

Accepted: December 19th 2020

Ruptures of mesentery- a silent posttraumatic injury (Case Report)

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Abstract

The mechanism of mesenteric injury in blunt abdominal trauma involves compression and deceleration forces which result in a spectrum of injuries that range from contusions to tearing of the bowel wall, tearing of the mesentery, and loss of vascular supply. Hemoperitoneum is a major sign of severity in abdominal trauma, which, in most cases, requires emergency surgery.

Our patient showed that the diagnosis of mesenteric injury should be considered even in patients who sustain only minor abdominal trauma. In this case the patient's symptoms were suggestive only for the orthopedic lesion and not for the hemoperitoneum.

Trans-scapho-lunate dislocation fracture is a rare lesion that may go unnoticed at initial assessment in a polytraumatized patient. A delay in the diagnosis and treatment of a scaphoid fracture may alter the prognosis after consolidation.

Keywords: abdominal contusion, hemoperitoneum, mesenteric rupture, scaphoid fracture

Introduction

The treatment of abdominal injuries is one of the current problems of emergency surgery, both of to the high incidence and to the severity of the injuries. The severity of these traumas is due to the rich vascularization of the intra-abdominal organs, served by large vessels, and their injury is complicated by severe bleeding. Identifying intra-abdominal lesions is a major challenge, many of which

may not be evident during the primary investigation period.

Hemoperitoneum is a major sign of severity in abdominal trauma, which, in most cases, requires emergency surgery. Trauma patients in need of emergency surgery for ongoing haemorrhage have increased survival if the elapsed time between the traumatic injury and admission to the operating theatre is minimized [1]. Any injury to the abdominal wall can be accompanied by internal injuries, but the viscera can be damaged even in the

absence of a traumatic mark on the abdominal wall.

Small bowel injuries occur in 50% of cases with penetrating abdominal wounds. However, the most common intestinal injuries appear as a result of abdominal contusions (70%), when they are also associated with injuries of the mesentery, the third cause of hemoperitoneum, after trauma to the spleen and liver [2].

Three mechanisms act on the intestine in the case of abdominal contusions:

- its wreaking between the vertebrae and the anterior abdominal wall
- sudden increase in intraluminal pressure
- disinsertions at the junctions between fixed and mobile intestinal segments.

The usual mechanism of the mesenteric injury is direct crushing of the small bowel against the vertebral column [3]. Tearing and shearing forces, especially seat belts in car accidents, applied to the abdomen, particularly at points of mesenteric attachment, can also be the mechanism. According to the surgical literature, proximal jejunum and distal ileum are more prone to injury from blunt trauma because of the short mesentery in these areas [4].

Lesions of the mesentery can be bruised or ruptured (vertical ones are less severe, those parallel to the intestine are more serious). Ruptures located nearby intestine, affecting the marginal arches and straight vessels, can compromise the vitality of the loop if they are larger than 3 cm. Ruptures located near the root of the mesentery may involve important vessels with compromising the vitality of a large part of the intestine. In a mesenteric rupture located in a vascular area, large enough, a loop can be engaged, which can cause intestinal occlusion **Fig. 1**.



Fig. 1 The ruptured small intestine and mesentery root (right part of the dashed lines) [2]

The abdominal cavity has a high capacity for distension, up to 5 l in adults, which allows the accumulation of a significant amount of blood in a short time, with hemorrhagic shock. Early diagnosis and treatment can be extremely important in saving the patient's life [5]. The presence of hemoperitoneum in closed traumas requires careful clinical examination and targeted paraclinical examinations.

Ruptures of the mesentery are manifested by signs of internal bleeding. The laboratory examination shows leukocytosis and, in case of internal hemorrhage, the decrease in the number of red blood cells, hemoglobin and hematocrit. However, the doctor must keep in mind that a complete posthemorrhagic hemodilution takes at least 18 hours to occur, and the refilling of circulating capillaries takes about 4-5 hours to cause a significant decrease in hematocrit and hemoglobin concentration. Therefore, a normal hematocrit in the first hours after the accident does not rule out the presence of internal bleeding.

