

PLAIN FILMS EVALUATION IN PATIENTS WITH JEJUNAL INJURY BY BLUNT ABDOMINAL TRAUMA

Patchrin PEKANAN,¹ Rachanee SINSAWATJAROEN,^{1,2}
Auichai KARNJANAPITAK³

ABSTRACT

Roentgen findings in 10 cases of jejunal injury by blunt abdominal trauma were retrospectively reviewed. Free fluid, free air, small bowel rigidity, dilatation of the duodenal loop, dilatation of the stomach and the normal gas pattern was seen. Free fluid was present in 60% of cases, free air in 30% of cases and normal gas pattern in 40% of cases. Small bowel rigidity and dilated duodenal loop occurred in association with the injury to the small bowel and the duodenal loop respectively. But the gastric dilatation did not indicate gastric injury. Without solid organ injury, the presence of free fluid should arouse the suspicion of the bowel injury. Lack of positive findings on plain films of the abdomen did not exclude bowel injury. Jejunal perforation occurred in the sites far from the fixed region in 50% of cases.

INTRODUCTION

Blunt abdominal injury is associated with small bowel rupture in 5% to 10% of cases.^{1,2} The mortality rate remains in the region of 30%.³ Significant factors affecting mortality are multiple injuries and therapeutic delay of 24 hours or more. The usual association of blunt small bowel injury with a focal blow to the abdominal wall, which may be caused by a slight blow.⁴ A seatbelt or bicycle handlebar has been emphasized by Dickinson.¹ All reports in the literature agreed that the segments of the small intestine most commonly involved are duodenum near the ligament of Treitz, jejunum just beyond the ligament, and the ileum just proximal to the ileocecal valve.⁵ Plain films of the abdomen are usually included in the evaluation of the blunt abdominal trauma, we conducted a retrospective study of the plain films in the patients with jejunal injury.

PATIENTS AND METHODS

Between 1991-1995, 72 patients with blunt abdominal trauma admitted to the hospital. Ten cases had jejunal injury. Plain films of the abdomen of the cases of jejunal injury were reviewed and compared with the operative findings. The detailed information was summarized in the table 1.

RESULTS

All patients were male. The age range was 18 to 62 years old ; two cases were 18-20 years old, 5 cases were between 21-30 years old, 2 cases were between 31-40 years old and a case of 62 years old. Car accident occurred in 6 cases, fall injury was seen in 3 cases and an assault was noted in one case.

1= Department of Radiology, Ramathibodi Hospital , Rama 6 Street , Bangkok 10400, Thailand

2= Department of Radiology, Haatyai Hospital , Haatyai , Songkla, Thailand

3= Department of Surgery, Ramathibodi Hospital

Plain film findings were: free fluid in 6 cases, limitation in fluid evaluation in 2 cases; free air in 3 cases; rigidity of small bowel loops in one case; dilatation of the duodenal loop in 2 cases; gastric dilatation in 2 cases; downward displacement of the splenic flexure in one case and normal gas pattern in 4 cases.

Jejunal injury was noted at the following sites: 2 inches from the ligament of Treitz (LOT) in 1 case, 1 foot from LOT in 2 cases, 2-2.5 feet from LOT in 4 cases, at mid jejunum in 1 case, at distal jejunum in 1 case and no information concerning the site of jejunal injury in 1 case.

Dilated duodenal loop was associated with loop injury in one case and without duodenal injury in another case.

Rigidity of small bowel loop was seen in associated tear of the ileal serosa.

There was no gastric injury in the cases that had gastric dilatation.

No splenic injury or surrounding hematoma in the case that had downward displacement of the splenic flexure .

Normal gas pattern was seen in both single and multiple organs/ loops injury.

| No. | Age | Cause | Radiographic findings | Operative findings |
|-----|-----|--------------|---|---|
| 1 | 25 | assault | Free fluid Free air Rigidity of small bowel | -Rupture of distal jejunum, 3 mm diameter -Tear rectus muscle and hematoma -Tear serosa of ileum -Subserosal hemorrhage at the transverse colon |
| 2 | 27 | Fall | Free fluid Normal gas pattern | -Hemoperitoneum, 2000 cc -Tear mesentery of jejunum, 2.5 feet from ligament of Treitz -Tear splenic capsule with active bleeding -Contusion of cecum and ascending colon |
| 3 | 30 | Car accident | -Free fluid, free air -Dilated 2 nd part duodenum | -Ruptured jejunum, 2.5 feet from ligament of Treitz -contusion of the 1 st and 2 nd part of the duodenum -Hematoma at tail of pancreas |

