

Use of a Gum Elastic Bougie in a Penetrating Neck Trauma

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GEB: gum elastic bougie

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Abstract

The case of a patient with a zone II penetrating neck injury who was intubated successfully utilizing the gum elastic bougie (GEB) is reported. He presented at a forward operational base in Afghanistan with a shrapnel wound in his neck as well as a cough and hoarseness. There were two wounds on each side of his laryngeal cartilages. The patient's breathing rate gradually increased and labored inhalation developed while the aeromedical evacuation was delayed for tactical reasons. Subcutaneous emphysema and edema concealed the anatomical landmarks, making a cricothyrotomy unsafe, and no fiber optic devices were available on site. Intratracheal intubation was decided upon by the doctors involved. Because of the anticipated difficulty of intubation, the GEB was used from the outset. During direct laryngoscopy, edema, blood, and mucus concealed the anatomic reliefs of the larynx. The glottis was not visible. On the second attempt, "clicks" were clearly perceived and the tube was railroaded over the bougie. Finally, the patient was evacuated to an Afghan military hospital.

In this report, the benefit-risk balance for the use of the GEB in penetrating neck trauma is discussed. Although the use of the GEB cannot be recommended in all cases of penetrating neck injury, it should be considered as an option. This technique is not without risk, but in very remote settings or hostile environments, especially when cricothyrotomy is not possible, it can be lifesaving.

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Introduction

Head, face, and neck trauma are common on the battlefield. They account for 20%-30% of soldiers' wounds in modern wars (Iraq and Afghanistan).¹ Three percent to six percent of those lesions are fatal.² Uncontrollable hemorrhage is the most common cause of death.³ Airway management can be difficult in such situations. There could be injury to the airway and airway obstruction could happen anytime, even with a seemingly stable patient. Videolaryngoscopy, or fiber optic devices, are useful but not always available in remote settings; cricothyrotomy is not always feasible with injuries to the larynx. This report describes the case of a patient with a zone II penetrating neck injury who was successfully intubated utilizing the gum elastic bougie (GEB).

Report

An Afghan soldier presented himself at a forward operational base in Afghanistan with a shrapnel wound in his neck as well as a cough and hoarseness. The patient was conscious and able to stand, and was placed in a half-sitting position. His hemoglobin oxygen saturation was 92%, and it increased to 95% with oxygen inhalation. There were two wounds on each side of his laryngeal cartilages, in the zone II of the neck. Subcutaneous emphysema and edema made determining the exact location of the lesions impossible. There was neither uncontrolled hemorrhage nor other injury.

The patient's evacuation was organized. His breathing rate gradually increased and inhalation became labored while his evacuation was delayed for tactical reasons. The patient became agitated.

Airway management of such a patient in a helicopter during an aeromedical evacuation was expected to be difficult. The neck's anatomical landmarks were concealed by subcutaneous emphysema and edema, preventing the doctors from performing a cricothyrotomy. There was

no fiber optic device on site. An intratracheal intubation, using a GEB, was decided upon by the doctors involved.

After preoxygenation, rapid sequence intubation was carried out using the GEB. During direct laryngoscopy, the glottis was not visualized. The lumen was completely obstructed by the edematized and bleeding laryngeal mucosa, concealing the anatomical landmarks of the glottis. The bougie was blindly passed as anteriorly as possible, just behind the epiglottis. On the second attempt, no resistance was felt and "clicks" were clearly perceived as the tip of the bougie passed over the tracheal rings, attesting to the tracheal placement of the bougie. The lubricated tube was railroaded over the bougie while maintaining the grip on the laryngoscope blade. To facilitate the passage of the bevel through the laryngeal structures (especially arytenoids), the endotracheal tube was rotated approximately 90 degrees. Nevertheless, the tube did not advance easily, and the cricoid pressure had to be released to make it easier. The proper endotracheal tube positioning was finally confirmed by a positive colorimetric end-tidal CO₂.

The risk of a tension pneumothorax was controlled after beginning positive pressure ventilation. A cervical collar was applied. Finally, the patient was evacuated to an Afghan military hospital. Unfortunately, no information about care or the extent of the wounds was obtained from the Afghan hospital, but records indicate the patient left the hospital and went home.

Discussion

This case illustrates the performance of the GEB, even in penetrating neck trauma. Such management cannot be considered as optimum in a developed country; in this case, the austere environment and the remote setting led to the decision to use the GEB.

In an urban environment, such a patient (conscious and breathing) should not be intubated until he is in an operating room where a surgical tracheotomy can be performed, or in the emergency room with a fiber optic device available.⁴ Pending airway management, the patient requires oxygen. He has to be positioned in a half-sitting position, and he must not be left alone. Conscious sedation may be useful if agitation appears. The patient must be moved to the operating room as soon as possible. Except for critical situations like impending asphyxia, airway management can be delayed briefly in order to exercise

maximum caution. Here, the delayed evacuation, the inability to provide care in the helicopter, and the worsening of symptoms made the doctors involved decide to manage the airway on the spot.

In this case, there were two options: (1) an infraglottic surgical approach with a cricothyrotomy, a well-understood procedure taught in military settings;⁵ or (2) an intratracheal intubation, which appeared to be difficult. Subcutaneous emphysema and edema made the recognition of neck's anatomic landmarks complicated. Furthermore, cricothyrotomy is not recommended in cases of suspicion of laryngeal fracture.^{5,6} The benefit-risk balance for cricothyrotomy was not favorable. Intratracheal intubation was therefore preferred. Because of the anticipated difficulty of intubation, the GEB was used at the outset.

Performance of the GEB is well documented and reliable.^{7,8} Success rates of the bougie in emergency settings on unexpectedly difficult airways range from 70%-80%.^{8,9} Although some authors recommend it as the first adjunct in such situations,^{10,11} there is little data on its use in the case of a penetrating neck trauma. In most cases, intratracheal intubation is feasible without using any advanced method.^{12,13} Furthermore, for casualties with penetrating injuries, especially in zone I, the bougie must be used with great caution. The tip of the bougie can easily penetrate a tracheal tear, and the risk of false passage is high. In such cases, priority must be given to the cricothyrotomy if the technique is feasible.¹⁴ This is why there are almost no cases reported where a GEB is used in a penetrating neck trauma. Steinfeldt et al have reported one case, but they have inserted the bougie directly through the anterior open neck.¹⁵ This case highlights the usefulness of the GEB for airway management of penetrating neck injuries in an austere environment.

Conclusion

Although the use of the GEB cannot be recommended in all cases of penetrating neck injury, it should be considered, especially in remote settings when cricothyrotomy is impossible. This technique is not without risk, but in hostile environments, it can be lifesaving. In such an unusual situation, the attending physician must adopt an approach to airway management based on the individual clinical scenario and the circumstances, rather than relying on a preset algorithm.

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