Tracheoesophageal fistula following prolonged intubation – diagnostic and therapeutic difficulties

Przetoka przełykowo-tchawicza po długotrwałej intubacji – trudności diagnostyczne i lecznicze

Authors' Contribution:
A – Study Design
B – Data Collection
C – Statistical Analysis
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ABSTRACT:

Introduction: Tracheoesophageal fistula is one of the very rare complications of prolonged pressure exerted by the endotracheal tube on the tracheal wall.

Aim: The article presents a case of a male patient who had developed a tracheoesophageal fistula and reviews the diagnostic and therapeutic approaches to this condition.

Case report: The patient had been intubated using an endotracheal tube inserted into the airway and connected to a ventilator as part of the treatment of severe COVID-19 infection. Prolonged intubation, which lasted 35 days, resulted in the development of pressure injuries and subsequent fistula formation. As a result, the patient started complaining of a nagging cough and difficulty swallowing. During the diagnostic process, the patient experienced recurring episodes of pneumonia. Multiple ENT examinations, gastrointestinal consultations, and imaging studies did not provide a basis for an accurate diagnosis. Finally, the initial diagnosis was provided by a repeated CT scan. After the presence of tracheoesophageal fistula had been confirmed on bronchoscopy, the patient was referred for surgery.

Conclusions: Diagnosis of tracheoesophageal fistula resulting from excessive pressure exerted by the endotracheal tube can be very difficult and time-consuming. Prompt diagnosis and surgical correction reduce the chances of life-threatening complications and restore the patient's quality of life.

KEYWORDS: fistula, intubation, tracheoesophageal fistula

STRESZCZENIE:

Wstęp: Jednym z bardzo rzadkich powikłań długotrwałego ucisku rurki intubacyjnej na ściany tchawicy jest wytworzenie przetoki przełykowo-tchawiczej.

Cel: W pracy zaprezentowano przypadek mężczyzny, u którego doszło do wytworzenia przetoki przełykowo-tchawiczej oraz dokonano przeglądu metod diagnostycznych i leczniczych tego schorzenia.

Opis przypadku: W procesie leczenia infekcji COVID-19 o ciężkim przebiegu pacjentowi wprowadzono rurkę intubacyjną do dróg oddechowych i podłączono do respiratora. Przedłużona intubacja, która trwała 35 dni, doprowadziła do powstania zmian odleżynowych, a następnie wytworzenia przetoki. Od tego czasu pacjent uskarżał się na dokuczliwy kaszel i trudności w połykaniu. W czasie trwającej diagnostyki obecne były nawracające zapalenia płuc. Wielokrotne badania laryngologiczne, konsultacje gastrologiczne i badania obrazowe nie dawały podstaw do postawienia trafnej diagnozy. Wstępne rozpoznanie dostarczyła powtórzona po raz kolejny tomografia komputerowa (TK). Po potwierdzeniu obecności połączenia tchawiczo-przełykowego w bronchoskopii pacjenta skierowano na zabieg chirurgiczny.

Wnioski: Diagnostyka przetoki przełykowo-tchawiczej, spowodowanej uciskiem rurki intubacyjnej, może być bardzo trudna i czasochłonna. Szybkie rozpoznanie i korekcja chirurgiczna zmniejszają szanse wystąpienia zagrażających życiu powikłań oraz przywracają komfort życia pacjenta.

SŁOWA KLUCZOWE: intubacja, przetoka, przetoka przełykowo-tchawicza

ABBREVIATIONS

CT – computed tomography
EBUS-TBNA – endobronchial ultrasound-guided transbronchial needle aspiration
ENT – Ear, Nose, and Throat
PET-CT – combined positron emission tomography and computed tomography
PPI – proton pump inhibitor

INTRODUCTION

Tracheoesophageal fistula due to the pressure exerted by the endotracheal tube on the tracheal wall is a very rare complication. Its incidence is estimated to be < 1% in long-term ventilated patients [1]. Much more common causes of this condition include congenital defects, iatrogenic damage during a surgery, penetrating injuries, tumors, infections, or complications of radiation therapy.

AIM

The article presents a case report and a review of the diagnostic and therapeutic approaches to tracheoesophageal fistula (Tab. I.).

