

Management of Duodeno-Jejunal Flexure Transection after Blunt Trauma - A Modified Approach

Mahim Koshariya, Vidhu Khare*, Sourabh Mishra, Rahul Rathod, Sagar Maggo, Shivangi Pandey, Arshad Khan, Vijay Tekam, M.C.Songra

Department of Surgery, Gandhi Medical College and Associated Hamidia Hospital, Bhopal, India

*Corresponding author:

Dr. Vidhu Shekhar Khare
Department of Surgery,
Gandhi Medical College and
Associated Hamidia Hospital,
Bhopal, MP, India, 462001
E-mail: vidfriendcircle@gmail.com

Rezumat

Managementul secționării post-traumatice a flexurii duodeno-jejunală în urma contuziilor abdominale - o metodă alternativă

Context: Leziunile intestinului subțire sunt rareori consecința contuziilor abdominale și, de obicei, afectează segmentul intestinal fix. Gestionarea prematură a unor astfel de leziuni are ca rezultat o fistulă entero-cutanată cu debit crescut. În mod tradițional, tratamentul perforațiilor de la nivelul flexurii duodeno-jejunale constă în excluderea pilorului prin gastrojejunostomie. Dovezi mai recente sugerează că enterorafia primară sau anastomoza termino-terminală duodeno-jejunală protejată printr-o duodenostomie dirijată cu tub extern pot fi la fel de eficiente.

Obiectiv: Obiectivul studiului este de a oferi o variantă alternativă de gestionare a leziunilor de flexură duodeno-jejunală prin evitarea duodenostomiei dirijate pe tub extern.

Material și metode: Pacienții internați în perioada 1 iulie 2015 - 1 iunie 2018 au fost identificați și examinați pentru prezența leziunilor de flexură duodeno-jejunală. Au fost excluse cazurile de leziuni non-accidentale.

Rezultate: În perioada studiului, s-au identificat 10 cazuri de secționare intestinală post-traumatică la nivelul flexurii duodeno-jejunale. Toți cei 10 pacienți au fost internați în stare de șoc, la 24 de ore după momentul traumatismului. După resuscitare volemică și investigații paraclinice, s-a practicat laparotomia în urgență. Duodenul a fost mobilizat în întregime, capetele secționate au fost debridate și s-a practicat anastomoză duodeno-jejunală termino-terminală în două straturi. Un tub nazojejunal (NJ) de 18-French a fost plasat distal de anastomoză și un tub nazogastric (NG) de 18-

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French a fost plasat în stomac pentru decompresie gastrică. În toate cazurile s-a efectuat o jejunostomă de alimentație. Ambele tuburi NG și NJ au fost îndepărtate după ce intestinele și-au recăpătat mișcările peristaltice, iar jejunostoma de alimentație a fost suprimată la primul control postoperator. Nu au existat complicații la nivelul duodenului. Evoluția postoperatorie a fost favorabilă în toate cazurile.

Discuții și concluzie: plasarea tuburilor nazojejunal și nazogastric elimină necesitatea duodenostomiei sau, respectiv, a gastrostomiei. Această metodă protejează anastomoza duodeno-jejunală și scade rata complicațiilor duodenale.

Cuvinte cheie: contuzie abdominală, secționarea flexurii duodeno-jejunale, abordare modificată, decompresie nazogastrică, decompresie nazojejunală

Abstract

Background: Small bowel injuries are infrequent after blunt trauma and typically affect fixed segment. Untimely management of such injuries, results in high-output entero-cutaneous fistula which increases morbidity and mortality. Treatment of duodeno-jejunal flexure transection has been traditionally done by pyloric exclusion with gastrojejunostomy, but more recent evidence suggests that end-to-end anastomosis or primary closure may be equally effective in which duodeno-jejunal anastomosis is protected via an external tube duodenostomy.

Objective: The objective of the study is to provide a modification to the technique of management of duodeno-jejunal flexure injury, avoiding external tube duodenostomy.

Material and Methods: Patients admitted from July 1, 2015 to June 1, 2018 were identified and examined for duodeno-jejunal flexure transection. Non-accidental injury cases were excluded.

