



# Usefulness of surgical closure following intraoperative endoscopic additional stenting of duodenal perforation by stent: Report of a case



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## ABSTRACT

**INTRODUCTION:** Malignant duodenal stenosis occurs in patients with advanced periampullary cancer. Insertion of a self-expanding metal stent for the treatment of this condition carries the risk of subsequent perforation of the duodenum. We report successful treatment of duodenal perforation induced by a stent. **PRESENTATION OF CASE:** An 80-year-old woman suffering from stenosis caused by advanced periampullary cancer underwent metallic stent placement and her symptoms improved. While attempting biliary re-stenting to prevent restenosis after 4 months, the proximal end of the duodenal metallic stent migrated into the abdominal cavity. Using a laparotomy intraoperative endoscope, duodenal stents were placed into the prolapsed stent in the form of stent-in-stent to reduce the axial force of the stent, after which the puncture site was closed by suturing. No leakage or stenosis was observed at the duodenum, and the patient was able to eat normally until her death 4 months after surgery.

**CONCLUSION:** Surgical closure following intraoperative endoscopic additional stenting is a viable option for duodenal perforation caused by a stent.

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## 1. Introduction

Malignant duodenal stenosis sometimes occurs in patients with advanced periampullary carcinoma, and detrimentally affects the quality of life of patients because of unpleasant symptoms including insufficient oral intake, nausea, and vomiting. Self-expandable metallic stents have been introduced to treat malignant duodenal stenosis, especially in patients with a short life expectancy, as a therapeutic alternative to surgical bypass [1,2]. Duodenal stenting is reported to relieve symptoms associated with stenosis of the duodenum and to improve the patients' quality of life [3]. As duodenal stenosis usually follows biliary stenosis arising from periampullary carcinoma, double stenting of both duodenal and biliary stenosis should be performed for palliation [3,4].

Complications associated with the placement of a self-expandable metallic stent for duodenal obstruction are reported in approximately 19.4–26.2% of cases [5]. Perforation of the duodenum, though rare, can be life threatening. Herein we report the successful treatment of duodenal perforation induced by a stent by means of surgical closure following intraoperative endoscopic additional stenting.

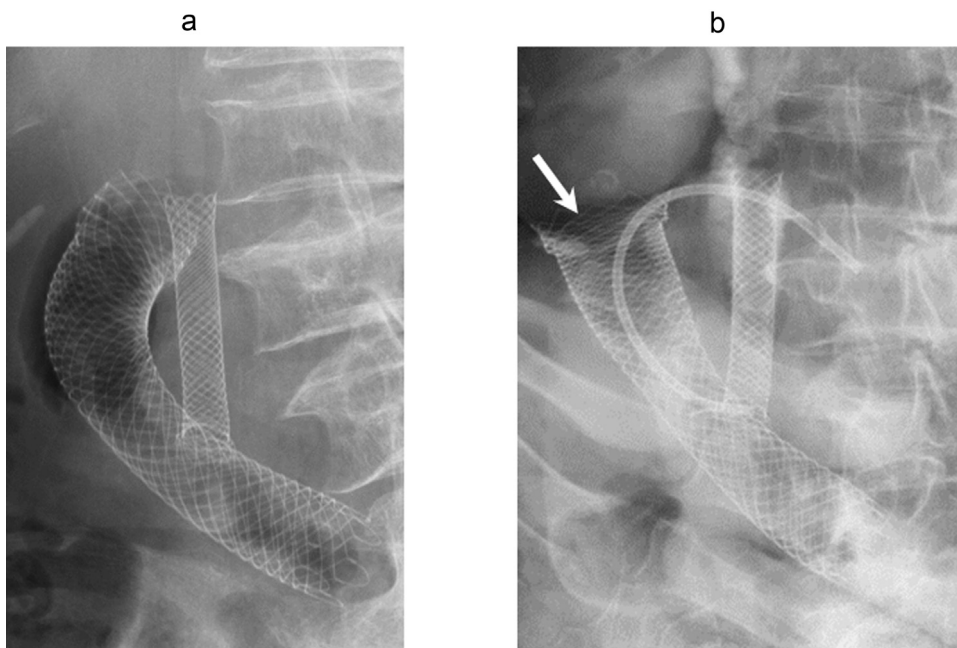
## 2. Presentation of case

An 80-year-old woman was referred to our hospital because of fever and anorexia. Imaging and endoscopic examination revealed stenosis of not only the lower bile duct, but also the second portion of duodenum. Biopsy of the lower bile duct revealed adenocarcinoma. She refused surgery and underwent placement of a WallFlex duodenal stent (2.2 × 120 cm; Boston Scientific, Marlborough, MA, USA) and a bile duct metallic stent for duodenal and biliary stenosis, respectively (Fig. 1a). She was discharged from hospital with improvement of symptoms.

