

Duodenum Injury in Blunt Abdominal Trauma, Incidence and Management

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Highlights

- Blunt abdominal injuries are very common after traffic accidents.
- It is difficult to diagnose isolated duodenum injuries and they are generally associated with multiple organ injuries.
- Quick diagnosis and management are very important to prevent complications.

ABSTRACT

Background and aim: Blunt abdominal trauma is hard to diagnose specially after accidents and is associated with high risk mandating quick diagnosis and management. The aim to determine the frequency of duodenal injury in blunt abdominal trauma.

Method: Various surgical procedures, and its post-surgery problems we conducted a retrospective study on 447 individuals who visited the emergency room complaining of blunt abdominal pain and analyzed them for causes and complications.

Results: The primary cause of trauma was traffic accidents, out of the 447 patients, 8.7% had duodenal injuries along with other injuries. The most effective diagnostic technique for stable patients in the diagnosis of duodenal injury was computed tomography (CT) with IV or oral contrast. The most frequently impacted site in the duodenum was in the second portion (41%), whereas the least affected site was in the fourth section (7.7%). The majority of injuries are of category II (53.8%), whilst those of grade IV and V are the least common. There were no solitary duodenal injuries among the linked injuries, which were primarily numerous (38.5%), with the pancreatic and colon being the least common.

Conclusion: It is challenging to determine if there is an isolated injury from nonspecific signs and symptoms in clinical examination, the most frequently occurring injury associated with duodenum is multiple organ injury, and the most effective treatment for duodenum injury in grades 2,3, and 4 is repair with three-tube decompression with a low percentage of post-operative complication.

Key words: blunt abdominal trauma, duodenum injury

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INTRODUCTION

Due to abdominal crushing or shearing forces, Duodenum damage occurs. It accounts for 0.2-2.7% of all laparotomies related to trauma. The incidence of duodenal injuries owing to blunt abdominal trauma is 11.2-26% (1-4). Due to the intimate anatomical connections to important organs, duodenal trauma typically results in one to four other abdominal organ injuries and an isolated injury is therefore uncommon. (4,5). Since it is located in the retroperitoneum it can be difficult to identify a duodenal damage that is isolated. This could result in delayed diagnosis, incorrect diagnosis, and inadequate treatment, which would increase fatality rates by up to 45% (6,7). An increased risk of injury and tearing in fixed sections of the intestine, such as the duodenum, results from direct compression between the abdominal wall and the spine in blunt abdominal trauma (8). Mortality rates associated with duodenal injuries have been found to range from 5% to 23%, while morbidity is known to range from 7% to 55% (9-11). Because the duodenum is a retroperitoneal organ and frequently does not show distinct clinical signs and symptoms right away, blunt duodenal injury is difficult to diagnose clinically (12). Patients who have sustained an acceleration/deceleration injury or who have had a violent anterior compression of the lower thoracic spine or abdomen are more likely to sustain one of these injuries (13). While isolated duodenal injuries are uncommon, the pancreas and the duodenum can both be hurt at the same time (14). Due to close relationships, the liver and colon are the most often affected organs in connection with duodenal injury. Anatomically, the second part of the duodenum is the most impacted, followed by the third, fourth, and first portions, Emergent laparotomy should be performed in unstable patients with suspected intra-abdominal injuries, while hemodynamically stable patients with substantial physical trauma typically undergo CT imaging. Isolated duodenal laceration and hemorrhage are uncommon, but they are possible (15-17). Unstable patients with suspected intra-abdominal injuries should receive an emergency laparotomy, while hemodynamically stable patients who have sustained considerable blunt trauma typically undergo CT scanning. The American Association for Trauma Surgery (AAST) (18) had duodenal injury graded on a scale of 1 to 5:

1. Grade I hematoma; just one duodenal segment is involved; partial thickness; no perforation.
2. Hematoma of grade II; more than one area affected. Alternately, laceration refers to a

circumference-less disturbance. Disruption of the second part of the duodenum's girth.

3. Grade III laceration. Or Laceration; disruption of the first, third, and fourth parts of the duodenum by 75% to 100%.
4. Grade IV laceration, involving the ampulla or distal portion of the common bile duct, and disrupting more than 75% of the second half of the duodenum. Massive disruption of the duodeno-pancreatic complex with grade V laceration, also known as vascular duodenum de-vascularization (19).

