



## SMALL BOWEL INJURIES IN ABDOMINAL TRAUMA

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**ABSTRACT**

It is difficult to identify the small bowel injury in trauma. Intestinal injury is the third most common organ injured in the abdominal trauma. This study is also aimed to find out how effectively we can improve the treatment to reduce the morbidity and mortality.

**Materials and methods** In this study, 22 patients who got penetrating injuries and 17 patients who got blunt injuries were analysed. After admission after doing resuscitation, the patients were enquired in detail. Patient who is having penetrating injury into the peritoneum on wound injury were taken up for this study.

**OBSERVATION AND RESULTS** Total number of blunt abdominal injury cases taken were 17. Among these duodenal Injury was 3 Cases, Jejunal Injury was 5 Cases and Ileal Injury was 9 Cases. In Penetrating injury, duodenal Injury was 3 Cases, Jejunal Injury was 8 Cases and Ileal Injury was 11 Cases

**CONCLUSION** In this study, 39 cases of small bowel injury reported to government Rajaji Hospital has been studied. The study has revealed that the commonest cause of blunt abdominal trauma are motor vehicular accidents. The commonest cause for penetrating injury is assault with pointing instrument or knife. Earlier the diagnosis of small Bowel Injuries better the prognosis confirms the other studies. But in the Majority of cases its clinical signs and symptoms are considerably masked and often misleading. Since a close clinical observation repeated examination by same person with the relevant data helps in proper diagnosis.

In addition to conventional treatment two cases of duodenal injuries due to stab wound were successfully managed with single layer interrupted 2-0 silk sutures to the duodenum and intra peritoneal flank drain in emergency situation saved the patients.

**KEYWORDS :** BLUNT INJURY, PENETRATING INJURY, SMALL BOWEL INJURY

**INTRODUCTION**

Abdominal trauma is a leading cause of morbidity and mortality among all age groups. Injuries of the small intestine are common in penetrating abdominal trauma. It is difficult to identify the small bowel injury in trauma. Intestinal injury is the third most common organ injured in the abdominal trauma.

The study was aimed to evaluate the Common cause of injury, type of injury and with regard to age, sex, incidence, presentation of various organ injuries, complications associated with small bowel injuries in abdominal trauma and factors responsible for them and management.

This study is also aimed to find out how effectively we can improve the treatment to reduce the morbidity and mortality.

**Materials and methods**

In this study, 22 patients who got penetrating injuries and 17 patients who got blunt injuries were analysed. After admission after doing resuscitation, the patients were enquired in detail with respect to age, sex, cause of injury, presentation, location of injury, associated injuries, treatment, mortality and morbidity and the mode of injury. Patient who is having penetrating injury into the peritoneum on wound injury were taken up for study. In this study of cases following injuries were noted.

**Penetrating injury**

1. Duodenal Injury-3 Cases
2. Jejunal Injury -8 Cases
3. Ileal Injury-11 Cases

**Blunt Injury**

1. Duodenal Injury-3 Cases
2. Jejunal Injury -5 Cases
3. Ileal Injury-9 Cases

**OBSERVATION AND RESULTS**

Total number of blunt abdominal injury cases were 17. The distribution of the organ involvement and the associated other organ injuries were

shown in table 1

**TABLE 1- DISTRIBUTION OF ORGAN INVOLVEMENT IN BLUNT ABDOMINAL TRAUMA**

ORG ANS	TOTAL NUMBERS OF CASES INJURED	ISOLATED INJURY	ASSOCIATED WITH OTHER ORGAN INJURIES	
			NUMBER	ORGAN INVOLVED
ILEUM	9	6	3	LIVER - 1 MESENTERY - 1 RIBS - WITH HEMOTHORAX - 1
JEJUNUM	5	2	3	B/L BOTH BONE FRACTURE LOWER LIMP AND MESENTERIC HEMATOMA - 1 GASTRIC PERFORATION - 1 LIVER - 1
DUODENUM	3	0	3	MESENTERY TEAR - 1 LIVER - 1 PANCREAS - 1

