

To Observe the Treatment Outcomes of Duodenal Injury in Penetrating and Blunt Trauma Patients

MUHAMMAD ASIF¹, MUHAMMAD AAMIR JAMIL², IMRAN YOUSAF³, MUHAMMAD FAHEEM ANWER⁴, MUHAMMAD WASEEM ANWAR⁵

¹Assistant Prof. of Surgery, M. Islam Teaching Hospital, Gujranwala

²Senior Registrar of Surgery, Shaikh Zayed Hospital, Lahore

³Senior Registrar of Surgery, Pak Red Crescent Medical and Dental College, Dina Nath, Kasur

⁴Associate Prof. of Surgery, CMH Lahore

⁵Assistant Prof. of Surgery, CMH Lahore

Correspondence to Dr. Muhammad Asif., Email: drasif5797@gmail.com Mob: 0300-6429757

ABSTRACT

Aim: To study about the management of duodenal injury in two clinical aspects, blunt and penetrating injury, along with its complications.

Study design: Observational case series.

Place and duration of study: Accident & Emergency and General Surgery Departments at M. Islam Teaching Hospital, Gujranwala from March 2019 to March 2020.

Methodology: One hundred patients presenting in Accident & Emergency and General Surgical Department of with penetrating chest trauma as diagnosed clinically were included. Routine investigations like complete blood tests, X-rays and special investigations i.e. ultrasound, CT scan were done only in cases where patients were stable. Each hemithorax was divided into medial and lateral hemithorax by an imaginary line drawn longitudinally from clavicle down to the costal margin passing through the nipple. All patients were observed for the type of treatment they were getting i.e. thoracotomy or tube thoracostomy. Patients who were initially treated with tube thoracostomy were cautiously observed for any developing indications for thoracotomy. If such indications arose thoracotomy would be arranged at the earliest possible.

Results: A total of 100 patients, 85 (85%) were males and 15 (15%) were females. Male to female ratio was 5.66:1. The mean age of patient was 35.65±9.75 years. There were 38 (38%) had road traffic accidents, 10 (10%) were fall, 7 (7%) injured with fight, 41 (41%) victims of firearm injury and only 4 (4%) victims of stab. The mean blood pressure was 82.15±7.97mmHg. Eighty five (85%) patients were stay in the hospital for 2 weeks and while 15 (15%) were hospital stay >2 weeks. The mean values of hospital stay was 12.45±4.16 days.

Conclusion: It is concluded that penetrating thoracic trauma is a major cause of morbidity and mortality. The overall complications rate for blunt trauma injuries after adequate treatment is 18% and mortality rate is 8%.

Keywords: Blunt trauma, Thorocotomy, Tube thoracostomy, Pneumothorax

INTRODUCTION

Duodenal injury is a challenge to a trauma surgeon, because the retroperitoneal location. When the patients identified, the current associated with the other abdominal injuries and increased the rate of morbidity and mortality. The estimates of duodenal lesions occur in all patients is 4.3% with the abdominal injuries, from 3.7-5% and their anatomical proximity to other organs.^{1,2} Although all these factor create intraoperative dilemmas in the surgical management of duodenal injuries.³ The blunt duodenal injuries are relatively rare, but the diagnosis is usually delayed resulting in significant morbidity and mortality. The blunt trauma accounts for 11.2–26% of this injury.^{4,5} In a study reported by Huerta, the mortality and morbidity ranges from 6-25% and 30-60% respectively in blunt duodenal injuries.⁶

The management of the injured duodenal varies according to severity of the duodenal injury and duration of injury before the diagnosis⁷. Duodenal fistulas are serious complication with morbidity. The recent reports reveal a significant improvement in morbidity and mortality of duodenal injury and with traumatic gastrointestinal injury⁸. The past incidence is still relatively high with an overall morbidity rate of 50 to 60% and mortality rate of 0-7%.⁴

The treatment of the ruptured duodenum has been a surgical challenge to the trauma surgeons. This management purpose is to prevent duodenal fistula which is a serious complication of mortality⁷. The most of duodenal wounds of blunt trauma can be successfully treated by simple suture repair and few patients require some other operations to protect the repaired duodenal suture line or to make the leakage⁸. Various other procedures have been advocated since the beginning of the 20th century and among them, pyloric exclusion is currently one of the most widely used methods⁹.

MATERIALS AND METHODS

After the approval of hospital ethical committee, a total of 100 patients were included in this study. All the patients of blunt trauma, abdominal injury were received in the Department of Accident & Emergency and admitted in Surgical Department. The diagnosis was confirmed by clinical examination, radiological investigations. All data was collected of hospital admitted patients and recorded i.e. sex, age, grade of duodenal injury, number and size of lesions, associated abdominal injuries, surgical procedure performed, presence and type of complications and duodenal related morbidity and mortality. All operations were performed in surgical operation theatre. All the data was entered in computer and analyzed with the help of SPSS 20 computer software programme. The frequency of complications was calculated as percentage.

