

## SMALL BOWEL CONTUSION AND PERFORATION DUE TO UNCOMMON BLUNT ABDOMINAL TRAUMA

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**Abstract: Introduction:** Small bowel injuries are rare, accounting for only 1% - 5% of injuries following blunt abdominal trauma, while small bowel perforation has been reported in 0.3% of patients. Delays in early diagnosis or misdiagnosis significantly contribute to the mortality and morbidity associated with small bowel injuries. Blunt abdominal trauma poses a diagnostic challenge, with focused assessment using sonography in trauma and computed tomography abdomen becoming invaluable methods for diagnosis, integrated into management guidelines.

**Case Report:** We present a case of jejunal perforation and contusion resulting from blunt abdominal injury due to a fall onto a fence. The initial chest X-ray did not reveal any traumatic injuries or subdiaphragmatic free gas. Computed tomography of the abdomen and small pelvis revealed free fluid in the peritoneal cavity and thickening of the jejunal wall, corroborated by abdominal ultrasound. Surgical intervention confirmed a diagnosis of small jejunal perforation.

**Conclusion:** Given the minimal and often clinically undetectable signs in patients with blunt abdominal trauma, timely and accurate imaging diagnostics and prompt surgical intervention significantly reduce the morbidity and mortality associated with these injuries.

**Keywords:** Blunt abdominal trauma, Jejunal perforation, Contusion, Computed tomography, Surgery.

### INTRODUCTION

Trauma stands as the leading cause of mortality among individuals aged 1 to 44 years (1). In blunt abdominal trauma (BAT), small bowel and mesentery injury (SBMI) rank as the third most prevalent organ

injury, following liver and spleen injuries. SBMI in blunt abdominal trauma constitutes a mere 1% - 5% of cases, with seatbelt injuries from motor vehicle accidents being the predominant mechanism in urbanized regions (2).

Blunt abdominal trauma often poses diagnostic challenges, complicating early recognition. Computed tomography (CT) serves as the gold standard for evaluating BAT, revealing various direct and indirect imaging signs indicative of bowel injuries documented in the literature. Signs such as wall discontinuity, enteric luminal contrast extravasation, extraluminal air, wall thickening, differential bowel wall enhancement, and the presence of free intraperitoneal fluid or mesenteric fat stranding are identified markers of traumatic bowel injuries.

Preoperative identification and localization of small bowel perforations typically present challenges, often remaining unclear before surgery. Thorough exploration of the entire small intestine by the surgeon is pivotal to detecting all potential injuries.

Here, we present a case involving a 22-year-old man who experienced jejunum perforation and contusion following a rare blunt abdominal injury, emphasizing diagnostic methods and operative treatment.

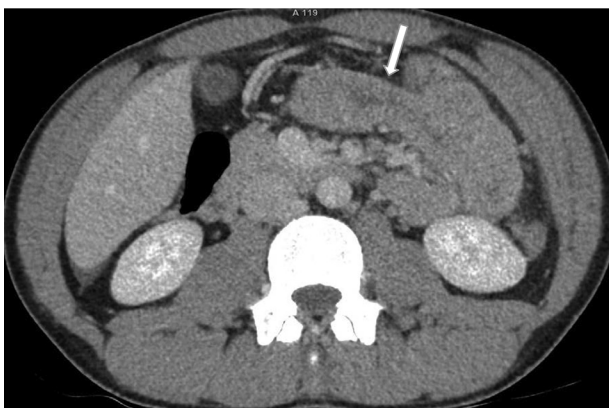
### CASE REPORT

A 22-year-old man was admitted to the Emergency Surgery at the University Clinical Center of Serbia following blunt trauma to the abdomen from a fall onto a fence. Upon abdominal examination, the patient exhibited tenderness in the left upper quadrant during palpation. Laboratory results revealed an elevated white blood cell count of  $19.1 \times 10^9$  ( $3.4-9.7 \times 10^9/L$ ),