Distribution of organ involvement in penetrating trauma, the number of case and the associated with other organ injuries were shown in table 2

**TABLE 2 - DISTRIBUTION OF ORGAN INVOLVEMENT IN PENETRATING TRAUMA**

ORGANS	TOTAL NUMBER OF CASES INJURED	ISOLATED INJURY	ASSOCIATED WITH OTHER ORGAN INJURIES	
			NUMBER	ORGAN INVOLVED
DUODENUM	3	0	3	PANCREAS AND HEPATIC – 1 FLEXURE – 1 URETER – 1 LIVER TEAR - 1
JEJUNUM	8	4	4	HEMATOMA MESOCOLON– 1 HEMATOMA GREATER OMENTUM - 1 RETRO PERITONEAL HEMATOMA – 1 GASTRIC PERFORATION LIVER LACERATION
ILEUM	11	9	2	MESENTERY – 2

## DISCUSSION

Annan in 1837 reported the first case of intestinal rupture secondary to blunt trauma in America. These injuries are seen in the younger age groups and usually occur due to road traffic accidents. The present study showed similar results.

## DUODENAL INJURIES

Duodenum is commonly injured both in penetrating and blunt trauma. Our case study is as follows.

TOTAL NUMBER OF CASES STUDIED : 6 CASES

PREOPERATIVE DIAGNOSIS; HOLLOW VISCUS INJURY

VASES OPERATED: 6 CASES

PENETRATING INJURY: 3 CASES

BLUNT INJURY: 3 CASES

SINGLE LAYER CLOSURE WITH SILK (INTERRUPTED): 2 CASES

2 LAYER CLOSURE (INNER VICRYL OUTER SILK) : 1 CASE

JEJUNAL PATEH AND PGJ : 1 CASE

2 LAYERS CLOSURE WITH JEJUNOJEJUNOSTOMY: 1 CASE

Post operative diagnosis : 1 case

Post operative mortality: 1 case

Mode of injury in all the 6 cases were entirely different.

The injury admission interval was different. One patient was admitted with in 2 hours. After injury, and in other patients, the longest interval was 24 hours. One patient with duodenal injury, pancreatic injury and hepatic flexure injury by a knife (single stab wound) admitted 6 hours after injury. Injury operation interval was ranging from 5 hours to 28 hours. The delayed operative treatment was due to the delayed admission.

At the time of admission, only two patients with penetrating injury were suspected of having hollow viscus injury and had the features like stab wound in the hypochondrium, low back area. Only two patients were resuscitated with I.V. fluids and blood and taken up for surgery. Commonest finding in two patients were presence of penetrating injury into the peritoneum, persistent tenderness over the epigastrium and hypochondrium. 2,3,4 Rigidity was present in the 5 cases on admission. Liver dullness obliterated in all 5 cases. Free fluid present in all the cases of penetrating injury. Bowel sounds were absent in all the 3 cases of stab injury.

Exploration of the penetrating wound done in all the cases 2 cases showed penetration into the peritoneal cavity.

Plain xray abdomen taken for all patients. Four patient showed air under diaphragm. One patient showed obliteration of psoas shadow.

The diagnosis of hollow viscus injury were obtained on the basis of clinical examination and investigation.

All the 6 cases were operated, one had duodenal injury at the junction of IInd and IIIrd part, (antr.surface), injury to head of pancreas (Pancreas was split into two), tear in the hepatic flexure and right end of transverse colon and hematoma in the transverse mesocolon.

But there was no injury to pancreatic duct and bile duct as indicated by free flow of bile into the duodenum. This patient under went single layer interrupted closure of duodenal tear with 2-0-atraumatic silk,

pancreatotomy with 2-0 atraumatic silk and right hemicolectomy with ileo-transverse end-to-end anastomosis.

Right flank drain kept for 10 days. Patient had nasogastric tube decompression for one week.

Post operatively serum amylase, and other investigation are within normal limits. He had pancreatic fistula which stopped 24 days after surgery otherwise no complications.