CASE REPORT

In late October 2020, a 36-year-old male patient had been admitted to the COVID-19 Infection Intensive Care Unit for cardiopulmonary failure in the course of COVID-19. An endotracheal tube was placed within the trachea, and the patient was connected to a ventilator. A gastric tube was also inserted. A low-pressure cuff tube was used for intubation. With gradual improvement, the patient was disconnected from the ventilator, and the endotracheal tube was removed after 35 days of treatment. Tracheostomy was planned on the day before extubation, but the patient's condition had improved enough for the anesthesiologists to abandon the procedure. After switching from enteral feeding to oral feeding, the patient started to report difficulty swallowing and coughing. ENT consultation revealed arytenoid swelling, which resolved after the introduction of proton pump inhibitor (Prazol 40 mg). Gastroscopy was recommended, yet not approved by the patient. The patient was discharged home with a recommendation for follow-up with his primary care physician. During subsequent visits, the patient continued to complain of coughing and difficulty swallowing. Recommendations included continued use of throat moisturizing agents and IPP (Petit drill junior 5 mL × 2, Controloc 40 mg × 1). The patient was referred to an otorhinolaryngology clinic. After several days, the patient developed symptoms of pneumonia and was given an antibiotic (Augmentin 1000 mg × 2 for 7 days). In February 2021, chronic nasopharyngitis was diagnosed upon a visit to the ENT clinic. X-ray imaging of the lungs was scheduled at the following visit to the outpatient clinic to reveal no significant changes. After the patient had been referred to the Outpatient Clinic for Tuberculosis and Lung Disease due to persistent symptoms of pneumonia, a CT scan was performed to reveal lesions typical of the history of COVID-19 infection. In June 2021, during subsequent visits, the patient started reporting exercise-induced dyspnea. In September, he attended another visit at the ENT specialist's. Fiberoscopy was performed to reveal mucosal edema along with posterior laryngitis and post-intubation granuloma within the left vocal fold. Gastroenterology consultation was recommended, and a referral was issued for a granuloma removal procedure, which ultimately has not been completed. In January 2022, the patient attended another ENT visit, which resulted in the finding of a large swelling of the arytenoids and the interarytenoid area, along with secretion deposits. No vocal fold lesions requiring surgery were identified at that time. During a subsequent visit to the clinic in July 2022, rales were auscultated above the lungs. Due to the above, the patient was prescribed an antibiotic (Zinoxx 500 mg × 2 for 5 days). Gastroscopy was performed in September to reveal no esophageal lesions other than a small focus of mucosal inflammation. The gastric mucosa presented with minor inflammatory lesions. During the several outpatient visits over the following months, the primary care physician prescribed steroid therapy, bronchodilators, and an antibiotic (Miflonide Breezhaler 0.2 mg, Ventolin 0.1 mg, Klabax 500 mg), which resulted in transient improvement of the patient's condition. In November, irritable bowel syndrome was diagnosed by a consulting gastroenterologist. During the subsequent visits to the Outpatient Clinic for Tuberculosis and Lung Disease, screening for infection-induced asthma and a CT scan were scheduled. A CT scan of the lungs was performed to reveal nodules of a potentially cancerous origin. A PET-CT scan was ordered. In the examination report, the nodules were identified as likely attributable to cancer. In June 2023, the patient was admitted to the thoracic surgery department for the diagnosis of lung cancer. CT-guided fine-needle biopsy and endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) of the tumor were performed. Cancer was not confirmed, and the patient was discharged. During a visit to the Outpatient Clinic for Tuberculosis and Lung Disease in August, the patient complained of cough, a feeling of laryngeal obstruction, and decreased exercise tolerance. A month after the visit, a CT scan was performed, which, in addition to visualizing lung nodules, raised the suspicion of a tracheoesophageal fistula covered by a thin membrane. As a result, the patient was referred to the Pneumology Outpatient Clinic, where a bronchoscopic examination was performed. Tracheoesophageal fistula was visualized in the exam. At about the same time, the patient had developed pneumonia, which was treated in the pneumology department. After inflammation had healed, the patient was transferred to the Department of Thoracic Surgery where bronchoscopy was repeated. As a result of the exam, the fistula was determined to be 2 × 1 cm in size and located 4 cm below the vocal cords and 5 cm away from the tracheal bifurcation. Esophageal mucosa was observed to invaginate into the tracheal lumen during respiration. Consequently, in December 2023, the patient was transferred to the Department of Thoracic Surgery, where a surgery to suture up the fistula was performed. The surgery was performed from cervical access using a flanged incision technique. In the course of the surgery, the trachea was dissected from the esophagus at the level of the fistula. Tracheal narrowing was observed along a 3-cm section above the fistula. The fistula openings were sutured longitudinally with continuous sutures. The stenotic section was resected, and the ends of the

tracheal canal were joined by transverse suturing. No complications were encountered in the postoperative period. (Fig. 1.).

DISCUSSION

The most common complications of prolonged intubation include mild erosive lesions or ulcerations, which may give rise to future tracheal stenosis. Such complications can affect up to 20% of patients subjected to long-term ventilation [2].

The diagnosis of a fistula can be difficult for several reasons. Symptoms such as coughing, difficulty swallowing, or choking are not specific to this condition; instead, they are more indicative of respiratory infection or gastroesophageal reflux disease. The development of a fistula can quickly lead to secondary conditions, such as pneumonia or respiratory failure, which further distort the diagnosis. Routine examinations such as CT scans and endoscopic examinations are characterized by low sensitivity, in this case due to the possibility of esophageal mucosa being invaginated into the tracheal lumen, giving an illusion of preserved tissue continuity.

Chest X-ray in the supine position with orally administered contrast agent has been suggested by the authors of other studies on the diagnosis of tracheoesophageal fistula. However, it should be noted that a negative result of this test does not exclude the presence of a small connection between the esophagus and the trachea [3]. Nonetheless, the above is not a standard test and had not been performed in the presented case.

