Isolated Small Bowel Perforation After Blunt Abdominal Trauma: Report Of 2 Cases

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Citation

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Abstract

Isolated perforation of the small bowel after blunt abdominal trauma is infrequent and the diagnosis can be elusive. Although computerized tomography is the modality most commonly used, there is no consensus over the optimal diagnostic approach. Diagnostic difficulties result in delayed surgical treatment and eventually in increased morbidity and mortality. We report two cases of isolated small bowel perforation after blunt abdominal trauma in patients involved in car accidents. Seat belts were used in both cases. Thorough physical examination and immediate diagnostic radiology and laboratory workup failed to detect evidence of any intraabdominal injury. Deterioration of the clinical picture raised suspicion of small bowel perforation and the delayed surgical intervention resulted in postoperative complications and prolonged clinical course.

INTRODUCTION

The prior concern during blunt abdominal trauma (BAT) is injury of solid organs, which is mostly responsible for the resulting mortality. Hollow viscus injuries are much more uncommon compared to the non-hollow ones. It has been reported that small bowel is the most commonly injured hollow viscus and the third most commonly injured organ in BAT [1,2]. Serosal tears, intramural hematomas, mesenteric vessel injuries and transmural perforation or transection of the bowel are considered different types of small bowel injury [1]. Small bowel perforation (SBP) after BAT is an infrequent injury. A large multi-institutional study on blunt hollow viscus injury performed by the Eastern Association for the Surgery of Trauma indicate that after blunt abdominal trauma the incidence of small bowel injury and SBP is 1.1% and 0.3%, respectively [2]. Isolated SBP pose additional diagnostic difficulties. Firstly, since it is not associated with any other intraabdominal injury, it cannot be diagnosed incidentally during an emergency celiotomy. Secondly, although marked improvement in the quality of computerized tomography (CT) has been achieved over the last years, the false-negative rate of CT is still disturbingly high for SBP [3]. Thirdly, clinical presentation of SBP is usually vague and physical examination inconclusive so suspicion comes only when marked deterioration of the clinical status has been established.

The aim of this study is to present two cases of isolated SBP caused by blunt abdominal injury treated during the last five years in our department and to emphasize the diagnostic and therapeutic considerations associated with this condition.

CASE REPORT 1

A 47-year-old woman was admitted to the emergency department after a car accident. The patient reported that she was the driver of the car and had the seat belt on. She also complained of pain on her left anterior chest. Vital signs were normal (blood pressure 130/75mmHg, pulse rate 90/minute), a seat belt sign was found and left anterior chest tenderness with no crepitus. Abdominal palpation revealed mild diffuse periumbilical tenderness without guarding. Plain chest x-rays showed a 5 th left rib fracture with ipsilateral pneumothorax, which was treated with thoracostomy tube placement. Routine blood tests were normal. Due to the abdominal tenderness a computerized tomography (CT) scan was performed which detected no intraabdominal injury. After 24 hours of observation, the patient's clinical status deteriorated as she complained of severe abdominal pain and the clinical examination revealed signs of generalized peritonitis. Upon laparotomy, a rupture on the antimesenteric border of the jejunum, 50cm distal to the ligament of Treitz, was found. No other injuries were detected and a small segmental resection of jejunum and end-to-end anastomosis was performed. On histology,

disruption of all intestinal layers was found, not associated to ischemia. On the 3 rd postoperative day the patient developed acute respiratory distress syndrome (ARDS) for which she remained in intensive care unit for 40 days. She was discharged from the hospital after 60 days of hospital stay.

CASE REPORT 2

A 25-year-old woman was brought to the emergency department following a motor vehicle accident. She was the driver of a car involved in a high-speed collision and she reported having the seat belt on. The patient was fully alert and complained of left chest pain and vague abdominal discomfort. Her vital signs were normal (blood pressure 120/75 mmHg, pulse rate 95/minute). There were ecchymoses and tenderness over the left shoulder and upper chest. Abdominal examination revealed mild tenderness on the left upper quadrant. Plain chest x-rays demonstrated a fracture on the 7 th left rib without pneumothorax. Laboratory data were within normal limits. Suspicion of splenic injury led to an abdominal CT scan, which failed to detect any intraabdominal injury. During the second day of hospitalization (roughly 36 hours after admission) she reported that the abdominal pain became unbearable along with nausea and vomiting. Abdominal examination revealed tenderness and guarding. Repeat abdominal x-ray showed the presence of free intra-abdominal air. Intraoperatively, suppurative peritonitis with pseudomembrane formation was found along with a solitary jejunal perforation 40cm distal to the ligament of Treitz. Resection of the affected jejunal segment was performed, followed by an end-to-end anastomosis and meticulous irrigation of the peritoneal cavity. Postoperatively the patient developed persistent low blood albumin levels with severe ankle edema, which subsided over the following ten days as well as left pleural effusion, which was treated with chest drainage. The patient was discharged on the 19 th postoperative day.

DISCUSSION

The rarity of isolated SBP after BAT makes diagnosis problematic to the trauma specialist and even more so to the surgeon that is not exclusively committed to trauma care. Experience with such an injury is limited because surgeons encounter it very infrequently. Consequently, there is no optimal diagnostic approach and no clear algorithm for patient care, which results in the diagnostic delays that are associated with increased morbidity and mortality [4].

