Original Paper

Preperitoneal Approach for Femoral Hernia Repair

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ABSTRACT

Background/Aims: Although Lichtenstein's procedure is the standard procedure in surgical hernia treatment, and the role of laparoscopic hernia repair is constantly increasing, preperitoneal approach for femoral hernia repair should be equally considered.
Methodology: After the horizontal incision of transversal fascia, preperitoneal space is visualized. The hernial sac is opened and its content is placed in the abdominal cavity, or if there is a need, resection is performed. Once the peritoneum is sutured, the iliopubic tract and Cooper's ligament are bridged with two or three sutures in the medial portion of the femoral ring.
Results: From 1998 to 2008, 94 patients were treated for femoral hernia using the preperitoneal approach. Out of 94 participants, 86 were female. Intestinal obstruction was present in 48 cases. Resection of the small intestine or omentum was performed in 40 patients. There was no perioperative mortality. We observed early postoperative complications in 4 patients. Following the procedure, there was no recurrence of the femoral hernia.
Conclusions: We found that preperitoneal repair is the method of choice in surgical treatment of femoral hernia. The surgical technique is simple and feasible, while fully acknowledging the functional anatomy of the inguinofemoral region and the etiology of the condition.

INTRODUCTION

The femoral hernia was described in 19th century by Guy de Chauliac (1). The first preperitoneal repair was performed in 1920 by an English surgeon, Cheatle. The method was again promoted in 1936 by Henry *et al.* (2). After redefining the anatomy of the inguinofemoral region in the early 1950's, the possibility of surgically repairing different types of inguinofemoral hernias was established by Condon, Harkins and Nyhus (2-6). The factors associated with the development of inguinofemoral hernia are anatomic features, altered collagen structure and metabolism, occupational and situational features (6).

The bones of the pelvis appear to have an important role in the development of inguinofemoral hernia in adults (2,6). This theory is supported by a high risk for femoral hernia in females because of a flat female pelvis, which leads to a widening of the orifice of femoral canal in its horizontal dimension (2,6). The primary disorders of connective-tissue biology and decreased synthesis or increased degradation of collagen attached to aging also has an impact on femoral hernia development (6-9). The occupational and situational factors are not significant (6,10). The risk for femoral hernia increases following pregnancy and in patients on permanent peritoneal dialysis for chronic renal failure. In both cases, systemic metabolic changes are more relevant than the increase of intra-abdominal pressure (6,10).

The knowledge of functional surgical anatomy is crucial for understanding the femoral hernia development. All types of inguinofemoral hernias occur because of anatomical and structural disorders of the transversal fascia. Transversal fascia is an important part of the transversal musculoaponeurotic intra-abdominal layer (2,6). The iliopubic tract makes the inferior margin of direct and indirect inguinal hernias, while Cooper's ligament makes the posterior margin of femoral hernia together with pectineal fascia (2,6). Clearly, the inguinal ligament is not important in femoral hernia repair. The iliopubic tract constitutes the most important structure in femoral hernia repair. The variations in insertion of this tract are considered an important factor in femoral hernia development (2,6). The common insertion of the iliopubic tract is the pectineal line (2,6). If the insertion is shifted medially, or the overall density of connective tissue in the iliopubic tract is reduced, the resulting broad aperture of the femoral canal can increase the risk of femoral hernia (2,6). This anatomical variation allows the protrusion of the preperitoneal fat tissue into the femoral canal, and subsequently the propulsion of the peritoneal sac into this space (2,6). The available procedures for femoral hernia repair are tension-free procedures (10), (Lichtenstein's procedure or laparoscopic hernia repair), the Shouldice technique (11) and preperitoneal approach (3).

METHODOLOGY

Patients

We used a preperitoneal approach for femoral hernia repair in 94 patients from 1998 to 2008. These data were analyzed preoperatively: age, gender, side of hernia, presence of intestine obstruction and kind of procedure (urgent or elective). The hernial sac content and resection were noted intraoperatively. After the surgery, we monitored early postoperative complications, duration of hospital stay and hernia recurrence. We used low molecular weight heparin for thromboprophylaxis (FragminTM, Pharmacia AB, Stockholm, Sweden). Antibiotics were prescribed only in case of resection of the intestine or omentum. Follow-up examination took place two weeks after the procedure. In December 2008, participants of the study were asked to fill out a questionnaire. Characteristics of the patients and outcomes were statistically analyzed using SPSS 11.0 for Windows computer software (SPSS Inc., Chicago, IL, USA).

