

## Case report

# Successful endoscopic closure with endoscopic clips for endoscopic ultrasound related large duodenal perforation

Koji Takahashi<sup>1</sup>, Ryo Saito<sup>1</sup>, Yoshihisa Takeuchi<sup>1</sup>, Chihiro Goto<sup>1</sup>, Masami Awatsu<sup>1</sup>, Kentaro Ishikawa<sup>1</sup>, Hideaki Ishigami<sup>1</sup>, Meiji Kuga<sup>1</sup> and Yoshio Masuya<sup>1</sup>

<sup>1</sup>Department of Gastroenterology, Chiba Rosai Hospital, Japan

### Abstract

**Objectives:** Duodenal perforation as a complication of endoscopic ultrasound-guided fine needle aspiration may progress to acute peritonitis and septic shock. Open surgery, the standard treatment, can be avoided by performing closure during endoscopy using endoscopic clips.

**Patient:** A 77-year-old woman was referred to our hospital with salivary gland swelling. She had elevated hepatobiliary enzymes and jaundice. Computed tomography (CT) revealed pancreatic head swelling and bile duct dilation. Endoscopic ultrasonography revealed a hypoechoic mass in the pancreatic head. The pancreatic head mass was punctured twice using a 22-gauge Franchine-type puncture needle at the duodenal bulb. The endoscope was advanced to the descending part of the duodenum, and part of the superior duodenal angle was perforated (diameter approximately 15 mm) with the endoscope. The duodenal mucosa around the perforation was immediately closed using endoscopic clips.

**Results:** Abdominal CT showed gas in the peritoneal and retroperitoneal spaces. The patient experienced abdominal pain and fever and was treated with fasting and antibiotics. The gas gradually decreased, symptoms improved, and she was discharged 18 days after the perforation. Histopathologically, the pancreatic tissue was consistent as autoimmune pancreatitis.

**Conclusion:** Endoscopic closure using endoscopic clips may be a better therapeutic option for duodenal perforation caused by endoscopy.

**Key words:** endoscopic closure, endoscopic clips, endoscopic ultrasound, duodenal perforation

(J Rural Med 2021; 16(3): 165–169)

## Introduction

Endoscopic ultrasound (EUS) and EUS-guided fine needle aspiration (EUS-FNA) are widely used to diagnose various biliary and pancreatic diseases. Both procedures are considered safe. However, in rare cases, severe complications can occur. An oblique-viewing endoscope is used for EUS-FNA. Duodenal perforation, which is unlikely to oc-

cur when using a forward-viewing endoscope, may occur when using an oblique-viewing endoscope. Duodenal perforation as a complication of EUS-FNA may progress to acute peritonitis and septic shock. Open surgery is the standard treatment, but there are reports that surgical closure can be avoided by performing closure during endoscopy<sup>1-3)</sup>. We describe a patient with pancreatic head swelling who developed a large duodenal perforation with an oblique-viewing endoscope during EUS-FNA and was treated successfully with immediate closure of the perforation using endoscopic clips.

## Case report

A 77-year-old woman was referred to our hospital with salivary gland swelling. She presented with jaundice, and blood tests showed elevated hepatobiliary enzymes. Contrast-enhanced computed tomography (CT), which was performed because obstructive jaundice was suspected, re-

Received: January 18, 2021

Accepted: March 2, 2021

Correspondence: Yoshio Masuya, Department of Gastroenterology, Chiba Rosai Hospital, 2-16 Tatsumidai-higashi, Ichihara-shi, Chiba 290-0003, Japan

E-mail: bluesman@krc.biglobe.ne.jp

This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial No Derivatives

(by-nc-nd) License <<http://creativecommons.org/licenses/by-nc-nd/4.0/>>.



