An innovative method for placing a double-lumen irrigation-suction tube in the management of abdominal infection

A case report

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Abstract

Rationale: Currently, the use of double-lumen irrigation-suction tube for drainage has become increasingly more common. However, the insertion process is complex, and the position of the double cannula placed in this manner is not accurate. We developed a method for placing the drainage tube and use it in the treatment of an abdominal infection.

Patient concerns: A 51-year-old man with an abdominal infection due to colonic anastomotic fistula was admitted. Routine laboratory tests revealed an elevated white blood cell count ($17 \times 10^9/L$) and C-reactive protein level (78 mg/L). Computed tomography (CT) revealed that the peritoneal cavity was filled with fluid.

Diagnoses: The patient was diagnosed with colonic anastomosis fistula by gastrointestinal radiography. Abdominal infection was diagnosed based on CT scan, inflammatory markers, and patient signs and symptoms.

Interventions: Two punctures were performed. After skin expansion, the source of infection was drained with a suction catheter (diameter = 1.0 cm) under continuous negative pressure of 150 to 200 millibars, along with continuous saline irrigation at 300 mL/h.

Outcomes: Pus in the abdomen drained completely. The abdominal infection was controlled. There were no adverse events.

Lessons: Abdominal infection in fistulas is a fatal disease. The main therapeutic target is full drainage at an early stage. Precise positioning of the tube, continuous negative pressure irrigation and drainage are key points in the treatment.

Abbreviation: CT = computed tomography.

Keywords: case reports, drainage, intra-abdominal infection, punctures

1. Introduction

Abdominal infection in fistula is a fatal disease. The main method for the treatment of abdominal infection includes puncture or operative drainage.^[1] Operative drainage carries high morbidity and mortality.^[2] However, puncture is often inaccurate and not efficacious.^[3] Liu et al^[3] reported a method for the placement of a double-lumen irrigation-suction tube using a sump drain via trocar

puncture. This method was unable to determine the direction of puncture accurately and was dangerous for abscesses with complicated adjacent relations. We developed a method for placing a double-lumen irrigation-suction tube to achieve infection source control for abdominal infections. We report the case of a 51-year-old man with abdominal infection treated in this manner.

2. Case presentation

A 51-year-old man presented to our facility with intermittent fever and fecal water outflow (200 mL/d) from the drainage tube of the right abdomen after resection of the transverse colon. The medical history included early colon cancer in the hepatic flexure, primary abdominal surgery, and aggressive fluid resuscitation. Physical examination showed a passive drainage tube in the right abdomen and a well-healed surgical incision. Routine laboratory tests revealed an elevated white blood cell count ($17 \times 10^9/L$) and C-reactive protein level (78 mg/L). Computed tomography (CT) scan revealed that the peritoneal cavity was filled with fluid. The patient was diagnosed with colonic anastomosis fistula by gastrointestinal radiography. Antibiotics (ceftazidime) were administered intravenously 30 minutes before the puncture. The patient agreed to share his experience via signed informed consent. Because of the retrospective nature of the study, ethics approval was not required.

Two punctures were performed. The puncture site of the right lower abdomen was close to the anastomosis, and the other was located in the pelvic cavity adjacent to the bladder. The patient lay supine during the procedure. After iodophor disinfection and

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Figure 1. (A) Modified closed double-lumen irrigation-suction tube consists of irrigation catheter (☆), suction catheter (identified by black arrow), and supporting pipe (identified by white arrow). (B) Abscess was drained from suction catheter (●) under continuous negative pressure of 150 to 200 millibars along with continuous saline irrigation at 300 mL/h.

paving sterile sheet, the introducer needle (14Ga single-lumen medical central venous catheters single lumen, Yinxin, Jiangxi, China) was inserted in the abscess under CT guidance. A guidewire (14Ga single-lumen medical central venous catheters single lumen, Yinxin, Jiangxi, China) was introduced into the abscess through the introducer needle. Skin expanding devices (minimally invasive drainage expansion package, Reborn medical, Zhuzhou, Hunan, China) from 8F to 20F were used to dilate the skin successively to create a track with a diameter >1 cm, guided by guidewire. A 10-mm sump drain, a modified closed double-lumen irrigation-suction tube, was then pierced under CT guidance and guided by guidewire to make sure the distal end of the tube was in the core of abscess. The 2 tubes were fixed to the

skin of the abdominal wall with no. 4 silk suture. All procedures were carried out with the patient under local anesthesia (lidocaine).

