ORIGINAL ARTICLE

Tube Duodenostomy - A Safe Approach for the Management of 'Complex Duodenal Injuries' in Poly Trauma Patients

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ABSTACT

Though duodenal injuries are uncommon injuries but are associated with significant morbidity and mortality. A simplistic approach with primary repair with or with out tube Duodenostomy is ideal for the vast majority of cases, particularly grade III, IV duodenal injuries in poly trauma patients, where as primary repair alone is recommended for uncomplicated grade I and II injuries. Complex procedure such as pyloric exclusion with or without gastrojejunostomy may be indicated for delayed treatment or severe, high grade combined pancreatico duodenal injuries. A high index of early diagnosis and a judicious treatment plan based on a careful consideration of all the available options are essential for optimum outcome.

Key words: Tube Duodenostomy; Duodenal injury;

INTODUCTION

The management of duodenal injuries has remained controversial in the injuries of the gastro-intestinal tract among the trauma surgeons. The retroperitoneal location of the duodenum, its proximity to important abdominal structures, marginal blood supply, the biliary, pancreatic and gastrointestinal secretions it contains, and delay in diagnosis of its injuries, cause difficulties in intra operative management of its injuries. There is high incidence of duodenal leakage due to blow out. To avoid duodenal blow out duodenal decompression in the form of tube duodenostomy is advocated in complex grade III, IV injuries. The purpose of this study is to made guidelines and suggest simple and safe surgical procedure for young trauma surgeons dealing with severely injured poly trauma patients having duodenal injuries, because complex duodenal repair is time consuming and technically challenging. In this study we retrospectively analyzed our experience with management of duodenal injuries particularly with reference to 'Tube Duodenostomy', a safe damage control procedure in complex duodenal injuries in poly trauma patients.

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MATERIALS & METHODS

Sixty seven patients with duodenal injuries were treated at the Department of General Surgery District Headquarters (Teaching) Hospital Rawalpindi from January 1999 to December 2009. The definitive diagnosis of duodenal injury was obtained at laprotomy in all patients.

All data were collected from hospital patient's record. For each patient, the following data were recorded from the documents: age, sex, grade of duodenal injuries, anatomical location of duodenal injury, associated abdominal organ injuries, surgical procedure performed, complications and duodenum related morbidity and mortality.

The duodenal injuries were classified in all patients as grade I to V using the duodenal organ injury scale (DIS) according to AAST (American Association for the Surgery of Trauma) (Table-I).

The duodenal injury repair methods used were primary repair (PR), repair with tube Duodenostomy (RTd), and complex repair (CR). PR was defined as simple closure of the duodenal perforation with absorbable suture materials. RTd was defined as simple closure of the duodenal injury and placement of a tube into the duodenum for decompression. CR include a variety of methods like pyloric exclusion, pancreatico- duodenectomy etc. Primary repair with Tube Duodenostomy by inserting 18Fr Foleys' catheter was performed in all grade III and IV injuries. A tube drain was placed in Para duodenal space. All associated intra abdominal injuries were treated on their merit. Third generation cephalosporin was given as prophylactic antibiotic and continued post operatively where indicated. Duodenostomy tube was removed after two weeks and patients remained on total parental nutrition during this period. We

specifically analyzed our results of primary repair with tube Duodenostomy with reference to morbidity and mortality.

Table-I: Duodenum Organ Injury Scale According to AAST (American Association for the Surgery of Trauma)

Grade	Extent of injury	Injury Description
I	Haematoma Laceration	Involving single portion of duodenum, partial thickness, no perforation
II	Haematoma Laceration	Involving more than one portion, Disruption<50% of circumference
III	Laceration	Disruption 50-75% of circumference of D2 Disruption 50-100%of circumference of D1, D3, D4
IV	Laceration	Disruption > 75% of circumference of D2 , involving ampula or distal common bile duct
V	Laceration Vascular	Massive disruption of duodenopancreatic complex, Devascularization of duodenum

D1: 1st part of duodenum; D2: 2nd part of duodenum; D3: Third part of duodenum; D4: 4th part of duodenum

RESULTS

During the 10 years period, (1999-2009), the incidence of duodenal trauma was 3.1% (67 patients) among 2159 abdominal trauma patients operated in surgical unit DHQ (Teaching) Hospital Rawalpindi.