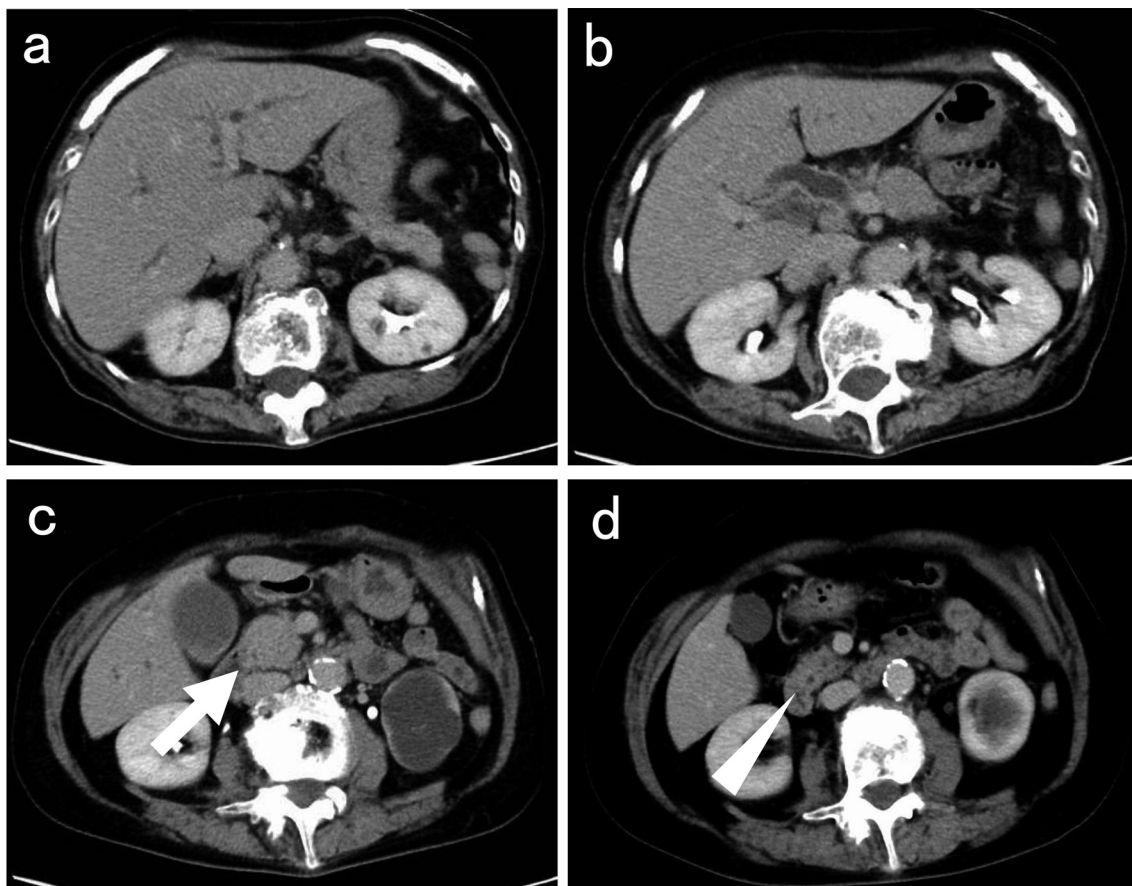
vealed pancreatic head swelling and bile duct dilation compared to CT images from 5 years ago (Figure 1). Considering the possibility of pancreatic head cancer, we decided to perform EUS-FNA.

EUS showed a hypoechoic mass in the head of the pancreas, but no dilation of the pancreatic duct. Bile duct wall thickening and luminal dilation were also observed. The pancreatic head mass was punctured twice using a 22-gauge Franchine-type puncture needle at the duodenal bulb (Figure 2). Subsequently, when the endoscope was stretched to advance to the descending part of the duodenum for observation, a part of the superior duodenal angle (SDA) was perforated with the endoscope. The EUS endoscope was immediately removed, and a forward-viewing endoscope was inserted, revealing a perforation with a diameter of approximately 15 mm in the SDA (Figure 3). We decided to close the perforation using an endoscopic procedure, and the duodenal mucosa around the perforation was closed using endoscopic clips. When the perforation was judged to be closed, the procedure was completed. Abdominal CT performed after the procedure showed gas in the peritoneal