We found that, Single layer closure with non absorbable material is more useful than conventional methods of closure reported in western literatures like duodenal diverticulization, pyroic exclusion, triple tube decompression. 5,6,7

We also found that Nasogastric tube decompression and intraperitoneal flank drain is much better than triple tube method of decompression. 8,9 Disadvantage of triple tube method is multiple holes in GIT in a patient who already has a duodenal injury.

A 18 year old male was admitted with the stab injury just below the right sternal angle. The complaints at admission pain abdomen, abdominal distension. On examination abdomen is tense, tender, rigid with tachy cardia and sweating present. Abdominal paracentesis and DPL were found to be strong positive. This patient under went laparotomy. On opening the abdomen there was injury to end of the IInd part of duodenum and right ureter found. Bile was coming through the duodenal papillae. Duodenal injury closed in a two layer with inner vicryl (2-0) and outer silk (3-0).

End-to-end anastomosis of ureter has been performed with C-3-0 vicryl and ureteric stent. Stent was removed cystoscopically later. Patient discharged on 15th POD.

We found that, ureteric injury should be suspected, whenever there is duodenal injury and ureteric injury can be managed successfully with 3-0 vicryl and ureteric stent.

A 18 years old male was admitted with history of fall from bicycle 2 days back. The complaints at admission were pain abdomen and mild blood stained vomiting. No peritoneal signs except epigastria tenderness. Ryle's tube aspirate was coffee colored. Two days after admission patient showed peritoneal signs, increasing distension, vomiting with negative bowel sounds. 8 days after injury patient developed visible gastric peristalsis. Since patient was found to be having mitral incompetence surgery was delayed and laparotomy was done nine days after injury taking all cardio vascular precautions. Prior to that USG abdomen was done and report was a mass lesion anterior to left kidney. Laparotomy finding was drained. There was a tear in the anterior inferior border of liver which was sealed by omentum. There was jejunum jejunum adhesion which was the cause for VGP and is released.

Post operatively serum amylase raised upto 2000 IV/L as 7 days after surgery and amylase in drainage fluid was 6000 IV/L serum calcium was normal. A cavitogram was done. There was a tear in the C loop of duodenum. The drainage fluid was more of bile, suggesting duodenal injury drainage stopped 24 days after surgery and patient was discharged on 30th POD.

So we are found that, the retroperitoneal duodenum should be exposed in patients with blunt trauma to upper abdomen. Adequate exploration of the duodenum is mandatory, if there is retroperitoneal hematoma in the right upper quadrant.

One patient of 45 yrs. old male admitted with H/O Blunt injury abdomen. On laparotomy there was injury to III rd. part of duodenum with mesenteric tear and non- expanding hematoma with jejunal patch with 2-0 vicryl and posterior gastro jejunostomy by inner catgut (2-0) outer 2.0 silk. Post - operative period was uneventful.

40 yrs old male patient admitted for bull gore injury communicate into the peritoneal cavity. On laboratory there was tear in the III rd part of Duodenum and liver lacerations in the inferior border found. Duodenal tear was closed with 2 layers inner 2-0 vicryl outer 3-0 silk and jejunojejunostomy has been performed. Liver injury was managed with horizontal mattress sutures by 1-0 chromic catgut. Unfortunately this patient died postoperatively because of delayed treatment and associated liver injury. This patient operated 24 hours after injury. So earlier the diagnosis, better the prognosis and also we should avoid major procedures and prolonged surgery.

Jejunal injuries

Jejunal injuries can be caused by both penetrating and blunt injuries. Our case study is as follows.

TOTAL NUMBER OF CASES STUDIED : 13 CASES

PRE OPERATIVE DIAGNOSIS – 8 CASES

## PER OPERATIVE DIAGNOSIS – 5 CASES

## ISOLATED JEJUNAL INJURY – 6 CASES

## ASSOCIATED WITH OTHER ORGAN INJURY – 7 CASES

## NUMBER OF CASES OPERATED – 13 CASES

## PENETRATING INJURY – 8 CASES

## BLUNT INJURY – 5 CASES

All the penetrating injuries except one case were caused by assault with knife one case of penetrating injury to jejunum is caused by bull gore injury.