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|----|----|--------------|--|---|
| 4 | 34 | Car accident | -Normal bowel gas pattern -Poor technique for free fluid evaluation | -Ruptured jejunum, 2 cm in diameter -Small amount of hemoperitoneum |
| 5 | 62 | Fall | -Free fluid -Gastric dilatation | -Hemoperitoneum, 500-600 cc -Two perforated sites of jejunum, 2 feet from the ligament of Treitz -Hematoma at mesentery of ileum |
| 6 | 29 | Car accident | -Free air -Downward displacement of splenic flexure | -Tear jejunum, 2 inches from ligament of Treitz -Hematoma at mesentery of cecum -Fluid in cul de sac, 100 cc |
| 7 | 35 | Fall | -Normal bowel gas pattern -Poor technique for free fluid evaluation | -Rupture and contusion proximal jejunum, 1 foot from ligament of Treitz |
| 8 | 21 | Car accident | -Free fluid -Normal gas pattern | Hemoperitoneum, 300 cc -Perforation of mid-jejunum -Hematoma at medial wall of ascending colon, lesser omentum, superior border of pancreas |
| 9 | 19 | Car accident | -Free fluid -Fixed dilated 2 nd and 3 rd part of the duodenum | -Perforation of jejunum, 2 feet from ligament of Treitz -Serosal tear of cecum, contusion of ascending and descending colon |
| 10 | 18 | Car accident | -Gastric dilatation | -Rupture jejunum, 1 foot from ligament of Treitz -Left retroperitoneum hematoma |

DISCUSSION

The vast majority of intestinal injuries result from automobile accidents, and impact against the steering wheel is the most frequent cause of the damage to the small bowel in adults.⁶ The portion of the bowel which is most often injured is that which happens to occupy a midline position at the moment of impact. Other less common sites of damage are the first portion of the jejunum and the terminal ileum, where the intestine is fixed.

Because the small intestine and its mesentery are mobile and easily compressible, it generally escapes injury from compression forces that seriously damage solid viscera. The most common mechanism of nonpenetrating intestinal trauma involves crushing of the bowel against the spine.⁷ The anatomical proximity of the abdominal wall to the anterior lordotic curvature of the lumbosacral spine accounts for a high incidence of injury to the portion of the bowel that overlies that segment of the vertebral column.

A second mechanism of small intestinal injury in blunt abdominal trauma involves tearing or shearing of the bowel and its mesentery at points of fixation. The proximal jejunum is relatively fixed at the duodenal-jejunal junction by a short mesentery and the ligament of Treitz. Similarly, the terminal ileum is fixed at its junction with the large bowel by fixation of the cecum, and by a short terminal mesentery and several peritoneal folds. Shearing forces applied to these two sites may result in tears and perforations of the bowel. Pathological fixation of the bowel also predisposes to injury. The relationship of intestinal injury to intra-abdominal adhesions has been well documented⁸ and knowledge of a previous operation should increase the suspicion of possible intestinal damage in victims of blunt trauma. Similarly, fixation of the small intestine within an inguinal hernia has led to perforation. When the fixation

of the intestine is in relation to the spine the possibility of injury increases.

Bursting of a distended or kinked loop of intestine is a rare mode of jejunal or ileal injury, if it occurs at all. Rupture of the duodenum is known to result from a sudden elevation of intraluminal pressure in the face of a closed pylorus and kinking at the duodenal-jejunal angle. Compressive forces applied beyond the ligament of Treitz are readily dissipated by the free movement of intestinal contents, so that bursting injuries of the small bowel are unusual.⁹

When the bowel ruptures, the serosa splits first followed by the mucosa. The submucosa is the last layer to give way.¹⁰ Rupture of the small bowel occurs most frequently on the antimesenteric border.

The diagnosis of small bowel injury is based on the usual findings associated with damage to the abdominal viscera. These include abdominal pain, signs of peritoneal irritation on physical examination, a positive abdominal tap, an elevated leukocyte count. A negative abdominal tap and normal roentgenograms do not by any means rule out small bowel damage, particularly during the first 24 hours after injury.

Blunt wounds of the small intestine range from perforations and avulsions to intramural hematomas and serosal tears. Delayed perforation of such lesions up to 10 days after injury has been reported.¹¹ Injuries of the small bowel mesentery range from contusions and hematomas to avulsions. Rarely, laceration or avulsion of the major vessels occurs. Thrombosis of the mesenteric vessels is an unusual complication of blunt abdominal trauma and has been reported to cause delayed death.¹²

Jacobson et al, reported 7 cases of jejunal injury.⁵ Only 2 cases showed free subphrenic air. Trapping of gas behind the transverse mesocolon was probably present in one case. Free fluid was seen at surgery in 6 cases and no detail concerning this in one case. Five cases showed non-specific ileus, one case had no ileus and one case had air-distention of the stomach and the duodenum.

In conclusion:

1. Free air was seen only in 30% of cases of jejunal injury.
2. Free fluid was detected more, in 60% of cases, if the more sensitive examination for free fluid was used, e.g. ultrasonography, the percentage of this finding in the jejunal injury might be increased. If solid organs were not injured, the presence of free fluid should arouse the suspicion of bowel injury.
3. Normal gas pattern was present in 40% of cases.
4. Gastric gaseous dilatation was not associated with gastric injury.
5. Duodenal dilatation and rigidity of small bowel loop indicates injury to duodenum and small bowel loop respectively, however, the number of cases were small.
6. The paucity of positive findings in the roentgen examination of the abdomen does not exclude small bowel injury by blunt trauma.
7. The jejunal injury far from the fixed point was present in 50% of the cases.

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