METHODS

We performed a retrospective study between November 2018 and November 2022. The inclusive criteria are:

- Patients who come to the Medical city hospital's emergency room in Baghdad complaining of blunt abdominal injury;
- Both gender;
- All ages;
- Stable patients who underwent computed tomography (CT);
- Unstable patients who required surgical interventions

A total of 447 cases were recorded. As these patients reach the emergency department, they are first given an ABCD resuscitation (Airway, Breathing, Compression and Defibrillator). Patients were analyzed with respect to cause of injury, degree and location of injury and the management followed. If surgery is performed, the colon was mobilized throughout all laparotomies using Kocherization movements to thoroughly investigate the duodenum. The majority of patients required repair with triple tube decompression, while some only required primary closure and a peritoneal drain after dealing with the duodenum injuries according to the grade of injury, the patients' general health, and other associated injuries through extended mid-line incision after general anesthesia. Roux-en-Y duodenojejunostomy and extremely few cases necessitate pyloric exclusion. Patients were monitored for two weeks after surgery by measuring fluid input and output using drains and daily dressings, and four-hourly vital sign checks to look for any postoperative issues, particularly those involving duodenal damage.

RESULTS

Out of the 447 patients with abdominal blunt

trauma 39 patients (8.7%) had duodenal injuries; the majority of these patients had acute abdominal symptoms. Stable patients were sent for imaging studies primarily (CT with contrast), while unstable patients were sent to the operating room for exploratory laparotomies after being given informed consent. All unstable patients underwent surgery within two to twenty-four hours of admission. Patients between 20-29 age range (*fig. 1*) were the most affected (46.1%) (18 patients), and the lowest affected age group was 10 to 19 (5.1%) (2 cases). 69.2% of the patients were male, 30.8% of the patients were female, as shown in *fig. 2*. Positive CT with contrast findings of duodenum injury were found in 89.7% of cases (35 patients), while erroneous negative findings for duodenal injury were found in 10.3% of instances (four patients) with no instances of false positives, as in *fig. 3*. All 39 of the duodenum-injured patients who had surgery had peritoneum that was yellowish in hue. The associated injuries with the duodenum were found to be: 5.1% (2 patients) associated with splenic injury, 7.6% (3 patients) associated with small bowel injury, 12.8% (5 cases) associated with liver injury, 10.2% (4 patients)

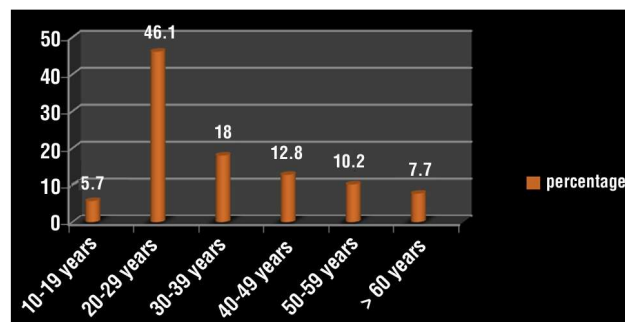


Figure 1 - Age distribution of the patients

associated with common bile duct injury, and 46.1% (18 patients) associated with multiple organs injury, pancreatic injury (*fig. 4*).

Grade II injuries made up 53.8% of all injuries (21 patients), whereas grade IV and V injuries made up the least amount of injuries. 2.5% One patient for each while grade I 33.3% (13 patients) and 3 patients (7.6%) with grade III type of injury as in *fig. 5*.

The most common site of duodenum injury is the second part 41% (16 patients) and the least site is the fourth parts 7.7% (3 patients) followed by multi-

