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Title: TOOTH ASPIRATION IN A PATIENT WITH TRAUMATIC BRAIN INJURY

Short Title: TOOTH ASPIRATION AND TRAUMATIC BRAIN INJURY

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Abstract

Tooth aspiration can infrequently complicate the course of patients with trauma and may be undiagnosed for long, thus resulting in late complications such as atelectasis and recurrent infections. Flexible bronchoscopy is considered the preferred initial procedure for management of airway foreign bodies in adults. However, in trauma patients with concomitant head injuries, fiberoptic bronchoscopy might lead to intracranial hypertension.

We herein report a case of aspirated tooth in a patient with traumatic brain injury removed by flexible bronchoscopy, while intracranial pressure (ICP) was continuously monitored. It highlights the importance of thorough review of radiographs and chest CTs for foreign body aspiration in trauma patients, especially

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maxillofacial trauma, as it may remain undiagnosed for long. Moreover, it serves as a reminder of the difficulty in maintaining the ICP within normal limits during bronchoscopy in patients with traumatic brain injury and highlights the need for continuous monitoring of cerebral hemodynamics and harmonization with the recommendations for bronchoscopy via an endotracheal tube.

Keywords: aspiration, bronchoscopy, tooth, traumatic brain injury.

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Introduction

Although aspiration of a tooth into the tracheobronchial tree in trauma patients is a known complication, it is uncommon and often overlooked, especially if it is not accompanied by acute respiratory distress [1,2]. Flexible or fiberoptic bronchoscopy is considered the preferred initial procedure for management of airway foreign bodies in adults [3]. In intubated and mechanically ventilated patients it is considered a safe procedure provided that a list of recommendations are followed [4]. However, in trauma patients with concomitant head injuries, fiberoptic bronchoscopy might lead to intracranial hypertension [5].

Several relevant cases have been reported, mainly in maxillofacial trauma patients [1,2], but only in few of them a concurrent brain injury was present [6,7]. We report, herein, on a patient with severe traumatic brain injury and a tooth aspiration in the right tracheobronchial tree, which was successfully removed via fiberoptic bronchoscopy.

Case presentation

A 35-year-old man was admitted comatose to the emergency department of our tertiary-care hospital after a road traffic accident. The patient was immediately intubated for airway protection, because of a low Glasgow Coma Scale of 6/15, and mechanical ventilation was initiated. A brain computed tomography (CT) scan revealed traumatic subarachnoid hemorrhage, multiple cerebral contusions and a mandibular fracture. A chest CT scan revealed right lower lobe atelectasis. Laboratory values were within normal limits. His previous medical history was unremarkable. The patient was subsequently transferred to the intensive care unit (ICU). He was hemodynamically stable. Lung auscultation revealed decreased breath sounds at the right lung base. Arterial blood gases were within normal limits. An intra-parenchymal catheter for continuous monitoring of intracranial pressure (ICP) was inserted. In the routine chest X-ray performed in the ICU on the following day the presence of a radiopaque shadow in the right lung was observed near the inferior right hilum (Figure 1). A meticulous examination of the emergent chest CT scan revealed a previously overlooked,

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well-calcified foreign body in the right lung (Figure 2). Fiberoptic bronchoscopy was performed by pulmonologists-intensivists experienced in bronchoscopy and revealed a tooth wedged in the right subsegmental bronchus of RB9 (laterobasal), as well as purulent secretions (Figure 3,4). After several attempts the tooth was ultimately removed by means of alligator forceps. The total procedure lasted one hour and fifteen minutes. All fiberoptic bronchoscopies were performed by a 6.3 (external diameter) flexible bronchoscope with video display, through an endotracheal tube of 8.5 mm inner diameter, under sedation, analgesia, muscle relaxation, topical tracheal anesthesia and appropriate ventilator settings, by using the specific swivel adaptor to maintain the minute ventilation as recommended [4]. During procedures, the intracranial catheter revealed transient ICP surges up to 35 mm Hg, that were promptly treated with additional sedation, hypertonic saline solutions and temporary interruption of the bronchoscopy. Mean arterial pressure was kept constant and ranged between 70 and 75 mmHg during the whole procedure. There was no need for vasopressor drugs. No significant bleeding was noted at the site of tooth removal. No acute neurologic deterioration secondary to bronchoscopy was observed, as evidenced by the fact that the patient did not demonstrate persistent intracranial hypertension or developed herniation acutely. His Glasgow coma score (GCS) did not change after sedation was stopped. The patient finally survived and was transferred from the ICU to the high dependency unit. A written consent was obtained from the patient's next of kin for publication.

Discussion

In the present case, mandibular trauma, altered consciousness and intubation in an emergency setting represent risk factors for foreign body aspiration. Aspiration of a tooth must always be treated immediately, because it may traumatize the lining mucosa or cause airway obstruction, atelectasis, bronchiectasis, obstructive pneumonia and lung abscess [8].

