Tracheal Stenosis Detected During Endotracheal Intubation in a Patient With Down Syndrome

Tomoaki Ujita, DDS, PhD;[1] Toru Yamamoto, DDS, PhD;[1] Yutaka Tanaka, DDS, PhD;[1] Shigenobu Kurata, DDS, PhD;[2] and Kenji Seo, DDS, PhD[2]

[1]Department of Dental Anesthesiology, Niigata University Medical and Dental Hospital, Niigata, Japan; [2]Division of Dental Anesthesiology, Graduate School of Medicine and Dental Sciences, Niigata University, Niigata, Japan

We report a case in which tracheal stenosis was discovered during endotracheal intubation. A 19-year-old woman with Down syndrome was scheduled to undergo treatment of multiple dental caries under intubated general anesthesia. During the first general anesthetic, we felt some resistance while advancing the endotracheal tube through the trachea. Prior to a second general anesthetic 2 years later, we performed 3-dimensional computed tomography to evaluate the tracheal stenosis and devised a strategy that established an airway without advancing the endotracheal tube over the stenotic lesion. Careful attention is required when performing endotracheal intubation because patients with Down syndrome sometimes have tracheal stenosis.

Key Words: Tracheal stenosis; Difficult intubation; Down syndrome; Airway management; Congenital heart disease.

Trisomy 21 (Down syndrome) is the most common chromosomal abnormality and is associated with multiple characteristic features and potential findings that warrant added consideration during anesthetic management. Patients with Down syndrome have an increased incidence of congenital cardiac and spinal abnormalities as well as more underappreciated airway anomalies such as subglottic stenosis. This case report presents the discovery of tracheal stenosis in a female patient with Down syndrome undergoing intubated general anesthesia for dental care.

CASE PRESENTATION

A 19-year-old woman (height, 130 cm; weight, 48 kg; body mass index, 28.4 kg/m^2) with Down syndrome was scheduled to undergo intubated general anesthesia for restorative dental treatment of multiple teeth due to dental caries. She had a history of patent ductus arteriosus surgical ligation performed under general anesthesia at the age of 1 year 6 months. There were no other pertinent medical or surgical history findings, and she was not taking any medications. An anteroposterior chest radiograph (Figure A) was obtained preoperatively, which showed a stenotic region between the glottis and the tracheal bifurcation. However, this radiographic finding was not readily appreciated preoperatively.

During her first general anesthetic for dental care at 19 years of age, the patient underwent slow mask induction followed by oral intubation with a size 7.0 (9.7-mm outer diameter), cuffed, reinforced oral/nasal endotracheal tube (ETT). However, some resistance was felt subglottically at a depth of 18 cm from the corner of the mouth, and it became difficult to advance the ETT further. A fiberoptic bronchoscope was used to confirm the stenotic area and to visualize that the tip of the tracheal tube could not be advanced further. We successfully changed to a size 5.0 (outer diameter 6.9 mm), cuffed, reinforced oral/nasal ETT and advanced it to a depth where its tip was beyond the stenotic area and 3 cm above the tracheal bifurcation. Stable ventilation was obtained, and surgery was performed as planned.

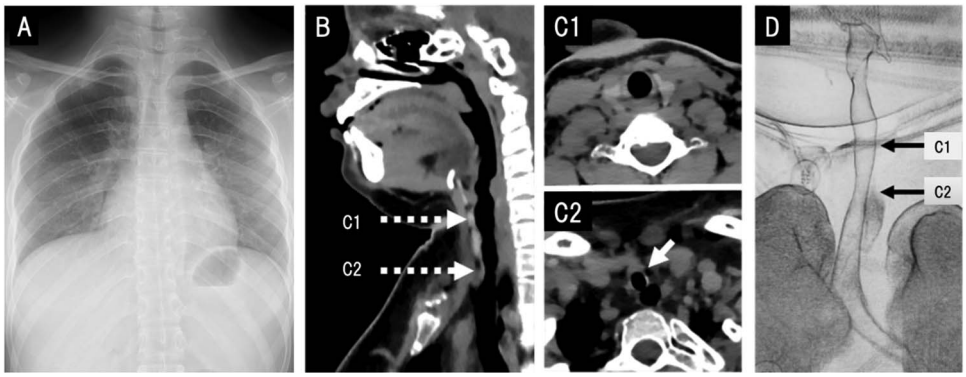
The patient returned for additional dental care requiring general anesthesia at 21 years of age and underwent computed tomography (CT) scans of her head, neck, and chest preoperatively. Tracheal stenosis was identified in the subglottic area (smallest diameter, 6.4 mm; widest diameter, 8.0 mm; Figure B–D). Therefore, we decided to perform oral intubation using another size 5.0 ETT and again examined her trachea during intubation with a fiberoptic bronchoscope. However, this time, the tip of the tracheal tube was positioned above the tracheal stenosis to prevent tracheal damage and edema caused by external forces. Its depth from the mouth

