

Title : Removal of aspirated teeth in a multiple trauma patient using fiberoptic bronchoscopy
with simultaneous tracheostomy: Review of two cases

Running head : Fiberopitc bronchoscopic removal of aspirated teeth

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Abstract

Aspiration of a tooth in facial trauma is a known complication. There have been few reports on the consequences of maxillofacial trauma, especially when the patient is intubated. We report on two complicated cases of multiple teeth aspiration and their removal in intubated patients. A special technique using flexible bronchoscopy with simultaneous tracheotomy was used for safe and successful removal of aspirated teeth. We suggest that simultaneous tracheostomy is a safe and effective method for removal of a bronchial foreign body in maxillofacial traumatized patients.

Keywords: maxillo-facial trauma, tooth aspiration, fiberoptic bronchoscopy

Introduction

Foreign body aspiration is common among children, however, aspiration of a foreign body, especially a tooth, is uncommon among adults¹. Despite numerous reports of tooth aspiration and removal, there have been few reports on the consequences of maxillofacial trauma, especially when the patient was intubated. We report two successful cases of foreign body (avulsed tooth) removal using fiberoptic bronchoscopy with simultaneous tracheostomy in severe maxillo-facial trauma patients.

Case 1

A 48 year-old unrestrained male was injured after a motorcycle accident. After arrival at the hospital, endotracheal intubation was attempted to obtain a secure airway, because the patient had severe maxillofacial injury with bleeding and edema. The attempt failed due to poor visibility caused by massive oral bleeding. Continued attempts of cricothyroidotomy and tracheostomy also failed and eventually, blind oral tracheal intubation with a 7.5mm inner diameter (ID) endotracheal tube was performed. The patient had an open comminuted fracture of the right mandibular body, a bursting fracture of the ninth thoracic (T) vertebra with a three-column T-spine fracture, flail chest with multiple fractures of both ribs, pneumomediastinum, and liver contusion. His injury severity score (ISS) was 22. Initial chest X-ray before intubation did not show a foreign body in the bronchus. However, a chest X-ray after intubation showed two teeth in the right main bronchus. (Fig. 1) Chest computed tomography (CT) confirmed the location of teeth in the right middle and lower bronchi. (Fig. 1)

Because the patient had severe maxillofacial injury with bleeding and edema, he was in need of a secure airway and removal of teeth using rigid bronchoscopy was impossible. We considered using fiberoptic bronchoscopy (FOB) via the endotracheal tube. In that way, manipulating the foreign body while ventilating seemed possible. However, there was a size discrepancy between the teeth and endotracheal tube. The two teeth measured 25x9 mm and 27 x 9 mm each in size, and the inner diameter of endotracheal tube was 7.5mm. In this setting, extracting the teeth out of the airway is impossible without removing the endotracheal tube (Fig. 2-A). Such an attempt will result in interruption of ventilation, and entail the risk of failure of re-intubation.

We decided to perform tracheostomy as a route for manipulation and removal of the teeth, while maintaining the endotracheal tube as a secure route for ventilation. The inner diameter of the tracheostomy tube (8.0mm) is similar to the endotracheal tube (7.5mm), which was still too narrow for the teeth to pass through. It necessitated removal of tracheostomy tube for the removal of teeth, but ventilation was possible via endotracheal tube (Fig. 2-B.).

The patient was under mechanical ventilation (CMV, volume controlled, PEEP 8.0 and FiO₂ 1.0) via endotracheal tube, fully sedated. Tracheostomy was performed as follows: the tracheostomy site was confirmed by trans-illumination of the introduced FOB. The endotracheal tube was retracted above the level of planned incision site. Open tracheostomy was made using an 8.0 French tube (Tracho[®] Pure, inner diameter: 8.0mm; Frankfurt, Germany), and mechanical ventilation was done via the tracheostomy. The FOB (BF-XT40; Olympus; Tokyo, Japan) was introduced via the tracheostomy tube. Using an endoscopic basket, a tooth was dragged up to the distal end of the tracheostomy tube. The route of mechanical ventilation was switched to the endotracheal tube during and following removal procedure. The tooth and the tracheostomy tube were pulled out together from the tracheostomy site. The second tooth was removed in the same manner. The total procedure time was 3 hours. Most of the time was spent grasping the teeth, because it was wedged in the bronchus and hard to grasp. After removal of the teeth, the tracheostomy tube was re-inserted, and mechanical ventilation resumed through the tracheostomy. The endotracheal tube was removed. The patient had no significant air leakage, or desaturation during the procedure. There was no ventilation interruption during the entire procedure. The chest X-ray showed improvement, and five days later, the patient was weaned from mechanical ventilation.