The aspirated tooth may be undiagnosed for long, especially in patients with severe trauma, and lead to delayed complications [6]. Notably, in comatose, mechanically ventilated patients, the most common signs

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and symptoms following a foreign body aspiration i. e. cough, dyspnea, stridor or wheezing are usually absent. Furthermore, a foreign body, including tooth, may be missed in chest X-rays because of superimposition of other radiolucent structures. As a result, particularly in cases of tooth aspiration, a delay in diagnosis was noted in several cases among those reported [1,6,7], indicating the need for a high level of suspicion. In the present case, right lower lobe collapse and decreased breath sounds ipsilaterally were the only findings, both of them nonspecific. The initially underdiagnosed chest CT scan was also not surprising in the setting of the emergent evaluation of a severely injured patient, focusing mainly on the life-threatening vital organ injuries.

Both rigid and flexible fiberoptic bronchoscopy are the procedures of choice for diagnosis and removal of foreign bodies from the tracheobronchial tree [9]. However, in trauma patients rigid bronchoscopy is not feasible because of the need of a secure airway and cervical spine safety. On the other hand, in intubated and mechanically ventilated patients with brain injury, flexible fiberoptic bronchoscopy either via orotracheal tube or via a tracheostomy performed for this purpose in more complicated cases, can induce a rise in ICP [4,5,10,11,12]. The insertion of the flexible bronchoscope into the endotracheal tube results in elevated airway pressures that may be transmitted to the thoracic space and therefore raise ICP (raising both systolic blood pressure and impairing venous return) [10]. Additionally, any hypercapnia due to hypoventilation during the procedure may contribute, at least in part. Therefore, a small cross-sectional area remaining in the endotracheal tube when bronchoscope in place, must be avoided, to minimize the effect on airway resistance and its deleterious consequences on the ICP. An adequate cross sectional area is strictly mandatory in order the procedure to be safely performed.

To our knowledge, this is the first case report of flexible bronchoscopy for removal of a tooth in a patient with traumatic brain injury and an ICP monitor in place. Although we used extra sedation, analgesia, muscle relaxation, hypertonic solutions and topical tracheal anesthesia as suggested by previous studies in which bronchoscopy was performed in traumatic brain injury patients to aid in the diagnosis of nosocomial pneumonia or to aid in resolving lobar atelectasis, the increases in ICP were not fully prevented and we had

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to remove the scope and increase ventilation several times [11]. Thus, if the procedure is expected to take long, like in our case, ICP monitoring during the procedure seems to be vital.

This case highlights the importance of careful review of chest CTs and radiographs by radiologists and clinicians with detailed knowledge of the clinical course and that the bronchoscopic procedure when dealing with a foreign body wedged in a subsegmental bronchus may take long time and thus elevations in ICP necessitating removal of the scope must be expected and bronchoscopy must be performed with caution in patients with diminished cranial compliance.

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Figures

Figure 1 (Original)

Chest X-ray showing the tooth in the right lung (arrow)