Results: In the study period, a total of 10 patients were admitted with duodeno-jejunal flexure transection. All cases were admitted 24 hours after the injury and presented with shock. After fluid resuscitation and investigations, they were taken for urgent laparotomy. The whole of duodenum was mobilised, the transected ends were debrided and end-to-end duodenojejunal anastomosis was performed in two-layer fashion. An 18-French Nasojejunal (NJ) tube was placed beyond the anastomosis, and an 18-French nasogastric (NG) tube was placed in the stomach for gastric decompression. A feeding jejunostomy was performed in all cases. Both NG and NJ tubes were removed after bowel movements started and FJ was removed on first follow up. There was no incidence of duodenum related complications, and all were doing well on follow up.

Discussion and Conclusion: Placing the nasojejunal and nasogastric tube eliminates the need for duodenostomy and gastrostomy, respectively. This method protects the duodeno-jejunal anastomosis and decreases the incidence of duodenum-related complications.

Key words: Blunt trauma, duodeno-jejunal flexure transection, modified approach, nasogastric decompression, nasojejunal decompression

Introduction

Small Bowel Injuries are relatively uncommon after blunt trauma and typically affect fixed bowel segments viz. the duodenum, duodeno-jejunal (duodeno-jejunal) flexure, proximal jejunum, and terminal ileum. Duodenal

injuries occur in 4.3% of all patients with abdominal injuries, ranging from 3.7% to 5%. The duodenum is rarely injured alone, because of its proximity to other important organs. The occurrence of multiple associated injuries is the rule, not the exception.

The liver is the most injured organ along

with the duodenum with a frequency of 17%. Other organs include the colon (13%); the pancreas (12%); the small intestine (11%); the stomach (9%), and vascular injuries (arterial and venous) (15%).

The mechanism of injury is complex in the case of blunt injuries when both ends may be blunt, and duodenal injuries are a consequence of crushing or compression. Crush injuries usually occur when a direct force is applied against the abdominal wall and transmitted to the duodenum, which is then projected against the spinal column, on which it lies, for example, when the steering wheel impacts the epigastrium. They also occur when acceleration and deceleration forces act on the mobile and non-mobile portions of the duodenum, such as during a fall from a great height (1). Untimely management of such injuries, especially transection at duodeno-jejunal flexure, typically results in a difficult high-output entero-cutaneous fistula. There have been extensive research and trials on different surgical techniques to repair duodenal and duodenopancreatic injuries, from duodenorrhaphy with external drainage/duodenostomy tube, triple-ostomies (gastrostomy, duodenostomy and jejunostomy), serosal and mucosal patches to duodenal resection (1). Management of Duodeno-Jejunal flexure transection has traditionally been done by pyloric exclusion with gastrojejunostomy, but recent evidence

has suggested that end-to-end anastomosis or primary closure may be equally effective in which the Duodeno-Jejunal anastomosis is protected by external tube duodenostomy. A novel approach has been suggested by Sarada P Sahoo et al. which involves simultaneous use of a nasogastric and a nasojejunal tube for decompression avoiding external tube duodenostomy (2) (*Fig. 1*).

Material and Method

Patients admitted from July 1, 2014 to June 1, 2018 were identified and examined for duodeno-jejunal flexure transection. The center is a tertiary healthcare center, addressing population of around 14,660,000, which is fifth of the population of the state it is in. Cases due to non-accidental injury were excluded. In the study period, 10 patients were admitted for duodeno-jejunal flexure transection.

Operative Method

After stabilisation of the patients, they were taken for urgent laparotomy and repair. No laparoscopic approach was used for initial visualisation. Initial repair was preordained for all cases as per the institutional protocol. Mobilisation of second and proximal third of the duodenum was done by Kocher's and Cattell's manoeuvre. Distal third part of

