Хирургия. Журнал имени Н.И. Пирогова
2026, №9, с. 79–83.
https://doi.org/10.17116/hirurgia202609179

Pirogov Russian Journal of Surgery
2026, No.9, pp. 79–83.
https://doi.org/10.17116/hirurgia202609179

The first experience of intraluminal endoscopic suturing of external gastropleural fistula

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Abstract

Gastropleural fistula (GPF) is a rare disease characterized by fistulous tract between gastric and pleural cavities via the diaphragm. The authors present diagnosis and comprehensive treatment of a patient with GPF. Endoscopic closure of gastric wall defect using the Apollo OverStitch device for intraluminal suturing followed by video-assisted argon plasma coagulation (VAP) of cavity walls through thoracostomy and placement of vacuum aspiration system resulted in a positive clinical outcome in a patient with delayed postoperative complication.

Keywords: *gastropleural fistula, endoscopic closure of defect, device for intraluminal suturing, endoscopic surgery.*

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To cite this article:
Teterin YuS, Yartsev PA, Gurtsiev MKh, Malikova VD, Zolotarev DV, Diduev GI. Intraluminal endoscopic suturing of external gastropleural fistula. *Pirogov Russian Journal of Surgery.* 2026;9:79–83. (In Russ.). https://doi.org/10.17116/hirurgia202609113

Первый опыт внутрипросветного эндоскопического ушивания наружного желудочно-плеврального свища

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Резюме

Желудочно-плевральный свищ (ЖПС) — редкая патология, при которой формируется свищевой ход, соединяющий полость желудка с плевральной полостью посредством диафрагмы. В статье представлен клинический случай диагностики и комплексного лечения пациента с ЖПС. Применение эндоскопического метода ушивания дефекта стенки желудка с использованием устройства для наложения внутрипросветных швов Apollo OverStitch с последующей видеоассистированой аргоноплазменной коагуляцией (АПК) стенок полости через торакостому и установкой вакуумно-аспирационной системы позволили достичь положительного клинического исхода при лечении больного с поздним послеоперационным осложнением.

Ключевые слова: *желудочно-плевральный свищ, эндоскопическое ушивание дефекта, устройство для наложения внутрипросветного шва, эндоскопическая хирургия.*

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Как цитировать:
Тетерин Ю.С., Ярцев П.А., Гурциев М.Х., Маликова В.Д., Золотарев Д.В., Дидуев Г.И. Первый опыт внутрипросветного эндоскопического ушивания наружного желудочно-плеврального свища. *Хирургия. Журнал им. Н.И. Пирогова*. 2026;9:79–83. https://doi.org/10.17116/hirurgia202609179

Introduction

Gastropleural fistula (GPF) is an extremely rare disease characterized by fistulous tract between the stomach and the pleural cavity through the diaphragm. Its incidence is still unknown, as only a few cases on this issue are available worldwide. In 1960, Markowitz A. et al. [1] first mentioned GPF as a complication of surgical treatment of hiatal hernias. Diagnosis was based solely on clinical data and radiography data. The «gold standard» of treatment at that time was open surgery, i.e. pleural drainage and hernia repair. This approach underlies further study of diagnosis and treatment of this rare but potentially dangerous pathology. According to international literature, the most common causes of GPF are intraoperative iatrogenic injuries (lung resection, gastric bypass (2–8%) and reconstructive surgery for hiatal hernia) [2–7]. Primary diagnostic methods for GPS include gastric contrast-enhanced X-ray, chest CT, CT of the abdomen and esophagogastroduodenoscopy.

Treatment strategy in such cases is still not established (all publications describe various options) that emphasizes the need for a standardized treatment algorithm incorporating modern capabilities of endoluminal endoscopic surgery [4, 7, 8]. Innovative endoscopic interventions offer new opportunities in the treatment of patients with GPF. Currently, the OverStitch system (Apollo Endosurgery, USA) is one of the most novel methods for suturing gastric wall defects. This system is designed for placement of full-thickness sutures using a flexible endoscope and enables effective closure of various defects. Visual control enables high positioning accuracy, minimizes trauma to surrounding tissues, and reduces the risk of complications typical for open surgeries. Importantly, there is only one description of this technology in a patient with postoperative suture failure after proximal gastrectomy for malignancy in Russian literature. Intraluminal surgery was followed by complete closure of gastric stalk wall failure and restoration of gastric function [8].

We present diagnosis and treatment of a patient with GPF. Endoscopic defect closure was performed using the Apollo Overstitch device for intraluminal suturing.

A 48-year-old patient presented with complaints of fever (38°C), weakness, and moderate amount of gastric discharge from a fistula on the left side of the chest wall in the seventh intercostal space along the midaxillary line.

