

Post-scan: another role of ultrasound in central venous catheter insertion

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To the Editor:

Ultrasound (US) has become a useful tool for achieving safer central venous catheter (CVC) insertion. The utilization of US before vein puncture (pre-scan) can provide important anatomical information on the vessels and detect abnormalities such as vein obstructions caused by thrombi [1]. The real-time use of US (US-guided technique) during CVC insertion is known to improve the success rate and reduce the incidence of complications [2]. In order to ensure safety, it is recommended that CVC insertion should be performed under real-time US guidance. However, only a limited number of anesthesiologists currently use pre-scan and/or real-time US techniques during CVC insertion [3].

Although pneumothorax is a relatively rare complication related to CVC placement, it cannot be eliminated, even when US is employed, particularly when vascular access via the subclavian/axillary vein is selected. Occult pneumothorax is difficult to detect with chest radiography and can rapidly progress to tension pneumothorax during the perioperative period if its diagnosis is missed or delayed. Therefore, early detection of this complication with a less invasive method is important.

Recently, many techniques that utilize US to detect occult pneumothorax have been proposed in the field of

emergency and critical care medicine [4, 5]. Soldati et al. [5] reported that the accuracy of lung US scan in detecting occult pneumothorax is as high as that of CT scanning. In Japan, however, US is only rarely employed to detect pneumothorax. We encourage our departmental staff to routinely use US not only before and during but also after CVC insertion, to perform a “post-scan” to detect pneumothorax as described below.

After CVC insertion, the anterior or lateral chest wall (where accessible) is quickly scanned with a portable echograph (MicroMax, Sonosite, Bothell, WA, USA; used with a linear 5–10 MHz probe). A normal lung is diagnosed based on one or more of the following four signs [4, 5]: (1) lung sliding, a to-and-fro motion of the pleural line synchronized with respiration; (2) comet tail, a roughly

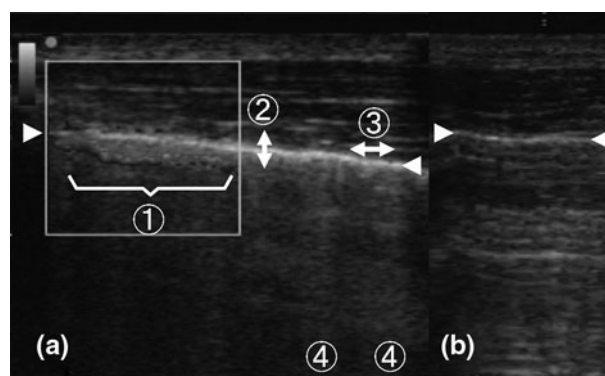


Fig. 1 Two-dimensional (2-D) US images. *White triangles* indicate the pleural line. **a** Normal lung: ① power sliding; *white box* indicates an area of interest with the color power Doppler area; ② lung pulse (motion of the lung/wall interface is only visible in real time); ③ lung sliding (same as above); ④ comet tail artifact arising from the pleural line and heading deeper. **b** Pneumothorax case: the pleural signs described above are absent and several horizontal reverberations can be seen in the background

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vertical artifact arising from the pleural line; (3) lung pulse, a perception of heart activity at the pleural line, and; (4) power sliding, lung sliding enhanced by the color power Doppler (Fig. 1a). US diagnosis of pneumothorax is based on the disappearance of these signs and the accentuation of image reinforcements due to air reverberation. A pneumothorax detected with this US approach (which was also confirmed by CT) is shown in Fig. 1b. This scanning procedure can be repeated as necessary. Using this technique, it is possible to exclude at least anterior and lateral pneumothorax in anesthetized patients in the supine position. We also evaluate hematoma formation around the insertion site using US after CVC placement. In addition, this technique can be used after US-guided nerve blocks such as infraclavicular block, which is at risk of pneumothorax.

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