

Double lung point in an 18-month-old child: a case report and literature review

Zhongheng Zhang

Department of Critical Care Medicine, Jinhua Municipal Central Hospital, Jinhua Hospital of Zhejiang University, Jinhua 321000, China

Correspondence to: Zhongheng Zhang, MMed. Department of Critical Care Medicine, Jinhua Municipal Central Hospital, Jinhua Hospital of Zhejiang University, 351#, Mingyue Road, Jinhua 321000, China. Email: zh_zhang1984@hotmail.com.

Objective: Double lung point is a rare sign of pneumothorax in clinical practice. In this report I presented an 18-month-old child who presented with bilateral pneumothorax.

Data synthesis and case presentation: Ultrasonography examination revealed conventional lung point sign on the right and double lung point on the left side. Thoracentesis was attempted and closed thoracic drainage was performed on the right side, but no gas was drawn on the left side. Clinical implication of double lung point sign found in chest ultrasonography is that the size of pneumothorax is limited and conservative treatment is enough.

Conclusions: To the best of our knowledge, this is the first case of double lung point identified with ultrasonography in child. The strength of the case is that the double lung point sign is supported by computed tomography (CT). Furthermore, we propose that the presence of double lung point indicates limited pneumothorax and conservative management may well be attempted.

Keywords: Double lung point; critical care ultrasonography; children; pneumothorax; lung point; detection

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Introduction

Ultrasound has been utilized for assessment of pneumothorax in clinical practice for nearly two decades and its diagnostic performance has been demonstrated to be optimal (1). By using computed tomography (CT) as the “gold standard”, its sensitivity and specificity can reach as high as 95% and 100%, respectively (2). The most specific sign to confirm pneumothorax is the “lung point” which is generated by the inspiratory increase in the volume of collapsed lung (3). In typical situation, the air floats to the anterior-inferior chest zone of a supine patient, and the size of pneumothorax can be estimated by the location of lung point. However, in certain situations, there can be some variations of the typical sign of lung point. I describe here a double lung point sign in an 18-month old child who suffered from severe pneumonia.

Case presentation

An 18-month-old female child was presented to the

emergency department for febrile and productive cough for 6 days. On physical examination, she appeared weak and sluggish. The heart rate was 153 beats/min, blood pressure was 116/76 mmHg, temperature was 38.4 °C, and the pulse oxygenation was 93% on 6 L/min oxygen mask. A chest X-ray was immediately obtained and the result showed bilateral inflammatory infiltrates and pneumothorax (*Figure 1*). She was then transferred to the intensive care unit (ICU) for further monitoring and management. On the way to the ICU, a CT was obtained. The result of CT scan showed bilateral pneumothorax with 30% compression on the right side and less than 10% on the left side, and there were inflammatory infiltrates in both lungs (*Figure 2*).

The patient's condition continued to deteriorate with respiratory distress and pulse oxygenation dropped to 76%. Emergent tracheal intubation was performed and mechanical ventilation was instituted. Thoracentesis was attempted and closed thoracic drainage was performed on the right side, but no gas was drawn on the left side.

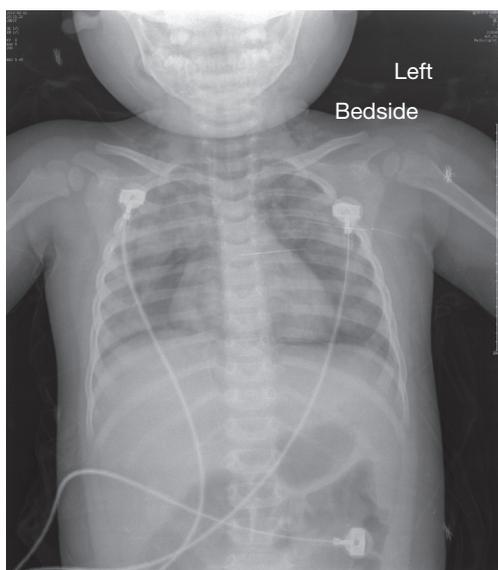


Figure 1 Plain chest X-ray shows bilateral pneumothorax with more lung compression on the right side.

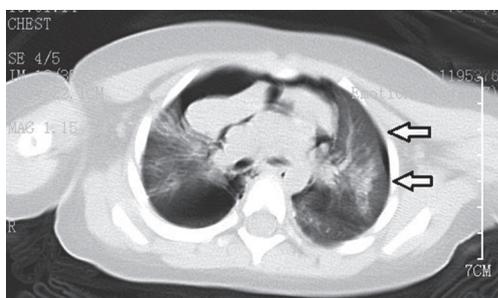


Figure 2 Computed tomography shows bilateral pneumothorax with 30% compression on the right side and less than 10% on the left side, and there were inflammatory infiltrates in both lungs. Arrows indicate the contact points between parietal and visceral pleura.