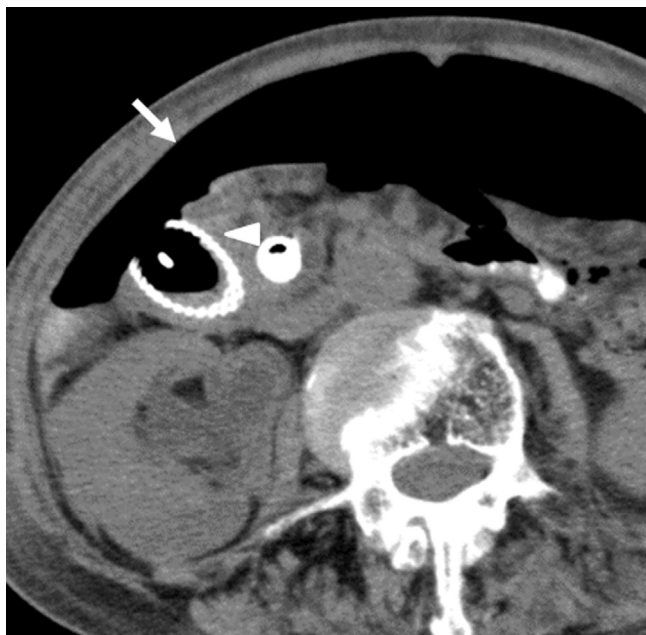
Four months later she was readmitted because of cholangitis due to biliary stent obstruction. We attempted biliary re-stenting, but found it difficult to stretch the endoscope (TJF-260; Olympus, Tokyo, Japan) in the second portion of the duodenum because of the indwelling stent. Ultimately the proximal end of the metallic stent migrated into the abdominal cavity as a result of compression of the exterior of the duodenal bulb (Fig. 1b). We decided to intervene surgically after confirmation of perforation of the first portion of the duodenum on computed tomography (CT) (Fig. 2). At laparotomy we found a 4 cm perforation from the first to the second outside portion of the duodenum with prolapse of the duodenal stent (Fig. 3). After positioning the prolapsed stent in the duodenum, intraoperative endoscopy was performed to place a total of three Niti-S gastroduodenal stents (2.2 × 12 cm, 2.2 × 8 cm,

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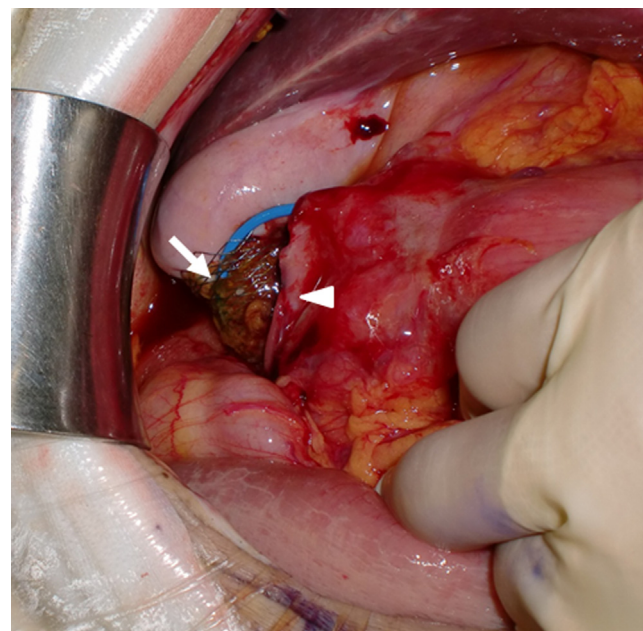
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**Fig. 1.** (a) Radiograph shows duodenal and bile duct double stenting for malignant duodenal and biliary obstruction. (b) Radiograph shows migration of the proximal end of the duodenal metal stent into the abdominal cavity during biliary re-stenting (arrow).



**Fig. 2.** Computed tomography shows that the metallic stent (arrowhead) perforated through the duodenal wall and the pneumoperitoneum (arrow).



