

Case Report

Unanticipated adverse event of endoscopic submucosal dissection: Rectal perforation associated with injury of the cecum wall, Report of a case

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Endoscopic submucosal dissection (ESD) is a standard treatment for early gastric cancer, but it is not generally used for colorectal lesions because of its high risk of adverse events. An unanticipated adverse event of rectal ESD is reported. A 71-year-old man was found to have a laterally spreading tumor at the upper rectum. ESD was performed. During the ESD, rectal perforation occurred, and emergency laparoscopic surgery was performed. At the operation, rectal perforation with retroperitoneal emphysema was detected. Surprisingly, an 8-cm-long, lacerated wound was found at the cecum wall. It was thought to have been caused by heat injury due to ESD. The perforated site was resected, and the laceration of the cecum was repaired by extracorporeal suture. In patients with perforation during ESD, it is essential to keep in mind that other organs might have heat-induced injury, and the patient should be more carefully followed.

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Introduction

There have been marked recent developments in endoscopic surgery for superficial lesions of the gastrointestinal tract. Endoscopic mucosal resection (EMR), which includes strip biopsy and endoscopic aspiration mucosectomy (EAM), is generally used for the treatment of early intramucosal gastric cancer less than 20 mm in diameter without lymph node metastasis. Endoscopic resection is recommended for the therapy of well-differentiated intramucosal early gastric cancer without ulcer formation by the Japanese Gastric Cancer Association (JGCA).¹

Endoscopic submucosal dissection (ESD) was introduced

as therapy for early gastric cancer in 1998 by Hosokawa et al.² and has been increasingly used ever since. The method can be used to treat lesions even greater than 20 mm in diameter and/or with ulcer formation. In addition, its advantage is that lesions are highly likely to be removed en bloc.³⁻⁵ On the other hand, some disadvantages of ESD have also been reported. ESD requires greater skill, longer operation time, and higher costs than EMR. Furthermore, compared to EMR, there is a higher incidence rate of serious adverse events such as perforation.³

Recently, ESD has been introduced for the treatment of esophageal or intestinal lesions based on the accumulation of evidence for gastric lesions. Adaptation of ESD for the

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therapy of colon lesions requires more proficiency because the wall of the colon is thinner and has many folds. Therefore, it has only been introduced in specific hospitals in Japan, such as university hospitals with skilled specialists.⁶

Despite the fact that ESD is still not a standard surgical method, it certainly has many advantages compared to the conventional methods. It is expected that standard protocols to carry it out safely and efficiently will be established. An unanticipated adverse event of ESD for the treatment of a colon lesion is described. Adverse events associated with ESD for colon lesions, including this one, are analyzed and discussed to help establish ESD standards.

Case Report

A 71-year-old man visited our hospital because of anemia and positive fecal occult blood testing on his annual health check-up. The patient had been healthy except for a cholecystectomy at age 50. A flexible fiberscope colon examination showed a 3.5-cm, granular type, laterally spreading tumor (LST-G) in the upper part of the rectum. Most pit patterns were type IV, with type III only at the marginal area (Fig. 1). On pathological examination of the specimens obtained from the lesion, the diagnosis was tubular adenoma, high grade, Group 3. There was a high possibility of early cancer. ESD was performed for further examination and therapy of the lesion using Flush Knife (Fuji Film) and SB Knife (Sumitomo Bakelite) were used as the devices of ESD. Because of severe fibrosis and bleeding at the submucosal layer, this ESD procedure was technically very difficult.

