



Deadlock - Reflection on Difficulty Placing During Endotracheal Tube - A Case Report

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Abstract

Tracheal stenosis may have multiple etiologies: primary or secondary, congenital or acquired. For unanticipated tracheal stenosis, it often poses certain challenges to anesthesia, endotracheal intubation, and even fatal crises. This case details the crisis encountered during endotracheal intubation in a 60-year-old man and suggests some reflexive recommendations and airway management strategies.

Keywords

Tracheobronchopathia Osteochondroplastica, Missed Diagnosis, Endotracheal Tube, Difficult Intubation, Difficult Airway, Airway Management Strategy

Introduction

Most common tracheal stenoses are secondary tracheal stenoses and are associated with trauma, which can be internal, such as prolonged endotracheal intubation, tracheostomy, flame burns, or external, such as blunt or penetrating neck trauma [1]. However, it should not be neglected that there are also some rare etiologies that may lead to diffuse thickening and stenosis of the trachea, such as Tracheobronchopathia Osteochondroplastica (TO) [2]. This disease is characterized by abnormal submucosal ossification of the trachea and bronchi and hyperplasia of cartilaginous nodules protruding from the lumen and generally does not involve the posterior wall of the airway, but often causes irregular narrowing of the lumen and airway obstruction [3].

A 60-year-old male, occupation: construction worker, underwent cecectomy and ileostomy for cecal perforation 1 year ago, and underwent enterostomy reduction in the second stage according to the plan after surgery, and was discharged uneventfully after surgery. However, 1 month after surgery, the man inadvertently found a mass protruding outward at the right infraumbilical abdominal wall without symptoms such as pain or fever, which was more prominent with increased intra-abdominal pressure. After outpatient treatment, "abdominal incisional hernia" was considered, and the patient was admitted to the Department of Gastrointestinal Surgery with this diagnosis, and planned to undergo "tension-free repair of abdominal incisional hernia and abdominoplasty." According to the requirements of surgical anesthesia, the patient perfected chest CT, ECG, blood examination, and other auxiliary examinations, suggesting moderate

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coronary atherosclerosis and mild bronchiectasis in the left lower lobe, and the other examinations showed no significant abnormality.

Anesthesia Induction Process:

According to the patient's preoperative physical condition, we performed radial artery puncture under local anesthesia to monitor invasive blood pressure, and then started routine anesthesia induction: intravenous administration of ciprofol 25 mg, sufentanil 20 µg, and rocuronium 50 mg. After the patient's consciousness disappeared, pressure-controlled mechanical ventilation and bimanual jaw support suggested that the patient's mask ventilation worked well. After the onset of the induced drug, the glottis was exposed using a video laryngoscope, the glottis was exposed first level, 5 ml of 2% lidocaine supraglottic and subglottic local anesthesia was given, and a 7.5-gauge reinforced cuffed endotracheal tube was inserted. However, when the cuff was just passed through the glottis, it was found that it could not be advanced further, and the endotracheal tube was rotated slightly clockwise or counterclockwise with the same result. To avoid hypoxia and hemodynamic compromise, we exited the endotracheal tube and found that the catheter exited uneventfully without significant injury.

Replaced with a 7.0 reinforced cuffed tracheal tube, the catheter cuff smoothly passed through the glottis this time. However, resistance was found again after passing through the glottis, but the resistance was smaller than the previous time, and it smoothly went deep after slight rotation to reach the position 21 cm from the incisors. Following mechanical ventilation, the patient was found to have normal airway pressure, symmetrical bilateral breath sounds on auscultation were clear, and no obvious dry or moist rales or wheezing rales were heard. The entire induction intubation lasted for 3 min without significant hemodynamic disturbances. Surgery started normally. The operation lasted for 90 minutes, the patient recovered uneventfully, was extubated and returned to the ward, and was discharged 5 days later.

Discussion

Now there seem to be two questions in front of us that need to be answered: 1. What are the reasons why the patient experienced difficulty in placing the

endotracheal tube? Tracheal spasm? Tracheal scarring? Others? 2. Why did the second intubation succeed without using any additional medications after the first intubation failed, and there were no obvious abnormalities in mechanical ventilation. Curious, I ordered the patient's previous chest CT images (**Fig-1A** and **Fig-1B**).

Although the patient's chest CT did not report significant tracheal abnormalities, we found that the tracheal cartilage presented high-density shadows in the plane below the glottis and continuously downward, and the morphology (fusiform) was inconsistent with the tracheal cartilage (round or oval) in normal patients. It suggests that the patient may have calcified or sclerotic tracheal cartilage. Subsequently, we obtained the chest CT image of the patient 1 year ago, and we found that the tracheal cartilage of the patient had a higher relative density and a more irregular shape compared with 1 year ago (**Fig-2A** and **Fig-2B**).