The treatment mainly depends on the size and location of the fistula. Small defects can be treated endoscopically with clips, stents, or tissue adhesives. Larger fistulas require surgical intervention. Depending on the case, it is possible to pursue cervical or thoracic access to the site. Direct closure of the fistula guarantees good results, provided there is no tension on the tissues involved in the anastomosis. The method was used in the case described herein.

For larger fistulas, segmental resection and anastomosis should be considered. A one-stage surgery is possible when the distance between the esophageal stumps does not exceed 3 cm. For larger resections, stump stretching is attempted so that anastomosis can be achieved in the second stage. A gastrostomy and a salivary fistula are temporarily formed until gastrointestinal tract continuity is restored. While shorter tracheal defects can be fused together, reconstruction using the patient's tissues is needed in cases of longer ones [4].

Large fistulas can be repaired during a one-stage, minimally invasive procedure involving isolation of the fistula and esophageal reconstruction by colonic interposition. The remaining part of the esophagus is then used as a cuff to ensure tracheal continuity while a substernally displaced colonic segment connects the esophageal stump to the pylorus [5].

Another method reported to afford satisfactory results consists in the use of the Amplatzer duct occluder, as commonly used to close small cardiac septal defects. The occluder treatment is a minimally invasive procedure involving the placement of a device consisting of two discs

Tab. I. Etiology of tracheoesophageal fistula.

	ETIOLOGY OF TRACHEOESOPHAGEAL FISTULA
1	Congenital defects
2	Prolonged intubation
3	Malignancies
4	Injuries
5	Complications after surgery
6	Radiotherapy
7	Chemotherapy
8	Infections

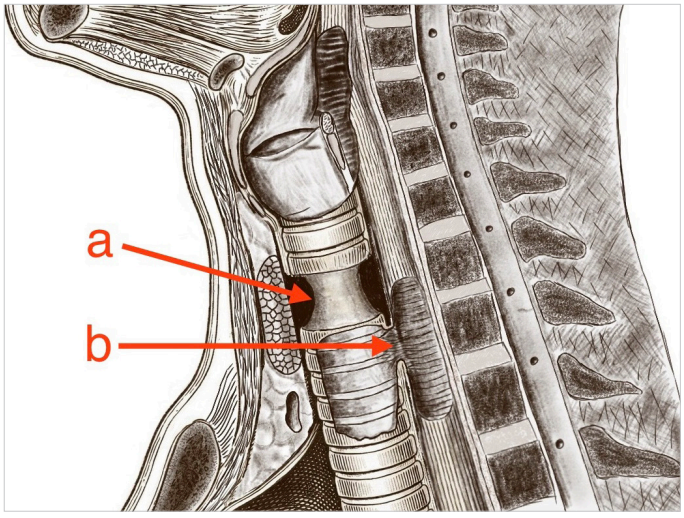


Fig. 1. Sagittal cross-section of the pharynx and trachea. Tracheal stenosis (A); tracheoesophageal fistula (B).

made of thin metal (usually a nickel and titanium alloy) mesh covered with polyester fabric, at the fistula site, thereby closing its lumen. The procedure is performed under general anesthesia, with a guidewire being inserted into the fistula using a bronchoscope, followed by the occluder. This treatment is dedicated especially to cachexic patients in whom standard surgery would carry a high risk of complications [6].

Pharyngitis, caused either by food entering the trachea through the fistula while eating or by retrograde inflow of gastric contents, is the most common complication of tracheoesophageal fistula [7]. Aspiration pneumonia, on the other hand, is characterized by a significant mortality rate, which, according to some authors, can range from 30% to as high as 76% in the elderly [8].

In order to prevent the above, literature reports draw attention to the use of high-volume, low-pressure endotracheal tubes as they offer less chance of ulceration and thus subsequent complications [9, 10]. The pressure in the balloon should be maintained at 20–25 cm H_2O [11]. Endotracheal tube cuff manometer should be used to monitor the pressure.

It is important that a properly sized tube be selected for each patient, with the patient's height, weight, age, and gender being taken into account [11].

Tracheostomy should always be considered during prolonged mechanical ventilation as it offers a number of advantages over endotracheal intubation, including better tolerance of the tracheostomy tube, greater stability of the artificial airway, reduced work of breathing, reduced risk of pulmonary infections, and improved patient comfort [12]. In the case described above, tracheostomy had been considered; however, due to the patient's sudden improvement in health, a decision was made to abandon mechanical ventilation altogether.

Some authors suggest that tracheotomy be performed 5–7 days after endotracheal intubation. This period can be extended on the condition that adequate cuff pressure is maintained and monitored [13].

CONCLUSIONS

1. Persistent coughing attacks as experienced by the patient following the ingestion of foods or liquids after long-term endotracheal ventilation should give grounds for suspicion and thus take up diagnostic screening for the presence of a tracheoesophageal fistula;
2. Prompt diagnosis and surgical correction are key in the prevention of life-threatening complications and restoring the patient's quality of life;
3. In order to avoid the formation of a tracheoesophageal fistula during prolonged intubation, an appropriately sized low-pressure cuff tube should be used, and the balloon pressure should be checked on a regular basis.

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