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Case Report

Massive immediate post-tracheostomy bleeding from the innominate artery

Nurul Najwa Mohd Zakir[1,2], *Irfan Mohamad*[1], *Shen-Han Lee*[2], *Zulkifli Yusof*[2], *Zahidah Muhammod Riaz*[3]

[1] *Department of Otorhinolaryngology, Head and Neck Surgery, School of Medical Sciences, Universiti Sains Malaysia, Kubang Kerian, Kelantan, Malaysia*
[2] *Department of Otorhinolaryngology, Head and Neck Surgery, Hospital Sultanah Bahiyah, Alor Setar, Kedah, Malaysia*
[3] *Department of Radiology, Hospital Sultanah Bahiyah, Alor Setar, Kedah, Malaysia*

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Abstract

Introduction: Tracheostomy is a surgical airway management procedure that involves making an incision on the anterior neck and opening a direct airway through an incision in the trachea.

Aim: We report a case of a difficult tracheostomy complicated by massive immediate bleeding from the innominate artery that required a median sternotomy for vascular access and control.

Case study: A 26-year-old lady with a short neck underwent a tracheostomy in a semi-emergency setting in view of prolonged intubation and frequent intubation prior. The tracheal incision was performed in between the 3rd and 4th tracheal rings and was complicated by massive bleeding from the innominate artery tear that was located below the sternum and necessitated a midline sternotomy procedure to access the artery. The artery was then repaired primarily and covered with a strap muscle that was swung over to the right and sutured to the periosteum of the right clavicle. She lost 6 L of blood, prompting a massive blood transfusion. Postoperatively, there was no bleeding from the wound, but she had an infected sternotomy wound that was managed with antibiotics and dressings. The tracheostomy tube care was uneventful.

Results and discussion: The short-neck hyperextension during trachea exposure can cause major thoracic vessels and tracheal rings to move upward, leading to tracheal incisions being made lower than intended and risking major vessel injury.

Conclusions: Imaging before surgery is recommended to delineate the anatomy and detect any major vessels present in the case of anticipated difficult tracheostomy.

Corresponding author: Irfan Mohamad; School of Medical Sciences, USM Health Campus, Jalan Raja Perempuan Zainab 2, 16150 Kota Bharu, Kelantan, Malaysia. Phone: +609-7676006.
E-mail address: irfankb@usm.my

1. INTRODUCTION

Tracheostomy is one of the oldest surgical procedures recorded and is performed for a number of reasons, including bypassing an upper airway obstruction, facilitating weaning from mechanical ventilation, toileting pulmonary secretions, and as an adjunct to major head and neck surgery.[1] While tracheostomy is usually a straightforward and common procedure, it may be associated with a number of complications, most notably haemorrhage, which, on rare occasions, can be potentially fatal.[2]

2. AIM

We report a case of a difficult tracheostomy complicated by massive immediate bleeding from the innominate artery that required a median sternotomy for vascular access and control.

3. CASE STUDY

A 26-year-old lady, with underlying uncontrolled myasthenia gravis (MG) disease diagnosed 3 years prior, has resulted in multiple admissions and 16 intubations. For current admission, she was in prolonged intubation and was planned for a semi-emergency tracheostomy. During the initial evaluation, she was intubated with a size 7.0 endotracheal tube (ETT) for 10 days, and ventilated with synchronized intermittent mandatory ventilation (SIMMV) mode and a FiO_2 (fraction of inspired oxygen) of 0.35. Clinically, she is a middle-sized lady with a short neck and a partially-defined laryngeal structure. The trachea was central and no goitre or pulsatile mass was palpable. Her blood investigation was satisfactory for the procedure with a haemoglobin level of 10.2 and a normal coagulation profile. She was also not on any anti-coagulation medication.

The initial steps of the tracheostomy were performed in a typical manner. The trachea was exposed by retracting the thyroid isthmus superiorly, followed by an incision made at the 3rd to 4th tracheal ring, and a cuffed size 7.0 tracheostomy tube was inserted. However, brisk bleeding occurred, necessitating partial division of the left strap muscles to allow proper visualisation of the bleeding vessel, which was then ligated with haemostatic clamps and nylon 3–0 ties. The wound was closed after haemostasis was achieved, and the patient was well ventilated following insertion. The estimated blood loss was 600 mL as a result of the brisk bleeding.