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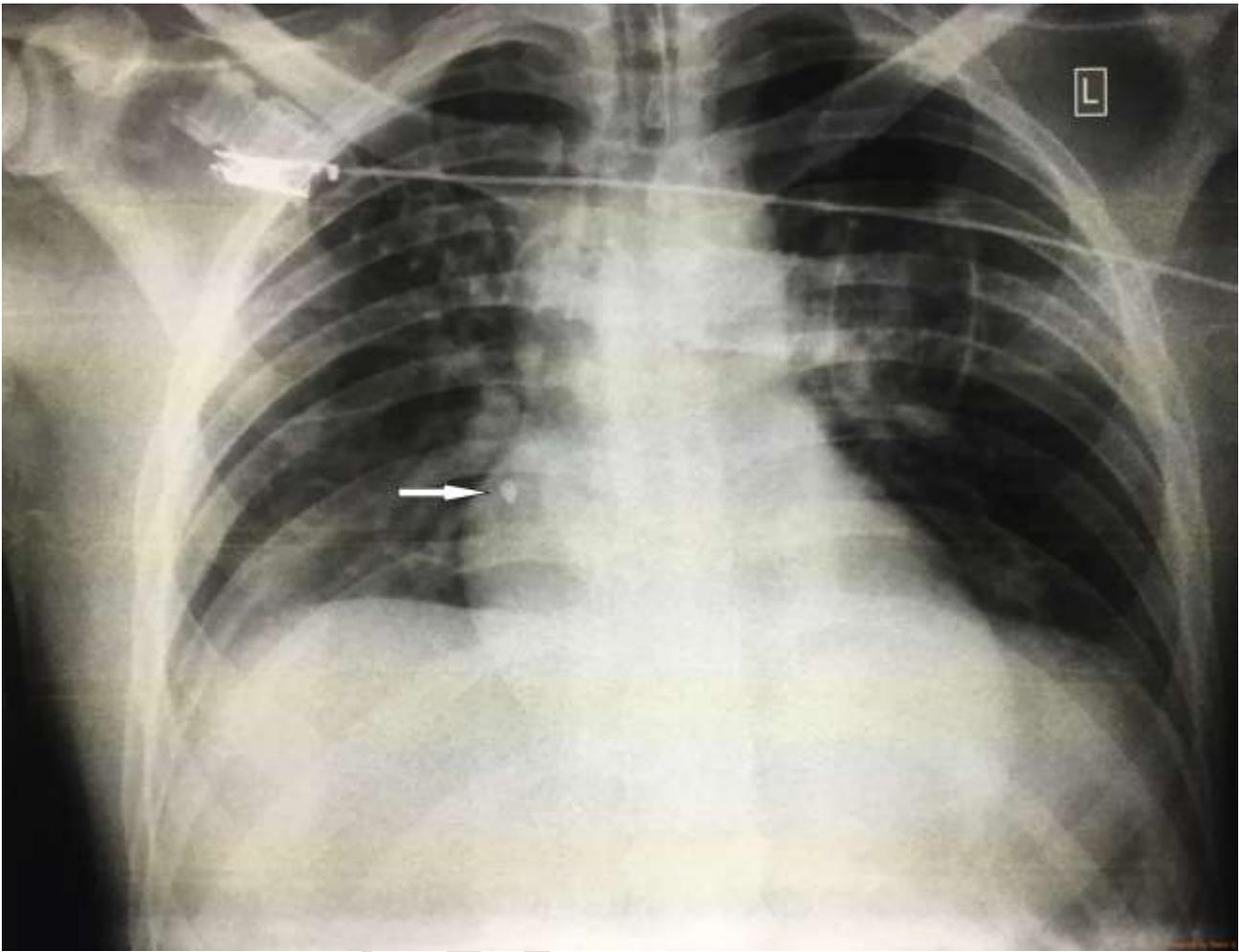


Figure 2 (Original)

Chest computed tomography showing a well-calcified foreign body in the right lung and the collapse of the lower lobe

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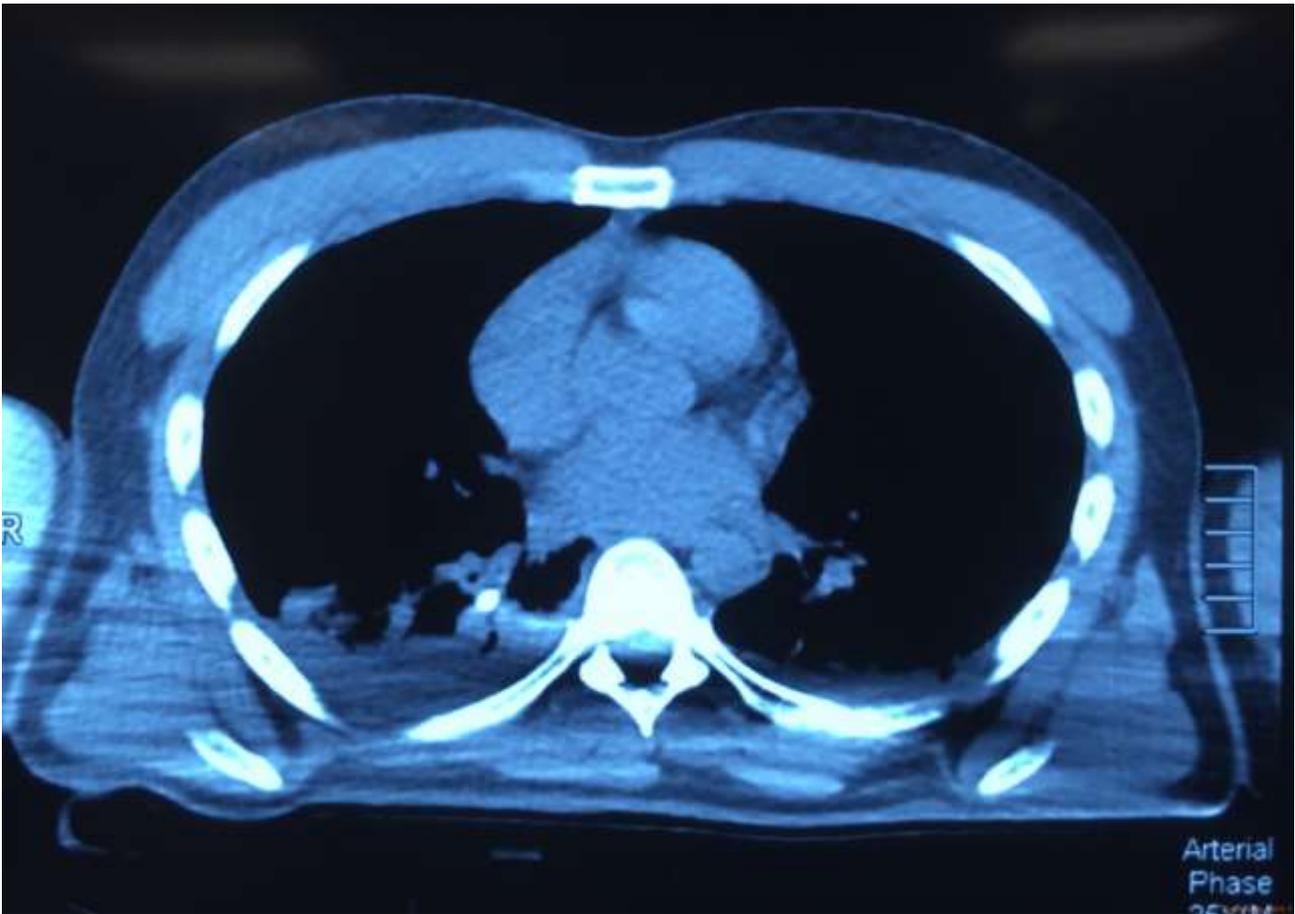