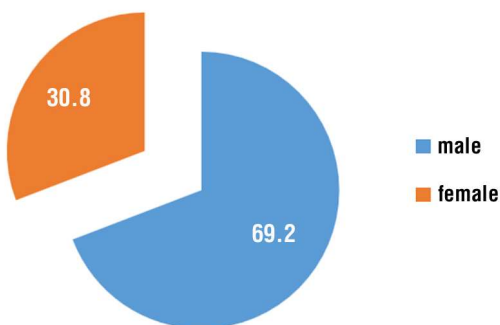


Figure 2 - Sex distribution of the patients

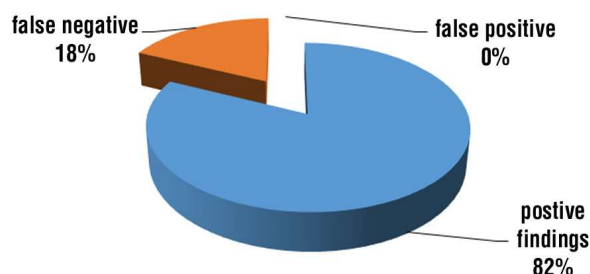


Figure 3 - CT findings

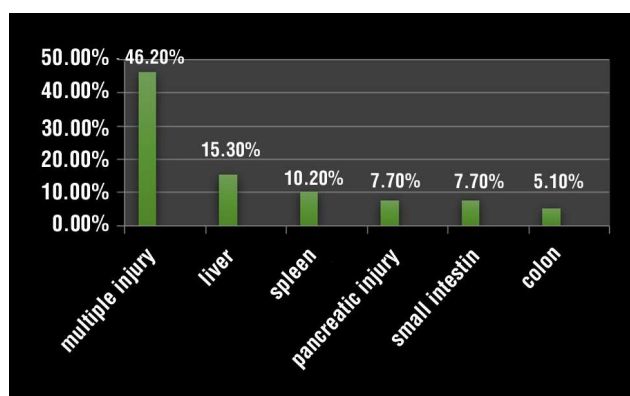


Figure 4 - Associated injuries with duodenum injury

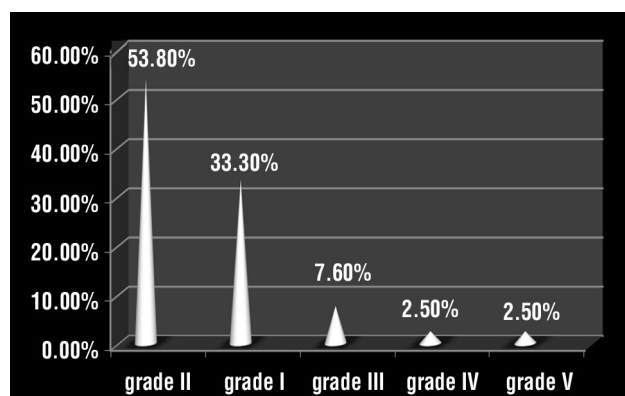


Figure 5 - Grade of duodenal injury

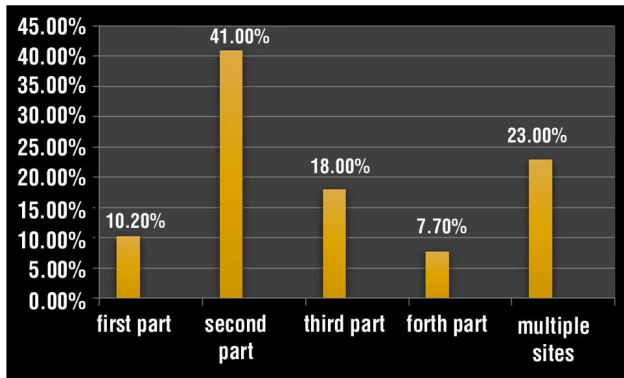


Figure 6 - Sites of duodenal injury

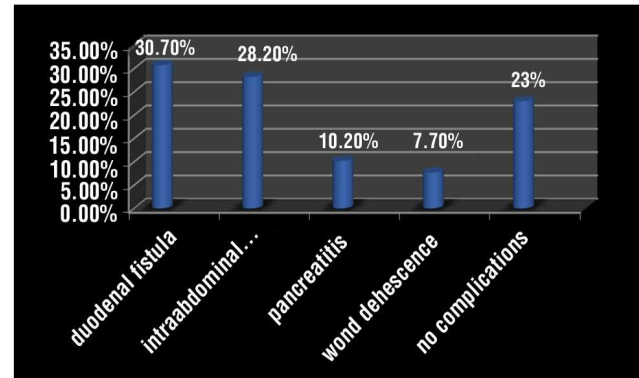


Figure 7 - Post-operative complications

ple site injury 23% (9 patients), while the third part 18% (7 patients) and first part affected in our study 10.2% (4 patients) as in *fig. 6*. Regarding the types of treatments carried out in our study, triple decompression repair accounted for 57% of cases, followed by primary closure (22%), pyloric exclusion (7%), and Roux-en-Y (14%). Wound dehiscence occurred in 3 patients (7.7%), intraabdominal abscess in 11 patients (28.2%), posttraumatic pancreatitis occurred in 4 patients (10.2%), and there were no sequelae in 9 patients (23.0%), according to *fig. 7*. As shown in *fig. 8*, duo-denum fistulas were the most frequent post-operative complications related to the duodenum injury.

The average length of stay in the hospital was 7 to 15 days, and 5.5% of patients (12.8%) died after surgery from complications related to duodenal leaks.

DISCUSSION

Early diagnosis of isolated duodenal injury in blunt abdominal trauma is typically challenging due to minor findings on physical examination. Blunt abdominal trauma is a rare condition because of its retroperitoneal location and critical tissues associated with it (2). For the majority of patients who merely have a duodenal hematoma without a perforation, surgery is not essential because the duodenal hematoma usually dissolves on its own in 1-4 weeks (4-6). In stable patients with traumatic abdominal injuries, CT with intravenous and intraluminal contrast is still the gold standard diagnostic test, despite its limits in differentiating between duodenal hematoma and duodenal perforation. In the instance that was reported, CT showed vigorous arterial extravasation along with duodenal and maybe pancreatic transection (20).

