WORLD JOURNAL OF GASTROENTEROLOGY, HEPATOLOGY AND ENDOSCOPY

Combined Off-Rib Intercostal Flap Used in Tracheoesophageal Fistula

Chen Y | Physician in neurogeriatrics and cognitive disorders and researcher, China

Article Information

Article Type: Case Report
Journal Type: Open Access
Volume: 3 Issue: 7
Manuscript ID: WJGHE-v3-148
Publisher: Science World Publishing

Recieved Date: 09 Nov 2022
Accepted Date: 12 Dec 2022
Published Date: 19 Dec 2022

***Corresponding Author:**
Yaohua Chen,
Physician in neurogeriatrics and cognitive disorders and researcher, China,
E-mail: 279376894@qq.com

Citation:
Chen Y (2022).
Combined Off-Rib Intercostal Flap Used in Tracheoesophageal Fistula. J Gastroenterol Hepatol Endosc , 3(7);1-4

1. Abstract

The patient is a 50-year-old male who underwent gastric cancer + 2 field lymph node dissection (Roux-en-Y esophageal + jejunal anastomosis) in November 2021 in our abdominal surgery department. The esophagotracheal fistula was clarified by esophageal radiograph and tracheoscopy, and the tracheal fistula opening was located in the left main bronchus. Tracheoesophageal fistulas are relatively rare after gastrectomy + 2 field lymph node dissection. A pedicle flap is commonly used to fill in around the fistula during surgery to prevent recurrence of the fistula. The intercostal muscle flap is controversial because of calcification and unreliable blood supply and itself is a narrow strip of muscle with insufficient volume as a repair material. The combined off-rib intercostal flap and parietal pleura as a whole was placed between the two fistulas and sutured in place to avoid recurrence of the fistula. the patient recovered well. Combined off-rib intercostal flap is an optimal choice for repair of tracheoesophageal fistulas in chest.

2. Background

Tracheoesophageal fistula in the chest is rare but life-threatening complication associated with high mortality [1-3]. However, treatment is demanding and challenging, we present our experience of repairing the fistula by combined off-rib intercostal flap.

3. Case Description

A 50-year-old male underwent gastrectomy and esophagojejunal Roux-en-Y anastomosis with two-field lymph node dissection for gastric cancer in our abdominal surgery department in November 2021. The patient underwent a total gastrectomy and the jejunum was anastomosed to the esophagus through the posterior mediastinal route using a circular stapler. An esophagotracheal fistula was detected by esophagogram 7 days after surgery. The esophagogram showed a spillage of contrast into the trachea (Figure 1). After the diagnosis was confirmed, the patient was referred to our department for treatment of tracheoesophageal fistula. Tracheoscopy showed that the fistula was located in the left main bronchus below the carina, and the jejunal wall was visible through the tracheal fistula. (Figure 2) Blood count showed a low white blood cell count of 1.76 × 10 9 /L with a neutrophil ratio of 81.2%. Sputum culture did not show any significant pathogenic bacteria.

We took the following three measures to improve the success rate of the treament. A gastric tube was left across the anastomosis, complete parenteral nutrition, and octreotide to suppress the secretion of digestive juices. After correcting the patient's nutritional status, we performed the surgery for repair. We prefer to repair tracheal and esophageal fistulas in only one operation after the fistula is predicted to be cleaned. The fistula was cleaned around the fistula before it could be closed (perhaps requiring multiple wash-outs and debridements). Considering the damage of the right intercostal muscle from the previous surgery and the fact that the tracheal fistula was located in the left main bronchus, we chose to

open the chest on the left side.

We resected the 5th rib with the uninjured periosteum. We identified the 4th and 5th intercostal muscles and parietal pleura as a whole carefully dissected the muscles from the ribs while making sure we did not obstruct the neurovascular bundle (Figure 3). The multiple adhesions between the pleura and were released. Then we see the fistulas could be seen located at the left main bronchus and esophagojejunal anastomosis, then the fistula was closed directly with 4-0 PDS sutures. The combined off-rib intercostal flap was placed between the two fistulas and sutured in place to avoid recurrence of the fistula (Figure 4). A thoracic drain and two mediastinal drains (each placed cross outside of the fistula) were placed, and the chest wall incision was closed directly. This was a successful single-stage repair. After the operation we keep gastric tube, complete parenteral nutrition, octreotide to suppress digestive secretion and antibiotic therapy. A 3-week postoperative esophageal radiograph showed no spillage of contrast. (Figure 5) At the follow-up, the patient recovered well and was able to eat normally and without dysphagia.

