

- crash helmets. *J Trauma* 1985; 25: 566-567.
7. Costa MC, Robbs JV. Non-penetrating subclavian artery trauma. *J Vasc Surg* 1988; 8: 71-75.
  8. Stoneham MD. Bilateral first rib fractures associated with driver's airbag inflation: case report and implications for surgery. *Eur J Emerg Med* 1995; 2(1): 60-62.
  9. Qureshi T, Mander BJ, Wishart GJ. Isolated bilateral first rib fractures – an unusual sequel of whiplash injury. *Injury* 1998; 29: 397-398.
  10. Hassan ANA, Ballester J, Slater N. Bilateral first rib fractures associated with Horner's syndrome. *Injury* 2000; 31: 273-274.

## Case Report

# Emergency percutaneous tracheostomy

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### Summary

We present a case of acute upper airway obstruction secondary to angio-oedema. The patient underwent emergency percutaneous tracheostomy. Other options available for emergency surgical airway are discussed.

Complete upper airway obstruction that cannot be alleviated by supraglottic intubation devices is a rare situation in emergency medicine. The primary aim in the management of such patients is to provide rapid oxygenation. The options available to the physician include temporary (needle transtracheal jet ventilation, cricothyroidotomy) or definitive airway procedures (tracheostomy). The fastest method available to provide oxygenation is an emergency cricothyroidotomy,<sup>1,2</sup> which can be performed within 10 seconds.<sup>3</sup> Percutaneous tracheostomy (PCT) is becoming more popular in intensive care units (ICUs), and the guidewire dilator forceps technique described by Giggs *et al.*<sup>4,5</sup> is well documented in non-emergency situations. PCT has the advantage of being feasible under local anaesthesia, at the bedside and without first requiring airway access. It has been performed within 3 minutes in the emergency situation<sup>6</sup> and the average time was 5½ minutes in a study done by Ben-Nun *et al.*<sup>7</sup> on trauma patients.

### Case report

A 76-year-old man presented to our emergency department with sudden onset of difficulty in breathing and swelling of his face, lips and tongue. He was a known hypertensive on hydrochlorothiazide and used doxazosin for benign prostate hypertrophy. On clinical examination he had swelling of his face, lips and tongue with marked respiratory difficulty.

The patient's breathing rapidly became more laboured and he subsequently developed acute upper airway obstruction.

He required airway support, and endotracheal intubation was attempted by the anaesthetist using 10 mg intravenous midazolam. Endotracheal intubation was unsuccessful and the ENT specialist was consulted. After injecting a local anaesthetic, a small skin incision was made over the upper part of the trachea. A large-bore cannula was inserted into the trachea and the position was confirmed by aspirating air. The guidewire was inserted via the cannula into the trachea. A percutaneous dilator was inserted over the guidewire. After dilating the subcutaneous soft tissue a tracheostomy tube was inserted over the guide wire. This procedure was performed within 2 minutes with no complications.

A diagnosis of acute upper airway obstruction secondary to angio-oedema was entertained. Further enquiry revealed that the patient used aspirin regularly and this was the presumed cause of the angio-oedema. The patient developed acute renal failure and nosocomial pneumonia over the next week. He died 12 days after admission in the ICU.

### Discussion

Of the emergency surgical airway interventions, cricothyroidotomy is well recognised. There are two potential problems in performing a cricothyroidotomy. Firstly, it might be difficult to identify the cricothyroid membrane correctly, especially in patients who have sustained trauma to their larynx. Secondly, it might be potentially difficult to maintain the airway once a needle cricothyroidotomy has been performed. The plastic cannula described in textbooks is often very soft and can kink easily. It is also difficult to secure this tube after insertion and it can become displaced. Apart from these potential problems a needle cricothyroidotomy is only a temporary solution until a definitive airway can be provided, for example by means of a tracheostomy.

Conventional breathing systems deliver low flow because of the small internal diameter of the cannula, and jet ventilation can cause barotrauma in complete upper airway obstruction.<sup>1</sup> Surgical cricothyroidotomy is a more definitive option. The

danger of a surgical cricothyroidotomy is the risk of injuring the cricoid cartilage, which is the only complete ring in the upper airway. Injury to the cricoid cartilage can cause scarring, with subsequent subglottic stenosis. Indications for performing a cricothyroidotomy (surgical or needle) are very limited. It is therefore extremely difficult to gain experience and become confident in performing this procedure.