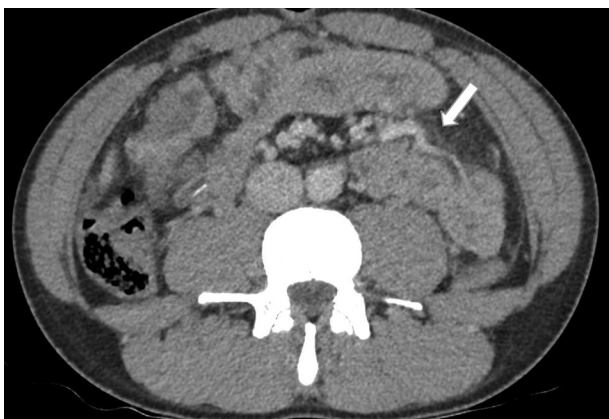
with other parameters within the normal range. A chest X-ray showed no evidence of traumatic injuries or subdiaphragmatic free gas (Figure 1). Focused assessment with sonography in trauma (FAST) indicated a 10 mm thickening of the jejunal wall in the left hemiabdomen, increased echogenicity around the mesentery, and a small amount of free fluid between



**Figure 1.** Chest X-ray showing no signs of pneumoperitoneum



**Figure 2.** Post-contrast phase in axial section - circumferentially thickening of jejunal wall (arrow)



**Figure 3.** Post-contrast phase in axial section - fat stranding in the mesentery (arrow)



**Figure 4.** Post-contrast phase in axial section - pelvic free fluid (arrow)

loops, including the supramesic space. Subsequent abdominal and pelvic CT with intravenous contrast confirmed circumferential thickening and edema of the jejunal wall measuring 10 mm, alongside mesenteric “fat stranding” (Figures 2 and 3). The bowel wall displayed robust post-contrast opacification with serosal enhancement of the jejunum. The CT scan identified a substantial volume of pelvic free fluid and a small quantity between the jejunal loops and the subhepatic space (Figure 4). Other bowel loops appeared normal without visible signs of solid organ damage or extraluminal free air. The CT findings led to a diagnosis of jejunal contusion. An emergency laparotomy revealed an 8-9 mm diameter perforation in the jejunum, approximately 20 cm from the Treitz ligament. A moderate amount of serohemorrhagic intraperitoneal free fluid was drained, followed by suturing of the perforation site using a two-layer technique. The patient was discharged one week later after an uneventful postoperative recovery.

## DISCUSSION

Small bowel perforation, as a part of BAT, is a rare condition reported in 0.3% of patients (3). The initial clinical examination might pose challenges and imprecisions; signs of bowel injury might manifest after several hours or even days. The nearly neutral pH of the small bowel content, along with reduced enzyme activity and low bacterial density, leads to the slow development of peritoneal inflammation. Moreover, undetected and delayed diagnosis of SBMI significantly correlates with increased mortality and morbidity (2).

The diagnostic methods for blunt abdominal trauma with suspected SBMI include diagnostic peritoneal lavage, FAST, and CT. FAST, being a non-invasive and rapid method to detect intraperitoneal fluid, serves as a widespread diagnostic modality for trauma patient evaluation. According to Kahn et al, the presence of intra-abdominal free fluid detected on FAST, without injury to a solid organ, indicates a high suspicion of

SBMI. However, the authors emphasize that the presence of free peritoneal fluid is not a specific finding indicative of bowel injury (4). CT has emerged as the standard imaging modality for hemodynamically stable and high-risk patients with BAT (5). In a study involving 11,924 blunt trauma patients, bowel wall thickening and mesenteric stranding were found to be the second most frequent sensitive signs for bowel injury, following free peritoneal fluid. The authors highlight pneumoperitoneum, bowel wall hematoma, and oral contrast extravasation as highly specific signs of bowel injury. However, though pneumoperitoneum is recognized as a direct sign of bowel injury, another study reported its lack of direct association with small bowel perforation in SBMI patients (6,7). Perforation might occur in cases where a small bowel perforation is contained, temporarily covered, or involves only the leakage of liquid content. The presence of an intramural hematoma with a significant mass effect on adjacent structures strongly suggests blunt trauma to the bowel wall. Notably, thickening of the small bowel might also occur in non-traumatic intramural hematoma due to edema.

In our case, CT didn't reveal pneumoperitoneum or intramural hematoma, known as highly specific signs of bowel injury. Conversely, in the absence of specific CT indications for traumatic bowel and mesentery injury, the presence of indirect signs, like mesenteric stranding with bowel wall thickening, raises significant concern for bowel injury (8). In the context of jejunal contusion and perforation following BAT, the circumferential thickening of the jejunal wall with fat stranding between loops and free intra-abdominal fluid are notable features in our case.

