Iatrogenic oesophageal fistulas after neck region surgery

Jatrogenny przetoki przełyku po zabiegach chirurgicznych w obrębie szyi

Krzysztof Kowalik1, Anna Gruszczynska2, Agnieszka Kowalska3, Marek Pękala4, Andrzej Modrzejewski1

1Clinical Department of General Surgery Pomeranian Medical University in Szczecin; Head: Prof. Andrzej Modrzejewski MD PhD
2Department of Forensic Medicine Pomeranian Medical University in Szczecin; Head: Prof. Mirosław Parafiniuk MD PhD
3Gastroenterology Ward of St. Luke's Specialist Hospital in Końskie; Head: Iga Detka-Kowalska MD
4Department of Genetics and Pathomorphology Pomeranian Medical University in Szczecin; Head: Prof. Jan Lubiński MD PhD

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ABSTRACT: Introduction: Iatrogenic esophageal fistulas after neck surgery are a rarely discussed topic in the Polish literature. Due to the scarcity of publications on esophageal fistulas, esophageal perforation after neck surgery, the topic of this paper was undertaken. For this purpose, the literature was reviewed and a description of two cases was presented, comparing the diagnostic and therapeutic difficulties encountered to the world literature.

Case reports: In the cases presented, esophageal fistula formation occurred after operations in the neck. In the first case, the esophageal fistula was a complication after resection of Zenker's diverticulum and in the second case, the fistula developed after removal of the thyroid gland. Esophageal fistulas in the described patients proved to be a major therapeutic challenge. Despite a number of repair procedures undertaken by surgeons, laryngologists and thoracic surgeons in both patients, full therapeutic success was not achieved. In the present study, the authors related the management modalities of the presented patients to the experience of other centers. Methods of treating esophageal fistulas, possible complications and ways of treating these complications are discussed.

KEYWORDS: oesophageal fistula, treatment, Zenker’s diverticulum

INTRODUCTION

Zenker’s diverticulum (pharyngoesophageal diverticulum) is a protrusion of the mucosal and submucosal layers of the esophageal wall. It can arise spontaneously or as a result of external pulling [1]. The pharyngoesophageal diverticulum is formed in an anatomically weakened area known as Killian’s triangle [2]. It usually occurs in patients in the 7th and 8th decades of life, and is found occasionally in young people. It occurs symptomatically in the general population with a frequency of 1/0000 to 11/10000, depending on the region of the world [3], and the incidence in men is 1.5 times higher than in women. The most common symptom reported by patients is dysphagia [2]. The recurrence rate after surgical treatment is 36/1000, while reoperations are correlated with lower patient mortality but a higher risk of complications [4].
AIM

The aim of this study was to present 2 cases who developed complications of difficult-to-heal esophageal fistulas after previous neck surgeries. This paper proposes diagnostic and therapeutic management and describes the diagnostic difficulties when patients have developed iatrogenic esophageal fistulas.

PRESENTATION OF CASES

Case No 1.
A 44-year-old female patient was admitted to the Department of General and Gastroenterological Surgery because of an increasing, for 2 years, difficulty in swallowing, fetor ex ore, a feeling of pressure after meals, and saliva retention.

The patient was diagnosed with Zenker’s diverticulum. Then she was qualified for surgery.

An incision was made along the sternocleidomastoid muscle. The esophagus was dissected, then the base of the diverticulum, and, finally, it was cut away. The neck wound was treated with single sutures and a Redon drain was placed.

On postoperative day 5, the patient developed swelling and soreness of the neck wound. The X-ray of the patient’s neck with the administration of a radiocontrast agent showed a shadow at the C6–C7 level, backward from the esophagus.

The gastroscopy performed showed a narrowing at the level of the laryngeal part of the esophagus.

Magnetic resonance imaging (MRI) of the neck showed a postoperative esophagogastric fistula that deviated to the left and extended upward to the lower pole of the left thyroid lobe. Air and fluid retention were present in the described space. The fistula was 8 cm long and up to 2.5 cm wide.

A corrective surgery was undertaken to close the fistula. The operation was performed under general anesthesia (the patient was intubated).