Then, we obtained the anesthesia record sheet of the patient 1 year ago and found that the tracheal tube used by the patient at that time was inconsistent with the current model. The current model is FORNIA Disposable Anesthesia Endotracheal Tube Set (7.5#), while the previous model is Teleflex Endotracheal Tube and Accessories (7.5#). A comparison is shown in **Fig-3A** and **Fig-3B**.

This seems to answer two previously mentioned questions: 1. Because the patient's tracheobronchial cartilage is calcified, often involving the anterior and lateral walls, without the posterior wall, when the catheter that is shaped to form a hook enters the glottis, it is always easy to reach the anterior wall of the tracheal cartilage and form an angle with the stiff trachea, which cannot be smoothly deepened. On the other hand, the irregular shape of calcified cartilage also caused some difficulty in placement. 2. We found that the models of the two endotracheal tubes were not consistent. The cuff of the tube from one year ago had lower tension, and it was tightly attached to the tube when not inflated. However, after evacuating the cuff of the tube from one year later, irregular folds appeared. When these folds rubbed against the irregular and rigid trachea, it increased the resistance to the insertion of the endotracheal tube.

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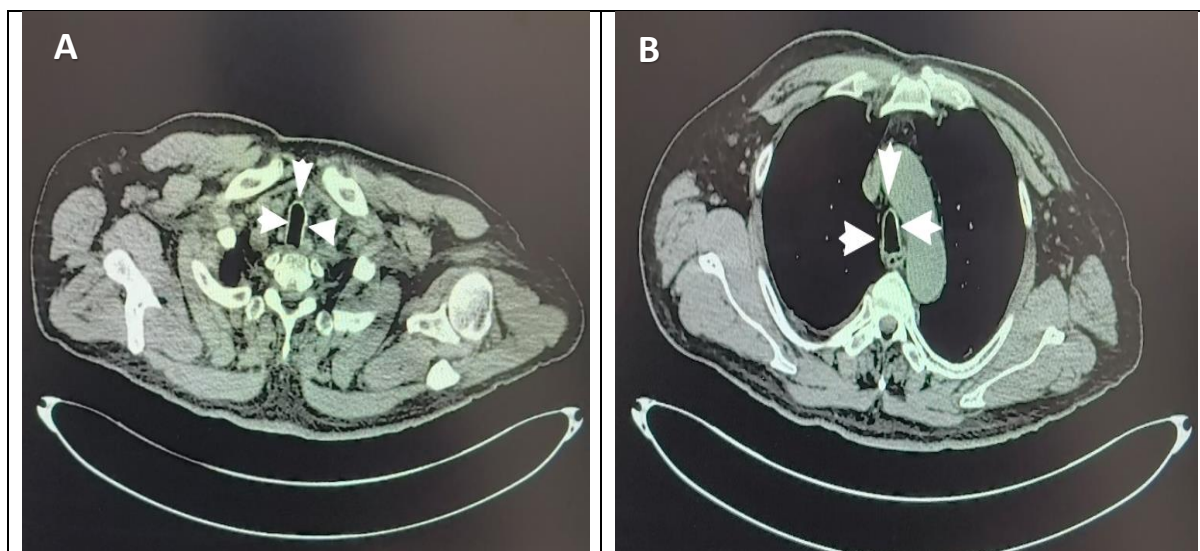


Fig-1:

