

Case Report

Minimally invasive surgical necrosectomy for infected walled-off necrosis using endoscopy with the flexible overtube technique : A case report

Takashi HAMADA, Tatsuya OKAMOTO, Amane KITASATO, Tamotsu KUROKI

Department of Surgery, National Hospital Organization Nagasaki Medical Center 2-1001-1, Kubara, Omura, Nagasaki 856-0835, Japan

Background: Minimally invasive surgery with a step-up approach is essential for treating infected walled - off necrosis (WON) which has a high mortality rate. Percutaneous endoscopic necrosectomy with a flexible overtube which has various advantages is performed in our institution. We herein introduce safety and easy percutaneous endoscopy with flexible overtube technique for minimally invasive surgical necrosectomy.

Case presentation: The patient was placed in the supine position and tilted to the right lateral side. The skin was incised 8 cm according to the situated percutaneous drains. Following the tract of the drain, the cavity of infected WON was reached in the retroperitoneum. The percutaneous drain was removed, and a flexible overtube was inserted. An endoscope was inserted through the flexible overtube. The necrosis was then crushed with saline flushing and removed by suction or forceps. A new drain was placed in the cavity to allow continuous drainage after surgery. Necrosectomy should be limited to a glimpse of normal granulation tissue, as aggressive debridement carries a risk of bleeding and/or organ injury. Using the step-up approach, endoscopy may be useful in cases of minimal residual necrosis.

Conclusion: Percutaneous endoscopy with the flexible overtube technique for minimally invasive surgical necrosectomy is easy to perform and safe for treating infected WON.

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Key words: flexible overtube, percutaneous endoscopic necrosectomy, infected WON

Background

Necrotizing pancreatitis occurs in 20% of acute pancreatitis patients, leading to a substantial increase in morbidity and mortality(1). Walled-off necrosis (WON) with encapsulated necrotic pancreatic tissue usually occurs after four weeks from the onset of necrosis (2). The major cause of sepsis and organ failure in cases of complicated pancreatitis is infection of the WON, with a reported mortality rate of 32%-39% (3, 4).

In recent years, the step-up approach of percutaneous catheter placement with subsequent minimally invasive surgical

necrosectomy has been performed instead of open surgical necrosectomy (5). The step-up approach may reduce mortality and the rate of complications in patients requiring surgical interventions; however, minimally invasive procedures, such as percutaneous or endoscopic drainage, successfully treat only about 45% of infected WONs (6, 7). Therefore, a hybrid approach combining percutaneous drainage and endoscopic necrosectomy is a useful treatment for refractory infected WON. Percutaneous endoscopic necrosectomy using a metallic stent for endoscopic transgastric drainage has been reported(8). However, in our facility, we perform percutaneous endoscopic necrosectomy with a flexible overtube (SUMITOMO

Address correspondence: Takashi Hamada, MD, Department of Surgery, National Hospital Organization Nagasaki Medical Center, 2-1001-1, Kubara, Omura, Nagasaki 856-0835, Japan.

Telephone number: 81-957-52-3121; Fax number: 81-957-54-0292; Email: taka.hama84@gmail.com

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Figure 1. Flexible overtube (SUMITOMO BAKELITE CO., LTD., Tokyo, Japan). Outer diameter: 18 mm, total tube length: 195 mm.

BAKELITE CO., LTD., Tokyo, Japan) (Figure 1) which has advantages over a metallic stent.

We herein report a safe and easy approach to percutaneous endoscopic necrosectomy with a flexible overtube technique for minimally invasive surgical necrosectomy of infected WON.

Case presentation

The patient, 49 years-old man, had severe abdominal pain and was rushed to our hospital. He was urgently admitted to our hospital with a diagnosis of severe acute pancreatitis. Although the patient survived the acute phase with intensive care, computed tomography (CT) showed an infected WON in the left side of the abdomen (Figure 2). Percutaneous

drainage was performed for the infected WON, but the patient was not improved for only one drain, another drain was inserted after two weeks. However, the insertion of two drains was ineffective for the infected WON. A transgastric endoscopic approach was considered, but it was not indicated because there was no easily accessible into the infected WON on CT. Then, the patient was referred to our department for surgery.

