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Enormous postoperative perforation after endoscopic submucosal dissection for duodenal cancer successfully treated with filling and shielding by polyglycolic acid sheets with fibrin glue and CT-guided abscess puncture

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Abstract

A female in her 70s underwent esophagogastroduodenoscopy (EGD) for screening, and an approximately 15-mm 0-IIa lesion was detected in the descending portion of the duodenum. Due to the malignant potency of the lesion, endoscopic submucosal dissection (ESD) was performed. Microperforation occurred during ESD. The lesion was removed *en bloc* and the post-ESD ulcer bed was closed with clips. The next day, the patient had abdominal pain and computed tomography (CT) revealed a small amount of free air in the retroperitoneal space. Since there were no findings to suggest panperitonitis, conservative medical management including fasting and antibiotics was continued. Abdominal pain subsequently improved. However,

EGD on the 8th day after ESD for follow-up showed shedding of the post-ESD ulcer that penetrated the retroperitoneal space. A surgical approach was not indicated because a few days may have already passed since postoperative perforation occurred and the spread of inflammation to the retroperitoneum was suspected. In an attempt to promote closure of the perforated cavity, we patched polyglycolic acid sheets and fibrin glue to the cavity wall on days 17, 18, and 20 after ESD. The formation of granulation tissue was detected in the cavity one week later. CT showed an abscess in the right retroperitoneum, for which CT-guided abscess puncture was performed. Thereafter, the cavity gradually decreased. After the initiation of oral intake on postoperative day (POD) 63, the general condition of the patient was stable and she was discharged on POD 87. Polyglycolic acid sheets with fibrin glue and CT-guided abscess puncture were useful for closing the large cavity that developed after duodenal postoperative perforation.

Keywords

duodenum, endoscopic submucosal dissection, postoperative perforation, polyglycolic acid sheet

Introduction

The technique of endoscopic submucosal dissection (ESD) has recently been developed and accepted as a treatment for duodenal lesions as well as esophageal, gastric, and colorectal lesions [1, 2]. However, the duodenum has an anatomically thin muscle wall and is a location in which endoscopic maneuvers and the maintenance of a stable endoscopic view are difficult. Moreover, it is exposed to the flow of pancreatic and bile juices, which may digest the muscle layer. Therefore, the risk of intraoperative and postoperative perforations is higher in the duodenum than in other organs [3]. Urgent surgery is the standard treatment for perforation unless complete endoscopic closure is achievable because the outflow of pancreatic and bile juices to the retroperitoneal space may worsen the general condition of patients [4]. On the other hand, bioabsorbable polyglycolic acid (PGA) sheets (Neoveil; Gunze Co., Kyoto, Japan), which are commonly used in surgery fields, have been reported to guide fibroblast cells and promote granulation [5-8], and have also recently been used in endoscopic fields for the closure of perforations and prevention of postoperative bleeding and perforations [9-15]. We encountered a patient with a large postoperative duodenal perforation

after ESD, who was successfully treated with filling and shielding by PGA sheets and fibrin glue.

Case Report:

A female in her 70s underwent esophagogastroduodenoscopy (EGD) for screening, which revealed an approximately 15-mm 0-IIa lesion in the descending portion of the duodenum (Fig. 1). It was located on the anal side of the papilla of Vater and cancer was suspected. ESD was performed as a diagnostic treatment. Microperforation occurred in the early stage of the procedure (Fig. 2). The lesion was removed *en bloc* and the ulcer bed was closed with clips. The next day, the patient had abdominal pain without a fever and computed tomography (CT) showed a small amount of free air in the retroperitoneal space. Since we considered that the ulcer bed was totally closed by clips and there were no findings to suggest panperitonitis, surgery was not indicated and conservative medical management including fasting and antibiotics was continued. Abdominal pain gradually improved. Although laboratory data showed an increase in CRP up to 30 mg/dl on postoperative day (POD) 3, it also gradually decreased. EGD on the 8th day after ESD for

follow-up showed shedding of the post-ESD ulcer; it penetrated the retroperitoneal space with clip detachment (Fig. 3). Despite a consultation with surgeons, a surgical approach was not indicated because a few days may have already passed since postoperative perforation occurred and the spread of inflammation in the retroperitoneum was suspected. All the clips that had fallen off in the retroperitoneal space were endoscopically retrieved. In an attempt to promote closure of the perforated cavity, we attached PGA sheets and fibrin glue to the cavity wall on POD 17 (Fig. 4). PGA sheets, which were cut into approximately 15 × 7-mm pieces, were held with biopsy forceps and transported to the cavity through the channel of the scope. After the cavity wall had been sufficiently covered with several sheets, solution A (fibrinogen) of Beri-plast P Combi-Set was applied and pushed against the sheet using a spray tube, and this was followed by the spraying of solution B (thrombin) using another spray tube. After the first treatment on POD 17, the PGA sheets were found to have been partially peeled off on POD 18 and 20, and they were added. They were also attached for the parts where they could not be filled on POD 17 because necrotic cell debris was covering. Thereafter, the formation of granulation tissue was gradually detected in the cavity. On the