Aside from a clinical examination, X-rays of chest and pelvis in conjunction with focused abdominal sonography for trauma (FAST) [6] or diagnostic peritoneal lavage (DPL) [7] are recommended diagnostic modalities during the primary survey [8]. Empty abdominal

radiography reveals pneumoperitoneum. Ultrasound reveals peritoneal effusion. FAST has been established as a rapid and non-invasive diagnostic approach for the detection of intra-abdominal free fluid in the emergency room [9]. Large prospective observational studies determined a high specificity and accuracy but low sensitivity of initial FAST examination for detecting intra-abdominal injuries in adults [10].

The treatment is surgical and it represents an emergency consisting in suturing the intestine. In more complicated cases, with laceration of the loop wall or mesentery, resection followed by anastomosis may be necessary. Cleaning and drainage of the peritoneal cavity must be performed.

Case report

A 56-year-old patient, from Bucharest, was brought to the Emergency Department of the University Emergency Hospital, Bucharest, following a road accident (motorcyclist). During transport to the hospital, the patient remained hemodynamically stable, with TAS = 120-130 mm Hg.

The Preliminary Physical examination showed a patient in good general condition, hemodynamically and respiratory stable. Clinical examination on devices and systems highlighted the following: small abrasions on the face; respiratory system - normal conformed thorax, respiratory rate = 17-18 breaths per minute, presence of bilaterally vesicular murmur, without rales, oxygen saturation measured by pulse oximetry = 99%; cardiovascular system - rhythmic heart sounds, well heard, ventricular rate = 78 beats/minute, no added breaths or noises, peripheral pulse presence, blood pressure = 120/ 70 mmHg; digestive system - supple abdomen, mobile with breathing, minimal diffuse pain on palpation, without signs of peritoneal irritation; reno-urinary tract - painless renal

lodges; osteo-articular system - pain and functional impotence at the level of the left fist joint, open wound at the left leg, contusion at the right knee; temporo-spatially oriented patient.

In order to have a definite diagnosis, the following investigations were required: full blood count, biochemistry and coagulogram, blood group and Rh, skull radiographs, cervical and lumbar spine, thoraco-pulmonary, pelvic, left carpal and left ankle radiographic joint, focused assessment of trauma sonography (FAST): identification of fluid in the peritoneal cavity and rapid assessment of traumatic injuries.

The patient's values were the following: leukocytes = $16.40 \times 10^3 / \text{mm}^3$ with the modification of the leukocyte formula: lymphocytes 7.9%, monocytes = 8.1%, neutrophils = 16.7%, eosinophils = 0.5%, basophils = 0.1%; Hb = 13.2 g/ dl, Hct = 39.8%, MCV = 84.1/ fL, MCH = 27.9/ pg, platelet = $294 \times 10^3 / \text{mm}^3$. Regarding biochemistry, only glycemia and urea were modified (glu = 149 mg/ dl, urea = 61.8 mg/ dl). A coagulogram showed a spontaneous INR of 1.14.

EKG: sinus rhythm, normal morphology of waves and segments.

The radiography of the radiocarpal joint showed a dislocation at this level **Fig. 2a, 2b, 2c**.



Fig. 2a Dislocation of radiocarpal joint



Fig. 2b Dislocation of radiocarpal joint



Fig. 2c Dislocation of radiocarpal joint

Abdominal ultrasound showed a 15 mm collection visible at the Morrison space and another one of 12 mm perisplenic, without free fluid in the cost-diaphragmatic sinuses.

Given these results, it was considered useful to perform a CT scan of the abdomen and pelvis with contrast, which highlighted the following pathological aspects: the presence of blood density in the root of the mesentery extending over an area of 61/ 46 mm transaxially, located mainly parasagittal on the

left, perihepatic 25 mm, perisplenic 22 mm, left parieto-colic niche 12 mm, right iliac fossa 15 mm, Douglas sac bottom 29 mm (Fig. 3 a-c).

