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Intubation Technique in a Patient with Tracheobronchopathia Osteochondroplastica

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

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Conflict of interest: None declared

Patient: Male, 67-year-old
Final Diagnosis: Tracheobronchopathia osteochondroplastica
Symptoms: Difficult airway management
Medication: —
Clinical Procedure: —
Specialty: Anesthesiology

Objective: Rare disease

Background: Tracheobronchopathia osteochondroplastica (TO) is a rare disorder characterized by cartilaginous or ossified submucosal nodules of unknown etiology that project into the tracheobronchial lumen. TO is often accompanied by endotracheal stenosis from cartilage proliferation and is often detected by difficult endotracheal intubation incidence.

Case Report: Here we report the case of a patient (67-year-old man) with TO scheduled to undergo robot-assisted total prostatectomy for prostate cancer. The tracheal lumen was especially narrow at an area 1 cm below the glottis, with the smallest lumen diameter being 9 mm. After rapid induction, the bronchoscope passed through the stenosed region, and a 6.5-mm spiral endotracheal tube (ETT) was inserted with bronchoscopic assistance. However, because of resistance, the spiral ETT could not pass through the stenosed area. After changing to a 6.5-mm normal ETT, intubation was successfully performed with gentle rotation. Owing to the rotation, the tip entered and gained access to the gap between nodules. With use of a bronchoscope, we confirmed that the tip of the ETT was advanced 10 cm from the glottis, where the site of maximum stenosis was not covered by the tube cuff, and where the tip did not cross the bifurcation. After surgery, no bleeding or edema was found on bronchoscopy.

Conclusions: In patients with TO, it is important to assess the airway condition and prepare for difficult intubation. In this case, tracheal intubation was performed with rotation using a bronchoscope and normal ETT.

MeSH Keywords: Airway Management • Anesthesia • Intubation, Intratracheal

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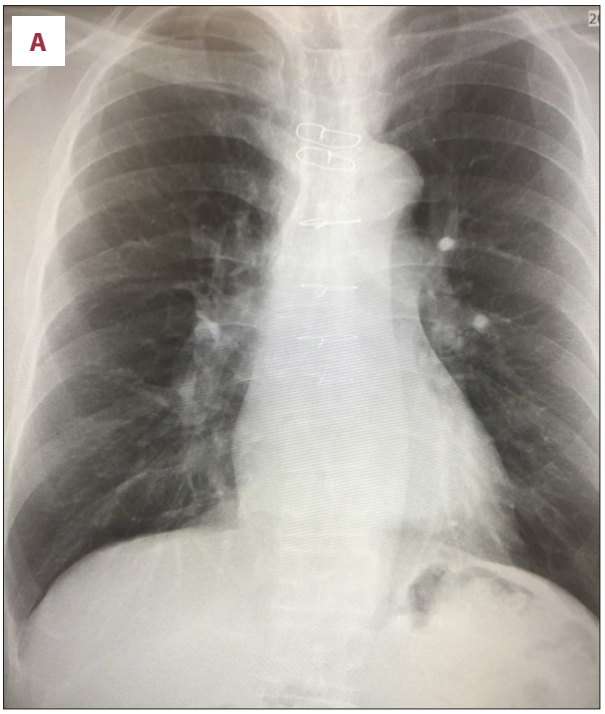
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Background

Tracheobronchopathia osteochondroplastica (TO) is a rare disorder characterized by cartilaginous or ossified submucosal nodules of unknown etiology that project into the tracheobronchial lumen. The condition is usually asymptomatic but can, in rare cases, result in upper respiratory symptoms [1]. These respiratory symptoms can be identified via computed tomography (CT) results and confirmed with bronchoscopy [2]. Although TO was reported in 0.4% of performed bronchoscopies [3], its frequency is actually higher [2] since TO can be asymptomatic or present with nonspecific respiratory symptoms such as chronic cough and wheezing, often leading to misdiagnosis [4]. TO is also one of the rare causes of difficult intubation. This case report illustrates the importance of appropriate airway management for a patient with TO.

