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Laparoscopic treatment of mesenteric avulsion and intestinal perforation after blunt abdominal trauma: A report of a case

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ABSTRACT

INTRODUCTION: Intestinal injuries are quite involved in non-penetrating abdominal trauma after liver and spleen. The incidence of small bowel injury after blunt abdominal trauma has increased nowadays, since high-energy transfer impacts producing large abdominal wall displacements are more frequent, such as car crash.
CASE REPORT: We report a case of a 49-year-old Caucasian woman, victim of a violent car crash, resulting in multiple small bowel perforations and mesenteric avulsion. Since the patient was hemodynamically stable, a laparoscopic approach was carried on.
DISCUSSION: Blunt abdominal trauma are responsible of 6–14.9% of all traumatic injuries (Galia et al., 2017). The frequency of small bowel lesions ranges from 5% to 15%, while small bowel mesenteric injuries are approximately found in 5% of patients after blunt abdominal trauma. There are different biomechanical reasons explaining how a blunt trauma can cause damages to small bowel and its mesentery. Clinical diagnosis of small bowel perforation after blunt abdominal trauma is often challenging for non-specific objective clinical signs and because peritoneal irritation symptoms are present only in collaborative patients.
CONCLUSION: Laparoscopy is a safe and feasible tool in selected patients with blunt abdominal trauma, both for diagnosis and treatment. The prerequisites for applying mini invasive approach are both the hemodynamic stability of the patient and an adequate surgical expertise in advanced laparoscopy.
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1. Introduction

Intestinal injuries are quite frequent after non-penetrating abdominal trauma. Small bowel and mesentery represent the most frequently involved structures in blunt abdominal trauma after liver and spleen [1]. The frequency of small bowel lesions ranges from 5% to 15% [2,3]. Small bowel mesenteric injuries are approximately found in 5% of patients after blunt abdominal trauma [4]. This incidence has increased because the high-energy transfer impacts producing large abdominal wall displacements such as car crash are more frequent [5]. We report a case of both intestinal perforations and mesenteric laceration after a blunt abdominal trauma, treated with laparoscopic approach, in line with the SCARE criteria [6,7].

2. Case report

We describe a case of a 49-year old Caucasian woman who was admitted to emergency room after a violent car crash. Blood pressure at the time of her access to our University Hospital was 115/75 mmHg, pulse rate was 100 and Glasgow Coma Scale (GCS) 15. The laboratory results showed: haemoglobin 11 g/dL, haematocrit 33%, platelets count 284 $10\hat{3}/\mu L$. She had no other comorbidities and her family history was negative for other diseases. Since the woman looked hemodynamically stable we performed a total body contrast-enhanced CT scan that revealed peritoneal free air and an abundant abdominal fluid with siero-hematic characteristics (60 UH). After intra-venous contrast administration we identified a perfusion reduction in the IV hepatic segment and at the inferior pole of the spleen (Fig. 1). The small bowel presented an increasing in wall thickness [8,9]. Besides the abdominal findings, the patient had multiples fractures in right femur, right kneecap, right ulna and anterior arch of left third rib.