Surgical technique

The skin, together with the aponeurosis of external oblique abdominal muscle, was incised horizontally 1-1.5cm above the external inguinal ring, 5-6cm in length. The fibers of the internal oblique and transversal abdominal muscles were dissected with a blunt instrument. The ilioinguinal nerve was intact. After the incision of transversal fascia, the preperitoneal space was exposed (**Figure 1**). It is easy to identify the femoral ring with hernial sac (**Figures 2** and **3**), spermatic cord structures, the deep inguinal ring and the deep inferior neurovascular epigastric band. Because the orifice of the femoral ring is usually smaller than the bulging sac, the incision and mobilization of iliopubic tract insertion on the medial side of femoral canal required reducing of the hernial sac content. If there was any uncertainty regarding the status of the hernial sac content, especially after strangulation, it could be resolved by incision of the peritoneum to inspect the condition of the strangulated tissue. If the hernial sac content was unviable, the intestinal resection and primary "end to end" anastomosis could be performed along with omentum resection. The peritoneum was closed with absorbable sutures. After that, the iliopubic tract was sutured into the superior pubic ramus. The femoral ring diameter was reduced by connecting the iliopubic tract and Cooper's ligament with one or two slow absorbable sutures (**Figure 4**). The sutures must be carefully placed to ensure the adequate closure of the femoral ring without impinging the femoral vein in any way (**Figure 5**). It is unnecessary to completely obliterate the orifice of femoral canal in order to prevent hernia recurrence (**Figure 6**). Transversal fascia and the aponeurosis of external oblique abdominal muscle were sutured with absorbable threads and the fibers of the transversal and internal oblique abdominal muscles were bridged with two or three absorbable sutures.

