

## Case Report

# Delayed Small-intestinal Perforation Caused by Blunt Abdominal Trauma : A Case Report

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### ABSTRACT

Delayed intestinal perforation after trauma is rare but can be overlooked without follow-up. We report a case of delayed intestinal perforation after abdominal trauma in a 45-year-old man, who was successfully treated without complications. The previously healthy patient had severe lower abdominal pain because of a single-bicycle accident and was brought to the Kawaguchi Municipal Medical Center. An initial contrast-enhanced computed tomographic examination showed no abdominal hematoma or free air but did show mild ascites in the pelvis. The physical and laboratory findings suggested a low possibility of peritonitis. However, the patient was admitted to our hospital for observation. The next day, an X-ray examination of the chest showed free air under the right side of the diaphragm. Furthermore, a second contrast-enhanced computed tomographic examination showed free air and an edematous intestinal wall with abscess around the terminal ileum. Therefore, emergent laparotomy was performed and revealed a perforated thickened ileum with an abscess in the right lower abdomen. Partial resection of the small intestine was performed. The patient was discharged without complications, such as paralytic ileus, on postoperative day 13. Delayed intestinal perforation should be considered after blunt abdominal trauma, even if a patient does not present with peritonitis.

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Key words : delayed intestinal perforation, free air, blunt abdominal trauma

### INTRODUCTION

Traumatic intestinal perforation is most likely to occur at the time of a blunt abdominal injury but is rare. Even more rare is for blunt abdominal trauma to cause a delayed intestinal perforation<sup>1</sup>. The diagnosis is often delayed by the late onset of symptoms after the blunt trauma. We describe a case of delayed intestinal perforation in a patient who was successfully treated by means of emergent surgery without severe complications.

### CASE REPORT

A 45-year-old man, who had been healthy since birth, was brought to our hospital after having a single-bicycle accident. The patient complained of severe lower abdominal pain ; however, a physical examination of the patient upon arrival found no rebound tenderness and suggested a low possibility of peritonitis or peritoneal irritation. Other findings of physical examination were : blood pressure, 142/72 mm Hg ; heart rate, 86 beats per minute ; body temperature, 36.4°C ; body weight, 68.0 kg ; and height, 170.0 cm. The patient's family history and medical history

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were not clinically significant. Hematologic examination showed no abnormalities, such as anemia (hemoglobin : 13.4 g/dl). Contrast-enhanced computed tomographic (CT) examination showed slight ascites in the pelvis but no intra-abdominal bleeding or free air (Fig. 1). The patient was admitted to our hospital for observation. The next day, a follow-up X-ray examination of the chest showed free air (Fig. 2A). A second CT examination revealed a thickened wall of the small intestine near the distal ileum with free air and abscess formation (Fig. 2B).

On the basis of these findings, the patient underwent

emergent surgery with lower median laparotomy. The estimated volume of bloody ascites fluid was 500 cc. Intraoperative examination showed that the small intestine had been perforated 70 cm from the terminal ileum (Fig. 3). Partial intestinal resection and functional end-to-end anastomosis were performed. The abdominal wall was closed with a 1-layer continuous technique and nonabsorbable sutures. Pathological examination showed infiltration of inflammatory cells, including neutrophils, at the perforated site (Fig. 4). The postoperative course was uneventful and without temporary paralytic ileus, and the patient was discharged on

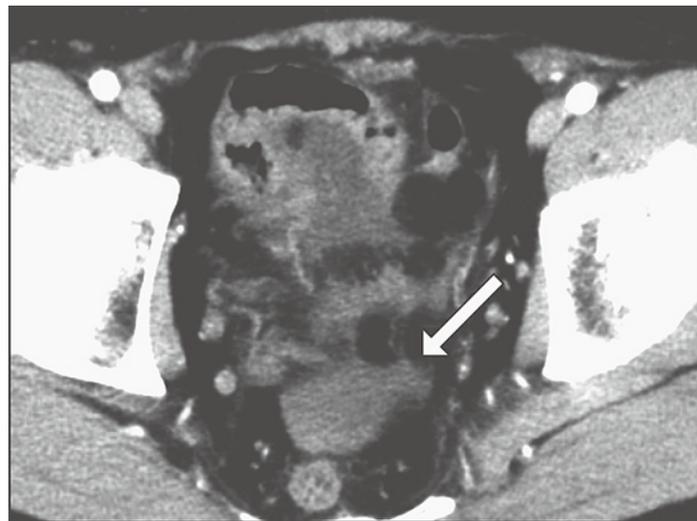
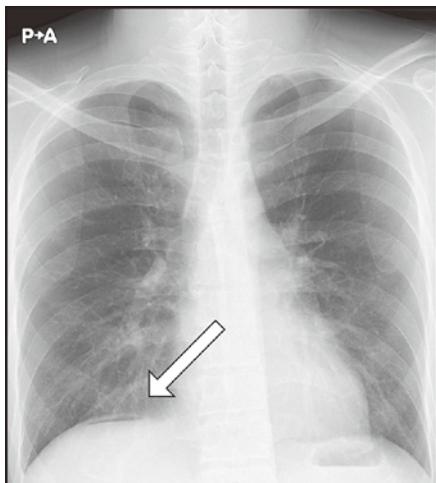


Fig. 1. Contrast-enhanced computed tomographic examination of the abdomen after trauma showed slight ascites (arrow) in the pelvis without free air or hematoma.