Case Report

A 67-year-old man (height, 168 cm; weight, 70 kg) with TO was scheduled for robot-assisted total prostatectomy for prostate cancer. At 51 years old he was diagnosed with TO via bronchoscopy. At age 64, he was scheduled for intracardiac repair of an atrial septal defect (ASD). However, intubation could not be performed because of considerable endotracheal tube (ETT) resistance, although mask ventilation was possible. A few months later, the patient was successfully intubated with a 6.5-mm inter-diameter [ID] normal ETT using an ETT introducer, and the ASD repair surgery was completed.



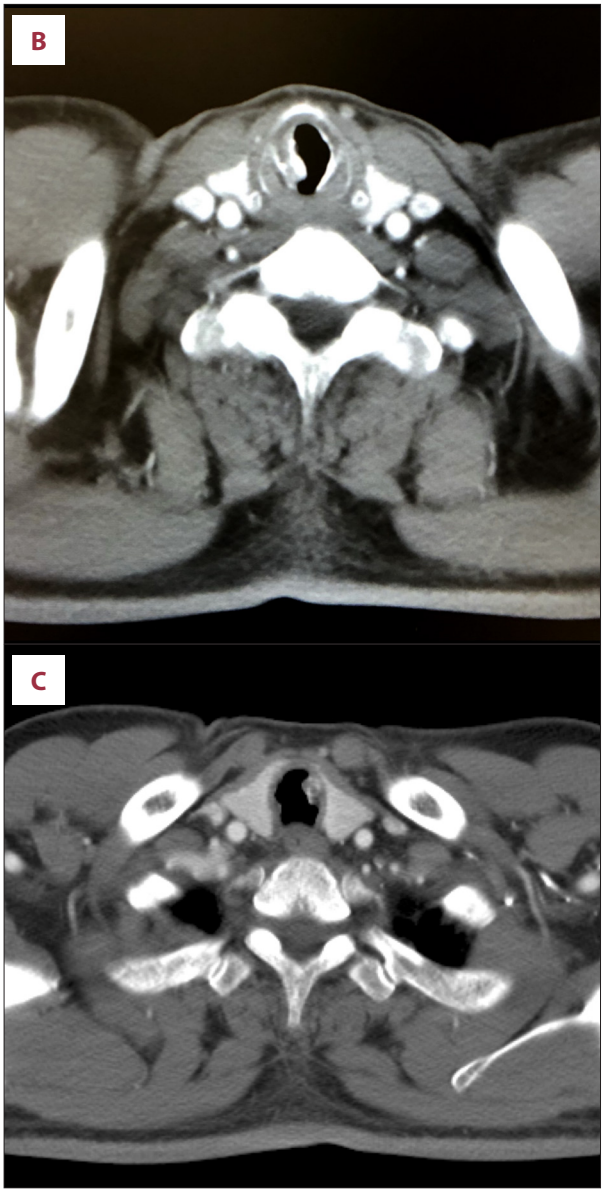


Figure 1. Preoperative chest X-ray and computed tomography (CT) scan images. (**A**) Chest X-ray image before surgery; (**B**) CT scan image 1 cm beneath the glottis; (**C**) CT scan image 3 cm beneath the glottis.

In the latter procedural attempt, the anesthesia was carefully planned on the basis of his medical history. Preoperative examination revealed no significant complications other than TO. He had no respiratory symptoms, had normal respiratory function, and airway stenosis was not detected on chest X-ray imaging (Figure 1A). A chest CT scan revealed endotracheal stenosis due to bony nodules under the glottis protruding from right (Figure 1B) and left (Figure 1C) into the tracheal lumen 2 cm away. The lumen was especially narrow at an area 1 cm below the glottis, with 9 mm being the smallest lumen diameter. The distance from the stenotic site to the tracheal bifurcation was

