Small Bowel Injuries in Penetrating Abdominal Trauma during War: Ten-Year Follow-Up Findings

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Background: Injuries of the small intestine are common in penetrating abdominal trauma. This article presents 10-year follow-up results for 23 patients with penetrating small bowel injuries who were treated in Nova Gradiška City Hospital during the 1991–1992 war in Croatia. The early hospital mortality rate was 13% (three deaths), and good results were found for 16 (84%) of 19 patients after 10 years. Methods: The hospital charts of 23 patients who sustained small bowel injuries during an 8-month period were reviewed. Of 20 patients who survived, 19 came for an examination and interview 10 years after injury. The following criteria were used: existence of an abdominal wall defect or hernia, bowel passage problems, and reoperations attributable to the small bowel injury. Results: Early results revealed adhesive peritonitis and ileus for three patients demanding early reoperation (13%) and a hospital mortality rate of 13% (three deaths, mainly attributable to multiple injuries). Ten years after injury, 16 patients had no problems, whereas 3 reported occasional abdominal pain. Conclusion: Penetrating abdominal injuries in war demand urgent diagnostic procedures and, in almost all cases, urgent laparotomy. In cases with no evidence of abdominal penetration and cases involving multiple injuries, an aggressive approach reduces the risk of missing small bowel injuries. Use of established principles for surgical management of small bowel injuries yields good results and low incidences of late complications and difficulties.

Introduction

The war against Croatia started in the spring of 1991. Many city hospitals near or within the battle lines were transformed into war hospitals, providing surgical care and treatment under wartime conditions. In this study, we describe wounded injuries of the small bowel who were treated in Nova Gradiška City Hospital during an 8-month period (1991–1992). Penetrating injuries of the small bowel occur in 40 to 50% of penetrating abdominal trauma cases.2,3 The abdominal contamination and observed peritoneal irritation are expected to be delayed and thus tend to be diagnosed late, especially with blunt trauma.2,4 In penetrating abdominal wounds caused by high-energy bodies, a considerably greater incidence of small bowel injuries is to be expected.2,3,5,6

Methods

The hospital charts of 23 patients with small bowel trauma from penetrating abdominal injuries sustained during 8 months of war were analyzed. Only one patient was female; the mean age of the patients was 29.6 ± 12 years. Three patients (13%) were civilians and the others were members of the Croatian army or police force. The cause of injury was a shell fragment in 12 cases (52%) and a bullet in 11 cases (48%) (Table I). With respect to concomitant injuries, 11 patients (48%) sustained injuries to other body regions, whereas 12 (52%) had injuries of other abdominal organs, namely, the colon in 12 cases (52%), the spleen in 6 cases (26%), the liver in 3 cases (13%), the urinary bladder in 2 cases (9%), and the stomach and kidneys in 1 case (4%) each. The mean injury severity score was 17 ± 6 (range: 9–32) (Table I). Fifteen wounded patients (65%) were in shock at the time of admission to the hospital.

We found two duodenal injuries (one produced by a shell fragment and one by a bullet). One was sutured and secured with a temporary nasoduodenal tube and gastroenteral and enterointeretal anastomoses. The other was sutured and secured with a temporary nasoduodenal tube.

Only two wounded patients were brought to the hospital after a long delay (one after 8 hours and one after 3 days, with an injury missed in a primary survey). All other patients were brought to the hospital and operated on in an urgent manner. For treatment of the small bowel injury, three possible operative procedures were performed, i.e., sutures in 9 cases (39%), resection followed by terminoterminal anastomosis in 11 cases (48%), and a combination of suturing where applicable and resection of other injured parts of the small bowel, followed by terminoterminal anastomosis, in 3 cases (13%) (Table I).

Of 20 patients who survived, 19 returned for an examination and interview 10 years after injury. The following criteria were used: existence of abdominal wall defect or hernia, bowel passage problems, and reoperations attributable to the small bowel injury.

Results

Early results indicated the following complications. Adhesive peritonitis and ileus were found in three cases (13%), requiring reoperation. With a complication not attributable to the small bowel injury, we found pneumonia in one case (4%). Three deaths (13%) were noted; two patients died during the primary surgical procedure. Three patients underwent a secondary procedure, i.e., primary colostomy closure because of concomitant colon injury.

All patients who survived (20 patients) were invited for an examination and interview 10 years after injury; 19 responded...
TABLE I
CAUSE AND TYPE OF INJURY, OPERATIVE PROCEDURES, AND LATE RESULTS FOR 23 WAR-WOUNDED PATIENTS WITH SMALL BOWEL PERFORATION

<table>
<thead>
<tr>
<th>Cause of Injury</th>
<th>Operative Procedure</th>
<th>Injury Severity Score</th>
<th>Good Late Result</th>
<th>Death (Hospital)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal Organs</td>
<td>Multiple Injury</td>
<td>8</td>
<td>17 ± 5</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>Colon Injury</td>
<td>Abdominal Organ</td>
<td>6</td>
<td>16 ± 7</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>Termination</td>
<td>Abdominal Anastomosis</td>
<td>11</td>
<td>17 ± 6</td>
<td>16</td>
<td>23</td>
</tr>
</tbody>
</table>

and were examined. One patient underwent a delayed operation for treatment of a postoperative hernia 2 years after injury. Good functional results were found for 16 patients (84%) and 3 patients (13%) reported occasional abdominal pain (Table I).

Discussion

Penetrating abdominal injuries in war demand urgent diagnostic procedures and, in almost all cases, urgent laparotomy. A problem arises when there is no evidence of penetration into the abdominal cavity, such as with wounds that do not involve the abdominal wall, smaller wounds from explosive shell fragments of low-impact energy, or cases of multiple wounds in all body regions, with one or even more "leading injuries" to the other body regions.1,3,5,6 If a colon injury is not indicated, then spillage from a small bowel perforation can lead to delayed signs of peritoneal irritation.5,7 Diagnostic procedures are problematic: radiological findings of subphrenic air or sonographic findings do not present reliable indications for urgent laparotomy. Diagnostic peritoneal lavage has been described as an option in cases with suspicion of perforation in abdominal trauma.7,8 Reported mortality rates for small bowel injuries range from 25 to 33%.7

Intraoperative management is governed by established principles, with excision and sutures, if applicable, or resection followed by end-to-end anastomosis. Sometimes, when disseminated small bowel penetration occurred, suturing was sufficient in some parts and resection was indicated in other parts. We think that diverting stomies have no place in the surgical management of penetrating small bowel injuries.

Under war conditions, with evident signs of abdominal penetration, the need for laparotomy is obvious. In other cases, with unclear signs of penetration, the decision regarding laparotomy depends on the experience of the surgeon, who can rely on supplementary diagnostic procedures in some cases. Each wound in the region of the abdominal wall, caused by a shell fragment or a bullet, demands radiological investigation (antero-posterior and lateral X-ray views, with the diaphragm and pelvic ring). If the shadow of a metallic foreign body is recognized in the projection of the abdominal cavity, then urgent explorative laparotomy is indicated.9 Current technological developments allow laparoscopy, which we strongly recommend. Our findings for a small group of war casualties with penetrating small bowel injuries demonstrated good results 10 years after injury.

References