Surgery was generally performed one month after percutaneous catheter drainage in patients with a stable general condition. The extent and location of the infected WON was confirmed preoperatively by CT. Patients were placed in the supine position, tilted to the right lateral side, under general anesthesia. The skin was incised 8 cm according to the situated percutaneous drains (Figure 3A). The reason for the 8 cm incision is to facilitate smooth insertion and easy handling of the overtube. We confirmed the direction of the drain by CT and visualized it before surgery to avoid iatrogenic colon perforation. By following the tract of the drain, the cavity of the infected WON was reached in the retroperitoneum. The percutaneous drain was then removed, and a flexible overtube was inserted (Figure 3B). An endoscope was inserted to view the cavity through the flexible overtube (Figure 3C). The necrosis was crushed with saline flushing and then removed by suction or forceps (Figure 4A), and necrotic tissue was efficiently removed from the cavity via aspiration with the flexible overtube (Figure 4B). Necrosectomy should be limited to a glimpse of normal granulation tissue, and it is important to avoid bleeding and/

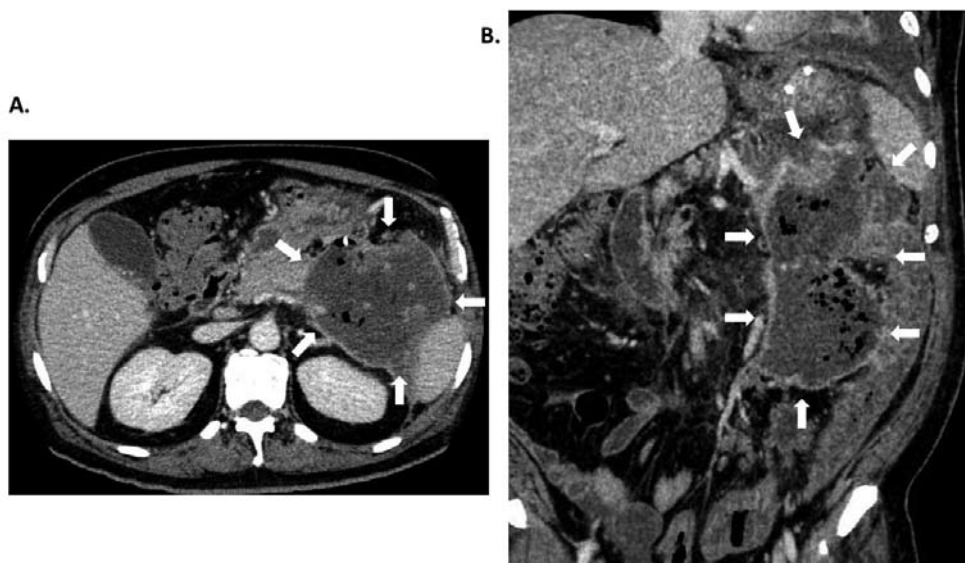


Figure 2. A) Contrast-enhanced CT axial and B) coronal scans showed a hypodense focal lesion with internal septations in the pancreas tail, resulting in a focal contour bulge.

or organ injury. Finally, a new drain was positioned in the cavity to allow continuous drainage after surgery.

The patient was discharged from the hospital a week after necrosectomy without complications. The drain was removed

before discharge. The wound removed the drain was protected with gauze, and the patient was followed up in the outpatient clinic.

