

## Massive subcutaneous emphysema during bag-mask ventilation after failed intubation

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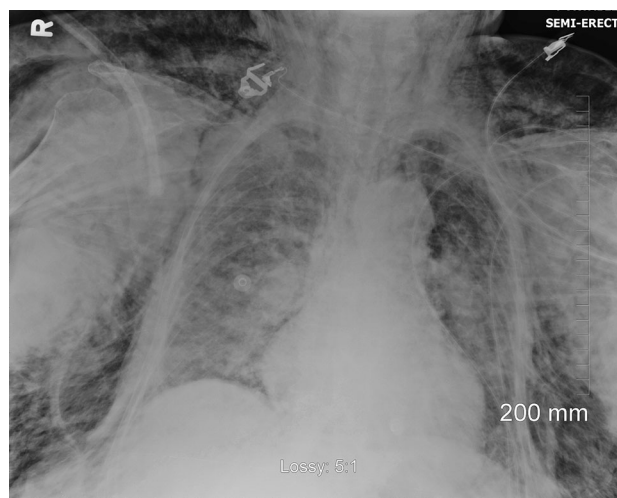
An 84-yr-old woman with a history of obesity and hypertension presented to the Emergency Department with sudden onset of left-sided facial droop, hemiparesis, and dysarthria. After a computed tomography scan showed occlusion of the right cerebral artery, she was administered intravenous thrombolysis with a tissue plasminogen activator. Shortly thereafter, she developed an allergic reaction manifesting as laryngofacial angioedema and required intubation.

Following three unsuccessful intubation attempts, an anesthesiologist was called to provide airway assistance. Intubation was challenging because of an enlarged tongue and substantial facial swelling. The anesthesiologist placed an endotracheal tube twice, first with a Bullard laryngoscope (Circon ACMI, Stamford, CT, USA) and then with GlideScope (GVL; Verathon, Bothell, WA, USA). However, there was no carbon dioxide (CO<sub>2</sub>) detected using a colorimetric detector (CO<sub>2</sub> Easy; Westmed, Tucson, AZ, USA), and significant oxygen saturation (SaO<sub>2</sub>) occurred.

Following a fifth attempt at intubation, bag-mask assistance for ventilation became more difficult, with the SaO<sub>2</sub> stabilizing in the high 80s and low 90s. The patient

exhibited increased soft tissue swelling of the neck and upper chest with prominent subcutaneous crepitus. Portable chest radiography confirmed extensive subcutaneous emphysema (Figure). As an otolaryngologist prepared for an emergency bedside tracheostomy, a final intubation attempt was successful using a flexible bronchoscope, during which a large supraglottic laryngeal perforation was noted in the right laryngeal ventricle.

Airway injury during emergency room intubation has been reported to occur in up to 0.2% of attempts.<sup>1</sup>



**Figure** Portable semi-upright chest radiography provided this radiograph of an 84-yr-old woman who developed laryngofacial angioedema after an allergic reaction to thrombolytic administration used to treat an acute stroke. After several emergent attempts at tracheal intubation, a large laryngeal perforation resulted in massive subcutaneous emphysema during bag-mask ventilation

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Fortunately, laryngeal perforation is a rare subset of these injuries. The most significant risk factor for airway perforation is a difficult airway,<sup>2</sup> particularly when multiple attempts at intubation have occurred.<sup>3</sup> Airway providers should maintain a high index of suspicion for perforation during the peri-intubation period, being alert for the appearance of subcutaneous emphysema, pneumothorax, or pneumomediastinum, particularly in the context of a difficult intubation with multiple prior attempts. Capnography monitoring should be employed. The absence of CO<sub>2</sub> detection following intubation should alert the operator to a potentially misplaced endotracheal tube. Flexible bronchoscopic intubation is the preferred method to secure the airway for suspected airway injuries.

**Conflicts of interest** None declared.

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