

Emergent Retrograde Tracheal Intubation with a Gum-Elastic Bougie in a Trauma Patient

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BACKGROUND: Patients with severe maxillofacial trauma pose a challenge when their airways must be secured. Often, emergent surgical airways are established when laryngoscopy or fiberoptic intubation are unsuccessful. When an airway cannot be surgically established, the anesthesiologist is forced to use novel approaches to airway management, but there are few descriptions of such techniques in the literature.

METHODS: After unsuccessful laryngoscopy and a failed cricothyroidotomy and tracheostomy in a patient with deforming maxillofacial trauma, a gum-elastic bougie was inserted retrograde through a tracheal defect in a cephalad manner and exited the patient's mouth.

RESULTS: The patient was successfully intubated using a modified retrograde technique through a tracheal defect with a gum-elastic bougie.

CONCLUSIONS: When an uncontrolled airway cannot be secured surgically and a tracheal defect is present, retrograde intubation with a gum-elastic bougie may be considered as an emergent management option.

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Emergent surgical airways are often established in trauma patients. This case report describes the novel use of a gum-elastic bougie for retrograde intubation after a failed surgical airway in a trauma patient.

CASE REPORT

The patient was a morbidly obese 25-yr-old man who sustained an open-head injury while cutting tree branches. He was found unresponsive and bleeding from the mouth, ears, and nares. His Glasgow Coma Scale score was 3 at the scene, and breathing was agonal. The emergency medical providers could not intubate the trachea with conventional laryngoscopy nor could they insert a Combitube. An emergent cricothyroidotomy was unsuccessful because of the patient's injuries. He was transported to our institution while being mask-ventilated with great difficulty with an oral airway in place.

When the patient arrived in the emergency department, his oxygen saturation by pulse oximetry (SpO₂) was 80%–84% despite bag-mask ventilation with 100% oxygen. The trauma surgeon extended his cricothyroidotomy incision in an attempt to establish a tracheostomy. Because of the girth of the patient's neck, along with continuous bleeding, exposure was extremely difficult. The tracheostomy cannula could not be passed into the open trachea. His SpO₂ decreased to <60% and he became bradycardic.

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The anesthesia service was called for emergent airway management. Direct laryngoscopy with in-line cervical stabilization was attempted, but the redundant tissue, small mouth, and copious bleeding made visualization impossible. Retrograde intubation with a wire was considered, but because of the now nearly occluded airway, it was felt the wire would not pass effectively. Since the trachea was already open, a gum-elastic bougie (Portex-SIMS, Hythe, Kent, UK) was passed angled-tip first through the tracheal rent below the cricoid cartilage in a cephalad direction. The bougie was palpated in the midopharynx and guided out the mouth. An 8.0 endotracheal tube was passed successfully over it. When the endotracheal tube reached the tracheal rent, the bougie was removed and the airway secured. End-tidal carbon dioxide was detected, bilateral breath sounds and chest rise were auscultated, and the patient's SpO₂ increased to 95%. Despite a secure airway, the patient died about 15 min later because of his injuries.

DISCUSSION

The "cannot intubate/cannot ventilate" scenario is one of the most stressful situations the anesthesiologist may face. The ASA has developed a well-known difficult airway algorithm to help guide the practitioner in such situations (1). Emergent surgical airway (i.e., cricothyroidotomy or tracheostomy) is the main end-point of this algorithm. If it fails, as in this case, the anesthesiologist is forced to innovate.

Although using a bougie to assist in a retrograde intubation is novel, devices other than a wire have been used for guiding the endotracheal tube in a retrograde fashion. Butler and Cirillo (2) originally described retrograde intubation nearly 50 yr ago for intraoperative placement of an oral endotracheal tube using a preexisting tracheostomy. The endotracheal tube was passed over a 16F catheter attached to a

curved wire stylet introduced through the patient's tracheal stoma. There were no reported complications in the original article. Barriot and Riou (3) mention using a central venous catheter as a guide because it allowed air to be injected to locate it in the mouth of patients with severe maxillofacial trauma. The premise is that abnormal or obstructing airway anatomy may pose a challenge in passing a more flexible guide, and that copious secretions can make finding it difficult in the oropharyngeal space.

There is little information regarding the rate of failed emergent cricothyroidotomy. A case series and literature review by Isaacs and Pedersen (4) reports that of 65 emergent cricothyroidotomies performed at their institution, 49 airways were successfully secured, 13 were uncertain but probably secured, and 3 (4.6%) failed to secure the airway. Their review of nine other case series indicates 308 of 320 airways (96%) were secured. In neither study is mention made of airway management after a failed surgical airway. A more recent case series by Wright et al. (5) reports 100% success on 46 of 46 emergent cricothyroidotomies, including five patients with gunshot wounds to the face.

A literature search did not find another instance of this variation of airway management. Seinfeldt et al. (6) describe using a gum-elastic bougie to secure the

trachea in a penetrating zone II neck injury; however, the bougie was passed antegrade through an exposed trachea. Antegrade placement was not an option in our scenario. Clearly, retrograde intubation using a bougie will never be a typical method for securing an airway. The risks include creating a false passage with the bougie, vocal cord injury, retropharyngeal hematoma, and damage to supraglottic and oropharyngeal structures. However, when an emergent tracheostomy fails to secure an airway and a tracheal rent is present, this may be a "last resort" option.

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