

OPIS PRZYPADKU / CASE REPORT

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Bougie-assisted external intubation in a woman with complete tracheostomy obstruction in prehospital care – case report**Ho Hsin-lu¹, Przemysław Kluj², Paweł Ratajczyk², Tomasz Gaszyński²**¹ Student Scientific Club of Innovations in Resuscitation, Critical Care and Emergency Medicine at the Department of Anesthesiology, Intensive Care and Pain Management, Medical University of Lodz² Department of Anesthesiology, Intensive Care and Pain Management, Medical University of Lodz**Abstract**

In the past few decades, the issue of rapid airway management in emergencies has been widely discussed. It poses significant challenges, especially in prehospital care, where precise timing of intervention is crucial for patient survival. Considering patients' conditions, in severe airway obstruction 'can't intubate, can't oxygenate' scenario, how to handle the emergent settings is even critical for patient prognosis and survival. More devices and tools are newly designed to help handle emergencies more efficiently. For example, a bougie guide has facilitated the process of external intubation, not only by reducing the time of the process but also by significantly lowering its complications. This case report presents the successful management of a complete tracheostomy obstruction in a female patient in a prehospital setting using bougie-assisted cricothyroidotomy. The bougie guide, a helpful tool, provides an efficient solution for external intubation when standard methods are ineffective and when the time of intervention matters. The case underscores the importance of bougie as a life-saving tool in prehospital emergency airway management. *Anestezjologia i Ratownictwo 2024; 18: 249-253. doi:10.53139/AIR.20241829*

Keywords: prehospital care, tracheostomy obstruction, bougie guide, external intubation

Introduction

Airway management in emergency settings is a critical and challenging aspect of prehospital care. The rapid assessment and intervention required in cases of airway obstruction can significantly impact patient outcomes. Bougie guide, a gum-elastic endotracheal tube introducer, is a useful tool to facilitate the process of external intubation in emergent situations, especially in prehospital care. This helps in reducing the time for ventilation and the risk of complications compared to other intubation techniques [1].

External intubation is of importance for patients under conditions 'can't intubate can't oxygenate' (CICO) or complete ventilation failure [2]. Criteria

for declaring a CICO situation includes anesthetized child who cannot be woken rapidly or is unconscious with GCS score under 8, unable to intubate, unable to oxygenate/ ventilate with either an oropharyngeal airway or a two-person ventilation technique, oxygen saturation below 80% with bradycardia, reversible causes that have been excluded or cricoid pressure (if applied) that has been removed. Under this situation, a passage between the anterior part of the neck and trachea must be created in order to deliver the oxygen to maintain the oxygen saturation in the body, which can be done by tracheostomy or cricothyroidotomy.

Tracheostomy refers to the procedure that creates a temporary opening in the trachea and exteri-

orizes the trachea to the skin of neck for producing a more permanent fistula [3]. Standard surgical cricothyroidotomy, also called emergency surgical airway (ESA), is a procedure for securing the airway by making an incision in the cricoid membrane. While these two methods play important roles of airway management in emergencies, it comes to attention that the bougie-aided cricothyroidotomy is much more efficient in terms of external intubation especially in the patients under CICO situation. This case report details the successful use of bougie-assisted external intubation in a prehospital environment to manage a complete tracheostomy obstruction in a woman.

Case report

A two-person emergency medical services team (EMS) was dispatched to a 71-year-old woman with shortness of breath resulting from tracheostomy obstruction. The event was dispatched with the first urgency code. The time to reach the scene of the incident from the moment of receiving the order was 6 minutes.

After reaching the patients' apartment, which was located on the 2nd floor of the building, the team found a woman lying in bed who, when the rescuers arrived, showed symptoms of complete airway obstruction. The first impression was bad. The woman was unable to inhale or exhale air through the tracheostomy. There were traces of dried blood and granulation tissue around the hole. There was no tube inserted into the tracheostomy opening. Initial examination revealed complete tracheostomy obstruction caused by accidental prolapse of the tracheostomy tube during routine toileting.

In order to accurately illustrate the case, the ABCDE examination scheme will be used - derived from European Resuscitation Council (ERC) Advanced Life Support (ALS) - routinely used in pre-hospital care, where in general A (Airways) corresponds to the assessment of the airway patency, B (breathing) - the assessment of breathing, C (circulation) - the assessment of the circulatory system, D (disability) - assessment of the nervous system, E (exposure, environment) - patient exposure, assessment of the scene of the incident, overall assessment of the situation.