Figure 3 The ultrasound demonstrated double lung point on 3-5 intercostal space of the left side of the chest, along the anterior axillary line (4). Available online: <http://www.asvide.com/articles/467>

Due to the rapid respiratory rate despite mechanical ventilation, vecuronium was used for muscular relaxation. Analgesia and sedation were routinely instituted. Because there was pneumothorax found in CT scan and high inspiratory pressure, the extension of the pneumothorax should be suspected. Repeated portable ultrasonography was performed by experienced intensivist. The patient was assumed a supine position and the examination was started by scanning the anterior chest with a 7.5 MHz probe (M-turbo, Sonosite, Washington, USA) (Figure 3). As shown in the video, there were two lung points on both sides of the screen. Between these two points, there was no lung sliding or B-line suggesting separation of visceral and parietal pleura. Laterally to the points, the pleural sliding and B-line sign were evident. Both lung points moved simultaneously with respiration.

The oxygenation continued to deteriorate and the child died in 36 hours after ICU admission.

Discussion

Lung point is a well-described sign on chest ultrasonography that if present has 100% specificity for the diagnosis of pneumothorax, and its sensitivity is superior to the chest X-ray (5,6). However, the diagnostic value of lung point may be compromised by the coexistence of subcutaneous emphysema, pleural calcifications, obese body habitus and thoracic dressing. Owing to complex conditions in the chest, some variations of lung point for pneumothorax are present (7). Among them the double lung point sign is an interesting sign that is rare in clinical practice. The term “double lung point” has been used to describe another completely different ultrasonographic sign in neonate where the patient suffers from transient tachypnea (8,9). However, this phenomenon was later renamed as “double transition point” by expert’s opinion. Therefore, I still used the term “double lung point” in the present study.

To the best of our knowledge, the double lung point sign has been reported in three cases in the literature (Table 1). One is a 49-year-old woman with occult pneumothorax in lung apex after trauma, and this case was confirmed by CT imaging (10). Another case is a 22-year-old male with spontaneous pneumothorax in right apex (11). The third case was not reported in a formal pattern, but it is mentioned with several sentences and a figure by the author in a letter to the editor. Thus, the clinical background of this is unknown (12). One common feature of the pneumothorax presented as double lung point is that the volume of gas

Table 1 Clinical characteristics of three cases presented alternating lung points demonstrated by ultrasound

Cases	Causes of pneumothorax	Age (yrs)	Gender	Location	Treatment
Our case	Pneumonia	2-month	Female	Left anterior	Conservative
Aspler <i>et al.</i> , 2014 (10)	Trauma	49	Female	Anterior Left, near the fractured clavicle	Conservative
Volpicelli <i>et al.</i> , 2011 (11)	Spontaneous	22	Male	Right apex	Conservative
Soldati <i>et al.</i> , 2010 (12)	NR	NR	NR	NR	NR

NR, not reported.

is limited and invasive procedure for air drainage is not required. In two cases, the pneumothorax was observed and closely monitored and it absorbed spontaneously without any invasive procedure. The clinical outcome is generally good. In our case, the emergent condition was suspected to be associated with the pneumothorax and thoracentesis was attempted in the hope that it could relieve the emergency. However, no gas was drawn even under a skillful hand by a senior thoracic surgeon.

One important point in assessment of pneumothorax is to quantify its size. The plain chest X-ray is limited at this point and occult pneumothorax with small volume gas is often missed. Ultrasound is able to detect such occult pneumothorax and a little evidence suggests the position of lung point is able to differentiate between large and small pneumothorax. It is thought that the more laterally the lung point locates, the larger the size of pneumothorax would be. This notion was first hypothesized by Lichtenstein and then demonstrated in human Volpicelli *et al.* in a recent study (13,14). In an animal experiment, Oveland and coworkers (15) demonstrated a linear relation between the pneumothorax size and the lateral position of the lung point, and the relationship was comparable to that obtained by CT scan. However, there was uncertainty on the quantification of pneumothorax volume with conventional lung point. In the 2012 international evidence-based recommendations for point-of-care lung ultrasound, the statement “Bedside lung ultrasound is a useful tool to differentiate between small and large pneumothorax, using detection of the lung point” was assigned as grade C evidence without consensus (16). Herein, I propose that the presence of double lung point indicates limited pneumothorax and conservative management may well be attempted, which is supported by our case as well as by other cases as summarized in *Table 1*.

In aggregate, I reported the first case of double lung point in pediatric patient and the strength of our report is that pneumothorax was validated by CT scan. This finding

supplemented the common form of lung point. Clinical implication of identifying double lung point is that the size of pneumothorax is small and surgical procedure may not be helpful.

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