FIGURE 1 Entering preperitoneal space

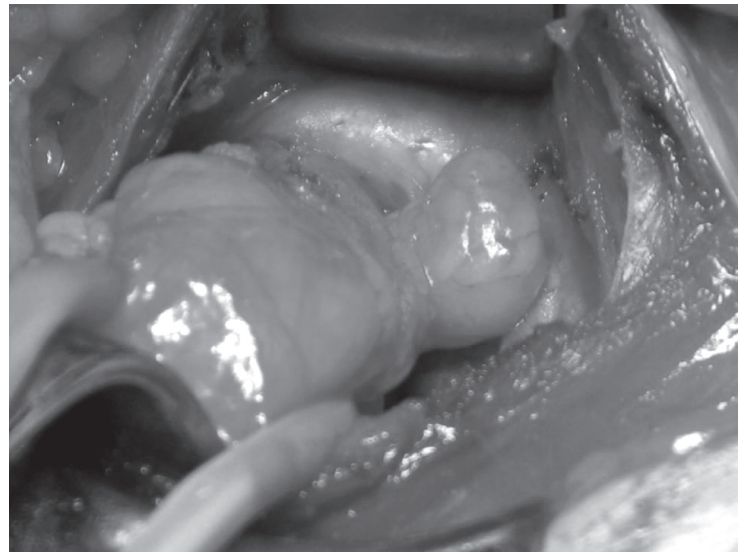

FIGURE 2 Femoral hernia sac

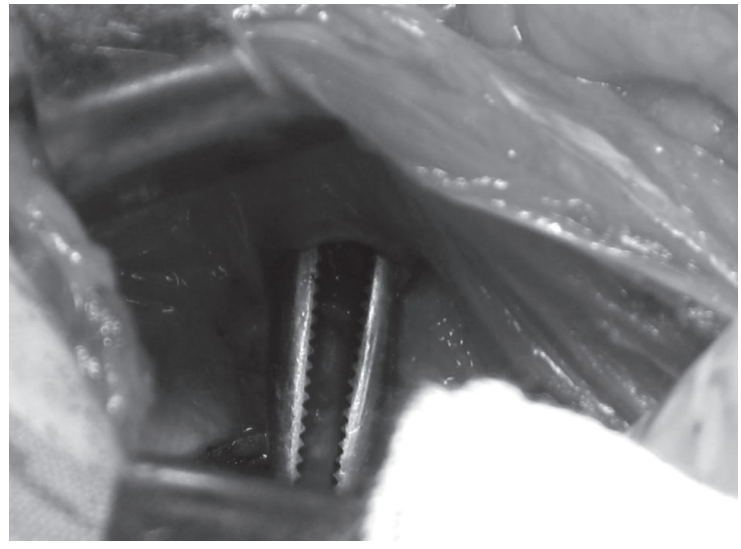

FIGURE 3 Femoral canal

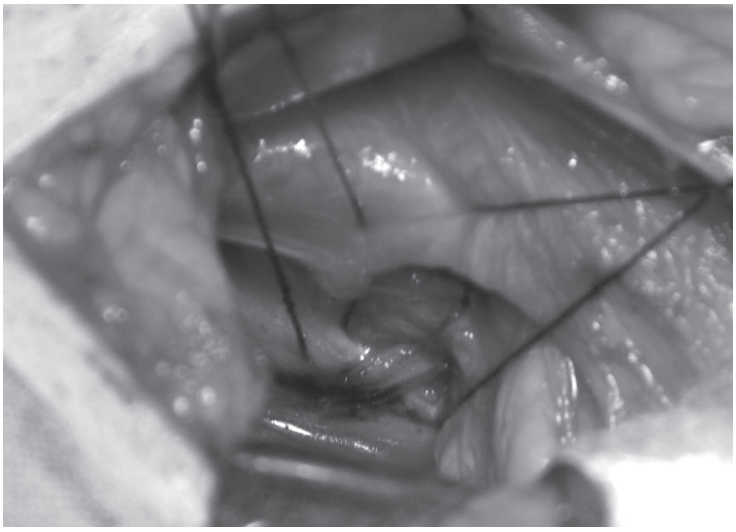

FIGURE 4 Placing sutures on the internal femoral ring

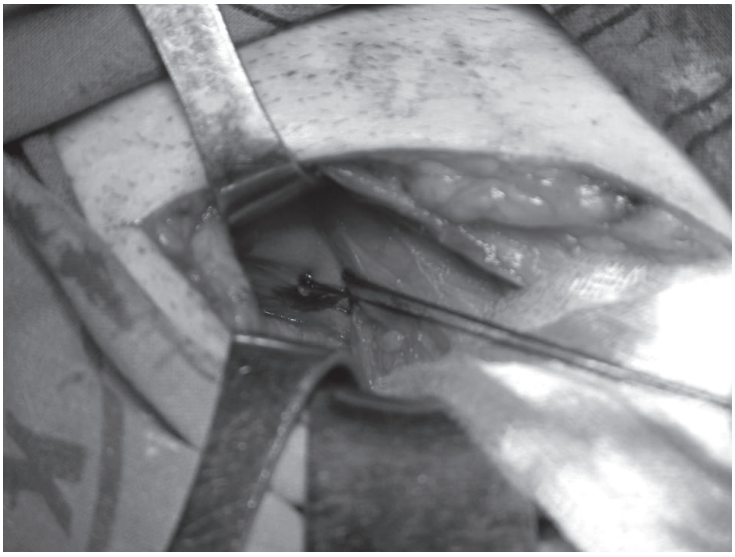

FIGURE 5 Closure of the femoral canal

RESULTS

Between 1998 and 2008 we operated on 94 patients with femoral hernia, using the preperitoneal repair. There were 86 (91.49%) female and 8 (8.51%) male participants. The average age was 59.8 years (16-81 years). There were 70 (74.47%) patients with left-sided and 24 (25.53%) with right-sided hernia. The elective procedure was performed on 30 (31.91%) patients and the urgent procedure on 64 (68.09%) patients. The intestinal obstruction was verified by clinical examination and confirmed by abdominal plain X- rays in 48 (51.06%) patients. The ileum was inside the hernial sac in 52 (55.32%) patients, a part of omentum in 24 (25.53%) patients, a part of sigmoid colon in 6 (6.38%) patients and ovary in 2 (2.13%) patients, while in 10 (10.64%) patients there was no content inside the hernial sac. Richter's type of hernia was found in 14 (15.63%) patients with incarcerated hernia. The resection and "end to end" anastomosis of the small intestine due to strangulation and ischemic necrosis was performed in 26 (27.66%) patients and partial resection of omentum in 14 (15.63%) patients. The average duration of the procedure was 41.5min (25-120min.). The second generation of cephalosporines was used in 28 (70%), the combination of gentamycin and metronidasole in 8 (20%) and gentamycin alone in 4 (10%) patients with small intestine or omentum resection. Thromboprophylaxis by low molecular weight heparin was given to all patients. During the early postoperative period there were no major complications. The erosive gastritis was endoscopically verified in one patient, and one patient was diagnosed with bronchopneumonia. Both patients were treated conservatively, followed by a full recovery. The average duration of hospital stay was 4.9 days (2-12 days). The follow up examination was done two weeks after the procedure. No complications were observed, and all patients were in good general condition. In December 2008, the patients were asked to fill out a questionnaire. In total, 80 (85.10%) patients completed the questionnaire and underwent follow-up examination. Other patients were excluded from the study. In the group of 80 patients, there was no recurrent hernia.

DISCUSSION

