

Online Appendix 4 Intercostal drain insertion

Local anaesthesia

Creating a sterile field and applying local anaesthesia to the intercostal space are the first steps of insertion. The technique for local anaesthesia for small-bore chest drain insertion is similar to that for pleural aspiration (for reference see Online Appendix 3: Pleural aspiration, Figure 2). However, for larger-bore drains inserted via blunt dissection local infiltration of lidocaine around the periosteum of the two ribs surrounding the space is necessary due to the inevitable pressure exerted on the ribs during the process. Before proceeding to drain insertion, aspiration of air or fluid with the needle applying the anaesthetic is necessary, and failure to do so should prompt careful assessment including repeat thoracic ultrasound (TUS) examination to avoid an unsuccessful and complication-ridden procedure.

Procedure

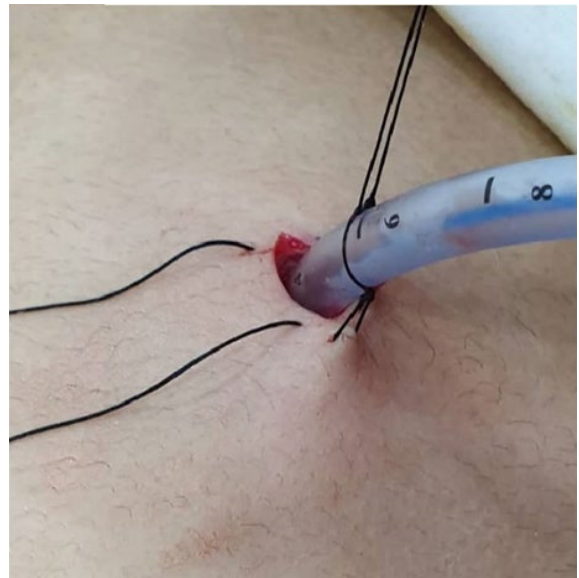
For the detailed steps of the Seldinger and blunt dissection techniques and the equipment needed for each procedure, the reader is referred to the Pleural procedures and thoracic ultrasound: British Thoracic Society Pleural Disease Guideline 2010 and the BTS guidelines for the insertion of a chest drain.^{1,2} Some commercial Seldinger-type drain kits are packed with all equipment required for insertion except for the local anaesthetic and the sutures. Additionally, some drain kits include a plastic stylet which provides support to the body of the drain during insertion preventing its kinking inside the chest-wall tract.

A U-shaped (closing) suture is applied before inserting large bore drains² but this is not necessary for smaller bore drains (Figure 1a). The pointed end of plastic dilators used for Seldinger drains can potentially cause visceral injury if advanced too far³ and thus it is recommended not to advance more than 1 cm beyond the parietal pleura¹. Guards over the plastic dilators are now available to prevent insertion of unnecessary excessive lengths. This simple addition enhances safety of the procedure.

Figure 1: Intercostal drain insertion suture types



(a) U-shaped (closing) suture



(b) Holding suture

It is often taught that chest drains should be directed apically for pneumothorax and basally for effusions.^{1,4,5} This may be feasible in the blunt dissection technique where the clamp used to push the drain into the thoracic cavity can provide guidance. However, this may be less feasible with the Seldinger technique. Recent data suggest that chest drain position after insertion does not significantly affect the duration of chest drainage in PSP⁶, or the need for another ipsilateral intervention in patients with trauma⁵. It is useful, however, to avoid directing the drain medially to guard against irritating or compressing mediastinal structures.⁷ Some sources

suggest that placing a chest drain close to the diaphragm reduces the efficacy of pleurodesis⁸, but there are no data to support this observation.

Chest drains have distance markings which typically start from the most distal (sentinel) side hole (Figure 2). It is important to ensure that all the drainage holes are well inside the pleural cavity to avoid complications (see below). Ultrasound measurement of thickness of the chest wall is very valuable in determining final depth. In general, drains should be advanced until the 8- or 10-cm mark in average adults, and advanced deeper in subjects with thick chest wall or where the drain is inserted in the “arm up” position. The depth at which the drain is fixed should be documented in the procedure report.

Figure 2: Chest drain distance markings



Fixing the chest drain to the chest wall can be achieved by a combination of suturing, firm dressing and locking mechanisms for some types of small-bore drains. A holding suture should be used with chest drains regardless of the size (Figure 1b). Failure to suture small-bore drains leads to doubling the risk of drain fall out.⁹ Commercial bespoke dressings are now available for some small-bore drains and should be used where possible. Due to differences in the design of different drains according to manufacturers, operators should be familiar with the insertion and removal practice of whichever device they use.

References

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