

## Correspondence

# Chest Sonography in the Diagnosis of Pneumothorax

**To The Editor:** I read with interest article by Balesa *et al.*<sup>1</sup> It is welcome that in this rapidly expanding field of point of care lung ultrasound we have publication of Indian experience. Several aspects of the article<sup>1</sup> merit comment.

The authors have not mentioned their working sonographic definition of pneumothorax in the material and methods section. The definition varies in literature. In 2008, Lichtenstein and Mezière<sup>2</sup>, gave a flow-chart for diagnosis of acute respiratory failure with point-of-care ultrasound and included pneumothorax in the differential diagnosis.<sup>2</sup> In 2012, the 'International Liaison Committee on Lung Ultrasound (ILC-LUS) for International Consensus Conference on Lung Ultrasound (ICC-LUS)'<sup>3</sup> gave a specific flow-chart for ultrasound diagnosis of pneumothorax.<sup>3</sup> It appears from the article of Balesa *et al.*<sup>1</sup> that the authors have not followed both<sup>2,3</sup> these recommendations.

In the results section, Balesa *et al.*<sup>1</sup> write that "Lung sliding, i.e. to-and-fro movement of pleural line with respiration was the most useful sign in the detection or exclusion of pneumothorax. It was absent on all cases diagnosed to have pneumothorax." This statement is misleading.

The most useful sign for the diagnosis of pneumothorax is the presence of 'lung point'.<sup>2,4</sup> Its presence is pathognomic i.e. 100% specific of pneumothorax.<sup>2,4</sup> However, lung point is not very sensitive for the detection of pneumothorax. In various studies, lung point was seen in 66%<sup>4</sup>-89%<sup>2</sup> of cases. Both, the BLUE protocol<sup>2</sup> and the ICC-LUS<sup>3</sup> include lung point in their flow-charts for the diagnosis of pneumothorax and make it imperative to look for it. In fact, Balesa *et al.*<sup>1</sup> have cited the year 2000 article of Lichtenstein *et al.*<sup>4</sup> as reference no. 22. In this article, Lichtenstein *et al.*<sup>4</sup> reported that lung point has 100% specificity for pneumothorax. Still Balesa *et al.*<sup>1</sup> did not mention lung point in their methods. Similarly, Balesa *et al.*<sup>1</sup>, have not stated about observing lung pulse in their article. Lung pulse is necessary in the ICC-LUS<sup>3</sup> flow-chart.

Absence of lung sliding is found in many lung conditions. In all conditions that visceral pleura is not in contact with parietal pleura like pneumothorax, hydropneumothorax and pneumonectomy or when there is no respiratory movement in visceral pleura, like inflammatory adhesions, loss of lung expansion, endobronchial intubation, apnoea, atelectasis, pneumonia and chronic symphysis, lung sliding is absent.<sup>2</sup>

Balesa *et al.*<sup>1</sup> mention two false positive cases. One patient had a large infected bulla and one had pleural thickening. Balesa *et al.*<sup>1</sup> provide insufficient sonographic examination information<sup>2,3</sup> to apply the

BLUE protocol<sup>2</sup> and the ICC-LUS flow-chart<sup>3</sup> to differentiate between these diagnoses and pneumothorax. Balesa *et al.*<sup>1</sup> have not reported on lung point, lung pulse, 'posterior and/or lateral alveolar and/or pleural syndrome' (PLAPS), doppler frequency adjustment for cardiac pulsation<sup>5</sup> and shred sign in their article. It is possible these false positives may have been resolved using the BLUE protocol<sup>2</sup> or the ICC-LUS flow-chart.<sup>3</sup>

Balesa *et al.*<sup>1</sup> have stated that B lines are one of static signs. This is inconsistent with definition of B lines. Observation of image characteristics with time, i.e. the 'Dynamic' nature, is necessary for defining B lines. Seven point definition of B lines has been given. "The B line is the name given to an artifact with seven features: a hydroaeric comet-tail artifact; arising from the pleural line; hyperechoic; well defined; spreading up indefinitely; erasing A lines; and moving with lung sliding when lung sliding is present".<sup>2</sup> The last of these-movement with lung sliding, is always present.<sup>6</sup>

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## References

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**The Author's Reply:** We would like to thank you for the keen interest in our article and for your comments. As mentioned in our discussion, chest sonography was used for the first time in the evaluation of pneumothorax at our institution. This was not a point of care lung ultrasound study, but was conducted by radiologists on haemodynamically stable patients shifted to the Department of Radio-diagnosis to look for

pneumothorax only. This study was undertaken to familiarise us with ultrasonographic signs of pneumothorax so as to be able to train other colleagues, anaesthetists and surgeons in this rapidly evolving field.

As mentioned in the article, this study was done from October 2010 to March 2012. Therefore, the flow chart for ultrasound diagnosis of pneumothorax given in 2012 by "International Liaison Committee on Lung Ultrasound (ILC-LUS) for International Consensus Conference on Lung Ultrasound (ICC-LUS)" was not applicable in our study. Hence, "Lung Pulse" was not evaluated in our study.

As this was our first experience of lung ultrasound, all the static and dynamic signs mentioned in our article in the material and methods section, were evaluated in every patient to make a diagnosis of pneumothorax, in addition to lung point. Our diagnosis of pneumothorax was based on a combination of sonographic signs, i.e. absence of lung sliding, comet tail artifacts/B-lines, Seashore sign (M-mode) and Power slide (power Doppler) with presence of A-lines, Stratosphere sign (M-mode) and lung point. Thus, the BLUE protocol was followed particularly for making a diagnosis of pneumothorax; but evaluation by M-mode and Power Doppler were also added. We have not mentioned the "BLUE" protocol as we did not aim to study various causes of dyspnoea, but only study the utility of ultrasound in the evaluation of pneumothorax

In our study, lung point was present in 62 out of 100 positive cases of pneumothorax, while absent lung sliding was present in 89 pneumothorax cases. The study was not designed to study the sensitivity and specificity of each sonographic sign, so as suggested by the reviewers/editors, these figures were edited. As mentioned in the literature, we also found lung point to be a specific sign (100% specificity) for the diagnosis of pneumothorax, but lung point was less sensitive than absent lung sliding in diagnosing pneumothorax.

The reason that we did not find lung point in many of the patients was probably that in our study more than 70% of the patients had post-traumatic pneumothorax (35%) or residual pneumothorax after intercostal tube drainage (36%). It was difficult to change position of patients who had suffered trauma; and in patients with ICD *in-situ*, in addition to limited window being available for ultrasound, presence of mild subcutaneous emphysema made ultrasound evaluation for lung point difficult. Hence, in our experience, absent lung sliding was the most useful (sensitive) sign in the diagnosis of suspected pneumothorax (in the widely varied clinical settings including chest trauma and post ICD residual pneumothorax), although not most specific.

It is a well known fact that lung sliding may be absent in many conditions other than pneumothorax as mentioned, but we have not diagnosed pneumothorax solely on the basis of absent lung sliding. Combination of all the signs as described above was used for the diagnosis of pneumothorax.

During the study we also observed that B-lines are dynamic in nature as these move with respiration; and due to typographical error listed as a static sign was of pneumothorax in our article. A classification of signs as dynamic and static was given by Soldati *et al* (2006).

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