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Severity and treatment of "occult" intra-abdominal injuries in blunt trauma victims

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ABSTRACT

Background: to assess the severity and treatment of "occult" intra-abdominal injuries in blunt trauma victims.
Method: Retrospective analysis of charts and trauma register data of adult blunt trauma victims, admitted without abdominal pain or alterations in the abdominal physical examination, but were subsequently diagnosed with intra-abdominal injuries, in a period of 2 years. The severity was stratified according to RTS, AIS, OIS and ISS. The specific treatment for abdominal injuries and the complications related to them were assessed.
Results: Intra-abdominal injuries were diagnosed in 220 (3.8%) out of the 5785 blunt trauma victims and 76 (34.5%) met the inclusion criteria. The RTS and ISS median (lower quartile, upper quartile) were 7.84 (6.05, 7.84) and 25 (16, 34). Sixty seven percent had a GCS $\geq$ 13 on admission. Injuries were identified in the spleen (34), liver (33), kidneys (9), intestines (4), diaphragm (3), bladder (3) and iliac vessels (1). Abdominal injuries scored AIS $\geq$ 3 in 67% of patients. Twenty-one patients (28%) underwent laparotomy, 5 of which were nontherapeutic. The surgical procedures performed were splenectomy (8), suturing of the diaphragm (3), intestines (3), bladder (2), kidneys (1), enterectomy/anastomosis (1), ligation of the common iliac vein (1), and revascularization of the common iliac artery (1). Angiography and embolization of liver and/or spleen injuries were performed in 3 cases. Three patients developed abdominal complications, all of which were operatively treated. There were no deaths directly related to the abdominal injuries.
Conclusion: Severe "occult" intra-abdominal injuries, requiring specific treatment, may be present in adult blunt trauma patients.

Introduction

In blunt trauma victims, abdominal injuries are less frequent and diagnosed in no more than 10% of all cases, depending on the sample analyzed [1,2]. However, there is a significant percentage of patients with abdominal injuries who do not present with signs and symptoms [2]. The low accuracy of physical examination when diagnosing internal injuries can be associated with some variables, such as a decreased level of consciousness, the presence of "distracting" injuries to other body parts, and the need for sedation, intubation, or analgesia. [3,4]

Imaging tests, such as the focused assessment sonography for trauma (FAST) or complete abdominal ultrasound scans, are not able to rule out the presence of abdominal injuries [5,6]. The most accurate imaging technique is computed tomography (CT), which has a false negative rate lower than 5% [7]. However, the liberal use of CT has been criticized because it is associated with increased costs and risks to patients, such as exposure to radiation and intravenous contrast agents [8,9].

On the other hand, the delay in the diagnosis of abdominal injuries may result in serious complications and eventually deaths referred to as "preventable" [10,11]. Therefore, various algorithms for the evaluation of the abdomen in victims of blunt abdominal trauma have been proposed, each of which with advantages and disadvantages. In an attempt to conduct the diagnostic evaluation and to optimize the use of imaging methods, some scores aimed at identifying trauma victims at a higher risk of abdominal injuries

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are being used [12,13]. Nevertheless, even with all of these tools for the detection of these injuries, abdominal injuries in a small number of patients will remain unnoticed, thus leading to an uncertain prognosis [14].

We believe it is important to know the characteristics of trauma victims with "occult" abdominal injuries, as well as their clinical course and possibility of related complications. Our objective is to study blunt trauma victims admitted without abdominal pain, with normal physical examination of the abdomen and who were subsequently diagnosed with intra-abdominal injuries, with a focus on their clinical presentation, severity, treatment and complications.

Method

We have performed a retrospective analysis of medical records and protocols of blunt trauma victims aged 13 years and older, admitted between 2008 and 2010. We have included in this study trauma victims who, on admission, did not have abdominal pain or alterations in the physical examination of the abdomen that were suggestive of internal injuries, but who were subsequently diagnosed with some sort of intra-abdominal injury.

The abdominal physical examination on admission was performed by the chief resident (3rd or 4th year) in the presence of an attending physician before administering any intravenous medication. Patients with retroperitoneal haematoma and no injuries to specific viscera and those only presenting with lumbar spine fractures alone were excluded from this study.

The abdominal imaging protocol routinely used in our unit relies on FAST, complete ultrasound (US) and computed tomography (CT), depending on the evaluation of the risk of abdominal injury conducted by the attending physician. In addition to the imaging investigation, we have also conducted laboratory tests, such as white blood cell counts, serum amylase determination, and arterial blood gas analysis to assess possible abdominal injuries. Leukocytosis, increased amylase levels and metabolic acidosis are suggestive of injuries that may have not been identified by imaging studies and require further investigation.

We have assessed the mechanisms of trauma, vital signs on admission, trauma severity, supplementary exams conducted, diagnosed injuries, complications, and treatment provided. For severity stratification, the following trauma indexes were used: Glasgow coma scale (GCS) [15], revised trauma score (RTS) [16], abbreviated injury scale (AIS) [17], organ injury scale (OIS) [18], and injury severity score (ISS) [19]. We considered injuries as severe whose AIS ≥ 3.