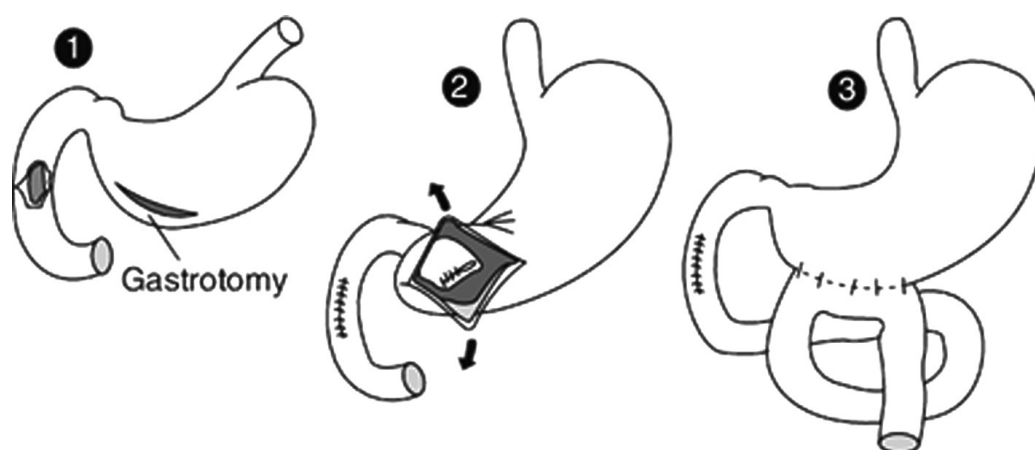


Figure 1. Traditional technique of duodeno-jejunal flexure transection repair: 1. gastrostomy, 2. primary repair and pyloric exclusion, 3. formation of gastrojejunostomy

duodenum was mobilised by dividing the parietal fold inferior to the paraduodenal fossa. The fourth part was mobilised by freeing the ligament of Treitz. the Duodeno-Jejunal flexure was mobilised allowing duodenum and jejunum to be in a linear orientation. The transected ends were debrided back to healthy tissue and an end-to-end duodeno-jejunosomy was performed in two layers, using interrupted 2-0 polyglactin (inner) and 2-0 silk (outer) sutures. Stapled anastomosis was not used as it was not cost effective. An 18 French non adapted Nasojejunal tube was inserted across the anastomosis before completion. Furthermore an 18 French non adapted Nasogastric tube was inserted in stomach for gastric decompression. The Nasojejunal tube was used for decompression and therefore not used for feeding. A Feeding Jejunostomy (latex catheter, 12 Fr) was inserted by Witzel technique in every case for nutritional supplementation in case of possible entero-cutaneous fistulation. Open made jejunal feeds were used for nutrition. In all the cases, peritoneal wash was given, and two abdominal drains were inserted at the end of the procedure. The same operating team was used for all cases (Figs. 2, 3, 4).

Results

Both nasogastric and nasojejunal tubes were removed after bowel movements started around the 7th or 8th postoperative day and feeding jejunostomy was removed on first follow-up visit (around 3 weeks). There was no incidence of duodenum related complications in any of the patients, and all were doing well on follow-up.

Of the 10 patients, one had multiple jejunal tears, and one had splenic laceration (Grade III) along with hemoperitoneum as associated injuries.

On admission, all the patients were given fluid resuscitation and investigated by routine blood investigations, X-Rays of chest and abdomen, USG chest and abdomen, and CECT abdomen. All were taken for laparotomy as all indicated features of perforation peritonitis.

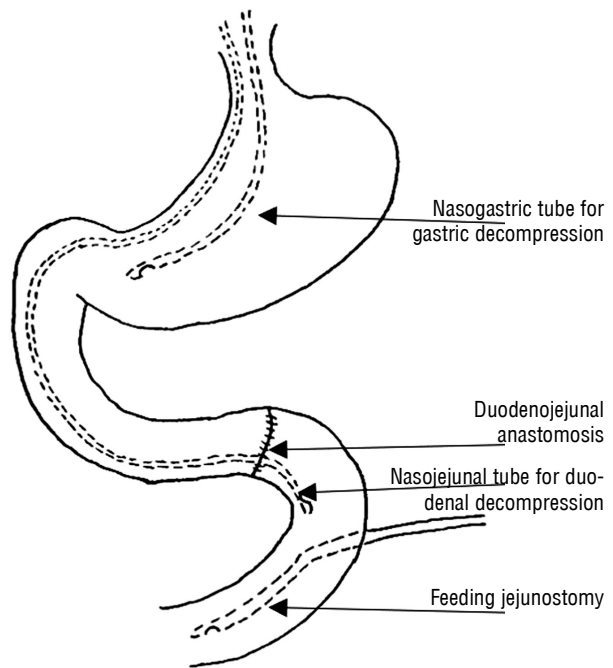


Figure 2. Gastric and duodenal decompression following duodenojejunosomy for duodeno-jejunal flexure transection