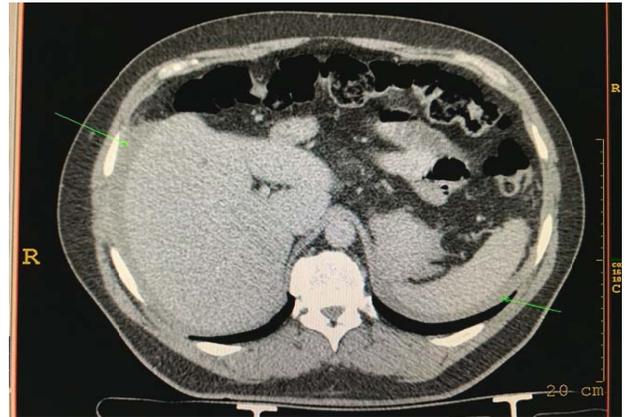


Fig. 3a Perihepatic and perisplenic blood density

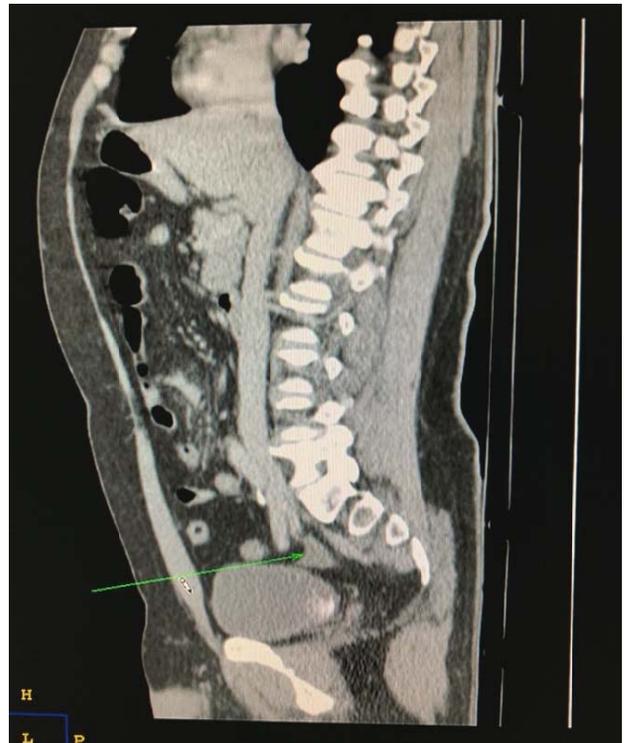


Fig. 3b Liquid blade in the bottom of the Douglas bag

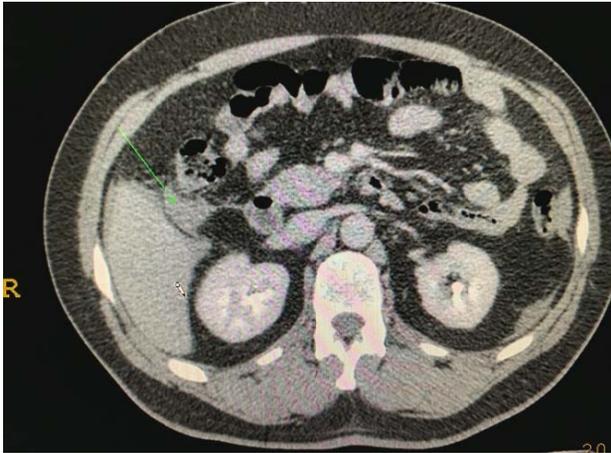


Fig. 3c Perihepatic and subhepatic serohematic accumulation

Diagnosis

The patient was hospitalized with a diagnosis of polytrauma due to road accident, hemoperitoneum due to mesenteric rupture, suspected spleen injury, left carpal fracture-dislocation, minor craniocerebral trauma, right knee contusion.

