



Case report

A case of two traumatic penetrations of a duodenal diverticulum caused by a kick to the upper abdomen

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ABSTRACT

Introduction and importance: A duodenal diverticulum is a pseudodiverticulum that lacks a proper muscular layer. Cases of traumatic penetration or perforation of a duodenal diverticulum are relatively rare.**Case presentation:** A 67-year-old woman was injured when her roommate kicked her in the upper abdomen, and was transferred to our hospital 6 h after the injury with upper abdominal pain and lethargy. Computed tomography revealed a duodenal diverticulum and retroperitoneal emphysematous changes and exudates. Peritonitis due to duodenal penetration was suspected and emergency laparotomy was performed. Intraoperative findings revealed two traumatic penetrations of the duodenal diverticulum. We resected the diverticulum with an automatic suture device and covered the resection site with omentum. Twenty-one days postoperatively, she was transferred to her original hospital with no complications following an uneventful postoperative course.**Clinical discussion:** Most causes of penetration or perforation of the duodenal diverticulum are diverticulitis, and few reports have described penetration or perforation of duodenal diverticulum due to trauma. Our case was extremely rare that caused by a kick to the upper abdomen and resulted in two penetrations of a duodenal diverticulum although factors contributing to the multiple penetrations were considered.**Conclusion:** Penetration or perforation of a duodenal diverticulum occasionally results in a rapid deterioration to a severe state. Comprehensive judgement of the general condition and laboratory findings and selection of an appropriate treatment policy is important.

1. Introduction

A duodenal diverticulum is a pseudodiverticulum that lacks a proper muscular layer, and is the second most common gastrointestinal diverticulum after colonic diverticulum [1]. Penetration or perforation of a duodenal diverticulum can involve stagnation of gastrointestinal tract contents, diverticulitis, increased diverticulum pressure, or weakening of the intestinal wall due to aging. Most cases of penetration or perforation of the duodenal diverticulum are caused by diverticulitis, and few reports have described penetration or perforation of a duodenal diverticulum due to trauma [2–6]. We report here an extremely rare case of two traumatic penetrations of a duodenal diverticulum caused by a kick to the upper abdomen. This report has been reported in line with the SCARE Criteria [7].

2. Case presentation

A 67-year-old woman with schizophrenia was hospitalized in another hospital. She had a history of surgery for rectal cancer and was receiving oral treatment for schizophrenia. She was injured when her roommate kicked her in the upper abdomen, and was found with upper abdominal pain and lethargy 2 h after the injury. Her level of consciousness was seen to be decreased 6 h after injury, the Glasgow Coma Scale (GCS) score was 8, and she was transported to our hospital by ambulance. The patient was 148.2 cm tall and weighed 32.6 kg, with a lean body type. She described tenderness in the upper right abdomen, but showed no subcutaneous bleeding spots, rebound tenderness, or muscular guarding. Computed tomography (CT) of the abdomen showed a duodenal diverticulum, along with emphysematous changes and exudates in the duodenum and retroperitoneal space on the dorsal side of

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the ascending colon, but no obvious sites of penetration (Fig. 1). Peritonitis due to duodenal diverticulum penetration was suspected, her level of consciousness was seen to be decreased, and given the CT findings, penetration was attributed to the movement of a large volume of intestinal contents from the intestinal tract to the retroperitoneal side. As we judged that improvement with conservative treatment was unlikely, emergency surgery was performed.

A midline incision was placed about 15 cm above to below the navel. No obvious contamination was evident in the abdominal cavity. Emphysematous and brownish changes were observed in the retroperitoneum on the dorsal side of the ascending colon. Passive hepatic curvature and duodenum revealed strong contamination of the retroperitoneum. Further exploration revealed a diverticulum with a major axis diameter of 5 cm and a base of 4 cm on the descending limb of the duodenum, with two penetrations of 3 cm and 1 cm (Fig. 2). Since the diverticulum was separated from the duodenal papilla, the diverticulum including the two penetrations was excised with an automatic suture device so as not to leave the diverticulum. The staple stump was then buried and sutured in the serosal muscular layer, and covered with omentum (Fig. 3). The operation time was 128 min, with total blood loss of 10 g.

The excised specimen was unfolded by incising the 3 cm penetration from the base and submitted for histopathological examination (Fig. 4). Histopathological examination revealed pseudodiverticulum and findings consistent with penetrating peritonitis.

The postoperative course was uneventful, and she was transferred to the original hospital on postoperative day 21.