Case2

A 69-year-old male was severely injured after a fall down the stairs. He was diagnosed with traumatic SAH, diffuse axonal injury, compression fracture of the left temporal bone, lung contusion, multiple rib fractures, avulsion of multiple teeth, and foreign bodies in bronchus. His injury severity score was 42 points. It was also suspected that he had been injured by falling down as a result of a cerebrovascular accident. He was intubated immediately after arrival to the emergency room. The initial Chest X-ray showed a tooth-like foreign body in the left bronchus. (Fig. 3-A) Chest CT showed avulsed teeth in the left bronchus. (Fig. 3-C, D); Migration of the teeth to the right bronchus was noted on follow-up image. (Fig. 3-B) He developed pneumonia associated with the tooth, and chest X-ray showed worsening with time. Seven days after admission, the tooth was removed using fiberoptic bronchoscopy through the tracheostomy site, as in case 1. It took 2 hours. Another tooth was observed in the larynx, and removed under the vision of Glido-Scope (Verathon[®]; Bothell, Washington, USA) and instrumentation using a Magill forceps. The patient did well throughout the entire procedure. There was no interruption of ventilation.

Removed teeth are shown in Fig. 4 for the two cases.

Discussion

Use of a rigid bronchoscope is the best option for removal of a foreign body in the trachea and bronchus. A large diameter fiberoptic-bronchoscope can be an alternative for a deeply located foreign body. In the above cases, we could not use a rigid bronchoscope due to the severe maxillofacial injury, which required a definitive airway (case 1) and such an attempt could have worsen cervical spine injury (case 2). Therefore, we had to use a fiberoptic bronchoscope. A Fiberoptic bronchoscope with video display can be useful for removal of foreign bodies, especially when the object is stuck and embedded inside the bronchus².

Removing a foreign body with FOB is not simple, but a complex procedure. There are several methods for removal of a foreign body in the bronchus, such as using a Fogarty catheter, endoscopic forceps, or a basket. Using a basket alone may not be sufficient for removal of a foreign body, especially when it is wedged and slippery to grasp. Tal-Or et al. reported on a method using a Fogarty catheter³. They introduced a Fogarty catheter No. 3 through the bronchoscope passing beyond the tooth, between the gap of the tooth and the luminal wall. Then they inflated the balloon, pulled out the catheter, allowing the tooth to crawl up to the main bronchus. The method using a Fogarty catheter can be a good option, but it still has a risk of trauma to the bronchial wall⁴.

After successfully grasping the foreign body and pulling it up to the tip of the endotracheal tube, one may face the problem of a large foreign body that is unable to pass through the lumen of the tube. Some authors have reported failure of removal of a foreign body due to this reason.² Performance of tracheostomy and removing a foreign body through the tracheostomy hole, by grasping and pulling it out with forceps might be an option for removing a large foreign body.⁴ There are disadvantages in this method. The tracheostomy tube must be removed during the procedure, and it results in loss of the airway (though it might be temporary). Failure of removal due to poor visibility, or rolling and slipping of the foreign body is also possible. In fact, we experienced such a failure in first attempt of case 1. On the first attempt, we did prepare for the tracheostomy, but did not insert the tracheostomy tube. We first introduced FOB via endotracheal tube, dragged the tooth up to the level

of planned tracheostomy site, then tried removing it with Kelly clamp after opening the tracheostomy site wound. It failed due to poor visibility. The tooth was also hard to grasp.

The patient was able to ventilate via the endotracheal tube, throughout the entire procedure, even when the tracheostomy tube was removed. Performing tracheostomy enabled a shorter course of visualization and shorter distance of removal. Successful extraction of the tooth from trachea was possible by removing it with the tracheostomy tube. We accomplished simultaneous removal of the tooth and tracheostomy tube by continuously pulling the basket, resulting in the tooth being kept against the tip of the tracheostomy tube during the removal.

Whatever instrument and method are used, we suggest that performing a tracheostomy simultaneously while keeping the patient orally intubate is a better option for removal of a foreign body in the bronchus, especially in a patient with maxillofacial trauma. Having two routes of approach enables use of an instrument with a larger diameter, which cannot be inserted through the inner channel of the bronchoscope. More importantly, it enables a secure airway and prevents an airway leak of the airway when the patient is mechanically ventilated.

