

CASE REPORT

Hyoid bone fracture: an unrecognised complication of intubation or transoesophageal echocardiogram?

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Abstract

A 55-year-old man sustained a compound hyoid fracture in the perioperative period surrounding coronary artery bypass surgery. The two most likely mechanisms of injury were external laryngeal pressure sustained either during transoesophageal echocardiogram (TOE) or intubation. He was managed operatively and made an uneventful recovery. The procedure that led to the hyoid fracture was not determined. Of note, this has not been previously described as a complication of either procedure.

The hyoid is a horseshoe-shaped bone, consisting of a central body and a greater and lesser horn on each side. Functionally the hyoid provides a movable base for the tongue, attachment points for the middle portion of the pharynx and maintains patency of the pharynx, required during swallowing and respiration.¹

The hyoid bone lies in the anterior neck at the level of the C3 vertebra inferior to the protruding mandible bone, superior to thyroid cartilage, and anterior to the cervical spine. These structures protect the hyoid from a direct-impact injury.^{1,2} The hyoid is suspended by the stylohyoid ligaments as well as muscles attaching to the mandible, styloid processes, thyroid cartilage, manubrium and scapulae.¹

Injuries to the hyoid bone are uncommon and are reported to require a significant amount of, usually direct, force. Hyoid injuries are therefore reported more frequently in forensic investigations; and typical mechanisms of injury include manual strangulation, hanging, assault, road traffic accidents, athletic injuries and falls.^{1,6}

Case report

A 55-year-old man was referred to the Otolaryngology Head and Neck Surgery (ORLHNS) Service 14 days following a coronary artery bypass graft with a persistent cough, hoarse voice and odynophagia.

His preoperative comorbidities included ischaemic heart disease, paroxysmal atrial fibrillation for which he was anticoagulated on warfarin, hyperventilation syndrome and unconfirmed obstructive sleep apnoea. Incidentally he had suffered a fall 3 months prior to his operation, sustaining three broken ribs. There was no trauma to the neck during this incident. He weighed 75 kg and had a BMI of 24 kg/m².

Intubation for his coronary artery bypass graft was performed by an experienced consultant anaesthetist. It was achieved using a MAC 3 bladed laryngoscope, and a Cormack-Lehane grade 2 view was described, with no immediate complications following intubation. During the surgery the transoesophageal echocardiogram (TOE) probe was passed to monitor cardiac function. This was achieved with no technical difficulty, and no blood was noted on the probe on removal.

Postoperatively he had a prolonged period of intubation and was monitored in an intensive care unit for 3 days. Day 1 postoperatively he had a repeat TOE to investigate for potential postoperative bleeding because of persistent hypotension. This was technically routine, once again with no blood noted on probe.

He was extubated on day 3, which is longer than usual, secondary to persistent hypotension. He was subsequently noted to be coughing up copious greenish-brown sputum and treated for a presumed aspiration pneumonia. During this period, he had been off sedation for 24 hours prior to extubation. On review by a speech language therapist he was found to be aspirating thin fluids. He was diagnosed with aspiration pneumonia and resumed treatment with intravenous antibiotics.

The patient had ongoing hoarseness, a persistent cough, and odynophagia that was worse with solids. A repeat speech and language therapy review was sought. A fiberoptic endoscopic evaluation of swallowing was performed that raised a question of ulceration at the right pyriform fossa and this prompted assessment by the ORLHNS Service.

<http://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2015/vol-128-no-1412/6498>

On examination, the patient was tender over the area of his left thyroid cartilage, with restricted left neck rotation secondary to pain. No neck swelling or masses were noted, and he had been afebrile for more than 24 hours prior to review. On flexible nasal endoscopy the greater cornu of his hyoid bone was protruding through a mucosal laceration in the left pyriform fossa, with associated oedema and exudate. This was exquisitely tender to endoscopic palpation.

A computed tomography of his neck was requested, showing an undisplaced hyoid fracture. His symptoms had not improved with conservative measures (antibiotics and a fluid only diet) therefore we elected for operative management.

Intraoperatively, a mucosal laceration was seen on the left lateral wall of his hypopharynx with surrounding granulation tissue. An additional laceration was present on the posterior hypopharyngeal wall presumably due to repetitive trauma from the intraluminal bone. The greater cornu was grasped and pulled into the lumen of the hypopharynx and debrided using endoscopic shears until no further bony prominence was palpable.

The mucosa was left to heal by secondary intention. Postoperatively he had an uncomplicated recovery with resolution of his symptoms. When reviewed in the outpatient setting 2 weeks later, he presented with a normal voice, was tolerating a full diet and had no residual morbidity from the injury.