other hand, CT showed fluid collection with air and an increase in the density of surrounding fatty tissue in the right retroperitoneum, which indicated abscess formation even though antibiotics had been continuously administered (Fig. 5). Therefore, CT-guided abscess puncture was performed. On POD 31, anticipating further promoting of cavity closure, PGA sheets attachment was repeated. Thereafter, the cavity gradually decreased and the abscess disappeared (Fig. 6). The pathological result of ESD was a 19-mm adenocarcinoma that was limited to the mucosa with negative lateral and vertical margins. The patient started oral intake on POD 63 and her general condition was stable afterward. Though she could have been discharged around POD 70, her husband had been hospitalized at that time due to his orthopedic surgery and she desired to continue hospitalization until he recovered. She was discharged on POD 87 and the endoscopy on POD 106 showed the scar formation of the perforated site (Fig. 7). She maintained a good general condition for the past two years.

Discussion

ESD is now widely accepted as a standard treatment for superficial tumors

in GI tract such as esophagus, stomach, and large bowel, and its safety and usefulness have been confirmed [16-18]. However, the risk of immediate and postoperative perforation after ESD for superficial duodenal tumors is reported to be 6.3%-75% and 0%-14.3% respectively, which is higher than ESD in other organs such as the esophagus, stomach, and colorectum [4, 16-19]. Especially, endoscopic resection for non-ampullary duodenal neoplasms located on the side distal from the ampulla and treatment with piecemeal EMR or ESD are reported to have a possible risk of delayed perforation [20]. These findings indicate that the safety of ESD has yet to be established for superficial duodenal tumors. However, it is reported that the R0 resection rate and curability of duodenal EMR were inferior to that of ESD [3, 21]. Therefore, selecting EMR or ESD according to the size, histology and location of the tumors is considered to be necessary.

Although the prophylactic closure of post-EMR/ESD ulcer beds has been ~~reported to prevent hazardous postoperative perforation [3]~~considered to prevent hazardous postoperative perforation [4, 22], complete closure is sometimes difficult due to the sizes of mucosal defects and their locations. Furthermore, if intraoperative perforation occurs in the early stage of ESD,

the flow of pancreatic and bile juices to the retroperitoneum continues until clip closure is performed when dissection has proceeded to some degree and the clips do not disturb subsequent stages of the procedure. In the present case, intraoperative perforation occurred in the early stage and was closed after the completion of ESD. Exposure to pancreatic and bile juices during the procedure is considered to be an important factor for large postoperative perforations. Under these conditions, additional surgical enforcement of the duodenal wall may be desirable for the prevention of perforation. If the surgery had been performed the next day of ESD in this case, the patient might have recovered more quickly.

A new technique, "laparoscopic-endoscopic cooperative surgery (LECS)", has been developed to ensure the safety of ESD for duodenal tumors ~~[22, 23]~~[23, 24]. This technique combines ESD with laparoscopic seromuscular suturing for reinforcement of the duodenal wall. This method may contribute to decreasing the risk of postoperative perforation. However, LECS is not indicated for lesions involving the papilla or nearby regions at which the pancreas is located posteriorly. Furthermore, postoperative perforation may even develop after EMR [4], possibly when extensive coagulation is performed

for hemostasis, resulting in damage to the muscle layer, closure with conventional clips is incomplete, or clips fall off.

Therefore, the countermeasure for postoperative perforation should be considered. Urgent surgery may be the first choice. ~~However, even immediate surgery just after duodenal perforation by ESD is not always ensuring the favorable clinical course [24]~~However, even immediate surgery just after duodenal perforation by ESD is not always ensuring the favorable clinical course [25], and the risk of the failure of suture increases after the development of retroperitonitis and surgical approaches are not often indicated, as in the present case. Some endoscopic approaches may be required under these conditions. One endoscopic therapeutic option for large duodenal perforation is closure with an over-the-scope-clipping (OTSC; Ovesco Endoscopy AG, Tubingen, Germany) system ~~[25].~~[26]. OTSC closure is more reliable for the complete closure of relatively large mucosal defects than conventional clips. However, if the diagnosis of postoperative perforation is delayed and the mucosa surrounding the perforated cavity has already become hard, grasping the mucosa may be difficult. Conversely, if the perforated area becomes infected, the tissues become fragile and OTSC may

result in tearing the mucosa.

As an alternative, the attachment of PGA sheets with fibrin glue may be performed under these conditions. It has been reported to be useful for closure of ESD-related perforation in GI tract including esophagus, stomach and colon [13-15].

Since these sheets may fall off during the course, an examination a few days after first sheet shielding and reattachment if they have fallen off are desirable. In our experience, if sheets remain in place for more than 2 days, they will stay attached until their degradation and absorption.