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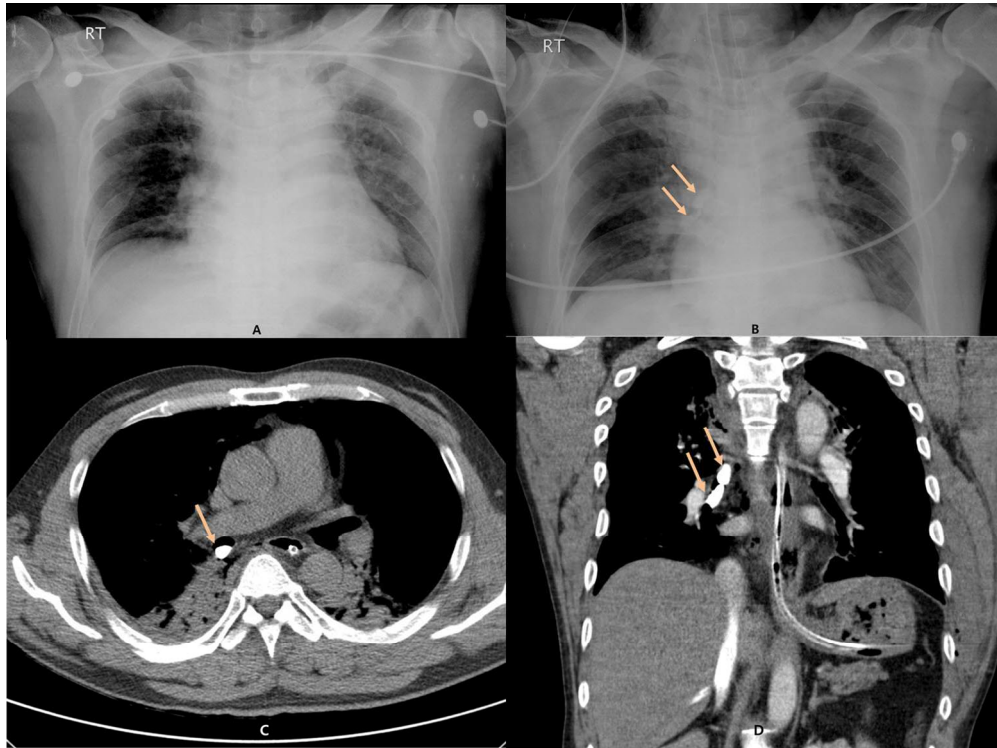
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Fig. 1 Case 1- Initial chest X-ray did not show the foreign bodies in the bronchus (A). After intubation, two teeth (arrows) were observed in the right bronchus (B). Chest CT scan showed the location of teeth in the right bronchus (C, D)

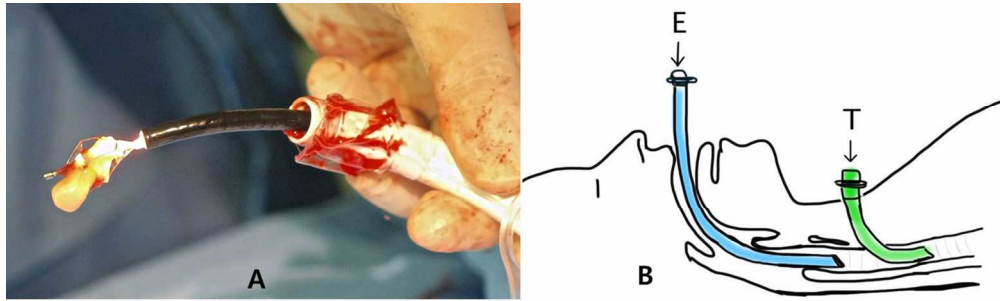
Fig.2 A. The tooth is grasped with basket of a FOB. The tooth is too large to pass through the tracheostomy tube lumen, and the tooth is removed with the tracheostomy tube. B. Schematic diagram of the procedure. Endotracheal tube(E) is retracted to the level above tracheostomy. Ventilation and manipulation with FOB is done via tracheostomy tube(T). After dragging up the tooth to the tip of tracheostomy tube with FOB, mechanical ventilation was switched to the endotracheal tube(E). The tooth and the tracheostomy tube(T) was then removed together.