Blunt abdominal trauma can cause bowel perforation by means of deceleration shear, and high-speed motor vehicle crash is one of the most common deceleration mechanisms. Small bowel is typically compressed against a fixed point, usually the vertebral column. This rapid increase in intraluminal pressure leads to perforation of the bowel wall at the antimesenteric border, where the bowel is usually weaker. Lap-only seat belts, commonly used in most cars until the 1980s, were largely held responsible for SBP. Fakhry et al. [5] reported an SBP incidence of 21.1% in patients wearing lap-only seat belts and 37.6% when the patients exhibited the seat belt sign. The 3-point (lap and shoulder) seat belts currently used in cars are equally incriminated for SBP [6]. In both our cases seat belts were used and in one of them the seat belt mark was found, a fact that favors the seat belt as the principal cause of this condition.

Because of the slow accumulation of fluid and/or air in the abdominal cavity, signs and symptoms of peritonitis require a number of hours to become clinically apparent. For this reason, physical examination during the initial evaluation is reliable for an early diagnosis in only 30% of blunt trauma injuries [7], in those patients who exhibit clear peritoneal signs. Clinical evaluation becomes even less effective when abdominal trauma is associated with other distracting injury, altered mental status from head injury and clouded sensorium due to alcohol/drug use or the administration of analgesic therapy. Clinical examination should always be coupled with further investigations in order to enhance diagnostic adequacy and to prevent unnecessary delays.

Elevated white blood cell (WBC) count and serum amylase levels could be suggestive of an intra-abdominal process and aid diagnosis in conjunction with history and physical findings. In practice, however, neither WBC nor red blood cell (RBC) counts are significantly different between patients with or without SBP [5,6]. Although abnormal serum amylase can be noted in such cases, no clear cut-off that could help differentiate patients with SBP could be determined [5]. Since both WBC count and amylase levels were normal on admission in both our cases, their contribution to a timely diagnosis was minimal. When peritonitis became clinically apparent, these tests also became abnormal, merely confirming the established diagnosis.

Several diagnostic modalities could be used for the identification of isolated bowel perforation. Free subphrenic air, a radiologic sign indicative of hollow viscus perforation easily detected in plain abdominal radiographs, could lead to

an early diagnosis in only 7-8% of the cases [6,8]. Focused Assessment with Sonography in Trauma (FAST) has received significant attention in both the United States and Europe as one of the initial steps in assessment of blunt abdominal trauma. FAST can detect free intraperitoneal fluid in a rapid, non-invasive and repeatable way, with a sensitivity of 91-100% [9]. FAST identifies only 8% of SBPs with direct sonographic evidence while in the majority of the cases it detects the presence of free fluid [9]. However, the overall usefulness of FAST in determining the need for exploratory laparotomy cannot be undermined [10]. Diagnostic Peritoneal Lavage (DPL) is another diagnostic tool used in BAT with high accuracy. DPL can identify SBP with great sensitivity (up to 100%) but relatively low specificity [11] and the possibility of complication during the catheter insertion cannot be neglected. Fang et al. [6] reported 98% sensitivity with this criterion. After the widespread adoption of CT as the principal diagnostic tool in BAT, FAST and DPL have been reserved mainly for patients with hemodynamic instability, for whom a time-consuming trip to the radiology department could prove disastrous. Because of the fairly good general condition of both our patients the diagnostic option of CT was chosen instead of FAST and DPL.

CT has proved to be the gold-standard examination for diagnosis of hemodynamically stable patients with blunt abdominal injuries, contributing toward a significant reduction of morbidity and mortality in trauma victims [12]. CT findings for SBP include free fluid without solid organ injury, free intraperitoneal air, thickening of the bowel wall, mesentery streaking, or dilated bowel loops [13]. These findings, however, have the drawback that they cannot visualize and evaluate small bowel wall tears directly. Fakhry et al. [5], in a large multi-center study, reported that the most common CT finding in BAT patients was free fluid and 21.1% of those patients proved to have SBP. In patients with free fluid without solid organ injury, 30.5% of the patients had SBP, resulting in sensitivity of 55.9% and specificity of 81.8%. Interestingly, 13% of the patients ultimately diagnosed with SBP on laparotomy had a normal preoperative CT scan [5]. Fang et al. [6] demonstrated that CT was diagnostic in 40% of the patients with SBP, with a false-negative rate of 10%. These alarming failure rates highlight the fact that CT cannot reliably exclude SBP and high reliance to it could lead to unfavorable outcome. A more aggressive approach suggesting exploratory laparotomy based solely on the CT finding of free fluid without solid organ injury has not gained widespread support [14]. On the contrary, there is growing evidence on the use of laparoscopy as an alternative modality for the diagnosis and treatment of SBP. With emergency laparoscopy, celiotomy can be avoided in 40% of the cases [8] while in the absence of peritonitis the laparoscopy-related morbidity rate is less than 1% [15].

SBP is associated with significant morbidity and mortality. Even more important than the complication rates reported in major studies (26-28.1%) [6,5] is the fact that the delay between presentation and the operative intervention increases the risk of bacterial contamination [6], and subsequently morbidity and mortality. Many of the patients with isolated SBP (and both our patients) remain undiagnosed for many hours (>24 hours) and eventually demonstrate a three-fold increase in mortality (15-16%) [2,5]. Postoperative complications like wound infection, wound dehiscence, intra-abdominal abscess, acute respiratory distress syndrome and sepsis, all occur at two to three times higher incidence in patients who undergo surgical repair of SBP with extended delay [4].

CONCLUSIONS

Isolated small bowel perforation in blunt trauma victims is hard to diagnose. Early diagnosis and appropriate operative management which are imperative to prevent increased morbidity, are delayed in many cases. The rarity of SBP, the patient's good general condition on admission and the relatively high false-negative rate of CT for detection of SBP can all be the cause of this delay. A combination of detailed history including the mechanism of injury, a period of close observation with repeated physical examinations, thorough investigations with CT and/or FAST and awareness of the possibility of small bowel perforation are cornerstones to successful management.

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