. Initial dose of 1 ml bupivacaine was sufficient in 9 patients. 3 patients required one additional dose of 0.2 ml and 3 patients required two additional doses of 0.2ml of bupivacaine. 4 patients had >20% fall in blood pressure which was adequately controlled by fluid and 3-6 mg of ephedrine.

Conclusion: CSA is very effective and beneficial technique for anesthesia in elderly patients with co morbidity.

References:
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Introduction: Peripheral nerve stimulation (PNS) may be able to relieve severe post-amputation pain, but PNS of large nerve trunks, such as the femoral nerve, has traditionally required surgery to place the lead in intimate contact with the nerve. The objective of the present study was to determine if a percutaneously-placed lead could deliver PNS to the femoral nerve and reduce Residual Limb Pain (RLP).

Material and methods: The case study was approved by the FDA under an Investigational Device Exemption (IDE), and Investigational Review Board approval was obtained. This study is a case report of a 49-year-old African-American male with severe RLP (and no significant Phantom Limb Pain) secondary to a below-the-knee amputation following a motor vehicle accident 33 years prior. A lead was inserted percutaneously under ultrasound guidance. Correct lead placement was confirmed by evoking a comfortable paresthesia with stimulation that covered ≥75% of the painful area without evoking muscle contractions, qualifying the subject to proceed to a 2-week home trial.

Results: The worst RLP score was 8 on the 0-10 scale of the Brief Pain Inventory-Short-Form (BPI-SF) at baseline prior to stimulation. The worst RLP score decreased to 3 by the end of the 2-week home trial, indicating >60% pain relief. Improvements were also reported in the pain interference score of the BPI-SF (100%), Pain Disability Index (74%), and Patient Global Impression of Change (“Very Much Improved”) at the end of the 2-week home trial relative to baseline.

Discussion: This case report indicates that PNS can be delivered to the femoral nerve and relieve RLP with a percutaneously-placed lead, suggesting that it may be feasible to provide pain relief with a novel PNS system that does not require surgery to access the peripheral nerve. Future studies are needed to confirm this result in additional patients and determine if PNS can be delivered to the sciatic nerve trunk with a single percutaneously-placed lead.

Funding: This work was sponsored by NDI Medical, Cleveland, OH and supported in part by the National Institute of Neurological Disorders and Stroke (NINDS) (R43NS066523). The content is solely the responsibility of the authors and does not necessarily represent the official views of NINDS or NIH.

A103

DESIRE FOR AUTONOMY IN MEDICAL DECISION MAKING AND CORRELATION WITH PATIENT DEMOGRAPHIC FACTORS

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Introduction: Patient centered care is a core element of medical practice, yet it has received very little attention in the context of chronic pain. Patients’ differ in the degree of involvement they desire during medical decision making and recent medical and psychiatric literature has reported dissatisfaction with
paternalistic doctor-patient models. This has demonstrated an adverse impact on treatment outcomes. Extant literature shows inconsistencies in patient preference for autonomy based on type of illness and demographics. API or Autonomy Preference Index is a measure of patient preference for autonomy in their medical decision making. On the API, 0 indicates no desire for involvement, 100 indicates a strong desire for autonomy, 50 indicates a neutral attitude towards autonomy. In Pain management, patients are solicited to be active, collaborative participants in their care to achieve optimal outcomes. We hypothesize that sociodemographic factors may predict the degree of autonomy desired by patient. Distinguishing the factors that are associated or predictive of a desire for greater degrees of autonomy may be essential towards promoting patient-centered care, that respects and responds to individual patients' preferences.

Methods: After obtaining IRB approval, information was obtained from 106 chronic pain patients presenting to the CUMC Pain center for evaluation, as part of an ongoing study. The questionnaires administered included a Socio-Demographic Form, Autonomy Preference Index (API), Pain and Distress Scale (PAD). The socio-demographic variables were treated as continuous or categorical variables depending on level of measurement. Bivariate analysis, Pearson correlation, single and multiple linear regression analysis were performed. Within group differences were identified using analysis of variance techniques.

Results: The mean API score was 70.3 +/- 13.1 (min 45.0, max 98.57) Significant correlation was noted between race, education, income and marital status with API. White and Asian race, higher family income, higher education were correlated with a significantly greater desire for autonomy. Linear regression analysis showed significant prediction for high desire for autonomy with higher education (R2 0.531) and higher income (R2 0.7316). Higher income and education were identified as independent predictors for a very high degree of desired autonomy. Within group difference showed a significant trend for married and divorced subjects desiring more autonomy, as did Whites and Asians compared to other races. Multiple regression analysis showed race and marital status were not independent predictors when education and income were controlled.

Discussion: Our findings can be viewed from the perspective of the Ottawa Decision Support Framework which emphasizes patients' need for knowledge, resolution of decisional conflict and the importance of value consonant decisions. Physicians should identify factors that promote optimal decision making. A better understanding of factors that predict desired degree of patient autonomy can enhance doctor-patient communication and result in better treatment outcomes.


Funding: Nothing to disclose.
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Introduction: Up to 90% of patients with pancreatic cancer have pain causing debility and reduced quality of life. Splanchnic nerve and celiac plexus blocks are effective treatment options, particularly in patients with sensitivities to opioids.

We present four patients with pancreatic cancer who underwent endoscopic ultrasound-guided transesophageal celiac plexus block (ECPB) with no or limited analgesic benefit who then underwent fluoroscopically-guided posterior retrocrural splanchnic nerve block (FSNB) with an improvement in their pain scores and quality of life.

The aim is to provide awareness that patients with pancreatic pain may obtain relief from FSNB even following failed ECPB.

Materials/methods: Four patients were identified over the past 18 months who met the inclusion criteria: age greater than 18 years, pancreatic cancer with upper abdominal pain, and completion or attempt of both ECPB and FSNB.

Results: Patient 1 failed ECPB due to displacement of the stomach by tumor and large varices in the gastric wall. Following FSNB he reported complete pain relief but required a one-night hospitalization for hypotension following the block. He reported ongoing relief at two weeks.

Patient 2 had complete pain resolution for 5 days after ECPB. His pain soon thereafter returned, and 8 months later he underwent FSNB. His pain significantly improved. Three weeks following the neurolysis he gained weight and restarted chemotherapy.

Patient 3 underwent ECPB without improvement. Following FSNB at the L1 level he had complete pain relief and required no oral pain medication for one week. A repeat FSNB was performed at the T12 level with further pain relief for one week.

Patient 4 underwent ECPB, however tumor burden impaired adequate visualization of the ganglia. The patient had no pain relief. Following FSNB she had complete pain relief, though she did develop symptomatic hypotension and required hospitalization. She required no parenteral pain medications at the time of dismissal.

Discussion: ECPB is often performed during endoscopy for otherwise diagnostic or therapeutic purposes. In two cases, access to the celiac ganglia was limited secondary to tumor burden. The procedure was aborted in one case, and no relief was achieved in two cases. After FSNA, all patients had significant pain relief for one week, and most reported ongoing benefit. No significant complications were seen following ECPB, while after FSNB two patients experienced expected side effects of hypotension or diarrhea - a known risk given that this patient population is often dehydrated and malnourished. While this case series is limited by a small sample size and lacks standardized data measurement, the clinical findings suggest that FSNB may more effectively provide successful analgesia in patients with pancreatic cancer.

Conclusion: FSNA can provide relief from upper abdominal visceral pain despite failed ECPB.

References: Wong, G.Y., et al. Effect of neurolytic celiac plexus block on pain relief, quality of life,


A105

HEALTHCARE RESOURCE UTILIZATION AND COSTS OF SPINAL CORD INJURY WITH NEUROPATHIC PAIN IN A MEDICARE POPULATION

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¹Truven Health Analytics, Washington, DC, ²Pfizer, Inc., ³Mount Sinai Medical Center, New York, NY, ⁴Wayne State, Detroit, MI, USA

Introduction: Spinal cord injury (SCI) generally occurs in a population approaching middle age (average age at injury 41 years), although recent studies indicate a trend toward a higher average age of both newly injured persons and all persons currently alive with SCI. [1] Neuropathic pain (NeP) secondary to SCI develops in an estimated 50 percent of patients with SCI and is known to be difficult to manage, adding to the specific challenges for management of older individuals with SCI. The objective of this study was to characterize the healthcare resource utilization and economic impact related to the presence of NeP associated with SCI in a Medicare population.

Material and methods: This retrospective longitudinal cohort study used US administrative medical and prescription claims from the MarketScan Medicare Supplemental Database from 2005 through 2010 for Medicare beneficiaries to compare the cost of illness between SCI patients with (cases) and without (controls) NeP. Medicare patients with medical and pharmacy benefits one year before and after their index dates (cases first NeP diagnosis, controls proxy from randomized case) were selected. Baseline patient demographics and clinical characteristics were measured in the pre-index period for the case and control cohorts. In the post-index period, clinical characteristics, treatment patterns, healthcare resource utilization and costs were analyzed, comparing healthcare resource utilization and costs between cases and controls using univariate and bivariate descriptive data, as well as multivariable analyses using generalized linear models to adjust for the effects of potential confounders or risk factors.

Results: A total of 82 cases (67.1% females, mean age 79.4) and 5,961 control patients (52.6% females, mean age 78.7) met selection criteria. Cases had significantly higher comorbid burden (all p > 0.001) including musculoskeletal pain (84.1% cases, 49.4% controls), gastrointestinal conditions (58.5% cases, 28.6% controls), arthritis (OA or RA, 51.2% cases, 25.0% controls), and osteoporosis (35.4% cases, 14.7% controls). The adjusted odds ratio of inpatient admission for cases over controls was 3.22 (p < 0.001). All-cause expenditures modeled to adjust for risk factors was $33,804 for cases and $17,304 for controls for an incremental economic burden of $16,500 (standard error $3,492) per SCI NeP Medicare patient during the 12-month post-index period.

Discussion: In this Medicare population, SCI patients with NeP were characterized by healthcare
resource utilization and expenditures that were substantially and significantly greater than among SCI patients without NeP. While NeP cannot be ascribed as fully causal since there are other factors, including unknown or uncollected factors, that may be involved, these findings suggest the need for an integrated approach to patient management. Medicare patients represent a population with special needs regarding appropriate therapeutic choices. Further studies are warranted to more fully account for the differences between NeP and non-NeP patients with SCI, and to investigate multimodal approaches that can optimize patient management.


Funding: This study was sponsored by Pfizer Inc., New York, NY, USA.

A106

CHARACTERISTICS OF SUBJECTS WITH HUMAN IMMUNODEFICIENCY VIRUS-RELATED NEUROPATHIC PAIN IN THE UNITED STATES: BEAT NEUROPATHIC PAIN OBSERVATIONAL STUDY

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Introduction: Previous research has shown that, across a number of neuropathic pain (NeP) types, many patients with NeP are unable to obtain complete pain relief, resulting in reduced health-related quality of life (HRQoL) and functioning, sleep disturbance, anxiety, depression, and lost productivity. However, there is limited published data on the burden associated with Human Immunodeficiency Virus-Related Neuropathic Pain (HIV-NeP).

Material and methods: The objective of the BEAT Neuropathic Pain study was to characterize the impact of HIV-NeP on HRQoL, self-reported functioning, anxiety and depression, and productivity. The BEAT Neuropathic Pain study was a cross-sectional, observational study of 104 subjects diagnosed with HIV-NeP recruited during a routine office visit to a participating primary care or specialty physician in the United States (US). Subjects completed a questionnaire and physicians completed a case report form based on a 6-month retrospective chart review. Subject-reported pain and pain interference with function were assessed using the Brief Pain Inventory-Short Form (BPI-SF), HRQoL using the EuroQol 5-dimensions (EQ-5D) and the 12-item Short-Form Health Survey (SF-12v2), anxiety and depression using the Hospital Anxiety and Depression Scale (HADS), and lost productivity using the Work Productivity and Activity Impairment-Specific Health Problem (WPAI-SHP) scale.

Results: Subjects' mean age was 50.3 years, 78.8% were male, 20.2% were employed, and 88.5% had
at least one comorbid condition. The 3 most frequently reported comorbid conditions included: depressive symptoms (47.1%), sleep disturbance/insomnia (28.8%), and anxiety (27.9%). Mean Pain Severity Index score was moderate (5.4, 0-10 scale); the majority of subjects reported moderate (39.0%) or severe (35.6%) pain. The mean Pain Interference Index score was also moderate (5.5, 0-10 scale); scores on all seven function domains were significantly lower among subjects with worse pain severity (p<0.0001). The most affected pain-interference with function domains were sleep, enjoyment of life, normal work, and walking ability. Mean EQ-5D utility score was 0.57 (-0.1 to 1.0 scale); with lower mean utility scores among subjects with worse pain severity (mild: 0.70, moderate: 0.62, severe: 0.43; p<0.0001). The mean SF-12v2 Physical Component Summary (PCS) score was 34.3 (0-100 scale); with decreasing scores among subjects with worsening pain severity (mild: 43.0, moderate: 34.1, severe: 29.0; p<0.0001). The mean SF-12v2 Mental Component Summary (MCS) score was 39.6. No significant difference in MCS score was observed by pain severity level. Across all subjects, the mean HADS Anxiety score was 10.3, and the mean HADS Depression score was 8.5 (scores of 7-10= mild; 11 - 14 = moderate; 15-21 = severe). The mean HADS Depression scores were significantly worse among subjects with increasing pain severity (p=0.0050). Using the WPAI, lost productivity due to HIV-NeP resulted in 36.1% overall work impairment and 55.0% activity impairment.

