The accuracy of lung ultrasonography to identify the position of left sided double lumen tracheal tube in elective thoracic surgery: a preliminary study.

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INTRODUCTION

One lung ventilation in thoracic surgery

- In thoracic surgery, a double lumen tracheal tube is required for one-lung ventilation.
- Rapid identification of the accurate position of the double lumen tube is important.
- Fiberoptic bronchoscopy is confirmative technique, but it requires specific device and experienced staff.

Identification of double lumen tracheal tube position

- **Chest auscultation**
 - easy, rapid technique, but individual and less sensitive
 - hypoventilation can be identified by decreased breath sound
- **Lung sonography**
 - require sonography, but relatively easy, visualizing, more informative
 - hypoventilation can be identified by decrease or no pleural movement

OBJECTIVES

We compared the accuracy of two methods (chest auscultation and lung sonography) for the detection of appropriate position of left sided double lumen tracheal tube.

METHODS

➤ This is a prospective observation study

➤ Inclusion criteria

- ① >19 years old adults
- ② ASA PS 1 or 2

➤ Exclusion criteria

- ① BMI<18.5 or >35 kg/m²
- ② Patients with severe chest deformity
- ③ Patients with history of tracheostomy
- ④ Patients with anticipated of difficult intubation
- ⑤ Patients with history of lung resection
- ⑥ Patients with history of pleural disease or pleura surgery

➤ Detection of DLT tube position using lung sliding sign

Pleural line.

Normally, the pleural line can be moved according to the lung movement. (a sliding sign)
However, if the lung was not ventilated, the sliding sign can be disappeared.

➤ Primary outcome

: Accuracy of each procedure using 2 x 2 table

FOB	Aus/Sono	Correct	Incorrect
Correct		A	B
Incorrect		C	D

$$\text{Accuracy} = \frac{A+D}{A+B+C+D}$$

STUDY PROTOCOL

RESULTS

➤ Demographics and intraoperative data

	Auscultation group (n=34)	Sonography group (n=32)	P
Demographics			
Age	60±12	68±10	0.004
Sex (Male incidence)	22 (64.7%)	17 (53.4%)	0.343
BMI (kg/m ²)	23.8 [21.6 to 25.7]	23.4[22.2 to 25.7]	0.964
ASA	2 [1 to 2]	2 [2 to 2]	0.429
Intraoperative data			
First check time (seconds)	49 ± 17	140 ± 66	< 0.0001
Second check time (seconds)	50 ± 17	113 ± 29	< 0.0001
Final check time (seconds)	100 ± 69	131 ± 68	0.011
Abnormal position			
Esophageal intubation	3 (8.8%)	1 (3.1%)	0.614
Right bronchial intubation	1 (2.9%)	1 (3.1%)	1.000
Too deep	7 (20.6%)	5 (15.6%)	0.604
Too shallow	5 (14.7%)	5 (15.6%)	0.918
Tube movement (cm)	1 [0 to 2]	1 [0 to 2]	0.684
Pleural adhesion	4 (17.4%)	8 (33.3%)	0.215
Anesthesia time (min)	265 [180 to 323]	265 [186 to 305]	0.847
Operation time (min)	184 [122 to 220]	186 [116 to 216]	0.627
Crystalloid amount (ml)	1020 [618 to 1553]	1040 [616 to 1356]	0.730
Transfusion (unit)	0 [0 to 0]	0 [0 to 0]	0.248
Urine output (ml)	390 [156 to 575]	295 [170 to 380]	0.418

➤ Accuracy between auscultation and sonography

	Chest auscultation (n=34)				Accuracy	
FOB	1st correct	2nd correct	1st incorrect	2nd incorrect	1st check	2nd check
Correct	15	17	2	1	59.4%	64.7%
Incorrect	11	11	4	5		
					P = 0.660	
	Lung sonography (n=32)				Accuracy	
FOB	1st correct	2nd correct	1st incorrect	2nd incorrect	1st check	2nd check
Correct	12	13	6	7	63.3%	68.8%
Incorrect	5	3	7	9		
					P = 0.6511	

➤ After the deletion of patient with pleural adhesion

	Lung auscultation (n=30)				Accuracy	
FOB	1st correct	2nd correct	1st incorrect	2nd incorrect	1st check	2nd check
Correct	13	14	1	1	60.7%	63.3%
Incorrect	10	10	4	5		
					P = 0.849	
	Lung sonography (n=24)				Accuracy	
FOB	1st correct	2nd correct	1st incorrect	2nd incorrect	1st check	2nd check
Correct	8	11	5	3	60.8%	83.3%
Incorrect	4	1	6	9		
					P = 0.088	

CONCLUSION

- Lung sonography **did not show better accuracy** than chest auscultation according to this preliminary data.
- Lung sonography requires **more time** than chest auscultation.
- Even **a novice**, lung sonography shows **good accuracy**.
- **Pleural adhesion** may contribute **false-negative result** in lung sonography.