A surgical open tracheotomy takes much longer than a cricothyroidotomy and is not indicated in patients where respiratory support cannot be provided during the procedure. The anaesthetic options when performing a surgical tracheotomy include general or local anaesthesia. General anaesthesia may be achieved by gaseous induction while the patient is breathing spontaneously and attempted intubation as the patient is anaesthetised, or by fiberoptic intubation using local anaesthesia.<sup>8,9</sup> Both these procedures are hazardous and may take up to 10 minutes or longer before airway control is achieved.

When using local anaesthetic skin infiltration to perform an open tracheotomy the patient needs to be very co-operative for the duration of the procedure, which is often difficult for distressed and hypoxic patients.

In the early publications most authors considered obesity and a short neck as relative contraindications for percutaneous tracheostomy, whereas cervical injury, paediatric age and emergency were regarded as absolute contraindications. Since then PCT has been performed safely in obese patients with short or fat necks and in trauma patients without cervical spine clearance.<sup>10-12</sup> The study performed by Ben-Nun *et al.*<sup>7</sup> concluded that in experienced hands emergency PCT in trauma patients is feasible and safe.

It is important to stress that there are potential complications with this technique, especially when performed in the emergency setting. It is therefore important that only staff already trained in performing this procedure should consider doing it in the emergency setting. The advantage of the PCT method is that the same technique is utilised in both elective and emergency situations, therefore the surgeon can easily acquire considerable experience, which will make it safer to use in the emergency setting. A number of comparative stud-

ies<sup>13-16</sup> between PCT and open tracheotomy demonstrated either a lower complications rate with PCT or no statistical difference between the two methods.

## Conclusion

In experienced hands, PCT may be considered an option when definitive emergency access is required within 10 minutes.

## REFERENCES

1. Dob DP, MacLure HA, Sony N. Failed intubation and emergency percutaneous tracheostomy. *Anaesthesia* 1998; 53: 72-74.
2. Vitberg DA, Reed DB. Crackdown on crics: Needle cricothyroidotomy and percutaneous transtracheal jet ventilation explained. *J Emerg Med Serv* 2001; 26: 58-62, 64-65, 78-79.
3. Safar P, Penninckx J. Cricothyroid membrane puncture with special cannula. *Anesthesiology* 1967; 28: 943-945.
4. Griggs WM, Worthley LI, Gilligan JE. A simple percutaneous tracheostomy technique. *Surg, Gynaecol Obstet* 1990; 170: 543-545.
5. Griggs WM, Myburgh JA, Worthley LI. Urgent airway access – an indication for percutaneous tracheostomy? *Anaesth Intensive Care* 1991; 19: 586-587.
6. Basaranoglu G, Erden V. Failed intubation due to posterior fossa haematoma requiring emergency percutaneous tracheostomy. *Br J Anaesth* 2002; 88: 310-311.
7. Ben-Nun A, Altman E, Lael-Anson E. Emergency percutaneous tracheostomy in trauma patients: An early experience. *Ann Thorac Surg* 2004; 77: 1045-1047.
8. McIntyre JWR. The difficult tracheal intubation. *Can J Anaesth* 1987; 34: 204-213.
9. Fulkerson WJ. Fiberoptic bronchoscopy. *N Engl J Med* 1984; 311:511-514.
10. Mansharamani NG, Kaziel H, Garland R. Safety of bedside dilatational tracheostomy in obese patients in the ICU. *Chest* 2000; 117: 1426-1429.
11. Urwin S, Short S, Hunt P. Percutaneous dilatational tracheostomy in the morbidly obese. *Anaesthesia* 2000; 55: 393-394.
12. Mayberry JC, Wu IC, Goldman R. Cervical spine clearance and neck extension during percutaneous tracheostomy in trauma patients. *Crit Care Med* 2000; 28: 3436-3440.
13. Khalil TM, Koss W, Margulies DR. Percutaneous dilatational tracheostomy is as safe as open tracheostomy. *Am Surg* 2002; 68: 92-94.
14. Graham JS, Mulloy RH, Sutherland FR. Percutaneous versus open tracheostomy: a retrospective cohort outcome study. *J Trauma* 1996; 42: 245-250.
15. Friedman Y, Fildes J, Mizock B. Comparison of percutaneous and surgical tracheostomies. *Chest* 1996; 110: 480-485.
16. Holdgaard HO, Pedersen J, Jensen RH. Percutaneous dilatational tracheostomy versus conventional surgical tracheostomy – a clinical randomised study. *Acta Anaesthesiol Scand* 1998; 42: 545-550.