Case Report

Isolated duodenal injury following blunt abdominal trauma✩,✩,✩

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ABSTRACT

We are reporting a rare case of an isolated duodenal injury (IDI) involving the second and third parts of the duodenum in a 22-year-old male patient following a blunt abdominal trauma. The purpose of this paper is to report the clinical findings, cross-sectional imaging findings, and management of IDI. As IDI can be vague clinically, the presence of periduodenal free fluid on computed tomography scan should raise the suspicion of the diagnosis. Early recognition and management are essential to prevent associated morbidity and mortality.

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Introduction

Duodenal injury (DI) accounts for approximately 3%-5% of all abdominal trauma [1–3], with an incidence of 25% occurring as a consequence of blunt abdominal trauma (BAT) [4]. Isolated duodenal injuries (IDI) are rarely reported [1–3]. The recognition of DI can be challenging due to its retroperitoneal location. This may lead to misdiagnosis or delay in the diagnosis and treatment; increasing the mortality rates up to 40% [5,6].

We are reporting a case of IDI involving the second and third parts of the duodenum; due to BAT from a high-speed road traffic accident, which was identified in the computed tomography (CT) examination.

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Fig. 1 – Computed tomography (CT) scan of the abdomen axial (1a) and coronal (1b) section of an enhanced CT showed circumferential edematous wall thickening of the duodenum (arrow) involving the second and third parts, with suspicion of wall defect and heterogenous dense free fluid, representing duodenal hematoma (arrowhead). (1c) sagittal reconstruction of an oral contrast CT scan demonstrates duodenal wall perforation (arrow).

Case report

A 22-year-old male patient brought by an ambulance to the emergency department after he sustained BAT from a high-speed road traffic accident. Initial trauma assessment was done. The patient was hemodynamically stable, with a Glasgow Coma Scale of 13/15, and no active external bleeding or deformities. On examination, there was mild chest tenderness at the left side. The abdomen was soft with generalized tenderness. The rest of the examination was unremarkable. He received initial fluid resuscitation, antibiotics and analgesics. Blood analysis showed a hemoglobin concentration of 14.8 g/dL, a white blood cell count of $7.5 \times 10^3$/L, and serum amylase of 69 U/L. Electrolytes, urea, international normalized ratio and other routine analysis were all within normal values. He underwent CT scan which included head, cervical spine, chest, abdomen, and pelvis. Contrast enhanced computed tomography scan was obtained at the standard 70 seconds venous phase. The chest and abdominal radiographs were unremarkable. The CT abdomen and pelvis demonstrated a circumferential edematous wall thickening comprising the second and third parts of the duodenum and a suspicious area of wall defect associated with heterogeneous dense free fluid. The latter findings suggested a duodenal hematoma. There were no obvious injuries to the liver parenchyma, spleen, pancreas, renal parenchyma, adrenals, ureters, major vessels, psoas muscles, or the vertebral and pelvic bones (Fig. 1). CT scans of the head, cervical spine and chest did not reveal any abnormal findings. We performed a CT scan of the upper abdomen with 400 mL of water-soluble oral contrast, which confirmed the presence of leak into the retroperitoneal space (Fig. 2). There was no pneumoperitoneum or pneumoretroperitoneum detected. The rest of the injected contrast material passed the jejunum without obstruction. The patient had an exploratory laparotomy revealing an incomplete disruption of the third part of the duodenum with 50% of the duodenal circumference involving the lateral and posterior aspect (Fig. 3). Paraduodenal hematoma tinged with bile and right paracolic gutter nonpulsatile hematoma were detected
as well. There were no other apparent injuries within the adjacent solid organs. Primary repair of the duodenum with gastrojejunostomy and pyloric exclusion were done. The patient made an uneventful recovery and was discharged 8 days after surgery.

**Discussion**

DI accounts for approximately 3%-5% of all injuries to the abdominal organs [1–3]. Out of all DIs, 25% resulted from BAT, while the remaining percentage are from penetrating trauma [4]. DIs are even rarely reported [1–3], due to their anatomical position in relation to other organs, which can be a diagnostic challenge to physicians. Delay in the diagnosis and treatment beyond 24 hours raise mortality from 11% to 40% [6].

