Acta Med. Nagasaki 37:75–77

Traumatic Injury of the Small Bowel

Masao Tomita, Toshio Miura, Teruhisa Shimizu, Toru Nakagoe, Hiroyuki Kusano, Kousei Miyashita

The First Department of Surgery, Nagasaki University School of Medicine

Traumatic perforation of the small bowel is clinically reviewed in the analysis of a result of clinical experience.

It is generally accepted that delay in diagnosis in common because definite clinical signs is prone to being concealed. It is due to a low incidence of the appearance of free gas in the peritoneal cavity on abdominal XP film. To salvage the patients in early stage, surgeons should be alert to a latent interval in this stage.

Recently, the incidence of abdominal trauma is now increasing in occurrence. The imaging techniques of CT and US are of great value to detect a presence of the traumatic lesion. However, it is difficult to justify whether surgery should be mandatory or not in an initial time period of this disease. In the digestive organ with the lumen, it is necessary that traumatic perforation should be quickly detected and treated. It is without saying that a presence of free gas is a confirmable finding. In contrast, abdominal free gas is unlikely to appear and often fails to detect in the early stage. Pathogenesis of perforation of the gut is much different from each other. It is well known that perforation of lower part of the gut more frequently provokes endotoxic shock.

The purpose of this study is to clarify clinical features in the pathogenesis of perforation of the small bowel.

Patients

During the 12 years from January 1976 to December 1987 at the First Department of Surgery, Nagasaki University School of Medicine, six patients were surgically treated. The causes traumatic perforation of the small bowel were traffic accident in three patients and fall in three.

The perforations in combination with laceration were seen in eight in whom five were in traffic accident, two in workmen's accident and one in fall respectively. Otherwise, single laceration was recognized in five patients with traffic accident.

The six patients with perforation of the small bowel were listed in Table 1. The time interval to the operation ranged from six to 20 hours except for only one, who was showing a latent interval of 49 days,.

Table 1. Patients with injuries of the bowel and the mesenterium

age (yrs) / injuried organ	~9	10~	20~	30~	40~	50~	60~	total
small bowel	2	2	0	0	2	0	0	6
small and mesenterium	1	0	1	0	2	1	3	8
mesenterium	0	1	2	1	1	0	0	5
total	3	3	3	1	5	1	3	19

The reasons for undergoing surgery were the detection of abdominal free gas in four (66.7%), shock in two (33.3%) and leucocytosis (over $1x10^4$) in three. The detection of abdominal free gas was limited in two patients in an early stage. It had become by change in body position from supine to lateral position as shown in Fig. 1. CT in case 3 showed accumulation of fluid around the liver and spleen, and distended upper portion of the gut with high density as shown in Fig. 2. It is suggestive of a presence of intramesenterial hematoma caused by laceration.

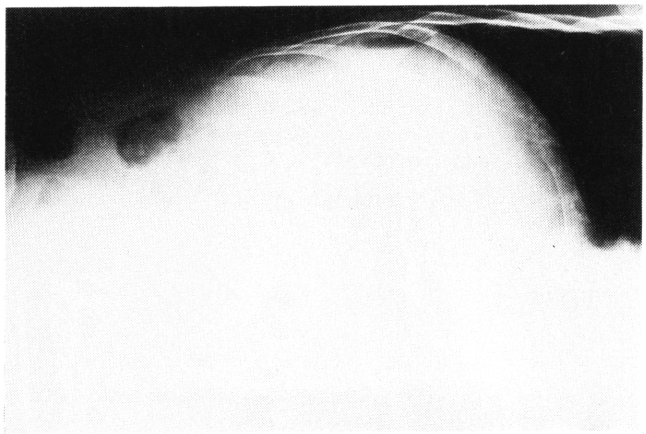

Fig. 1. Free gas in lateral position

The injury sites were corresponded with the site 60cm distal to Treitz' ligament in three, middle of the small intestine in one and the end of the ileum in two, respectively. A 15cm complete separation with intestinal necrosis was seen as the most severe injury of the small intestine

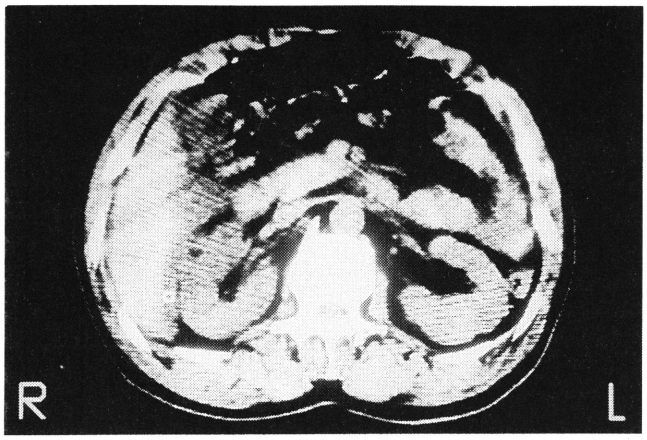

Fig. 2. CT: accumulation of peritoneal fluid and distended gut

(Fig. 3). Two out of six patients had the laceration that is away from the site of perforation (Table 2).

