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CASE REPORT

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Single staged repair of an anastomotic tracheal fistula following Mckeown esophagectomy via cervical incision: a case report

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Abstract

Background The incidence of tracheoesophageal fistula (TEF) following esophagectomy is less than 3%, but it often leads to severe complications and can even be life-threatening to patients. Surgical repair methods for TEF include muscle or omental flap support, biologic patch repair, and sleeve resection. In recent years, there has been an increasing number of case reports on primary closure via a cervical incision, with a rising success rate and a lower incidence of postoperative complications.

Case presentation A case is presented involving a 68-year-old female patient with esophageal squamous cell carcinoma who underwent thoracoscopic McKeown esophagectomy combined with gastric conduit reconstruction. On postoperative day 10, the patient presented with severe coughing. Gastroscopy and bronchoscopy confirmed a tracheoesophageal fistula at the anastomotic site. After 2 weeks of anti-infective therapy, drainage, and nutritional support, the fistula persisted. Subsequently, an exploratory surgery was performed via the original cervical incision, and the fistula was repaired with primary suture. The patient received routine dressing changes and continued anti-infective therapy postoperatively. One week later, gastroscopy and bronchoscopy revealed complete healing of the trachea, with closure of the anastomotic fistula, and no abnormalities were detected upon oral intake.

Conclusion This case demonstrates that in patients identified early, with complete drainage, adequate anti-infection measures, and improved nutritional status, primary closure of the tracheoesophageal junction through the original cervical incision can successfully treat an anastomotic trachea-fistula following esophagectomy. Our report details the process of primary repair of TEF through the cervical approach, contributing additional references to existing literature.

Keywords Anastomotic tracheal fistula, Esophagectomy, Cervical incision

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Background

Esophageal cancer is the seventh most common malignant tumor worldwide, with squamous cell carcinoma accounting for over 90% of cases in China [1–3]. The McKeown esophagectomy, as one of curative surgical procedure for mid-thoracic esophageal malignancies, is widely employed for patients with malignant tumors located in the thoracic esophagus, yet the risk of cervical anastomotic leaks remains significant [4, 5]. Compared with anastomotic leakage, the occurrence of tracheoesophageal fistula (TEF) following esophageal cancer surgery is a rare yet destructive complication that often leads to persistent infection and poses a significant threat to the patient's life [6–8]. Management strategies for anastomotic leaks primarily include wound drainage, endoscopic treatment, and surgical debridement and repair [9, 10]. Conversely, the repair techniques for tracheoesophageal fistulas mainly consist of muscle or omental flap support, biologic patch repair, and sleeve resection [7, 8]. Repair of the fistula can save patient lives by preventing further deterioration of the respiratory system.

In the case we report, a patient who underwent a three-field esophagectomy (cervical, thoracic, and abdominal approach) for esophageal cancer developed severe coughing and choking symptoms 10 days postoperatively after consuming a liquid diet. On postoperative day 14, fiberoptic bronchoscopy and gastrointestinal endoscopy confirmed the presence of a tracheoesophageal fistula. After 2 weeks of conservative treatment with persistent fistula, we successfully primary suture repair of the fistula via the original cervical incision.