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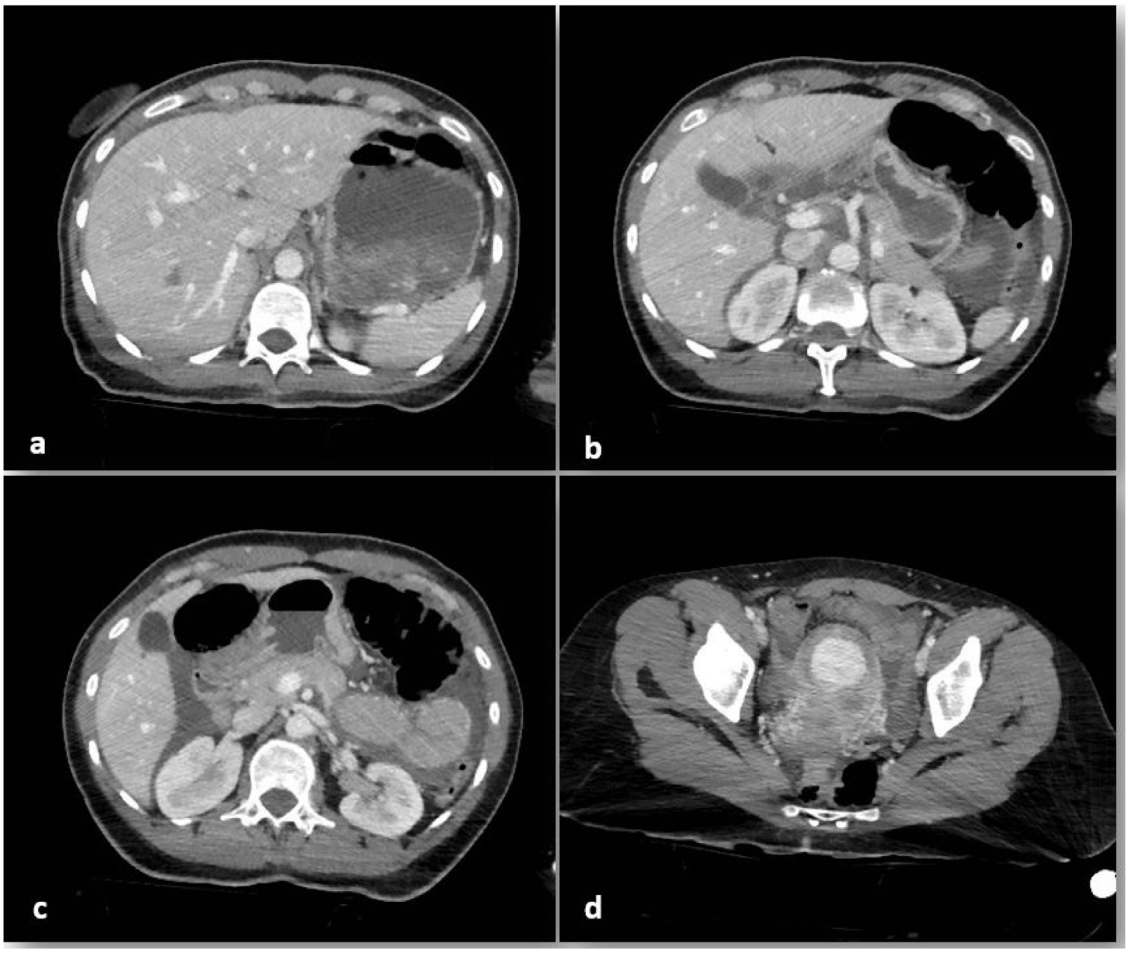

Fig. 1. Preoperative CT abdominal scan revealed peritoneal free air and abdominal fluid with siero-hematic characteristics (60 UH). After intra-venous contrast administration we identified a perfusion reduction in the inferior pole of the spleen.

Thus, with diagnosis of intestinal perforation we decided to perform a laparoscopic exploration. The procedure was carried out by a senior resident with an equipe experienced in emergency and laparoscopic surgery [10–13]. After administration of general anaesthesia, patient was placed in dorsal lithotomy position. A nasogastric tube was placed to decompress the stomach and coverage with broad-spectrum intravenous antibiotics was ensured. We induced the pneumoperitoneum via a trans-umbilical optical trocar and than we inserted other two 5-mm trocars in left iliac fossa and in left hypocondrium. This trocars position allowed us to easily explore the small bowel from ileocecal valve to Treitz ligament in order to identify intestinal perforation [14,15]. The exploration of the abdominal cavity confirmed copious amount of hemoperitoneum suggesting active bleeding and enteric material due to intestinal perforation (Fig. 2). No macroscopic lesions of other visceral organs or big vessels nor retroperitoenal collecting were identified. We did a meticulous exploration of small bowel and we found five perforation sites. At the same time the corresponding mesentery presented multiple tearing lesions with active bleeding from disruption of jejunoileal vessels (Fig. 3). Hemostasis with bipolar forceps was promptly carried out. We made a laparoscopic intestinal resection including the portion of ileum compromised by the multiples post-traumatic perforations (about 80-cm lenght). A side-to side anastomosis with Echelon Flex45 mm was achieved. The whole abdomen was subsequently washed with warm saline solution. On third postoperative day we observed an enteric spillage from the abdominal drain despite no signs of sepsis and the hemodynamic stability. A re-laparoscopy was performed revealing another subcentimetric perforation of ileum [16]. Considering the small size of the perforation and the optimal trophic status of intestinal mass we carried out a double layer intestinal suture. The postoperative course was uneventful and the patients was discharged on postoperative day 14.

