CLINICAL CASE

Modified stent for the treatment of tracheomegaly combined with a tracheoesophageal fistula: a case report

Stent modificado para el tratamiento de traqueomegalia combinada con fístula traqueoesofágica: reporte de un caso

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Abstract

Tracheoesophageal fistulas (TEFs) are common in clinical practice and we address them in different ways according to their etiologies. Herein, we present a case of tracheomegaly combined with a TEF after long-term tracheotomy. We placed a modified silicone stent into the trachea to simultaneously cover the fistula and maintain an artificial airway for ventilation. After migration of the modified stent, we replaced it with a prolonged tracheotomy tube. This modified stent is a novel clinical attempt at addressing TEFs that should be more thoroughly explored.

Keywords: *Modified stent. Silicone stent. Tracheomegaly. Tracheoesophageal fistula.*

Resumen

Las fístulas traqueoesofágicas son frecuentes en la práctica clínica y las abordamos de diferentes formas según sus etiologías. Aquí, presentamos un caso de traqueomegalia combinada con una fístula traqueoesofágica después de una traqueotomía a largo plazo. Colocamos un stent de silicona modificado en la tráquea para cubrir simultáneamente la fístula y mantener una vía aérea artificial para la ventilación. Después de la migración del stent modificado, lo reemplazamos con un tubo de traqueotomía prolongado. Este stent modificado es un intento clínico novedoso para abordar las fístulas traqueoesofágicas que debe explorarse más a fondo.

Palabras clave**:** *Stent modificado. Stent de silicona. Traqueomegalia. Fístula traqueoesofágica*

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Introduction

Acquired tracheoesophageal fistulas (TEFs) are abnormal channels between the trachea and esophagus caused by acquired factors and can be divided into malignant TEFs and benign TEFs according to their etiology. Long-term tracheal intubation or tracheotomy is one of the most common causes of benign TEFs. Tracheomegaly is dilatation of the trachea to a transverse diameter > 25 mm in men and 21 mm in women[1]. Common causes include Mounier-Kuhn syndrome, long-term smoking, chronic bronchitis, emphysema, pulmonary cystic fibrosis, connective tissue disease, and pulmonary fibrosis[2]. Long-term tracheal intubation or tracheotomy can also cause secondary tracheomegaly[3]. Few reports have described tracheomegaly complicated with TEF[4]. We report a case of tracheomegaly combined with TEF due to long-term tracheotomy that was treated with a modified stent.

Case report

Chief complaints

A 57-year-old man was admitted to our hospital with the chief complaints of craniocerebral trauma for more than 1 year and a TEF for 1 week.

History of present illness

More than 1 year prior, the patient experienced severe craniocerebral injury after trauma and then underwent tracheotomy after intracranial operation. Chest computed tomography (CT) was performed for the month-long recurrent fever and suggested a TEF. Then, the patient was transferred to our hospital.

History of past illness

The patient had craniocerebral injury 1 year ago.

Personal and family history

The patient denied smoking and drug use. His father died of the unknown cause and his mother died of a heart attack.

Physical examination

The patient's vital signs were stable and the Glasgow Coma Scale score was 4 + T + 1. Pupillary reflexes were delayed. The patient was uncooperative with the physical examination. His right skull was depressed, which was considered a post-operative change. He was tracheotomized and breath sounds were low.

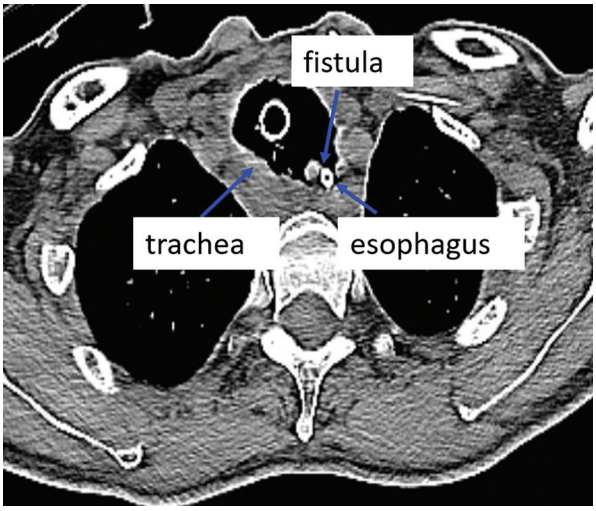

Figure 1. *Trachea and fistula in the chest computed tomography.*

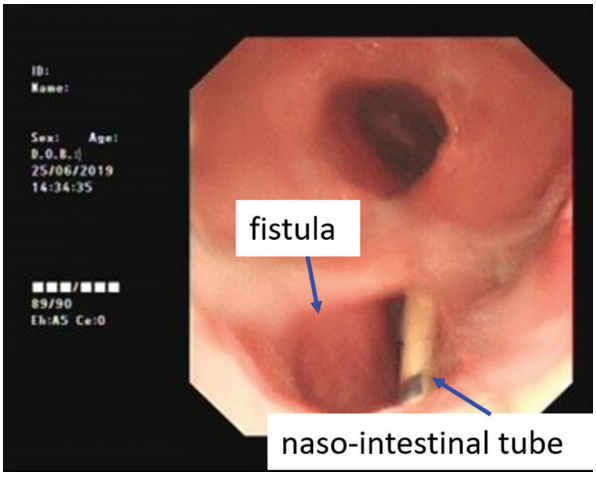

Figure 2. *The tracheoesophageal fistulas by the bronchoscopy.*

Laboratory examinations

No obvious abnormalities in routine laboratory examinations were found.