Four cases of blunt injury to jejunum were caused by motor vehicle accidents one case of blunt injury to jejunum was caused by assault with stick.

The injury admission interval ranged from 2 hour to 16 hours. The injury operation interval ranged from 6 hours to 30 hours in blunt injuries. Four hours to seven hours in penetrating trauma. Delayed operation in blunt injury due to equivocal presentation. 10,11

At the time of admission, only two patient had haemodynamic instability who were resuscitated with fluids and blood.

At the time of admission all the patients with blunt injury had persistent tenderness in the epigastrium and umbilical areas.

Liver dullness obliterated only in 3 cases. Air under diaphragm on plain X-ray abdomen were present in only 3 cases.

DPL done in 2 cases of blunt injury and positive in only one case.

All the 5 cases were operated. 25 years old one patient was admitted with history of road traffic accident. This patient had both bone fracture lower limb upper third for which A.K. cast had been applied. On laparotomy there was multiple perforations involving jejunum with hematoma of mesentery and greater omentum found. Jejunal perforations found 40 cms from the D.J. flexure, Involved segment was resected and end to end anastomosis has been performed with – 2 – 0 eh. catgut. Greater omentectomy also done.

This patient developed wound gapping during post operative period. Secondary suturing has been performed for him later. This patient was transferred to orthopaedic department after suture removal.

One had gastric perforation in the poster and antr. Wall of stomach, both were sutured in 2 layers with 2 – 0 chromic catgut.

One patient had lacerated liver injury over the inferior margin which is not bleeding for which no treatment has been given.

All the perforations in the jejunum except multiple perforation in one case repaired with 2 – 0 chromic Catgut – two layers closure in transverse axis.

All the cases of jejunal perforations due to penetrating trauma the penetrating wound is examined and explored. There were communications into the peritoneal cavity found.

Plain X-ray abdomen taken for all patients. Air under diaphragm present in 5 patients.

Two cases presented with omental prolapse.

All the 8 cases were operated.

One patient of 26 years old male admitted with history of bull gore injury.

On laparotomy there was multiple jejunal perforations for length about 30 cms from D.J. flecture. Retroperitoneal non expanding hematoma and hematoma of greater omentum found.

He under went Resection of the involved segment of jejunum and end to end anastomosis with 2 – 0 ehromic catgut in 2 layers.

Retroperitoneal hematoma was not disturbed.

All the other patients are injured due to stab injury with knife – managed – with simple closure of the perforation by 2 – 0 chromic catgut in 2 layers.

Associated gastric perforation in one patient closed with 2 – 0 chromic catgut in 2 layers.

Post operatively all the patients were treated with broad spectrum antibiotics and metronidazole. All of them were discharged with good condition. 12, 13,14

## ILEAL INJURES

Ileal injures can be caused by both penetrating and blunt injuries our case study is as follows.

TOTAL NUMBER OF CASES STUDIED : 20 CASES

PRE OPERATIVE DIAGNOSIS 15 CASES

PRE OPERATIVE DIAGNOSIS 5 CASES

## ISOLATED ILEAL INJURY 15 CASES

ASSOCIATED WITH OTHER INJURIES – 5 CASES.

NUMBER OF CASES OPERATED – 2 CASES

## PENETRATING INJURY – 11 CASES

## BLUNT INJURY – 9 CASES

## POST OPERATIVE MORTALITY – 1 CASE

All the penetrating injuries are caused by assault with knife or pointed instrument.

In blunt injury 6 cases were due to motor vehicle accidents. 3 cases are due to assault with stick.

The injury admission interval ranged from 2 hours to 72 hours. The injury operation interval ranged from 4 hours to 80 hours.

At the time of admission only one patient had haemodynamic instability who was resuscitated with fluids and blood.

At the time of admission all the patients with blunt injury had persistent tenderness in the abdomen, rigidity, distension and free fluids. 15,16 Liver dullness obliterated in 6 cases. Air under diaphragm in plain x-ray were present in 6 cases.