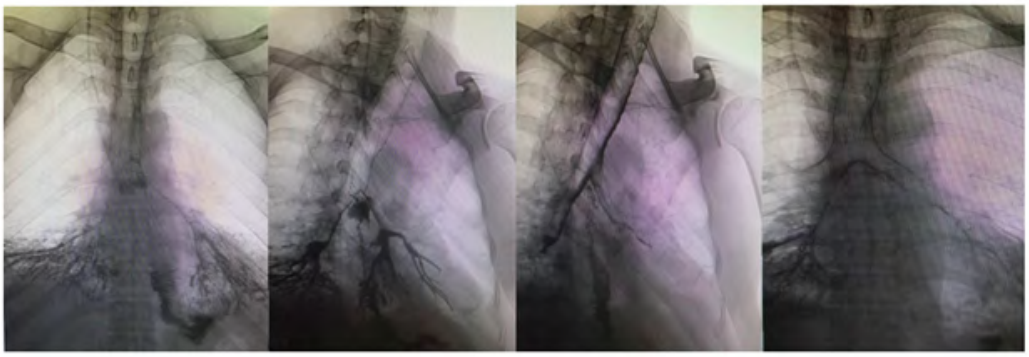

Figure 1: The esophagogram showed a spillage of contrast into the trachea.

Figure 2: Tracheoscopy showed that the fistula was located in the left main bronchus below the carina, and the jejunal wall was visible through the tracheal fistula.

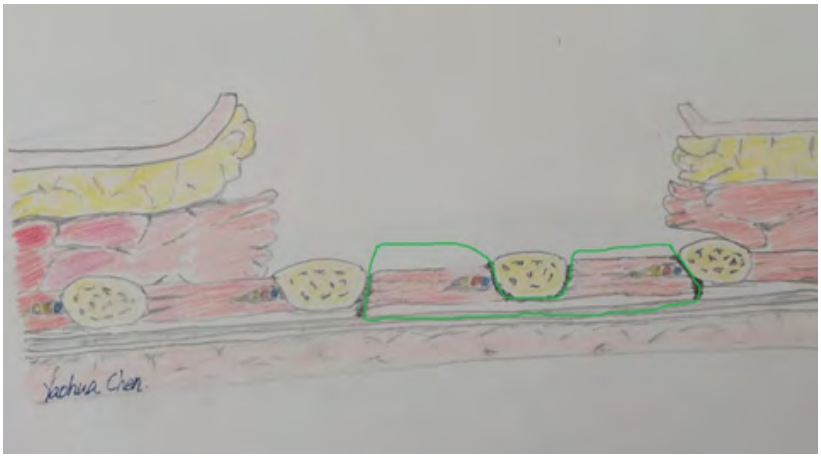

Figure 3: We resected the 5th rib with the uninjured periosteum. We identified the the 4th and 5th intercostal muscles and parietal pleura as a whole carefully dissected the muscles from the ribs while making sure we did not obstruct the neurovascular bundle.

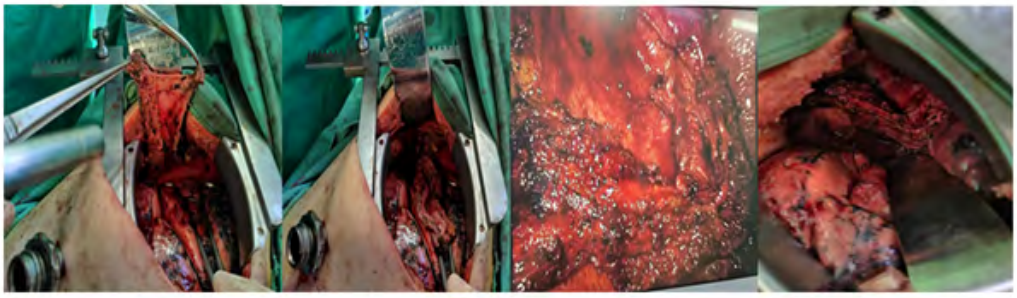

Figure 4: A 3-week postoperative esophageal radiograph showed no spillage of contrast.