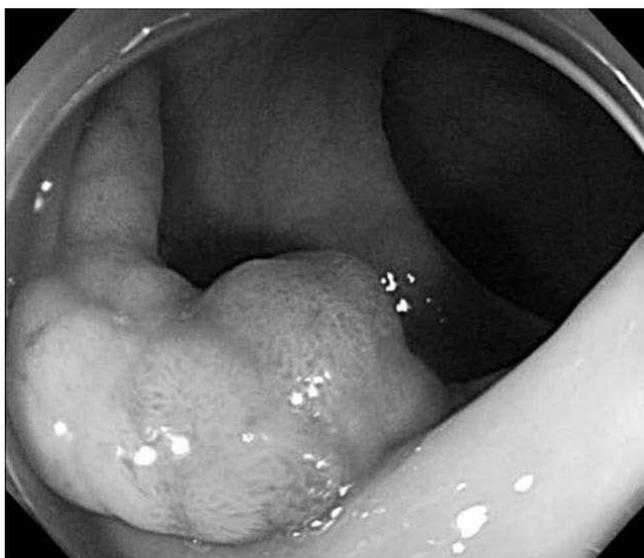


Figure 1. Colonoscopy showed a 3.5-cm-diameter, lateral spreading tumor is seen at the rectosigmoid colon.

3-hours later from the start of ESD, perforation of the local upper part of the rectum occurred, and closure of the perforation with clips was unsuccessful. Therefore, the patient was transferred to our department for surgical treatment. At the time of the transfer, physical examination revealed an alert patient with normal vital signs. His abdominal wall was slightly hard and swollen. The rest of his examination was unremarkable. Laboratory investigation showed a normal CBC count, except for mild thrombocytopenia (platelets $8.8 \times 10^4/\mu\text{L}$). After transfer to our department, emergency laparoscopic surgery was performed because the lesion was in an early stage.

The laparoscopic operation was begun using a five-port approach. Visibility was poor because of dilatation of the bowels. The perforation was found in the upper part of the rectum associated with subserosal emphysema (Fig. 2). The cecum was also dilated, with seromuscular injury of 8 cm in length (Fig. 3). Peritoneal contamination was minimal. The rectosigmoid colon was detached by the medial approach, and anal side resection was done by a linear stapler. The left lower quadrant port was elongated to 3 cm for mini laparotomy. The perforated site was pulled out, and oral side resection was done extracorporeally. The perforated lesion was resected with the tumor, and colono-rectal anastomosis was done by the double stapling technique (DST). The injured cecum was sewn using Roeder's knot technique (Fig. 4).

On pathology, the surgical specimen was tubular adenocarcinoma, well-differentiated, tub1>tub2, pM, med, INFa, ly0, v0, pN0, fStage0, pPM0, pDM0, pRM0, curA. The patient made good progress after surgery and was discharged on postoperative day 20.

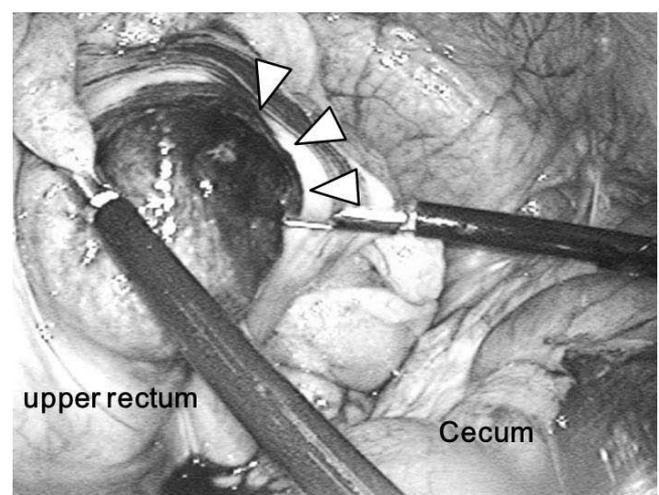


Figure 2. The perforated site was seen at the upper rectum (white arrow heads). There were subserosal emphysemas around the perforated site.