Treatment

Given the traumatic context, emergency exploratory laparotomy was required.

Fractures without displacement are indicated for conservative treatment. For the traumatic injury of the hand, in the first stage, the immobilization in the antebrachial-palmar plaster splint was practiced for 2 weeks.

Hemostasis and suturing of the mesentery were performed, peritoneal cleaning and drainage for traumatic rupture of the mesentery (ileal loop) with secondary hemoperitoneum were also performed together with the suturing of the leg wound. During the surgery the spleen injury was denied. The postoperative evolution was favorable, and the patient was transferred to the orthopedics department to continue the specialized treatment.

CT of the hand was required for surgery. CT for open reduction of the trans-scapho-lunar

fracture of the left hand and osteosynthesis with a Herbert screw and a brooch were performed (Fig. 4a, 4b).



Fig. 4a, 4b Fracture-dislocation trans-scapho-lunate

Open reduction of the trans-scapho-lunar dislocation fracture of the left hand and osteosynthesis with a Herbert screw and a brooch were performed (Fig. 5a, 5b, 5c).



Fig. 5a Brooch osteosynthesis



Fig. 5b Osteosynthesis with Herbert screw and brooch



Fig. 5c Osteosynthesis with Herbert screw and brooch

Discussions

The mechanism of mesenteric injury in abdominal contusions involves compressive and decelerating forces that result in a spectrum of lesions ranging from contusions to rupture of the intestinal wall, shearing of the mesentery, loss of the vascular bed. The diagnosis of mesenteric lesions tends to be delayed. Early detection and surgery, when necessary, are essential to improve the outcome of treatment. Morbidity and mortality due to delayed diagnosis occur as a result of hemorrhage of damaged mesenteric vessels and peritonitis by rupture of the intestinal wall or intestinal ischemia.

Although nonspecific, one or more of the following clinical signs and symptoms can usually be found: abdominal pain, tenderness, distension, low bowel noise, hypotension, and shock [11,12]. FAST ultrasound or exploratory laparotomy should be used to assess patients who have suffered a polytrauma and are hemodynamically unstable. FAST abdominal ultrasound is a quick, non-invasive, repeatable test that provides valuable information on the existence of free fluid in the peritoneal cavity and lesions of the parenchymal organs (liver, spleen, kidneys). The areas to be checked are: Morisson perihepatic space (hepato-renal recess), perisplenic space and pelvis [5,13].

On the other hand, hemodynamically stable patients can benefit from abdominal CT, which helps to locate free fluids, to detect pneumoperitoneum or mesenteric hematomas. CT examination provides fine-grained information on visceral lesions and the presence of free fluid in the peritoneal cavity, the blood density of which is suggestive of hemoperitoneum. Specific CT signs, such as a sentinel clot or extravasation of intravascular contrast material, may indicate the source of bleeding and are useful in surgical management. In addition, the configuration of accumulated blood can help identify the injured organ; for example, triangular fluid

collections in the mesentery are suggestive of mesenteric lesions [14] (Fig. 6).

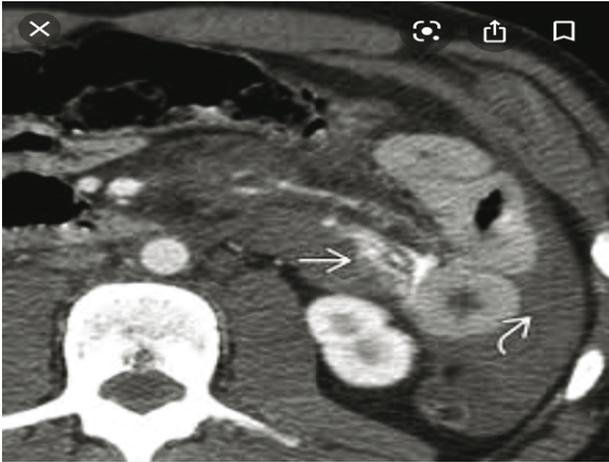


Fig. 6 Mesenteric foci of fluid

This aspect has the highest sensitivity for mesenteric lesions, but is not specific.