Upon return to the intensive care unit (ICU) from the post-anaesthesia care unit, the patient's blood pressure suddenly rose to 180/100 mm Hg, and there was a spurt of blood from the tracheostomy wound. Manual compression failed to control the bleeding, and the neck hematoma quickly grew to a size of 10 × 5 cm. The patient was immediately brought back to the operating room for a neck exploration.

The tracheostomy tube was removed, and the patient was reintubated with a similar-sized ETT. Upon exploration of the neck, there was profuse bleeding from a tear on the innominate vessel below the sternum necessitating a midline sternotomy by the general surgery team to access the vessel. Vascular control was obtained by vascular clamps proximal and distal to the vessel tear, and the tear was repaired primarily with Prolene 5–0 continuous sutures and covering of the left strap muscle swung over to the right and sutured to the periosteum of the right clavicle to cover the repaired vessel. The thyroid isthmus was divided and suture-ligated and the previous tracheal incision extended superiorly till the 2nd tracheal ring while the lower part of the previous incision re-sutured back, and the previous tracheostomy tube is reinserted. The total estimated blood loss is 6 L, and she received a total of 9 units of packed cell, 6 units of fresh frozen plasma, 4 units of platelet, and 4 units of cryoprecipitate, and her haemoglobin level was 12.4 postoperatively.

She was transferred to ICU after surgery, and her subsequent postoperative course was uneventful, save for an infected sternotomy wound that was successfully treated with antibiotics and dressings. The 1st tracheostomy tube change was done on 14th postoperative day and went smoothly.

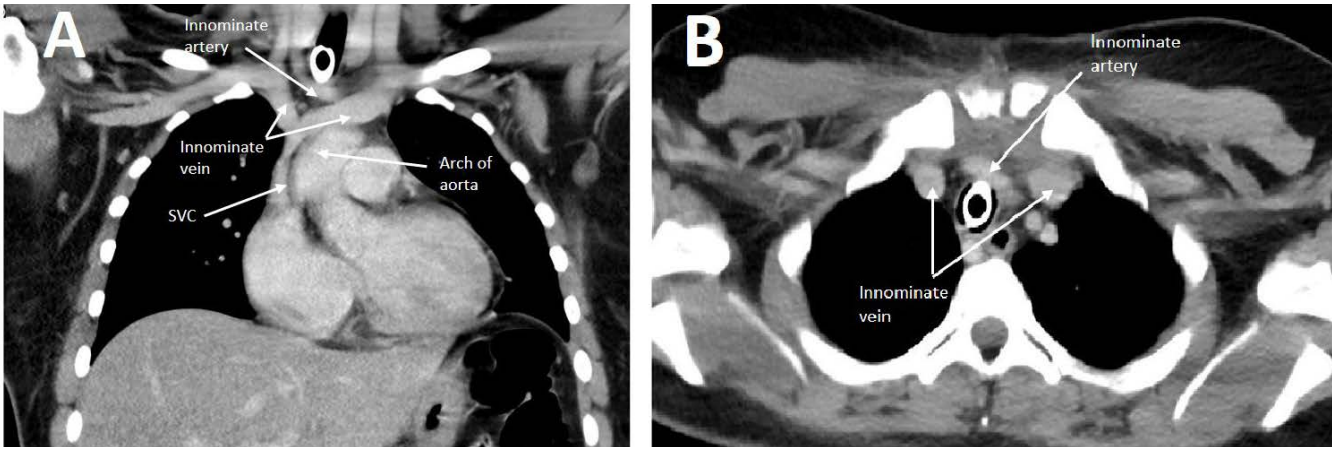

Figure 1. CT scans of the thoracic region: (A) coronal cut, showing the right innominate artery just below the tracheostomy tube and it is normally located; (B) axial cut, showing the evidence of sternotomy, innominate artery located anterior of the tube and posterior to the sternum. SVC – superior vena cava.