It should be mentioned that the CT-guided abscess puncture might have been crucial as well as PGA attachment for the preferable clinical course in the present case in spite of the terrible large duodenal perforation.

Furthermore, it is important to note that the findings of retroperitonitis and retroperitoneal abscess due to postoperative perforation after ESD for duodenal lesions are not as clear as peritonitis and intraabdominal abscess, and may result in a misdiagnosis and delayed diagnosis, as in the present case. If postoperative perforation is suspected, an immediate examination such as CT is strongly recommended to evaluate the indication for emergency

surgery.

In summary, we encountered a patient with postoperative perforation after ESD for duodenal cancer, who was successfully treated with filling and shielding by PGA sheets and fibrin glue, and CT-guided abscess puncture. Although further studies are warranted in order to verify the usefulness of PGA sheets with fibrin glue for duodenal perforation, this case demonstrated their potential for postoperative duodenal perforation that cannot be treated with surgery or OTSC.

Figures

Figure 1: An approximately 15-mm 0-IIa lesion in the descending portion of the duodenum on the anal side of the papilla of Vater.

Figure 2: During ESD, microperforation occurred (➡) and the post-ESD ulcer

bed was closed with clips.

Figure 3: EGD on the 8th day after ESD for follow-up showing shedding of the post-ESD ulcer (➡) penetrating the retroperitoneal space.

Figure 4: Polyglycolic acid sheets and fibrin glue patched and filled on the cavity wall (➡) on POD 17.

Figure 5: CT showing fluid collection with air and an increase in the density of surrounding fatty tissue in the right retroperitoneum, indicating abscess formation.

Figure 6 a/b/c: The cavity on postoperative days 22, 45 and 59; the space gradually decreased.

Figure 7: The scar after postoperative perforation on postoperative day 106 (➡).

Conflict of Interest:

Dr. Toyonaga invented the Flush knife-BT in conjunction with Fujifilm and receives royalties from its sale.

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Figure 1

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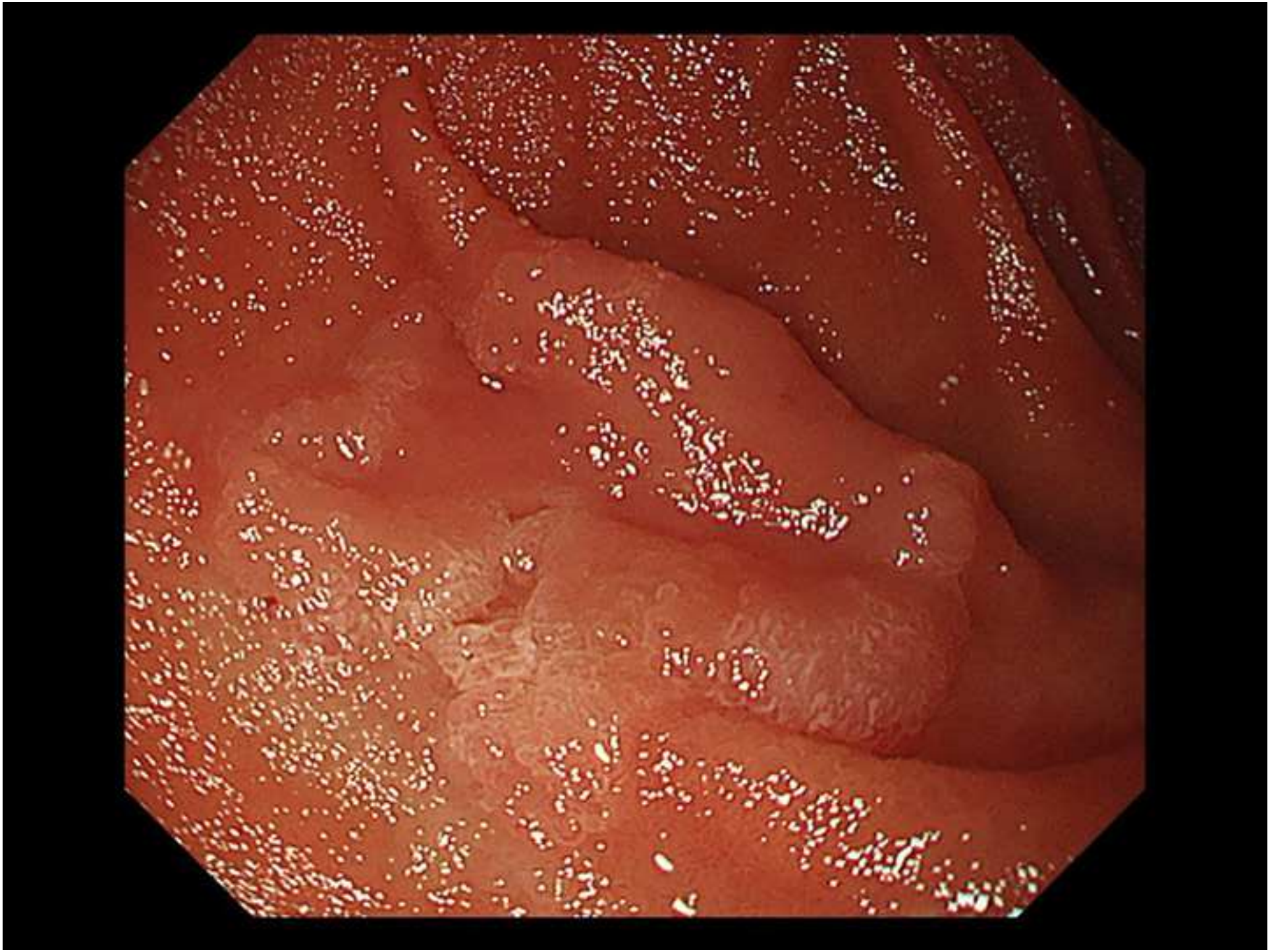