3. Discussion

Blunt abdominal trauma are responsible of 6–14.9% of all traumatic injuries [17]. The frequency of small bowel lesions ranges from 5% to 15% [2,3], while small bowel mesenteric injuries are approximately found in 5% of patients after blunt abdominal trauma [4]. The leading cause of the injuries of abdominal hollow viscera is strictly related to very high-energy trauma, which is typical of car crash, pedestrian hits by vehicles and fall from heights. those conditions are usually associated with multiple additional hurts [18,19]. In car crash, the patients with hollow viscus injuries seem to be more frequently rear seats passengers [20]. There are different biomechanical reasons explaining how a blunt trauma can cause damages to small bowel and its mesentery. During the trauma, the gastrointestinal tract may be crushed between the vertebrae and the anterior abdominal wall impacting on an object like seat-belt or car steering wheel. This condition can result either in local laceration of bowel and mesentery, mesenteric haematoma, dissection of bowel, localized devascularisation and full thickness contusions which can lead to late perforation as in our case report. Also rapid deceleration can be responsible of small bowel lesions when producing shearing forces between fixed and mobile portions

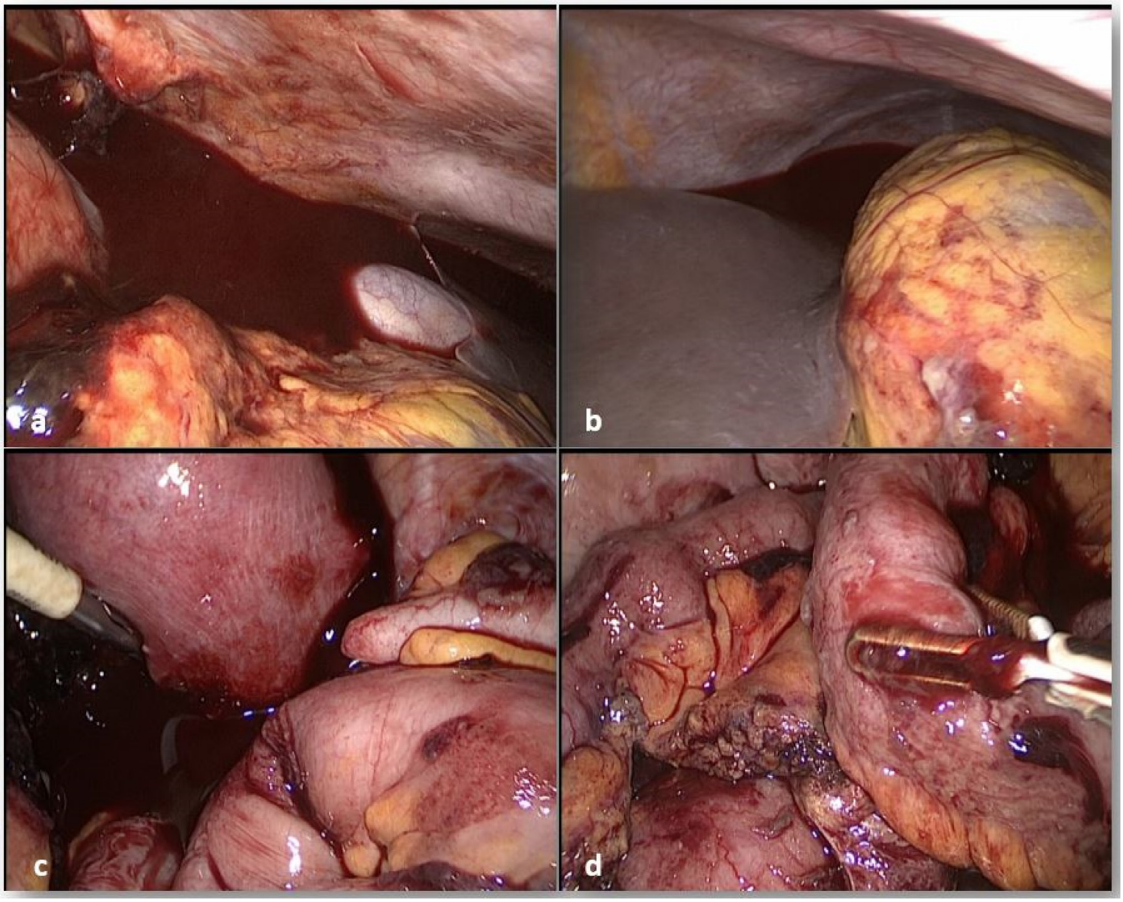

Fig. 2. Details of surgical procedure: a–c) laparoscopic exploration with copious amount of hemoperitoneum suggesting active bleeding; d) small bowel with an increasing in wall thickness.

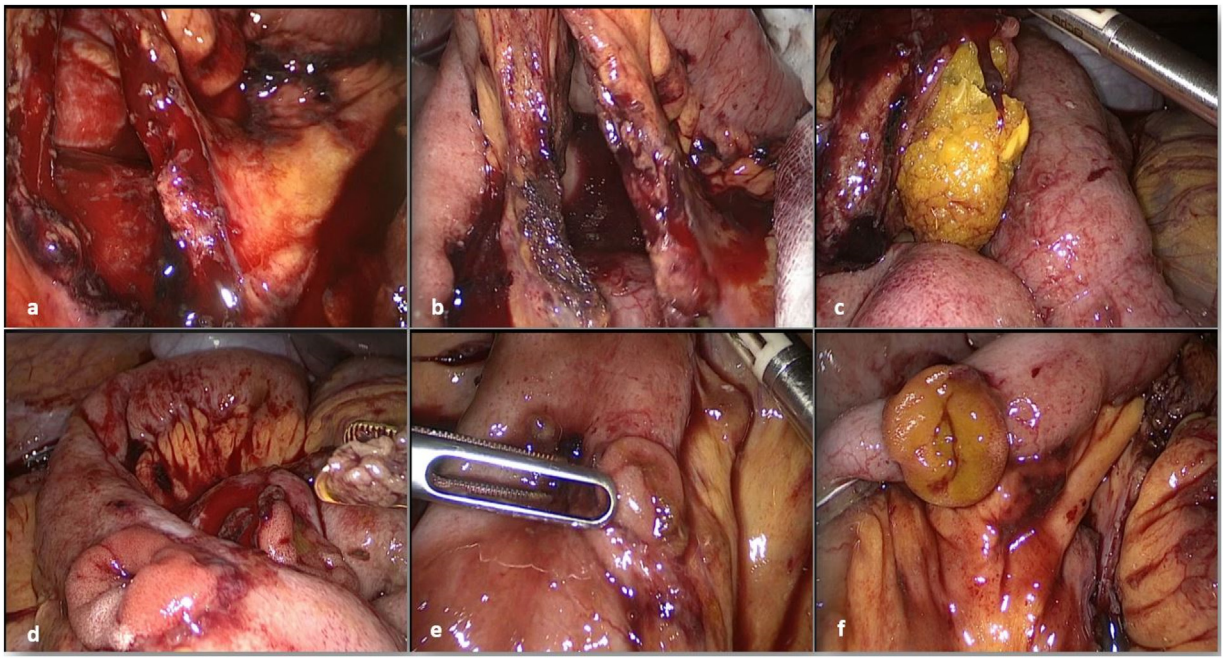

Fig. 3. a–b) Mesentery presented multiple tearing lesions with active bleeding from disruption of jejunoileal vessels. Hemostasis with bipolar forceps was promptly carried out.; c-d-e-f) meticulous exploration of the small bowel showed five perforation sites.

