



**ORIGINAL RESEARCH PAPER**

**Radiology**

**USE OF ULTRASONOGRAPHY FOR DIFFERENTIATION BETWEEN BULLAE AND PNEUMOTHORAX**

**KEY WORDS:**

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**ABSTRACT**

**Purpose** Lung ultrasound (US) is applied in emergency medicine, critical care, and trauma surgery, and also in pulmonary and internal medicine. In some cases, pneumothorax (PTX) distinguishes with bullous diseases. In this study, we aimed to discuss the success of US in detecting PTX versus bullae.

**Methods** Prospective blinded study was performed. US is done from anterior and lateral wall in all patients.

**Results** Study population included 50 patients. The sensitivity for the presence of the pleural sliding in the diagnosis of bullae was 95.80%, and the specificity was 100.0%.

**Conclusion** Direct visualisation of ultrasonographic pleural sliding can be a good tool for differentiating bullae and pneumothorax.

**INTRODUCTION**

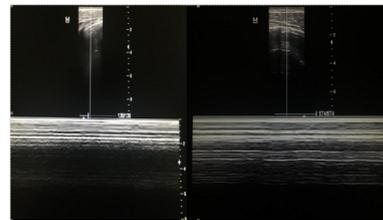
- Pneumothorax (PTX) is defined as air in the pleural space, between the parietal and visceral pleura,
- It is an emergency and is an important cause of respiratory failure which needs urgent management to avoid unwanted consequences.
- Bullae are defined as air-filled space that forms within the lung parenchyma.
- There are four sonographic signs to diagnose pneumothorax: lung sliding, B lines, lung point, and lung pulse.
- This study is aimed to discuss the success of US on detecting pneumothorax versus bullae.

**Materials and methods**

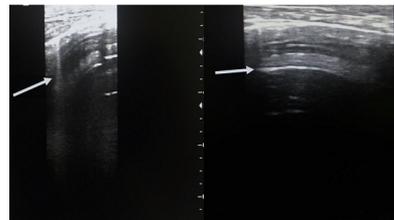
- **Study design:** A prospective blinded study in patients presenting to the emergency department with blunt thoracic trauma.
- **Sample size:** 50.
- **Inclusion criteria:** Patients having chest radiography scan which could not differentiate bullae and PTX and also no other major pathology (ARDS, fibrosis, pleurodesis, etc.) were observed and informed consent was taken.
- **Exclusion criteria:** Patients who needed immediate chest decompression and hemodynamically unstable patients were excluded.
- An ESOATE MY LAB 40 USG machine with a 7.5 MHz linear probe was used.
- US was performed from anterior and lateral wall and findings (B-line, pleural sliding, B-mode, M-mode) were recorded.

**Statistical analysis**

- Kruskal-Wallis test and 2 test were used to assess differences.
- Sensitivity, specificity, positive likelihood ratio (PLR), negative likelihood ratio (NLR), negative predictive value (NPV), and positive predictive value (PPV) for the presence of pleural sliding, presence of A-lines, and presence of B lines were calculated.
- SPSS 20.0 for Windows was performed for statistical analysis.
- P < 0.05 was considered significant



**Fig 1 a) Seashore sign in normal lung and b) barcode sign in pneumothorax**



**Fig2 B-line artefacts (a) in normal lung US and the absence of B-line and the presence of A lines (b) in pneumothorax US**

**Table 1 - Demographic data in patients with PTX and bullae**

	PTX (n= 25)	Bullae (n= 25)	Total (n= 50)
age ( years) median	55	60	57
female (n= 8)	5	3	8
vital signs (n=50) median			
SO2 (%)	90	90	90
HR (bpm)	82	87	87
SBP (mmHg)	121.5	123	123
DBP ( mmHg)	73.5	76	75

**Table 2 - Statistical analysis**

	Presence of pleural sliding	Presence of A lines	Presence of B lines
Sensitivity	95.8%	4.1%	4.1%
Specificity	100%	0.0%	100%
+ LR		0.03%	
- LR	0.04		0.95
PPV	100%	3.8%	1%
NPV	96%	0.0%	48%

**RESULTS:**

In all pneumothorax patients' presence of pleural sliding and B-line artefacts were never seen, also there was presence of A-lines in all patients. The presence of stratosphere sign in M-mode was the only visible pattern.

In the bullae group same as pneumothorax group in all patients' stratosphere sign in M-Mode were seen except there was one patient with presence of A-lines and presence of B-line, and in one patient the presence of pleural sliding could not be visualized.

The sensitivity of the presence of pleural sliding in the diagnosis of bullae was 95.80% and specificity was 100.0%.

**Table 3 - US findings in PTX and bullae patients**

	Pneumothorax (n= 25)	Bullae (n= 25)	P value
USG findings			
Pleural sliding	0	24	< 0.001
Presence of A lines	25	1	0.30
Presence of B lines	0	1	0.30
Stratosphere sign (M mode)	25	25	

Presence of pleural sliding can differentiate between pneumothorax and bullae, p value < 0.001 (significant)

**CONCLUSION**

- In conclusion, chest US was found to be a valuable diagnostic tool in pneumothorax diagnosis and direct visualization of ultrasonographic pleural sliding would be a good tool for differentiating bullae and pneumothorax which could not differentiate on chest x-ray.
- Artefacts could not differentiate bullae from pneumothorax.
- Giant bullae seem not to be differentiated by US.

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