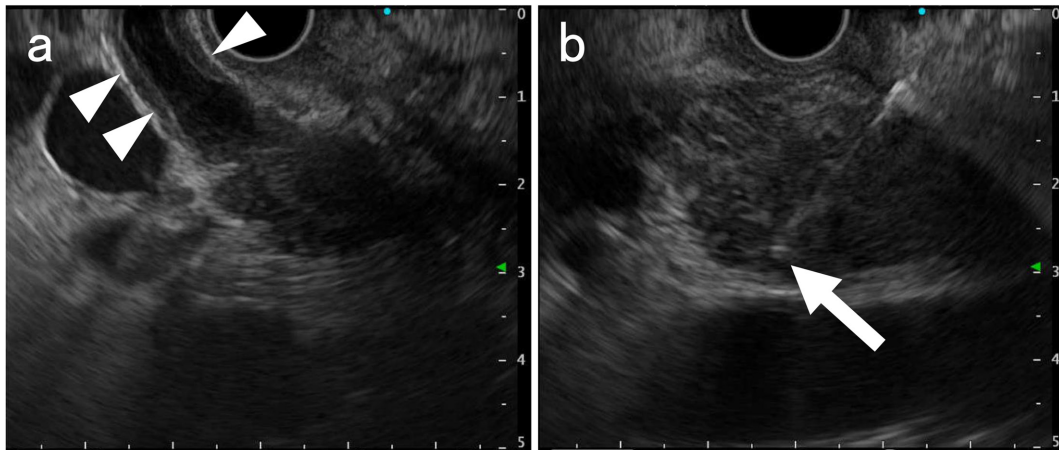
and retroperitoneal spaces (Figure 4). After the procedure, the patient experienced abdominal pain and fever and was treated with fasting and meropenem. The gas in the peritoneal and retroperitoneal spaces gradually decreased, and her symptoms improved. Oral intake was resumed 8 days after the perforation. Her subsequent clinical course was good, and she was discharged 18 days after the perforation.

Histopathological examination of the pancreatic tissue collected by EUS-FNA revealed fibrosis and inflammatory cell infiltration. The inflammatory cells were mainly lymphocytes and plasma cells. Immunostaining showed 10 or more IgG4-positive cells per high-power field. No tumor cells were observed. These findings are compatible with a diagnosis of autoimmune pancreatitis.

