

Laryngoscopy Complicated by Thyroid Cartilage Fracture

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THYROID cartilage fracture can result in upper airway obstruction and hypoxia. Although rare, it must be added to the differential diagnosis of postextubation problems. Issues related to thyroid cartilage fracture run the gamut from hoarseness to hypoxia. I describe a case of thyroid cartilage fracture resulting from laryngoscopy.

CASE REPORT

A 44-yr-old man with a thoracic aortic aneurysm presented for aortic arch grafting. He had a history of hypertension, alcohol abuse, smoking, and descending thoracic aortic aneurysm replacement 7 yr before this admission. There was no history of neck trauma, voice changes, difficulty swallowing, or respiratory problems. He was 6 feet (182 cm) tall and weighed 145 pounds (66 kg). His body mass index was 20 kg/m². After induction of general anesthesia, mask ventilation was easy. After paralysis with 60 mg rocuronium, laryngoscopy and intubation attempts with a Macintosh 3 blade, Miller 2 blade, stylet, and vigorous external laryngeal manipulation yielded only Cormack Lehane grade 3 views of the larynx. Adequate visualization of the larynx and intubation were achieved with a Glidescope® (Verathon, Bothell, WA) and Glidescope Reusable Stylet® (Verathon). External laryngeal manipulation was applied as forcefully as the assistant could perform the maneuver.

The endotracheal tube and Glidescope Reusable Stylet® were introduced beyond the vocal cords and into the larynx. After successful tracheal intubation, anesthesia and surgery progressed well. After the procedure, he was transferred to the intensive care unit, where he was extubated on postoperative day 3. Hoarseness was evident at that time and persisted to postoperative day 13. On day 13, computed tomography scan of the neck demonstrated a nondisplaced thyroid cartilage fracture (fig. 1). There was no significant laryngeal

hematoma or arytenoid cartilage dislocation. The pharynx, base of tongue, floor of mouth, and trachea were all grossly normal. He was discharged on postoperative day 14.

Discussion

Isolated thyroid cartilage fracture is a rare event.^{1,2} In the past, thyroid cartilage fracture was thought to result solely from external neck impaction. Blunt force trauma is the usual mechanism of injury.³ The most common setting is a motor vehicle accident in which the steering wheel or dashboard strikes the neck of a driver.⁴ Sudden forceful lateral hyperextension has been implicated in one case of thyroid cartilage fracture. Laryngeal fracture typically manifests as external bruising, subcutaneous emphysema, cuts, abrasions, upper airway obstruction, dysphonia, aphonia, or dysphagia.⁵ Mental status changes can result from upper airway obstruction producing hypoxemia rather than direct head trauma.^{6,7} Thyroid cartilage fracture from laryngoscopy has never been reported previously.

After extubation in the intensive care unit, hoarseness persisting to postoperative day 13 prompted laryngology consultation. Computed tomography scan of the neck demonstrated thyroid cartilage fracture. There was no history of neck trauma before entering the hospital. He did not present to the operating room with signs or symptoms of laryngeal fracture. There is no reason to suspect that the fracture predated his surgery. Induction of general anesthesia was standard, and the mask ventilation was uncomplicated. Neither anesthesia induction nor mask ventilation should jeopardize the thyroid cartilage. Multiple laryngoscopies with vigorous external laryngeal manipulation⁸ yielded only Cormack Lehane Grade 3 laryngeal views. Aspects of laryngoscopy could place the thyroid cartilage at risk for trauma during blade placement and laryngeal manipulation. Macintosh 3 and Glidescope® blades were positioned in the vallecula against the anterior airway wall. In this location, they reside posterior to the hyoid bone. During this difficult laryngeal exposure, maximal force was exerted on to the laryngoscope. Anterior laryngeal structures were stretched, placing them on unusually high tension. Vigorous external laryngeal manipulation could produce extraordinary forces on the thyroid cartilage. Thyroid cartilage fracture could result. This mechanism is analogous to that described by Lin *et al.*⁵

Another mechanism of injury can explain this complication. Glidescope® Reusable Stylets are rigid and approximate 60° angulation of the scope. Forcefully placing the tube-stylet unit deep into the larynx drives the stylet up against the anterior laryngeal wall, just behind the thyroid cartilage. In this way, vigorous advancement of the tube-stylet unit could exert substantial pressure on the thyroid cartilage, placing it

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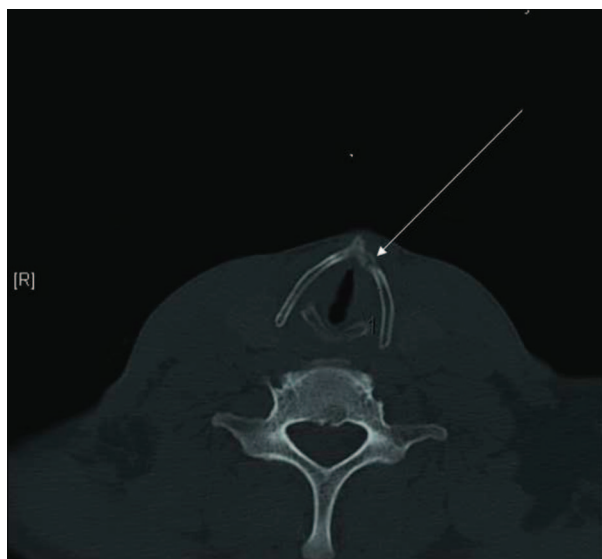


Fig. 1. Neck computed tomography scan demonstrating non-displaced left anterior thyroid cartilage fracture. Arrow points to the fracture.

at risk for fracture. If the stylet extends beyond the endotracheal tube, it becomes the leading edge of the tube-stylet unit and exerts even greater pressure on anatomic structures of the anterior neck. Under such circumstances, it could act like a chisel against the thyroid cartilage.

This is the first report of thyroid cartilage fracture resulting from laryngoscopy and intubation. Two mechanisms of injury are postulated. The first involves unusually forceful laryngoscopy and external laryngeal manipulation. The second describes placing a rigid curved stylet deep into the larynx. To avoid this complication, extreme force during laryngoscopy and external laryngeal manipulation should be avoided. If adequate laryngeal views are unobtainable without unusual force to the larynx, then an alternative technique such as flexible fiberoptic laryngoscopy may prevent thyroid cartilage fractures. In addition, rigid curved stylets should be introduced only between vocal cords. Once positioned at the

cords, tracheal tubes should be advanced over rigid stylets into the larynx and trachea. Malleable stylets conform to laryngeal anatomy more gently than rigid stylets and are far less likely to exert substantial forces to airway structures.

Summary

This patient presented to the operating room without a history of neck trauma and without signs or symptoms of laryngeal fracture. No part of his anesthetic, other than laryngoscopy and intubation, placed him at risk for thyroid cartilage damage. His surgery was thoracic not cervical. Nevertheless, thyroid cartilage fracture was documented postoperatively. Mechanisms by which laryngoscopy and intubation could explain this finding are described. Even during difficult laryngoscopies, gentle manipulations are best. If undue force is required, another intubation technique, such as flexible fiberoptic laryngoscopy, could prevent such complications.

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