The femoral hernia is not as frequent as inguinal hernia, but it remains an important surgical problem. Patients with femoral hernia can have no significant difficulties for a long period. These patients usually seek surgical attention after incarceration, accompanied by clinical symptoms of intestinal obstruction. This is followed by a certain morbidity and mortality rate. Up to 40% of hernia repairs, mainly inguinal and femoral, are performed due to incarceration or bowel obstruction in patients over 65 years of age (12,13). Our results show that the femoral hernia occurs more often in females (over 90%), the majority of procedures were emergency procedures (more than 60%), and that the average age was 60 years. Female patients with femoral hernia have a significant risk of complications. Furthermore, emergency surgery in the elderly patients is also accompanied by a high risk of complications, especially in patients with coexisting conditions. This increases the morbidity and mortality rate, especially after necrotic bowel resections (14,15). This is why femoral hernia should be considered a high risk condition. Duration of symptoms, duration of hospital stay, accompanying conditions and ASA class are important prognostic factors (15,16). This also presents a reason why an elective femoral hernia repair has to be performed whenever it is possible (15). When this is not a possibility due to an acute incarceration, the ideal surgical treatment has to fulfill the following criteria: reduction of the hernial sac and its contents, good exposure and easy access for possible resection and safe hernia repair through the same access (17). Based on our results, we conclude that the preperitoneal repair can be recommended as a method of first choice for femoral

hernia repair (17-19), in both emergency and elective procedures.

The method is based on recent findings regarding etiology of femoral hernia and the anatomy of the inguinofemoral region. Incision of the skin in a natural fold prevents the flexion crease of the groin. The preperitoneal approach allows proximal control of the incarcerated or strangulated viscera, avoiding excessive manipulation with gangrenous or necrotic intestine. It also prevents potential leakage of infectious content into the peritoneal cavity and penetration of bacteria, toxins, potassium and anaerobic metabolism products into the blood stream during hernia repair (20). It provides excellent exposure for hernia reduction and resection through a single incision (18), and the possibility of intraoperative injury of the ilioinguinal nerve is prevented. The preperitoneal approach is acceptable in treatment of direct and indirect inguinal hernia and preperitoneal lipoma. However, Lichtenstein's procedure and laparoscopic hernia repair approach are more feasible in both cases. Preperitoneal approach using mesh in recurrent hernia is safe, with minimal patient morbidity and a low recurrence rate, which is why this technique is a method of choice in all cases of recurrent hernia (21). We did not observe any hernia recurrence during the study period.