The combined injury was seen in one who underwent the rupture of rectus abdominis muscles. The operative procedures of a resection of the small bowel were used for five patients except for one who underwent suture repairs of the sites of perforation and of mesenterial laceration. As the postoperative complication, there were the increase in a serum amylase level, abscess formation on the abdominal wall and dehescence of the operative wound in one, respectively. However, these were not severe and healed spontaneously without special treatment.

In case of latent traumatic perforation, on day 49 from the abdominal trauma, the signs of acute abdomen were manifested enough to necessitate emergency operation.

At laparotomy, there was a cystic tumor of 10x7 cm in size, which accompanied a small perforation on the anterior wall, 10cm distal to the Treitz' band (Fig. 4).

Histological finding revealed that cyst formation was present on the contralateral side of the attachment of the mesenterium. There was no definitive differentiation in histology between intestinal serosa and cystic wall, showing transition of both histologic patterns.

Discussion

The diseases of the small bowel are very rare in occurrence. In contrast, there are various kinds of contributory causes to perforation of the small bowel. These are classified as follows, traumatic, foreign body, ulcerative, tumorous, ileus, vessel originated-disease and idiopathic, respectively.[1] Needless to say, the death of perforation is closely associated with the time interval from onset to operation. As a result, the death related to perforation of the small bowel 17.1% which is between those of the colon (27.3%) and the stomach and duodenum (11.1%), respectively.[2]

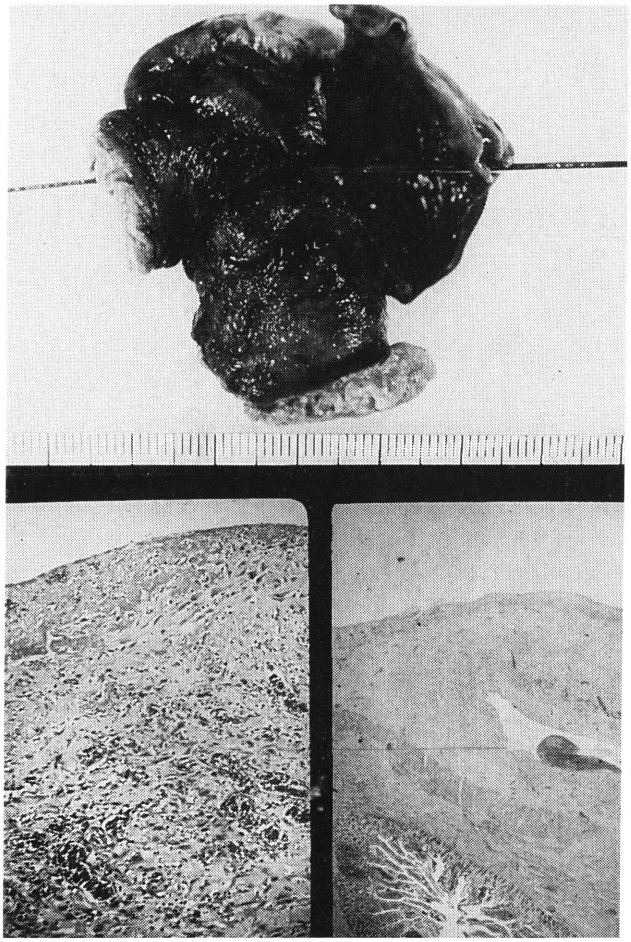

Fig. 3. upper: Surgical specimen of perforated small bowel with cystic lesion
lower left: histology of perforated site
lower right: histology of cystic lesion

Table 2. The sites of perforation

Perforation 60 cm distal to Treiz' band	3
Middle of the small intestine	1
end of the ileum	2