Figure 2

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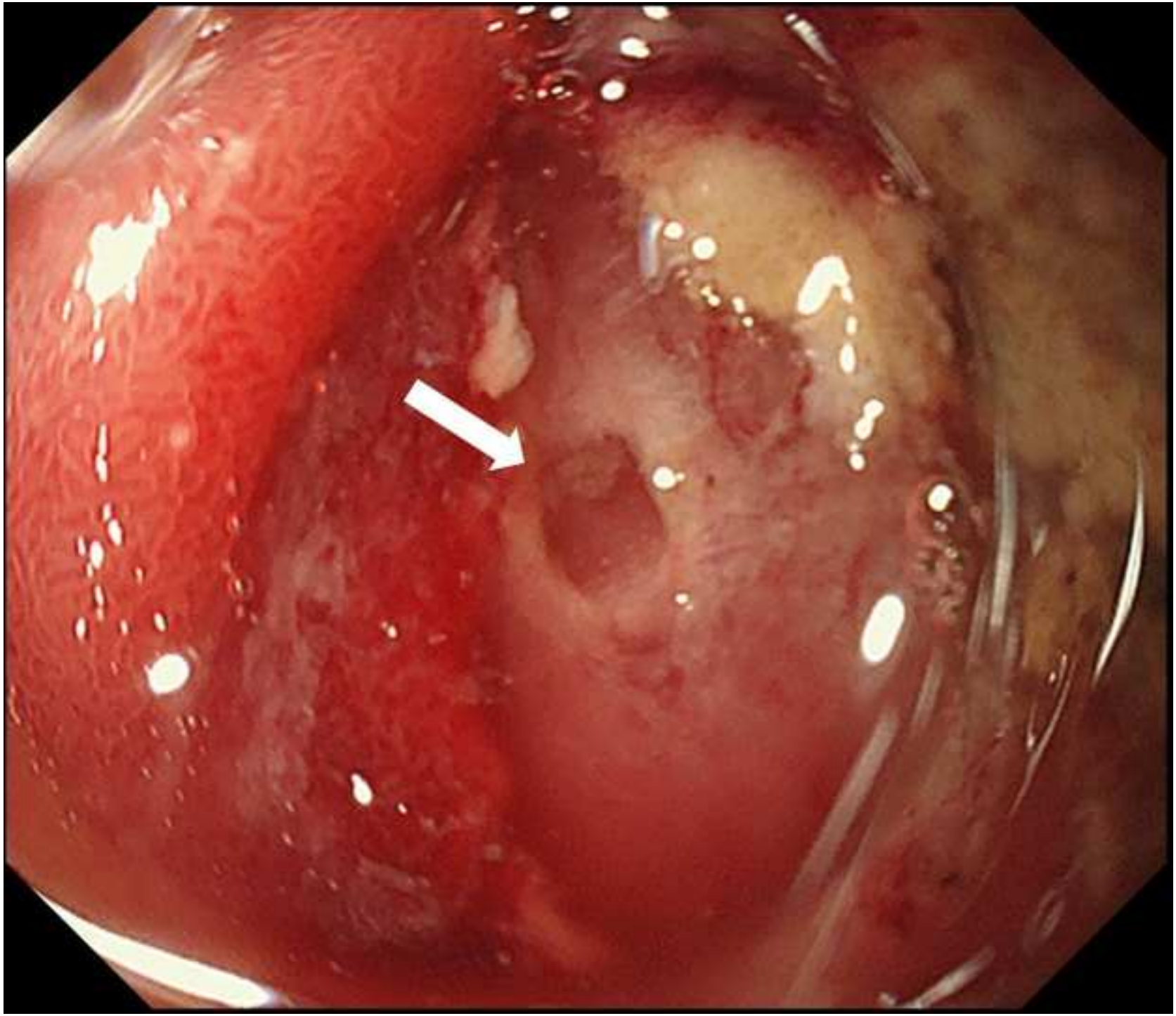


