Research Article

Analysis of Difference of Double Lung Ultrasound in Patients with Single Lung Ventilation

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Abstract

Objective: To retrospectively analyse the lung ultrasound images of 60 patients undergoing thoracoscopic partial pneumonectomy and compare the difference of bilateral lung ultrasound images.

Results: B3 lines were predominant in ventilating side lung, B7 lines and atelectasis were predominant in operative side lung.

Conclusion: Short-term lung injury after one-lung ventilation is mainly on the ventilation side, and the main manifestation is pulmonary edema.

Introduction

One-lung ventilation is a commonly used ventilation method in thoracic surgery at present, but many studies have found that one-lung ventilation can cause certain lung injuries. The mechanism of lung injury was different on both sides. Mechanical barotrauma was the main injury on ventilation side, and mechanical stimulation induced inflammatory response. On the collapsed side, local inflammatory reaction and reperfusion injury were mainly caused by surgical operation [1-3]. Whether there is a difference in ultrasound images of the two lungs has not been reported. Pulmonary ultrasound can accurately identify common pulmonary complications during the perioperative period, such as pulmonary edema, pneumothorax and atelectasis. The author conducted a study on ultrasound images of the two lungs in the department of chest, and the report is as follows.

Materials and Methods

I Data and Methods

Sixty patients aged 35-78 years after thoracic surgery in the Second Affiliated Hospital of Dalian Medical University from December 2020 to July 2021 were retrospectively analysed. The patients had no history of respiratory and circulatory failure or abnormal liver and kidney function. They all woke up in the post-anaesthesia care unit, resumed spontaneous breathing and had tracheal tube removed.

II Instruments and Methods

Use of Philips SPARQ colour ultrasonic instrument, convex array probe.
i BLUE Protocol

The operator compared the size of the patient's hands and placed them together on the patient's anterior chest wall and placed the hypothenar of the left hand on the patient's subclavicular margin. Check the position of the blue dot: the third and fourth metacarpophalangeal joint of the left hand; Lower blue dot: right palm.

ii Diaphragm Point

Level with right hand hypothenar.

iii PLAPS Point

The point at which the lower blue point intersects the posterior axillary line vertically backward.

iv Lung Ultrasound Image Line A

Echo line parallel to pleural line, equidistant, repeated and gradually decaying.

v B3 Line

Appears from pleura line, points to the far end of the screen without attenuation of radium rays, and moves with breathing high-echo line, spacing between adjacent echo lines is 3mm.

vi B7 Line

The property is the same as B3 line, adjacent echo line spacing 7mm.

vii Fragmentary Sign

Solid tissue with fragmentary irregular strong echoes at the deep and aerated lung boundaries.

viii FATE Protocol

Parasternal long-axis ultrasound images were selected for collection, and cardiac dysfunction such as left ventricular systolic dysfunction was excluded.

Results

The characteristics of lung ultrasound images were 3.3% in ventilated side A, 50% in B3 line, 45% in B7 line and 1.7% in fragment sign. On the collapsed side, 33.3% of the patients were in A, 15% in B3 line, 40% in B7 line, and 11.7% in fragmentation sign. The relationship between operation time and line B: within 2 hours of operation, 30% of ventilator-lung B3 line, 60% of ventilator-lung B7 line, 5% of surgically side lung B3 line, 25% of lung B7 line; After operation for more than 2 hours, 65% of ventilated lungs were at B3 line, 25% at B7 line, and 25% at B3 line and 55% at B7 line.

| Table 1: Ultrasonic imaging of two lungs. |
|----------------------------------------|
| Upper blue point | B3 line, A | B7 line, A |
| Lower blue point | B7 line | Fragment sign, B3 line |
| PLAPS point | B7 line, B3 line | B7 line, A |
| Diaphragm point | B3 line, B7 line | B3 line |

Transthoracic echocardiography showed no abnormal cardiac function. Left ventricular ejection fraction was > 50%, the diameter of inferior vena cava was 2-2.5cm, and the variation rate of inferior vena cava was 10-20% (Table 1, Figures 1 & 2).

