Case report - Thoracic non-oncologic

Tracheobronchomalacia treated by inserting a long T-tube into the left main bronchus

Taichiro Goto⁎, Yoshitaka Oyamada, Misa Wakaki, Ryoichi Kato

⁎Department of General Thoracic Surgery, National Hospital Organization Tokyo Medical Center, 2-5-1 Higashigaoka, Meguro-ku, Tokyo 152-8902, Japan

Received 5 June 2009; received in revised form 19 September 2009; accepted 23 September 2009

Abstract

An 88-year-old woman with advanced Parkinson’s disease (stage V on the Yahr scale) had difficulty in expectoration and underwent tracheostomy in 1999. In July 2004, granulation tissue was formed in the tracheal lumen at the tip of the tracheostomy tube, and a standard type silicone T-tube was inserted. Thereafter, she was cared for at home, where she was doing well until early March 2009, when a decrease in SaO2 and difficulty in sputum aspiration were noted. Bronchoscopy showed crescent type tracheobronchomalacia involving the trachea down to the orifice of the left main bronchus. Considering its localization, an intact right main bronchus, a history of tracheostomy tube placement resulting in granulation tissue formation in the lower trachea, and the future need for frequent sputum aspiration, we inserted a long T-tube into the left main bronchus, which is easily replaceable and facilitates sputum aspiration. Right-lung ventilation was maintained through a side aperture made in the long T-tube. After its insertion, her respiratory status stabilized, secretion drainage improved, and she was discharged for treatment at home. Herein, we describe a tracheobronchomalacia patient in whom airway patency was achieved by inserting a long T-tube with a side aperture into the left main bronchus.

Keywords: Tracheobronchomalacia; Airway stenosis; T-tube; Bronchoscopy

1. Introduction

Tracheobronchomalacia is the result of a weakness in the tracheal and bronchial cartilage that supports the airway, leading to obstruction of expiratory airflow and interference with secretion clearance [1]. We encountered a patient with Parkinson’s disease, in whom tracheobronchomalacia became worse during treatment at home. A long T-tube with a side aperture was inserted, resulting in improved ventilation and secretion drainage. We report a tracheobronchomalacia patient in whom airway patency was achieved by inserting a long T-tube with a side aperture into the left main bronchus.

2. Case report

An 88-year-old woman with advanced Parkinson’s disease (stage V on the Yahr scale) had difficulty in expectoration, became unable to take anything orally, and underwent tracheobronchomalacia and gastrostomy in 1999. After tracheostomy, she breathed spontaneously through a tracheostomy tube, and was cared for at home. However, granulation tissue formed in the tracheal lumen at the tip of the tracheostomy tube, resulting in respiratory failure, and she visited our department in July 2004. To dilate the stenotic bronchus, a standard type silicone T-tube was inserted. We chose a silicone T-tube because we considered that its use would result in minimal granulation tissue formation or prevention of stent migration, facilitate sputum suction at home, and that it had an additional advantage in its easy removability when the patient experienced tube-related problems, such as sputum retention within the stent.

Thereafter, she was cared for at home, where she was doing well until early March 2009, when a decrease in SaO2 and difficulty in sputum aspiration were noted, and she visited our department. Bronchoscopy showed crescent type tracheobronchomalacia almost completely obstructing the trachea down to the orifice of the left main bronchus during expiration. Blood gas analysis showed a PaO2 of 56.6 mmHg and PaCO2 of 57.2 mmHg in room air, indicating CO2 retention. We inserted a long T-tube into the left main bronchus. The T-tube used was custom-made by Koken Co, Ltd, the oral, pulmonary, and vertical limbs were 5.0, 15.0, and 5.0 cm long, respectively, and the outside diameter was 10.0 mm. The oral limb of the long T-tube was cut to 2.0 cm, and the pulmonary limb to 11.0 cm based on CT and bronchoscopic findings. The long T-tube was marked with a felt-tip pen at 1 cm intervals from its pulmonary end to indicate the location of a side aperture to be created. Using a bronchofiberscope inserted from the oral to pulmonary end of the long T-tube as a guide, its pulmonary end was guided from the tracheostomy and bronchoscopic findings. The long T-tube was created. Using a bronchofiberscope inserted from the oral to pulmonary end of the long T-tube as a guide, its pulmonary end was guided from the tracheostomy and tentatively inserted into the left main bronchus. The location of the right main bronchus was observed from inside.
the long T-tube, which was then removed. A side aperture was made around one-third of the circumference of the long T-tube at 6.8–8.0 cm from the vertical limb where the right main bronchus was observed from the tube lumen, and then the long T-tube was re-inserted to complete the insertion procedure (Fig. 1). Right-lung ventilation was maintained through a side aperture. After its insertion, her respiratory status stabilized, and secretion drainage improved. Blood gas analysis revealed a \( \text{PaO}_2 \) of 63.8 mmHg and \( \text{PaCO}_2 \) of 39.8 mmHg in room air, indicating improved \( \text{CO}_2 \) retention. Chest X-ray showed that the pulmonary end and side aperture of the long T-tube were located in the left main bronchus and orifice of the right main bronchus, respectively, and the lungs were well expanded (Fig. 2). After we instructed the patient’s family to remove the tube immediately if the patient should become asphyxiated, she was discharged for treatment at home. She is currently being followed-up through regular home visits, and is scheduled for periodic bronchoscopy for airway evaluation.