Received December 6, 2022; accepted for publication February 20, 2023.

Address correspondence to Dr Kenji Seo, Division of Dental Anesthesiology, Graduate School of Medicine and Dental Sciences, Niigata University, Niigata, Japan, 951-8514; seo@dent.niigata-u.ac.jp.

Anesth Prog 71:85–86 2024 | DOI 10.2344/anpr-63-16-65

Figure. Imaging Studies of the Airway



Images illustrating the patient's subglottic stenosis. (A) Preoperative anteroposterior chest radiograph with the detectable tracheal stenosis. (B) Sagittal CT image illustrating the tracheal stenosis and the location of the other horizontal CT images (C1 and C2 arrow). C1: normal area above the stenotic lesion. C2: stenotic area (C1: minor axis, 11.0 mm; major axis, 13.0 mm; C2: minor axis, 6.4 mm; major axis, 8.0 mm). (D) Three-dimensional reconstructed CT image with C1 and C2 arrows.

was 18 cm, but the ETT cuff was positioned past the glottis. The surgery was completed, and the patient was extubated without complications after visualizing the normal appearance of the tracheal mucosa with a fiberoptic scope.

DISCUSSION

Tracheal stenosis is a rare condition affecting 1 in 65,000 people[1] and is present in approximately 0.4% of people with Down syndrome. The diameter of the trachea tends to be 1.3 to 3.2 mm smaller than that of people without Down syndrome.[2] This trend applies not only to the tracheal stenosis but also to the entire trachea of patients with Down syndrome. Furthermore, 50% to 75% of cases of congenital tracheal stenosis also have concurrent congenital heart defects.[3] In this case, the patient had a patent ductus arteriosus that had been surgically corrected. Therefore, clinicians must be aware of the potential for airway management and intubation difficulties when managing anesthesia for patients with Down syndrome.

Expecting a difficult airway during the second general anesthetic, we determined the location of the stenotic area by measuring its distance from the glottis using CT imaging.[1,3] This imaging permitted precise morphological evaluation of the tracheal stenotic lesion, allowing us to determine whether the ETT could be placed above the stenotic area[4] and to prevent mechanical injury due to excessive pressure on the tracheal walls. The mechanism of tracheal stenosis or congenital heart disease in patients with Down syndrome remains unknown. However, close attention is needed when performing endotracheal intubation because tracheal stenosis can be present in some patients with Down syndrome.

This report was originally published in the *Journal of the Japanese Dental Society of Anesthesiology* (2023;51:30–32).

ACKNOWLEDGMENT

We thank Edanz (https://jp.edanz.com/ac) for editing a draft of this manuscript.

REFERENCES

1. Hewitt RJ, Butler CR, Maughan EF, Elliott MJ. Congenital tracheobronchial stenosis. *Semin Pediatr Surg*. 2016;25(3):144–149.
2. Fockens MM, Hölscher M, Limpens J, Dikkers FG. Tracheal anomalies associated with Down syndrome: a systematic review. *Pediatr Pulmonol*. 2021;56(5):814–822.
3. Kylat RI. Tracheal stenosis and congenital heart disease in trisomy 21. *Children (Basel)*. 2019;6(9):98.
4. Kawabata M, Sakuraba S, Tagawa T, Sato K, Okuda M, Arisaka H. Severe but asymptomatic tracheal stenosis found during tracheal intubation in a patient with a normal preoperative chest X-ray [in Japanese]. *J Clin Anesth (Japan)*. 2009;33(11):1803–1804.