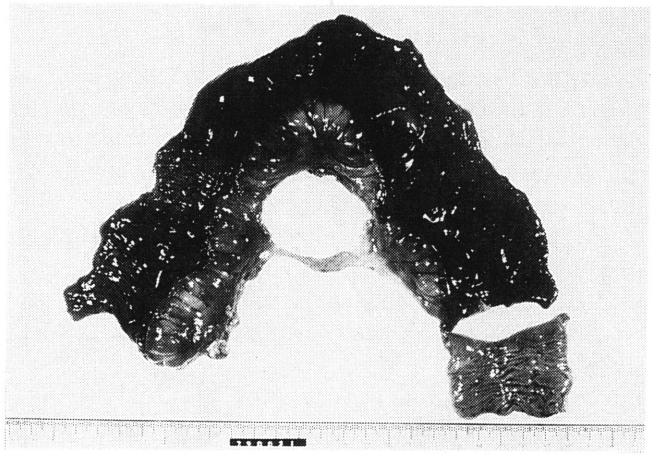

Fig. 4. complete separation by laceration of the small bowel

The influential factors on poor prognosis are that 1) perforation in the lower part of the bowel is easy to produce outfloor of intestinal bacteria into the peritoneal cavity to be finally responsible for endotoxic shock 2) precise diagnosis for perforation of the small bowel is prone to delay in determination because of unclear clinical sings at the initial stage 3) general condition is easy to become deteriorate in the original diseases of malignancy and arterial embolism.

A poor prognosis for perforation of the small bowel is coined by the time interval of more than 12 hours from onset to surgery. The low appearing rate of free gas is reported as being 10% by Asano[3] and 18% by Koike[4] in cases of perforation of the small bowel, when compared with perforation of the stomach and the duodenum, which accounts for 70 to 80%.

Even leucocytosis was not so common as to be seen in 51.4% as reported by Haidome.[5] At shock, it is recognized that the levels of the leucocyte counts are sometimes reduced. A tool of diagnosis for perforation of the small bowel CT and US scan is useful in evaluating abnormalities of the abdominal cavity. A presence of free gas in the peritoneal cavity can be detected on CT scan.[6]

We experience a patient with a long latent interval for clinical signs to be manifested physicians should be aware of patients with a latent interval among those with abdominal trauma, ranging from 23.5%[7] to 29.2%[8] in incidence.

Oya[8] reported in detail that perforation with a latent interval needs for a long time period until perforation following abscess formation.

The most valuable finding to determine a presence of perforation of the small bowel is a sign of defence musculare, which is more often absent or scanty at the initial stage. It is necessary to carefully observe the change in the patient's condition in the course of the disease. The surgical outcome is not so pessmistic although it closely relates to the disease time from onset to surgery. Catastrophic perforation is in association with abdominal trauma accompanying increased abdominal pressure.[9] In case of primary malignant tumors, a perforation of the small bowel caused by leiomyosarcoma, malignant lymphoma and carcinoma is almost similar incidence although it is easy to perforate in malignant lymphomas.

It is needless to say that the surgical treatment for perforation of the small bowel is necessary and surgical procedure comprises of either direct suture or resection in the selection of considering patient's general conditions and perforated original lesions. While the patient's condition is not suitable for surgery, staged operations are attempted by temporary intestinal fistula. The most ominous outcome is expected in patients with perforation by acute embolism of the mesenteric artery since surgical insult has become grave for the reasons of a wide resection for irreversible severe ischemic necrosis.

References

1) Kawata K, Okamoto E: Perforation of the small bowel. Surg Therap 22:667-672, 1980.
2) Yamaguchi A, Hachisuka K, Hori A et al: Acute abdomen caused by malignant tumors —perforation of the digestive tract— J Jpn Asso Clin Surg 46:455-463, 1985.
3) Asano T, Shida H, Yamamoto N: how to operate for perforation of the lower part of digestive tract. Clin Curg 40:227-231, 1985.
4) Koike H, Maeda S, Numata M, et al: Factors influential on therapeutic outcome. Surg Treat 22:441-444, 1980.
5) Haidome K, Ohara T, Kondo Y: Perforation of the digestive tract. Surg Treat 26:863-868, 1984.
6) Kitamura K, Kuwata K, Sasaki Y et al: Clinical evaluation in 36 patients with traumatic rupture. Clin Surg 40:1119-1122, 1985.
7) Ukijima M, Yamaoka I, Isoyama T et al: pathophysiology of perforation of the digestive tract. Surg 36:127-133, 1974.
8) Oya H, Yamaoka I. Isoyama T et al: trauamtic rupture of the bowel. Clin Surg 28:1084-1096, 1973.
9) Otsuka K, Hayashi H, Nagano T et al: Perforation of the small bowel in two patients with injuinal hernia.