

Point-of-Care Airway Ultrasonography Prior to an Emergency Cricothyroidotomy

Case report

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نقطة الرعاية للمسلك الهوائي بتخطيط الصدى قبل عملية بضع الغشاء الحلقي الدرقي الطارئة

تقرير حالة

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ABSTRACT: The use of ultrasonography in acute and critical care medicine is becoming increasingly common. However, use of an airway ultrasound as an adjunct to determine the type of intervention needed and assess complications is not common practice. We report a 56-year-old male who presented to the Emergency Department of the Sungai Buloh Hospital, Selangor, Malaysia, in 2015 with hoarseness, stridor and impending respiratory failure. A point-of-care ultrasound performed to assess the neck and vocal cords indicated a heterogeneous echogenic mass in the larynx, thus ruling out a cricothyroidotomy. The patient was therefore referred for an emergency tracheostomy. This case highlights the importance of point-of-care airway ultrasonography in the assessment of patients with stridor. This imaging technique not only helps to detect the cause of the stridor, but also to determine the feasibility of a cricothyroidotomy in emergency cases.

Keywords: Emergency Medicine; Stridor; Ultrasonography; Airway Management; Tracheostomy; Case Report; Malaysia.

المخلص: أصبح استخدام تخطيط الصدى في طب الرعاية الحادة والجرعة أمراً شائعاً بشكل متزايد. ومع أن، استخدام الموجات فوق الصوتية للمسلك الهوائي تعتبر مساعدة لتحديد نوع التدخل المطلوب وتقييم المضاعفات إلا أنها غير شائعة الاستخدام. نعرض حالة مريض ذكر عمره 56 عاماً تقدم لقسم الطوارئ بمستشفى سونغاي بولاه، سيلنجر، ماليزيا، في 2015 بأعراض بحة، صرير وفشل تنفسي وشيك. تم تقديم نقطة الرعاية باستخدام الموجات فوق الصوتية لتقييم الرقبة والحبال الصوتية والتي أظهرت وجود كتلة متغايرة مولدة للصدى في البلعوم، وبالتالي تم استبعاد إجراء بضع الغشاء الحلقي الدرقي. تم بذلك تحويل المريض لإجراء فغر الرغامى الطارئ. هذه الحالة تسلط الضوء على أهمية تخطيط الصدى في نقطة الرعاية للمسلك الهوائي عند تقييم المرضى الذين يعانون من صرير. هذه التقنية التصويرية لا تساعد فقط على اكتشاف سبب الصرير، ولكن أيضاً تحدد جدوى عملية بضع الغشاء الحلقي الدرقي في الحالات الطارئة.

الكلمات المفتاحية: طب الطوارئ؛ صرير؛ تخطيط الصدى؛ علاج المسلك الهوائي؛ فغر الرغامى؛ تقرير حالة؛ ماليزيا.

THE PRESENCE OF STRIDOR INDICATES AN upper airway obstruction.¹ In emergency departments, patients with stridor are often treated emergently according to strict management protocols. In such cases, the attending physician must be able to evaluate the patient and determine the type of airway management intervention required, such as a cricothyroidotomy.¹ However, with the high rate of success of newer airway management techniques, such as orotracheal intubation, rates of cricothyroidotomies have declined over the past decade to approximately 0.4–1.2%.^{2–5}

Unfortunately, as this procedure is uncommon, the prevalence of complications during a cricothyroidotomy can vary from 6.1–54.5%, depending on the clinical circumstances of the case, technique employed and experience of the surgeon.^{6,7} Although point-

of-care ultrasonography (POCUS) is very useful in critical care and acute medicine, its role in airway management is not routine, even though several studies have advocated its use.^{8–10} The current case demonstrates the benefits of POCUS in assessing the airway of a patient with stridor and informing the choice of emergency airway intervention.