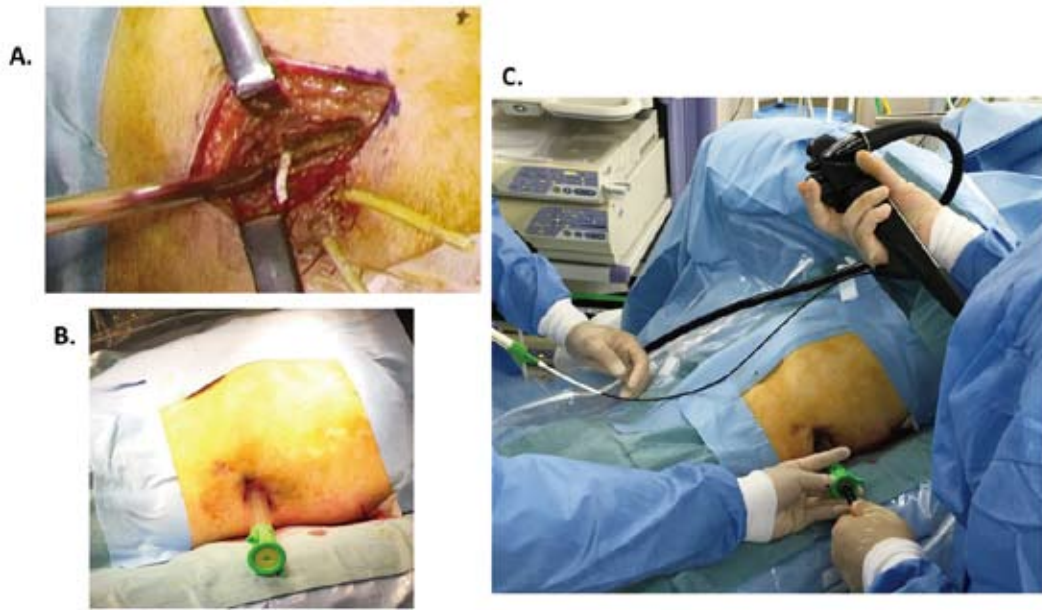


Figure 3. A) The skin was incised according to the situated percutaneous drains. By following the tract of the drain, the cavity of the infected WON was reached in the retroperitoneum. B) An overtube for endoscopy was inserted through the tract of the drain into the cavity, instead of a trocar. C) The operator manipulated the endoscope. The assistants supported the operator holding the endoscope and passed devices.

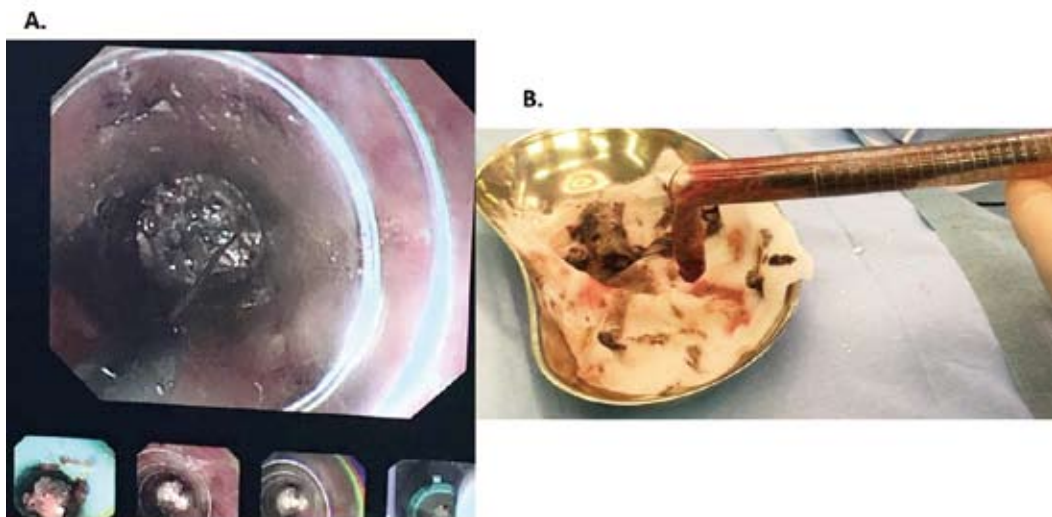


Figure 4. A) Endoscopy allowed for the detailed observation of even tiny spaces and the removal of necrotic tissue with a device. B) Clogged large debris was fully covered with the overtube and then removed from the abdomen.

