

Percutaneous Embolization of Anastomotic Leakage Following Total Gastrectomy with Esophagojejunostomy using N-Butyl-2-Cyanoacrylate Glue: A Case Report

위전절제술 및 식도공장문합술 후 발생한 문합부 누출의 N-Butyl-2-Cyanoacrylate 아교를 이용한 경피적 색전술: 증례 보고

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Total gastrectomy with Roux-en-Y esophagojejunostomy is a common surgical treatment for early gastric cancer; however, postoperative complications such as anastomotic leaks remain a serious risk. This report details a 59-year-old female who underwent total gastrectomy with Roux-en-Y esophagojejunostomy for early gastric cancer, followed by percutaneous embolization for esophagojejunal (EJ) anastomotic leakage. Despite initial percutaneous drainage for fluid accumulation at the EJ site, subsequent CT revealed significant anastomotic dehiscence. Endoscopic treatment was ineffective and surgical intervention posed a high risk of mortality; therefore, percutaneous embolization was requested. This involved four sessions using cut gel foam, N-butyl-2-cyanoacrylate, and lipiodol. The procedure was successful without complications and led to complete resolution of the leakage and dehiscence. Follow-up CT scans at 6- and 32-months post-procedure confirmed the absence of recurrence. This case highlights the potential of percutaneous embolization as a treatment option for anastomotic leakage after Roux-en-Y esophagojejunostomy.

Index terms Gastric Cancer; Roux-en-Y Anastomosis; Anastomotic Leak; Embolization; Interventional Radiology

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**Case Report** 

# **INTRODUCTION**

Total gastrectomy with Roux-en-Y esophagojejunostomy is the cornerstone of surgical treatment for gastric cancer, offering the potential for cure or substantial disease control (1). This intricate procedure involves complete excision of the stomach followed by reconstruction of the gastrointestinal tract to maintain continuity. Despite technological advances in surgical methods, postoperative complications, particularly anastomotic leakage, remain significant concerns. Occurring in 2.1%–14.6% of cases, anastomotic leakage is not only a severe complication, with mortality rates of up to 50% (2), but also a determinant of postoperative prognosis. Anastomotic leakage exacerbates the risk of respiratory complications, prolongs hospital stay, and often necessitates reoperation, making it a critical postoperative challenge (3). Prompt detection and effective management are vital to enhance patient recovery.

The treatment of anastomotic leakage remains complex and evolving. Although various approaches, including conservative management, endoscopic interventions, and reoperations, have been explored, consensus on the optimal treatment strategy remains lacking (4).

In this report, we present the imaging findings and clinical course of a patient who developed anastomotic leakage at the esophagojejunal (EJ) anastomosis site after total gastrectomy and Roux-en-Y esophagojejunostomy. The patient was successfully treated by percutaneous drainage and subsequent embolization using gel foam and N-butyl-2-cyanoacrylate (NBCA) glue (Histoacryl; B. Braun, Melsungen, Germany).

# **CASE REPORT**

A 59-year-old woman underwent total gastrectomy with Roux-en-Y esophagojejunostomy for early gastric cancer. Initially planned as a robotic surgery, the procedure was converted to an open technique because of bleeding at the EJ anastomosis site. On the second postoperative day, the patient experienced abdominal pain, which prompted an abdominal CT scan that revealed fluid accumulation around the EJ anastomosis site. To assess potential leakage, an upper gastrointestinal series using Gastrografin (Bayer, Leverkusen, Germany), along with an abdominal CT scan, was performed, indicating no leakage on postoperative day 6.

However, persistent fever required interventional percutaneous drainage to alleviate fluid accumulation. Under ultrasonographic and fluoroscopic guidance, a drainage catheter was inserted adjacent to the left lobe of the liver to target the EJ. The catheter was removed on postoperative day 19, as the volume of the drained fluid decreased. However, CT on postoperative day 26 revealed anastomotic dehiscence with an associated abscess (Fig. 1A). A subsequent upper gastrointestinal study with Gastrografin revealed a significant fistula and leakage, leading to the reinsertion of another drainage catheter. Endoscopic treatment was planned, and Green Plast (Green Cross, Yongin, South Korea) was injected into the leakage site through the catheter. Green Plast is a tissue adhesive frequently utilized in endoscopic procedures and is valued for its biocompatibility and ease of application. Stent implantation was not performed because of the high risk of migration and the use of hemoclips was challenging owing to wide dehiscence. Despite ongoing conservative management, the patient's condition had not improved on postoperative day 29, indicating failure of this approach. Tubography

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Fig. 1. Percutaneous embolization procedure for esophagojejunal anastomotic leakage and pre- and post-embolization CT scans in a 59-year-old female who underwent total gastrectomy with Roux-en-Y anastomosis.