The patients were mostly young with an average age of 30 years (Range 15-70 years). There was male predominance with 46 males (68.6%) and 21 females (31.1%). (Table-II)

According to mechanism of injury, the duodenal injury incidence rate was 58.20% (39 patients) due to Gunshot wounds, 26.08% (18 patients) due to Blunt trauma abdomen and 14.92% (10 patients) due to stab wounds. (Table-II)

Table-II: Patients' demographics and Mode of injury

	=n	%age
Male	46	68.6
Female	21	31.1
Age	15-70 (mean 29.9)	
Injury mechanism		
Gunshot	39	58.20
Blunt trauma	18	26.08
Stab wounds	10	14.92

Duodenal injury severity (DIS) according to American Association of Trauma Surgery is given in Table-III.

Table-III: Duodenal Injury Severity (DIS)

Grade	=n	%age
I	14	20.89
II	20	29.85
III	17	25.37
IV	11	16.41
V	05	07.46

The majority of duodenal injuries were managed by primary repair 34 patients, (50.7%) followed by primary repair combined with duodenal decompression with Tube Duodenostomy in 25 patients, (37.31%). Complex duodenal repair was performed in 08 patients: (11.94 %), Table-IV.

Table-IV: Operative procedures performed

Procedure	=n	%age
Primary repair (PR)	34	50.74
Primary repair & tube Duodenostomy (Rtd)	25	37.03
Complex repair (CR)	08	11.94

Out of total 67 patients, 59 patients (88%) had associated intra abdominal organ injuries which were managed on their merit. The most commonly injured associated organ was liver (31 patients) followed by stomach (26) small bowel (23), colon (19), and gall bladder (17 patients). The injured abdominal organ along with surgical intervention are given in Table-V.

Table-V: Associated intra abdominal organ injuries

Organ	=n	Intervention
Liver	31	Suture ligation
Stomach	26	Primary repair
Colon	19	Exteriorisation
Pancrease	05	Drainage 04 Pancreatectomy 01
Gall Bladder	17	Cholecystectomy
Small Bowel	23	Primary repair
Inferior vena cava	07	Repair
Right Kidney	11	Nephrectomy
Diaphragm	03	Repair
Retro peritoneal Haematoma	13	Exploration & drainage

Out of total 67 patients, 23 patients (34.3) have hemorrhagic shock on admission to emergency room. Five (7%) of these 23 patients died per operatively.

The morbidity related to primary repair with duodenal decompression with tube Duodenostomy in grade III, IV injuries is presented in Table VI. The morbidity causes were, displacement of Duodenostomy tube 3(10.71) patients, with subsequent secondary peritonitis in 2(7.1%) patients, subpherenic/subhepatic collection in 4(14.28%) patients. Para duodenal skin excoriation occurred in 5(17.85%) patients. Only one patient among primary repair with tube Duodenostomy group died due to

multiple organ dysfunction syndromes (MODS) secondary to high out put duodenal fistula. While 2 patients among complex repair group died due to disruption of repair and secondary peritonitis leading to multi organ failure (Table VII).