Fig. 3 Teeth are located in the left bronchus (A), and then moved to the right bronchus (B) one day later. Initial chest CT scan showed two teeth in the left bronchus (C, D)

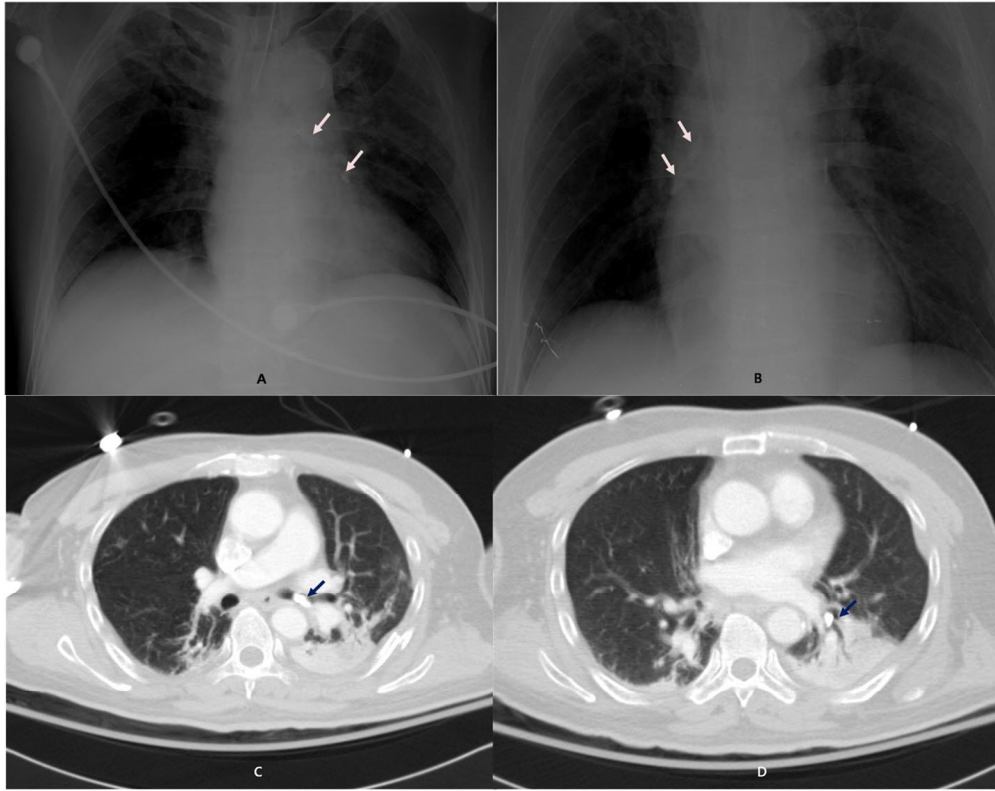
Fig. 4 Removed teeth in case 1 (A) and case 2 (B)



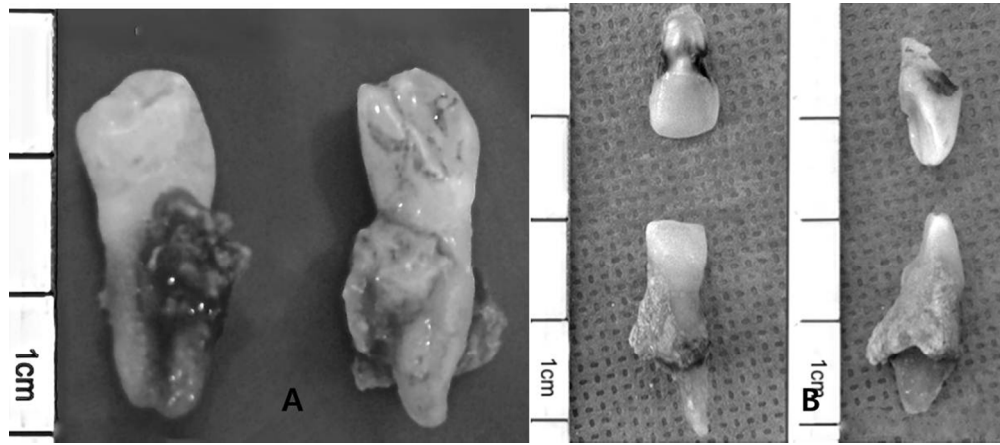
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246x76mm (150 x 150 DPI)



241x190mm (150 x 150 DPI)



205x89mm (150 x 150 DPI)