Discussion: The majority of subjects with HIV-NeP are unemployed, have at least one comorbid condition, and experience moderate to severe pain. In addition, findings from a variety of patient reported outcome measures indicate that HIV-NeP contributes to poor HRQoL, diminished functioning, interference with sleep, some level of anxiety and depression, and lost productivity.

A107
THE COMPARISON OF EFFECTIVENESS OF DIFFERENT DOSES OF FENTANYL ADDED TO HYPERBARIC BUPIVACAINE FOR SPINAL ANAESTHESIA IN EMERGENCY APPENDECTOMY. A RANDOMIZED DOUBLE BLIND CLINICAL STUDY
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Introduction: Although Subarachnoid block is one of the popular modes of anaesthesia for lower abdominal surgeries, various adjuvant have been added to prolong the effects of the spinal anaesthesia in terms of dense motor and sensory blockade with less haemodynamic alterations and minimal side effects. Bupivacaine is a commonly used local anaesthetic drug, the sensory and motor blockade is satisfactory but its duration of action is limited so the use of fentanyl as an adjuvant was considered for the faster onset of action, maximum sensory blockade and for prolonged duration of action. Different intrathecal doses of Fentanyl have been tried for the same but the most appropriate dose could not be found during the literature review. Hence this research was carried out to ascertain most appropriate dose.

Material and method: 120 adult patients of ASA physical status I and II, who received subarachnoid block for emergency appendectomy were enrolled for the study. After obtaining the ethical clearance from the institute's ethical committee, subjects were divided in to 4 equal groups of n=30 each. Group A patient as a control group had received 3ml of 0.5% hyperbaric bupivacaine + 0.6ml of normal saline ,and Group B, received 3ml of 0.5% hyperbaric bupivacaine + 10µg of fentanyl (0.2ml) + 0.4ml of normal saline. Similarly Group C patient had received 3ml of 0.5% hyperbaric bupivacaine + 20µg of fentanyl (0.4ml) + 0.2ml of normal saline and Group D patients received 3ml of 0.5% hyperbaric
bupivacaine + 30µg of fentanyl (0.6ml). The clinical parameters observed during the procedure were heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial blood pressure (MAP) and peripheral oxygen saturation (SPO2). All four groups were compared in time of 2 spinal segments regression of sensory block, pain free period and number of rescue analgesic required in first 12 hours and the perioperative incidences of nausea/vomiting and shivering.

Result: The demographic parameters were comparable in all the groups. Although the time taken for sensory regression of two dermatomes from the highest level of sensory block were longest in Group C- 2.22±2.11 hours than other groups, but the longest duration of pain free period observed (9.974±0.5898, 6.688±0.5156, 3.7767±0.3656 and 1.9157±0.28312 hours in Group D, C, B, A respectively) and the least number of rescue analgesic required over 12 hours postoperatively in group D patients than of other groups. The incidences of nausea/vomiting and shivering occurred least in Group D patients than other Groups.

Discussion: Patients who received intrathecal 30µg of fentanyl with bupivaine had excellent perioperative analgesia with the least degree of side effects. That could be because of synergistic inhibitory action of these two agents on Aδ-fiber and C-fiber conduction.

Reference:

A108
CAN SPHENO-PALATINE GANGLION BLOCK BE USED ROUTINELY FOR OUR OBSTETRIC PATIENTS FOLLOWING ACCIDENTAL DURAL PUNCTURE FOR PDPH TREATMENT?

Ashraf Sakr , M.D.1, Shaul Cohen2, Adil Mohiuddin2, Shruti Shah1, Anna A. Pashkova2, Christine Park No3, Arpan G. Patel2, Noah Rolleri2, Vishal Patel2, Christine W. Hunter3
1Anesthesiology, 2Anesthesia, UMDNJ-Robert Wood Johnson University Hospital, New Brunswick, NJ, USA

Introduction: An epidural blood patch (EBP), which is our standard of care for treatment of postdural puncture headache (PDPH) has numerous reports of side effects and complications (1). We reported our success with the application of sphenopalatine ganglion block (SPGB) for headache and PDPH in our obstetric patients. We determined that SPGB in dural punctured obstetric (OB) patients reduces the need for EBP along with its complications.

Methods: Review of our OB patients who underwent SPGB for PDPH identified 18 patients. With IRB approval, OB patients with accidental dural puncture from 17g epidural needle were offered SPGB before application of epidural blood patch. The patients were informed that if this treatment was unsuccessful at anytime, they could have an EBP. We applied cotton tipped applicators saturated in 5%
water soluble lidocaine ointment in each nostril for 10 minutes.

Data collected included age, height, weight, ASA status, duration of headache, severity of headache, stiffness of neck, tinnitus, photophobia, diplopia, nausea and vomiting before treatment, half hour, one hour, 2nd day, 3rd day and 4th day post treatment, the number of patients who required blood patch, time from dural puncture to recovery of headache and overall satisfaction from the block. Patients were followed up 30 mins, 60 mins, 48 hrs, 72 hrs and 96 hrs following this treatment. Upon discharge, patients were followed by phone daily for a week and were referred to our pain clinic when symptoms of post dural puncture recurred or persisted.

Results: All patients had ASA Class II, age 27.87±3, height 165.59±9 cm, weight 63.620±7 kg, duration of PDPH 49.9628±5 hrs, time from PDPH diagnosis to recovery 55.4436±8 hrs. 12 out of 18 patients (66.7%) were satisfied with SPGB treatment and did not require EBP. Seven patients (38.8%) required a second SPG block. Six (33.3%) were not satisfied and required an EBP. The overall satisfaction from this treatment was 9.01±1 (range 1-10, 10= best).

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>n(%)</th>
<th>Severity (0-10) Mean±SD</th>
</tr>
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<tr>
<td>Severity of headache (HD) before Rx (0-10)</td>
<td>8.3±1.8</td>
<td></td>
</tr>
<tr>
<td>HD after 1 hr of Rx</td>
<td>6/18 (33.3)</td>
<td>1.52±2.6</td>
</tr>
<tr>
<td>HD after 48 hrs of Rx</td>
<td>3/18 (16.67)</td>
<td>1.23±3.0</td>
</tr>
<tr>
<td>HD after 72 hrs of treatment</td>
<td>2/18 (11.1)</td>
<td>1.0±2.60</td>
</tr>
<tr>
<td>HD after 120 hrs</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>Nausea before Rx n (%)</td>
<td>2/18 (11.1)</td>
<td></td>
</tr>
<tr>
<td>Nausea 30 min after Rx</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>Vomiting n (%)</td>
<td>2/18 (11.1)</td>
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</tr>
<tr>
<td>Vomiting 30 min after Rx</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>Tinnitus before Rx</td>
<td>0 (0)</td>
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</tr>
<tr>
<td>Neck stiffness before Rx n (%)</td>
<td>7/18 (38.88)</td>
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<tr>
<td>Neck stiffness 48 hrs after Rx n (%)</td>
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</tr>
<tr>
<td>Diplopia before Rx n (%)</td>
<td>1/18 (5.55)</td>
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</tr>
<tr>
<td>Diplopia 30 min after Rx n (%)</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>Photophobia before Rx n (%)</td>
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<tr>
<td>Photophobia 30 min after Rx n (%)</td>
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</tbody>
</table>

[Table 1]

Conclusion: Our data suggests that every OB patient with PDPH may receive this minimally invasive technique which has minimal side effects and in most cases (66.7%) can avoid the need for a blood patch along with its side effects and complications.

ULTRASOUND GUIDED TRIGEMINAL NERVE BLOCKS: AN ALTERNATIVE TECHNIQUE

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Introduction: Trigeminal neuralgia (TN) is the most common cause of facial pain with a reported incidence of 5 per 100,000 patients per year. The pain is usually localized to one side of the face primarily in the distribution of the maxillary or mandibular nerve. Blockade of the Gasserian ganglion or its branches is frequently performed as a diagnostic or therapeutic tool in the management of TN. The block is generally performed using fluoroscopic or CT guidance. We have developed an ultrasound guided method for needle positioning and performance of this block. We report 5 cases in which we successfully performed this block using an ultrasound guided approach to the pterygopalatine fossa.

Materials and methods: After informed consent was obtained, the patients were placed in the lateral decubitus position. Standard ASA monitors were applied. A 8-15 MHz linear ultrasound probe was positioned on the lateral face below the zygomatic arch.

The zygomatic bone, the lateral pterygoid muscle, the lateral pterygoid plate (LPP) as well as the maxillary bone were visualized. The maxillary artery was identified in the pterygopalatine fossa. Using a 22 g echogenic needle, the needle was advanced in plane from lateral to medial toward the pterygopalatine fossa. The injectate was deposited deep to the lateral pterygoid muscle and plate and lateral to the maxillary artery. A total of 2mL of local anesthetic (Bupivacaine 0.25%) and steroid were injected.

Results: All blocks were performed safely by a trainee under the supervision of the senior author in less than 5 minutes. All cases were refractory to previous medical and surgical management. Repeat injections were frequently required to control the pain. All patients with a diagnosis of trigeminal neuralgia responded to these blocks. No immediate or short term (3 months) complications were reported.
Conclusion: Ultrasound guidance may provide an alternative approach to Fluoroscopy or CT scan guided trigeminal nerve block.

Reference:


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Table: Patient characteristics

<table>
<thead>
<tr>
<th>Case</th>
<th>Sex</th>
<th>Age</th>
<th>Previous Failed Therapy</th>
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<td>2</td>
<td>F</td>
<td>56</td>
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<td>1</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>76</td>
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<td>6</td>
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<tr>
<td>5</td>
<td>F</td>
<td>60</td>
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</tbody>
</table>

*UGTN = Ultrasound guided trigeminal nerve

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A110

INTRATHECAL ADMINISTRATION OF ATYPICAL ANTIPLATFORM RISPERIDONE BLOCKS SYSTEMIC MORPHINE INDUCED ANALGESIA IN MICE

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Introduction: We previously reported that descending serotonergic inhibition is mediated by spinal 5-HT7 receptors. Diminished pain sensitivity in schizophrenia has been reported, while the role of antipsychotic medications in the decrease of pain perception in these patients has been remained clarified. Risperidone is an atypical antipsychotic displaying 5-HT2A and D2 receptor antagonism, but also irreversibly binds to and inactivates the 5-HT7 receptors. It is well known that descending serotonergic pathways play a crucial role in the mechanism of morphine analgesia. In this study, we examined the effects of intrathecally administered risperidone on thermal nociceptive threshold and the
analgesia induced by systemic morphine in mice.

Material and methods: Antinociceptive effects were evaluated by radiant heat tail-flick test in adult male Balb-C mice (25-30 g). Risperidone (10 µg/mouse, i.th.) was given alone or 20 min before systemic morphine (1 mg/kg, 5 mg/kg, 10 mg/kg, s.c.). Tail flick latencies were measured before and 30, 60, 90 and 120 min after drug administration. Data was expressed as mean ± S.E.M (n=8). The significance of any differences in tail flick responses was assessed by using two way ANOVA followed by Dunnet test. The differences were considered significant at P< 0.05.

Results: The mean baseline tail-flick latencies of the naive animals were found to be 2.87 ±0.21. Spinally administered risperidone did not affect baseline tail-flick latencies during 120 min after injection. Morphine (1, 5, 10 mg/kg) elicited a dose dependent antinociceptive effect in the tail-flick responses. I.th. administration of risperidone (10 µg) completely inhibited the antinociceptive effects of Morphine (1, 5, 10 mg/kg) in 120 min our observation period.

Discussion: We found that risperidone alone did not alter thermal nociceptive threshold but it blocks morphine-induced antinociceptive effect. Thus, our study indicates that nociceptive thresholds are not changed by risperidone, but atypical antipsychotics possibly modulate opioid analgesia. through a blockade of spinal 5-HT2A and/or 5-HT7 receptors.