of intestinal tract, leading to full thickness lacerations of bowel wall and tear of mesenteric vessels with haemorrhage, hematoma and ischemia. Finally, bursting injuries may occur when intraluminal pressure suddenly exceeds the tension of bowel wall [21,22]. Small bowel and mesentery injuries are associated with high morbidity and mortality because diagnosis is usually difficult and may be delayed resulting in severe complications mainly related to bleeding, peritonitis and sepsis [23]. Clinical diagnosis of small bowel perforation after blunt abdominal trauma is often challenging for non-specific objective clinical signs and because peritoneal irritation symptoms are present only in collaborative patients. Furthermore clinical signs of peritonitis can generally have a late onset and may be attenuated by concomitant multiple lesions especially in case of neurological involvement. The algorithm of abdominal investigation in patients with blunt trauma depends on their haemodynamic status [24]. If haemodynamic conditions are stable the examination of abdomen can be first assessed with focused abdominal sonography for trauma (FAST) or by diagnostic peritoneal lavage (DPL). The diagnostic modality of choice remains CT scan in haemodynamically stable and collaborative patients [25]. Despite modern imaging tools, such as CT with multi-detector row technology, added more sensitivity and specificity in detection of hollow viscera and mesenteric injuries, the diagnosis remains arduous [26]. The main obstacle of all the radiological investigation is related to the inability to clearly visualize small bowel laceration and quantify their entity [27]. A partial or full mesenteric laceration is an infrequent cause of haemoperitoneum [28], but when it occur an immediate surgical treatment is mandatory [29]. Emergency surgery must be considered especially in severe hypotension associated with positive FAST, evisceration, haemodynamic instability or diffuse peritonitis, and laparotomy has been considered the standard procedure for these cases. Laparoscopic surgery can be a valid alternative both for diagnostic and for therapeutic purpose only in haemodynamically stable patients [30]. In patients with no indication for immediate laparotomy with clinical status suspected for mesenteric or hollow viscus injury laparoscopy can be used as a complementary diagnostic device to carry out an exploration of abdominal cavity, to check bowel perfusion, and eventually to resect affected bowel segments [31]. Laparoscopic approach appears to be a valuable choice in those patients with haemodynamic stability, avoiding the need of laparotomy and with comparable perioperative and postoperative outcomes with all the advantages of mini-invasive technique [32,33]. In the complex management of blunt abdominal trauma, when performed by experienced surgeons laparoscopy seems to be safe and feasible, providing also a high diagnostic accuracy. After surgical procedure, either laparotomic or laparoscopic, the risk of further bowel lesions remains high due to the compromised blood supply and the consequent ischemia. So in these patients a strict period of scrupulous surveillance must be observed.

4. Conclusion

Laparoscopy is a safe and feasible tool in selected patients with blunt abdominal trauma, both for diagnosis and treatment. The prerequisites for applying mini invasive approach are both the hemodynamic stability of the patient and an adequate surgical expertise in advanced laparoscopy. Mini-invasive approach can be used to avoid non-therapeutic laparotomy in those patients with unclear clinical and radiological findings thanks to its high diagnostic accuracy. Laparoscopy may prevent the risk of undiagnosed hollow viscus injuries leading to delayed laparotomy for acute peritonitis, reducing the gap between the non-operative management and trauma laparotomy in these circumstances avoiding missed injuries and maximizing therapeutic interventions. In our case, although the immediate surgical approach, the patient developed a secondary perforation of small bowel, followed by peritonitis. Thorough surveillance of the patient after surgery and high clinical suspicion was crucial for prompt reintervention.

Declaration of Competing Interest

The authors report no declarations of interest.

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Ethical approval

Ethical Approval was not necessary for this study.
We obtained written patient consent to publication.

Consent

We obtained written patient consent to publication.

Author contribution

Di Buono Giuseppe: study design, data collections, data analysis and writing.
Maienza Elisa: study design, data collections, data analysis and writing.
Buscemi Salvatore: data collections.
Gulotta Leonardo: data collection.
Romano Giorgio: study design, data collections, data analysis and writing.
Agrusa Antonino: study design, data collections, data analysis and writing.

Registration of research studies

Not applicable.

Guarantor

Di Buono Giuseppe.
Agrusa Antonino.

Provenance and peer review

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Availability of data and materials

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