



Editorial of current practise in the use of chest ultrasound in thoracic surgery

Kunal Bhakhri¹, Aman Coonar²

¹Senior Thoracic Registrar, ²Consultant Thoracic Surgeon, Royal Papworth Hospital, Hitchin, UK

Correspondence to: Kunal Bhakhri. Royal Papworth Hospital, 118 Benslow Lane, Hitchin, SG4 9RA, UK. Email: kunal.bhakhri@nhs.net.

Provenance: This is an invited article commissioned by the Academic Editor Shuang-Jiang Li (Department of Thoracic Surgery and West China Medical Center, West China Hospital, Sichuan University, Chengdu, China).

Comment on: Chiappetta M, Meacci E, Cesario A, *et al.* Postoperative chest ultrasound findings and effectiveness after thoracic surgery: A pilot study. *Ultrasound Med Biol* 2018;44:1960-7.

Submitted Aug 15, 2019. Accepted for publication Dec 24, 2019.

doi: 10.21037/jtd.2019.12.114

View this article at: <http://dx.doi.org/10.21037/jtd.2019.12.114>

Thoracic ultrasound (TUS), also known as chest ultrasound (CU), is a routine procedure but not often performed by thoracic surgeons. It is more commonly performed by others such as sonographers and radiologists. We evaluated our implementation in a thoracic surgery practice and found it easy to learn and use. It was acceptable to patients and was associated with faster care and reduced visits to other departments because of its “point of care” use (1). Procedures we undertook included drain placement, percutaneous biopsy and assessment of effusions. Despite such advantages usage by thoracic surgeons remains low. For a technology to become established it must offer significant advantages that make it both beneficial and improve the patient pathway.

Chiappetta and co-authors’ recent paper (2) inspired this editorial. They have put attention on the various lung abnormalities that could be discovered and monitored. In their initial study, patients after thoracic procedures were evaluated with TUS blinded to chest X-ray (CXR) to determine its utility. Twenty-four patients were enrolled prospectively and TUS allowed detection of lung abnormality, such as lung collapse, consolidation, hematoma, pleural effusions and pneumothorax. They found subcutaneous emphysema obscured the view and made diagnosis difficult.

They also highlighted the practical and logistical issues which need to be overcome if thoracic surgeons are using this modality. In the postoperative setting it competes with CXR and computerised tomography (CT). The advantage

of TUS is no radiation and a multi-dimensional view. The disadvantages include that it is operator dependent and can be difficult to record serial observations since they may be video files rather than side by side snapshots. Thoracic surgeons are more familiar with CXR and CT. Radiological images can be sent digitally and reviewed on a variety of devices but a CXR or CT may be easier for a thoracic surgeon to interpret than a TUS image.

Thoracic surgery patients often undergo serial CXR. TUS is effective in detecting clinically significant pneumothorax and other abnormalities, Possibly TUS could be used as an alternative to CXR. One prior study reported that ultrasound has a 100% negative predictive value (3) for pneumothorax and can predict the safe removal of chest tubes without the need for routine CXR (4).

The use of TUS for the diagnostic evaluation of pleural effusion as well as for guidance of thoracentesis has been known for many years, and is one of the most common indication of TUS (5).

The sensitivity and specificity of TUS for the detection of pleural effusions is as high as 93%, compared to CXR which has a sensitivity of 67% and specificity of 70% (6). Fibrinous septations are even better visualized by TUS than CT (7).

TUS can be reliably used to evaluate paralysis of the diaphragm. TUS has accuracy in diagnosis equivalent to fluoroscopy in patients, with the advantage of rapid bedside diagnosis along with the possibility to repeat the test at the clinician’s convenience, still maintaining contained costs

and reduced patient discomfort (8,9). However for the diaphragm many surgeons prefer the high image quality of functional MRI.

Excess use of radiography and its impact in terms of radiation exposure and healthcare costs is common knowledge. In children and younger adults, in whom the radiation risk is of more concern, TUS may be more acceptable and easier to implement (10).

The uptake of TUS by the thoracic surgical community, in decision making with regards to drain management post operatively has been slow. Only a handful of very small studies exist to illustrate the effectiveness of TUS in comparison to chest radiographs. A comprehensive study by Patella (11) concluded that TUS has a negative predictive value of 100% in ruling out large pneumothoraces post drain removal.

The implications for training, accreditation, resource allocation and practise development have been identified as some of the limiting factors, in the failure of thoracic surgeons accepting TUS as gold standard. However the requirements for practice development have been widely discussed and with the increasing availability of economical and portable units that also have good image resolution, it is reasonable to consider that TUS could become used more often by for interested clinicians.

To propagate further we need to ensure that thoracic surgeons and their teams are trained in its use, maintain familiarity and for easy to use devices to be readily available. The clinical potential may be obvious but needs support from hospital management to whom the benefit may not be apparent. Industry participation could also contribute to its wider use. The widespread adoption of TUS in other specialties such as emergency medicine with the FAST (focused assessment with sonography in trauma) scan shows that this is possible and that it can be successful (12).

Acknowledgments

None.

Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are

appropriately investigated and resolved.

References

1. Coonar AS, Hughes JA, Walker S, et al. Implementation of real-time ultrasound in a thoracic surgery practice. *Ann Thorac Surg* 2009;87:1577-81.
2. Chiappetta M, Meacci E, Cesario A, et al. Postoperative chest ultrasound findings and effectiveness after thoracic surgery: A pilot study. *Ultrasound Med Biol*. 2018;44:1960-7.
3. Lesser TG. Significance of chest ultrasound in the early postoperative period following thoracic surgery. *J Thorac Dis* 2019;11:S352-3.
4. Whitehouse MR, Patel A, Morgan JA. The necessity of routine post-thoracostomy tube chest radiographs in post-operative thoracic surgery patients. *Surgeon* 2009;7:79-81.
5. Volpicelli G, Elbarbary M, Blaivas M, et al. International evidence-based recommendations for point-of-care lung ultrasound. *Intensive Care Med* 2012;38:577-91.
6. Ruskin JA, Gurney JW, Thorsen MK, et al. Detection of pleural effusions on supine chest radiographs. *AJR Am J Roentgenol* 1987;148:681-3.
7. Maskell NA, Butland RJ, Pleural Diseases Group, et al. BTS guidelines for the investigation of a unilateral pleural effusion in adults. *Thorax* 2003;58 Suppl 2:ii8-17.
8. Ferrari G, De Filippi G, Elia F, et al. Diaphragm ultrasound as a new index of discontinuation from mechanical ventilation. *Crit Ultrasound J* 2014;6:8.
9. Goudie E, Bah I, Khereba M, et al. Prospective trial evaluating sonography after thoracic surgery in postoperative care and decision making. *Eur J Cardiothorac Surg* 2012;41:1025-30.
10. Amis ES Jr, Butler PF, Applegate KE, et al. American College of Radiology white paper on radiation dose in medicine. *J Am Coll Radiol* 2007;4:272-84.
11. Patella M, Saporito A, Puligheddu C, et al. Lung Ultrasound to Detect Residual Pneumothorax After Chest Drain Removal in Lung Resections. *Ann Thorac Surg* 2018;105:1537-42.
12. Brenchley J, Walker A, Sloan JP, et al. Evaluation of focussed assessment with sonography in trauma (FAST) by UK emergency physicians. *Emerg Med J* 2006;23:446-8.

Cite this article as: Bhakhri K, Coonar A. Editorial of current practise in the use of chest ultrasound in thoracic surgery. *J Thorac Dis* 2019;11(12):5706-5707. doi: 10.21037/jtd.2019.12.114