Case presentation

Patient information

A 68-year-old female presented with dysphagia to solid food and was diagnosed with mid-thoracic esophageal squamous cell carcinoma after comprehensive examinations at another hospital. The patient had no history of hypertension, diabetes, or coronary heart disease, no smoking or alcohol consumption history, and no family history of genetic diseases. Preoperatively, she was staged as cT3N1M0 and underwent two cycles of neoadjuvant therapy, consisting of carboplatin, paclitaxel injection, and camrelizumab. Six weeks after the completion of neoadjuvant therapy, she underwent a three-field esophagectomy (cervical, thoracic, and abdominal approach) at another hospital. During the operation, a single-lumen endotracheal intubation was performed, and the patient was positioned in the left lateral decubitus position. Thoracoscopic surgery was conducted with the creation of a pneumothorax. Intraoperative findings revealed a tumor located in the mid-lower esophagus, measuring approximately $3 \times 2 \times 1$ cm, with post-treatment changes and full-thickness involvement. Enlarged lymph nodes were observed around the left and right recurrent laryngeal nerves, as well as in the upper, middle, and lower esophageal regions and the subcarinal area. The esophageal tumor was resected with subtotal esophagectomy, and the aforementioned lymph nodes were dissected. The thoracic incision was then closed. The patient was repositioned supine, and a midline upper abdominal incision was made. The right gastroepiploic artery and vein were preserved, and the stomach was mobilized with dissection of abdominal lymph nodes. A tubular stomach was created using a Johnson & Johnson disposable intracorporeal linear cutter and stapling cartridge. A left cervical incision was made, the cervical esophagus was mobilized, and the tubular stomach was pulled up to the neck for end-to-end esophagogastrostomy. The muscular layer of the esophagus and tubular stomach was intermittently sutured with 3 – 0 Coated VICRYL. The mucosal layer, including both anterior and posterior aspects, was continuously sutured with 5 – 0 Coated VICRYL. The anterior muscular layer was then intermittently sutured with 3 – 0 Coated VICRYL. A jejunal feeding tube and a gastric tube were inserted. Postoperatively, the patient was administered cefazolin for anti-infection, esomeprazole for acid suppression, and received both enteral and parenteral nutritional support. On postoperative day 10, the patient developed severe coughing and choking symptoms after consuming a liquid diet. On postoperative day 14, fiberoptic bronchoscopy and gastrointestinal endoscopy confirmed the presence of a tracheoesophageal fistula. The patient was then placed on a nil-by-mouth status, and a nasogastric tube was inserted for decompression and nutritional support. She was administered cefotaxime 2 g intravenously twice daily for anti-infection therapy. The cervical incision sutures were removed, revealing purulent discharge. The fistula was not explored, and local debridement and dressing changes were performed. The thoracic drainage tube was retained for continuous closed thoracic drainage, with no purulent discharge observed.

Clinical findings

After two weeks of conservative treatment (four weeks postoperatively), the patient's cough persisted, suggesting non-healing of the fistula. She was then transferred to our hospital via the emergency department. A Computed Tomography (CT) scan of the chest and abdomen revealed a suspected mediastinal or tracheal fistula in the anterior wall of the anastomotic site. Further evaluation via fiberoptic bronchoscopy revealed a 5–6 mm tracheal fistula approximately 5 cm from the vocal cords, with significant purulent secretion surrounding the fistula (Fig. 1). Preoperative blood tests showed a white blood cell count of $7.17 \times 10\text{^}9/\text{L}$ and neutrophils at $5.72 \times 10\text{^}9/\text{L}$.

Fig. 1 After two weeks of conservative management, the fistula persisted. (**a**) The location of the fistula as visualized on CT scans. (**b**) The location of the fistula as observed during fiberoptic bronchoscopy