A computed tomography (CT) scan was performed a month after surgery to assess pneumonia. The location of the tracheostomy tube and the blood vessels on the CT scan confirmed that the previous intraoperative bleed was from the innominate artery and that the artery was not situated in an abnormally high position (Figure 1).

She was discharged after 2-month hospitalization and has no issues with tracheal care, which she can perform on her own at home. She still had recurrent MG crises that necessitated repeated hospitalizations and tracheostomy tube ventilation after that, but there was no problem changing from the cuff to the uncuff type of tube.

4. DISCUSSION

There are three types of tracheostomy complications: immediate (during surgery), early (within 2 weeks), and late (more than 2 weeks). Early (6%) and late (7%) complications were the most prevalent, while immediate complications were the least frequent (1%). The most frequently reported early complication was postoperative haemorrhage, while the most common late complication was airway stenosis.[3] Pneumothorax was the most frequent immediate complication, accounting for around 17% of cases, followed by haemorrhage. Major bleeding is uncommon, and minor bleeding usually originates from the anterior jugular venous system, veins feeding the thyroid, and/or the thyroid itself.[4]

Several pre-operative steps to prevent the tracheostomy bleeding complication, such as using ultrasound to locate the major superficial veins and detect aberrant vascular anatomy, may prevent artery injury.[5] Major vessels are frequently present anterior to the trachea at sites where a tracheostomy is performed. A large prevalence study of CT major vessels anterior to the trachea found 53% of them at the suprasternal notch, with the brachiocephalic artery (33%), right carotid artery (18%), left carotid artery (9%), left innominate vein (6%), and right innominate vein (0.2%) being the least common.[6]

The tracheostomy begins with positioning the patient with shoulders elevated and the head extended unless contraindicated by cervical disease or injury, followed by the palpation and marking of anatomical landmarks such as the thyroid notch, cricoid cartilage, and sternal notch.[7] However, cases of morbid obesity and a short neck make the landmark difficult; even with the proper positioning, it fails to elevate the larynx and expose the upper trachea.[8] While maximising neck extension might bring the trachea closer to the skin, it might also bring up major blood vessels from the upper superior mediastinum into the pretracheal region, putting them at risk for injury.[9] An adequate exposure of trachea is important before making the incision by retracting the thyroid isthmus superiorly if it is located above the 3rd tracheal ring and small incision or complete dissection of the isthmus is located between the 2nd and 3rd tracheal rings.[10]

Hwang et al described a difficult tracheostomy tube placement in a short-necked obese patient. The procedure repeatedly failed intraoperatively and was only successfully inserted using an ETT exchanger as a guidewire.[11] Soni et al. reported 3 cases of difficult tracheostomies, one of which was short neck; with proper planning and imaging prior to the operation, the tracheostomy was successfully completed without complications.[8] Ultrasound neck before operation and using the combination of an ultrasound and a fibre optic video bronchoscope may improve the outcomes of percutaneous tracheotomy procedures in short-neck patients.[12] There have been a few case reports of early or late tracheostomy tube usage complications involving bleeding from the tracheoinnominate artery fistula, with the earliest date of presentation on 11th day after the operation. Some of the cases were treated with endovascular embolization of the innominate artery, and some cases were fatal.[13,14]

This case report highlights the potential pitfalls of a low tracheostomy, which occurs more commonly than is usually appreciated. When the neck is hyperextended to facilitate exposure of the trachea in a short-neck patient, several tracheal rings may move upward and the major thoracic vessels may rise from the superior mediastinum into the pretracheal region, causing the tracheal incision to be made lower than realised and making the vessels susceptible to injury. Furthermore, the exposure of the trachea should be adequate before making an incision by retracting the thyroid isthmus; if it is still obstructing the trachea, the isthmus should be fully dissected. While the level of tracheal incision is commonly done at either between the 2nd and 3rd or between the 3rd and 4th tracheal rings in the literature, a lower tracheal incision increases the risk of injuring major anterior neck vessels.

5. CONCLUSIONS

In the case of a highly anticipated difficult tracheostomy, like morbid obesity, a short neck, or an anterior neck mass or pulsatile lesion: Imaging prior to surgery is recommended to delineate the anatomy, including any major vessels present.

Conflict of interest

The authors declare that they have no conflict of interest.

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