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Pleural ultrasound

David Feller-Kopman

The use of hand-held portable ultrasound (US) has probably had more of an impact in the care of patients with pleural effusions than any other development since Light introduced a method for distinguishing transudative from exudative effusions in 1972.[1] The advantages of US for the evaluation of pleural effusions include the ability to provide real-time guidance for procedures, the absence of radiation, portability and the ability to perform dynamic evaluations. US is more sensitive than chest radiography for the detection of pleural fluid and may be better than chest CT scanning for differentiating pleural effusion from pleural thickening. The use of US has also been associated with a reduction in "near misses" as well as an increased yield, even in experienced hands.[2] Because of these benefits, the use of US by non-radiologists has increased tremendously over the last few years. The American Board of Internal Medicine "strongly recommends" obtaining proficiency in the use of US to guide thoracentesis for fellows in pulmonary and critical care training programmes (http://www.abim.org/certification/policies/imss/ccm.aspx). Likewise, the American College of Emergency Physicians,[3] the American College of Surgeons[4] and the Royal College of Radiology[5] have all issued statements regarding the incorporation of US in the care of patients with pleural effusions.

There have been several recent reviews of the use of US to guide thoracentesis[6 7] and, when compared with historical controls, the use of US is associated with a significant reduction in complications as well as improved yield.[2 8 9] In addition, the sonographic characteristics of effusions have been shown to correlate with underlying pathology. Complex effusions (with or without septae) and homogenously echogenic effusions are usually exudative, whereas anechoic effusions could be either exudative or transudative.[10 11] The sonographic characteristics of effusions have also been found to predict the need for pleural intervention in patients with empyema.[12] To date, however, only the presence of a pleural mass and the "echogenic swirling pattern" have been suggestive of the presence of a malignant pleural effusion (MPE).[13 14]

In this issue of *Thorax*, Qureshi and colleagues,[15] by using a systematic approach to the patient with suspected MPE, were able to accurately identify patients with malignant and benign disease (***see page 139***). Thoracic US was performed without clinical history and considered consistent with MPE if diaphragmatic/parietal pleural nodules, pleural thickening >1 cm or hepatic metastases were found. The inability to resolve the five distinct layers of the diaphragm which are normally easily seen and a diaphragm thickness >7 mm were also associated with malignant effusions. Benign disease was considered present when infection was confirmed or patients had a clinical follow-up of at least 12 months. Thoracic US correctly diagnosed 26/33 patients with malignant disease and 19/19 patients with benign disease (sensitivity 79%, specificity 100%, positive predictive value 100% and negative predictive value 73%) for differentiating malignant from benign disease. In comparison with chest CT scanning as

Correspondence to: Dr D Feller-Kopman, Interventional Pulmonology, Johns Hopkins Hospital, 1830 East Monument St, Fifth Floor, Baltimore, MD 21205, USA; dfellerk@jhmi.edu

the gold standard, thoracic US performed quite well. In six of the seven false negative US examinations, chest CT identified malignancy based on parenchymal opacities, adenopathy or the identification of metastatic disease.

Although well conducted, there are several methodological issues that may limit generalisability of the results. First, there was a high incidence of MPE (especially mesothelioma) in this study population. The propensity of mesothelioma to cause thickening of the pleura and diaphragm, as opposed to other malignancies that may cause isolated pleural nodularity, may have biased the performance characteristics of US in this study. This issue will need to be more clearly defined in a larger study with a more typical distribution of MPE not caused by mesothelioma. Second, the US examinations were performed by two experienced radiologists. Although US is used by many non-radiologists to examine the pleural space, the expertise of the authors may have allowed them to identify abnormalities that would have been missed by their non-radiology colleagues. In addition to using a standard 3.5 MHz curvilinear transducer, the authors used a high-frequency 8–15 MHz linear array transducer which has significantly higher resolution. Likewise, the US equipment used in the study is more sophisticated than some of the hand-held units currently used by the non-radiology community. It would have also been interesting if the authors could have confirmed the utility of the "echogenic swirling sign" in their patient population.

One of the largest benefits of US in the evaluation of patients with suspected MPE is that it is a non-invasive imaging modality that does not expose the patient to radiation. As such, US should be positioned after the clinical examination or after a standard chest radiograph in the algorithm of evaluating patients with pleural effusions. Performing chest US prior to obtaining a chest CT scan will provide the physician with valuable clinical information including the ability to narrow one differential diagnosis, guide pleural drainage and potentially predict the ability of the lung to fully re-expand. Draining the effusion before the chest CT scan will reduce the effects of compressive atelectasis and aid in the evaluation of the underlying parenchyma. A contrary argument, however, is that the presence of pleural fluid improves the sensitivity of the chest CT scan for evaluating pleural thickening and nodularity. Likewise, chest CT scanning has the obvious benefit of identifying parenchymal opacities invisible to US and can simultaneously provide information about mediastinal lymph nodes and extrathoracic disease.

One of the lessons the reader should take home from this study is that chest ultrasonography should proceed in a standardised fashion with attention to and documentation of specific details (see online supplement to paper by Qureshi *et al*[15]). By using a systematic approach, important details will not be overlooked and the full benefits of pleural US will be realised.

Competing interests: None.

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Traffic-related air pollution, genetics and asthma development in children

Thomas Sandström,[1] Frank J Kelly[2]

In recent years, air pollution has increasingly become recognised as a major contributor to adverse health effects. Numerous studies have shown that poor air quality can adversely affect those with respiratory conditions such as asthma and chronic obstructive pulmonary disease and, more recently, cardiovascular conditions such as myocardial infarctions and stroke.[1] Wherever the location, air pollution has been shown to be associated with deterioration in patients with these conditions, as well as with increased mortality.

In patients with asthma, air pollution increases symptoms, medication use, bronchoconstriction, emergency room admissions and hospitalisations. These effects are linked to pollutants such as ozone, nitrogen dioxide and particulate matter (PM) and, increasingly, the role of traffic-related air pollution has been highlighted. Traffic pollution consists of a complex mixture of particles and gases from gasoline and diesel engines, together with dust from wear of road surfaces, tyres and brakes. The coarse particles from road dust have been clearly associated with worsening of asthma and respiratory symptoms.[2] Motor engine particles from diesel engines have been linked with worsening of asthma and increased bronchial hyper-responsiveness,

[1] Department of Respiratory Medicine and Allergy, University Hospital, Umea, Sweden; [2] Environmental Research Group, School of Biomedical and Health Sciences, King's College, London, UK

Correspondence to: Professor T Sandström, Department of Respiratory Medicine and Allergy, University Hospital, Umea SE-901 85, Sweden; thomas.sandstrom@lung.umu.se