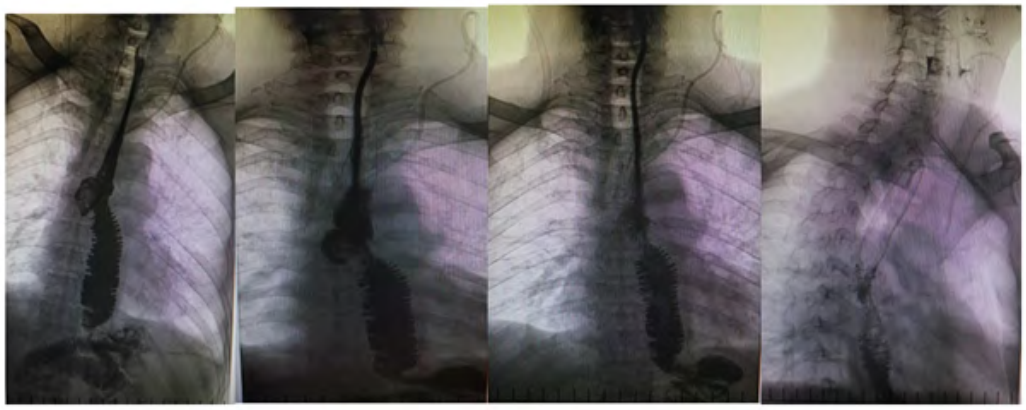

Figure 5: The combined off-rib intercostal flap was placed between the two fistulas and sutured in place to avoid recurrence of the fistula.

4. Discussion

Tracheoesophageal fistula in the chest is a very rare and potentially life-threatening complication [1-3]. Because conservative treatment fails in many cases, surgical intervention is an important treatment [4,5]. The surgical technique depends on various factors, such as: the length and size of the fistula, the presence of tracheal necrosis and other complications. It also depends on the location of the fistula, the viability of the surrounding tissues and the clinical condition of the patient [6]. Careful and strategic treatment can give the patient a chance to survive and reintroduce food via the mouth. Improving the patient's general condition is essential for recovery before surgery. A successful repair is based on the removal of inactivated tissue, repair of the fistula and tracheal defect, insertion of viable tissue and adequate drainage [7]. Improving the patient's general condition is essential for recovery after surgery [8]. The negative pressure of gastric tube draws intestinal juice, and octreotide reduces the production of digestive juices which contributes to the cleansing of the fistula. Postoperative application of a gastric tube and a mediastinal drainage tube will ensure adequate drainage. These are the basis for a successful surgery. Our team prefers one-stage surgery to repair the esophageal and tracheal defects. However, the repair of the closed fistula presupposes a clean wound. Perhaps a lot of irrigation and debridement is required. A pedicle flap is commonly used to stuff in between the fistulas during surgery to prevent recurrence of the fistula [9]. There are reports of replacing intercostal muscle flaps with latissimus dorsi and pectoral is major flaps [10,11], even with the newer technique of removing only part of the anterior serratus attachment, which still results in partial winging of the scapula and seroma, as well as partial loss of shoulder function [12].

The intercostal muscle flap is controversial and the reasons why many surgeons prefer not to use it is because of calcification over time and unreliable blood supply and the fact that the intercostal muscle itself is a narrow strip of muscle with insufficient volume as a repair material [13]. The advantages of the intercostal muscle flap are that it is easy to obtain and can be taken at the original surgical incision, it does not require special equipment and can be operated by a general thoracic surgeon (unlike the omental, serratus and vastus flaps, which are taken by plastic surgeons in many institutions), it can be taken long enough and can, for example, reach any bronchus as well as the entire thoracic esophagus [14]. The intercostal muscle flap takes only a few minutes to remove and does not increase morbidity, and when the flap is made without periosteum, it avoids ossification and reduces pain after chest surgery [14].

The quality of the flap was enhanced to ensure the surgical outcome and reduce the morbidity and mortality rate. With these factors in mind, we made the flap with one rib removed and complete

removal of the periosteum, allowing the two adjacent intercostal muscles and parietal pleura as a whole increasing blood supply and volume (Figure 3).

5. Conclusion

Reinforcing fistula closure with a vascularized muscle flap is a viable option to prevent dehiscence of the repair site and can be life-saving. Some of the key points that we think we need to keep in mind as thoracic and general surgeons before surgery. Cleaning of the fistula and improving the general condition of the patient. Nasogastric and mediastinal drains help to control the fistula and prevent ongoing mediastinal contamination, and a chest tube is left in place to drain fluid from the chest cavity. The use of somatostatin analogs also helps to reduce digestive fluid and thus helps to clean the fistula. The pedicle flap muscle can be chosen from the intercostal muscle flap. Combined off-rib intercostal flap preserves 2 sets of intercostal vessels, is easy to perform, ensures blood supply and volume of the muscle flap, contribute to fistula healing, and removal of one rib does not increase the difficulty of closing the chest.

Single-institution experience limits the generalizability of our findings. To our knowledge, no other studies have been published showing the technique performed by our surgical team.

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