Imaging examinations

Chest CT revealed severe dilation of the trachea, with a maximum diameter of approximately 38 mm, and the local formation of a TEF (Fig. 1). Bronchoscopy

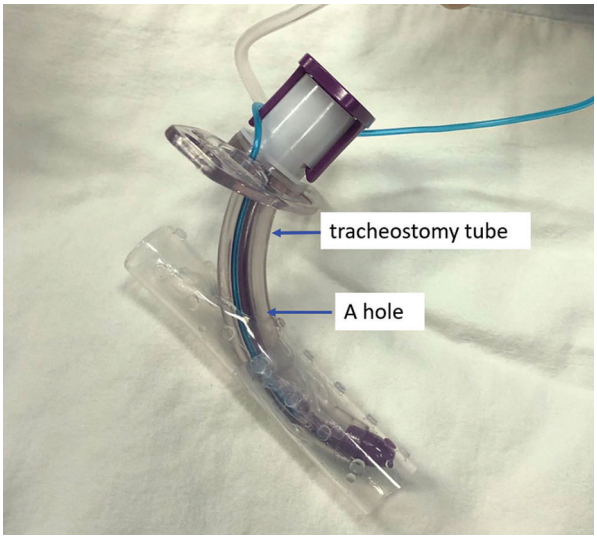

Figure 3. *The demonstration of modified silicone stent.*

showed that the upper segment of the trachea was obviously dilated, and a TEF with a diameter of approximately 1.2 cm could be observed; the nasointestinal tube in the esophagus could also be seen (Fig. 2).

Final diagnosis

The final diagnosis was TEF.

Treatment

We chose a Y-shaped silicone stent, truncated it to a length of 60 mm, and cut a hole in the surface for the insertion of a tracheostomy tube (Fig. 3). After the induction of anesthesia, we inserted a rigid bronchoscope into the trachea up to the air incision and removed the previous tracheostomy tube under bronchoscopic guidance. Then, we placed the modified silicone stent (15 mm × 60 mm) into the trachea to completely cover the fistula, ensuring that the hole in the stent was directly facing the air incision. After the stent was well supported, we inserted a No. 7 tracheostomy tube through the air incision and the hole into the stent (Fig. 4).

Outcome and follow-up

After the operation, the patient was well ventilated and discharged. Two months later, he came to our hospital again because of difficulty sputum suctioning and chest CT suggested migration of the stent. Then, we removed the stent and replaced it with a lengthened tracheotomy tube (70 mm).

Discussion

The principles for treating malignant and benign TEFs are different. Malignant TEFs mainly involve lung cancer and esophageal cancer, and their treatment should involve systematic support first due to the limited life expectancy. A covered self-expandable metal stent is often recommended for this kind of TEF[5] but not for benign TEFs as it can adhere strongly to the esophagus, which makes it difficult to remove after prolonged placement. For benign TEFs, closing the fistula by surgery is the first choice, but recently, stents have been explored more frequently for treating benign TEFs that are not suitable for surgery[5].

Post-tracheotomy or post-intubation TEFs are mostly caused by overinflation of the cuff of endotracheal or tracheotomy tubes, which results in ischemic necrosis of tracheal membrane tissue. In the presence of severe underlying diseases and atypical symptoms and due to late diagnoses, the fistula is always large and accompanies a locally dilated trachea. Therefore, surgery is the first choice[6]. Our patient became comatose after a severe craniocerebral contusion, which means that he was unsuitable for surgery. Maintaining a tracheotomy tube was necessary, indicating that closing the fistula was paramount. The extremely dilated trachea also increased the difficulty of treatment. We reviewed the literature on tracheomegaly complicated with TEF and found a report on only one similar case. The patient had an extremely dilated trachea with a transverse diameter of 4.6 cm on chest CT and a giant fistula with a diameter of 3 cm after long-term tracheotomy. Conservative treatments such as total parenteral nutrition and pressure control of the tracheotomy cuffs were chosen because of the poor general condition of the patient. The final outcome was not mentioned in the report[4].