Duodenal damage can be treated in a number of techniques, from simple procedures like primary

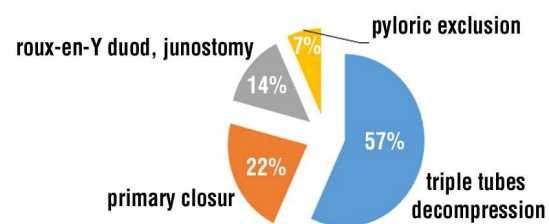


Figure 8 - Types of surgery performed as a management for duodenal trauma

closure (duodenorrhaphy) to more involved operations including pyloric exclusion, duodenal diverticulation, resection and anastomosis, and pancreaticoduodenectomy. Nonetheless, no one repair technique can totally rule out the chance of developing a duodenal fistula. Primary closure (duodenorrhaphy) in one or two layers, or by excision and anastomosis, is an appropriate management strategy for the majority of duodenal lesions (21). The incidence of duodenal injury in our study was (8.7%) which is relatively higher than reported in similar studies. According to Santos et al between 3.7% and 5% of patients with abdominal injuries had duodenal injuries, accounting for 4.3% of all cases (15).

Injuries to the duodenum are more frequently experienced by men (69.2%), according to various studies, including Santos et al (15). This can be attributed to the elevated incidence of traffic accidents, which can be attributed to the absence of regulations, inadequate enforcement, and a general lack of seatbelt usage among drivers in this region. Similar to Santos et al (15), approximately 46% of the population in our survey fell into the 20-29 age, which is the age of workers and students in our nation. This age group is also more vulnerable to street fights and violence which could lead to increased susceptibility to trauma.

Our results indicated that 81.8% of stable patients with blunt abdominal trauma had positive findings, 19.1% had false negative results, and there were no false positive results. This finding is consistent with other studies that have examined isolated duodenal injury following blunt abdominal trauma. According to Marah Ashi (22), roughly 46.2% of injuries experienced damage to the liver (15.3%) and spleen (10.2%) respectively. The liver is the most frequently affected organ when there has been trauma to the duodenum, according to Santos et al (15). In our investigation, the second section of the duodenum was the site most frequently affected by multiple site injuries (41%). This comes in concordance with Pandey et al where who reported 58% of cases with the second part injured (23).

In our analysis, grade 2 injuries made up roughly 53.8% of all cases, followed by grade 1 injuries, which made up 33.3%. This could be explained by the fact that the duodenum is situated deep within the abdomen, where it is best protected by the retroperitoneum. Our therapy and surgical options rely on the severity of the injury, therefore the most frequent technique performed on our patients was triple tube decompression repair, which was performed on roughly 57% of them. Similar to our study, this form of treatment promotes healing and reduces post-operative complications (23). Other types of therapy included primary sutures in 22% of cases, which increased the risk of duodenal fistula. Following the patients' post-operative care for two weeks, the most common complication was duodenal leak and duodenum fistula, which occurred in 30.7% of cases and was followed by an intraabdominal abscess in 28.2% of cases. Fortunately, 23% of individuals had no sequelae from grade 2 or 3 duodenal lesions. Although serious complications can arise after surgery, however, when promptly identified and properly managed, patients can achieve favorable outcomes with relatively low morbidity and mortality rates.

Limitation of study

Our study had a several limitations:

1. Our analysis just examines CT results from individuals who had duodenal trauma that was known to have occurred in the past. The number of other abdominal trauma patients with CT results comparable to or identical to those reported here was not counted. The characteristics that we list as helpful in identifying duodenal injuries—particularly in separating nonsurgical

duodenal hematomas from surgical duodenal perforations, which do not require surgery—need to be prospectively assessed in a group of subsequent patients who have suffered blunt abdominal trauma.

2. Ultimately, no definitive findings concerning the CT results that seem to be able to distinguish between the severity of duodenal injuries can be made due to the limited number of patients in our sample. To validate the results seen in our series, results from a greater number of patients need to be assessed.

CONCLUSION

Due to the organ's retroperitoneal location and high rate of concomitant injury because of its connections to other significant organs, it is challenging to determine if there is an isolated injury to the duodenum from non-specific signs and symptoms in clinical examination. The best way to diagnose duodenum injury in stable patients is a CT with contrast, and the most frequently occurring injury associated with duodenum is multiple organ injury. Since high-speed traffic accidents are the most common cause of duodenum injury in blunt abdominal trauma, strict laws governing high speed must be implemented in our nation. The most commonly associated injury with duodenum is multiple organs injury, the most effective treatment for duodenum injury in grades 2, 3, and 4 is repair with three-tube decompression with a low percentage of post-operative complication.

Author contribution

All authors contribute in all sections of the paper.

Conflict of interest

All authors declare that they have no commercial associations that might pose a conflict of interest in connection with the submitted article.

The authors have no conflicts of interest to disclose.

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