A111
SUTURING THE EPIDURAL CATHETER REDUCES THE INCIDENCE OF FAILED EPIDURAL BLOCK IN OBSTETRIC PATIENT

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Introduction: Recommendations for securing epidural catheter include using a multi-orifice epidural catheter placed at least 4 cm into the epidural space. We examined whether suturing the epidural catheter to the skin can further reduce the incidence of failed epidural block.

Methods: One thousand three hundred and twenty four ASA Phs I-II parturients requesting epidural block for L&D or C/S were studied. The epidural space was located at L2-3 or L3-4 using loss of resistance to air technique and a midline approach with the patient in lateral or sitting flexed position. An 18 guage “Braun” (B. Braun Medical Inc., Bethlehem, PA 18018) closed end tip catheter was directed 5 cm cephalad and the patient was then asked to unflex her back.

The patients were randomized to one of two groups:

GROUP I (660) parturients had their epidural catheters sutured with 3-0 silk suture at the insertion site and then looped downward 5 cm.

GROUP II (664) parturients had their epidural catheters looped downward 5 cm without being sutured.
Mastisol glue and transparent dressing were then applied. An investigator recorded the patient's age, height, weight, parity, position for insertion of catheter, distance of epidural space from skin, and previous history of epidural block, spinal block, spinal tap, dural puncture or blood patch. Also recorded were incidence of failed epidural block (a properly functioning epidural block which subsequently failed), catheter dislodgment, blood vessel puncture, dural puncture, need for catheter readjustment or reinsertion, occurrence of unilateral block, efficacy of sensory block for C/S, maximum lumbar and sacral sensory block, lowest Bromage Score (1= complete motor block, 5=no weakness of hip flexion), catheter position and length of catheter coiled under the skin at time of catheter removal, and overall satisfaction (0=worst, 10=best).

Results: Groups did not differ in age, weight, height, parity or previous history, distance of epidural space from the skin, lowest Bromage Score, maximum sensory level or efficacy of sensory block for C/S. Overall satisfaction was high in both groups, 9.5±0.9 vs. 9.1±1.1 (p< 0.00001) for Groups I & II respectively. The length of catheter coiled under skin upon removal was 0.7±0.8cm vs. 0.4±0.8cm (p< 0.0001) for Groups I & II respectively. Incidence of catheter movements and resulting complications and corrections are shown in Tables I & II respectively.

Table I: Catheter Movement Upon Removal

<table>
<thead>
<tr>
<th>None</th>
<th>Outward</th>
<th>Inward</th>
<th>Dislodged</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>528</td>
<td>62</td>
<td>49</td>
</tr>
<tr>
<td>Group II*</td>
<td>218</td>
<td>229</td>
<td>111</td>
</tr>
</tbody>
</table>

*Significantly greater than Group I, p< 0.00001.

Table II: Incidence Of Complications & Corrections

<table>
<thead>
<tr>
<th>Failed</th>
<th>One-sided</th>
<th>Blood Vessel</th>
<th>Readjustment</th>
<th>Reinsertion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>9</td>
<td>6</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Group II *</td>
<td>43</td>
<td>**34</td>
<td>***17</td>
<td>**30</td>
</tr>
</tbody>
</table>

*Sig. greater than Group I, p< 0.00001 **Sig. greater than Group I, p< 0.00002

***Sig. greater than Group I, p< 0.008 ****Sig. greater than Group I, p< 0.001.

Conclusion: Suturing the epidural catheter reduced catheter movement and need for reinsertion, decreased the incidence of one-sided anesthesia and catheter puncture of epidural vessels, and increased the success rate of epidural block.
A POOLED ANALYSIS EVALUATING EFFICACY AND TOLERABILITY OF TAPENTADOL ER FOR CHRONIC, PAINFUL DIABETIC PERIPHERAL NEUROPATHY (DPN)

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The efficacy and tolerability of tapentadol ER were evaluated using pooled data from 2 randomized-withdrawal, placebo-controlled, phase 3 studies (NCT00455520; NCT01041859) of similar design in patients with moderate to severe, chronic, painful DPN. In each study, patients were titrated to their optimal dose of tapentadol ER (100-250 mg bid) during a 3-week, open-label (OL) titration period. Patients who had tolerated tapentadol ER and had ≥1-point improvement in pain intensity (11-point NRS) from the start to end of titration were randomized to placebo or tapentadol ER (dose determined during titration) for a 12-week, double-blind (DB) maintenance period. Average pain intensity over the previous 12 hours was recorded twice daily. The primary efficacy endpoint was mean change in pain intensity from the start to Week 12 (LOCF) of DB maintenance. Mean (SD) pain intensity for the overall population (n=1,034) was 7.29 (1.38) at the start of OL titration and decreased to 4.15 (2.10) at the end of titration. With placebo (n=343) and tapentadol ER (n=360), respectively, mean (SD) pain intensity scores were 3.48 (2.02) and 3.67 (1.85) at the start of DB maintenance and 4.76 (2.52) and 3.77 (2.19) at Week 12; mean (SD) changes from the start to Week 12 of DB maintenance were 1.28 (2.41) and 0.08 (1.87), indicating that pain intensity worsened with placebo but was relatively unchanged with tapentadol ER. The least-squares mean difference for the change from start to Week 12 of DB maintenance for tapentadol ER versus placebo was −1.14 (95% CI, −1.435 to −0.838; \( P < 0.001 \)).

AEs led to treatment discontinuation for 16.3% (169/1,040) of patients during OL titration and 8.2% (28/343) of patients receiving placebo and 14.2% (51/360) of those receiving tapentadol ER during DB maintenance. Results of this pooled analysis support those of the individual studies and indicate that tapentadol ER was effective and well tolerated for managing moderate to severe, chronic, painful DPN.

PATIENT GLOBAL IMPRESSION OF CHANGE (PGIC) AND BRIEF PAIN INVENTORY-SHORT FORM (BPI-SF) ASSESSMENTS WITH TAPENTADOL EXTENDED RELEASE (ER) FOR PAINFUL DIABETIC PERIPHERAL NEUROPATHY (DPN)

Aaron Vinik¹, Douglas Y. Shapiro, M.D.², Keith Karcher², Bernd Lange³, Christine Rauschkolb², Mila Etropolski²

¹EVMS Strelitz Diabetes Research Center, Norfolk, VA, ²Janssen Research & Development, L.L.C., Raritan, NJ, USA, ³Grünenthal GmbH, Aachen, Germany

In this randomized-withdrawal, placebo-controlled study (NCT01041859) of tapentadol ER for moderate to severe, chronic, painful DPN, patients were titrated to an optimal dose of tapentadol ER (100-250 mg bid) during a 3-week, open-label period. Patients with ≥1-point reduction in pain intensity (11-point numerical rating scale) were then randomized to receive placebo (n = 152) or their optimal dose of tapentadol ER (n = 168) during a 12-week, double-blind, maintenance phase. At double-blind endpoint, the distribution of PGIC scores was significantly better with tapentadol ER versus placebo (\( P \)
From the open-label start to double-blind endpoint, tapentadol ER was associated with a significant reduction in the mean (SD) pain intensity subscale score of the BPI-SF (placebo, -2.3 [2.33]; tapentadol ER, -3.0 [2.16]; \( P = 0.003 \)) versus placebo. The mean (SD) change in the pain interference score of the BPI-SF from open-label start to double-blind endpoint was -2.6 (2.38) for placebo and -3.0 (2.07) for tapentadol ER (\( P = 0.05 \)). Nausea (21.1%) and vomiting (12.7%) were the most common TEAEs (≥10%) with onset or worsening in intensity during the maintenance phase in the tapentadol ER group. Compared with placebo, tapentadol ER (100-250 mg bid) provided significant improvements in PGIC and BPI-SF scores for the management of moderate to severe, chronic, painful DPN.
This Phase 3, randomized-withdrawal, placebo-controlled study (NCT01041859) evaluated the efficacy and tolerability of tapentadol ER for the management of neuropathic pain associated with DPN. Adult patients with moderate to severe, painful DPN with symptoms for ≥6 months and ≥3-month history of analgesic use for painful DPN were titrated to an optimal dose (balancing efficacy and tolerability) of tapentadol ER (100-250 mg bid) during a 3-week open-label period. At the end of the titration period, patients with ≥1-point reduction in pain intensity from the beginning to end of titration were randomized (1:1) to receive placebo or their pre-determined optimal dose of tapentadol ER for 12 weeks (double-blind, fixed dose, maintenance phase). The primary efficacy endpoint was mean change in average pain intensity (recorded twice daily [average pain during previous 12 hours]; 11-point NRS) from the start to Week 12 (LOCF) of the double-blind maintenance phase. Treatment-emergent adverse events (TEAEs) were recorded. A total of 358 patients completed the open-label titration period; 318 patients (placebo, n=152; tapentadol ER, n=166) were randomized and received ≥1 dose of study medication. At the start versus Week 12 of double-blind maintenance, respectively, mean (SD) pain intensity was: tapentadol ER, 3.70 (1.78) versus 4.01 (2.23); placebo, 3.35 (2.17) versus 4.83 (2.60). Mean (SD) change in average pain intensity from the start to Week 12 of the double-blind maintenance phase was: tapentadol ER, 0.28 (2.042); placebo, 1.30 (2.428) (least-squares mean difference for tapentadol ER vs placebo, -0.95 [95% CI, -1.415 to -0.493]; P < 0.001 favoring tapentadol ER). TEAEs (≥10%) reported in the tapentadol ER group during double-blind maintenance were nausea (21.1%) and vomiting (12.7%). Tapentadol ER (100-250 mg bid) was effective and well tolerated for the management of moderate to severe, neuropathic pain associated with DPN in adults.

IMPACT OF TAPENTADOL EXTENDED RELEASE (ER) ON NEUROPATHIC PAIN SYMPTOMS IN PATIENTS WITH PAINFUL DIABETIC PERIPHERAL NEUROPATHY: RESULTS OF A RANDOMIZED-WITHDRAWAL, PLACEBO-CONTROLLED, PHASE 3 STUDY

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1Janssen Research & Development, L.L.C., Raritan, NJ, USA, 2Grüenthal GmbH, Aachen, Germany

Introduction: The efficacy and tolerability of tapentadol ER has previously been demonstrated for the management of moderate to severe, chronic pain related to diabetic peripheral neuropathy (DPN).1 The current phase 3, randomized-withdrawal, placebo-controlled study (NCT01041859; approved by Ethics Committee) evaluated the impact of tapentadol ER (100-250 mg bid) on neuropathic pain symptoms as a secondary endpoint in patients with chronic, painful DPN.

Methods: Adult patients with moderate to severe, chronic, painful DPN with symptoms and signs for ≥6 months and analgesic use for that pain for ≥3 months before screening were titrated to their optimal dose (balancing efficacy and tolerability) of tapentadol ER (100-250mg bid) during a 3-week open-label period. Average pain intensity over the previous 12 hours was recorded twice daily (11-point numerical rating scale [NRS]). Patients who tolerated tapentadol ER and had ≥1-point reduction in pain intensity from the beginning to end of the open-label period were then randomized (1:1) to receive placebo or their optimal dose of tapentadol ER (determined in the open-label period) during a 12-week,
double-blind, fixed-dose, maintenance period. The primary efficacy endpoint was the mean change in average pain intensity from the start to Week 12 (last observation carried forward) of the maintenance period. Neuropathic pain symptoms were evaluated using the Neuropathic Pain Symptom Inventory (NPSI), a self-administered questionnaire (rated on an 11-point NRS; 0 = no [symptom] to 10 = worst [symptom] imaginable) addressing 5 dimensions of neuropathic pain (burning pain, pressing pain, paroxysmal pain, evoked pain, and paresthesia/dysesthesia). Individual dimension subscores were combined to yield a total NPSI score. Treatment-emergent adverse events (TEAEs) were recorded.

Results: The mean (standard deviation [SD]) pain intensity score was 7.3 (1.30) at the start of the open-label period and decreased to 3.6 (1.99) at the end of the open-label period. The mean (SD) change in average pain intensity from the start to Week 12 of the maintenance period was 1.30 (2.428) in the placebo group (n=152) and 0.28 (2.042) in the tapentadol ER group (n=166; least-squares mean difference [LSMD] for tapentadol ER vs placebo, -0.95 [95% confidence interval (CI), -1.415 to -0.493]; \( P < 0.001 \), favoring tapentadol ER). Mean changes from the start to Week 12 in all 5 NPSI subscores were significantly different between the tapentadol ER and placebo groups, favoring tapentadol ER (all \( P \leq 0.015 \)). The mean (SD) change from baseline to Week 12 in the NPSI total score was 10.10 (24.38) in the placebo group and 1.26 (19.80) in the tapentadol ER group (LSMD [95% CI], −8.62 [−13.59 to −3.64]; \( P < 0.001 \), favoring tapentadol ER). The most common TEAEs (incidence \( \geq 10\% \)) in the tapentadol ER group during maintenance were nausea (21.1%) and vomiting (12.7%).