Initial "ABC" pre-examination:

- A - obstructed (tracheostomy tube falling out, bleeding).
- B - inability to take a breath, no chest movements, spo₂ 45%, facial cyanosis, extra respiratory muscles activated, no respiratory sounds, no breath sounds, trachea in axis, jugular veins not visible.
- C - pulse palpable in the carotid and radial arteries, approximately 120/min - the assessment of other cardiac parameters was not performed due to the direct life-threatening airways obstruction.

Medical interview (background story):

The patient's son was present at the scene and took care of his mother at home. Four months earlier, the mother had suffered an ischemic stroke. During a hospital stay due to a stroke, sepsis occurred and the patient was introduced to a coma afterwards connected to a respirator within the ICU for 3 weeks. She has been under his care at home for a week. According to obtained information from the son, the tracheostomy tube fell out accidentally. The man tried to insert the tube himself, but without success. Additionally repeated attempts caused damage to the tracheostomy and bleeding, and also damaged the ring securing the tube, which made it impossible to re-use.

The intervention performed after the pre-examination:

- A - suctioning the tracheostomy opening with an automatic suction device, leaving a patent suction catheter in the trachea. Inserting the catheter to a depth of approximately 3 cm into the trachea allowed the patient to minimally resume gas exchange. Oxygen supplementation using an improvised method through a suction catheter, approximately 12l/min.
- B - return of respiratory function in the form of shallow chest movements, spo₂ 65%, facial cyanosis, additional respiratory muscles activated. Some breath sounds appeared over the lungs, sounds around the tracheostomy, trachea in axis, jugular veins not visible.
- C - pulse palpable on the carotid and radial arteries approx. 110-120/min, BP 150/90, heart sounds, intravenous access green 20G. Due to the persistent desaturation, the full further CDE examination still were not performed.

The implementation of the above described procedures enabled a more detailed inspection of the wound and planning of further treatment of the patient.

Due to persistent airway obstruction, which could turn back into complete obstruction at any time a decision was made to perform the bougie-assisted external intubation procedure using the tactical version of the bougie guide (photo 1) and endotracheal tube 6.5 ID (photo 2).

After suctioning the tracheostomy opening with a suction device, widening the opening with the rescuer's finger and inserting a bougie guide to a depth of approximately 5 cm, endotracheal tube was inserted to the trachea. To reduce pain, the patient received 50 µg of fentanyl intravenously before the procedure.



Photo 1. Bougie guide – tactical version
Source: private collection Przemysław Kluj

After the procedure, the following vital signs were obtained in the full ABCDE examination:

- A – patent, secured with an endotracheal tube stabilized with a dedicated for endotracheal intubation immobilization set (adapted to the place where the tube is placed).
- B – 14 breaths/minute, spo2 98% at 6l/min, alveolar sounds bilaterally over the entire lungs. Trachea in axis, jugular veins invisible, no signs of external bleeding around the wound.
- C – pulse palpable on the carotid and radial arteries approx. 100/min, BP 140/90, ECG – normal.
- D – patient is trying to speak, all other parameters in normal range.
- E – obesity, bedridden person, laryngeal laxity due to long hospitalization in the ICU over the last month.



Photo 2. Female after bougie-assisted external intubation performed in pre-hospital environment.

Source: private collection Przemysław Kluj

To avoid the tube falling out and causing secondary injuries, the patient was placed on a rigid spine board and the fire brigade was asked to help with carrying patient down the stairs and placing her in the ambulance.

During transport without complications - parameters in the photo 3. The patient was transferred to the ED in a stable condition, with a patent airway.

Discussion

Tracheostomy is a frequently performed procedure in long-term ventilated and neurologically impaired patients. The primary indications for tracheostomy are upper airway obstruction to facilitate weaning from mechanical ventilation, secure management of the airway, and for clearance of bronchial secretion [4,5]. Accordingly to the publications present in the literature, accidental dislocations of tracheostomy cannula are common and often related with mechanical



Photo 3. Patients' clinical parameters during transport to the hospital.

Source: private collection Przemysław Kluj

and patient-threatening complications especially in pre-hospital care where resources are always limited.

Wiefhoff et. al. within one year observational study performed in Germany, demonstrated that recannulation after accidental dislocation was accompanied by 29% of mechanical complications during reinsertion, and 16% led to patient-threatening complications [5].

In another study, Ishizaki et. al. demonstrated dislocation rates among adult patients in Japan that increased rapidly up to 3 months after tracheostomy and reaches 41% among 752 patients that underwent tracheostomy. Additionally authors emphasized that older age, female sex, emergency endotracheal intubation, cerebrovascular disease, head injuries, and cardiac arrest were associated with prolonged tracheostomy [6].