Table VI: Tube Duodenostomy related complications

Complications	=n	%age
Displacement of Duodenostomy tube	03	10.71
Secondary Peritonitis	02	07.01
Subpherinic /Subdiaphragmatic collection	04	14.28
Para Duodenostomy skin excoriation	05	17.85
Repair- tube duodenostomy related mortality	01	03.57

Table VII: Complex repair related complications

Complications	=n	%age
Disruption & secondary peritonitis	2	25
Sub pherenic / Sub diaphragmatic	1	12.5
Mortality	2	25

DISCUSSION

Duodenal injury management is a challenging problem in trauma surgery because of the complex treatment and infrequent occurrence duodenal injury is the indication for 3.7% of all laparotomies for trauma[1] and is rarely presented as an isolated injury. The liver is the most frequently associated injured organ in poly trauma patients[2].

The major mechanism of injury in different studies was penetrating abdominal injury (88%) and Gunshot wounds accounted for (80%) of penetrating abdominal injuries in our study[3].

Mortality and morbidity rates following trauma to duodenum continue to be higher. The operative management of duodenal injuries remained controversial[3]. There is wide range of operative options available depending upon the grade and severity of duodenal injury ranging from simple repair to triple ostomies and pancreatico duodenectomy. All these options are not suitable for every patient with duodenal injury and are technically demanding and time consuming[4].

Simple primary repair such as simple closure or duodenorraphy is an adequate method. If there is risk that primary repair would narrow the lumen or in cases of severe grade III, IV injuries, pedicled mucosal graft, jejunal serosal patches, omental patch only, pyloric exclusion and Roux-en-Y reconstruction can provide an alternative[5,6]. These procedures may not be safe in the hands of young trauma surgeons dealing with poly trauma patients.

Grade I and II duodenal injuries in stable patients can safely be managed with simple repair However in patients with poly trauma, haemo-dynamically instability and patients with complex grade III, IV duodenal injuries. Primary repair may lead to increased rate of re-exploration due to duodenal repair dehiscence.

Primary repair with duodenal decompression with Tube Duodenostomy is an alternative, simple, safe option for all these complex cases. Tube Duodenostomy was first introduced by Stone and Fabian, as triple ostomy (gastrostomy, duodenostomy, and jajunostomy)[8,9]. They had 237 patients and observed only one duodenal fistula when tube decompression was used, while among 44 patients without the duodenal decompression, eight patients had duodenal fistulas. The idea of tube Duodenostomy is to protect the suture line in the duodenum. Some authors have supported tube duodenostomy[11,12] while others have not[4,7].

In our study though having small number of cases, we found that duodenal decompression with primary repair is a safe, simple and effective procedure in the management of grade III, IV complex duodenal injuries in term of early deaths by reducing operative time in severely injured poly trauma patients. Which is also supported by the emerging concept of damage control surgery, that recommends minimum safe and simple life saving surgical intervention can reduce immediate mortality in trauma patients[2].

Ivatury and colleagues have published several reports regarding the management of duodenal injuries. In their recent report they classified treatment according to the hemodynamic status of the patients[7]. They pointed out that in hemo-dynamically unstable patients, a damage control approach should be adopted to avoid early deaths and for hemodynamically stable patients more complex duodenal repair procedures can be considered.

In our study we found that the patients outcome as for as duodenal injury related mortality concerned, remained very low (01 patient) by adapting the procedure of primary repair with duodenal decompression with tube duodenostomy in complex grade III and IV duodenal injuries by reducing duodenal repair dehiscence. With our experience of management of duodenal injuries, we suggest that most of grade I and II duodenal injuries can be primarily repaired; where as in grade III and IV complex injuries primary repair with duodenal decompression with tube duodenostomy should be considered.

CONCLUSION

The aim of this study was to report our experience with duodenal injuries and determine if primary

repair, and /or tube duodenostomy, and complex repairs are valid option for definitive operative repair of severe duodenal injuries. Our experience suggest that the use of primary repair with duodenal decompression with tube duodenostomy is a simple and safe option in complex grade III ,IV injuries in poly trauma patients, where as primary repair alone is recommended for uncomplicated grade I and II duodenal injuries. Early diagnosis, prompt resuscitation and operation and a tailor made approach in expert hands leads to better outcome.

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