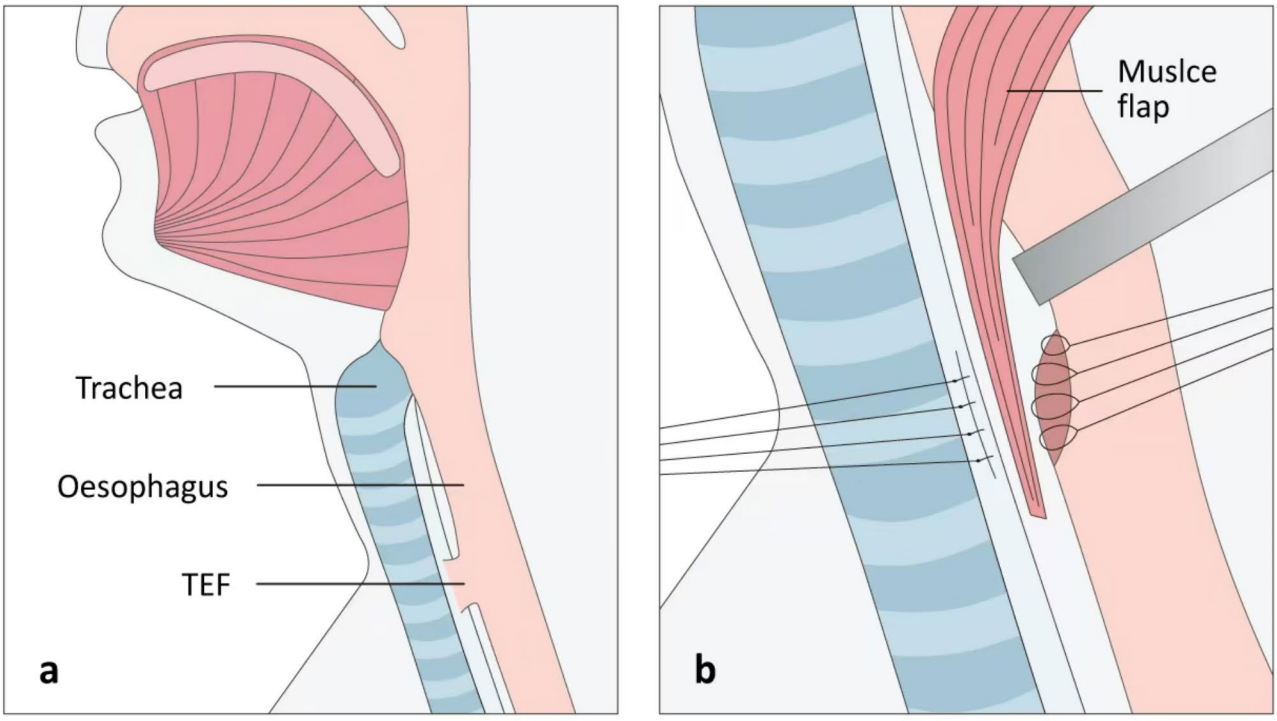

Fig. 2 Schematic illustration of fistula repair via a cervical incision. (**a**) Preoperative schematic diagram of the fistula. (**b**) During the surgical procedure, the tracheal membranous defect and the esophageal perforation were repaired with interrupted sutures. A vascularized portion of the sternocleidomastoid muscle flap was used to interpose between the trachea and esophagus

Intervention

During the surgery, the patient was placed in a supine position with single-lumen tracheal intubation under general anesthesia. We explored along the anterior border of the left sternocleidomastoid muscle at the original incision site, mobilizing along the midline to expose the trachea while preserving a strip-shaped muscular flap. After adequately dissecting the surrounding tissues, we identified a 1 × 0.5 cm defect at the esophagogastric anastomosis and a 0.6 × 0.6 cm defect in the membranous part of the trachea, with no clear purulent fluid present and the granulation tissue appearing reddish. The perforations in the gastrointestinal tract and the membranous portion of the trachea were repaired with interrupted full-thickness sutures using 3 – 0 Coated VICRYL. A vascularized portion of the left sternocleidomastoid muscle flap was dissected and interposed into the esophagotracheal space. The sternocleidomastoid muscle and the muscular layer of the gastrointestinal tract were then sutured with interrupted 3 – 0 Coated VICRYL to separate the gastrointestinal tract from the trachea (Fig. 2). A water test was performed on the incision, revealing no air leakage from the trachea. After satisfactory hemostasis, the wound was irrigated, and the upper part of the incision was closed with sutures, while a drain was placed in the lower part. Given the high risk of pulmonary