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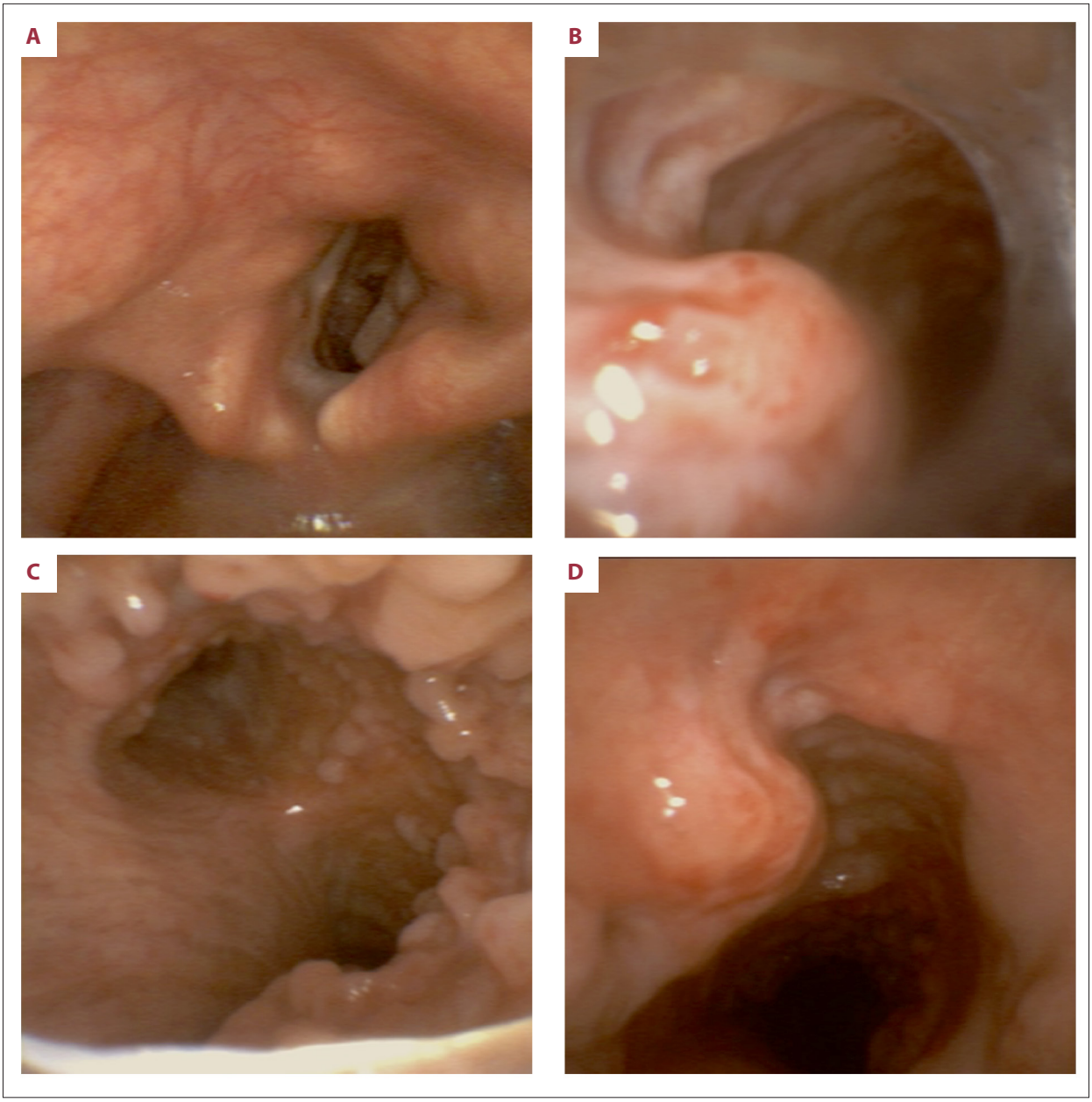


Figure 2. Bronchoscopy images during surgery. (**A**) Glottis; (**B**) bony nodules protruding toward the tracheal lumen; (**C**) tracheal bifurcation; (**D**) postoperative trachea.