RESULTS

There were 85 (85%) male patients and 15(15%) patients were female and male to female ratio was 5.66:1 (Table 1). The mean age of the patients was 35.65±9.75 years and divided in four age groups. Most of the patients were 45 (45%) in age group from 31-40 years. Twenty five (25%) patients were in age group between 20-30 year, 20(20%) patients were in age group between 41-50 years. Only 10(10%) patients were in age group >50 years (Table 2). Thirty eight (38%) patients were met road traffic accident of blunt trauma, 10(10%) were fall from height, 7 (7%) were injured with fight. There were 41(41%) patients had firearm injury and only 4(4%) had stab (Table 3). Table 4 showed the most common operative procedure 48(48%) performed was with tube duodenostomy, gastrojejunostomy and feeding jejunostomy of patients and had primary repair 23(23%) patients in second part of duodenum. Nineteen (19%) patients had triple tube procedure of 2x2cm² perforation in second part of duodenum. Ten (10%) patients had Whipple procedure of 3x3cm² perforation in the second part of duodenum and transaction of common bile duct and shattered head

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of pancreas. The most common complication encountered postoperatively were duodenal fistula 7(7%), pancreatic fistula had in 5(5%) patients while 6(6%) patients had wound dehiscence and 8(8%) patients were expired postoperatively (Table 5). Out of 100, 88(88%) patients remained in the hospital for a period of upto 2 weeks while 12(12%) patients required hospital stay for more than 2 weeks. The mean±SD values of hospital stay was 9.43±3.37 days (Table 6).

Table 1: Gender distribution of patients (n=100)

Gender	No.	%
Male	85	85.0
Female	15	15.0

Male to female ratio: 5.66:1

Table 2: Age distribution of patients (n=100)

Age (years)	No.	%
20–30	25	25.0
31–40	45	45.0
41–50	20	20.0

Mean±SD = 35.65±9.75

Table 3: Frequency type of injury (n=100)

Findings	No.	%
Blunt trauma		
Road traffic accident	38	38.0
Fall	10	10.0
Fight	7	7.0
Penetrating		
Firearm injury	41	41.0
Stab	4	4.0

Table 4: Surgical procedures of patients (n=100)

Procedures	No.	%
Tube duodenostomy + Gastrojejunostomy + Feeding jejunostomy	48	48.0
Primary repair	23	23.0
Tripple tube	19	19.0
Whipple	10	10.0

Table 5: Postoperative complications of patients (n=100)

Complications	No.	%
Duodenal fistula	7	7.0
Pancreatic fistula	5	5.0
Wound dehiscence	6	6.0
Death	8	8.0

Table 6: Distribution of patients according to hospital stay (n=100)

Hospital stay (weeks)	No.	%
<2	88	88.0
>2	12	12.0
Mean±SD	9.43±3.37 days	

DISCUSSION

The incidence of duodenal injuries is related to the geographic setting of the traumatic incident. Penetrating trauma accounts for 78% of all duodenal injuries, whereas blunt trauma accounts for 22%. Retroperitoneal duodenal ruptures caused by blunt trauma occur only rarely. The second portion of the duodenum is injured more often than any other portion and poses greater technical difficulties for surgical management. Injuries affecting multiple portions of the duodenum occur with a frequency of 14%, resulting in greater technical challenges to the surgeon.

A study reported by Bozkurt, the leading cause of duodenum trauma was penetrating injuries predominantly due to road traffic accident, fall from height and fight injuries. The second common cause of duodenal injuries was penetrating injuries like firearm injuries and stab injuries in some cases. There was 21(42%) patients had firearm injuries and 3(5%) of patients had stab injuries. In blunt trauma there were 19(38%) had road traffic accident, 5(10%) patients had fall from height and only 3(6%) of patients had injuries in different type of fights.⁴ According to study of Chand

78.12% cases were due to penetrating injuries predominantly firearm injuries and 22.98% were due to blunt trauma second part of duodenum was found to be the most commonly injured site in 53% case which is comparable with our study.¹⁰ In a study carried out by Pandey, the duodenal injury was more prevalent due to penetrating injuries (57%) than blunt injuries (43%) of abdomen. Most of the patients of penetrating injury had reported to hospital within 6 hours while in blunt trauma they reported to hospital in between 12 and 24 hours.¹¹ In a collective review of different series containing 1408 patients with duodenal injuries, reported an average incidence of duodenal fistula for 6.6%. Other complications reported with duodenal trauma include intra-abdominal abscess, pancreatitis, duodenal obstruction and bile duct fistula.¹²