The cut on the left side of the neck was hockey stick shaped. It was made in the area of the lower third of the neck. The skin flap along with the platysma muscle was dissected out. The sternocleidomastoid muscle, internal jugular vein and common carotid artery were dissected near the division, in the upper part of the neck.

In the lower part of the neck, all anatomical structures remained in massive, hard adhesions, without the possibility to release them and make them visible. The omohyoid muscle was then dissected, making the prevertebral fascia visible, and the esophagus was dissected as well. Subsequently, the fistula was excised along with a conglomerate of scar tissue in the area at the level of the sternoclavicular joint, adjacent to the cervical pleura. The site of the esophageal fistula was reached, about 3 cm below the isthmus.

The esophagus surrounding the fistula was then dissected. Releasing the posterior wall downward, a large abscess from the posterior mediastinum (about 15–20 ml of pus) was evacuated. The pocket of the abscess, laying on the lateral periphery of the esophagus, was rinsed with octenidine. A perforation in the esophagus about 1 cm long was found. The perforation was treated with 3 layers of sutures. The lower attachment of the sternocleidomastoid muscle was cut off and the muscle was sewn into the area of the closed fistula. A drain was also inserted into the mediastinum. After the procedure, the patient was transferred to the Department of Anesthesiology and Intensive Care due to acute respiratory failure during the procedure.

Eight days after the first operation, restoration of the tissue defects was undertaken with a free fasciocutaneous flap taken from the forehead (Chinese flap). Intraoperatively, after opening the wound on the neck, necrotic soft tissues were visible. Pus was evacuated from the posterior mediastinum. The patient’s esophageal opening was widened and the severely narrowed esophagus was dilated 2 cm below the fistula. Then, after the fistula was thoroughly cleaned of necrotic tissue and pus, the harvested fasciocutaneous flap was grafted under the fistula and sewn into the wall of the altered esophagus. When transplanting the harvested flap, the anastomosis of the radial artery with the superior thyroid artery and the radial vein with the internal jugular vein was performed.

After the surgery, the patient was found to have lower pharyngeal swelling and salivation from the wound edges. Treatment with atropine and Botox was applied to reduce the salivary flow, but no improvement was observed.

Due to swelling of the throat, the patient developed respiratory failure. The patient required mechanical ventilation until the 19th postoperative day. She also remained cardiovascularly unstable and for this reason required an infusion of pressor amines.

After a week, the patient’s general condition was not improving. She required another surgery to evacuate the identified mediastinal abscess. Three days later, the patient was operated on again, and a thrombus in the pedicle of the free flap with necrosis of 75% of the surface of the flap was found. The flap was removed. In addition, the patient showed a 1.5 cm esophageal perforation and an esophageal obstruction below the opening. An open gastrostomy was performed and a suction drain was placed into the mediastinum. In addition, the fistula was rinsed daily. During the following days of hospitalization, the patient developed pneumonia. After two weeks, the patient had a suction drain removed, which had previously been replaced twice. The patient underwent a follow-up chest X-ray, which found a persistent pneumothorax enveloping the right lung. An X-ray of the esophagus with a radiocontrast agent showed its retention in the dilated esophagus at the Th1–Th2 level, which was emptying during the examination. In addition, two irregular shadows merging together were visualized at the Th3–Th4 level. One of the described lesions was not visible in previous examinations. In contrast, the second lesion appeared larger, compared to the previous examination. A computed tomography (CT) scan of the patient’s neck and chest described the presence of a fluid reservoir up to 12 cm long and 3.5 cm wide with air in the lumen. The lesion was
The patient was gradually introduced to an oral liquid diet and nutrition via gastrostomy.

No swallowing disorders were observed. The patient was discharged from the hospital after a six-month hospitalization. She is currently receiving conservative treatment. She feeds partially orally with nutrition through a gastrostomy. She remains under constant supervision of the gastroenterology center.

**Case No. 2**

A 24-year-old female patient had undergone resection of nodular goiter 7 years earlier.

She was admitted to the Department of General and Endocrine Surgery for surgical treatment due to suspected follicular thyroid carcinoma with lymph node metastasis. The diagnosis was confirmed by cytological examination of material taken during the fine-needle aspiration biopsy of the thyroid gland and lymph node. The patient underwent surgery.

