



ROLE OF INTRAOPERATIVE ULTRASOUND GUIDED CHEST PHYSIOTHERAPY DURING WHOLE LUNG LAVAGE (WLL) FOR PULMONARY ALVEOLAR PROTEINOSIS (PAP) -A CASE REPORT.

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Introduction

Pulmonary Alveolar Proteinosis (PAP) is a rare disease characterized by alveolar accumulation of surfactant components in distal air spaces.^{1,2}

The most common symptoms are a nonproductive cough, progressive dyspnea and weight loss. The chest radiograph usually shows bilateral alveolar or nodular infiltrates without mediastinal or hilar lymphadenopathy.² The diagnosis is made by open lung biopsy specimen or special staining of segmental bronchial washings obtained through a flexible bronchoscope. Although a number of therapeutic measures have been tried with variable results, whole lung lavage (WLL) is recognized as the most effective treatment for patients with significant dyspnea on exertion.

Although many studies have reported the importance of chest physiotherapy in pulmonary conditions especially in ICU setups, the studies on pulmonary outcome in PAP with intraoperative LUS guided chest physical therapy intervention during WLL are not available, where theoretically alveoli are flooded with lavage fluid¹⁰. Chest physiotherapy is carried out with guided LUS which increase the effectiveness of CPT would while reducing complications and thus making the procedure safer. Hence, this case is reported to further explore the chances of making intraoperative LUS guided chest physiotherapy during whole lung lavage in patient with pulmonary alveolar proteinosis a standard procedure.

Case description:

This case report follows a 54-year-old male patient with biopsy-proven Pulmonary Alveolar Proteinosis presenting with type I respiratory failure. The patient was examined and basal crepitations, air entry equal breath sounds were auscultated bilaterally. At the time of admission PAO₂ was 52 mmHg, SpO₂ = 86% in room air and during course of treatment with 40% O₂ in venturi mask PAO₂ was reported to be 54 mmHg and SpO₂ was 89%.

Management for this patient was decided to be bilateral whole lung lavage under general anesthesia. Single lung lavage of the left side was done first. After intubation with a double lumen endotracheal tube, and connecting the patient to ventilator, single lung ventilation of right side

and complete isolation of left lung (which was to be lavaged) was achieved.

The left lung was then lavaged with warm saline. Each lavage cycle was terminated when the endotracheal tube was filled with warm saline. Success (alveoli flooding) is confirmed by LUS followed by 8 - 10 minutes of effective gravity assisted chest physiotherapy guided by point of care lung ultrasonography carried out in right lateral decubitus position and drainage of the fluid done. Physiotherapy was stopped when C-profile changed to A-profile. A total of 5 liters of pre-warmed saline was used to irrigate the left lung out of which 3 liters of lavage fluid was retrieved. The fluid retrieved showed marked difference in the color and density after each cycle starting with pink, frothy dense quality with thick white sediments proceeding to whitish, milky, less dense quality with lesser white sediments as the lavage cycles progressed.

Six days later, the patient under went right lung lavage ,irrigating with 7 liters and retrieving 6 liters with effective lung ultrasound guided postural drainage and chest physiotherapy including percussion, vibration and shaking till an almost clear lavage with lesser sediments where collected. Continuous physiotherapy sessions including lung expansion therapy, airway clearance techniques and progressive monitored ambulation was carried out till the patient was discharged and home exercise program was prescribed at discharge.

Discussion

Pulmonary alveolar proteinosis (PAP) is a lung disorder which was first described in 1958 by Rosen et al⁷ and is a rare disease with a prevalence of 0.1 per 100,000 individuals. Pulmonary Alveolar Proteinosis occurs due to deposition of amorphous lipoproteinaceous material in the alveoli. This mainly results from primary or acquired form of macrophage dysfunction that results in abnormal processing of surfactant. Over a course of time, phospholipids and surfactant apoproteins accumulate in the alveoli⁴

The technique of WLL is well described⁵. In general, aliquots of 1 liters of warm saline are required for each lavage, with a total of up to 10 to 13 lavage cycles. Chest percussion during the lavage procedure significantly

increases the recovery of the lipoproteinaceous material⁶. Complications of WLL include malpositioning of the ET tube, saline spill over into the unlavaged ventilated lung, and hydropneumothorax. After WLL, symptoms often improve dramatically; however, long-term follow up is needed since the clinical outcome is variable.

We wanted to quantify impact of intraoperative LUS guided chest physiotherapy and also determine if the gravity assisted chest manipulations might further improve the lavage results. The use of chest percussion during WLL in the operating room reduces the length of the procedure and clearly increases the therapeutic results in patients with PAP(8,9,10) Others have reported a more complete clearing of the chest radiographs and our experience supports this.