Discussion: Results of this study show that tapentadol ER (100-250 mg bid) is effective for managing neuropathic pain symptoms in patients with moderate to severe, chronic, painful DPN.

References:


Funding: Janssen Research & Development, L.L.C., and Grünenthal GmbH.
Methods: In each study, patients were titrated to their optimal dose of tapentadol ER (100-250 mg bid) in terms of efficacy and tolerability during a 3-week open-label titration period. Average pain intensity over the previous 12 hours was recorded twice daily on an 11-point numerical rating scale. At the end of the open-label period, patients who tolerated tapentadol ER and had ≥1-point improvement from the start of titration were randomized (1:1) to receive placebo or tapentadol ER at their previously determined optimal dose during a 12-week, double-blind maintenance period. The primary efficacy endpoint was the mean change in pain intensity from the start to Week 12 (last observation carried forward) of the double-blind maintenance period. For the responder rate analysis, the number and percentage of patients achieving ≥30% and ≥50% improvement in pain intensity from the start of the open-label titration period to Week 12 of the double-blind maintenance period were evaluated. Adverse events (AEs) and treatment discontinuations were monitored.

Results: A total of 703 patients (placebo, n=343; tapentadol ER, n=360) received ≥1 dose of study medication in the double-blind maintenance period and were included in the pooled efficacy analyses. For the primary endpoint, mean (standard deviation) changes from the start to Week 12 of the maintenance period were 1.28 (2.410) in the placebo group and 0.08 (1.870) in the tapentadol ER group (least-squares mean difference for tapentadol ER versus placebo, −1.14 (95% CI, −1.435 to −0.838; P < 0.001, favoring tapentadol ER). In the placebo and tapentadol ER groups, respectively, 43.9% (150/342) and 54.4% (196/360) of patients achieved a ≥30% improvement and 28.4% (97/342) and 38.9% (140/360) of patients achieved a ≥50% improvement in pain intensity from the start of titration to Week 12 of the double-blind maintenance period (P ≤0.005 for both comparisons, favoring tapentadol ER). During the double-blind maintenance period, 30.0% (103/343) of patients in the placebo group and 28.9% (104/360) of patients in the tapentadol ER group discontinued treatment prematurely; 8.2% (28/343) and 14.2% (51/360) of patients, respectively, discontinued because of AEs. During the double-blind maintenance period, 56.0% (192/343) of patients in the placebo group and 74.7% (269/360) of patients in the tapentadol ER group reported ≥1 treatment-emergent AE.

Discussion: Results of responder rate analyses using pooled data from 2 similarly designed, randomized-withdrawal, placebo-controlled, phase 3 studies in patients with moderate to severe, chronic, painful DPN support the results of the primary efficacy analysis of change from baseline in pain intensity and indicate that tapentadol ER (100-250 mg bid) is effective for managing pain related to DPN.


Funding: Janssen Pharmaceutical Research & Development, L.L.C.

A117

ENGINEERED NANOPARTICLES FROM METALS AGGRAVATES NEUROPATHIC PAIN SYNDROME AND EXACERBATE BLOOD-SPINAL CORD BARRIER BREAKDOWN, ASTROCYTIC ACTIVATION AND NEURAL INJURY: NEUROPROTECTIVE EFFECTS OF NANOWIRED CEREBROLYSIN

Aruna Sharma , M.B.B.S. 1, Linyuan Febg 2, Dafin Fior Muresanu 3, Ranjana Patnaik 4, Herbert Moessler 5, Hari Shanker Sharma 1

ENGINEERED NANOPARTICLES FROM METALS AGGRAVATES NEUROPATHIC PAIN SYNDROME AND EXACERBATE BLOOD-SPINAL CORD BARRIER BREAKDOWN, ASTROCYTIC ACTIVATION AND NEURAL INJURY: NEUROPROTECTIVE EFFECTS OF NANOWIRED CEREBROLYSIN

Aruna Sharma , M.B.B.S. 1, Linyuan Febg 2, Dafin Fior Muresanu 3, Ranjana Patnaik 4, Herbert Moessler 5, Hari Shanker Sharma 1
Neuropathic pain syndrome includes sensitivity to touch and pain perception including phantom pain. Chronic neuropathic pain is either caused by brain or spinal cord injury, nerve lesion, diabetic neuropathy, amputation and neuromuscular disorders. In animal models chronic neuropathic pain simulating some of the clinical symptoms can be introduced by constriction, ligation or transection of sensory and/or motor spinal nerves. Rats develop neuropathic pain slowly and hypersensitivity could be seen up to 2 to 4 weeks after nerve injury. In a rat model of L-4 and L-5 nerve ligation, our laboratory was the first to show that breakdown of the BSCB to albumin and activation of astrocytes occur progressively over 2 to 10 weeks that were most prominent in the ipsilateral side of the cord. Hypersensitivity to pain though lessened after 4 weeks, but neurodegenerative changes progressed over time. This suggests that neuropathic pain could induce remarkable neurodegenerative changes in the spinal cord hindering in development of suitable therapeutic treatment of neuropathic pain in clinics.

Previous experiments in our laboratory showed that the magnitude and intensity of brain or spinal cord injury are altered by nanoparticles intoxitations. However, effects of nanoparticles in modifying neuropathic pain syndrome are still unknown. In present investigation we examined the role of nanoparticles on development of neuropathic pain, BSCB dysfunction, astrocytic reactivity and neural injury after spinal nerve ligation.

Spinal nerve ligation of L-4 & L-5 was performed surgically and rats were administered Cu, Ag or Al nanoparticles (50 to 60 nm; 50 mg/kg, i.p.) once daily for 10 days. Morphological examination of the cord including albumin immunoreactivity for BSCB dysfunction, GFAP reactivity for astrocytic activation and Nissl staining for neural injuries were examined after 2, 4, 8 and 10 weeks after nerve ligation. Nanoparticles treated rats exhibited prolonged hypersensitivity to external stimulation (fur touching) up to 8 weeks. Leakage of albumin and activation of astrocytes in the spinal cord segments T10, T12 and L5 were exacerbated by 120 % at 4 weeks; 250% at 8 weeks and 300 % at 10 weeks after ligation in nanoparticles treated group. This effect was most marked in Cu and Ag treated animals. Neuronal injury closely corresponded to albumin leakage in the spinal cord. Cerebrolysin in high doses (5 ml/kg) if co-administered with nanoparticles daily was sable to reduce morphological changes in the cord effectively. However, cerebrolysin given after 4 to 6 days of nanoparticles administration failed to induce sufficient neuroprotection. On the other hand, nanowired cerebrolysin given in identical doses showed marked neuroprotection and reduction in hyperalgesia in these rats. These observational are the first to show that (i) nanoparticles potentiate duration of hyperalgesia of neuropathic pain and exacerbate disturbances in spinal cord microfluid environment and (ii) nanowired cerebrolysin administered at a later stage could thwart these changes indicating a potential role of nano drug delivery in pain management.

Supported by the Air Force Office of Scientific Research (London), Air Force Material Command, USAF, grant FA8655-05-1-3065; Swedish Medical Research Council Grant Nr. 2710; and Ever NeuroPharma, Austria.
EFFECT OF PEROXISOME PROLIFERATOR-ACTIVATED RECEPTOR PARTIAL AGONIST ON DIABETES INDUCED NEPHROPATHY IN RATS

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The study has been designed to investigate the comparative effect of Rosiglitazone (4mg/kg, i.p.), a selective PPAR-γ agonist and nTZDpa (3mg/kg i.p.), a partial PPAR-γ agonist in diabetes-induced nephropathy in rats. The single administration of STZ (50 mg/kg, i.p.) produced diabetes. The development of diabetic nephropathy was assessed biochemically by estimating blood urea nitrogen, serum creatinine and urinary albumin. Further, serum TBARS and reduced glutathione were estimated to assess the oxidative stress. The nTZDpa and Rosiglitazone treatment were started in diabetic rats after one week of STZ administration and continue for four weeks. nTZDpa treatment markedly ameliorated diabetic nephropathy as compared to Rosiglitazone. However, there was no significant difference between Rosiglitazone and nTZDpa in all the parameters assessed. Thus, it may be concluded that partial or full PPAR-γ agonist alleviate diabetic nephropathy.

A119

COMPARISON BETWEEN PARAVERTEBRAL BLOCK AND CERVICAL EPIDURAL BLOCK IN PATIENTS UNDERGOING BREAST SURGERY - A DOUBLE BLINDED RANDOMIZED CONTROL TRIAL

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Background and aim: Regional anaesthesia is becoming an increasingly important aspect of modern anaesthesia practice. Paravertebral block and Cervical epidural anaesthesia are two main techniques which can be used for giving regional anaesthesia for breast cancer surgery. Here in this study our aim is to compare these two techniques in terms of perioperative vitals and their efficacy.

Method: After ethical permission 60 patients of ASA I and II of age group 18-60 yrs undergoing surgery for breast carcinoma were enrolled in this prospective, double blinded, randomized study. Participants were randomly allocated into either Group CEA or Group PVB. Group CEA received cervical epidural block at C7-T1 or C6-C7 with 10 ml of 0.5 % bupivacaine. Group PVB received Paravertebral block at each level from C7 to T6 with 3 ml of 0.5% bupivacaine. All hemodynamic parameters like HR, NIBP, ECG and SpO2 were monitored during surgery. Surgeon's response was recorded on a scale of 1-5. Post-operative requirement of morphine was calculated for the first 24 hours. Data analysis done by student's t-test/mann-whitney test.

Results: Onset of block was early in CEA group. Hemodynamic parameters like NIBP, HR…etc were decreased in CEA group more than the PVB group which is statistically significant but the decrease lies within normal physiological values. Decrease in SpO2 was more in CEA. Surgeon satisfaction score was more for CEA group than PVB. Failure rate was more in PVB group.

Conclusion: Paravertebral group is associated with better hemodynamic control while the efficacy and results of block were better in Cervical epidural. Hence both these techniques can be used safely and
choice should be made according to patients' need.

IPSILATERAL KNEE/HIP INVOLVEMENT ADVERSELY AFFECTS PAIN AND FUNCTION OUTCOMES AFTER TOTAL HIP OR KNEE ARTHROPLASTY

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Background and purpose: Persistent pain and functional limitation are unfavorable outcomes after knee and hip replacement, which are getting increasing attention due to a dramatic increase in rates of knee and hip replacements. Our objective was to assess the association of ipsilateral knee/hip pain on short- and mid-term pain and function outcomes after total hip or knee arthroplasty (THA/TKA).

Methods: We used the prospectively collected data from the Mayo Clinic Total Joint Registry to assess the association of ipsilateral knee or hip joint involvement with moderate-severe pain and moderate-severe functional limitation at 2- and 5-year follow-up after primary and revision THA and TKA using multivariable-adjusted logistic regression analyses. Analyses were adjusted for patient characteristics (unmodifiable - age and gender; and modifiable - BMI, comorbidity, depression and anxiety), implant fixation (cemented/hybrid versus not cemented) and health care access as assessed by the distance from medical center.

Results: At 2-year, 3,823 primary THA, 4,701 primary TKA, 1,218 revision THA and 725 revision TKA were studied. After adjusting for multiple covariates, ipsilateral knee pain was significantly associated with outcomes after primary THA (all p-values < 0.01): (1) moderate-severe pain: at 2-years, odds ratio (OR), 2.3 [95% confidence interval (CI), 1.5, 3.6]; at 5-years, OR 1.8 [95% CI:1.1, 2.7]; (2) moderate-severe functional limitation: at 2-years, OR 3.1 [95% CI:2.3, 4.3]; at 5-years, OR 3.6 [95% CI:2.6, 5.0]. Ipsilateral hip pain was significantly associated with outcomes after primary TKA (all p-values < 0.01): (1) moderate-severe pain: at 2-years, OR 3.3 [95% CI:2.3, 4.7]; at 5-years, OR 1.8 [95% CI:1.1, 2.7]; (2) moderate-severe functional limitation: at 2-years, OR 3.6 [95% CI:2.6, 4.9]; at 5-years, OR 2.2 [95% CI:1.6, 3.2]. Similar associations were noted for revision THA and TKA patients.

Conclusion: Presence of ipsilateral joint involvement after primary and revision THA and TKA is a poor prognostic factor for pain and function outcomes. A potential way to improve outcomes may be to address ipsilateral lower extremity joint involvement.

EFFICACY OF INTRATHECAL ADENOSINE WITH BUPIVACAINE IN VAGINAL HYSTRECTOMY SURGERIES

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Introduction: Adenosine is an important signaling molecule in immunity and inflammation. It is known to produce antinociception when administered systemically. We evaluated the efficacy of two different doses of intrathecal adenosine as an adjunct to 0.5% hyperbaric bupivacaine in patients undergoing vaginal hysterectomy under spinal anaesthesia.