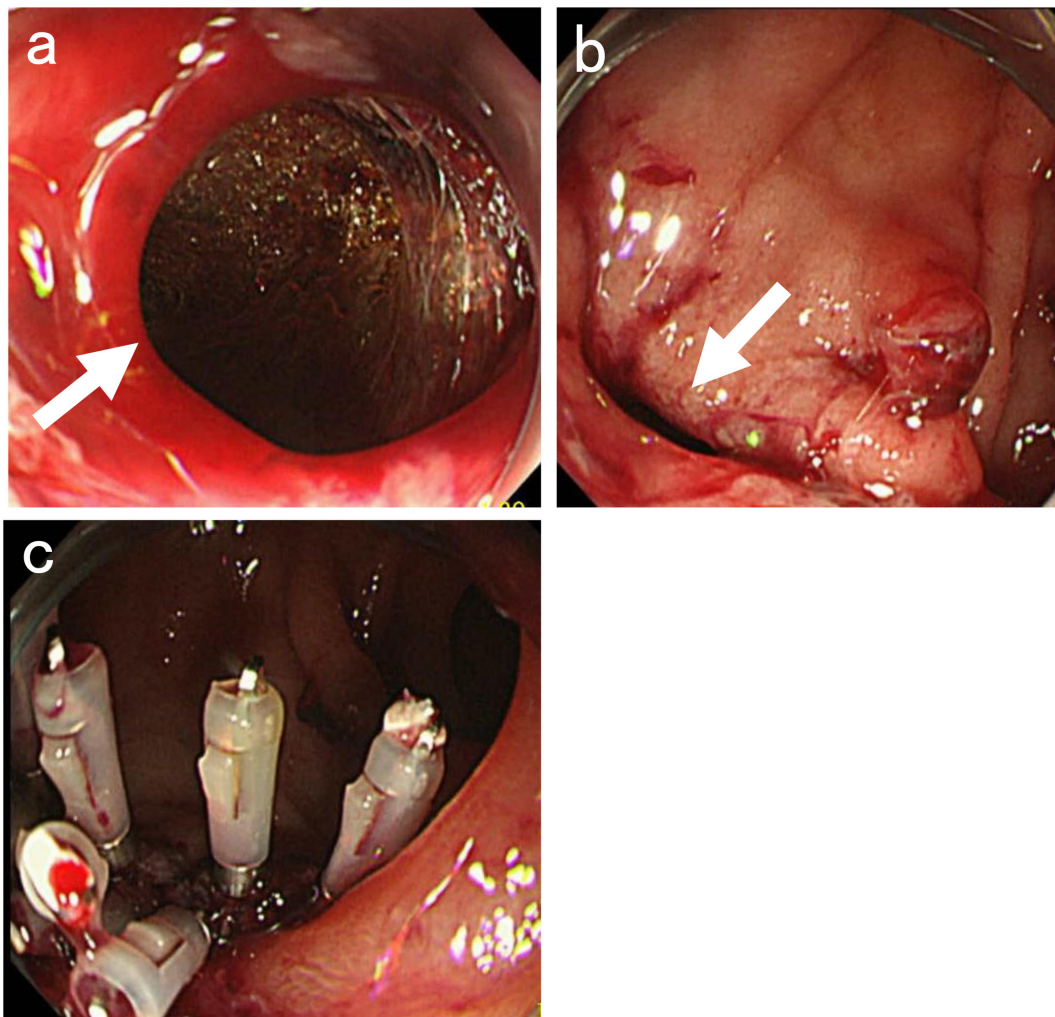
She was diagnosed with IgG4-related disease, and her salivary gland swelling was thought to be related to the condition and IgG4-related salivary glanditis. The elevation in hepatobiliary system enzymes and jaundice improved spontaneously, and no steroids were administered. She is being followed up with periodic blood tests and contrast-enhanced CT.



**Figure 1** (a–c) Contrast-enhanced computed tomography (CE-CT) images before endoscopic ultrasound-guided fine needle aspiration. Images show swelling of the head of the pancreas (arrow) and bile duct dilation. (d) CE-CT 5 years previously. Images show no swelling of the head of the pancreas (arrowhead).

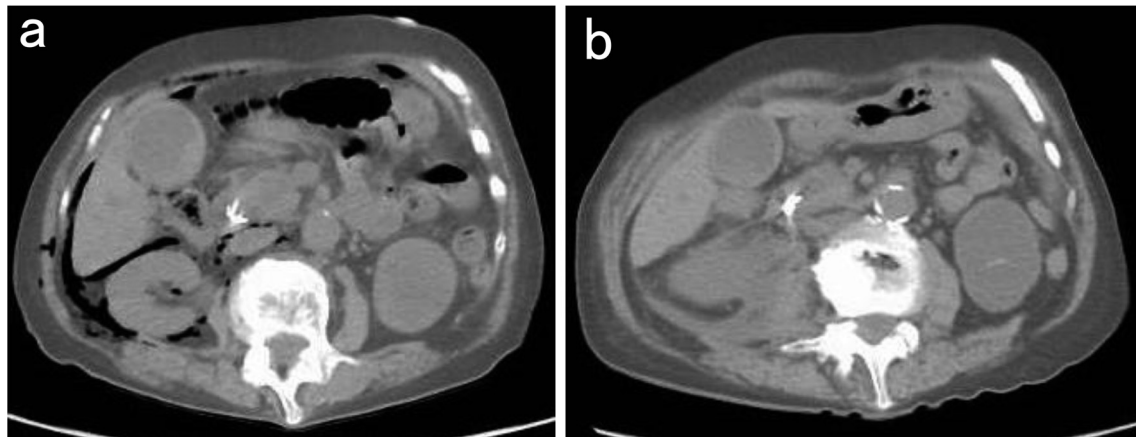


**Figure 2** (a) Endoscopic ultrasound showed a hypoechoic mass in the head of the pancreas. Bile duct wall thickening (arrowhead) and luminal dilation were also observed. (b) From the duodenal bulb, the pancreatic head mass was punctured twice with a 22-gauge Franchine-type puncture needle. The tip of the puncture needle is indicated by arrows.



