

Cricothyroidotomy in emergency practice: Two case reports:

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Introduction

Establishing a patent airway is of vital importance in the critically ill or injured patient. This is routinely accomplished by rapid sequence oral-tracheal intubation.¹The failure to intubate and ventilate a patient is often unpredictable and is a rare and frightening situation. Rapid and successful cricothyroidotomy is one of the important rescue measures under such circumstances.² Reluctance to perform this procedure may lead to repeated unsuccessful attempts at oral-tracheal intubation and inadvertently, to hypoxia and subsequent brain damage or mortality.

The skill to perform this procedure is thus essential for all Emergency Physicians.³ Competence in cricothyroidotomy can be acquired with minimal training, using manikins or human or pig cadavers.⁴ Equally important is a clear mental picture of an algorithm for emergency management of the airway (see figure 1).⁵

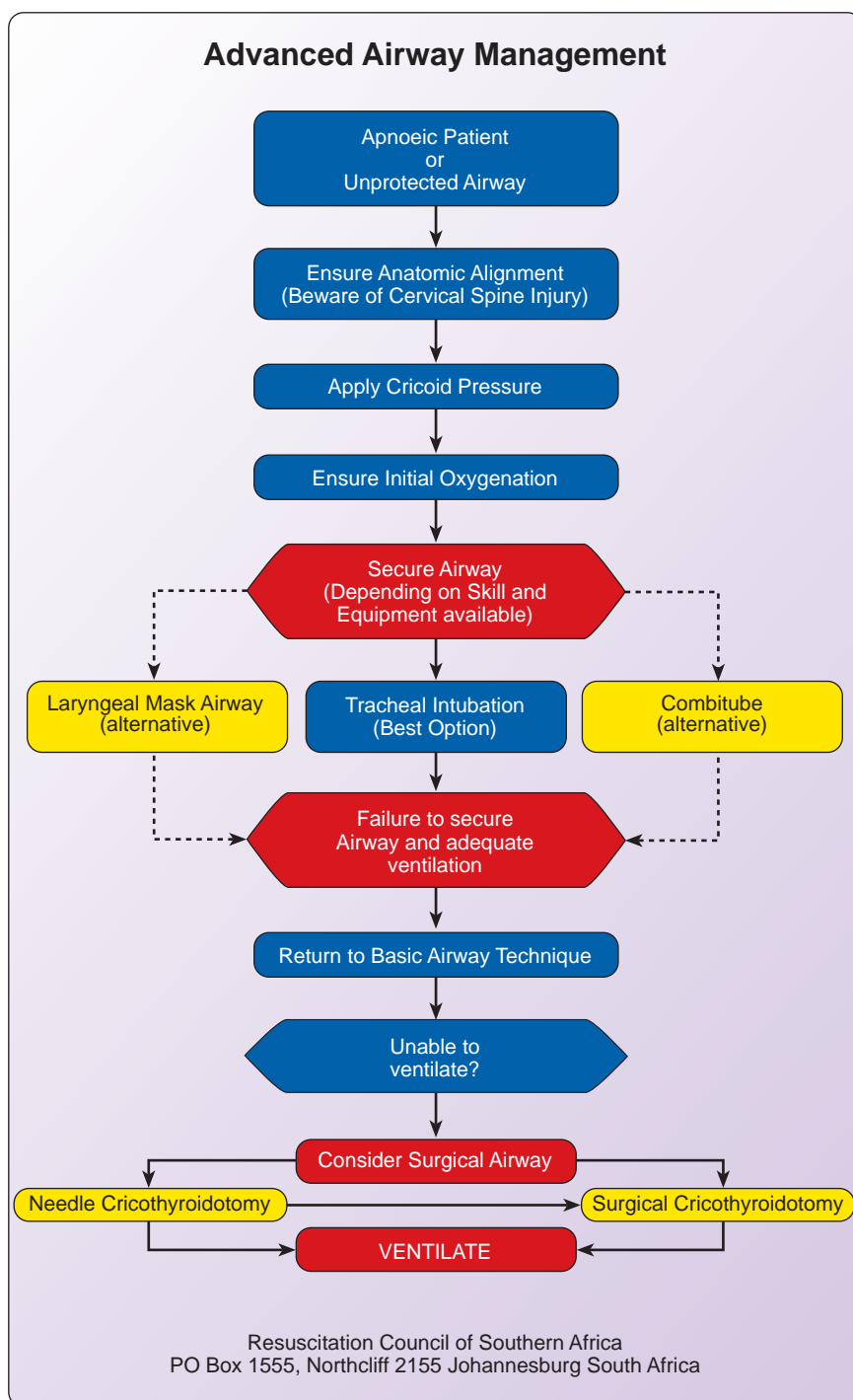
To illustrate the application of cricothyroidotomy to emergency airway management two case reports are presented. These patients neatly illustrate how the principles of emergency medicine are similar in trauma and non-trauma emergencies.