Case Report

A 56-year-old male presented to the Emergency Department of the Sungai Buloh Hospital, Selangor, Malaysia, in 2015 with shortness of breath, stridor and hoarseness. He had started experiencing breathing difficulties and coryzal symptoms a few months previously. The patient reported that the hoarseness had begun about six months prior to presentation and

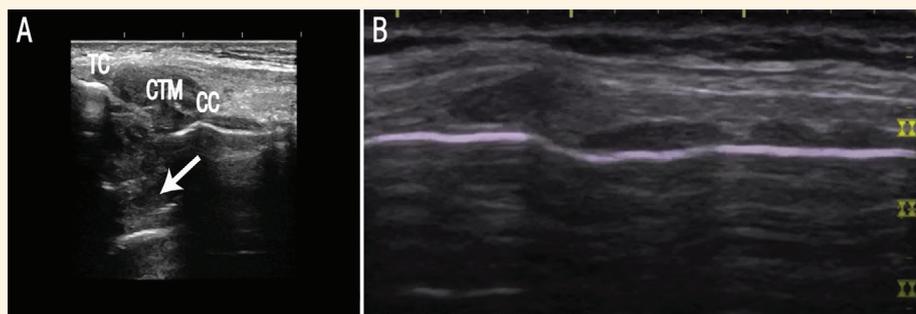


Figure 1: Longitudinal point-of-care airway ultrasonography of (A) a 56-year-old male with stridor showing a distorted cricothyroid membrane with a mass underneath (arrow) in comparison to (B) an example of a normal airway.
TC = thyroid cartilage; CTM = cricothyroid membrane; CC = cricoid cartilage.

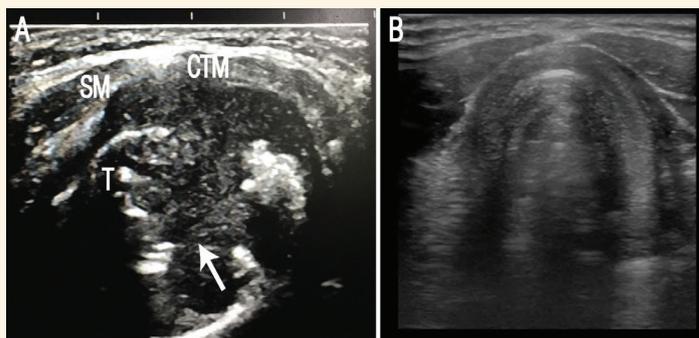


Figure 2: Transverse point-of-care airway ultrasonography of (A) the airway of a 56-year-old male with stridor showing intraluminal heterogeneous echogenic mass (arrow) in comparison to (B) an example of a normal airway.
SM = sternohyoid muscle; CTM = cricothyroid membrane; T = trachea.

was associated with weight loss, loss of appetite and *dysphagia*. However, he was still able to eat and drink. He had seen a local general practitioner but these symptoms had not been investigated. One week prior to presentation, he started to experience noisy breathing precipitated by an upper respiratory tract infection and he reported feeling breathless upon exertion.

At presentation, the patient could sit upright and was mildly tachypnoeic with inspiratory stridor. His breathing sounds were normal and he was able to talk in a hoarse voice without drooling. His blood pressure

was 118/80 mm Hg and he had a pulse rate of 70 beats per minute. Oxygen saturation was at 98% with a nasal *cannula*. A clinical examination revealed no visible mass in the head, neck or chest region and the trachea appeared to be centrally located. There were also no signs of venous distension of the neck or chest wall or evidence of facial or upper extremity oedema. An airway ultrasound was performed to investigate the structure of the airway and identify the cause of the stridor. Notably, this revealed a hyperechoic artefact extending throughout the cricoid cartilage, which was inconsistent with the structure of a normal airway [Figure 1]. The mass had ill-defined borders with heterogeneous echogenicity [Figure 2].

Anticipating that airway management would be difficult and potentially involve intubation or a cricothyroidotomy, the patient was referred to the otorhinolaryngology team for further assessment and definitive management. Flexible laryngoscopy revealed a fungating mass involving the false vocal cords and extending to the subglottic region [Figure 3]. As the patient was stable and able to maintain oxygenation, he underwent an emergency tracheostomy. Later, a computed tomography scan was suggestive of a laryngeal carcinoma [Figure 4], which was successfully removed.



Figure 3: Flexible laryngoscopic image of the airway of a 56-year-old male showing an intraluminal fungating mass (arrow).