Figure 3

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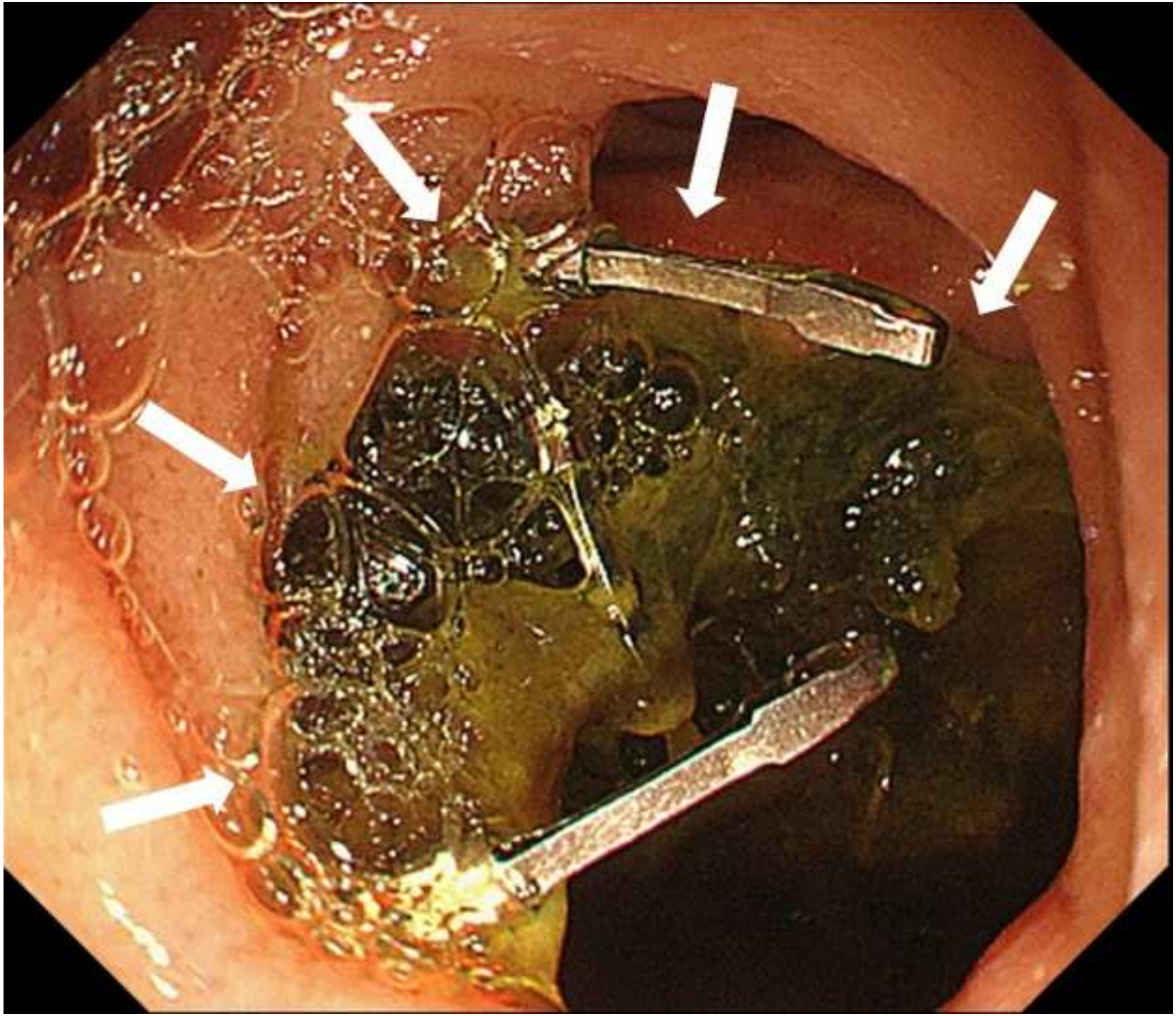