Central tendencies for the quantitative variables are shown as median (lower quartile, upper quartile). We have compared average Glasgow coma scale scores on admission among patients with AIS abdomen <3 and AIS ≥ 3. For the statistical analysis, we have used the Mann–Whitney test, considering $p < 0.05$ as significant.

We have subsequently analyzed the same variables only in the subgroup formed by the patients admitted with Glasgow coma scale scores greater than 12 and systolic blood pressure higher than 100 mmHg. We have also evaluated those patients whose SBP $>$ 100 mmHg and GCS $>$ 12 on admission and presented no other injuries with AIS ≥ 3 to other body parts.

Results

During the period the study was conducted, 5785 blunt trauma victims were admitted and, of these, 220 (3.8%) presented with some intra-abdominal injury. Among these cases, 76 (34.5%) did not present with abdominal pain or alterations in the physical examination of the abdomen on admission, constituting the sample studied in this investigation. Participants were aged between 14 and 82 years, with median = 34 years (23 years, 47 years), with 79% of them being males. The main mechanisms of trauma were pedestrians being hit by automotive vehicles in 28 cases (37%), motorcycles in another 28 (37%), level falls (13%), and occupants of 4-wheeled vehicles in 7 cases (9%).

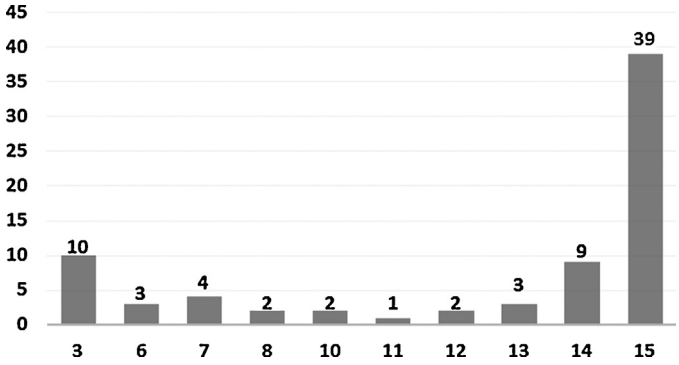

Fig. 1. Distribution of the 76 asymptomatic victims of blunt trauma sustaining abdominal injuries according to the Glasgow coma scale on admission.

On admission, the median (lower quartile, upper quartile) values for GCS systolic blood pressure, heart rate and respiratory rate were, respectively, 15 (8, 15); 120 mmHg (100 mmHg, 130 mmHg); 90 bpm (80 bpm, 102 bpm); and 18 ipm (15ipm, 23ipm). The median (lower quartile, upper quartile) values for the RTS and ISS were, respectively, 7.84 (6.05, 7.84) and 25 (16, 34).

On admission, 39 victims (51%) had Glasgow coma scale scores equal to 15 (Fig. 1), while 16 victims (21%) were admitted with SBP $\leq$ 90 mmHg. Nineteen cases (25%) required orotracheal intubation on admission. Nine patients had used some sort of sedative or analgesic drug prior to being admitted to hospital, all of whom had a GCS $<$ 8 on admission.

Concomitant injuries to the extremities were identified in 40 patients (53%), being considered as severe in 30 (39%). Thirty-eight trauma victims (50%) had injuries to the thoracic segment, 34 (45%) of which were classified as severe. Injuries to the head segment were diagnosed in 28 cases (37%), 23 (30%) of which were severe (Fig. 2). Twenty patients (26%) presented with pelvic fractures.

Of 76 patients, 70 (92%) underwent FAST on admission, 48 (69%) of whom had negative results. Thirty-eight patients (50%) underwent abdominal ultrasound scans on admission, 4 (11%) of whom had negative results. Abdominal CT scans were performed in 66 cases (87%), 4 (6%) of which were negative (Fig. 3).

The abdominal organs mostly affected were: the spleen in 34 cases (45%), followed by the liver in 33 (43%), kidneys in 9 (12%) and hollow viscera in 4 (5%), diaphragm in 3 (4%), bladder in 3 (4%) and iliac vessels in 1 (1%) (Table 1, Fig. 4). All patients had their

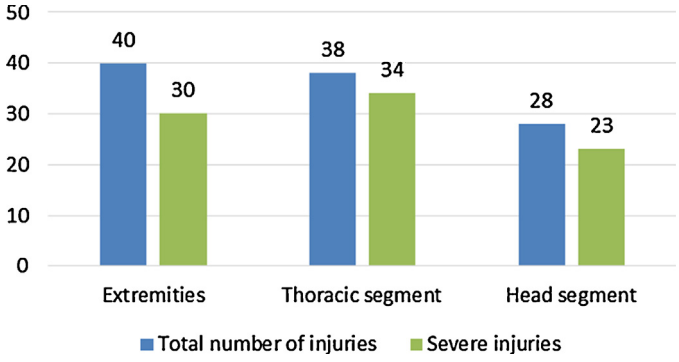

Fig. 2. Frequency of the injuries in other body segments in the 76 asymptomatic blunt trauma victims sustaining abdominal injuries.