The “Closed-Airway Sneeze”: An Unusual Cause of Laryngeal Fracture

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Abstract
Laryngeal fracture is a potentially life-threatening injury that occurs most commonly by trauma to the external neck. In rare instances, endolaryngeal trauma can also result in laryngeal fracture. We report a rare case of laryngeal fracture due to increased intraluminal pressure during a “closed-airway” sneeze. Case: A 38 year old man presented to the emergency department one day following a vigorous closed-airway sneeze that resulted in throat pain, mild hemoptysis and hoarseness. Physical examination revealed crepitus of the anterior neck soft tissue without signs of external trauma. CT scan of the neck confirmed an airway injury with a minimally-displaced fracture of the thyroid cartilage and extensive subcutaneous emphysema. Objective Describe this unique case and review the literature for management considerations that apply to endolaryngeal fractures Study Design: Case Report.

Methods: Data was collected via a chart review.

Results: The patient regained full laryngeal function without complication following conservative medical management. Conclusions: Medical management can be successfully instituted in cases of laryngeal fracture when there is lack of concomitant surrounding tissue injury.

Case
A 38-year-old man presented to the emergency department one day following a vigorous sneeze during which he pinched his nose and closed his mouth (“Closed-airway sneeze”). The patient felt a pop during the sneeze followed by mild hemoptysis, throat pain, and hoarseness. He denied any history of anterior neck trauma on extensive questioning. He had fallen 2.5 years prior, but did not have soft tissue neck trauma as confirmed by CT scan at that time (Figure 1A). He was otherwise healthy without contributory medical history. Physical examination revealed mild hoarseness and crepitus of the anterior neck without signs of external trauma. Fiberoptic laryngoscopy demonstrated normal vocal fold motion with mild anterior subglottic edema and no mucosal disruption (Figure 2). Contrast-enhanced CT scan of the neck revealed a minimally displaced, longitudinal fracture of the thyroid cartilage with marked retropharyngeal and parapharyngeal emphysema (Figure 1B,3). Barium swallow demonstrated no extravasation of contrast.

The patient was admitted for airway observation and serial fiberoptic laryngoscopy. Medical interventions included cool mist oxygen (face mask), systemic corticosteroids (dexamethasone 10mg intravenous every 8 hours for 36 hours), anti-reflux therapy (omeprazole 20mg twice daily), pain medication (oxycodeone 5mg QID), systemic antibiotics (cefazolin 2gm intravenous every 8 hours), voice rest, and head of bed elevation. At 48 hours post-admission, his neck pain had improved and the crepitus had resolved. The mild hoarseness was unchanged from admission with repeat laryngoscopy demonstrating improvement of the subglottic edema. He was discharged on hospital day 3 with an oral methylprednisolone tapering regimen and directions for a soft diet, voice rest, and outpatient follow-up. He had complete resolution of symptoms at 3 days following discharge with a normal examination at 1 week and 2 month follow-up appointments.

Discussion
Laryngeal fracture is a rare clinical entity that is most commonly caused by external trauma to the neck. Alternately, endolaryngeal fractures can occur with intubation or operative manipulation. This report presents a unique mechanism of endolaryngeal injury: increased intraluminal pressure generated during a closed-airway sneeze.

The act of sneezing is a highly coordinated protective reflex that is stimulated by irritation of the upper respiratory tract and mediated by the trigeminal nerve. Airway pressures rise acutely during a sneeze as the abdominal, diaphragmatic, intercostal, and pharyngeal musculature contract. The mean peak intraluminal pressure during tidal breathing is 0.9(±0.4) mmHg and increases to 4.6(±3.8) mmHg during a sneeze. However, preventing escape of the air after glottic opening, as in a closed-sneeze, allows peak pressures to rise to 176 mmHg, more than 38 times the pressure of a normal sneeze³.

Case
A 38-year-old man presented to the emergency department one day following a vigorous sneeze following a closed-airway sneeze was reported over 60 years ago; however, the diagnosis was based solely on physical exam².

Management of thyroid cartilage fractures can vary depending on the severity and concomitant injuries. A classification scheme for laryngeal injuries has been proposed⁴. The patient’s injuries in this case would best be classified as a type II injury. While the recommended treatment for type II injuries is tracheotomy, medical management was in this case due to minimal endolaryngeal findings and the unique mechanism of injury which occurred without external neck trauma. When appropriate laryngeal injuries are treated non-operatively, good outcomes are expected for voice quality and airway patency⁵.

Conclusion
This case demonstrates the first confirmed report of a laryngeal fracture caused by a closed-airway sneeze in the English literature. While careful airway evaluation and close observation are needed for all laryngeal fractures, medical management can be successfully instituted when there is lack of concomitant surrounding tissue injury, as demonstrated in this case.

Table 1: Grading system for laryngeal fractures⁴

<table>
<thead>
<tr>
<th>Grade</th>
<th>Injury</th>
<th>Proposed management</th>
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<tbody>
<tr>
<td>I</td>
<td>Minor endolaryngeal hematoma without detectable fracture</td>
<td>Medical management</td>
</tr>
<tr>
<td>II</td>
<td>Edema, hematoma, minor mucosal disruption without exposed cartilage, nondisplaced fracture noted on CT scan</td>
<td>Tracheotomy</td>
</tr>
<tr>
<td>III</td>
<td>Massive edema, mucosal tears, exposed cartilage, cord immobility</td>
<td>Tracheotomy</td>
</tr>
<tr>
<td>IV</td>
<td>A group III with more than two fracture lines or massive trauma to the laryngeal mucosa</td>
<td>Tracheotomy, Stent placement</td>
</tr>
<tr>
<td>V</td>
<td>Complete Laryngotracheal separation</td>
<td>Secure airway, Surgical repair</td>
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References