Figure 1. Intraoperative photo showing the greater horn of the hyoid bone exposed within the pharynx



Figure 2. Axial CT showing the undisplaced left hyoid fracture

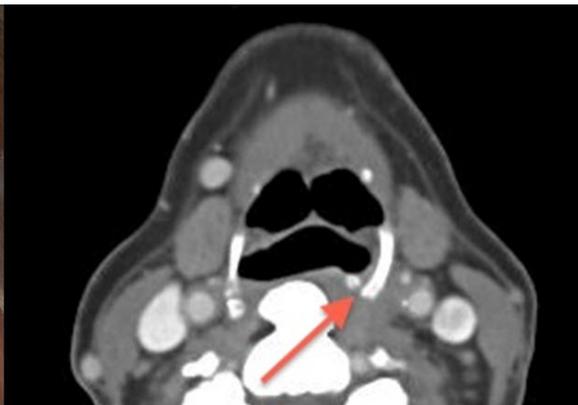


Figure 3. Photo showing the portion of greater horn of the hyoid bone that was debrided intraoperatively



Discussion

Traumatic fractures of the hyoid bone are a rare entity, with potentially life threatening complications and are often missed without a high index of suspicion. Common presenting symptoms are dysphagia, change in voice and stiffness secondary to pain. Most frequent presenting signs include anterior neck tenderness and swelling. Diagnosis is typically made using clinical findings along with a radiograph, CT scan, direct laryngoscopy, flexible nasal endoscopy or surgical inspection.

Conservative management with ice and analgesia is preferred when there is no evidence of perforation. A liquid diet can also be instituted until dysphagia subsides, or a feeding tube inserted.²

Symptomatic hyoid fractures associated with pharyngeal lacerations may require surgical repair or partial hyoid excision, as was the case with our patient.² With any respiratory compromise, there should be rapid intervention to secure the airway, either with endotracheal intubation or surgical tracheostomy.² At the time of writing, there are no randomised controlled trials regarding treatment of hyoid fractures.³

Mechanisms of hyoid injury have been most commonly reported and examined in the forensic literature.⁶ Studies have shown that the force required for fracture in the setting of manual strangulation is approximately 3.11kg. This is very much within an individual man or woman's one-handed grip strength.¹ Most commonly, the areas of the hyoid fractured during laboratory testing were between the body and the greater horn (48%), and the greater horn itself (49%).¹ This was in keeping with our case, where the greater horn was fractured, as shown in Image 3 above.

Other mechanisms reported include blunt force trauma secondary to sporting injuries, road traffic accidents, and falls.² Thus, injuries are usually preceded by notable events, usually obtained via history prior to physical examination; and are accompanied by other associated injuries such as fractures to facial and/or cervical bones. There has been a case report of hyoid fracture from hyperextension injury in the context of whiplash from a car accident, with no other associated injuries.³

In the case presented here, the mechanism of hyoid fracture was not able to be determined. The timing of symptoms however, point to an injury occurring perioperatively.

A known, although uncommon risk of direct laryngoscopy is pharyngeal laceration. During the intubation process, hyperextension of the neck, jaw thrust and cricoid pressure are common techniques used to improve visualisation. A possible explanation is that weakness in the wall caused by laceration, combined with hyperextension and pressure on the neck during intubation could be sufficient to cause fracture and subsequent protrusion of the hyoid bone into the hypopharynx, as seen on flexible nasal endoscopy.

An alternative explanation is that this could have happened during TOE. In total he underwent TOE on two occasions—once intraoperatively and once postoperatively. A rare complication arising from TOE is pharyngeal laceration and/or perforation.⁴

A common technique to increase the ease of scope insertion is the chin lift, where the mandible is manipulated with one hand in order to lift the tongue base forward. Grasping the larynx to distract it anteriorly and open the post cricoid region is a technique also described, and perhaps of all the manoeuvres this one would pose the greatest chance of hyoid bone fracture.⁵ As we have noted previously, the grip strength of a single person is sufficient to cause injury to the hyoid, and repeated handling of the neck may have been the cause for hyoid fracture in this case. However, we were unable to ascertain if this technique was used during our patient's procedure.

Hyoid fractures are rare, and not currently a recognised complication of either laryngoscopy, intubation, or TOE. Clinicians need to be mindful of the amount of force exerted on a patient's laryngeal skeleton during such procedures. Furthermore, patients with symptoms of neck swelling, stiffness and dysphagia after having these procedures should be treated with a high index of suspicion, and the appropriate investigations ordered to confirm the diagnosis.

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