At baseline, the patient was diagnosed with left-sided diaphragmatic hernia and abdominal organ dislocation into the left pleural cavity. Emergency left-sided thoracotomy and laparotomy were carried out 16 years ago. Dislocation was corrected via left diaphragmatic dome defect closure and suture line reinforcement with two mesh implants (on abdominal and pleural sides). Postoperative period was complicated by pleural empyema that required drainage of the left pleural cavity in the seventh intercostal space along the midaxillary line. Antibacterial therapy and debridement of the left pleural cavity were accompanied by recovery. The drainage tube was removed after 2 months, and the patient was discharged.

Two weeks after discharge, body temperature rose to 38°C, and the patient presented to local hospital. Examination revealed left-sided pleural effusion. Drainage yielded purulent and gastric contents. Thus, GPF was diagnosed. Surgical intervention was avoided due to extensive surgical procedures (thoracotomy, laparotomy), abdominal and pleural adhesions. The patient was discharged with a drain in the left pleural cavity and then followed-up for 15 years.

The patient learned from the media that the Sklifosovsky Research Institute for Emergency Care was developing new methods for diagnosing and treating gastrointestinal fistulas. Finally, he presented to our hospital.

There were favorable clinical status and no indications for emergency surgical treatment. Thus, laboratory and instrumental tests were prescribed: clinical and biochemical blood tests, C-reactive protein, chest CT, fistulography and esophagogastroduodenoscopy.

Chest CT revealed a drained chronic pleural empyema on the left ~ 60 cm^3 communicating with the fundus of the stomach.

Injection of contrast agent (Iogexol TR 350 mg iodine/ml, 30 ml) into drainage tube was followed by gastric contrast enhancement.

Esophagogastroduodenoscopy revealed fistula in the fundus of the stomach (up to 1.2 cm), and a previously installed mesh implant was visualized through this orifice **(Fig. 1)**.

Laboratory data upon admission: leukocyte count 6.91 x 10^9/L, total protein 73.01 g/L, CRP 9.7 mg/L.

Thus, external GPF complicated by chronic pleural empyema was diagnosed on the second day after hospitalization. Elective surgical intervention included left-sided thoracostomy, debridement and drainage of the left pleural cavity. After 3 days, thoracotomy was performed under endotracheal anesthesia. We removed mesh implant and performed necrectomy and debridement of the left pleural cavity with antiseptic solution (2% Povidone-Iodine solution). Diaphragmatic defect was sutured with interrupted sutures, and vacuum aspi-

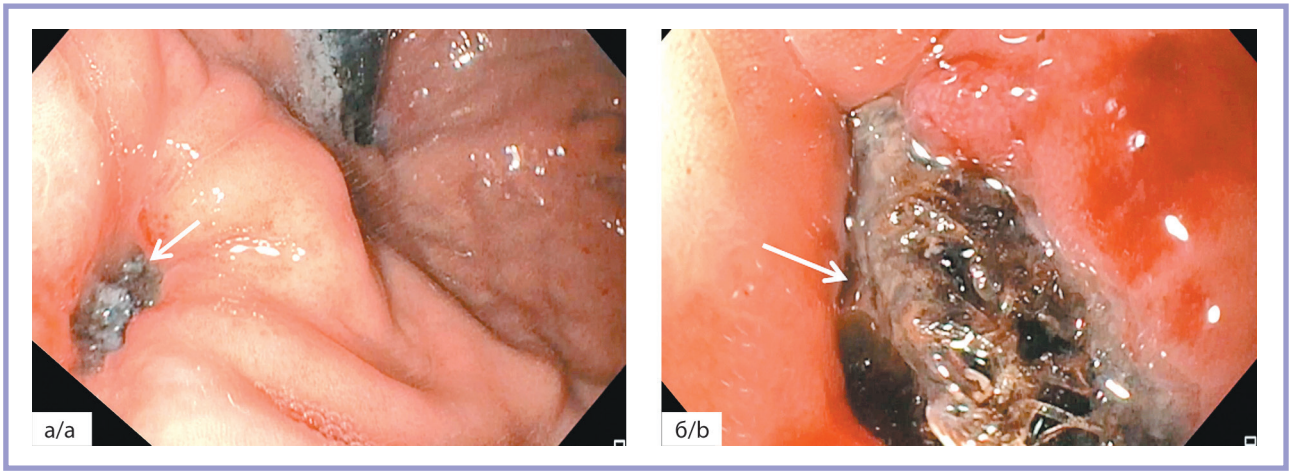


Fig. 1. Inversion examination of gastric fundus.
(a, b): mesh implant in orifice floor (arrows).
***Рис. 1.* Осмотр в инверсии дна желудка.**
(а, б): сетчатый имплантат в дне свищевого отверстия (стрелки).

ration system was installed. Surgery time was 3 hours. There were no intraoperative complications. Postoperative intensive care implied intravenous fluids, antisecretory medications, antibacterial therapy (cefoperazone 1 g + sulbactam 1 g twice daily), anticoagulation, symptomatic therapy, parenteral nutrition, vital function monitoring, clinical and laboratory parameters (leukocytes 10.2 x 10^9/L, CRP 122.2 mg/L), prevention of thromboembolic and septic complications.