Discussion

Several operative techniques for minimally invasive necrosectomy have been reported over the past 20 years, and various approaches such as single-incision laparoscopic surgery (9), have been found to be safe and effective (10). Percutaneous endoscopy with a flexible overtube for minimally invasive surgical necrosectomy is a straightforward method of directly accessing the infected WON and is easy technique. To compared with metallic stent, the overtube is soft and does not significantly damage the infected WON during insertion. Additionally, it can be inserted and removed as many times as necessary.

While open surgical necrosectomy, the gold-standard for treating infected WON, provides a large field-of-view for the abdomen, allowing for easier removal of necrotic tissue, it also has high rates of complications (34%-95%) and death (11%-39%) with a risk of long-term pancreatic insufficiency (2). Over the decades, it has been replaced with minimally invasive surgical necrosectomy, which seems to reduce the incidence of postoperative complications compared with an open approach (11). Minimally invasive surgical necrosectomy using the surgical step-up approach seems preferable to open surgical necrosectomy and is now considered the standard treatment for infected WON, with its low rates of postoperative complications (40%) and long-term morbidity, additionally there is no difference in mortality (minimally invasive vs open; 19% vs 16%, $p=0.70$) (12). In our department, we began performing laparoscopic or endoscopic necrosectomy five years ago and have maintained good outcomes. Seven patients have been treated with laparoscopic or endoscopic necrosectomy so far, and six have been successfully treated except for one who died due to a number of comorbidities.

Endoscopic pancreatic necrosectomy is commonly performed transluminally through transgastric or transduodenal routes, but necrosectomy via a transcutaneous route for laterally located infected WON is also useful (13). Inserting a flexible overtube for endoscopy in the cavity instead of a trocar or metallic stent facilitates handling. Endoscopy allows for a detailed observation of even tiny spaces, as unlike laparoscopy, endoscope lenses are self-cleaning, ensuring a good view at all times. In addition, necrotic tissue can be removed by various devices through an endoscope. The use of an endoscope-specific flexible overtube facilitates operations, because it provides good vision of the working space in necrotic tissue. The overtube is a soft transparent tube that can be inserted without damaging the cavity and enables us to monitor the surrounding. In addition, more

necrotic material can be efficiently removed from the cavity by aspirating the necrotic tissue with the flexible overtube (Figure 4B). In the step-up approach, laparotomy or laparoscopy may be preferred, but endoscopy may be useful in cases of minimal residual necrosis.

The main complications of necrosectomy are bleeding and colonic perforation. Bleeding post-necrosectomy has an incidence of about 20% (12). As mentioned, it is important to perform less-aggressive debridement to avoid bleeding. Removing the infected WON in its entirety at initial necrosectomy is impossible, so the goal is to decrease the volume of necrosis, liquefy the necrotic tissue and prepare for postoperative drainage or subsequent debridement. Colon perforation is seen in 15% of cases post-necrosectomy, with ischemic and iatrogenic causes hypothesized (14). Ischemia may be secondary to inflammation extending to the colon. Iatrogenic causes may be due to drain erosion or direct procedural injury. In the endoscopic approach, the drain can be confirmed visibly, and the tip can be kept at the center of the cavity, away from the colon.

In conclusion, percutaneous endoscopy with the flexible overtube technique for minimally invasive surgical necrosectomy is easy and safe to perform for treatment of infected WON.

Acknowledgements

All procedures performed in our study adhere to the tenets of the Declaration of Helsinki.

The authors declare no conflicts of interest in association with the present study.

Informed consent

Informed consent was obtained from all individual participants included in the study; personal information has been protected, and patient anonymity has been preserved.

Contributions

TH and TK acquired the data and drafted the manuscript. TH, TO, AK and TK were involved in drafting the manuscript. TK critically revised the manuscript. All authors read and approved the final manuscript.

Abbreviations

WON : walled - off necrosis

CT : computed tomography

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