The thyroid gland was reached with a collar suture, removing the scar from the previous surgery. A right residual lobe 31 × 8 × 6 mm in size and a left residual lobe 22 × 10 × 12 mm in size, nodular, hard, infiltrating the anterior wall of the esophagus, were visualized. The infiltration along the esophagus was found to reach the upper pole of the left thymic lobe. On the left side, the upper and lower thyroid vessels were dissected, ligated and cut. The residual left lobe was then excised, preparing along the anterior esophageal wall in a “sharp and blunt” fashion. The esophageal wall was thin, infiltrated, and fragile. Two sutures were placed over the muscularis mucosae of its anterior wall.

On the right side, the remaining thyroid parenchyma was removed after the recurrent laryngeal nerve was visualized, and the supplying thyroid vessels were dissected, ligated and cut. The enlarged lymph node was also taken from a separate incision in the left submandibular region.

The day after the operation was performed, the patient complained of pain and difficulty in swallowing. She noticed that condensed food was leaking from her neck. The patient was reoperated. After the sutures were removed, food and pus flowed out of the wound. Inspection of the left residual thyroid lobe sowing revealed necrotic lesions, with small, numerous areas of perforation of the anterior esophageal wall at a length of about 2 cm, covering half of the circumference of its wall. Esophageal suturing was impossible due to its inflammatory infiltration. A decision was made to emerge a salivary fistula. The distal residual esophagus was closed with a continuous suture and marked with metal clips. The proximal residue emerged in the left wound margin, sutured to the skin. A drain was inserted into the residual thyroid lobes lodge. The patient was then given a gastrostomy using the Kader method.

After the reoperation, the patient’s salivary fistula persisted. In addition, the movement of saliva into the mediastinum caused its inflammation. It was necessary to perform drainage of the mediastinum and the residual esophagus area.

After 26 days of hospitalization, the patient achieved resolution of the inflammatory process in the mediastinum, but the salivary fistula still persisted. At the follow-up, 4 weeks after the procedure was performed, the patient complained of swelling and redness of the tissues in the neck area above the esophagocutaneous fistula.

One month later, the patient was admitted to the Gastrointestinal Clinic for further treatment. The patient underwent gastroscopy and CT scan of the neck and chest. The inflammatory changes in the mediastinum were found to have regressed, with no signs of leakage of the radiopaque agent from the esophagus into the neck tissues.

The patient was qualified for reconstruction of the continuity of the upper esophagus. The reconstruction was performed using a free jejunum graft, which was sewn into the carotid vessels.

Ten days later, the patient had a previously placed (6 months before) gastrostomy removed. The patient remained under constant follow-up at the surgical outpatient clinic after the reconstructive surgery. During periodic follow-ups, no esophageal fistula was visualized on esophageal imaging with a radiopaque agent.

Thirty months after the original surgery, left vocal fold paralysis and hypothyroidism and parathyroidism persist. In addition, the patient has difficulty swallowing. On examination with a radiopaque agent, no salivary fistula was visualized.

**DISCUSSION**

**Complications of neck surgery**

The most serious complications after surgery in the neck are damage to the recurrent laryngeal nerve, parapharyngeal abscess, mediastinitis, esophageal stricture, and pharyngeal-cutaneous fistula.

Cutaneous fistulae occur in 19% of patients undergoing Zenker’s diverticulum surgery [5].

Removal of the diverticulum, which allows histopathological examination, is associated with a higher risk of pharyngocutaneous
fistula (up to 30%) and esophageal stricture [6]. After the operation, the first patient we described developed esophageal stricture, pharyngocutaneous fistula, and developed an abscess in the posterior mediastinum. In the second patient, due to infiltration of the thyroid tumor into the anterior wall of the esophagus, a surgical procedure was performed, during which the residual left thyroid lobe and the affected lymph node were removed.

**Treatment of esophageal perforation**

The authors of this paper reviewed the Polish literature and found only a few publications on the treatment of esophageal perforation after neck surgery. Therefore, on the basis of the reviewed world literature, an attempt was made to discuss methods of treatment of esophageal perforation.