Methods: Seventy five ASA I and II women in the age group 40-60 yrs scheduled for vaginal hysterectomy under spinal anesthesia were included. Patients were allocated to three groups of 25 patients each to receive 500µg adenosine (group I), 1000µg adenosine (group II) and normal saline (group III) with 2.6 ml of 0.5 % hyperbaric bupivacaine randomized in a double blind manner. Postoperative analgesia was provided with PCA fentanyl with loading dose of 2mg/kg, incremental dose of 10 mg and lockout interval of 10 minutes. Time of administration of rescue analgesia and total dose of fentanyl were recorded. The time to full recovery of sensory and motor block was noted.

Results: There were no differences in time to rescue analgesia and postoperative fentanyl consumption over 24 hours in all the groups. There was no significant difference in onset of sensory and motor block, regression of sensory block though statistically significant difference was noticed in time taken for regression of motor block.

<table>
<thead>
<tr>
<th>Group</th>
<th>Time of full recovery of sensory block (minutes)</th>
<th>Time of complete regression of motor block (minutes)</th>
<th>Duration of spinal anaesthesia (minutes)</th>
<th>Time of first rescue analgesia (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>82.83±22.75</td>
<td>206.74±38.83*</td>
<td>229.57±40.08</td>
<td>129.57±49.92</td>
</tr>
<tr>
<td>Group 2</td>
<td>79.88±25.23</td>
<td>175.40±50.019**</td>
<td>232.60±78.03</td>
<td>177.92±139.44</td>
</tr>
<tr>
<td>Group 3</td>
<td>89.36±25.31</td>
<td>212.05±39.97</td>
<td>237.59±36.83</td>
<td>144.32±59.21</td>
</tr>
</tbody>
</table>

Discussion: Adenosine receptors have been identified with their highest concentration in substantia gelatinosa in the dorsal column of the spinal cord primarily at intrinsic neurons and primary afferents. Adenosine did not enhance the effect of bupivacaine in our study which is in contrast to results by Apan et al where use of adenosine was found to extend the duration of analgesia in brachial plexus block. The results are also in contrast to a study where adenosine given as intraoperative infusion reduced the consumption of isoflurane by 50-60 % during surgery and postoperative analgesics by 20%. The fact that intravenously infused but not intrathecally injected adenosine could produce analgesia after visceral surgery suggest that lumbar spinal mechanisms may not be primarily responsible for antinociceptive effect. Further the dose requirement may be different between experimental pain where there is no continuous nociceptive input and acute perioperative pain with a massive afferent input. Adenosine also exerts well known anti-inflammatory effects. Therefore, a peripheral anti-inflammatory mechanism could be a plausible mechanism of action of intravenously infused adenosine.

References:


Funding: Received from University of Health Sciences, Rohtak.

A122

RESULTS OF A PILOT SHORT TERM HUMAN TESTING OF HIGH FREQUENCY NERVE BLOCK TO TREAT RESIDUAL LIMB PAIN FROM AMPUTATION

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Introduction: Animal studies showed instantaneous and reversible conduction block of motor and sensory nerves by alternating current of 5-50 kHz. This first-in-human study is to prove feasibility of acute treatment of intractable pain in residual limbs by applying high-frequency current on peripheral nerves proximal to the pain source, the neuroma formed at the end of the severed nerve.

Methods: Five lower-limb amputees with chronic and severe residual limb pain who attained temporary but significant pain reduction after local anesthetic injection were enrolled. A spiral nerve cuff electrode was placed on the target nerve during a 30-min surgery under general anesthesia. An external waveform generator was connected to the implanted electrode via a percutaneous interface. Frequencies between 5 and 30 kHz were tested. Subjects attaining significant and consistent pain reduction were given the portable generator for home therapy. All electrodes were explanted on 28th day post implantation per protocol.

Results: In subject 1, during one test with 10 kHz, immediate and complete reduction of chronic pain was attained. Pain returned to baseline level in 20 min after current termination. Subjects 2 and 3 both had baseline pain level of 0 during office visits. Partial or complete reduction of mechanically-induced pain was achieved inconsistently. In subjects 4 and 5, testing with 10 kHz resulted in pain reduction in minutes from 7 to 2 and 7 to 0, respectively, and pain relief lasted tens of minutes to hours after each 10-min therapy. Both subjects used the therapy at home and reported significant and consistent pain reduction. Subject 4 reported significant improvement in his ability to conduct daily activities. Subject 5 reported marked improvement of sleep, noting first pain-free sleep in years. No adverse events occurred during study. No noticeable nerve tissue damage was found upon visual inspection during explant surgery. No detectable sensory/motor function deterioration was found on post-explantation examination.

Discussion: The most important finding of this study is that a brief application of high-frequency current can result in an extended period of pain reduction. This means the device does not have to deliver energy to the nerve continuously for continuous pain relief, a huge benefit for the realization of this therapy by an implantable, battery-powered generator.

Conclusion: The feasibility of using high-frequency nerve block in reducing amputation pain is
demonstrated without adverse events by this first-in-human study. Larger-size and longer-term studies are warranted to confirm the findings.

A123

USAGE OF ULTRASOUND GUIDED PERIPHERAL NERVE BLOCKS AS A PREDICTOR OF SUCCESS FOR HIGH FREQUENCY ELECTRIC NERVE BLOCK IN PATIENTS WITH AMPUTATION STUMP PAIN

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Introduction: Animal studies showed instantaneous and reversible conduction block of motor and sensory nerves by alternating current of 5-50 kHz. In order to screen patients to see if they are a good candidate for high frequency nerve block accomplished with a surgical implantation of a stimulating cuff around a peripheral nerve, a test nerve block was completed using an amide local anesthetic (1% lidocaine). Keeping in mind that the mechanism of action of high frequency electric nerve block is similar injecting a peripheral nerve with an amide local anesthetic (which is a instantaneous and reversible conduction block of motor and sensory nerves) a pilot study was conducted to test this theory.

Methods: Nine lower-limb amputees with chronic and severe residual limb pain were enrolled in the study. Each patient underwent an ultrasound guided peripheral nerve block. If the patient was a below the knee amputation (3 of the 9 patients) a popliteal fossa block of the peroneal and tibial nerve was completed, and if the patient was a above the knee amputee a sciatic nerve block was completed. Ultrasound guidance was used to help visualize the nerve and neuroma in the amputated limb and then to identify a site for the nerve block as well as for surgical placement of a peripheral nerve spiral cuff surgically. After a successful nerve block, a spiral nerve cuff electrode was placed on the target nerve during a 30-min surgery under general anesthesia. An external waveform generator was connected to the implanted electrode via a percutaneous interface.

Results: Of the 9 patients enrolled, 6 were Above the knee amputees and 3 were below. Each underwent a screening peripheral nerve block using ultrasound guidance. Only 5 patients achieved significant pain reduction (defined as a perceived 50% reduction in pain) in two different peripheral nerve blocks 1 week apart. 4 of the AKA and 1 BKA patients were responders to the local. The other patients failed, in theory, due to the fact that the neuroma in the severed nerve may not have been the primary pain generator. The five patients were then implanted with a spiral cuff and has testing with a external waveform generator. All 5 patients achieved pain reduction with 4 out of 5 achieving significant pain reduction mimicking the test injection that was reproducible and repeatable.

Discussion: The most important finding of this study is a local anesthetic peripheral nerve block under ultrasound may be a positive predictor of high frequency electric nerve block. Since in residual limb pain- the stump pain is from a neuroma from a severed nerve and if one is able to block pain signal transmission from the nerve, the pain should be reduced. Since it is not practical to continuous infuse an amide local anesthetic proximal to a neuroma, a medical device consisting of a spiral nerve cuff and implantable internal pulse generator may be a way to accomplish a continuous nerve block in these patients.
INITIAL FINDINGS USING EXPAREL® (BUPIVACAINE LIPOSOME INJECTABLE SUSPENSION) VIA INFILTRATION INTO THE TRANSVERSUS ABDOMINIS PLANE (TAP) FOR POSTSURGICAL ANALGESIA IN ROBOTIC PROSTATECTOMY (RP)

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Introduction: TAP block infiltration has been increasingly adapted for postsurgical analgesia in abdominal procedures. We have sought to prolong the duration and efficacy of TAP block by previously reporting on the addition of dexamethasone to the injectate. We herein report on results using EXPAREL® (bupivacaine liposome injectable suspension, Pacira Pharmaceuticals, Parsippany, NJ; liposome bupivacaine (LB)) for TAP in two different volumes in the setting of RP.

Materials and methods: After IRB approval, 24 consecutive eligible patients in this open-label trial received TAP infiltration immediately after RP. Blocks were performed by 3 anesthesiologists; a single surgeon performed all cases. The first 12 patients received undiluted LB (266mg in 20cc, with 10cc per side) and the next 12 patients received diluted LB (266mg in 40cc, with 20cc per side). Pain scores (0=no pain, 10=worst possible pain), opioid use (morphine equivalents while inpatient, oxycodone/acetaminophen tablet use from discharge to end of study at Day 10), and safety parameters were recorded.

Results: All patients were discharged < 24 hours; during this time, patients in the 20cc LB group received a mean of 25mg opioids while patients in the 40cc LB group received a mean of 27mg opioids. From hospital discharge until the final visit on Day 10, both LB groups required a mean 0.7 percocet tablets a day (5mg oxycodone/325mg acetaminophen). The two LB patient groups reported mean pain scores of 4.4 and 5.3 at 1 hour postsurgery and 3.1 and 3.9 at two hours postsurgery; neither groups had mean scores above 3.0 at any further assessments throughout the remainder of the study. There were two serious adverse events (bilateral hematoma, pulmonary embolism) and two non-serious adverse events (knee swelling, knee stiffness); these were not considered related to study drug. At the Day 10 visit, 100% of available patients reported being either satisfied or extremely satisfied with their postsurgical pain control.

Discussion: To our knowledge, this is the first report of the use of LB in the setting of a TAP. In a similar study by the same authors last year, patients who received a TAP with either bupivacaine plus dexamethasone (n=25) or bupivacaine alone (n=22) after RP required totals of approximately 60mg - 70mg opioids. As those patients reported similar or higher pain scores than patients in the current study, LB appeared to decrease opioid requirements compared to these historical controls. There were no related AEs or SAEs in this study, suggesting a favorable safety profile. LB performed similarly in a diluted or undiluted state, resulting in pain scores of 3 or less from 6 hours to up to ten days following surgery. Although further studies are necessary to confirm these findings, initial results suggest that when administered as a TAP block in the setting of multimodal therapy, LB may offer a new option for postsurgical pain control.

References: 
3Prospective, Blinded, Randomized Evaluation of Dexamethasone Efficacy as Adjunct to Bupivacaine in Transversus Abdominis Plane (TAP) Block; Chow C, et. al.; ASRA 2011 Spring
Meeting.

Funding: The study was funded by Pacira Pharmaceuticals.

A125  
EFFICACY AND CONVENIENCE OF POSITION-ADAPTIVE STIMULATION: RESULTS OF THE RESTORESENSOR STUDY  
David Schultz¹, Lynn Webster², Mark Sun, PhD³, Ye Tan³  
¹MAPS Applied Research Center, Edina, MN, ²Lifetree Clinical Research and Pain Clinic, Salt Lake City, UT, ³Medtronic, Inc., Minneapolis, MN, USA

Introduction: Variation in the intensity of neurostimulation with body position is a practical problem for some patients implanted with a spinal cord stimulation system because positional changes may result in overstimulation or understimulation. The RestoreSensor™ neurostimulator with optional position-adaptive stimulation (AdaptiveStim™, Medtronic, Inc., Minneapolis, MN) was developed to address this problem.

Materials and methods: The primary objective of the RestoreSensor study was to assess the efficacy of position-adaptive stimulation in terms of pain relief and/or convenience compared with conventional manual programming. Other objectives included assessment of the number of manual programming adjustments and patient-reported advantages of position-adaptive stimulation. Safety objectives were to compare the number of patients who experienced adverse events associated with uncomfortable stimulation between the two study arms and to summarize all adverse events.

Patients at 10 centers in the U.S. were enrolled in the prospective, multicenter, open-label, randomized, crossover, IRB-approved study (Figure 1). Patients were implanted with the RestoreSensor neurostimulation device and randomized to either 6 weeks of position-adaptive stimulation adjustment or conventional manual adjustment alone. Crossover occurred at week 6 followed by 6 additional weeks of spinal cord stimulation in the opposite treatment arm. At the end of 12 weeks, patients independently reported their assessment of position-adaptive stimulation.
Results: A total of 79 patients were enrolled. Of the 76 patients who received implants and were randomized, no differences were seen between randomization groups in age (p=0.846) or gender (p=0.121). In an intent-to-treat (ITT) analysis, 86.5% of patients achieved the primary objective of improved pain relief with no loss of convenience or improved convenience with no loss of pain relief when using automatic position-adaptive stimulation compared with manual programming alone (Table 1). The results were statistically significantly greater than the predefined minimum success rate of 25%, p< 0.001. Position-adaptive stimulation also resulted in a statistically significant 41% reduction in the daily average number of programming button presses compared with manual programming alone.