A



B

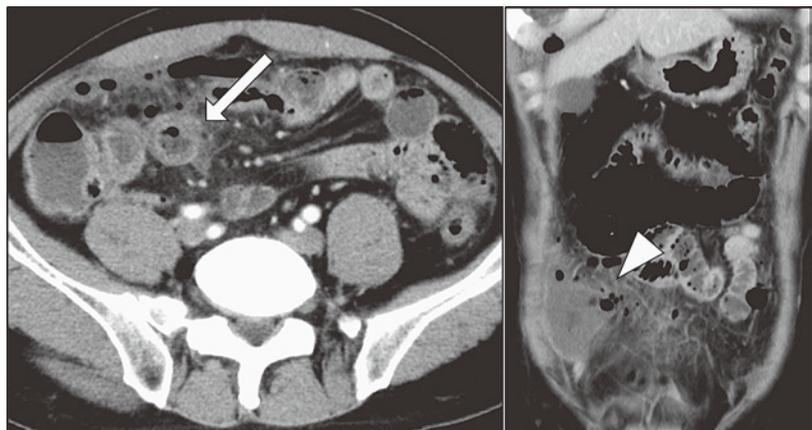


Fig. 2. A : An X-ray examination of the chest showed free air (arrow) under the right side of the diaphragm. B : A second contrast-enhanced computed tomographic scan of the abdomen showed focal wall thickness and pneumatosis intestinalis in the jejunum (arrow) and abscess formation in the abdominal cavity (arrow head).

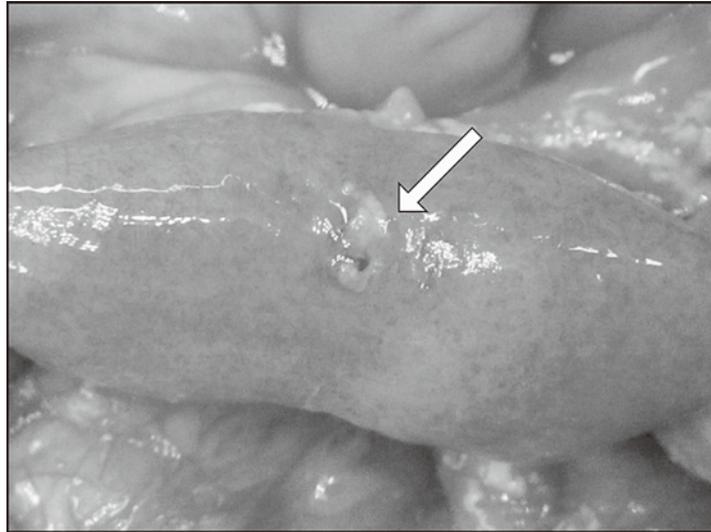


Fig. 3. This photographic obtained during surgery shows a 3-mm perforated site of the small intestine (arrow) that was 70 cm from the terminal ileum.

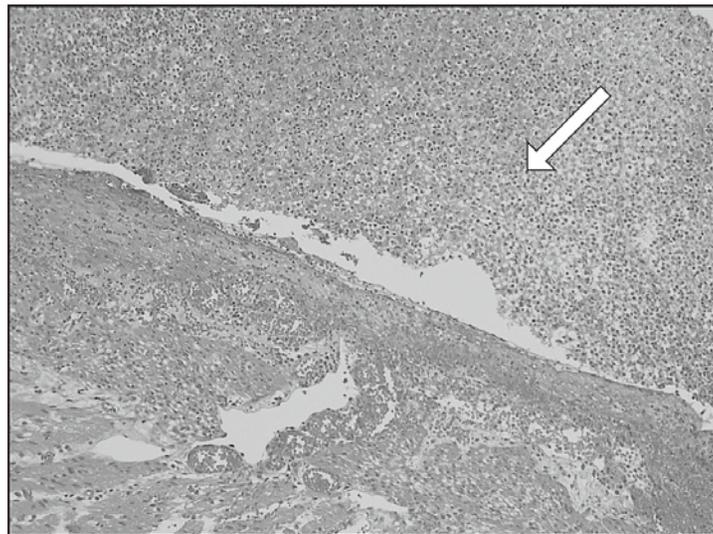


Fig. 4. Pathological examination found neutrophil infiltration (arrow) in the perforated site but no malignant findings ( $\times 40$ , hematoxylin and eosin staining).

postoperative day 13.