Treatment of esophageal perforation is carried out to prevent further spread of infection from the perforation, eliminate the infection, restore the integrity of the gastrointestinal tract, and plan nutrition [7]. Perforation in the cervical part of the esophagus is generally easier to treat than perforations occurring further down the esophagus.

Treatment choices include operative and non-operative management.

**Surgical treatment of esophageal perforation**

The need for surgery in iatrogenic, postoperative esophageal injuries occurs when the patient has been fed orally after the neck surgery and no more than 24 hours have elapsed from the time of postoperative injury to the time of diagnosis, and the patient’s general condition has deteriorated [7]. The location of the perforation is important for choosing the appropriate surgical approach. Small or well-limited perforations of the cervical part of the esophagus can be treated with drainage alone. The most appropriate surgical method for a perforation located in the middle part of the esophagus is through a right thoracotomy in the sixth intercostal space, and for a perforation in the lower part of the esophagus through a left thoracotomy in the seventh intercostal space. On the other hand, for perforations in the abdominal part of the esophagus, an upper midline laparotomy is used.

The procedures mainly emphasize the removal of the infected and necrotic tissue and thorough closure of the perforation with adequate drainage [8].

Surgical procedures under local or general anesthesia include primary, or enhanced closure, esophageal resection, drainage, T-tube drainage, and access closure and diversion [9].

The primary closure of the perforation is the treatment of choice when there are no additional esophageal abnormalities, and successful closure requires removal of the necrotic tissue from the wound, vertical incision of the muscular layer of the esophagus to expose the damaged mucosa, its safe closure, and drainage of the area after the removed necrotic tissue [10].

Therefore, the reinforced closure method was developed, which involves transplanting vascularized tissue flaps to reinforce the damaged area [11, 12]. The tissues used include fragments of the diaphragm, the rhomboid muscle and the latissimus dorsi muscle, and as for traumatic perforation of the cervical part of the esophagus, the sternohyoid, sternothyroid and sternocleidomastoid muscles [13].

Thorough mucosal repair was found to be necessary, as leaks of up to 50% were observed after the procedures, even after the reinforced closure method [14]. The primary surgical closure method, with or without reinforcement, proved to be the most effective form of treatment for esophageal perforation and it reduced mortality by about 60%, compared to other surgical methods [15]. Moreover, it has been proven in the Polish literature that closure of the defect with a vascularized flap is more effective in case of long-term perforations and infected surgical field than primary sutures reinforced with a local muscle flap. Such a procedure reduces the occurrence of a later complication, i.e. esophageal stricture [12].

A 44-year-old female patient developed an esophageal perforation measuring 1 cm. The treatment involved a reinforced closure method using the lower attachment of the sternocleidomastoid muscle. Drainage of the wound area was performed. In a 24-year-old female patient with a left thyroid lobe tumor, the resulting esophageal perforation was sutured during the first operation, using the primary closure technique. Incomplete closure of the perforation leads to leakage, which worsens the patient’s condition and prolongs treatment time [15].

Some patients with esophageal perforation also have abnormalities such as stenosis, achalasia or gastroesophageal reflux. In case of the distal esophageal obstruction, surgical dilatation of the stricture is necessary. Moghissia and Pender’s report shows that treatment of perforation without dilatation of distal obstruction resulted in a patient mortality rate of 100%. In contrast, treatment of both perforation and obstruction reduced mortality to 29% [16].

Due to the stenosis (2 cm below the fistula), one of our patients had this esophageal segment dilated. When the perforation is accompanied by gastroesophageal reflux, an anti-reflux procedure is necessary. In case of the esophageal perforation in the abdominal cavity, Nissen fundoplication is recommended, which involves suturing a portion of the gastric fundus around the lower esophageal segment. Perforation with obstruction caused by a neoplastic process requires resection [17]. If this is not possible, a synthetic esophageal endoprosthesis is implanted [18].

For the treatment of perforation associated with severe esophageal necrosis or pathological obstruction, esophagectomy is very effective, which involves total resection of the thoracic esophagus. [19]. Once the esophagus is reconstructed, this method preserves the continuity of the gastrointestinal tract and reduces the risk of sepsis [20].