Table 1:

OUT COMES	PRE LAVAGE	AT THE TIME OF DISCHARGE
MMRC	IV	I
DYPNEA INDEX	III	I
AUSCULTATION	Bilateral basal crepitations	NVBS, AE equal
SPO ₂	86% at Room air 89% while on 40% at venturi mask.	96- 97% at 2L/min O ₂
Chest X ray	Haziness present in perihilar and bilateral lower zones	Marked radiological clearing in bilateral lower zones
Oxygenation Index	135	233
A-a gradient	181	92.5

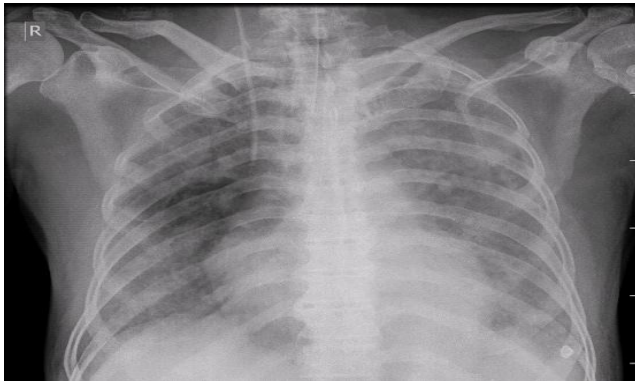


Figure 1: Before Lavage

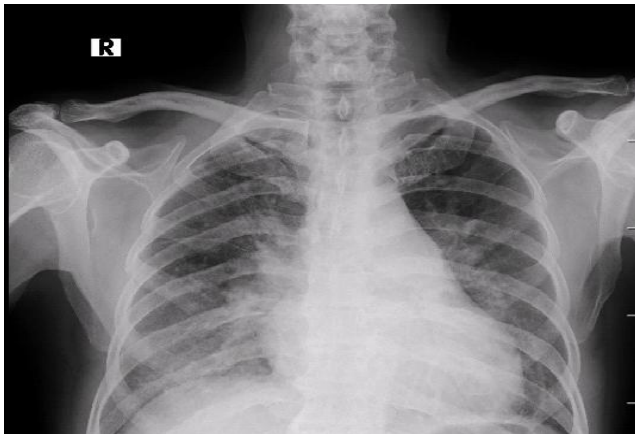


Figure 2: Time of discharge



Figure 3: Lavage fluid collected after WLL and intraoperative CPT arranged in sequence of collecting it.

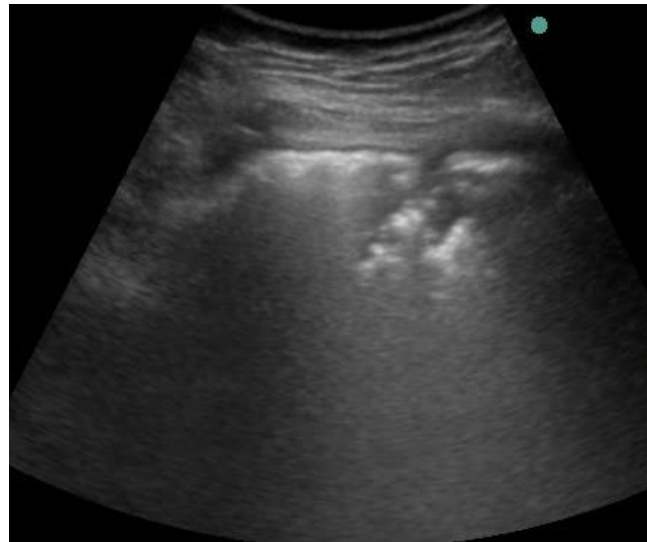


Figure 4: Beginning of whole lung lavage.



Figure 5: Consolidated lung at beginning of chest physiotherapy (at end of lavage)

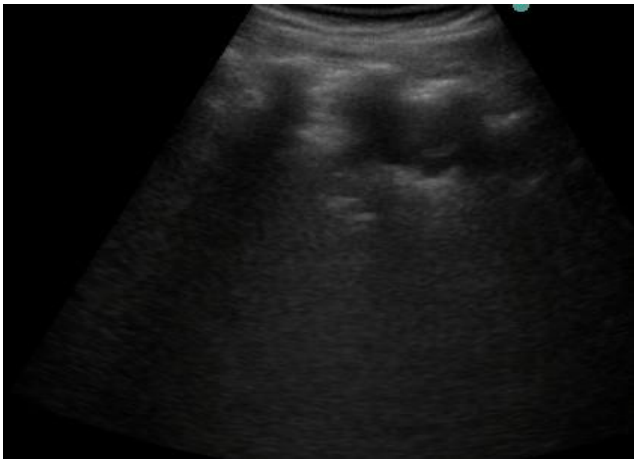


Figure 6: Small peripheral consolidation of lung seen at end of chest physiotherapy

Conclusions

The intraoperative use of the LUS guided CPT can be a useful adjunct in completing large volume lung lavage in patients with clinically symptomatic PAP and the possibility of it being a standard procedure during WLL should be explored seriously.

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