### DISCUSSION

Posttraumatic mesenteric or bowel injury can lead to life-threatening conditions and account for 3% to 5% of cases of blunt abdominal trauma<sup>2</sup>. Moreover, perforation of the small intestine accounts for only 0.3% of cases of blunt trauma<sup>3</sup>. Bowel injuries indicate diverse clinical conditions, including hematoma, stenosis, vein thrombus, and perforation. The precise mechanism of traumatic small intestinal

perforation remains unclear. However, a possible mechanism is a sudden pressure elevation within a closed segment of the intestine inducing antimesenteric perforation<sup>4</sup>. In the present case, we believe that the perforation was a complication of the mesenteric hematoma, which compromised blood flow to this segment of the bowel.

Including the present case, 12 cases of delayed small-intestinal perforation after blunt abdominal trauma have been reported<sup>5-13</sup> (Table 1). Almost all patients were boys or men, and their median age was 32 years (range : 7 to 45 years). In addition, the site of perforation was more often

Table 1. Reported cases of delayed intestinal perforation after blunt abdominal trauma

Case report	Year	Patient sex	Patient age, years	Type of accident	Delay, days	Perforated location	Mesenteric injury
Burrell et al. <sup>5</sup>	1973	male	30	motor vehicle	11	jejunum	–
Fleishman et al. <sup>6</sup>	1979	male	32	motor vehicle	35	ileum	–
Ross and Bickerstaff <sup>7</sup>	1985	male	13	fall	6	jejunum	–
Winton et al. <sup>8</sup>	1985	male	7	motor vehicle	6	jejunum	hematoma
Winton et al. <sup>8</sup>	1985	male	29	motor vehicle	6	jejunum	hematoma
Mauil and Rozycki <sup>9</sup>	1986	female	36	motor vehicle	4	jejunum	–
Coats <sup>10</sup>	1991	male	36	motor vehicle	26	ileum	tear
How et al. <sup>11</sup>	2009	male	28	motor vehicle	56	ileum	–
Subramanian et al. <sup>12</sup>	2010	male	32	motor vehicle	49	jejunum	–
Subramanian et al. <sup>12</sup>	2010	male	37	motor vehicle	77	jejunum	hematoma
Hamidian et al. <sup>13</sup>	2016	male	32	motor vehicle	42	ileum	tear/hematoma
Present case	2017	male	45	bicycle	1	ileum	hematoma

the jejunum than the ileum. The median delay of the perforation being diagnosed after abdominal trauma was 18.5 days (range : 1 to 77 days).

To diagnose delayed small-intestinal perforation after blunt abdominal trauma, several methods have been suggested. Logistic regression analysis of CT findings suggest that relevant predictors of bowel injury are mesenteric infiltration, bowel wall thickening, and free intraperitoneal air<sup>14</sup>. However, free air reportedly appears in less than 50% of cases of intestinal perforation<sup>15</sup>. Suggested as a first choice for the detection of small-intestinal injury is CT, which has a sensitivity of 97.7% and a specificity 98.5%<sup>16</sup>. On the other hand, diagnostic peritoneal lavage reportedly has a sensitivity of 100% and a specificity of 43%<sup>17</sup>. Moreover, reportedly useful diagnostic markers for intestinal perforation are serum levels of amylase and lipase<sup>18</sup>. Therefore, such methods for early diagnosis can improve the prognosis.

To treat cases of delayed intestinal perforation, the definitive first choice has been surgery. If laparotomy is performed more than 8 hours after diagnosis, the rates of mortality and complications are reportedly increased<sup>19</sup>. In addition, a delay of surgery for more than 24 hours reportedly does not significantly increase the mortality rate but does dramatically increase the rate of complications<sup>20</sup>. Therefore, early treatment can also improve the prognosis.

In the present patient, prompt surgery after the diagnosis of intestinal perforation resulted in no severe postoperative complications. As a point of attention, delayed intestinal stenosis is a possible complication of abdominal

trauma, even if intestinal perforation does not occur<sup>21,22</sup>.

Therefore, on the basis of the present case we conclude that delayed intestinal perforation should be considered in cases of blunt abdominal trauma, even if the patient has no peritoneal irritation after abdominal trauma. With careful management, posttraumatic abdominal pain should be followed up to avoid critical complications.

### CONSENT

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

### COMPETING INTERESTS

The authors declare that they have no competing interests.

### AUTHORS' CONTRIBUTIONS

NF, YN, HS, and MM performed the operation. YH, TI, and KK collected the patient data. NF wrote the whole manuscript. NF and YN searched the relevant literature. All authors read and approved the final manuscript.

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