Abdominal paracentesis positive in 5 cases. DPL positive in 2 cases.

All the cases were operated.

Isolated ileal injuries were repaired with 2 – 0 – chromic Catgut in 2 layers transversely.

32 years old male patient was admitted with H/O steering wheel accident. He was operated 4 hours after injury.

On laboratory 2 litters of hoemoperitoneum, mesenteric tear upto 30 cms from the Ileo – caecal junction, gangrene of ileum about 60cm from Ileo – caecal junction and two preformations 45 cm from the Ileo – caecal junction. Serosal tear in the sigmoid colon 8 cm from the rectosigmoid junction in the antemesenteric border also found.

It was treated with blood transfusion and resection of the involved ileum and end – to end anastomosis of ileum in 2 layers 2 – 0 chromic catgut has been performed.

Patient discharged with good condition on 13th POD.

45 years old patient admitted with H/O assault with stick.

O/E abdomen distended with positive guarding. Liver dullness obliterated, Bowel sounds absent x ray abdomen shows air under diaphragm. He underwent surgery 3 days after injury on laparotomy about 1500 ml of feculent fluid sucked out. There was a perforation in the ileum about 1 cm in diameter 45 cms. From the Ileo-caecal junction. Perforation was closed with 1-0 chromic Catgut in 2 layers.

This patient developed wound leak on II POD followed by established fecal fistula.

Fecal fistula managed with conservative line in the form of blood and hyperalimtaion.

He developed wound gapping for which he underwent secondary suturing.

One had liver injury which is not bleeding on laparotomy for which no treatment has been given.

One had fracture of Ribs 7,8,10 at RT side for which no specific treatment has been given. 30 years old female patient had hematoma in the mesentery, which is not expanding No treatment has been given for hamatoma.

30 years old male patient was admitted with H/O assault with stick, 12 hours after injury. He underwent surgery 4 hours after admission. On laparotomy there was mesenteric tear 60 cms from the ILEO\_CAECAL junction with multiple ileal perforations and haematoma in the mesocolon – perforation of the Ileum was closed C – 2 – 0 chromic catgut in 2 layers.

About 500 ml of Ileal contents evacuated from the peritoneal cavity.

Patient expired on 2 days after surgery, because of septic shock.

All the patients treated with antibiotics, nasogastric decompression.

All the 19 patients discharged with good condition.

We found that earlier the diagnosis better the prognosis. And also fecal fistula can be successfully managed with conservative management.

## CONCLUSION

1. In this study, 39 cases of small bowel injury reported to government Rajaji Hospital has been studied.

2. The study has revealed that the commonest cause of blunt abdominal trauma are motor vehicular accidents. The commonest cause for penetrating injury is assault with pointing instrument or knife.

3. Earlier the diagnosis of small Bowel Injuries better the prognosis confirms the other studies. But in the Majority of cases its clinical signs and symptoms are considerably masked and often misleading. Since a close clinical observation repeated examination by same person with the relevant data helps in proper diagnosis.

4. In addition to conventional treatment two cases of duodenal

injuries due to stab wound were successfully managed with single layer interrupted 2 – 0 silk sutures to the duodenum and intra peritoneal flank drain in emergency situation saved the patients.

5. Maximum incidence of blunt abdominal trauma has been between the age of 11 and 30 years. Age incidence in penetrating trauma is 20 – 50 Years.

6. Males are commonly affected then females because of their more outdoor activity.

In duodenal injuries we have kept nasogastric tube beyond the level of duodenal repair and continuous decompression performed until bowel functions returns. Our patients were required for 5 – 10 days of decompression. By doing this technique we can avoid large number of holes in G I T in triple tube method of decompression reported in world literature. We found that nasogastric tube decompression is better and less morbid.

7. Surprisingly in our hospital duodenal injuries are also common.

8. Extensive procedures like duodenal diverticulization, pyloric exclusion jejunostomy should be avoided in cases operated for duodenal injuries with delayed diagnosis and in risk patients.

In such cases minimal procedures like single layer closure of duodenal injury with silk and intraperitoneal flank drain should be done.

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