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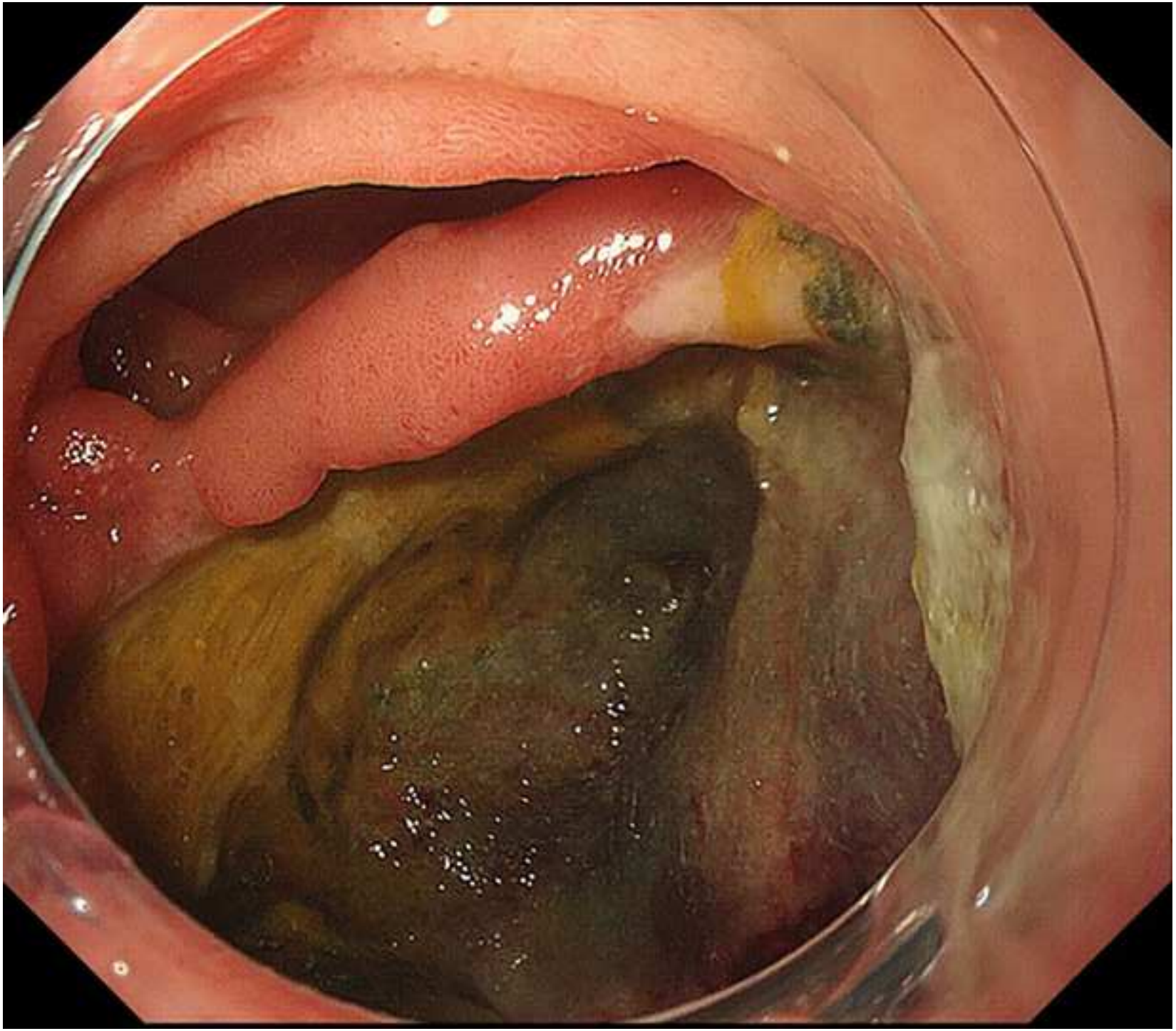


Figure 5

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Figure 6a

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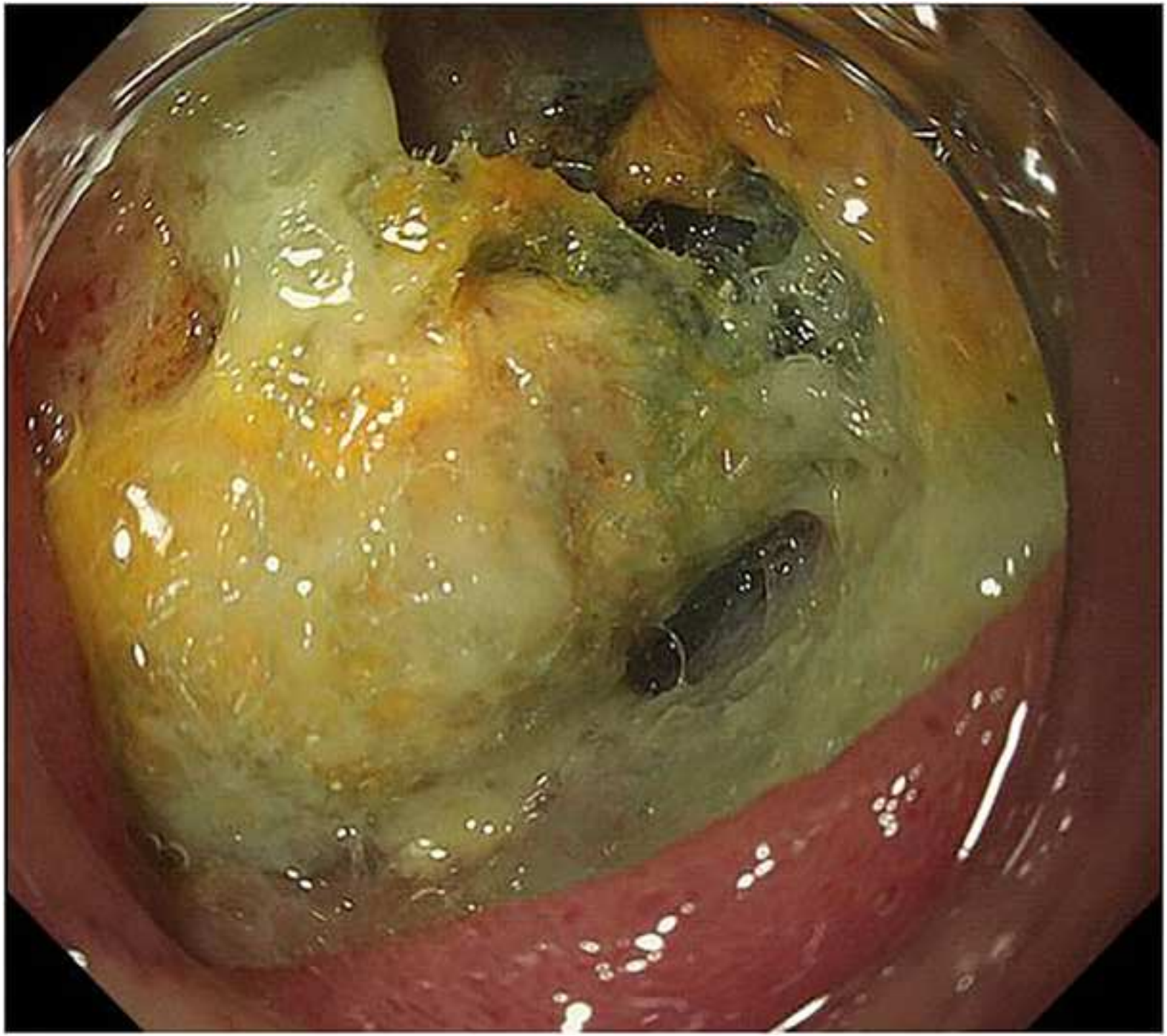