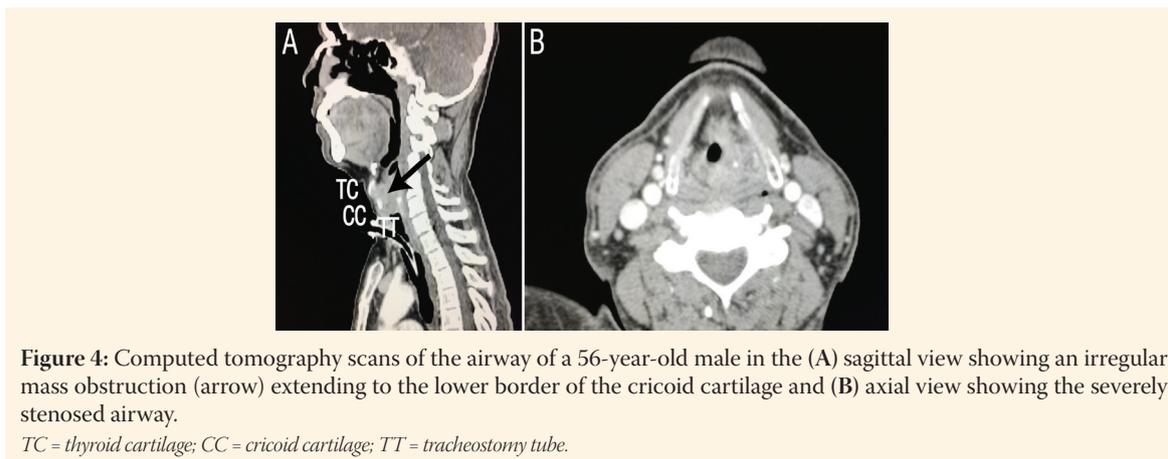


Figure 4: Computed tomography scans of the airway of a 56-year-old male in the (A) sagittal view showing an irregular mass obstruction (arrow) extending to the lower border of the cricoid cartilage and (B) axial view showing the severely stenosed airway.

TC = thyroid cartilage; CC = cricoid cartilage; TT = tracheostomy tube.

Discussion

In acute care medicine, delays in airway management can result in poor outcomes.¹¹ Emergency airway interventions range from laryngoscopy to a cricothyroidotomy, with the latter being a last life-saving resort when all other measures fail. Traditionally, a cricothyroidotomy is performed blindly as a form of emergent airway management.¹² Prior to the procedure, the cricothyroid membrane is identified based on surface landmarks and palpation. However, Elliott *et al.* demonstrated that this membrane was only correctly identified by 30% of anaesthetists, of which only 11% could locate the midline.¹³ In such cases, the cricothyroidotomy tube can be misplaced due to the inaccurate identification of these anatomical landmarks. In addition, technical problems in 40% of cases have been noted during cricothyroidotomies performed using the Seldinger technique.¹⁴

In comparison, POCUS is a noninvasive and readily available technique. Furthermore, it can provide detailed information regarding the anatomy of the airway as all of the internal structures can be visualised in a short period of time by placing the linear probe at the centre of the neck.¹⁵ Prior to an emergency cricothyroidotomy, an ultrasound allows for the reliable and rapid identification of the cricothyroid membrane and trachea, unaffected by the patient's body mass index.^{16,17}

The current case highlights the importance of POCUS, not only in the accurate localisation of anatomical landmarks, but also in the identification of any internal structural abnormalities and, consequently, the feasibility of performing a cricothyroidotomy. While it may be argued that POCUS is not expedient in a time-sensitive situation, failure and complication rates remain high for emergency cricothyroidotomies performed blindly, thus delaying critical life-saving interventions in any case.¹⁸ As such, the authors advocate the incorporation of POCUS-guided crico-

thyroidotomy skills in emergency medicine and critical care training, particularly in view of the reliability of this technique and its association with fewer complications compared to conventional methods.¹⁶

Conclusion

Routine POCUS should be considered in certain high-risk situations requiring emergency airway management, such as stridor and neck haematomas and masses. In such cases, the identification of an abnormal anatomical structure in the airway would make a conventional cricothyroidotomy unfeasible; hence, an alternative approach is required, such as a tracheostomy.

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