Intensive Care Med (2012) 38:920–921
DOI 10.1007/s00134-012-2514-3

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Real-time ultrasound-guided percutaneous dilatational tracheostomy

Accepted: 1 February 2012
Published online: 17 February 2012

Dear Editor,

Bronchoscopic guidance may be unreliable in assessing the level of cannula and guidewire insertion during percutaneous dilatational tracheostomy (PDT), besides exposing the bronchoscope to damage by the introducer cannula [1]. Ultrasound has been used to "pre-scan" the neck prior to PDT [2]. The feasibility of real-time guidance was explored in a small series; however, no attempt was made to view the point of guidewire entry into the chosen interspace [3]. In this retrospective observational study, we analysed the utility of real-time ultrasound in precisely guiding introducer cannula and guidewire insertion during PDT.

Approval was obtained from the hospital ethics committee. After performing anaesthesia, positioning and draping, we viewed the thyroid cartilage on the transverse axis (Fig. 1a) using a 12 MHz, linear probe (LOGIQ e, GE Healthcare, USA). The cricoid and tracheal cartilages were identified by sliding the probe caudally (Fig. 1b, c). The probe was placed over the first (T1) or second (T2) tracheal cartilage and its position adjusted to bring the chosen cartilage into view on the centre of the frame. The introducer cannula was inserted immediately caudal to the probe at its midpoint, at right angles to the trachea; this enabled entry between T1–T2 or T2–T3. The cannula tip was tracked by soft tissue movement and indentation of the air mucosal interface as it entered the tracheal lumen (Fig. 1c). Successful entry of the cannula into the tracheal lumen was identified by a "give way" feel. The level of guidewire entry was confirmed on longitudinal view by counting the tracheal cartilages downwards from the cricoid cartilage (Fig. 1d). The position of cannula entry on bronchoscopic view, as represented on a clock face, was noted. PDT was completed in the usual manner.

Real-time ultrasound-guided PDT was successful in all 62 patients studied over a 6-month period. The introducer cannula was inserted on the first attempt in 60 (96.8%) of patients. Level of guidewire entry was between the first and third tracheal cartilages in 58 (93.5%) patients and median (between 11 o'clock and 1 o' clock positions) in 55 (88.7%) cases. Median time to guidewire insertion was 12 s (range

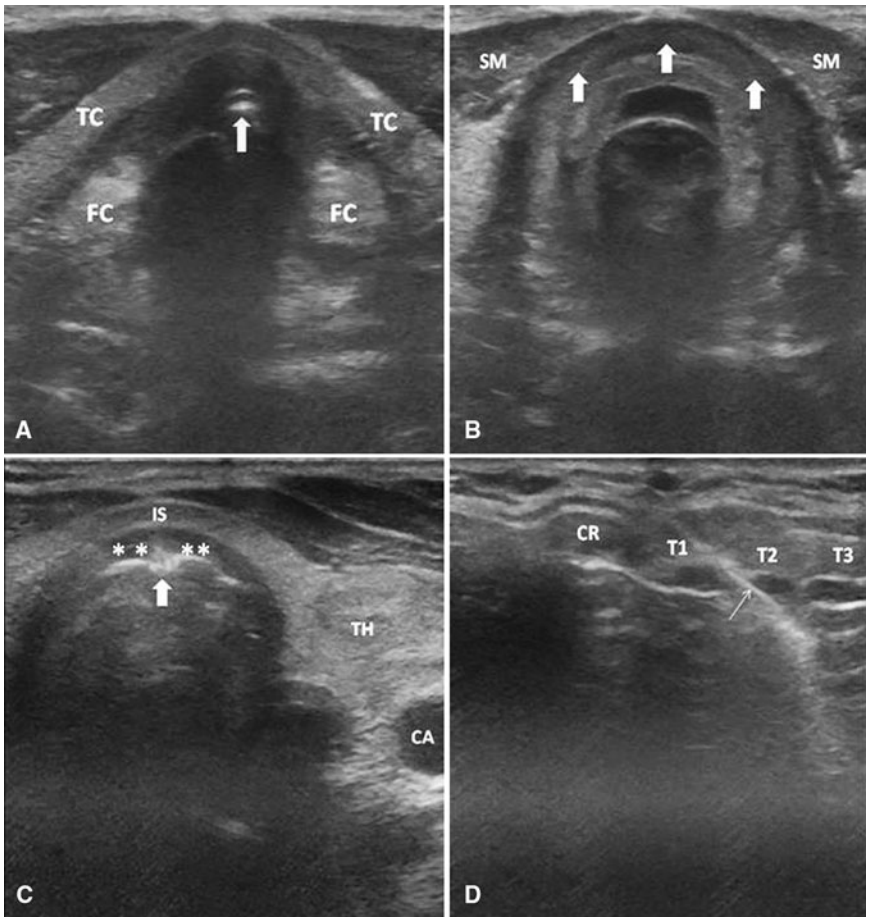

Fig. 1 **a** Transverse view. *TC* thyroid cartilage, *FC* false cords, *arrow* endotracheal tube. **b** *SM* sternomastoid muscle, *arrows* cricoid cartilage. **c** *IS* isthmus, *TH* lateral lobe of the thyroid, *CA* carotid artery, *arrow* indentation of the air mucosal interface by the introducer cannula, *asterisks* tracheal cartilage. **d** Longitudinal view. *CR* cricoid cartilage, *T1*, *T2*, *T3*, first, second and third tracheal cartilages, *arrow* guidewire passing through the T1–T2

8–122) and to complete the whole procedure was 12 min (range 9–22).

We used bronchoscopy only to confirm the position of the introducer cannula after insertion under real-time ultrasound guidance, thereby preventing damage to the bronchoscope. Blind insertion of the introducer cannula may result in inadvertent high or low placement [4, 5]. We had a high success rate with median entry; paramedian insertion is common during blind PDT [6] and may lead to stoma formation and abnormalities on the lateral tracheal wall [7] besides causing haemorrhage from injury to aberrant vessels [8].

In conclusion, we report on the largest series to our knowledge on real-time ultrasound-guided introducer cannula and guidewire insertion during PDT. Our study demonstrates the usefulness of real-time ultrasound guidance to site the introducer cannula at the appropriate level, in a median position. Controlled studies are required to investigate if enhanced precision with placement using ultrasound guidance will lead to fewer complications.

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