The above mentioned technique was used in all patients, along with repair of associated injuries. Median operating time was around 240 minutes. Average duration of ICU stay was 1.4 days. Average duration of total hospital stay was 8.8 days. One patient required secondary suturing under local anesthesia



Figure 3. Intra-operative photograph of Duodenojejunal flexure transection visible

Table 1. Details of Cases of duodeno-jejunal flexure transection treated by end-to-end anastomosis with decompression via nasogastric and nasojejunal tubes, along with a feeding jejunostomy

S. No.	Age/ Sex	MOI	AIS	Delay to surgery (hrs)	Injuries on surgery*	Details of associated injuries	Additional procedures performed	Duration of ICU stay (days)	Total hospital stay (days)	Outcome#
1	24/M	RTA	3	26	DJ flexure transection (Grade III) Perforation Peritonitis (Purulent)			1	8	Grade I
2	17/M	RTA	3	24	DJ flexure transection (Grade III) Perforation Peritonitis (Purulent)			1	7	Grade I
3	32/F	RTA	3	24	DJ flexure transection (Grade III) Perforation Peritonitis (Purulent)			1	8	Grade I
4	36/M	RTA	4	32	DJ flexure transection (Grade III) Perforation Peritonitis (Purulent) Multiple Jejunal Injuries		Jejunal loop resection and duodenojejunosomy	2	10	Grade IIIa (wound dehiscence)
5	28/M	RTA	4	24	DJ flexure transection (Grade III) Perforation Peritonitis (Purulent)			1	9	Grade I
6	21/M	RTA	3	26	DJ flexure transection (Grade III) Perforation Peritonitis (Purulent)			1	8	Grade I
7	26/F	RTA	3	36	DJ flexure transection (Grade III) Perforation Peritonitis (Purulent)			1	8	Grade I
8	24/F	RTA	5	28	DJ flexure transection (Grade III) Perforation Peritonitis (Purulent) Splenic laceration (Grade III) Hemoperitoneum		Splenectomy	4	14	Grade I
9	19/M	RTA	3	30	DJ flexure transection (Grade III) Perforation Peritonitis (Purulent)			1	8	Grade I
10	43/M	RTA	3	28	DJ flexure transection (Grade III) Perforation Peritonitis (Purulent)			1	8	Grade I

All cases were given a peritoneal wash and 2 abdominal drains were inserted at the end of the procedure.

*Injuries graded according to the American Association for the Surgery of Trauma Grading Systems.

#Outcomes graded according to the Clavien-Dindo Classification.

MOI - Mechanism of Injury, RTA - Road Traffic Accident, AIS - Abbreviated Injury Scale

due to wound dehiscence, all the other patients recovered without any complications.

Discussion

Most of the cases of hollow viscous perforation after blunt trauma occur are caused by Road Traffic Accidents and fall from heights

and are often associated with multiple injuries. Duodenal injuries are relatively uncommon, around up to 4.1% of severe abdominal injuries (3); blunt duodenal injuries are much less common than penetrating injury (4). Maingot states that often the signs and symptoms in rupture of the small bowel may be vague and misleading,