A. Axial image from contrast-enhanced CT scan on postoperative day 26 shows dehiscence at the anastomosis site (arrows) and air-filled cavity (\*).

B. Tubography image on postoperative day 29 demonstrates persistent leakage at the esophagojejunal anastomosis site despite ongoing conservative treatment.

C. Fluoroscopic image shows that the guidewire and catheter navigate above the anastomosis site.

D. Fluoroscopic image illustrating the injection of 1:2 mixture of NBCA and lipiodol after pulling back the catheter. The presence of a visible NBCA casting (arrowheads) indicates successful embolization.

E. Gross photo of cut gel foam, soaked in saline, folded and placed inside the catheter hub.

F. Axial image of CT scan taken at 32 months post-embolization shows no signs of leakage recurrence, with persistent glue casting (arrow). NBCA = N-butyl-2-cyanoacrylate



revealed persistent leakage (Fig. 1B).

Following a multidisciplinary team consultation, it was decided to proceed with fistula embolization to manage the persistent anastomotic leakage. The first percutaneous embolization session was performed on the 50th postoperative day. Initially, the cavity was filled with a gel foam sponge considering fistula's size. Gel foam sheath (Cutanplast, Mascia Brunelli, Milan, Italy), meticulously tailored to the required size (Fig. 1E), was then introduced into the anastomosis site through the catheter assisted by a guidewire and saline. Approximately 5–10 pieces of cut gel foam were inserted per session. Once the fistula site was reached, additional gel foam was placed in the free space at the anastomosis site. Following gel foam insertion, a mixture of NBCA and lipiodol (Guerbet, Villepinte, France) at a 1:2 ratio was injected (Fig. 1D) continuously from the lumen of the esophagus to the retroperitoneal space after navigating the guidewire and catheter above the anastomosis site (Fig. 1C). The procedure was completed by repositioning the percutaneous drainage catheter at the leakage site. The patient underwent four embolization procedures in total. The first two sessions used both gel foam and glue. Subsequent upper gastrointestinal studies revealed no significant leakage; however, minor contrast leaks were detected on non-contrast CT scans. Thus, only glue was used in the third and fourth sessions because the remaining tract was thin and linear. No signs of infection or catheter-related complications were observed during the four embolization sessions.

On postoperative day 85, CT confirmed successful embolization. The patient resumed her diet and was free of fever and pain, which led to catheter removal and discharge. Follow-up CT scans at 6- and 32-months post-procedure showed no fluid collection at the EJ anastomosis site, indicating the absence of recurrence (Fig. 1F). The patient has been doing well with no recurrence or other complications during 3 years of follow-up.

This study was approved by the Institutional Review Board of Hallym University Sacred Heart Hospital (IRB No. 2023-12-026). Informed consent was obtained from all participants prior to the study.

# DISCUSSION

EJ anastomosis leakage is a challenging complication traditionally managed with conservative treatment, an endoscopic approach, and re-operation. The most commonly applied methods involve continuing conservative treatment with antibiotics, fasting, nutritional support, and percutaneous insertion of a drainage tube around the anastomosis (2). In patients with anastomotic leakage, 39%–84.2% show improvement with conservative treatment, and complete resolution is usually achieved within 7–28 days (4). However, accurately placing the drainage tube at the site of the anastomosis is challenging and leads to an extended hospital stay. Additionally, if conservative treatment fails, other treatment methods such as surgery or endoscopic management should be considered.

Surgical treatment can be attempted when the patient is vitally unstable; however, it has a high mortality rate (approximately 63%) and is pursued only when other treatments fail or are not feasible (5). Feith et al. (6) reported a 70% endoscopic success rate in achieving complete healing after stent implantation. However, stent migration, which occurs in 61% of cases, can hinder wound healing or lead to strictures due to repeated insertions (4).