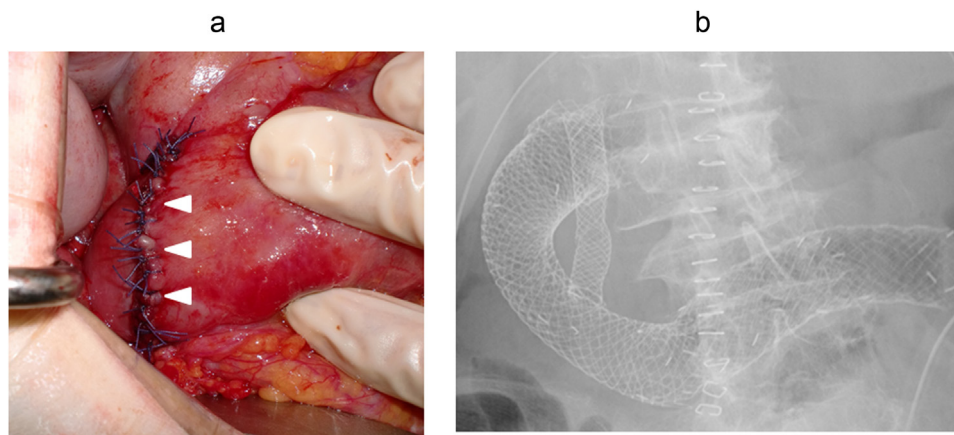
**Fig. 3.** Duodenal metallic stent (arrow) penetrated the duodenal wall (arrowhead).

and  $2.2 \times 10$  cm; Century Medical, Tokyo, Japan) on the caudal and cranial sides of the prolapsed stent in a stent-in-stent fashion to reduce the axial force on the prolapsed stent. We confirmed the diminished expanding force on the perforated lesion, and closed the duodenal perforation by Albert anastomosis (Fig. 4a). Postoperative radiography revealed successful coaxial placement of a total of four stents (Fig. 4b). No leakage or poor passage was observed at the duodenum, and the patient was able to eat normally until her death 4 months after surgery.

### 3. Discussion

To our knowledge, this is the first report of surgical closure following intraoperative endoscopic additional stenting for duodenal perforation induced by a stent.

Double stenting for duodenal and biliary obstruction has been reported in patients with advanced periampullary carcinoma [6]. Endoscopic retrograde cholangiopancreatography (ERCP) has been a safe procedure in patients with indwelling stents, with a low risk of stent prolapse and intestinal perforation. Perforation of the digestive tract is one of the most life-threatening complications and must be avoided. To prevent duodenal perforation, clips and fibrin



**Fig. 4.** (a) Direct suture was performed at the perforation site (arrowhead) after insertion of three stents. (b) Radiograph shows the successful coaxial placement of a total of four stents.

glue are used in ERCP for patients with a suspicion of perforation, but no imaging evidence [7,8]. In this study, a surgical approach was required because the post-event CT revealed the stent to be apparently prolapsed from the duodenum with free air excised in the peritoneal cavity. At laparotomy, the prolapsed duodenal stent was linearized and moved to the perforation site of the duodenum by axial force. Several strategies reported for intestinal perforation caused by a stent include removal or trimming of the stent followed by surgical closure [9–11]. In the present case, the stent could not be removed because of its strong adherence to the mucosa due to the enlarged tumour. Trimming the stent was considered unsuitable because it might cause additional bowel injury. We therefore decided to use Niti-S pyloric/duodenal stents with a small axial force for re-stenting up to the horizontal limb of the duodenum on the caudal side and up to the duodenal bulb on the cranial side of the existing stent. This reduced the force exerted on the injury site by the existing stent, making it possible to perform simple closure.

#### 4. Conclusion

Additional intraoperative endoscopic stenting followed by surgical closure is a viable option for duodenal perforation induced by a stent.

#### Conflict of interest

Kenji Shimizu and other co-authors have no conflict of interest.

#### Source of funding

We declare that we have no sources of funding.

#### Ethical approval

Documented informed consent was obtained from patient.

#### Consent

Written informed consent has been already obtained from this patients and we describe about it in our manuscript.

#### Author contribution

Shimizu Kenji: writing the paper, study concept or design.  
Hideo Baba and Hiroshi Takamori: reviewed and supervised the report.

#### Guarantor

Hiroshi Takamori.

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