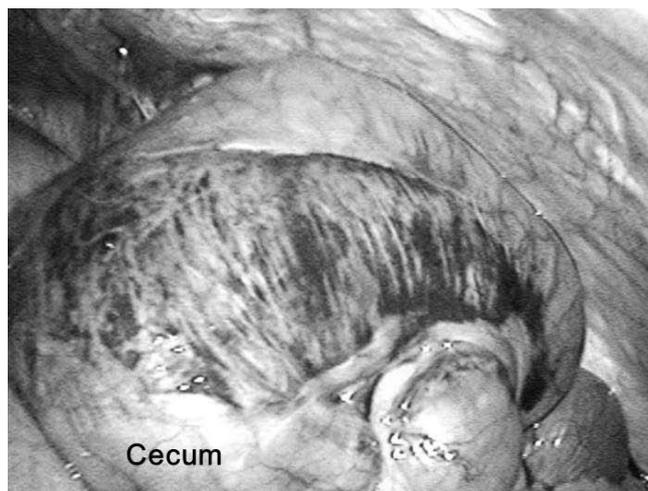


Figure 3. There is an approximately 8-cm tear of the seromuscular layer at the dilated cecum.



Figure 4. The seromuscular tear of the cecum is repaired by intra-corporeal suturing using Roeder's knot technique.

Discussion

A case of external cecum injury caused by ESD was described. Based on a search of PubMed, JMEDPlus, and the Japanese Medical Abstract Society Web, there have been no previous reports describing such an unexpected injury as an adverse event of stomach or colorectal ESD.

There have been marked developments in minimally invasive surgery. In 2007, 26% of surgeries for gastric cancer and 37% of surgeries for colon cancer were reported to be done with laparoscopy. The number of laparoscopic surgeries is expected to increase further.⁷

The indications for laparoscopic surgery and ESD show partial overlap. Gotoda⁸ reported the precise indications of ESD for early gastric cancer (expanded histological criteria

for endoscopic resection): 1) well-differentiated cancer; 2) no vascular invasion; 3a) intramucosal cancer without ulcer formation (no limitation of size); 3b) intramucosal cancer with ulcer formation of less than 30 mm in diameter; and 3c) micro-invasive cancer (sm) of less than 30 mm in diameter. The indications have expanded compared to EMR. It goes without saying that ESD is far less invasive than laparoscopic surgery.^{9,10}

Perforation is the most serious adverse event of endoscopic surgery of the gastrointestinal tract. Once perforation occurs, it not only requires far more invasive treatment, but it may also cause peritonitis resulting in mortality. ESD has a higher risk of perforation for colon lesions (0.74-8.1%) than for gastric lesions because the colon has a thinner wall and is mobile.^{3-5,11} For this reason, ESD for colorectal lesions is performed only in a few hospitals providing 'highly advanced medical treatments', which are special treatments approved by the Japanese Ministry of Health, Labour and Welfare.

On the other hand, the need for ESD for colorectal lesions is expected to increase in the future. Although almost all superficial lesions of the colon can be treated with EMR, LST lesions with submucosal invasion and lesions more than 20 mm in diameter need ESD. This type of lesions has an increased risk of perforation. When perforations occur as adverse events of endoscopic treatment, the injury of the serous membrane side is milder than that of the mucosal side because it is caused by heat injury.¹² In addition, the size of the perforation caused by ESD is smaller than that caused by EMR or strip biopsy.^{4,12,13} It has been reported that 98% of perforations caused by EMR are successfully treated with clip reefing,¹⁴ thought to be the first-choice treatment for such perforations.

The precise mechanism of the cecum injury caused in the present patient is not clear. However, the following can be considered. The patient's cecum might have come into contact with the rectosigmoid colon with inflation of the intestinal tract by air. Under these circumstances, the ESD device, which produces high heat, might penetrate the rectosigmoid colon and touch the serous membrane side of the cecum, making a lacerated wound. While similar adverse events of ESD have not been reported, a similar adverse event caused by endoscopic treatment has been demonstrated; it has been reported that pre-operative marking clips for sigmoid colon cancer penetrated the colon wall and reached the jejunum.¹⁵

Thus, inflation of the colon by air might lead to the colon contacting other organs when ESD is carried out. In this situation, heat injury can spread to the contacted organs if the ESD device creates a perforation. It has been suggested that other organs are also injured in cases of colon perforation

caused during ESD, but go undetected. It is essential to observe patients with great care, keeping in mind the risk of injury to other organs, when perforations happen during ESD treatment.

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