3. Discussion

A duodenal diverticulum is a pseudodiverticulum that lacks a proper muscle layer, and is the second most frequent gastrointestinal diverticulum after colonic diverticulum [1]. Many diverticula are acquired and frequency is greater in older individuals. The site of occurrence is often near the papilla in the descending duodenum, as so-called parapapillary diverticulum, but cases have also been described in the horizontal and ascending parts [4–6]. The mechanisms underlying penetration or perforation of a duodenal diverticulum can involve stasis of the gastrointestinal contents, diverticulitis, increased intra-diverticular pressure, trauma, and/or weakening of the intestinal wall due to aging [2]. According to previous reports, the age of onset is often in the 60s or 70s, and most penetrations or perforations are located in the descending part, as in our case [4,5]. Most injuries in previous reports were sustained in traffic accidents and involved only one site of penetration or perforation. On the other hand, our case represented an extremely rare case of two penetration sites due to blunt trauma caused by a kick to the upper abdomen. A PubMed search suggested this report offers the first description of penetration caused by a kick to the upper abdomen and resulting in two penetrations of a single duodenal diverticulum.

Factors contributing to the multiple penetrations in our case were considered to be related to the following: the duodenal diverticular wall

was directly damaged by being caught between the kicking foot and the spinal column; the lean body type of the patient resulted in increased pressure on the diverticulum due to external force compared to a less-lean body type; a severe and rapid increase in internal pressure occurred in the duodenal diverticulum when the diverticulum was compressed by the external force or the movement of gas in the intestinal tract into the duodenal diverticulum; the vulnerable part was wider than the normal duodenal wall tissue because of a huge pseudodiverticulum, which may have caused indirect penetration when the diverticular wall was crushed or damaged by direct external force, and was easily affected by digestive juices including gastric juice and bile because of the location of the diverticulum in the descending duodenum.

Although abdominal pain and leukocytosis may be observed as clinical symptoms, symptoms of peritoneal irritation do not appear or are often mild because the diverticulum penetrates more into the retroperitoneum than into the abdominal cavity. CT examination is useful for diagnosis, and is characterized by retroperitoneal emphysema and an area of low absorption around the pancreatic head, but diagnosis of perforation is rarely made on upper gastrointestinal endoscopy or from free air findings on abdominal plain X-rays, and the lack of specific findings can often lead to delayed or aggravated diagnosis [1,8]. A healthy individual may complain of symptoms such as abdominal pain immediately after the injury, but in our case the patient had difficulty describing symptoms because of schizophrenia and delayed onset of symptoms due to the retroperitoneal penetration. Large penetrations and high levels of contamination were also found intraoperatively, which could have led to a much more severe, life-threatening state if emergency surgery had not been selected.

Most duodenal diverticula go untreated, but are indicated for treatment when diverticulitis, bleeding, penetration, and perforation arise as complications. Relief from symptoms may be achieved with conservative treatments such as endoscopic clip stitching or administration of antibacterial agents if the general condition is good and the penetration or perforation is small, but surgery should be performed immediately if any deterioration of general condition, exacerbation of symptoms, or exacerbation of test results is identified [9]. Suitable surgical procedures include diverticulum resection, suture closure, and drainage. Omental covering of the suture site, duodenal vacation, and pancreaticoduodenectomy should also be considered depending on the degree of inflammation and the presence of penetration or perforation. In our case, we resected the diverticulum with an automatic suture device because the diverticulum was large with two penetrations, the inflammation around the penetrations was relatively mild, and the diverticulum was separated from the duodenal papilla. In consideration of the possibility of suture failure, we covered the resection site with omentum, and no postoperative complications were observed.

4. Conclusion

We encountered an extremely rare case of two traumatic penetrations of a duodenal diverticulum caused by a kick to the upper abdomen.

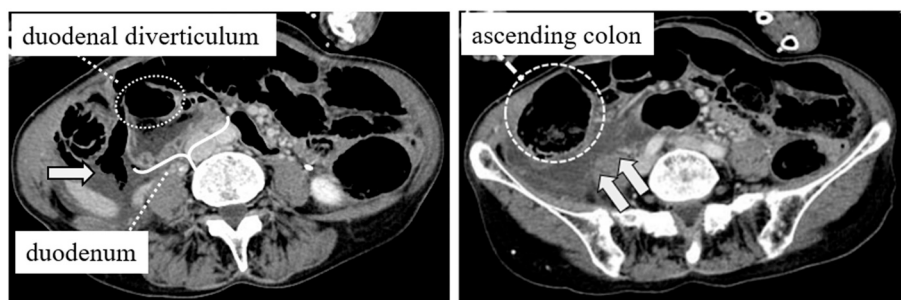


Fig. 1. CT findings.

CT show emphysematous changes around the duodenum (single arrow) and exudate on the dorsal side of the ascending colon (double arrow).