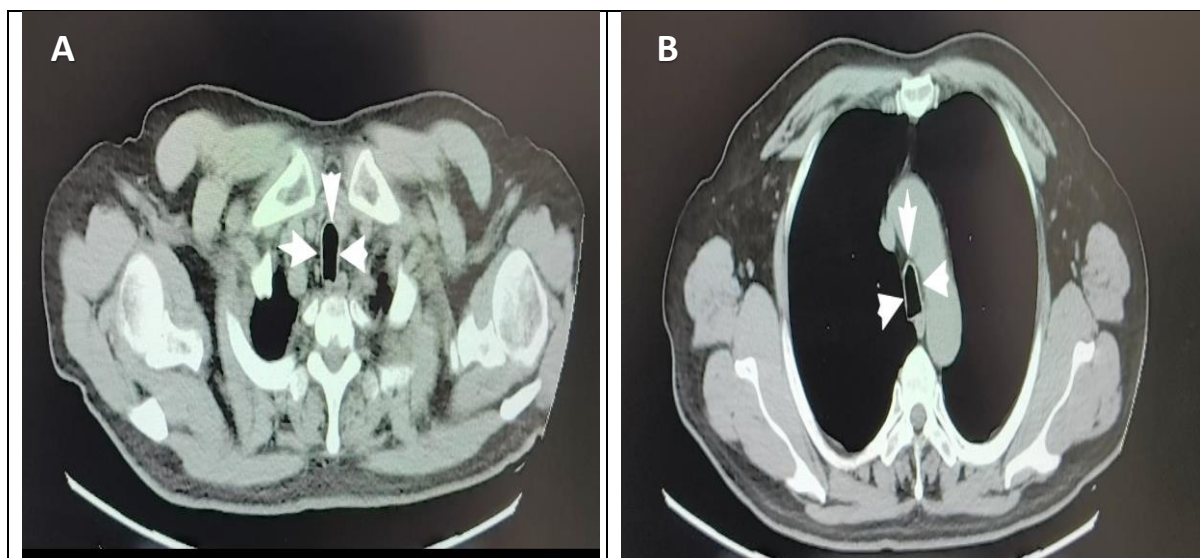


Fig-2:

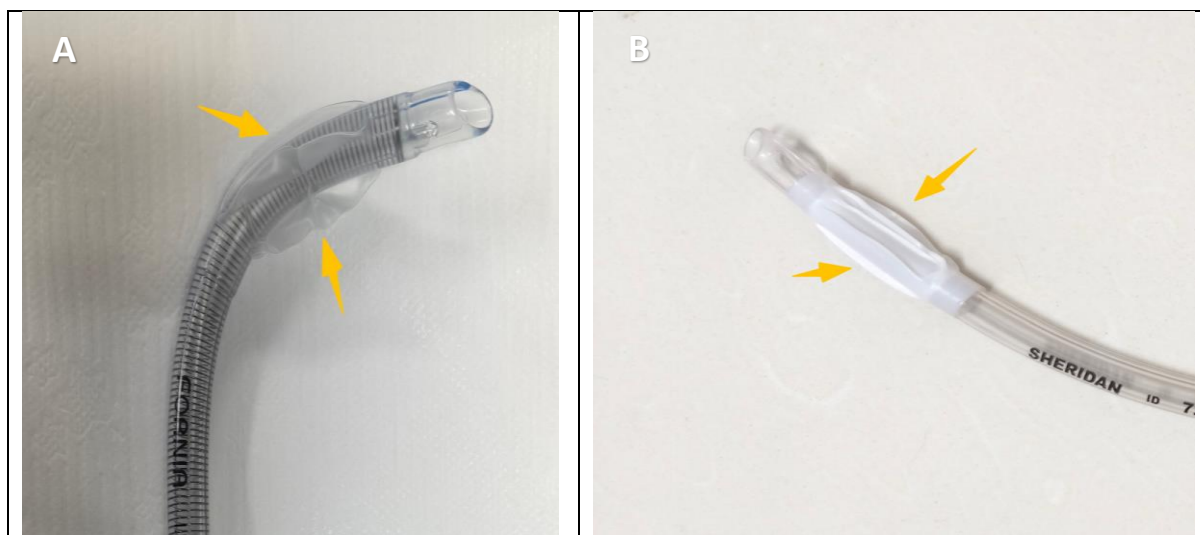


Fig-3:

Reflection

Imaging examination may have the possibility of missed diagnosis, and CT examination images of patients should be fully read before surgery, rather than paper reports. If placement is difficult during endotracheal intubation, but mask ventilation is normal, the plan can be adopted: 1. Consider supraglottic assisted ventilation. 2. Review the patient's medical history in detail and look for possible causes. 3. Replace with more senior and experienced physicians. 4. Use a cuff with lower tension and a catheter that fits well when the cuff is not inflated. 5. Switch to a smaller catheter. 6. Fiberoptic bronchoscopy or guidance may be performed if necessary.

Conclusion

Tracheobronchopathia Osteochondroplastica can cause irregular thickening or even stenosis of the tracheal lumen, which may lead to difficulty in placing the endotracheal tube, but there is usually no risk of difficulty in assisted ventilation and excessive tension is not required when encountered. However, it is important to note that the disease is progressive, and multiple surgeries in the same patient

may make airway manipulation more challenging. On the other hand, anesthesiologists should pay attention to the airway examination images of patients before surgery, as well as the material science of tracheal intubation, so that they can be flexible in emergency situations.

Conflict of Interest

The author has read and approved the final version of the manuscript. The author declares no conflicts of interest.

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