CT on the 4th day after surgery revealed persistent fistula in the fundus of the stomach and moderate (up to 100 ml/day) discharge of gastric content through the drainage tube.

After multidisciplinary consultation, we preferred endoluminal endoscopic suturing of gastric wall defect using the Apollo Overstitch suture device and subsequent video-assisted APC of cavity walls via thoracostomy.

On the fifth postoperative day, radiofrequency mucosal ablation of fistulous tract ostium was performed under endotracheal anesthesia as the first step before suturing the gastric fundus defect (electrode length 18 mm, temperature 85°C, power 8 W, exposure time 1 min; Tae-Woong Medical catheter, South Korea).

At the second stage, we sutured gastric wall defect with a three-layer Z-shaped suture using the Apollo Overstitch system and 2-0 non-absorbable polypropylene (Boston Scientific, USA; **Fig. 2**). Surgery time was 2 hours.

The third stage was video-assisted APC of cavity walls via thoracostomy **(Fig. 3)**.

Postoperative period was uneventful. The patient underwent treatment at the thoracic surgery department. We performed daily fractional lavages of the left pleural cavity with antiseptic solutions and elective (every 4 days) changes of the vacuum aspiration system (under 150 mmHg). System change was accompanied by APC of thoracostomy walls. There were 6 procedures. Wound discharge disappeared, fresh granulation tissue appeared and thoracostomy size decreased throughout this period.

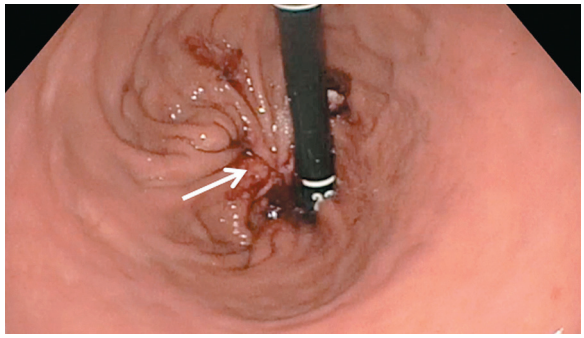


***Fig. 2.* Inversion examination: sutured defect of gastric fundus (arrow).**
***Рис. 2.* Осмотр в инверсии: ушитый дефект в дне желудка (стрелка).**

Therapy included enteral nutrition, infusion and physical therapy. Bacteriological data (Candida glabrata 105 CFU/ml, Corynebacterium striatum 106 CFU/ml sensitive to vancomycin and linezolid, Enterococcus species 104 CFU/ml sensitive to tigecycline and linezolid, Enterococcus raffinosus - multiresistant) justified appropriate antibacterial therapy (cefoperazone 2 g + sulbactam 2 g twice daily, vancomycin 1 g twice daily, tigecycline 50 mg twice daily).

Chest CT and gastric X-ray with contrast enhancement on the 40th day after hospitalization and on the 35th day after surgery revealed cavity shrinkage from 10.0 x 8.0 cm to 2.0 x 1.5 cm. There was no fistulous tract.

Endoscopic examination on the 41st day after hospitalization revealed postoperative suture in the fundus

