

**Faculty of Medicine  
Critical Care Medicine**



**The Role of Lung Ultrasound in Assessment of Lung Recruitment Maneuvres and Successful Weaning from Mechanical Ventilation in Acute Respiratory Distress Syndrome Patients (ARDS).**

**A thesis**

**For fulfillment of master degree in Critical Care Medicine**

**Submitted by**

**Doaa Mahmoud Abdelaziz Mohamed Elkadi**

(M.B.B.CH)

Faculty of Medicine – Fayoum University

**Supervised by**

**Prof. Osama Mahmoud Momtaz.MD**

Professor of Critical Care Medicine

Faculty of Medicine - Fayoum University

**Assist. Prof. Ahmed Fathy El Khateeb.MD**

Assistant professor of Critical Care Medicine

Faculty of Medicine – Fayoum University

**Dr. Aliaa Abdel Hameed.MD**

Lecturer of Critical Care Medicine

Faculty of Medicine – Fayoum University

**Fayoum University**

**2024**

**The Role of Lung Ultrasound in Assessment of Lung Recruitment Maneuvres and Successful Weaning from Mechanical Ventilation in Acute Respiratory Distress Syndrome Patients (ARDS).**

Thesis

Submitted for partial fulfilment of master degree in Critical Care Medicine By

**Doaa Mahmoud Abdelaziz Mohamed Elkadi**

(M.B.B.CH)

Faculty of Medicine – Fayoum University

Critical Care Medicine Department

Faculty of Medicine – Fayoum University

Fayoum University

2024

## SUMMARY

**Background;** Acute respiratory distress syndrome (ARDS) is an extremely dangerous lung condition that leads to low blood oxygen levels. It has an incidence of 5% of hospitalized mechanically ventilated patients. ARDS is associated with high morbidity and mortality in critically ill patients, with mortality reported as high as 45% in severe ARDS.

The use of recruitment maneuvers (RMs) is suggested to improve severe oxygenation failure in patients with acute respiratory distress syndrome (ARDS). Lung ultrasound (LUS) is a non-invasive, safe, and easily repeatable tool. It could be useful for evaluating severity and prognosis of ARDS and monitoring the lung recruitment.

**Aim;** we aim to assess the role of lung ultrasound in evaluating different lung recruitment maneuvers through the lung aeration score and its correlation to physiological parameters in mechanically ventilated ARDS patients.

**Methods;** This study was conducted on (60) mechanically ventilated patients with ARDS, 7 were excluded as they did not meet inclusion criteria then the rest 53 were divided into two groups: Group A: included 24 patients underwent lung recruitment using sustained inflation (SI) maneuver and Group B: included 29 patients underwent lung recruitment using staircase recruitment maneuver (SRM) from whom another 4 patients excluded as they developed hemodynamically instability during recruitment. Lung ultrasound aeration score (LUSS) and respiratory physiological parameters (ABG, PaO<sub>2</sub>/FiO<sub>2</sub>, Dynamic compliance) were collected at four time periods (before intervention, immediate after intervention, 12h after intervention and at weaning). This prospective study was held at Intensive Care Unit (ICU) at Fayoum University.

**Result;** We noticed that lung recruitment in both groups significantly increased PaO<sub>2</sub>/FiO<sub>2</sub> ratio and dynamic compliance immediately after recruitment compared with basal state .The increase in pao<sub>2</sub>/fio<sub>2</sub> ratio and dynamic compliance immediately were significantly more in group B than in group A (p-value 0.045 and 0.032 respectively). Also, we noticed that pao<sub>2</sub>/fio<sub>2</sub> ratio and dynamic compliance 12h after recruitment decreased compared with immediately after recruitment but significantly increased compared with basal state before recruitment.

Furthermore, we observed that LUSS was negatively correlated with pao<sub>2</sub>/fio<sub>2</sub> ratio and dynamic compliance. LUSS significantly decreased after recruitment in both groups but more in group B than in group A with p-value 0.04.

Mean arterial pressure (MAP) was significantly decreased in both groups immediately after recruitment more in group B than in group A with P-value 0.039 then increased after 12h with no statistically significance when compared with basal state.

There was statistically significantly difference in both groups according to pneumothorax complication more in group B (5 out of 25,20%) than in group A (0 out of 24,0%) with P-value 0. 002. There were no statistically difference in both groups regard days of mechanically ventilation (MV), length of ICU stay or mortality.

LUSS cut-off > 1 3.5 predicted mortality with sensitivity and specificity were 83.8% and 78.9%, respectively.

**Conclusion;** Among the several methods proposed for monitoring lung recruitment in patients with ARDS, transthoracic lung US is a feasible and radiation free way to assess lung aeration at patients` bedsides. Lung US score

can be used to evaluate re-aeration after lung recruitment maneuvers and correlate it with oxygenation index and dynamic compliance. Additionally, lung ultrasound can predict weaning in ARDS patients.

Staircase recruitment maneuver (SRM) can improve oxygenation and dynamic compliance more than sustained inflation (SI) in ARDS patients but has more adverse effects on hemodynamics and barotrauma. Both maneuvers have no effect on mortality, days of MV or length of ICU stay.