<table>
<thead>
<tr>
<th>Total number of patients (ITT)</th>
<th>No. of successes</th>
<th>Proportion of successes</th>
<th>Exact one-sided 97.5% low confidence limit</th>
<th>Exact p-value (one-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>74</td>
<td>64</td>
<td>86.5%</td>
<td>76.5%</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Table 1. ITT Analysis for Primary Objective

Patient-reported advantages of position-adaptive stimulation included: comfort during position changes (80.3%); activity (69.0%); control of therapy (57.8%); and sleep (47.9%).
There was no significant difference in adverse events associated with uncomfortable sensations from stimulation between the study arms, and the overall adverse event profiles were also similar. The incidence of device-related serious adverse events was 3.9%.

Discussion: This study demonstrates that automatic position-adaptive stimulation improves pain relief and/or convenience in patients indicated for spinal cord stimulation therapy. The study also demonstrates that the safety profile of this new technology is similar to conventional manual programming.

Position-adaptive stimulation represents an important innovation in spinal cord stimulation therapy, the benefits of which merit serious consideration by clinicians and patients when selecting a spinal cord stimulation system for the treatment of chronic trunk and/or limb pain.

Funding: The RestoreSensor study was funded by Medtronic Inc., Minneapolis, MN.

A126
RESULTS OF THE RESTORESENSOR STUDY: SPINAL CORD STIMULATION THERAPY IMPEDANCE DOES NOT VARY SIGNIFICANTLY WITH CHANGES IN BODY POSITION

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1MAPS Applied Research Center, Edina, MN, 2Lifetree Clinical Research and Pain Clinic, Salt Lake City, UT, 3Medtronic, Inc., Minneapolis, MN, USA

Introduction: Successful spinal cord stimulation (SCS) therapy requires that paresthesia sensation substantially cover the patient's painful areas. Changes in impedance can alter the electric field, thus changing the paresthesia thresholds. Therefore, characterization of impedance changes may be useful in optimizing SCS therapy.

Materials and methods: Patients indicated for spinal cord stimulation therapy were enrolled in a prospective, multicenter, open-label, randomized, crossover, IRB-approved study after a successful trial screening. Patients were implanted with a RestoreSensor™ neurostimulator (Medtronic, Inc., Minneapolis, MN) with percutaneous leads. Therapy impedance measurements were recorded in supine and upright positions with the clinician programmer during follow-up visits 1, 4, 10, and 16 weeks post-implant. Group impedance data (in Ohms) by visit and position from all active programs were averaged for each patient. A repeated measures analysis was applied to assess the variation in impedance with position over time (visit). Relative percent difference between upright and supine positions was also calculated: relative percent difference = 100% x (upright-supine)/upright.

Therapy impedance was defined as the impedance measured across all active electrodes at the therapy parameters. The accuracy of the therapy impedance measurement is the larger of ±10% or ±20 ohms in the range of impedance values observed in this study. All measured impedance data were included in the analysis.

Results: A total of 76 patients were implanted in the study (mean age 52.8 years, 59% female). Leads with compact electrode spacing were implanted in 80.3% of patients, and all but 4 patients were implanted with 2 leads. Approximately 90% of the lead tips were placed between T6-T9 for both leads, with T8 being the primary location.
The median impedance data for upright and supine positions at the 4 follow-up visits are presented in Figure 1. At 1 week post-implant, the median impedance was 346 ohms (upright) and 347 ohms (supine). At 16 weeks post-implant, the median impedance was increased to 441 ohms (upright) and 444 ohms (supine). Of note, median impedances were nearly the same within the limits of measurement accuracy for the upright and supine positions at each follow-up visit, although they increased over time. Repeated measures analysis found that the effect of position was not statistically significant (p = 0.610). The average relative percent difference in impedance between upright and supine positions was 3% (standard deviation 8.6%).

![Figure 1. Impedance by Visits and Positions]

Discussion: The study results confirmed that differences in impedance between the upright and supine positions during SCS therapy were insignificant and nearly within the accuracy specifications of impedance measurement. Of note, the impedance results were consistent in a large sample of real world pain patients using a wide range of lead electrode spacing and lead tip locations over 16-week post-implant follow-up. The study results also confirmed that impedance for both positions increased initially and stabilized over time.

Funding: The RestoreSensor study was funded by Medtronic, Inc. Minneapolis, MN.
EFFICACY OF SACROILIAC JOINT INJECTION IN PATIENTS WITH A HISTORY OF LUMBAR LAMINECTOMY VERSUS LUMBAR LAMINECTOMY AND FUSION: A RETROSPECTIVE STUDY

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Introduction: Sacroiliac joint (SIJ) dysfunction is known to be a significant source of low back and posterior pelvic pain. Initial conservative therapies including anti-inflammatory medications along with physical therapy are the standard of care. When patients fail to respond to conservative therapies, SIJ injections conducted under fluoroscopy may be warranted. It is well established that lumbar fusion creates changes in the biomechanics of the SIJ leading to SIJ dysfunction and pain that may be unresponsive to SIJ injection. This study compares the efficacy of SIJ injection for the treatment of SIJ pain in patients with a history of lumbar laminectomy versus patients with lumbar laminectomy and fusion.

Material and methods: A retrospective study consisting of the chart review of 344 patients diagnosed as having SIJ pain and treated with SIJ injection. Of the charts reviewed, 105 patients (29.6%) fulfilled the inclusion criteria where 69 patients had a previous history of lumbar laminectomy and 37 patients had a history of lumbar laminectomy with fusion. A survey of patients fulfilling the inclusion criteria was conducted yielding a total of 90 survey participants. The inclusion criteria were as follows:

1) Pain suspicious of being sacroiliac in origin based on physical exam.
2) Past surgical history of lumbar laminectomy with or without fusion.
3) Initial period of reduced lower back pain following surgery.
4) Failed conservative treatment of pain.

The primary outcome measure was pain relief following SIJ injection. A survey asked patients to rate their post-SIJ injection pain in the following manner.

1) No Pain relief.
2) Pain relief less than 1 month.
3) Pain relief 1 - 3 months.
4) Pain relief 4 - 6 months.
5) Pain relief 6 months or more.

Results: Of the 32 respondents with a history of laminectomy and fusion, 0% experienced pain relief greater than three months, whereas 53% of the patients with a history of laminectomy without fusion
experienced pain relief greater than four months, with 17% having pain relief greater than six months.

Discussion: The data strongly support our position that lumbar laminectomy with fusion creates SIJ dysfunction that is poorly responsive to SIJ injection for the treatment of pain, as compared to the treatment of pain in patients with a history of lumbar laminectomy without fusion.

References:


A128

DEMOGRAPHICS AND PUBLICATION PATTERNS OF APPLICANTS TO A PAIN FELLOWSHIP

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Introduction: Publication patterns have been documented among applicants for residency positions in several specialties, but less so in the fellowship application process. Additionally, several studies have documented the existence and frequency of publication misrepresentation among residency applicants, which may be a more important consideration in the competitive fellowship application process. The purpose of our study was to evaluate the demographics of pain fellowship applicants, including US vs. international applicants, residency training, and gender, as well as patterns of publication, including type and number of publication and accuracy of referenced publications.

Methods: All applications to a single pain medication fellowship over the course of 3 years were reviewed. Publications listed by applicants were scrutinized by a medical librarian for accuracy.

Results: Over the course of a 3 year period, 179 individuals applied to the Pain Fellowship at Mayo Clinic, Rochester MN. 55% and 39.5% of applicants were trained in Anesthesia and PMR, respectfully. The remaining 5.5% had backgrounds in Neurology, Psychiatry, Radiology, and Internal medicine. 65% graduated from US medical schools, and 82% were male. 252 journal articles and book chapters were listed as publications among the 179 applicants. This excluded abstracts or oral presentations. Of
the 179 applicants 60% listed at least 1 publication. 67% of the listed publications were confirmed to be completely accurate. 18% of the publications were unable to be verified (foreign journals or still in the submission process). 9% of the listed publications were confirmed, but contained minor inaccuracies. 5% of publications listed were deemed to be fraudulent.

Discussion: While the exact number of applicants annually is unknown our program continues to get approximately 60 applications for 4 slots per year making the acceptance process extremely competitive. As such, it is important to understand who is applying to these programs, and to what extent the majority of applicants are participating in research. Our data is unique in looking at demographics of applicants to pain fellowship, as well as their research experience. 60% of fellowship applicants to the Mayo Clinic Pain Medicine Fellowship listed a peer reviewed publication, which is greater than publications reported by residency applicants. Of those, most individuals referenced 1-2 articles. It has been well documented that applicants to various residency programs list fraudulent research articles, with various studies documenting rates of 0.6 to 11.3%. Less research has been done on applicants to fellowship programs, but it is reasonable to assume that fellowship applicants will have had more research opportunities. The rate of fraudulent articles in our study population was 5%. Fellowship directors and selection committees should be aware of the chance fraudulent publications, though the majority of publications were accurate.

References:


THE EFFICACY OF POSTOPERATIVE PAIN CONTROL AFTER TKA IN RAMATHIBODI HOSPITAL; A COMPARISON AMONG MULTIPLE TECHNIQUES

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Introduction: Pain control after a total knee arthroplasty (TKA) is challenging since most of patients are elderly with multiple comorbid diseases. Sixty percent of patients had severe postoperative pain which markedly disturbed recovery and rehabilitation. The objective of this study was to compare the efficacy of postoperative pain control after TKA among multiple techniques in Ramathibodi hospital.

Method: After ethical research committee approval, a retrospective observational study was conducted involving patients who underwent total knee arthroplasty with postoperative pain management by acute pain services in Ramathibodi hospital between January 2010 and December 2010; 12 months period. Demographic, anesthetic, operative data and additional analgesics usage were collected. Patients
received one of four postoperative pain control techniques including femoral nerve block (FNB), intravenous patient controlled analgesia (PCA), spinal morphine combined with intravenous tramadol (SMT), PCA combined with FNB (FPCA). The efficacy of postoperative pain control was quantified using numerical rating scale (NRS), the incidence of mild pain, side effects and patient's satisfaction in 24 and 48 hour after the operation. For NRS comparison, Kruskal-Wallis tests and Mann-Whitney U test were used. Chi-square test was used to compare the incidence of mild pain and side effects. P value < 0.05 was significant.

Results: 191 Patients (26M: 165F), aged 69 ±8 years, were enrolled in this study. There was no difference in demographic, anesthetic and operative data among groups. SMT group used additional tramadol more than other groups. FNB and FPCA groups had lower NRS in 24 and 48 hours postoperatively [FNB; 2 (0-7), 2 (0-5)] [FPCA; 3 (0-5), 2 (0-4)] than SMT [4 (0-10), 4.5 (0-5)] and PCA groups [4 (0-8), 3 (0-6)] (p< 0.05). Percentage of patients with mild postoperative pain (NRS < 4) was higher in FNB and FPCA than SMT and PCA group. SMT group had highest incidence of nausea, vomiting and itching in first 24 hours with lowest patient's satisfaction (p< 0.05).

Discussion: The femoral nerve block provided better postoperative pain control with fewer side effects when compared to systemic analgesic and spinal morphine. More than eighty percent of patients with FNB had mild postoperative pain for 48 hours which possibly promote function, rehabilitation and recovery.
detect if needle placement was perpendicular to skin.

<table>
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<th>Estimated effect</th>
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<th>p-value</th>
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<tr>
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</tr>
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</table>

[Univariate analysis (dependent variable: ED)]

Conclusion: We found no correlation between age and epidural space depth; however, there is significant positive correlation between BMI and epidural space depth.

As the BMI increases, the depth of epidural space also increases. Prediction of the distance from skin to epidural space will help to correctly place epidural catheters with fewer incidences of procedure related complications making epidural drug administration a safe practice.