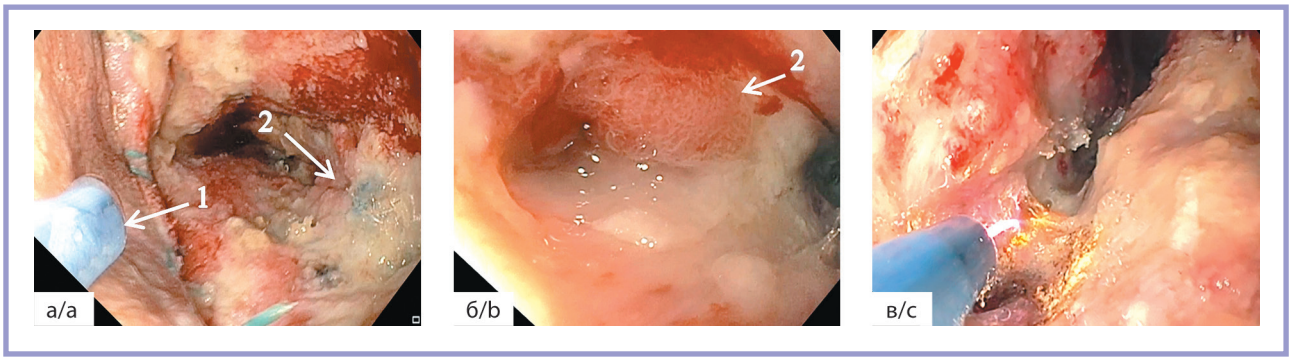


Fig. 3. Thoracostomy cavity.
a, b: 1 — APC catheter; 2 — gastric mucosa in thoracostomy floor (arrows); c — APC of cavity walls through thoracostomy.
***Рис. 3.* Полость торакостомы.**
а, б: 1 — катетер для АПК; 2 — участок слизистой оболочки желудка в дне торакостомы (стрелки); в — АПК стенок полости через торакостому. АПК — аргоноплазменная коагуляция.

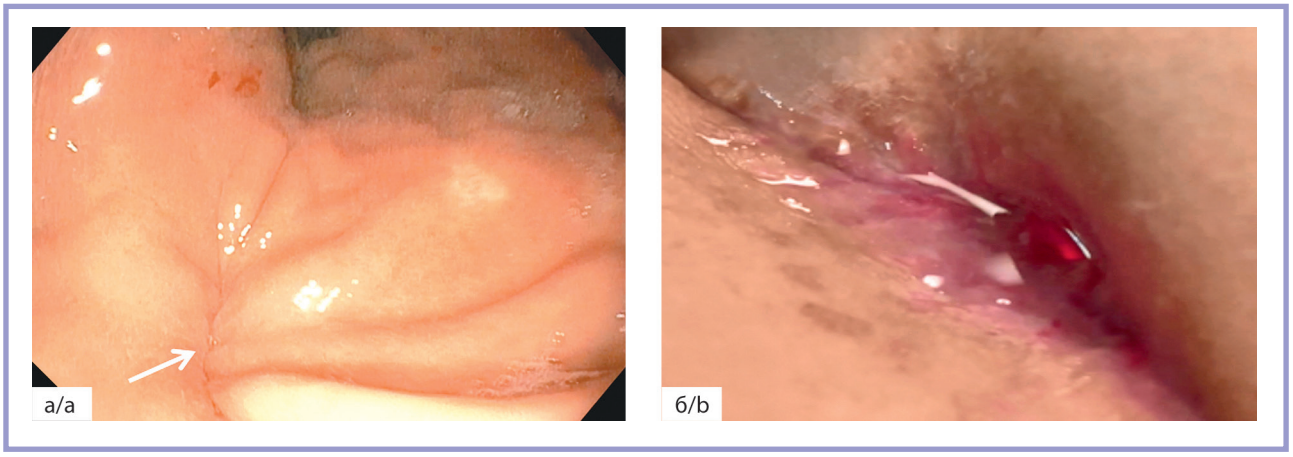


Fig. 4. Treatment results in 41 days after hospitalization.
a — inversion examination: postoperative suture in gastric fundus (arrow); b — thoracostomy: negative air leak test.
***Рис. 4.* Результаты лечения на 41-е сутки от госпитализации.**
а — осмотр в инверсии: послеоперационный шов в дне желудка (стрелка); б — торакостома: контрольный воздушный тест на герметичность отрицательный.

of the stomach. Air leak test under gastric insufflation was negative from the thoracostomy site **(Fig. 4)**.

Laboratory data on the 41st day: leukocytes 6.40 x 10^9/L, CRP 2.5 mg/L, total protein 68.68 g/L.

The patient was discharged on the 43rd day after admission. Follow-up chest CT and esophagogastroduodenoscopy confirmed complete closure of fistula.

In delayed period (5 weeks after surgery), the patient had no complaints. Esophagogastroduodenoscopy revealed a linear scar 0.5 x 0.2 cm within the fistula area. Gastric air insufflation revealed complete closure.

Conclusion

This case demonstrates safety and efficacy of the Apollo Overstitch device for intraluminal suturing in comprehensive treatment of patients with gastropleural fistulas. Multidisciplinary approach demonstrated high potential and allowed for gastropleural fistula closure without extensive surgical intervention. Further research is needed to evaluate this technique for closure of gastrointestinal defects and postoperative suture failure.

Author contribution:
Concept and design of the study — Gurtsiev M.Kh., Zolotarev D.V., Diduev G.I.
Collection and analysis of data — Malikova V.D.
Statistical analysis — Malikova V.D.
Writing the text — Malikova V.D., Gurtsiev M.Kh.
Editing — Yartsev P.A., Teterin Yu.S.

The authors declare no conflicts of interest.
Авторы заявляют об отсутствии конфликта интересов.

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Поступила 02.04.2026
Received 02.04.2026
Принята к печати 24.04.2026
Accepted 24.04.2026