Depending on the technical equipment and the surgeon's experience, exploration of the abdomen can be performed laparoscopically or through an open approach. According to the guidelines issued by the American Association for the Surgery of Trauma (AAST), small bowel perforations are categorized as gradus II (involving less than 50% of the bowel circumference) and gradus III (over 50% of the bowel circumference) (9). Surgical management of bowel perforation can vary according to AAST recommendations, ranging from simple primary closure to delayed restoration of bowel continuity. Although a thorough examination of the injured part of the intestine should be conducted in detail (assessing the condition of the defect edges and possible presence of a hematoma in the mesentery), in most cases, grade II injuries can be managed with primary sutures, while more extensive defects (gradus III) are treated by resection and anastomosis. To perform a primary closure (suture or anastomosis), the bowel wall must be free from trauma, inflammation, or necrotic tissue. In

cases where the bowel's condition or the patient's health is compromised, the risk of anastomosis or closure failure can be excessively high, making the exteriorization of the bowel defect a much safer primary measure. Patients with severe peritonitis, multi-organ failure, or poor mesenteric circulation should not be considered for primary anastomosis. The failure of an anastomosis could result in the patient's condition deteriorating, potentially leading to death. In such cases, some form of exteriorization, such as a double-lumen common stoma, allows postoperative monitoring of bowel vitality. The closure of the stoma, along with the re-establishment of bowel continuity, is a straight forward procedure that does not require additional laparotomy.

## CONCLUSION

Recognition of highly sensitive and specific imaging signs is crucial in diagnosing bowel injuries following BAT. Early utilization of imaging diagnostics and prompt surgical intervention play pivotal roles in reducing the morbidity and mortality associated with these injuries, despite the often subtle clinical manifestations observed in BAT patients.

## Abbreviations

**SBMI** — Injuries of the small bowel and mesentery

**CT** — Computed tomography

**BAT** — Blunt abdominal trauma

**FAST** — Focused assessment with sonography in trauma

**AAST** — American Association for the Surgery of Trauma

## Patient Consent

We obtained verbal and signed consent from the patient to publish the case report. All procedures performed were in accordance with the 1964 Helsinki Declaration and its later amendments.

## Author Contribution

All listed authors have made substantial contributions to all parts of the manuscript.

## Conflict of Interest Statement

All authors disclose that they have no conflicts of interest related to this study.

## Acknowledgments

None

## Licensing

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**Sažetak****KONTUZIJA I PERFORACIJA TANKOG CREVA  
USLED RETKE TUPE TRAUME ABDOMENA**

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**Uvod:** Povrede tankog creva su retke i čine samo 1%-5% povreda nakon tupe traume abdomena, dok je perforacija tankog creva zabeležena kod 0,3% pacijenata. Usled odložene pojave kliničkih znakova traumatske povrede creva, inicijalni klinički pregled može biti otežan i nespecifičan. Odlaganje rane dijagnoze ili netačna dijagnoza su dva glavna razloga mortaliteta i morbiditeta povezanih sa povredama tankog creva. Tupa trauma abdomena često predstavlja dijagnostički izazov. Ultrazvuk po FAST protokolu i kompjuterizovana tomografija zauzimaju značajno mesto u dijagnostici pacijenata sa tupom abdominalnom traumom.

**Prikaz slučaja:** Predstavljamo slučaj perforacije i kontuzije jejunuma nakon tupe traume abdomena, uzrokovane padom na ogradu. Prvobitni rendgenski

sнимак грудног коша није указивао на трауматску повреду, нити на присуство пнеумоперитонеума. Урађена је компјутеризована томографија абдомена и карлице која је показала присуство интраперитонеалне слободне течности и задебљање зида јејунума, што је виђено и ултразвучним прегледом. Индикована је операција и дијагноза перфорације јејунума је потврђена.

**Zaključak:** Zbog nespecifičnih i odloženih kliničkih znakova nakon tupe abdominalne povrede, pravovremena i pravilna imidžing dijagnostika kao i operativno lečenje značajno smanjuju morbiditet i mortalitet ovih pacijenata.

**Ključne reči:** Tupa trauma abdomena, Perforacija jejunum, Kontuzija, Kompjuterizovana tomografija, Hirurgija.

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