The mechanism of DI caused by BAT is considered to be complex when compared to penetrating trauma. It usually results from a severe frontal compression of the abdominal wall against the spinal column. It is mostly in relation to seat belt injuries, deceleration trauma, and handlebar compression trauma. Mechanisms of DIs related to sports, falls, and blows to the upper abdomen are less common [7].

In 2015, Santos et al. reviewed 15 published series that analyzed a total of 1042 patients with DI. The second portion of the duodenum accounts for 36% of all DIs, being the most common site affected, followed by the third portion, forth portion, and first portion with percentages of 18%, 15%, and 13%, respectively. Injuries in multiple portions were found in 18% of cases [8].

Diagram 2

**Fig. 2** – Coronal maximum intensity projection (MIP) of a complimentary CT scan after oral contrast revealed extravasation between the second and third part of the duodenum.

Diagram 3

**Fig. 3** – (3a) and (3b) Intraoperative images confirming the diagnosis of duodenal injury.

Injury to the duodenum due to BAT often co-exist with other visceral organs injuries or bone fractures [9]. The clinical symptoms can be vague or masked with co-existing injuries; leading to misdiagnosis and delay in the management with resultant increase in morbidity and mortality [8]. Therefore, a detailed history of the event is crucial. Symptoms of abdominal pain and vomiting are the key for DI [8,10]. Laboratory tests provide little help in the early diagnosis of DIs. Serum amylase level has a predictive value, although it may remain normal in the first 2 days of trauma in up to 40% of cases [7], as in our case. Ultrasound is a highly sensitive and specific screening tool used mainly to look for free fluid and gross solid organ injuries [11]. Abdominal X-ray (AXR) is useful in DIs only in case of positive extra-luminal air, which appears more commonly in penetrating trauma than in blunt [8]. Contrast enhanced computed tomography is the modality of choice in stable patients with BAT [10]. Findings of DI may present as duodenal wall defect, thickened wall, free fluid in adjacent space, with or without pneumoperitonium or pneumoretroperitonium [7,8]. However, CT scan could be negative in early onset of trauma, or with subtle findings in the form of minimal free fluid. If duodenal perforation is highly suspected; an oral contrast CT abdomen should be considered to rule out leak [7]. In our case,
the patient was evaluated with AXR and CT scan of the abdomen. Findings in AXR were inconclusive, however CT scan findings were significant for anterio-posterior wall defect of the second and third parts of the duodenum with periduodenal free fluid representing hematoma. To confirm leakage, we performed an oral contrast CT scan, which showed contrast leaking into the retroperitoneal space.

Treatment options vary according to the intraoperative findings. The American Association for the Surgery of Trauma (AAST) is the adopted system to evaluate DI and guide management. It classifies DI into grades I-V with the consideration to its anatomical site, the type of injury; hematoma, laceration, partial or complete disruption, and with or without involvement of ampulla of Vater and bile duct. No recent data on CT-based grading are available yet [7]. The surgical findings in our case were consistent with grade III laceration type of injury, and 50% disruption of the third part of duodenum.

Complications of DI are associated with a high rate of morbidity. They are mainly represented by duodenal fistulas and obstruction, which results from failure of surgical repair. Other complications such as intra-abdominal abscess, and recurrent pancreatitis were reported as well. DI mortality rate is determined according to the delay in injury recognition and repair time [8]. Snyder et al. reported a 50% mortality rate in patients who underwent delayed surgery, and a 50% incidence of fistula [12]. In the present case, the diagnosis was made early and the course was uneventful.

Conclusion

IDI is rare following BAT. Delay in the diagnosis is related to the site of injury and subtle clinical presentation. Contrast CT is recommended in patients with high index of suspicion for DI. Our case highlights an IDI at the second and third parts of the duodenum resulted from BAT. CT findings included thickened duodenal wall with free fluid in the surrounding structures, in the absence of other abnormalities. A subsequent contrast study confirmed our suspicion of IDI. Cautious interpretation of CT findings is critical in the recognition of IDI cases, direction of the surgical management, and achievement of better outcomes.

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