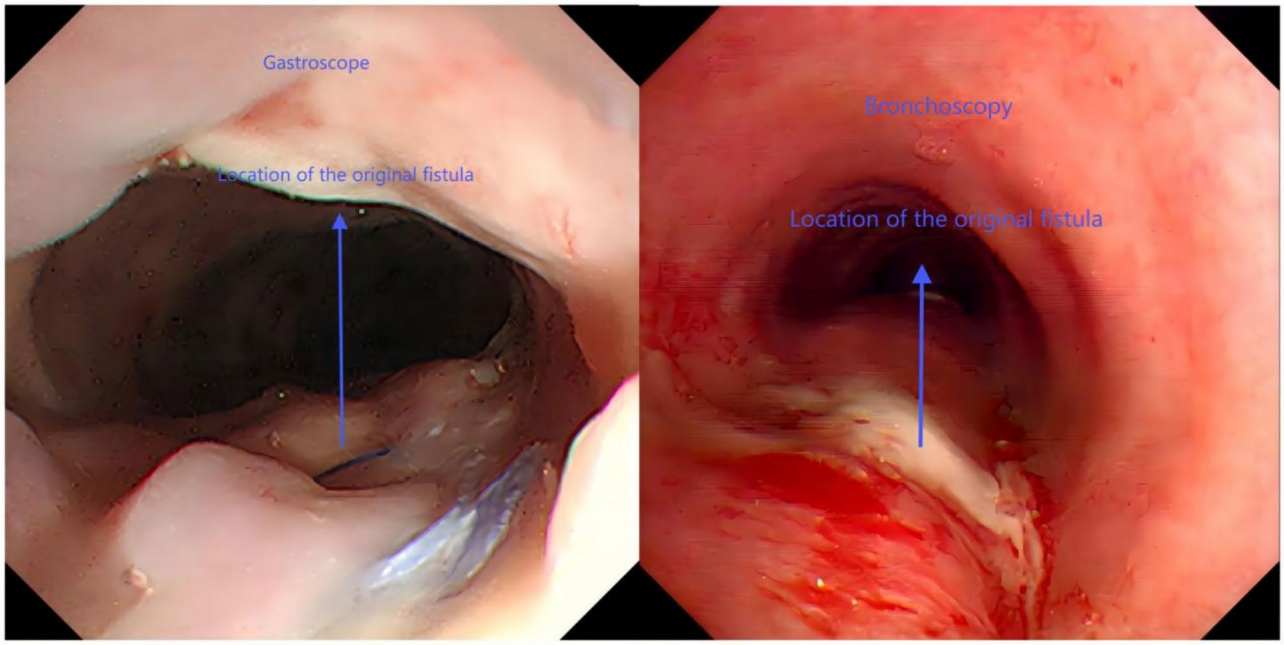

Fig. 3 The healed area of the fistula as indicated by fiberoptic bronchoscopy and gastroscopy at one week postoperatively

infection due to the aspiration of significant intratracheal secretions from the trachea intraoperatively, the patient was administered piperacillin-sulbactam for postoperative anti-infective treatment at a dose of 3 g every 8 h for a duration of 3 days. Additionally, the patient received enteral nutritional suspension and human serum albumin for nutritional support, esomeprazole for gastric mucosal protection, and routine dressing changes for the wound.

Follow-up

Three days post-surgery, the patient showed a significant reduction in cough symptoms, and there was no purulent discharge observed during dressing changes. On the sixth postoperative day, the lower drainage strip was removed, while tube feeding for nutritional support continued. One week later, gastroscopy and fiberoptic bronchoscopy confirmed complete healing of the trachea, with the disappearance of the tracheoesophageal fistula (Fig. 3). Thirteen days after surgery, the incision exhibited no significant exudate, prompting the implementation of simple intermittent closure of the lower part of the incision. By two weeks postoperatively, the patient was able to eat orally without any noticeable difficulty in swallowing. Additionally, the patient was discharged on postoperative day 19. During a six-month follow-up, the patient reported satisfactory wound healing, no further treatments required, absence of hoarseness, normal oral intake, and no discomfort during swallowing.