A131

EARLY EVALUATION OF PATIENT CHARACTERISTICS, HOSPITAL LENGTH OF STAY AND COSTS AMONG USERS OF TAVENTADOL IMMEDIATE-RELEASE (IR) AND OXYCODONE IMMEDIATE-RELEASE (IR)

Jay Lin1, Wing Chow2, Myoung S. Kim2, Marcia F.T. Rupnow2, Lien Vo , PharmD2

1Novosys Health, Flemington. 2Janssen Scientific Affairs, LLC, Raritan, NJ, USA

Introduction: Pharmacologic treatment for moderate-severe pain includes opioids; however, treatment-emergent side effects may limit use. Tapentadol IR is a centrally-acting analgesic with two mechanisms of action, μ-opioid receptor agonism and norepinephrine reuptake inhibition, indicated for the relief of moderate-severe acute pain in adults. RCTs demonstrated at equianalgesic doses tapentadol IR is associated with a better tolerability profile than oxycodone IR while providing similar pain relief. Yet, literatures on the associated economic effect, including hospital length of stay (LOS) and costs are limited. This study aimed to evaluate LOS and costs between tapentadol IR and oxycodone IR treated patients.

Materials and method: A retrospective analysis of patients (≥18 years) taking tapentadol IR or oxycodone IR between 6/1/2009 to 7/31/2011 selected from the OptumInsight Clinformatics™ Data Mart, a nationally representative integrated medical and pharmacy claims database, was conducted. Patients were assigned to tapentadol IR or oxycodoone IR cohort based on their initial drug usage (index event) and were required to have continuous insurance coverage 60 days before (baseline
period) and after (follow-up period) index event. Tapentadol IR patients were matched to oxycodoone IR patients (1:1) using exact match of key patient characteristics and propensity score matching with patient demographics and clinical characteristics as covariates. T-test and chi-squared test were employed to evaluate baseline differences between the two treatment cohorts.

Results: At baseline, among the unmatched cohorts, tapentadol IR patients (N=17,539) were older (47.18 vs. 43.63 year, p< 0.0001) and more were female (62.08% vs. 52.27%, p< 0.0001) compared with oxycodoone IR patients (N=85,821). Tapentadol IR patients were more likely treated for major joint replacement/lower limb reattachment (22.25% vs. 15.27%, p< 0.0001) or spinal fusion (4.41% vs. 4.05%) during hospitalizations at baseline. Except for osteoarthritis (12.59% vs. 14.31%, p< 0.0001; tapentadol IR and oxycodoone IR, respectively), a greater proportion of tapentadol IR patients vs. oxycodone IR patients (p< 0.0001) had pain-related conditions, including back (38.27% vs. 29.35%), neck (17.91% vs. 14.11%), and fibromyalgia pain (8.81% vs. 5.04%). After matching, tapentadol IR patients (n=10,185) and oxycodoone IR patients (n=10,185) were similar in age (mean = 46.11), gender (female = 57.81%), Charlson Comorbidity Index (mean = 0.17), and healthcare resource utilization at baseline. During follow-up period, within the matched cohorts, tapentadol IR patients had a significantly shorter mean per patient LOS (0.21 vs. 0.35 days, p< 0.0001), lower mean number of hospitalizations (mean=0.07 vs. 0.10, p< 0.0001), and lower total healthcare costs ($13,450 vs. $15,466, p=0.0001) than oxycodoone IR patients. The higher tapentadol IR cost at index ($190 vs $150, p< 0.0001) was more than offset by the differences in total healthcare costs.

Discussion: The characteristics of patients who took tapentadol IR were different from oxycodone IR patients in many respects. After matching, patients taking tapentadol IR had a lower number of hospitalizations, shorter hospitalized LOS and lower total healthcare costs than patients who received oxycodoone IR. Additional studies are needed to further delineate the real-world economic benefits of using tapentadol IR versus a traditional µ-opioid receptor agonist.

Funding: Janssen Scientific Affairs, LLC.

A132
REAL-WORLD EVALUATION OF ADVERSE EVENT RELATED OUTCOMES IN HOSPITALIZED PATIENTS USING TAPENTADOL IMMEDIATE-RELEASE (IR) VS. OXYCODONE IMMEDIATE-RELEASE (IR)
Jay Lin¹, Wing Chow², Samir Mody², Marcia FT Rupnow², Lien Vo , PharmD²
¹Novosys Health, Flemington, ²Janssen Scientific Affairs, LLC, Raritan, NJ, USA

Introduction: Tapentadol-IR is a centrally-acting analgesic with two mechanisms of action, µ-opioid receptor agonism and norepinephrine reuptake inhibition, indicated for the relief of moderate-severe acute pain in adults. RCTs demonstrated at equianalgesic doses tapentadol-IR is associated with a better tolerability profile than oxycodone-IR while providing similar pain relief. Real-world use of tapentadol-IR may differ from oxycodone-IR and impact the comparative analysis of patient outcomes. This study aimed to evaluate the real-world frequency of adverse events (AEs) between tapentadol-IR and oxycodone-IR treated hospitalized patients with similar patient and admission characteristics.

Materials and method: A retrospective analysis of hospitalized patients (≥18 years) selected from the Premier Perspective™ database between 6/1/2009 and 9/30/2011 who received at least one prescription
for tapentadol-IR or oxycodone-IR was conducted. Premier Perspective™ database is the largest integrated inpatient drug utilization database with patient level details and comprised data collected from 600+ hospitals nationwide. Tapentadol-IR users were matched to oxycodone-IR users (1:3) using exact match of key patient characteristics and propensity score matching with patient demographics and clinical characteristics as covariates. T-test and chi-squared test were employed to evaluate the differences in patients' characteristics and AE rates between the two treatment cohorts.

Results: Among the unmatched cohorts, tapentadol-IR patients (N=2,977) were older (mean = 61.68 vs. 55.15), more often female, (69.77% vs. 59.37%) and a greater proportion of them had prior opioid treatment (94.5% vs. 89.5%) compared with oxycodone-IR patients (N=549,148). Among all prior opioids used, Schedule II opioids were most common and included mono- or combination oxycodone. After matching, tapentadol-IR patients (n=1,858) and oxycodone-IR patients (n=5,574) were similar in age (mean=62.20 vs. 61.77) and gender (female=70.72% vs. 70.72%). The majority of matched patients in either cohort were admitted for elective surgery (65.45% vs. 62.68%) for knee joint (29.44% vs. 29.44%) or hip joint (11.95% vs. 11.95%) replacement. A greater proportion of tapentadol-IR patients vs oxycodone-IR patients received anti-nausea medication (51.29% vs. 41.32%, p< 0.0001), and/or constipation medication (23.36% vs. 16.59%, p< 0.0001) prior to initiation of the corresponding pain medications. However, after initiation of pain medications, a smaller proportion of tapentadol-IR patients vs. oxycodone-IR patients were prescribed with medications for nausea (29.87% vs. 33.98%, p=0.0011) and/or constipation (27.50% vs. 34.93%, p< 0.0001). Other AEs, including vomiting, dizziness, headache, somnolence, and pruritus, identified by ICD-9 codes, were generally low (< 5.0%) and their frequencies were not different between the two treatment cohorts prior to or after pain medication initiation.

Discussion: The majority of tapentadol-IR patients underwent an elective knee or hip replacement surgery. Prior to the initiation of corresponding pain medications, a greater proportion of tapentadol-IR patients received gastrointestinal AEs treatments compared with oxycodone-IR patients, but a lower percentage of them required such treatments after initiation of their corresponding pain medications. This study suggests that hospitalized patients who use tapentadol-IR may benefit from its better tolerability profile than those who use a traditional µ-opioid receptor agonist.

Funding: Janssen Scientific Affairs, LLC.

A133

UTILIZATION OF MONTHLY CADAVER LABS TO IMPROVE QUALITY OF PAIN MANAGEMENT FELLOWS EDUCATION

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The goal of any pain management fellowship program is the safe, efficient and cost effective training of the trainees. By utilizing a series of monthly cadaver teaching labs, we offer our fellows the unique opportunity to train in both routine procedures and advanced interventional pain management techniques while maintaining the underlying goals of safety, efficiency and cost effectiveness. Simulation based education has become one of the cornerstones of modern medical education and cadaver based workshops are an extension of that training. At the University of Cincinnati Pain Management fellowship, the pain management fellows are provided with regularly scheduled and
highly structured cadaver teaching labs each month.

Fellows are afforded the opportunity every month, under the guidance of experienced faculty and with the assistance of different device manufacturer representatives, to practice a wide variety of interventional procedures and surgical implants including but not limited to vertebroplasty, kyphoplasty, spinal cord stimulation implantation, intrathecal drug delivery systems implantation, facet joint procedures, epidural injections, and sympathetic blocks. Many of those aforementioned procedures can have significant risks, costs and patient comfort issues associated with them. Cadaver labs offer the opportunity to perform those procedures first on nonliving patients so that fellows can practice their techniques prior to performance on live patients. Thereby improving both safety and efficiency while affording the fellows more opportunities to perform those techniques. Additionally without the constraints or concerns for time management and patient comfort, more in depth teaching of technique and theory can be undertaken while in the cadaver lab.

The use of cadaver lab workshops as a teaching method is well established on a national basis with cadaver labs frequently being offered at many major national meetings as an opportunity for advanced teaching or acquisition of new skills. By expanding the use of cadaver labs to include fellows on a regular basis we allow more opportunities for instruction especially in cases of procedures that are less frequently performed. The cadaver lab based instruction we feel is allowing us to maximize the training experience of our pain management fellows, and as part of process making them more cost efficient and safe while maximizing patient comfort. We are advocating that consideration be given at all pain management fellowship programs to implementing a structured cadaver lab experience for the training of all pain management fellows.

A134

AUTOMATED PAIN ASSESSMENT AND DOCUMENTATION IN THE EMERGENCY DEPARTMENT: A NOVEL APPROACH

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Introduction: Emerging technology offers opportunities for novel approaches to pain monitoring in the Emergency Department (ED). One promising technology is the handheld tablet computer, which allows ED patients to connect to a local area network (LAN) that allows them to communicate with physicians and nurses at the department's central nursing station. The intent of this Automated Pain Tracker (APT) pilot project was to assess the feasibility and initial perceptions - from patients and nurses - of the utility of tablet computers in facilitating pain assessment and care.

Methods: This prospective, nonrandomized, convenience-sample pilot trial was conducted at a 700-bed urban hospital's academic ED (annual census approximately 50,000). Using commercially available tablet computers, an application was created allowing patients to indicate pain levels and request medications from their ED bed. Pain score (standard 0-to-10 scale), trends, and medication requests were displayed on a monitor at the central nurses' station. Using a 5-point Likert-scale instrument previously developed for querying patients and nurses regarding pain assessment and care, patients and nurses were asked to rate aspects of their pain assessment and care. The main analysis was descriptive. Median and interquartile ranges (IQR) were the measure of central tendency. Proportions of patients
and nurses “agreeing” (Likert rating 4 or 5) or “strongly agreeing” (Likert rating 5) with positive statements about pain assessment frequency and overall care are reported, with 95% binomial exact confidence intervals (CIs).

Results: Our convenience sample enrolled 16 patients. APT patients had a median age of 40 with interquartile range 31-51; 56% were female and 50% were white. Median initial pain score was 7.5 (IQR 5-9). Regarding the statement that overall pain assessment was adequate, 15 of 16 patients (94%, 95% CI 70-100%) agreed (Likert 4 or 5) and 13/16 (81%, 95% 54-96%) strongly agreed (Likert 5). Regarding the statement that pain assessment frequency was appropriate, 16/16 patients (100%, one-sided 97.5% CI 79-100%) indicated agreement (Likert 4 or 5) and 13/16 (81%, 95% 54-96%) indicated strong agreement (Likert 5). All 16 patients agreed (Likert 4 or 5) that APT was easy to use; 15/16 (94%, 95% CI 70-100%) patients strongly agreed (Likert 5). With regard to the statement “I would like to see APT used more in the ED”, 1 patient was neutral (Likert 3), 1 patient agreed (Likert 4), and 14 patients agreed strongly (Likert 5). Nurses caring for patients indicated agreement (15/16) or strong agreement (14/16) with the statement “I was satisfied with my patient's pain care.” 15/16 nurses expressed preference for more widespread use of the APT. No APT units were stolen, broken, or experienced significant technical difficulties during the pilot.

Conclusions: This pilot study, still ongoing, demonstrates the feasibility and utility of using tablet computers and LAN communications to facilitate pain assessment in the ED. Both patients and caregivers expressed consistently positive views regarding both the ease of use and impact on care of the device.

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A135
RELIABILITY OF PREDICTING THORACIC EPIDURAL CATHETER TIP SITE IN THE PEDIATRIC POPULATION
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Introduction: Appropriate epidural catheter tip placement is necessary to achieve effective postoperative analgesia. This study examines the relationship between entry site predicted by a trained anesthesiologist and the location of the epidural tip in the pediatric population to identify reliability of catheter placement.

Materials and methods: Retrospectively we examined the records of patients who received Arrow Flextip Plus brand epidural catheters between 2010-2011 at Children's Hospital of Wisconsin (n=174). After identifying thoracic placed catheters, cases were excluded if no x rays identified the epidural tip within the first postoperative or had caudal/lumbar insertion skin insertion (n=77). The difference between documented epidural insertion site and epidural tip on x ray was calculated (distoff). A multivariable linear regression was performed with the independent variables of weight, distance of catheter in epidural space, and insertion site against the dependent variable of distoff.