Case Studies:

Case 1 (Trauma):

A 57 year old man presented to an Emergency Unit with severe respiratory distress and stridor. While taking the patient to the resuscitation area and initiating treatment with oxygen and an intravenous line and setting up monitors the following history was obtained.

Figure 1:



The patient had been involved in a motor vehicle accident four days earlier. He sustained a whiplash type injury to his neck and some minor bruises to his face and knees. He was taken to his local hospital by private vehicle where he was evaluated and an X-ray of his cervical spine was done. The X-ray was apparently reported as within normal limits and he was given pain medication and discharged. Over the next four days the pain in his neck did not subside and his neck started to swell. When the swelling started to affect his breathing he decided to visit another hospital.

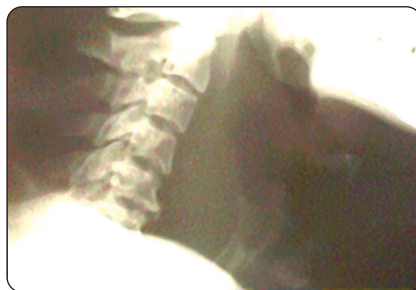
His condition in the Emergency Unit rapidly deteriorated after his arrival. He had a tightly swollen neck and he started coughing up blood. His oxygen saturation remained below 90% in spite of high flow oxygen administration. Adrenalin inhalations were started to attempt to decrease airway swelling but did not seem to help. The haemoptysis got worse and the patient started gesturing that he was not able to breathe. Within a minute the patient collapsed with respiratory arrest and an attempt was made to intubate him. This was unsuccessful due to blood and secretions. Even after rapid suctioning of the airway laryngoscopy was still not possible due to the distorted anatomy of the airway. Attempts at bag-valve-mask ventilation failed. The saturation dropped to below 60% and the decision was made to proceed to surgical cricothyroidotomy.

First the cricothyroid membrane lying anteriorly, between the inferior border of the thyroid cartilage and the superior border of the cricoid cartilage was identified. Time did not allow for local anaesthetic infiltration. Using a no.20 surgical blade, a transverse incision was made through the cricothyroid membrane. A no 6.5 cuffed ET tube was then inserted through the ostomy and the cuff inflated. The tube was secured to the neck with strapping to prevent accidental airway loss. The patient could then be easily ventilated and his saturation returned to normal. The patient started to breathe

spontaneously and regained consciousness. He was sedated with midazolam and morphine and an ENT surgeon then performed a formal tracheostomy.

Lateral C-spine X-ray later revealed a large prevertebral swelling as well as fractures of the inferior articular surface of C5 and superior articular surface of C6. There were no dislocations of the vertebrae and the spinal canal appeared uncompromised. (See figure 2)

Figure 2: A large prevertebral haematoma can clearly be seen (arrow). This obstructed the airway and distorted the normal anatomy making laryngoscope impossible.



The patient was later taken to theatre and an exploration of the neck was done via an anterior incision. No active bleeding was found, but a haematoma was drained.

The patient was admitted to ICU post operatively and discharged to a regular ward after three days. The tracheostomy tube was removed in the ensuing weeks and the patient made a full recovery. The only sequelae the patient was left with was some scarring to the neck. (see figure 3).

Figure 3: The only sequelae the patient was left with was scarring to the neck due to the cricothyroidotomy (arrow) and the exploration.



Case 2 (non Trauma):

A 56 – year old man presented to an Emergency Unit complaining of sore throat and difficulty in breathing. He had been treated for an upper respiratory tract infection a month earlier. He had a medical history of Diabetes and Hypertension. Treatment with an ACE inhibitor had been initiated a few days prior to his admission. The rest of his medical history was unremarkable.