Discussion and conclusions

Compared to anastomotic leaks, the incidence of tracheal or bronchial-esophageal fistulas following esophageal cancer surgery is lower but more destructive, posing a serious threat to patient life through respiratory system deterioration [6, 7]. Acquired tracheoesophageal fistula (TEF) often occurs in the early postoperative period following esophagectomy [11, 12]. In the relevant literature, the treatment of TEF includes surgical intervention, stent placement, and conservative management. Stent placement, as a common repair method, was also considered in our case [13, 14]. However, after being informed of the advantages and disadvantages of stent placement, the patient declined this option due to the potential complications associated with stent placement. These complications include granulation tissue hyperplasia, stent migration, and retention of secretions [15]. In addition, the high location of the TEF in this case would result in a strong foreign body sensation after stent placement, which would significantly affect the patient's quality of life. Regarding surgical intervention, approaches such as pectoralis major muscle flap combined with biological patch, muscle flap alone, and sleeve bronchial resection have been reported [7, 8]. Compared with other surgical interventions, the advantages of primary suture repair of gastrointestinal and tracheal fistulas via the original cervical incision include minimal secondary trauma to the patient and reduced risk of recurrent anastomotic leakage. Prior to surgical suture repair of gastrointestinal and tracheal fistulas, a period of anti-infective therapy and continuous drainage (for more than two weeks) should

be undertaken to allow the active inflammatory phase in the fistula area to subside, thereby further reducing the risk of fistula recurrence [16]. In the event of poor local anastomotic conditions or recurrence of the fistula, consideration may be given to sacrificing the gastric conduit, closing the tracheal defect, and re-establishing an artificial esophagus using the colonic segment, either simultaneously or in a second stage [17]. In this case, after two weeks of anti-infective therapy and adequate drainage, local infection was controlled, with fresh red granulation tissue observed intraoperatively, allowing for tension-free suturing.

However, this method still has certain limitations. TEFs are classified into three levels: small TEF (< 1 cm), moderate TEF (≥ 1 cm but < 5 cm), and large TEF (≥ 5 cm). For small TEFs, we can opt for fistula closure via the original cervical incision, while moderate or large TEFs may require more complex surgical approaches, such as special types of tracheal resection or oesophageal exclusion [18]. On the other hand, in this case, the original cervical incision could expose up to approximately 3 cm below the thoracic inlet. Tension-free suturing is necessary to minimize the risk of recurrent anastomotic leakage, which is influenced by the location of the TEF and the length of the tubular stomach. Based on preoperative fiberoptic bronchoscopy and CT findings, the fistula in this case measured approximately 6 mm and was located at the cervical tracheal level, with a high likelihood of successful dissection and suturing of the trachea and gastrointestinal tract. The use of a trans-illuminative fiberoptic bronchoscope during surgery may help to more accurately locate the position of the fistula, and the use of a fiberoptic bronchoscope during tracheal intubation is more effective, which helps to prevent excessive exposure of surrounding tissues [19]. Regarding the choice of muscle flap for separating the tracheal and gastrointestinal fistulas: a review of the literature reveals that, given the anatomical proximity of the trachea and esophagus, sternohyoid or sternothyroid muscles are commonly used to reinforce the repair site in small TEFs to prevent recurrence [20, 21]. In this case, since the omohyoid muscle had been transected during the initial esophagectomy, a vascularized portion of the left sternocleidomastoid muscle was chosen for reinforcement. When closing the incision, only the upper part was sutured to allow for adequate observation of wound healing and drainage, with a drain placed in the lower part.

This case demonstrates that small-sized (< 1 cm) anastomotic tracheal fistulas detected early can be successfully treated with primary suture repair of the esophagotracheal fistula via the original cervical incision, provided that drainage is complete, anti-infective therapy are adequate, and nutritional status is improved. When conditions permit, primary suture repair of the tracheoesophageal fistula not only alleviates the burden on physicians but also reduces patient suffering, conserves surgical costs, and offers the best chance for patient survival.

Abbreviations

CT Computed tomography

Author contributions

XW obtained the funding.TX and QL designed the study.HZ, CG, YZ， HG and YZ contributed to manuscript writing and assisted in collecting patient information, obtaining image data, and pathological results.RX, WD, XW and TX provided critical revisionsto the manuscriptfor important intellectual content.WD, XW, TX and QL reviewed and approved the final manuscript.

Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

This study has been approved by the Medical Research and Medical New Technology Ethics Committee of Sichuan Cancer Hospital.

Consent for publication

The patient gave permission for the publication of the case report.

Competing interests

The authors declare no competing interests.

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