Figure 6b

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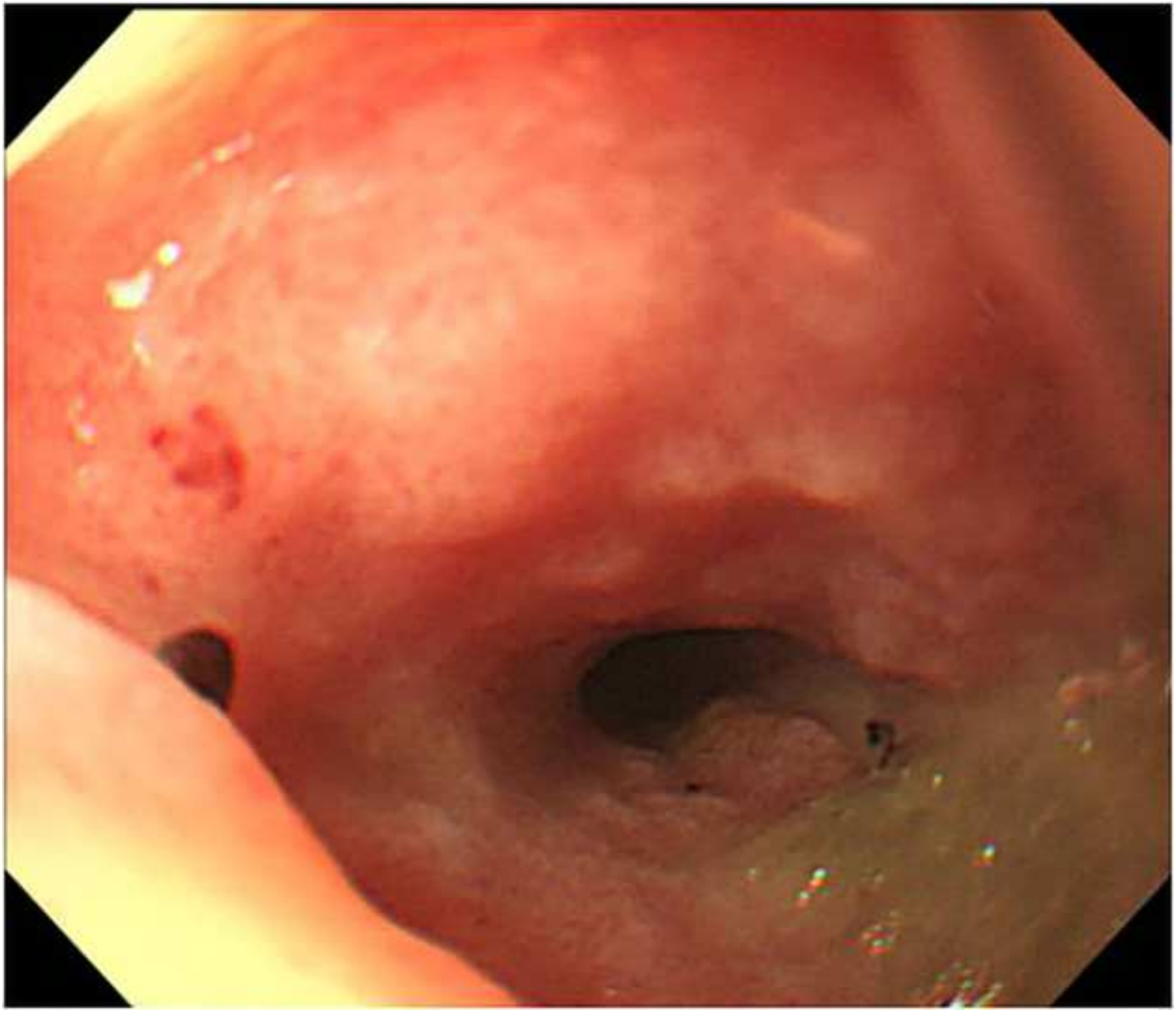