On examination he had severe swelling of the floor of his mouth, tongue, soft and hard palate.

Oxygen and adrenalin inhalations were initiated and an iv line was secured. Hydrocortisone 200mg was given intravenously and promethazine 20mg intramuscularly. In spite of this management it became increasingly difficult for the patient to maintain his airway and oxygen saturation. Attempts were made to secure the airway with oral-tracheal intubation by two senior Emergency Unit doctors. This was unsuccessful due to severe angioneurotic oedema of the soft tissues of the upper airway. Bag-valve-mask ventilation proved to be near impossible.

A cricothyroidotomy was then rapidly performed using a scalpel with a no 20 blade. Initially a no 5 uncuffed endotracheal tube was inserted. Ventilation was inadequate due to lack of a proper seal. This rapidly improved after replacing the tube with a no 6 cuffed endotracheal tube.

The patient was taken to theatre for a formal tracheostomy. During the operation he developed severe hypotension, bronchospasm and a skin rash. He received adrenalin to maintain his blood pressure. Postoperatively he was admitted to the ICU. He made a complete recovery. The anaphylactic reaction was attributed to the ACE inhibitor, which was subsequently stopped.

Discussion

In both these cases patients presented with the classical indication for cricothyroidotomy, namely the “cannot intubate, cannot ventilate” scenario.⁶ By the time the decision was made to

do cricothyroidotomy both patients were hypoxic and already in severe respiratory distress. This illustrates why quick accurate action should take precedence over meticulous time consuming technique when using this procedure.³ For this reason the larger no. 20 blade is recommended as was utilized in these cases. Using a once off stabbing incision with this blade a large enough ostomy can be made to insert the appropriate tube. This precludes the need for dilatation of the ostomy.³ A cuffed tube should always be used to provide adequate seal for ventilation and to prevent aspiration of gastric content.

Adrenalin inhalations did not seem to be effective in these cases. This was probably due to the severity of the obstruction in both cases. Intramuscular adrenalin should have been given in the second case as this was clearly an anaphylactic reaction. In both cases the cricothyroidotomies were followed up with formal tracheostomy. This represents the traditional view that emergency cricothyroidotomy is not a long term surgical airway. This view has recently been challenged with research that showed a similar complication rate for elective cricothyroidotomy compared to tracheostomy as a long term surgical airway.⁷

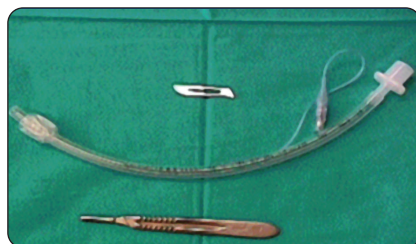
Both patients made an excellent recovery and had only minor complications. Complication rates for cricothyroidotomy range from 0 to 52%, similar to that for tracheostomy. Complications include injuries to major vascular, endocrine, neural and visceral structures, subcutaneous and mediastinal emphysema, creation of a false passage with extra-tracheal placement, vocal cord damage, perforation of the oesophagus, fistulae, and subglottic stenosis.²

There is only one absolute contra-indication to cricothyroidotomy and that is if the patient can be safely intubated orally or naso-tracheally.² Penetrating trauma with partial transection of the larynx or trachea is a relative contra-indication. Children under the age of 12 years do better

with needle cricothyroidotomy than surgical cricothyroidotomy.⁸

The minimum equipment needed to perform this procedure is illustrated in Figure 4.

Figure 4: Simple equipment needed to perform a cricothyroidotomy : 1 - A no. 20 blade. 2 - A no 6.5 cuffed endotracheal tube. 3 - A scalpel handle.



Conclusion

Cricothyroidotomy is a rare but life saving airway management procedure. It takes approximately 15 minutes to teach a medical practitioner to do a proper cricothyroidotomy on a manikin. Because this skill is so infrequently practised, one or two yearly retraining is essential.⁴ The real challenge though is to know when to perform this procedure and not to hesitate when it is needed. This is one of the rare instances in medicine where quick accurate action is more important than meticulous time consuming technique.

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