**Figure 3** (a, b) When the endoscope was stretched to advance to the descending part of the duodenum after ultrasound-guided fine needle aspiration, part of the superior duodenal angle (SDA) was perforated with the endoscope. The endoscope was immediately removed, and a forward-viewing endoscope was inserted, revealing a perforation with a diameter of approximately 15 mm in the SDA (arrow). (c) The duodenal mucosa around the perforation was closed by endoscopic clips.





**Figure 4** (a) After closure of the duodenal perforation, abdominal computed tomography (CT) showed gas in the peritoneal and retroperitoneal spaces and subcutaneous tissues. (b) CT images 12 days after endoscopic ultrasound-guided fine needle aspiration showed almost no gas.

This case report was conducted in accordance with the principles of the Declaration of Helsinki. Oral informed consent was obtained from the patient for publication of this case report and any accompanying images.

## Discussion

Although iatrogenic duodenal perforation is rare, as the number of EUS and EUS-FNA procedures has increased in recent years, iatrogenic duodenal perforation cases are expected to increase. A single-center retrospective study of 1,034 EUS-FNA procedures, focused on complications, reported that one duodenal perforation occurred (0.09%), and the patient underwent surgery but died afterwards<sup>4</sup>. Although duodenal perforation during EUS-related procedures is very rare, it can have serious consequences without early and reliable closure. Conventionally, patients diagnosed with duodenal perforation during or after EUS-related procedures are indicated for emergency open surgery. However, open surgery has disadvantages in terms of being more invasive than endoscopic closure<sup>5</sup>. In addition, patients with severe respiratory or cardiovascular disease may not be able to tolerate general anesthesia and may not be eligible for open surgery. Endoscopic closure has the potential to be a better therapeutic option. In recent years, reports of successful duodenal closure using over-the-scope clips (OTSCs) have been increasing<sup>3, 6, 7</sup>. With OTSCs, full-thickness suturing of the gastrointestinal tract is possible. OTSCs can easily close perforations immediately, but few facilities have OTSCs.

The mechanism of EUS-related endoscopic perforation of the duodenum involves mechanical trauma from the endoscope. In our case, the sites of fine needle puncture and perforation were different. At the time of EUS-FNA, there

was inflammation and mucosal edema of the duodenum, and it was difficult to advance the oblique-viewing endoscope into the descending part duodenum. It is probable that by stretching the scope, the force at the tip of the endoscope went in a direction other than the gastrointestinal lumen and perforated the duodenal wall, which was weaker than usual owing to inflammation and edema.

In our case, the endoscopic perforation was closed using endoscopic clips. Considering the possibility of perforation, EUS-related procedures should be performed with CO<sub>2</sub> insufflation. Many facilities have endoscopic clips, and this method is simple and can be used in many cases. However, the closure site may open again due to the endoscopic clips coming out of the perforated site; therefore, careful follow-up is necessary. Open surgery should be considered if abdominal pain becomes severe, blood test results show an increased white blood cell count and C-reactive protein level, or CT does not show a decrease in extraintestinal gas.

Endoscopic closure of a gastrointestinal perforation after an endoscopic procedure has a high probability of avoiding surgery if performed properly in appropriately identified cases<sup>8</sup>. If the following conditions are met, closure of the perforated site using endoscopic clips may be attempted. First, the position of the duodenal perforation can be viewed from the front using a forward-viewing endoscope. Second, the perforation size should be 15 mm or less, which is the diameter of the oblique-viewing endoscope for EUS. Third, when the perforation is found, sedation is good, and the respiratory and circulatory conditions are stable. Endoscopists should be careful not to allow clips to enter the abdominal cavity or retroperitoneal space.