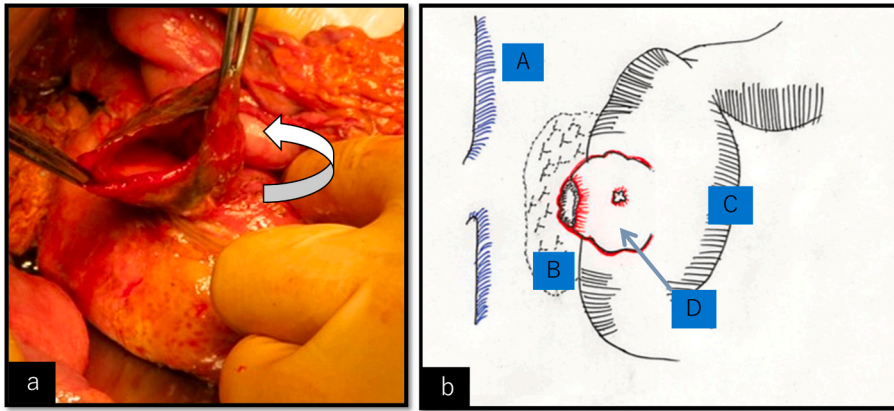


Fig. 2. Operative findings.
 A 5 cm diverticulum with two penetrations is seen on the descending limb of the duodenum.
 a) Macroscopic findings. A 3 cm penetration is widened with tweezers. A 1 cm penetration is present in the left wall of the diverticulum, but is not clearly depicted in the photograph (white arrow).
 b) Schematic illustration: A) inferior vena cava; B) pancreas; C) duodenum; D) duodenal diverticulum.

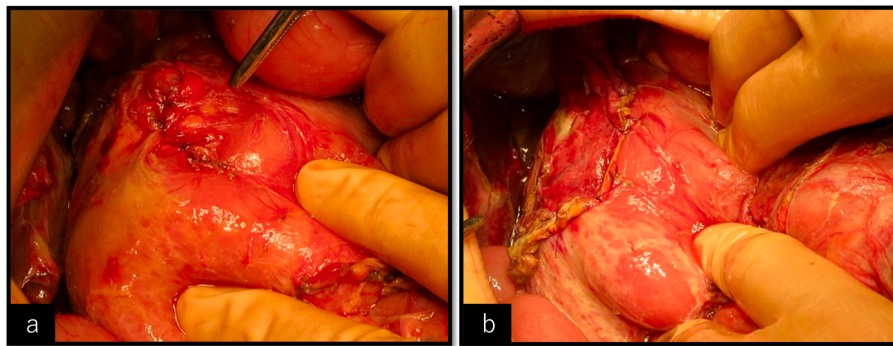


Fig. 3. Operative findings.
 The stapled stump is buried and sutured in the serosal muscular layer (a), and covered with omentum (b).

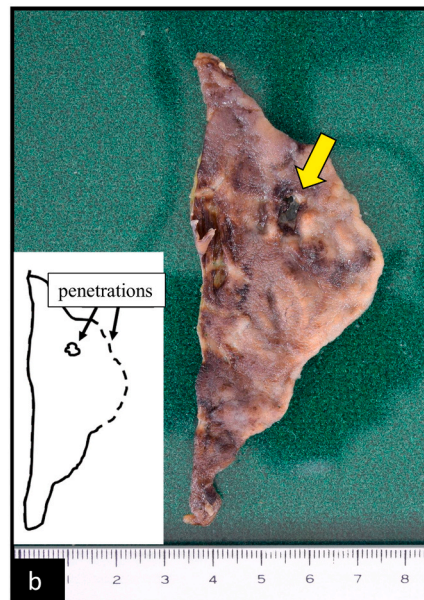
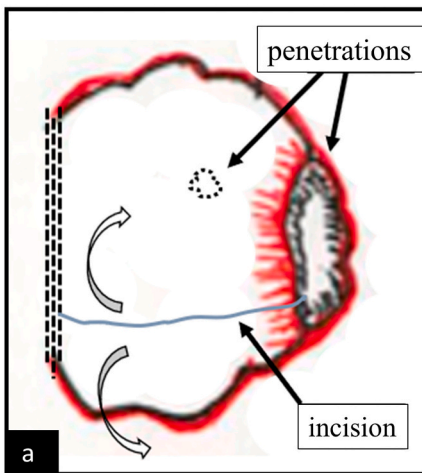


Fig. 4. Excised specimen findings.
 a) Schematic illustration: The excised specimen is unfolded by incising the 3 cm penetration site from the base.
 b) Schematic illustration and macroscopic findings: Site of the 1 cm penetration (yellow arrow). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Penetration or perforation of a duodenal diverticulum often leads rapidly to a severe state, and comprehensive judgement of the general condition and laboratory findings is important for selecting an appropriate treatment policy.

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Ethical approval

Not applicable.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Registration of research studies

1. Name of the registry:

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2. Unique identifying number or registration ID: researchregistry7009

3. Hyperlink to your specific registration (must be publicly accessible and will be checked): <https://www.researchregistry.com/register-now#home/>.**Guarantor**

Toshio Shiraishi.

CRediT authorship contribution statement

Toshio Shiraishi was responsible for the study concept. All authors have read and approved the final version of the manuscript.

Declaration of competing interest

All authors declare that have no conflict of interest.

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