

Using ultrasound for percutaneous tracheostomy: is it time to change practice?

Percutaneous tracheostomy is a common procedure performed on patients in intensive care units to facilitate weaning (Rajajee et al, 2011). This involves tracheal puncture with a needle under guidance of a bronchoscope and insertion of a guidewire, followed by dilatation of the tract and insertion of an appropriately sized tracheostomy tube. The use of the bronchoscope during insertion helps determine the correct site for needle puncture in the midline. It may also avoid other potential complications including perforation of the posterior tracheal wall.

Correct placement can also be helped by using ultrasound, either before starting the procedure or in 'real time', where ultrasound is used during tracheal puncture and tracheostomy insertion. This article discusses whether it is time to change practice and routinely use ultrasound for percutaneous tracheostomy.

Ultrasound for percutaneous tracheostomy

Ultrasound has recently been used in the insertion of percutaneous tracheostomy with the aim of improving safety. It enables measurement of the distance from the skin to the trachea, allowing choice of an appropriately sized tracheostomy tube and length which may be beneficial, especially in patients with larger necks (Rajajee et al, 2011). Ultrasound also allows visualization of the anterior tracheal wall, allowing selection of the optimal intercartilaginous space for placement of the tracheostomy tube and thus reducing the risk of subglottic stenosis (Rajajee et al,

2011). Ultrasound visualization of pre-tracheal blood vessels reduces the risk of accidental damage to anomalous blood vessels or surrounding structures. This suggests that use of real-time ultrasound to guide tracheal puncture would further reduce complications.

A feasibility study of real-time ultrasound guidance for percutaneous tracheostomy insertion showed promising results. Complications were avoided and correct tracheostomy positioning ensured in all patients in the study. It was also helpful in patients with morbid obesity and cervical spine precautions, in whom percutaneous tracheostomy can be challenging (Rajajee et al, 2011). These positive findings were supported by a trial on percutaneous tracheostomy in 50 patients comparing the traditional 'landmark and bronchoscopy' method *vs* 'ultrasound guided' which showed significantly improved first pass puncture in the ultrasound-guided group (Rudas et al, 2014).

Landmark technique with bronchoscope and no ultrasound

The landmark technique of insertion of percutaneous tracheostomy has been the accepted standard method for many years (Barba et al, 1995). This involves tracheal puncture by palpation of anatomical landmarks and the use of a bronchoscope to aid correct placement of the tracheostomy. This method is well established and has a low rate of complications associated with its use (Polderman et al, 2003). While Rajajee et al's (2011) study showed no complications when using ultrasound and reinforced several safety considerations during percutaneous tracheostomy, it does not prove that ultrasound should be routinely used during all percutaneous tracheostomy. Also, palpation and bronchoscopy were used in addition to rather than instead of ultrasound. Rudas et al's (2014) study revealed better first pass rates with ultrasound use but failed to show any significantly reduced complication rates.

In attempting real-time ultrasound-guided insertion, it can be difficult to visualize the actual needle and its tract since the needle must enter the trachea almost directly below the skin puncture rather than being passed beneath the probe at an angle as is typically the case in other procedures (Tremblay and Scales, 2011). Ultrasound alone would not prevent posterior tracheal wall perforation. As percutaneous tracheostomy complication rates are so low, clinicians may be reluctant to learn a new technique if there is no clear benefit to patients.

Conclusions

While there are claimed advantages in using ultrasound routinely during percutaneous tracheostomy the evidence is limited and equivocal. More randomized prospective comparative studies are needed to determine whether routine use of real-time ultrasound will confer any benefit over current conventional percutaneous tracheostomy approaches and give a clearer picture on the safety and reliability of ultrasound in percutaneous tracheostomy. **BJHM**

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Anaesthetic and critical care dilemmas are coordinated by Dr Matthew Henley, Specialist Registrar in Anaesthetics, Royal Free Hospital, London and Dr Ramanathan Kasivisvanathan, Speciality Registrar in Anaesthetics, University College Hospitals London, London

Dr Chima Oti is Specialist Registrar in Anaesthetics and Intensive Care, Guys and St Thomas Hospital NHS Foundation Trust, London SE1 9RT and **Dr Nadeem Sabir** is Consultant in Anaesthetics and Intensive Care, Northwick Park Hospital, Harrow, Middlesex

Correspondence to: Dr C Oti
(chimaoti@gmail.com)