If the mesenteric laceration is minimal and only a localized hematoma is present, the patient may be treated conservatively. However, the identification of a moderate/high volume of intraperitoneal fluid without the detection of solid organ damage should lead to a surgical evaluation for intestinal and mesenteric lesions [11].

The case of the presented patient showed that the diagnosis of mesenteric lesion should be considered even in patients suffering from minor abdominal trauma, and the rapid diagnosis depended on the suspicion raised by the emergency physician.

Scaphoid fractures are the most common type of wrist fracture, accounting for 10% of all hand fractures and up to 60-70% of all carpal fractures, being twice as common in men than in women [15]. Among the active and sports population, under 45 years old, the scaphoid fracture is one of the most common injuries, due to accidental falls or blows with the hand in hyperextension. The most common accidents of this kind come from sports and hobbies, such as skiing, motorcycling, cycling, handball, football, mountaineering [16].

Plain radiographs after the initial injury may not reveal a fracture, and a delay in the

diagnosis and treatment of a scaphoid fracture can alter the prognosis for union, increasing the risk of avascular necrosis and the long-term likelihood of arthritis.

The scaphoid fracture associated with perilous dislocation leads to an extremely unstable joint, which can cause devastating complications [17].

Dislocation reduction should be done as soon as possible, and this can be performed in the emergency department, with the delay of the final procedure. Any fracture associated with dislocation usually requires stabilization with small compression screws or percutaneous pins. Sometimes it is necessary to delay the final procedure due to the general condition of the patient, other associated injuries that require emergency intervention, excessive swelling of the wrist and hand or the need for adequate surgical assistance.

Indications for immediate surgical referral include the following: fracture of the proximal pole, fracture displaced more than 1 mm, delayed presentation of acute fracture, fracture associated with scapholunate ligament rupture, carpal instability (lunate tilt on radiograph), work considerations, when early return is desired in cases of nondisplaced fracture, evidence of nonunion or osteonecrosis.

Displaced or unstable fractures require percutaneous pin fixation or compression screw fixation to prevent malunion. Internal fixation is accomplished with either smooth Kirschner wires or a Herbert screw [18].

Mobilizing the joint is desirable before the bone and soft tissues have healed completely. Various splints are required to protect and support the wrist in its final stage of healing.

Conclusions

Mesenteric injury from blunt abdominal trauma is uncommon and can be difficult to diagnose. Mesenteric lesion should be

considered even in patients suffering from minor abdominal contusions, the speed and accuracy of diagnosis sometimes depending on the patient's life.

The particularity of the case lied in the fact that the patient's symptoms were suggestive only for the orthopedic lesion and not for the hemoperitoneum (life-threatening lesion). Timing of surgery when clinical and ultrasound signs support the diagnosis of hemoperitoneum can endanger the patient's life.

Trans-scapho-lunate dislocation fracture is a rare lesion that may go unnoticed at initial assessment in a polytraumatized patient. Simple radiographs may not reveal the fracture, and a delay in the diagnosis and treatment of a scaphoid fracture may alter the prognosis after consolidation. Like other dislocations, a trans-scapho-lunate fracture-dislocation is an emergency and should be reduced as soon as possible, and the final treatment should be applied when the patient's condition allows.

Conflict of Interest

The authors state no conflict of interest.

Informed Consent and Human and Animal Rights statements

An informed consent has been obtained from the individual included in this study.

Authorization for the use of human subjects

Ethical approval: The research related to human use complies with all the relevant national regulations, institutional policies, is in accordance with the tenets of the Helsinki Declaration, and has been approved by the institutional review board of the University Emergency Hospital, Bucharest, Romania.

Acknowledgements

None.

Sources of Funding

No funding was required for this study.

Disclosures

None.

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