9 cm. There was no apparent change in the TO status between the period before ASD surgery and this time. Since mask ventilation and intubation with a thin tube was possible in previous anesthesia induction, we planned for rapid induction with propofol injection. After that, and after confirming mask ventilation, we planned to administer muscle relaxants and intubate with an ID 6.5-mm (outer diameter [OD], 8.9 mm) spiral ETT under bronchoscopic (OD, 5.5 mm) (Ambu, Copenhagen, Denmark) guidance with a McGRATH® (Medtronic, UK) video laryngoscope. Since the arm of the machine is close to the ETT in robotic surgery, we planned to use a spiral tube to prevent bending or kinking of the ETT. Using the McGRATH, part of a subglottic nodule became visible (Figure 2A). On bronchoscopy, the nodules were confirmed on both sides of the tracheal lumen below the glottis. The bronchoscope passed through the stenosed region, and the 6.5-mm spiral ETT was inserted with bronchoscopic assistance. However, due to resistance, the spiral ETT could not pass through the stenosed area (Figure 2B). Next, a 6.5-mm normal ETT was successfully inserted with gentle rotation. Owing to the rotation, the tip entered and gained access to the gap between nodules. Specifically, we rotated the ETT clockwise and unidirectionally to reduce resistance to

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pass through the stenosis. The tip of the ETT was advanced 10 cm from the glottis, where the site of maximum stenosis was not covered by the tube cuff, and where the tip did not cross the bifurcation (Figure 2C). No bleeding was noted on bronchoscopy.

Intraoperatively, the tube tip was confirmed to be in front of the tracheal bifurcation in the Trendelenburg position. There was no difficulty with mechanical ventilation, despite some air leakage and formation of foamy saliva due to the imperfect seal caused by the diffuse tracheal nodules. After the patient awakened, the ETT was removed. The bronchoscope, however, was only removed after ensuring the absence of bleeding or stenosis due to tracheal edema (Figure 2D). The general anesthesia time was 451 min, of which 287 min were spent in the Trendelenburg position. The patient had an uneventful recovery with no respiratory symptoms after general anesthesia.

Discussion

Inserting the ETT with rotation into the trachea was a good idea in this case since, with rotation, the tip pressure did not concentrate in a single place. Because major nodules existed on both sides within short distance (Figure 1B, 1C), ETT insertion into the trachea was not possible with a normal intubation technique. Additionally, the selection of a normal tube instead of a spiral one was useful because of its stiffness, which helped to transfer the entry force, moving the ETT forward. Moreover, the information that mask ventilation had been previously uneventful, and that an ID 6.5-mm ETT could pass with the assistance of a bougie, was helpful for surgery planning. Unlike tracheomalacia, the airway lumen after muscle relaxant administration is generally not changed or narrowed. Although awake intubation may be necessary if there is a risk of "can't intubate, can't ventilate" in a predictably difficult airway management situation, we confirmed that we could mask ventilate with rapid induction. Undoubtedly, estimating the size and shape of the tracheal lumen on CT images preoperatively was useful; because of bronchoscopy, the intubation was performed gently. Bronchoscopic assistance helped to confirm stenosis, distance to the tracheal bifurcation, and the location of the ETT cuff. Using the bronchoscope after extubation, we were able to confirm the absence of bleeding.

Bony TO nodules might cause ETT cuff rupture [5]. A previous report used a laryngeal mask to prevent massive air leak [6]. In our patient, cuff rupture was avoided by evaluating the cuff position and stenosis by bronchoscopy. Although some air leakage was observed, it did not affect the ventilation conditions.

When confronted with a patient with TO, avoidance of airway manipulation seems ideal but may not always be prudent. A supraglottic airway device, i.e., the laryngeal mask airway, has been successfully applied to patients who required general anesthesia for intra-abdominal procedures [6]. However, endotracheal intubation is typically necessary when positive airway pressures are needed for ventilation [2]. As this patient was expected to undergo prolonged laparoscopic surgery in the Trendelenburg position, considering the risk of aspiration, endotracheal intubation was chosen over a supraglottic airway device. In patients with severe intra-airway projections, preoperative bronchoscopic interventions such as dilation and removal of obstructive spurs should be considered [2,7,8].

Conclusions

In a patient with TO, tracheal intubation with rotation was performed using a bronchoscope. For safe anesthetic management of patients with TO, it is important to anticipate a difficult airway, which requires appropriate airway assessment and planning.

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Conflicts of interest

None.

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