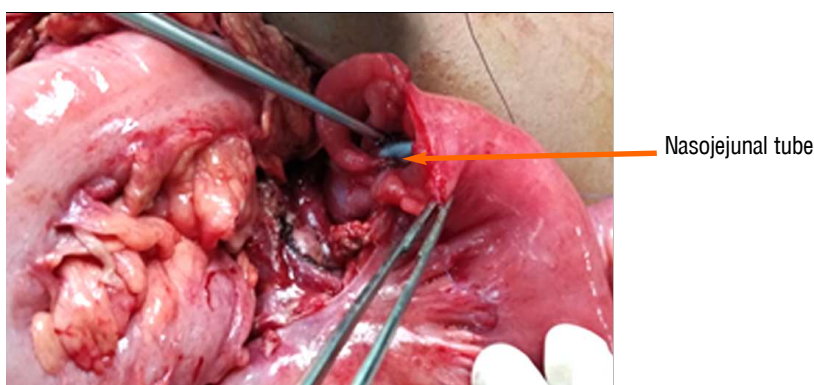


Figure 4. Intraoperative photograph of Nasojejunostomy tube passing beyond the eventual anastomosis

especially in retroperitoneal segments, so that the condition may go undiagnosed (5).

The diagnosis of duodenal or duodeno-jejunal injuries require a high degree of suspicion. Cope stated that occasionally, when complete transection of bowel occurs, the two ends may be temporarily closed due to contraction of the intestinal muscle, and the peristaltic movements are inhibited (6). If intestinal juice, including bile and pancreatic juice, leaks from the transected part, it will damage the surrounding tissues and lead to high-grade edema and inflammation. Late diagnosis is associated with increased morbidity and a longer hospital stay, relating to intestinal and mesenteric injury.

Immediate surgery following diagnosis is the current standard. The immediate control of bleeding from vascular structures or solid organs, such as the kidney or spleen, must be the gold standard manoeuvre in abdominal trauma surgery, followed by an immediate control of gastrointestinal contamination. The next step in the laparotomy must consist of a thorough abdominal cavity examination. The entire duodenum, including its four portions, must be carefully explored. Suspicious findings for a duodenal or duodeno-jejunal injury include duodenal subcutaneous emphysema, bile in the duodenal wall, free biliary fluid, the presence of retroperitoneal haematoma around the duodenum or a perirenal haematoma (1). Pyloric Exclusion usually entails a duodenal repair along with closure of the pylorus internally via an anterior gastrotomy, which is then used for a Gastrojejunostomy. Although technically simple, the Gastrjejunostomy permanently alters the gastrointestinal tract. The main concern in direct repair of a duodenal injury is protection of the suture line from the proteolytic action of upper gastrointestinal secretions.

Besides primary closure, other methods for diversion have been suggested such as use of tube duodenostomy for protection of duodenal suture line (7), 'triple-tube' decompression (nasogastric tube or gastrotomy, a retrograde and antegrade tubes for both duodenal decompression and feeding jejunostomy,

respectively), or a 'quadruple tube' decompression by using an additional T-tube in the common bile duct (8-10). Girgin et al. reported that the addition of tube duodenostomy in primary repairs resulted in significant increase of the duration of hospital stay (11).

The most serious complication possible following repair of duodenal injury is duodenal fistula. Other complications include intra-abdominal abscess, duodenal obstruction, pancreatitis, and bile duct fistula. The overall mortality rate following duodenal injuries is 17%.

In our study, placing the NJ tube beyond the anastomotic site helps in decompression of the duodenal and pancreatic secretions, and 18-French NG tube in stomach helps in gastric decompression without need for duodenostomy or gastrostomy, respectively. Feeding jejunostomy enables early enteral nutrition that has a positive effect on immune function and nutrition status. Additional factors that contribute to the success of procedure are proper Kocherization of the duodenum (ensuring tension-free repair), and good positioning of the biliary drainage tube. Thus, the procedure relies mainly on keeping the area empty and tension-free by decompressing all of the fluids that either enter in, or are secreted from, the region.

As it is a retrospective study and due to an overall low incidence of the Duodeno-Jejunal flexure transection, it would need a larger number of patients over a longer period of time to fully describe duodenum-related complications.

Conclusion

In Duodeno-Jejunal flexure transectional injury, prompt management in patients by end-to-end anastomosis, augmented with the placement of a Nasojejunal tube beyond the site of anastomosis along with a Nasogastric tube is an alternate, safe, and simple procedure in comparison with difficult procedures such as pyloric exclusion and gastrojejunostomy or external tube duodenostomy in patients with early or delayed presentation.

Conflict of Interest

The authors declare no conflicts of interests.

Ethics Approval

For performing this study ethical approval was obtained.

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