Interventional radiological management of postoperative enteric fistulas is increasingly performed (7). Common approaches include percutaneous abscess drainage, feeding tube insertion into the proximal jejunum, and fluoroscopic placement of a covered stent. However, novel approaches have been proposed for this purpose. Lisle et al. (8) reported three cases of embolization with gel foam for chronic enterocutaneous fistula, and Cambj Sapunar et al. (9) reported cases of percutaneous embolization using a glue and lipiodol mixture for persistent low-output enterocutaneous fistula after rectosigmoid colon surgery. Mauri et al. (10) performed glue embolization for fistulas in various locations, including the rectosigmoid colon, duodenum, jejunum, and bile duct, with successful treatment in 17 patients, excluding one who died for other reasons. Although these studies did not report EJ anastomotic leakage, the present case suggests that percutaneous embolization may be feasible under this condi-

tion. We used cut gel foam and NBCA glue together because glue alone might not be effective owing to its liquid nature and the large size of the fistula. The large extent of the dehiscence made it challenging to seal the area solely with gel foam and glue. Instead, the gel foam and glue adhered to the surrounding soft tissue, progressively narrowing the leakage point and facilitating healing. NBCA glue achieves embolization by rapidly polymerizing upon contact with ionic substances, thereby creating a mechanical barrier. When applied to relatively small structures such as the vascular system, complete occlusion may be achieved with a single procedure. However, in nonvascular structures, complete occlusion may be difficult with a single injection, and multiple injections may be necessary. Additionally, the potential inflammation caused by food materials and the reaction of fibrotic tissue should be considered. Follow-up tubography revealed a gradual reduction in the fistula size and complete closure, indicating the effectiveness of this method. The use of gel foam and glue for embolization provides a mechanical barrier that not only seals the leakage but also promotes tissue adhesion and healing. This method can be advantageous over conservative treatment as it directly addresses the leakage point and may reduce the duration of external drainage.

In conclusion, we report a case in which percutaneous management using a cut gel foam and NBCA lipiodol mixture was effective in treating EJ anastomosis leakage refractory to conservative management after total gastrectomy with a Roux-en-Y esophagojejunostomy.

#### **Author Contributions**

Conceptualization, K.L.M.; data curation, K.M., P.J.H.; supervision, K.L.M., K.M.; writing—original draft, L.J.H.; writing—review & editing, all authors.

#### **Conflicts of Interest**

The authors have no potential conflicts of interest to disclose.

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# 위전절제술 및 식도공장문합술 후 발생한 문합부 누출의 N-Butyl-2-Cyanoacrylate 아교를 이용한 경피적 색전술: 증례 보고

임정현<sup>1</sup>·권려민<sup>1\*</sup>·김민정<sup>1</sup>·박정호<sup>2</sup>

Roux-en-Y 식도공장문합술을 이용한 위전절제술은 조기 위암의 표준적 수술 방법 중 하나 이다. 수술의 발전에도 불구하고 문합부 누출은 여전히 심각한 수술 후 합병증 중의 하나로 남아있다. 본 증례는 조기 위암으로 위 수술을 시행 받은 후 식도공장 문합부 누출로 인해 경 피색전술을 받은 59세 여성의 사례를 보고한다. 수술 후 환자는 식도공장 문합부 주변으로 체액이 축적되어 경피 배액을 시행하였으며 CT에서 문합부 결손이 확인되었다. 내시경치료 효과가 미미하였고 재수술의 위험이 높아 경피적 색전술이 의뢰되었다. 자른 gelfoam과 Nbutyl-2-cyanoacrylate와 lipiodol의 혼합물을 활용하여 4회의 색전술이 시행되었다. 시술 후 합병증 없이 문합부 누출과 결손이 완전히 해결되었다. 시술 후 6개월과 32개월에 촬영한 추적 CT 스캔에서 재발은 없었다. 본 증례는 Roux-en-Y 식도공장문합술 후 문합부 누출에 대한 치료 방법 중 하나로 경피색전술의 가능성을 보여준다.

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