Figure 3 (Original)

Bronchoscopic view of the foreign body visible in the right subsegmental bronchus of RB9 (arrow)

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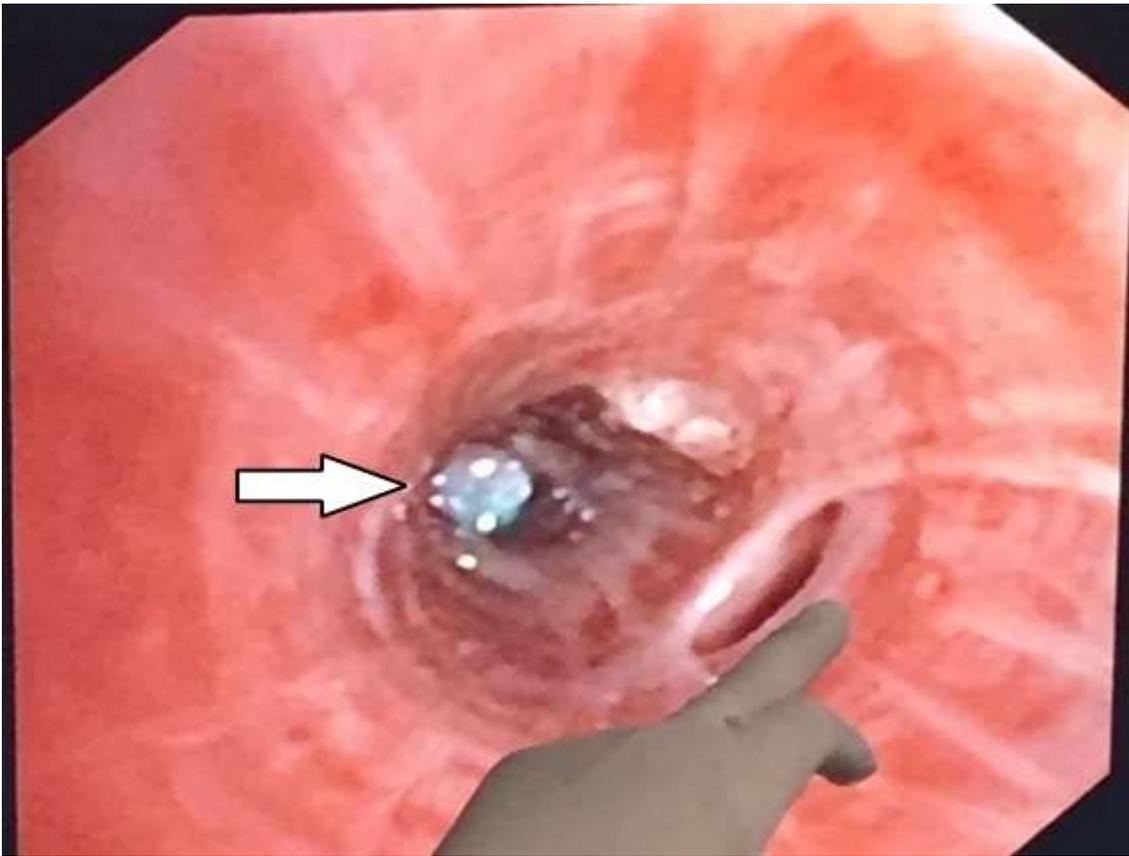


Figure 4 (Original)

Close-up of the foreign body

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