According to existing literature, the incidence of difficult endotracheal intubation ranges from 3% to 10%. While complications such as hypoxemia and aspiration are less likely to occur when the intubation is successful on the first attempt, the rate of first-attempt success in emergencies is generally below 90%. [7, 8]

A systematic review by von Hellmann et al. assessed the effectiveness of using a bougie—a semi-rigid introducer designed to assist with intubation—compared to a stylet or no introducer. The findings revealed that the bougie significantly increased the success rates of the first intubation attempt, with an 11% improvement in general cases and a 60% increase in patients with difficult airways. This highlights the bougie's effectiveness in improving first-pass success, particularly in challenging scenarios [8].

The utility of bougie guides extends beyond adult patients to pediatric cases. A 2024 review by Belal et al. noted that pediatric intubations represent a smaller fraction of overall cases, which leads to higher complication rates due to less frequent practice and unique anatomical challenges. Bougies designed for pediatric airways not only improve first-pass success and reduce intubation time, but they also demonstrate versatility in managing complex airway situations, such as in children with craniofacial anomalies or syndromes like Pierre Robin Sequence [9].

In resource-limited settings (RLS), simple tools like bougie guides are often favored over more advanced devices like video laryngoscopes. Bougies are significantly more affordable than video laryngoscopes, making them a practical option in settings with limited resources [9].

Patients with tracheostomies present unique challenges when it comes to complications and post-operative care by caregivers. Firstly, the risk of obstruction is one of the major difficulties after tracheostomy as the tracheal tubes may be blocked or dislodged due to mucus, blood clots, or granulation tissue built up around the incision site. Secondly, due to the limited access to the airway in such patients, unlike other alternative pathways such as oral or nasal airways, obstructions followed by tracheostomies are dangerous and life-threatening. Finally, education for the caregivers regarding routine care or emergency responses to reduce complications is essential. In this scenario, the patient's son's well-meaning but unsuccessful attempts to re-insert the tube caused additional injury, making the intervention somehow more complicated. [10]

Conclusions

This report highlights the critical nature of airway management in the pre-hospital setting, especially in our case, the complete airway obstruction followed by

tracheostomy. The 71-year-old patient with a history of mechanical ventilation during prolonged ICU stay after stroke and sepsis experienced a complete airway obstruction due to the accidental dislodgement of the tracheal tube during routine care at home.

Under the situation, the systematic application of ABCDE assessment for emergencies ensured a comprehensive and prioritized response from the EMS. The decision to perform the procedure with a bougie guide demonstrates the importance of EMS proficiency in advanced airway techniques. Furthermore, the use of analgesics such as fentanyl and the improvised solutions for temporary oxygenation such as a suction catheter also show the competence of the EMS.

Summary

The prompt and systematic approach and the combination of clinical skills, use of advanced techniques, and effective team coordination demonstrated

by the EMS team in this case likely prevented a fatal outcome in pre-hospital airway management. This report emphasizes the need for ongoing education, training, and allocations of new resources to support EMS providers in coping with difficult emergencies.

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Conflict of interest

None

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Piśmiennictwo/References

1. Braude D. The bougie-aided cricothyrotomy. *Air Med J.* 2009 Jul-Aug;28(4):191-4.
2. Myatra SN Critical language during an airway emergency: Time to rethink terminology? *Indian J Anaesth.* 2020 Apr;64(4):275-279.
3. Cheung NH. Tracheostomy: epidemiology, indications, timing, technique, and outcomes. *Respir Care.* 2014 Jun;59(6):895-915; discussion 916-9.
4. Durbin CG Jr. Indications for and timing of tracheostomy. *Respir Care.* 2005;50:483-7.
5. Wiefhoff J. Incidence and complications of cannula changes in long-term tracheotomized patients: a prospective observational study. *Spinal Cord* 58, 11-17 (2020).
6. Ishizaki, M., Tracheostomy decannulation rates in Japan: a retrospective cohort study using a claims database. *Sci Rep* 12, 19801 (2022).
7. Driver B. BOugie or stylet in patients UnderGoing Intubation Emergently (BOUGIE): protocol and statistical analysis plan for a randomised clinical trial. *BMJ Open.* 2021 May 25;11(5):e047790.
8. von Hellmann R. Effect of Bougie Use on First-Attempt Success in Tracheal Intubations: A Systematic Review and Meta-Analysis. *Ann Emerg Med.* 2024;83(2):132-44.
9. Belal M. Improving airway management in pediatric emergency intubation: A narrative review with a focus on bougie guidance in settings with limited resources. 2024;10. *Hong Kong Journal of Emergency Medicine.*
10. Aaron J. Prehospital Cricothyrotomy: A Narrative Review of Technical, Educational, and Operational Considerations for Procedure Optimization. *The Journal of Emergency Medicine.* 2024.