In our study 44 (88%) were male patients and only 6 (12%) patients were female. The male to female ratio was 7.33:1. In a study reported by Chand there were 29 (90.6%) male and 3 (9.4%) female with male to female ratio of 9.66:1 which is comparable with the current study.¹⁰ Another study reported by Moore the males constitute the great majority of patients with penetrating trauma injuries across the United States and the world. In some areas of the United States, approximately 90% of patients with penetrating trauma are male.¹³ A similar study done by Murakami, the male patients was 79% which is comparable with our study.¹⁴ In this study most of the patients were between 31-40 years of age group with mean±SD 35.65±9.75 years. A same study according to Moore, the blunt duodenal injuries are the leading cause of death in patients aged 10-50 years.¹⁴

In a study reported the prompt diagnosis and efficient treatment of duodenal injury is crucial, with evidence demonstrated by Pandey suggesting that a delay in diagnosis and treatment of more than 24 hours after injury can increase mortality from 11% to 40%.¹¹ However, the diagnosis is difficult unless a high index of suspicion is maintained in all cases of abdominal trauma, which otherwise may lead to misdiagnosis or delay in diagnosis. Ultrasound can be performed initially to rule out other injuries to intra-abdominal organs and vessels but, is an inadequate test for pancreatoco-duodenal area.¹⁵ Another study reported currently, contrast enhanced CT (CECT) is the diagnostic test of choice in stable patients with blunt abdominal trauma. The presence of retroperitoneal extra luminal air on CT is an important sign of duodenal injury requiring surgical repair. In fact, in this way, it may be possible to demonstrate the extravasations of contrast media in the presence of laceration. However, in some cases even CT scan can be negative at admission, or subtle CT findings such as small amount of unexplained fluid and unusual bowel morphology can be underestimated and dismissed.^{16,17} In a study carried out by Ladd, for these reasons, subtle findings on abdominal CT should be an indication for urgent laparotomy or explorative laparoscopy. In our study, all the patients were evaluated with plain X-ray of abdomen, ultrasonography and CT scan. We observed that the findings of CT were always significant as compared to other radiological investigations. Serum amylase level might be helpful, since persistently increased or rising level can be an indication of a lesion in the duodeno-pancreatic area. The treatment of duodenal injuries is based on the underlying etiology, severity of the injury, associated injuries to intra and extra-abdominal organ systems, and duration of delay in diagnosis.¹⁸

In our study the overall postoperatively mortality rate was 8% which is comparable with other national and international studies. A study done by Garcia the rate of mortality has varied according to the severity of organ injury which is comparable with our study.^{19,20} In a similar study reported by Lai the duodenal injuries have high morbidity and mortality rates (5.3%–30%, respectively).⁸ A study done by Bashir the mortality rate was 10-30%.²¹ The morbidity and mortality depends on factors such as severity of chest injury, condition of the underlying lungs, associated extra-thoracic injuries especially to head, abdomen and long bones. Road traffic accidents, firearm injuries, falls from heights, blasts, stabs and other acts of violence are the causative mechanisms involved.³ According to study of Chand the most common operative procedure performed

was primary repair with and without tube duodenostomy. Postoperatively 6.25% cases developed duodenal fistula, and the overall morbidity was found to be 32.37% and mortality 28% which is comparable with our study.¹⁰ Another study done by Ladd complications, such as fistula formation and postoperative chest infection, are more common after the repair of duodenal injuries (2%-14%).¹⁸ In another study done by Chen the overall mortality rate of duodenal injuries remains to be significant, with an average incidence of 17%¹².

These varieties of options should confirm the need of an expert chest surgeon, within the hospital to deal with this kind of trauma. This study suggests that majority of patients sustaining penetrating chest trauma can be managed by initial resuscitation and tube thoracostomy. Moreover thoracotomy has a definitive role in a group of patients who continue to bleed after tube thoracostomy, patients who sustain trauma to major airway, or patients presenting later with missed injuries or complications. The overall hospital stay of the patients after having sustained penetrating chest trauma was observed. The mean duration of hospital stay was 9.43±3.37 days with patients undergoing thoracotomies in emergency and the ones developing complications as a result of trauma staying in the hospital for longer durations.

CONCLUSION

It is concluded that the most commonly duodenal injury were second part of duodenum injury and manage with successfully primary repair with or without tube duodenostomy, triple tube, gastrojejunostomy, feeding jejunostomy and Whipple. The complicated injuries need more sophisticated operation techniques and followed by a high incidence of postoperative complications especially in duodenal fistula. In our study the overall complications rate for blunt trauma injuries after adequate treatment is 18% and mortality rate is 8%.

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