Silicone stents are currently widely used because of their biocompatibility, good tolerance, ease of removal, and wide choice of diameters and lengths. Conventional Y-type or straight silicon stents cannot meet the needs of complex cases in the clinic, however. Therefore, the use of modified silicone stents has been increasingly reported, such as for massive hemoptysis[7]. The use of lengthened tracheotomy tubes is common for patients with a TEF after long-term tracheotomy or intubation[8]. However, the balloon of the tube increases the risk of recurrent tracheal dilatation and TEF formation;

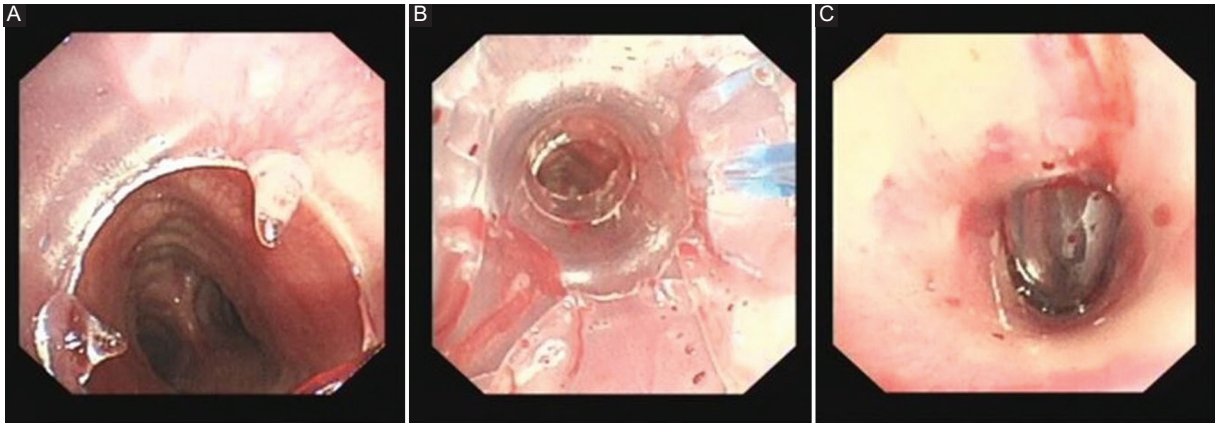

Figure 4. *Post-implantation of modified stent and tracheotomy tube.* **A:** *the bottom of modified stent.* **B:** *trachea by bronchoscopy through tracheotomy tube.* **C:** *the upper side of modified stent.*

therefore, in this case, a modified stent was inserted. First, the stent can cover the fistula; second, it preserves the air incision and, consequently, the artificial airway, thus allowing continued use of the balloon of the tracheotomy tube. The most common drawback of silicone stents is migration, which inevitably occurred 2 months later in our patient. We chose to replace it with a lengthened tracheotomy tube, which is the common method for treating TEFs caused by long-term tracheotomy.

Conclusion

This is the first report describing the novel, clinical application of a modified stent in the treatment of tracheomegaly complicated with a TEF. We expect to continue to explore this procedure in the treatment of benign TEFs.

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No funding was received for this study.

Conflicts of interest

The authors declare no conflicts of interest.

Ethical considerations

Protection of humans and animals. The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Confidentiality, informed consent, and ethical approval. The authors have followed their institution's confidentiality protocols, obtained informed consent from patients, and received approval from the Ethics Committee. The SAGER guidelines were followed according to the nature of the study.

Declaration on the use of artificial intelligence. The authors declare that no generative artificial intelligence was used in the writing of this manuscript.

References

1. Breatnach E, Abbott GC, Fraser RG. Dimensions of the normal human trachea. AJR Am J Roentgenol. 1984;142:903-6.
2. Celenk C, Celenk P, Selçuk MB, Ozyazici B, Kuru O. Tracheomegaly in association with rheumatoid arthritis. Eur Radiol. 2000;10:1792-4.
3. Posadzy M, Desimpel J, Vanhoenacker F. Staging of osteochondral lesions of the talus: MRI and cone beam CT. J Belg Soc Radiol. 2017;101(Suppl 2):1.
4. Kucuk C, Arda K, Ata N, Turkkani MH, Yildiz ÖÖ. Tracheomegaly and tracheosephagial fistula following mechanical ventilation: a case report and review of the literature. Respir Med Case Rep. 2016;17:86-9.
5. Wang H, Ke M, Li W, Wang Z, Li H, Cong M, et al. Chinese expert consensus on diagnosis and management of acquired respiratory-digestive tract fistulas. Thorac Cancer. 2018;9:1544-55.
6. Bolca C, Păvăloiu V, Fotache G, Dumitrescu M, Bobocea A, Alexe M, et al. Postintubation tracheoesophageal fistula-diagnosis, treatment and prognosis. Chirurgia (Bucur). 2017;112:696-704.
7. Zeng J, Wu X, Zhang M, Lin L, Ke M. Modified silicone stent for difficult-to-treat massive hemoptysis: a pilot study of 14 cases. J Thorac Dis. 2020;12:956-65.
8. Oe K, Araki T, Hayashi K, Yamagishi M. Tracheoesophageal fistula after long-term intubation. Intern Med. 2017;56:381-2.