3. Discussion

The term tracheobronchomalacia refers to a weakening of the tracheal and proximal bronchial walls that is manifested by collapse during forced expiration [1]. The etiologies of tracheobronchomalacia are variable and an incidence of tracheobronchomalacia is reported to be 1–4.5% in patients who underwent bronchoscopy for various pulmonary disorders [1, 2]. Although the cause of tracheobronchomalacia in this patient is hard to define, it may have been associated with frequent sputum aspiration, chronic cough, and the impingement of the T-tube tip on the tracheal wall. It is believed that in a patient with chronic cough, the repetition of compressive forces generated by the cough eventually leads to weakening and collapse of the supportive structures of the tracheal wall. Occasionally, an additional abnormality may appear at the point where the tip of the tracheostomy tube impinges on the tissue. Possible causes of tracheal weakness in these areas include pressure necrosis, impairment of the blood supply, recurrent infections, and mechanical friction with resultant inflammation of the mucosa [3].

Although surgery such as sleeve resection and tracheopexy is currently performed infrequently for the treatment of tracheobronchomalacia [4], internal stenting of the airway is now much simpler and more frequently employed [5–7]. In the present case, considering the localization of tracheobronchomalacia in the trachea down to the orifice of the left main bronchus, an intact right main bronchus, a history of tracheostomy tube placement resulting in granulation tissue formation in the lower trachea, and the need for frequent sputum aspiration, we inserted a long T-tube into the left main bronchus, which is unlikely to induce granulation tissue formation and facilitates sputum aspiration. Since the lesion may extend along the long-axis, the long T-tube has an advantage in that it can be easily replaced under the bronchoscope, and its vertical limb prevents stent migration. Since stent occlusion due to secretions is a serious complication, easy removability is also one of its advantages.

The possible alternatives to this procedure are: (i) the use of a Westaby stent, and (ii) the combined use of a Dumon or Hood Y-stent and Montgomery T-tube.

In the present case, the stent was emergently inserted, and no time was available to measure the distance from the tracheostomy stoma to the carina and the airway diameter, order a Westaby stent from a manufacturer, and wait for the delivery of the processed product. Moreover, since Westaby stents are not currently manufactured in Japan, it takes many days to order one from overseas. Our
procedure allows us to design and prepare a stent according to the extent of stenosis, and use it there and then. The use of a Westaby stent should be considered in patients who can wait for one to arrive, or when the hospital always has standard products matching the patient’s needs ready.

Since the present patient showed extensive tracheobronchomalacia, we considered it difficult to insert two stents separately. In addition, we were concerned that a Y-stent could not be removed if the patient experienced tube-related problems after returning home. Our procedure allows a family member to easily remove the stent in an emergency by pulling the vertical limb of the long T-tube.

Tracheobronchomalacia is progressive in some patients. Jokinen et al. performed repeat bronchoscopies in 17 of their patients with tracheomalacia and tracheobronchomalacia, and found that the level of severity had progressed in 13 [8]. The left main bronchus remains uncovered for about 2 cm from the tip of the long T-tube to the bifurcation between the upper and lower bronchus, and, if bronchomalacia or granulation occurs in this location, the long T-tube will be replaced by a new one whose pulmonary limb can be extended based on the data recorded in this case.

In conclusion, we herein report a patient with tracheobronchomalacia in whom airway patency was achieved by inserting a long T-tube with a side aperture into the left main bronchus.

References