Primary repair at the time of diagnosis may not be possible due to the severe infection and inflammation that result from late diagnosis of the perforation. In this situation, drainage alone is possible only in the case of a cervical esophageal perforation, but unacceptable when the wound is located in the thoracic or abdominal cavity, as infection may involve the surrounding tissues.
A T-tube is used to treat extremely difficult injuries [9]. It creates a controlled esophageal fistula that allows drainage of the esophagus and allows for a longer period of time required for the surrounding tissues to heal [21].

In cases of late diagnosis and extensive infection, the exclusion and diversion technique is used to treat esophageal perforations [22]. This technique involves closure of the perforation with extensive drainage of contaminated tissues, diversion with exclusion of the perforated segment. This is done to prevent further contamination of the wound area. The next stage of the procedure is the creation of a terminal or lateral cervical esophagostomy, which involves cutting through the esophagus in the cervical segment, emerging proximal to the esophagus, resulting in a cervical-esophageal fistula. The final part of the procedure is the creation of a gastrostomy to allow the patient to ingest food [9].

In the 24-year-old patient we described here with a left thyroid lobe tumor, the described technique was used to treat postoperative complications. In order to restore the continuity of the gastrointestinal tract, a second operation is necessary, which carries the risk of complications [9]. A 24-year-old patient also underwent a second operation to restore the continuity of the gastrointestinal tract, with the use of an autogenous jejunal graft with microvascular anastomosis. However, the patient’s swallowing difficulties, hypothyroidism and parathyroidism persisted after the surgery.

In contrast, the 44-year-old patient developed a number of complications, thus gastrostomy and mediastinal drainage were used.

**Non-operative treatment of esophageal perforation**

Among the treatment methods for esophageal perforation there are also non-operative procedures. They are recommended in patients with a small perforation and when there is a small amount of necrotic tissue in the mediastinum and pleura [23]. Non-operative treatment is considered most effective when the perforation is small and well confined, occurs in the cervical esophagus, was detected early, and resulted from dilatation of strictures or sclerotherapy of esophageal varices. In case of late diagnosis, non-operative treatment can be used only if there are minor symptoms. Non-operative treatment is used when the following conditions are met: the perforation is only in the mediastinum, the symptoms are mild, and there has been no infection [24].

During conservative treatment, the patient must remain fasting for 72 hours. If the patient shows clinical improvement after this time, a liquid diet can be started. It is also necessary to administer broad-spectrum antibiotics for at least 7–14 days and parenteral nutrition. In a 44-year-old female patient, broad-spectrum antibiotic therapy was administered and a liquid diet was introduced.

For non-operative treatment of malignant and non-malignant esophageal perforations, attempts are being made to use an endoscopically guided coated stent. This procedure should be performed in patients who do not qualify for open surgery [25]. Flanged stents that prevent the stent from moving are used, as well as self-expandable stents and also injection of tissue adhesive into the fistula tract. It is also possible to perform an endoscopic procedure using a metal self-expandable stent for the esophagus. This stent consists of, among other things, flanges and anchor hooks that prevent the stent from moving [19].

The introduction of adequate nutrition for the patient and the initiation of systemic antibiotic therapy are also important elements of further management. Long-term use of nasogastric probes is not recommended, as they damage the esophageal mucosa and have an adverse effect on wound healing. In case of prolonged treatment, jejunostomy or gastrostomy are beneficial, but these methods worsen the patient’s well-being [8]. In the patients we described, it was necessary to maintain a gastrostomy in the postoperative period. One of the patients is partially eating through a gastrostomy (and partially orally) until now.

**CONCLUSIONS**

1. After surgery in the neck, esophageal damage and esophageal fistula formation may occur in the early postoperative period;

2. Esophageal damage occurred during surgery in the neck may require surgical re-supply, while reoperations carry additional complications;

3. Esophageal damage in the form of perforation can be treated both surgically and nonsurgically. The management depends, among other things, on the size of the perforation. Patients with a small perforation and when there is a small amount of necrotic tissue in the mediastinum and pleura can be treated conservatively;

4. The treatment of esophageal fistulas involves many difficulties. It often requires multispecialty and individual management, so it should be carried out mainly by a team led by laryngologists with the participation of thoracic surgeons.