Figure 6c

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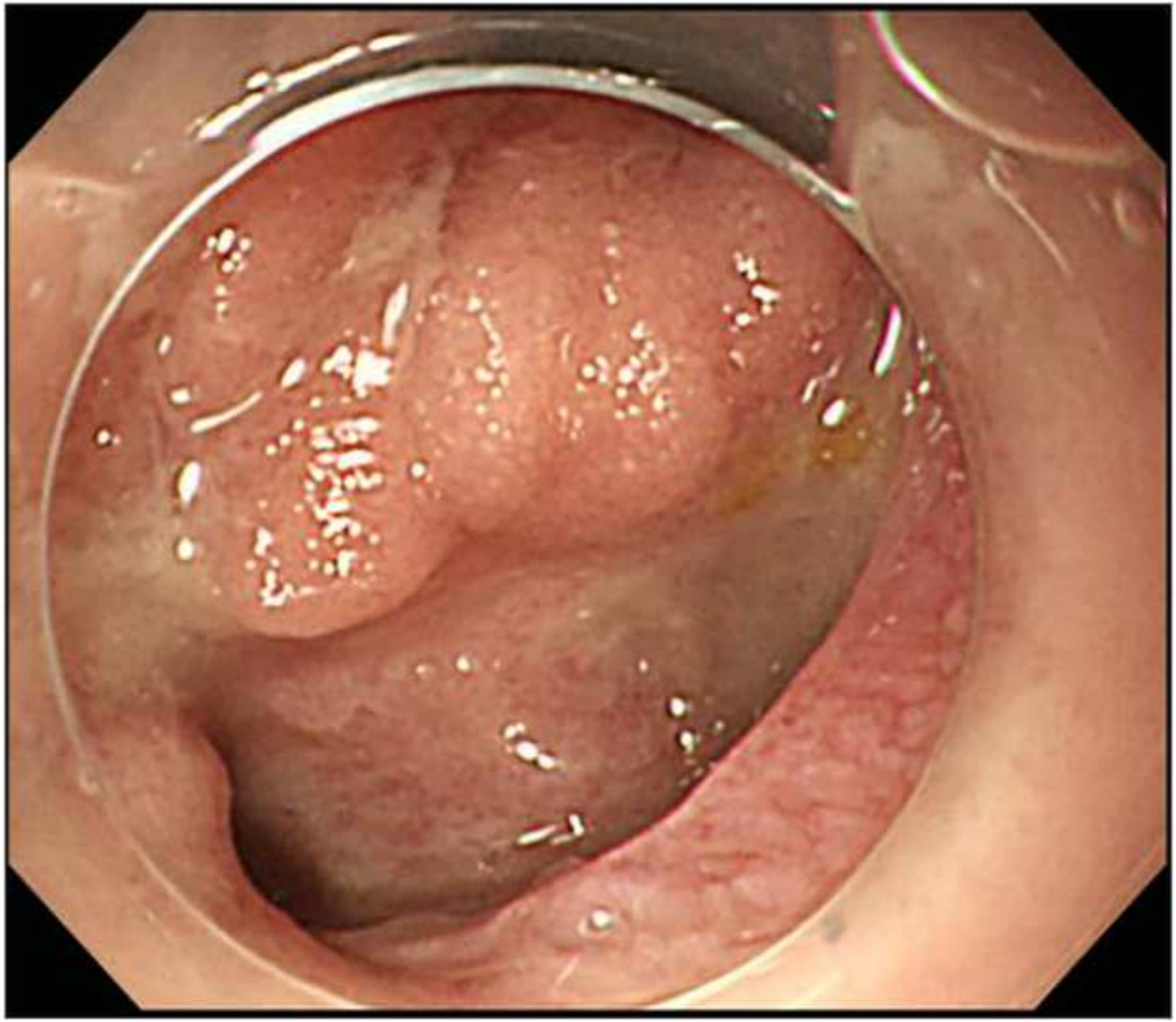


Figure 7

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