AIMS

- Provide the background information for the importance of thoracic ultrasound and data on safety of pleural procedures.
- Appreciation of basic anatomy and abnormal characteristics of pleural fluid on thoracic ultrasound
- Explain the specific findings of malignant pleural effusion, empyema and pleural thickening on thoracic ultrasound.

SUMMARY

Introduction

Pleural disease affects over 3000 people per million populations every year and the assessment requires a combination of clinical and radiological expertise of which ultrasound plays a key role (1). Thoracic ultrasound (TUS) was firmly within the sphere of activity of the radiologists until the last decade when a patient safety report concluded that the complication rates for blind pleural procedures were unacceptably high (2, 3). The increasing use of TUS by physicians represents the most significant advance in the management of pleural disease over the past decade. There is growing evidence that TUS reduces risk during pleural procedures (4).

TUS allows accurate identification of relevant anatomy including thoracic and abdominal viscera, and allows precise location of fluid and identification of its characteristics. TUS can reliably distinguish fluid from other causes of opacification on chest X-ray such as consolidation/collapse (unlike clinical examination) and can be used to provide real-time guidance during more complex interventions (4). It has the advantages of being portable, non-invasive, non-ionising and low cost. The importance of TUS has been recognized in both guidelines and training documents for thoracic and critical care physicians (2).

Pleural effusion

TUS can easily confirm the presence of an effusion, assess its character and is essential to guide pleural intervention. Pleural fluid is hypoechoic, appearing dark on US, often with an echogenic line of visceral pleura visible distally. Based on the echogenicity of the fluid effusions can be categorised to the following:
- Echogenic- are always exudates
- Non echogenic- can be either transudates or exudates

Exudative effusions (with high protein content) often form septations with the deposition of fibrin strands becoming thicker over time (5, 6). They are associated with infected or malignant effusion. Eventually, septations may be thick and profuse enough to give a honeycomb-like
appearance (7). By combining the echogenicity of the fluid with the septations effusions can be categorised to 4 groups:
- Anechoic
- Complex septated
- Complex non septated
- Homogenous echogenic

**Malignant pleural effusion**

TUS is able to distinguish malignant from benign effusions with an overall sensitivity of 79% and specificity of 100% in the presence of pleural thickening >1 cm, diaphragmatic nodularity or thickening >7 mm, visceral pleural thickening and pleural nodularity/irregularity are associated with malignancy pleural effusion, pleural nodularity (parietal, visceral or diaphragmatic) (5). These figures are comparable to the previously published data on diagnosis of malignant effusion with CT alone. In a study of 52 patients with suspected malignant pleural effusion, thoracic ultrasound correctly identified 26/33 malignant effusions and 19/19 benign effusions by using these criteria. However, ultrasound findings alone are not sufficient to make a diagnosis of pleural malignancy.

**Pleural thickening**

Pleural thickening can generally only be seen once >1cm in depth. Thickening can be echogenic or echo-poor. Identification can be difficult in the absence of pleural fluid due to lack of contrast between echogenic thickening, extra-pleural fat and the bright lung-pleural interface (8). Colour Doppler US can be useful to distinguish between thickening and small loculated effusions, as effusions may shows a fluid movement (e.g. with cardiac pulsation)

**Conclusions**

Portable ultrasound is a useful technique for evaluation of the pleural abnormalities at the bedside. Pleural ultrasound improves the accuracy of the physical examination and enables a better understanding of pleural pathology than the plain chest radiograph alone (2). The use of portal US machines by physicians will continue to increase; not least as a result of formalised training requirements, but as additional areas of value are being identified. It is really important for each respiratory physician to obtain training in the technique and understand the limits and seek further advice when required.

**REFERENCES**