Discussion

Minimally invasive endoscopy is the main method in thoracic surgery, but single-lung ventilation is still the main ventilation method. Mechanical stimulation of single lung ventilation can induce lung injury. Pulmonary injury on the surgical side may be complicated with ischaemia-reperfusion injury due to aggregation of inflammatory factors at the surgical site. Commonly used drugs, such as propofol, sevoflurane and dexmedetomidine, can inhibit lung injury to a certain extent, but lung injury still occurs clinically and affects the rapid recovery of patients [3]. How to diagnose lung injury quickly and conveniently is a big challenge in clinic. Bedside pulmonary ultrasound was first proposed by French scholars, and the BLUE protocol of pulmonary ultrasound for
Further improvement in the next step. Perioperative point of care ultrasound has good clinical significance in postoperative and perioperative application. Standardized use of perioperative point of care ultrasound after systematic training can provide visual evidence for perioperative decision-making and is expected to become a basic perioperative skill, with broad application prospects [12].

Foundation Items

2019 Annual Teaching Reform Project of Dalian Medical University; Liaoning Key clinical specialty construction project in 2017.

REFERENCES

1. Zhujian Y, Shanglong Y, Huagen L (2008) Comparison of the degree of bilateral lung injury in rabbits after single lung ventilation at different time. Chin J Emer Med 27: 133-135.
2. Yulin S, Yu B, Tingkun L (2017) Effect of single-lumen and double-lumen endotracheal intubation on ventilation and lung injury in laparoscopic radical resection of thoracic esophageal carcinoma. Chin J Emer Med 97: 2194-2197.
3. Wanjun Z, Quan W, Man L (2017) Research progress on different mechanisms of bilateral lung injury during single-lung ventilation. J Clin Anes 33: 193-195.
4. Lichtenstein DA (2015) BLUE-protocol and FALLS-protocol: two applications of lung ultrasound in the critically ill. Chest 147: 1659-1670. [Crossref]
5. Perera P, Mailhot T, Riley D, Mandavia D (2010) The RUSH exam: Rapid Ultrasound in Shocks in the evaluation of the critically Ill. Emerg Med Clin North Am 28: 29-56. [Crossref]
6. Holm JH, Frederiksen CA, Juhi Olsen P, Sloth E (2012) Perioperative effect of focused assessment with sonography for trauma (FASH). Anesth Analg 115: 1029-1032. [Crossref]
7. Manno E, Navam M, Faccio L, Bertolaccini L et al. (2012) Deep impact of ultrasound in the intensive care unit: the “ICU sound” protocol. Anesthesiology 117: 801-809. [Crossref]
8. Xiaotong W, Dawei L, Hongmin Z (2012) Diagnostic value of improved bedside pulmonary ultrasound in patients with severe pulmonary consolidation and atelectasis. Chinese Med J 12: 948-951.
9. Zhuang Y, Dai L, Chen M, Chang N, Chen J et al. (2018) Diagnostic value of lung ultrasound B-line score in acute heart failure. Zhonghua Wei Zhong Bing Ji Jiu Yi Xue 30: 156-159. [Crossref]
10. Luhao W, Xiangdong G, Minying C (2016) Severe capacity recovery in patients with late lung capacity of ultrasonic evaluation. J Chin Med Clin Anes 17: 1359-1363.
11. Qianyi P, Lina Z, Li L (2017) Analysis of pulmonary ultrasound imaging in patients with postoperative intensive care based on Blueplus protocol. Ultra Imag 26: 976-981.
12. Hong Y, Peng Z, Hai Y (2018) Perioperative ultrasound: basic skills of anesthesiologists in the new era. J Clin Anes 34: 814-826.

Surg Case Rep doi: 10.31487/j.scr.2021.10.04 Volume 4(10): 3-3