After closure of the perforation using endoscopic clips, a nasogastric tube should be placed for gastrointestinal decompression, and fasting and antibiotic administration are

required. Broad-spectrum antibiotics covering anaerobic bacteria should be selected. An abdominal surgeon should be consulted<sup>9</sup>. Close clinical monitoring is required to assess the patient's condition. Regarding physical findings, the degree of fever, abdominal pain, and signs of peritoneal irritation should be monitored, and the serum white blood cell count and C-reactive protein level are very important. The amount of extraintestinal gas outside the gastrointestinal tract should be checked using CT. When the fever disappears without antipyretics and there are no signs of peritoneal irritation, starting fluid intake should be considered.

If the perforation site is near the duodenal papilla, endoscopic nasobiliary drainage tube placement may be considered in some cases to avoid bile irritation<sup>9</sup>. However, this increases procedure time, and there is a possibility that the endoscopic nasobiliary drainage tube may stimulate the perforation closure site. Depending on the situation, the endoscopist should make an appropriate decision regarding endoscopic nasobiliary drainage tube placement.

There is also a perforation closure method targeting larger perforations that combines a detachable snare and en-

doscopic clips with a two-channel endoscope. Recently, it has been reported that this closing method can be performed with a normal single-channel endoscope<sup>10</sup>, but the procedure is cumbersome and the assistants must be familiar with the procedure. If the endoscopists and staff are accustomed to this closing procedure, it seems to be effective in cases where the diameter of the perforation is large and it is difficult to close it with only the endoscopic clips.

In conclusion, we report a successful endoscopic closure using endoscopic clips for EUS-related duodenal perforation. This procedure should be considered as an initial treatment option for duodenal perforations.

**Conflict of interest:** The authors declare no conflict of interest.

## Acknowledgements

The authors would like to thank all the staff involved in the treatment of our patient at Chiba Rosai Hospital. We would also like to thank Enago for English language review.

## References

1. Ahlawat SK, Haddad N. Repair of an EUS--induced duodenal perforation with endoscopic clips. *Acta Gastroenterol Belg* 2009; 72: 361–364. [[Medline](#)]
2. Liu Y, Wang D, Li Z. Endoscopic closure for EUS and ERCP related duodenal perforation by endoclips. *Gastroenterol Res Pract* 2016; 2016: 1051597. [[Medline](#)] [[CrossRef](#)]
3. Grande G, Manno M, Alberghina N, *et al.* Quick, safe and effective repair of EUS-related duodenal perforation using over-the-scope clip system (with video). *Dig Liver Dis* 2016; 48: 1099–1100. [[Medline](#)] [[CrossRef](#)]
4. Carrara S, Arcidiacono PG, Mezzi G, *et al.* Pancreatic endoscopic ultrasound-guided fine needle aspiration: complication rate and clinical course in a single centre. *Dig Liver Dis* 2010; 42: 520–523. [[Medline](#)] [[CrossRef](#)]
5. Lachter J. Fatal complications of endoscopic ultrasonography: a look at 18 cases. *Endoscopy* 2007; 39: 747–750. [[Medline](#)] [[CrossRef](#)]
6. Doğan ÜB, Keskin MB, Söker G, *et al.* Endoscopic closure of an endoscope-related duodenal perforation using the over-the-scope clip. *Turk J Gastroenterol* 2013; 24: 436–440. [[Medline](#)] [[CrossRef](#)]
7. Kirtane T, Singhal S. Endoscopic closure of iatrogenic duodenal perforation using dual over-the-scope clips. *Gastrointest Endosc* 2016; 83: 467–468. [[Medline](#)] [[CrossRef](#)]
8. Verlaan T, Voermans RP, van Berge Henegouwen MI, *et al.* Endoscopic closure of acute perforations of the GI tract: a systematic review of the literature. *Gastrointest Endosc* 2015; 82: 618–628.e5. [[Medline](#)] [[CrossRef](#)]
9. Li G, Chen Y, Zhou X, *et al.* Early management experience of perforation after ERCP. *Gastroenterol Res Pract* 2012; 2012: 657418. [[Medline](#)] [[CrossRef](#)]
10. Zeng CY, Li GH, Zhu Y, *et al.* Single-channel endoscopic closure of large endoscopy-related perforations. *Endoscopy* 2015; 47: 735–738. [[Medline](#)] [[CrossRef](#)]