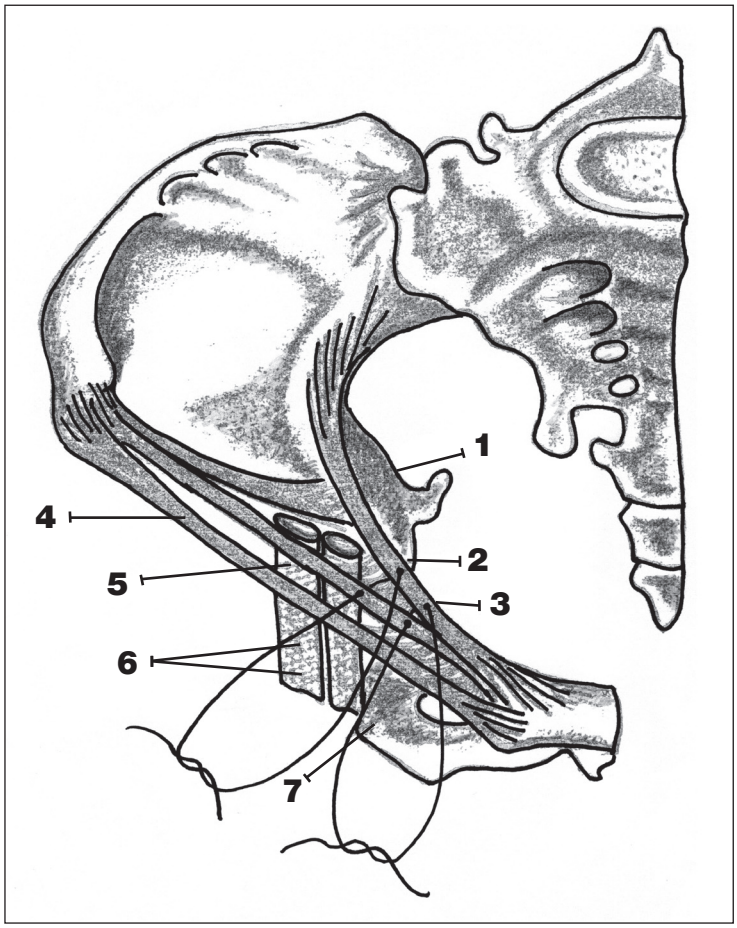

FIGURE 6 Anatomy of the femoral canal after placing sutures.
LEGEND: 1. Arcus ileopectineus, **2.** Cooper's ligament, **3.** Femoral canal, **4.** Inguinal ligament, **5.** Thompson's ligament, **6.** Femoral artery and vein, **7.** Retinaculum flexorum

CONCLUSIONS

The preperitoneal approach is more suitable for femoral hernia treatment compared to other procedures, such as Lotheisen and McVay's procedure, or laparoscopic hernia repair. Laparoscopic repair gives new and exciting results for inguinal and femoral hernia treatment. The results of laparoscopic hernia repair are very good, especially in treatment of recurrent and bilateral hernia. However, this method requires a long learning curve, and high cost of laparoscopic equipment. It is also important to identify the role of laparoscopy for incarcerated hernia with the intestine or necrosis of the omentum. These procedures are not in routine use and are not suitable for inexperienced surgeons, since they require experience and knowledge of principles and techniques in laparoscopic surgery. To perform the preperitoneal femoral hernia repair, the surgeon must possess a profound knowledge of the anatomy of the preperitoneal space and inguinofemoral region. We believe that the preperitoneal approach can be accepted as a method of choice for femoral hernia treatment, particularly for strangulated femoral hernia. It enables a safe approach to the femoral ring, inspection of the incarcerated tissue, easy approach to the abdominal cavity with the opportunity to investigate the condition of the incarcerated intestine, omentum or other organs. It also leaves the possibility of a resection and performing of femoral ring plastics. The procedure has a low incidence of postoperative complications, low postoperative morbidity and mortality, and a low recurrence rate.