Results: The analysis demonstrated no linear correlation between distoff and distance of catheter in epidural space (p=0.48) or entry site of thoracic epidural (p=0.82). However, weight of patient
negatively correlated with distoff \((r=0.55, p<0.001)\). Separating the patients into two groups (<20kg group and >20kg group), the catheter tip averaged 2.37 thoracic levels cephalad to the entry site in the less than 20kg group compared with 0.05 thoracic levels cephalad in the >20kg group \((p<0.001)\).

Discussion: When placing thoracic epidurals in pediatric patients < 20kg it may be reasonable to enter the skin two levels below the goal epidural tip level, whereas in patients greater than 20 kg one should insert the needle at the goal level. This practice should work despite entry skin level (high, mid or low thoracic) and distance catheter left in epidural space if within a reasonable range (3-6 cm).

A136
INTRAVENOUS THERAPIES FOR COMPLEX REGIONAL PAIN SYNDROME - A SYSTEMATIC REVIEW
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Introduction: Complex regional pain syndrome (CRPS) remains one of the most challenging clinical pain syndromes with unclear pathophysiology and unpredictable clinical course in spite of decades of basic and clinical research. Interventional pain management techniques (intravenous regional block, sympathetic block, neurostimulation etc) are frequently initiated after the conservative approaches fail to improve pain and limb function. In this review, we focus on the evidence from intravenous (IV) therapies such as IV regional block (IVRB) with anti-inflammatory medications, IVRB with sympatholytics, IV NMDA receptor antagonist, IV bisphosphonates, IV Free radical scavengers, IV immunoglobulin (IVIG), and other IV therapies for CRPS.

Material and methods: PubMed was searched for original articles that investigated CRPS and the use of any IV therapies mentioned above.

Results: The search yielded more than 80 relevant articles. Information on study design, sample size, type and route of medication, duration of therapy, primary outcome measures, and results was examined.

Discussion: Many IV medications have been used as an adjuvant in treating CRPS along with traditional therapies. Most of abovementioned IV therapies were followed by a standard physical therapy protocol. Case series reported effectiveness of several IV medications but most of these studies lack control or placebo for comparison. Based on the evidence discussed in this review, we recommend the following strategies. Recommendations are based on guidelines described by Guyatt et al\(^1\) and adapted by van Kleef et al (Table 1).\(^2\) IVRB with lidocaine with or without NSAIDs is a reasonable option (2B+). Effects of IV methylprednisolone are inconsistent (2B-). IV 10% mannitol is no more effective than placebo in CRPS I treatment (2A-) and results from case studies are inconsistent (2B-). No evidence of better effect of IVRB with guanethidine, droperidol, ketanserin, or atropine than placebo by RCTs (2A-). IVRB with clonidine, phenoxybenzamine, labetalol and IV anti-TNF antibodies were reported effective only in case studies (2C+). IV ketamine infusion may be tried in some refractory patients (2B+). IV bisphosphonates have the potential to reduce pain associated with bone loss in patients with CRPS I (1B+). IVIG might have emerged as a novel treatment modality for refractory pain cases of CRPS (1B+/2B+). IV magnesium can be tried although there is only one RCT reporting the effectiveness (1B+). There is a great need for RCTs of good methodologic quality in
terms of IV therapies for CPRS.

<table>
<thead>
<tr>
<th>Positive recommendation</th>
<th>Considered, preferably study-related</th>
<th>Only study-related</th>
<th>Negative recommendation</th>
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<tr>
<td>One or more RCTs of good methodologic quality demonstrate effectiveness. The benefits clearly outweigh risk and burdens (1 A+)</td>
<td>One or more RCTs with methodologic weaknesses, or large observational studies that do not indicate any superiority to the control treatment. Given that there is no positive clinical effect, risk and burdens outweigh the benefit (2 B-)</td>
<td>Effectiveness only demonstrated in observational studies. Given that there is no conclusive evidence of the effect, benefits closely balanced with risk and burdens (2 C+)</td>
<td>Observational studies indicate no or too short-lived effectiveness. Given that there is no positive clinical effect, risk and burdens outweigh the benefit (2 C-)</td>
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<td>One or more RCTs with methodologic weaknesses, demonstrate effectiveness. The benefits clearly outweigh risk and burdens (1 B+)</td>
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<td>RCT of a good quality which does not exhibit any clinical effect. Given that there is no positive clinical effect, risk and burdens outweigh the benefit (2 A-)</td>
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<td>Benefits closely balanced with risk and burdens (2 B+)</td>
<td>Benefits closely balanced with risk and burdens (2 A-)</td>
<td>Benefits closely balanced with risk and burdens (2 B+)</td>
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<td>Considered, preferably study-related</td>
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<td>Negative recommendation</td>
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<td>Different RCTs or observational studies yield contradictory results better or no better than the control treatment. Benefits closely balanced with risk and burdens, or uncertainty in the estimates of benefits, risk and burdens (2 B-)</td>
<td>Effectiveness only demonstrated in observational studies. Given that there is no conclusive evidence of the effect, benefits closely balanced with risk and burdens (2 C+)</td>
<td>Observational studies indicate no or too short-lived effectiveness. Given that there is no positive clinical effect, risk and burdens outweigh the benefit (2 C-)</td>
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<td>There is no literature or there are case reports available, but these are insufficient to suggest effectiveness and/or safety. These treatments should only be applied in relation to studies</td>
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[Table 1]

References:


Introduction: Clinically, capsaicin is used topically to relieve neuropathic pain through activation of transient receptor potential cation channel subfamily V member 1 (TRPV1) receptors. However, low oral bioavailability limits systemic use of capsaicin. Spinal administration of capsaicin would be attractive to treat chronic neuropathic pain involving molecular, cellular, and anatomical maladaptation in the spinal cord. Delayed up-regulation of spinal TRPV1 follows peripheral nerve injury (Kanai, 2005). Spinal TRPV1 is central to physiological thermal nociception and implicated in development of hyperalgesia. The current study was designed to examine if delayed intrathecal administration of capsaicin following initial peripheral nerve injury could alleviate thermal hyperalgesia and mechanical allodynia in an animal model of mononeuropathy induced by chronic constriction injury (CCI) of the sciatic nerve.

Material and methods: Under isoflurane anesthesia, male Sprague Dawley rats underwent unilateral CCI of the sciatic nerve. Ten days after CCI, eight rats were treated with intrathecal capsaicin (150 µg/100 µl bolus injection followed by 150 µg/100 µl 3-day slow infusion through an osmotic pump) and six rats were treated with vehicle. Pain behaviors were assessed with Plantar Test and von Frey Test at the following paradigm, one baseline measurement before CCI, three measurements at different days following CCI, and then three measurements following either intrathecal capsaicin or vehicle. The data was presented either as Mean ± SEM or Median (95% CL).

Results:

Table 1: Hindpaw withdrawal latency to heat (s) in Plantar Test

<table>
<thead>
<tr>
<th></th>
<th>Prior to CCI (inj. vs. non-inj.)</th>
<th>Post CCI</th>
<th>Post treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cap. (n=8)</td>
<td>14.45 ± 1.24 vs. 14.06 ± 1.26</td>
<td>8.38 ± 0.76 vs. 12.74 ± 0.84*</td>
<td>13.83 ± 1.25 vs. 14.33 ± 1.15</td>
</tr>
<tr>
<td>Veh. (n=6)</td>
<td>13.74 ± 1.09 vs. 14.16 ± 1.23</td>
<td>10.07 ± 0.54 vs. 13.83 ± 0.57*</td>
<td>11.38 ± 0.58 vs. 15.47 ± 0.62*</td>
</tr>
</tbody>
</table>

[Table 1]

The data is presented as the injured vs. the non-injured side for both capsaicin (Cap) and vehicle control (Veh). “*” represents ρ ≤ 0.05 (ANCOVA).
Table 2: Hindpaw withdrawal threshold (g) to mechanical stimulation (von Frey Test) in the injured side.

<table>
<thead>
<tr>
<th></th>
<th>Prior to CCI</th>
<th>Post CCI</th>
<th>Post treatment</th>
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<tbody>
<tr>
<td>Cap. vs. Veh.</td>
<td>15 (13 - 16) vs. 15 (10 - 17)</td>
<td>4 (2 - 10) vs. 6 (1 - 13)</td>
<td>8 (4 - 13) vs. 4 (2 - 6)*</td>
</tr>
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</table>

[Table 2]

The data is presented as the capsaicin vs. vehicle. “*” represents $p \leq 0.05$ (Mann Whitney U test).

Discussion: Our study indicates that delayed intrathecal administration of capsaicin following peripheral nerve injury eliminates thermal hyperalgesia and significantly reduces mechanical allodynia. This contradicts with the previous report (Yamamoto, 1992) that intrathecal capsaicin fails to alleviate thermal hyperalgesia when given at early stage following the injury. The discrepancy might be attributable to the differences in dosing regimen and timing of capsaicin administration between the two studies. In this study, capsaicin was administered at the time frame when delayed up-regulation of spinal TRPV1 occurs (Kanai, 2005). Capsaicin's efficacy might be positively related to the level of TRPV1 at the time of administration.

References:


Funding: University of Texas Health Science Center at San Antonio.
strong opioids and co-analgesics (eg, anticonvulsants)\textsuperscript{1} often provides better analgesic efficacy than monotherapy but may be associated with increasing side effects and related discontinuations.\textsuperscript{2} A recent study showed that tapentadol PR was effective and well-tolerated for managing severe, chronic low back pain with or without a neuropathic component.\textsuperscript{3} This randomized, double-blind phase 3b study (NCT01352741; approved by Ethics Committee) evaluated the effects of tapentadol PR monotherapy versus combination therapy with tapentadol PR and pregabalin on the neuropathic component of severe, chronic low back pain as a secondary endpoint.

Methods: Eligible patients had painDETECT scores of “unclear” or “positive” and average baseline pain intensity ≥6 (11-point NRS-3 [average 3-day pain intensity]). Patients were titrated to tapentadol PR 300 mg/day over 3 weeks. At randomization, patients with ≥1-point decrease in NRS-3 from baseline and NRS-3 ≥4 were randomized to target doses of tapentadol PR monotherapy (500mg/day) or tapentadol PR/pregabalin combination therapy (300/300mg/day) during an 8-week comparative period. The neuropathic component of low back pain was evaluated using painDETECT scores and the Neuropathic Pain Symptom Inventory (NPSI). Treatment-emergent adverse events (TEAEs) were documented.

Results: Observed-case analyses of painDETECT scores in the monotherapy and combination groups, respectively, included 150 and 157 patients at baseline and randomization and 111 and 123 patients at final evaluation; mean (SD) scores were 22.2 (5.69) and 23.4 (5.94) at baseline, 17.6 (6.11) and 18.3 (5.98) at randomization, and 12.0 (7.55) and 12.8 (7.18) at final evaluation of the comparative period; mean (SD) changes from randomization to final evaluation were −6.4 (8.69) and −6.3 (7.55; both \(P<0.0001\)). NPSI overall feeling scores (Figure) and subscores (observed-case) improved significantly from randomization to final evaluation in both treatment groups (all \(P<0.0001\)). In the monotherapy and combination groups, respectively, the percentage of patients reporting “no pain attacks during the last 24 hours” on the NPSI was 4.6% and 2.5% at baseline, 7.9% and 4.5% at randomization, and 25.7% and 18.5% at final evaluation. During the comparative period, the most common TEAEs (≥5%) for tapentadol PR monotherapy (n=154) and tapentadol PR/pregabalin combination (n=159), respectively, were dizziness (11.0% vs 17.6%), somnolence (8.4% vs 11.9%), hyperhidrosis (11.7% vs 6.3%), nausea (10.4% vs 9.4%), fatigue (8.4% vs 10.1%), constipation (7.1% vs 5.0%), headache (6.5% vs 8.2%), vomiting (5.8% vs 3.1%), and dry mouth (3.9% vs 5.0%).

Discussion: Comparable significant, clinically relevant improvements in neuropathic pain measures were observed with tapentadol PR (500mg/day) monotherapy and tapentadol PR/pregabalin (300/300mg/day) combination therapy, with fewer CNS-related TEAEs in the monotherapy arm. The favorable effectiveness and tolerability profile suggests that monotherapy with tapentadol PR, with its 2 mechanisms of action, is a viable treatment option for managing severe low back pain with a neuropathic component.

References:

\textsuperscript{1}Varrassi et al. CHANGE PAIN Physician Survey, EFIC 2009.


Funding: Grünenthal GmbH.
Figure. NPSI overall scores (observed-case).