The intraperitoneal-filled abscess was drained with a suction catheter under continuous negative pressure of 150 to 200 millibars along with continuous saline irrigation at 300 mL/h (Fig. 1). Approximately 2500 mL of pus and colonic fluid was aspirated after an irrigation-suction tube was introduced (Fig. 2). A postoperative contrast-enhanced CT scan was performed to evaluate tube placement and presence of pus (Fig. 3). The patient regained normal temperature 36 hours later. White blood cell count and C-reactive protein level dropped to $9.8 \times 10^9/L$ and 24 mg/L, respectively. The patient was given a nasointestinal tube by endoscopy, and total enteral nutrition (70 mL/h, Peptison Liquid, Nutricia, Netherlands) support was implemented through it 48 hours later. The patient did not have fever during the course of subsequent treatment. The white blood cell count was stable between $7-8 \times 10^9/L$. The C-reactive protein level was < 10 mg/L, 7 days after the puncture. No adverse events occurred during the treatment. He was discharged after resection and anastomosis for fistula 40 days later, and the 2 double-lumen irrigation-suction tubes were removed during the operation.

Figure 2. Approximately 2500 mL of pus and colonic fluid was aspirated after an irrigation-suction tube was introduced.

3. Discussion

Abdominal infection caused by fistula is a serious complication. Approaches to intra-abdominal abscess are mainly focused on puncture or operative drainage.^[1] Operative drainage is always associated with high morbidity and mortality,^[2,4] especially for critically ill patients. Puncture includes the Seldinger^[5] and trocar techniques.^[6]

The Seldinger technique is not always efficacious because the catheter can be easily blocked by necrotic tissue, clotted blood, and even purulent fluid. With the trocar technique, after the subcutaneous tissue was dilated, a catheter was inserted directly. Nevertheless, conventional catheters used in the standard trocar method were relatively small and can only provide suction without irrigation. Therefore, the application of these methods in peritoneal abscesses was limited.^[3]

Figure 3. (A, B) A large amount of pus was found around the bladder and the small intestine. (C, D) Sump drain in horizontal CT scan 48 hours after the puncture (irrigation-suction tube in right lower quadrant was identified by black arrow). CT = computed tomography.

Gu et al^[7] described a modified trocar technique for intra-abdominal abscess drainage using a sump drain by trocar puncture. However, the direction and depth of puncture could only be estimated depending on preoperative CT. The operation was not intuitive. The surgeon was unable to determine the direction of puncture accurately in the process of puncture. The technique could only be performed for superficial abscesses and was dangerous for abscesses with deep locations and complicated adjacent relations.

In this study, we developed a method for placing a double-lumen irrigation-suction tube for intra-abdominal abscess drainage. Our puncture sites were adjacent to the bladder and the small intestine. In addition, the sump drain could be placed deeply and accurately under CT guidance. There were 2 advantages to our modified technique. First, compared to the traditional Seldinger technique, with a sump drain used instead of a conventional catheter, there was less blockage and more rapid obliteration of the abscess cavity. Second, compared to the

modified trocar technique, puncture under CT guidance made the puncture more accurate and safer. The advantages above made it possible for percutaneous treatment of abdominal infection with deep location and complicated adjacent relations instead of surgical treatment because the risk of death in critically ill patients is high.

We developed a method of placing a modified closed double-lumen irrigation-suction tube under the CT guidance for intra-abdominal abscess drainage. Accurate and effective drainage can be achieved. This method can be applied in similar situations in the future.

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