REFERENCES

1. **Andrews E:** A hiytory of the development of the technique of herniotomy. Ann Med Hist 1935; 7:451-466.
2. **Nychus LM:** Iliopubic tract repair of inguinal and femoral hernia: The posterior (preperitoneal) approach. In: Nychus LM, Baker JR. Mastery of surgery, 1st ed. Bosaton: Luttle, Brown and Company 1984: 1283-1295.
3. **Nyhus LM, Condon RE, Harkins HN:** Clinical experience with the preperitoneal hernia repair for all types of groin hernias. Amer J Surg 1960; 100:234-237.
4. **Nyhus LM:** Anatomic reappraisal of the posterior inguinal wall. Surg Clin N Amer 1964; 44:1305-1309.
5. **Condon RE:** Surgical anatomy of the transversus abdominis and transversal fascia. Ann Surg 1971; 173:1-5.
6. **Condon RE, Carilli S:** The biology and anatomy of inguinofemoral hernia. Seminars in laparoscopic surgery 1994; 1:75-85.
7. **Tseng CC, Lin AD:** Triple-combined herniorrhaphy for inguinal hernia repair: experience of 1411 cases. Hepatogastroenterol 2007; 54:1433-1437.
8. **Catani M, De Milito R, Pietroletti R, Chiaretti M, Spaziani E, Leardi S, Simi M:** Is there a place for intraperitoneal onlay mesh repair (IPOM) of inguinal hernia among laparoscopic techniques? Hepato-gastroenterol 2004; 51:1387-1392.
9. **Casanova AB, Trindade EN, Trindade MR:** Collagen in the transversalis fascia of patients with indirect

inguinal hernia: a case-control study. Am J Surg 2009; 198:1-5.
10. **Perko Z, Rakić M, Pogorelić Z, Družijanić N, Kraljević J:** Laparoscopic transabdominal preperitoneal approach for inguinal hernia repair: a five-year experience at a single center. Surg Today 2011; 41:216-221.
11. **Rodríguez-Cuéllar E, Villeta R, Ruiz P, Alcalde J, Landa JI, Luis Porrero J, Gómez M, Jaurrieta E:** National project for the management of clinical processes. Surgical treatment of inguinal hernia. Cir Esp 2005; 77:194-202.
12. **Kulah B, Duzgun AP, Moran M, Kulacoglu IH, Ozmen MM, Coskun F:** Emergency hernia repairs in elderly patients. Am J Surg 2001; 182:455-459.
13. **Buononato M, Pittiruti M, Maria G, Nigro C, Sganga G, Civello IM:** Tension-free inguinal hernia repair in "one-day surgery". Experience of 1091 cases. Hepato-gastroenterol 2002; 49:715-718.
14. **Kulah B, Duzgun AP, Moran M, Kulacoglu IH, Ozmen MM, Coskun F:** Emergency hernia repairs in elderly patients Am J Surg 2001; 182:455-459.
15. **Alvarez JA, Baldonedo RF, Bear IG, Solís JA, Alvarez P, Jorge JI:** Incarcerated groin hernias in adults: presentation and outcome. Hernia 2004; 8:121-126.
16. **Sowula A, Groele H:** Treatment of incarcerated abdominal hernia. Wiad Lek 2003; 56:40-44.
17. **Mauch J, Helbling C, Schlumpf R:** Incarcerated and strangulated hernias - surgical approach and management. Swiss Surg 2000; 6:28-31.
18. **Malangoni MA, Condon RE:** Preperitoneal repair of acute incarcerated and strangulated hernias of the groin. Surg Gynecol Obstet 1986; 162:65-67.
19. **George SM Jr, Mangiante EC, Voeller GR, Britt LG:** Preperitoneal herniorrhaphy for the acutely incarcerated groin hernia. Am Surg 1991; 57:139-141.
20. **Sršen D, Družijanić N, Pogorelić Z, Perko Z, Juričić J, Kraljević D, Krnić D, Bilan K, Mimica Ž:** Quality of Life Analysis after open and laparoscopic inguinal hernia repair – retrospective study. Hepato-gastroenterol 2008; 55:2112-2115.
21. **Nyhus LM, Pollak R, Bombeck CT, Donahue PE:** The preperitoneal approach and prosthetic buttress repair for recurrent hernia. The evolution of a technique. Ann Surg 1988; 208:733-737.