



# Effect of Chest Physiotherapy on patient Hospitalized With Interstitial pulmonary fibrosis in intensive care unit { Case Study Report }



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## ABSTRACT

**1-Purpose:** The aim of this study is evaluate the effect of chest physiotherapy on hospitalized patients with IPF .

**2-Method and Materials:** Chest physiotherapy management was applied for 3 sessions. 1Session\day included. 1Session\day. The lesson lasts 45 minutes in total. the RP treatments that are advised for seriously unwell patients receiving hospital care in the ICU. Activating and releasing of respiratory muscles, positioning, percussion on chest to improve air way clearance , passive ROM of all limbs to prevent muscle atrophy , Mobilization to elbow and knee and ankle.

**3-Results :** Physiotherapy management lead to improved airway clearance and improve O2 saturation, improved mobility of elbow joint and knee Joint , activation of intercostal muscle , release of hyperactive neck muscles .

**4-Conclusion:** Early physiotherapy intervention for ICU patients with IPF lead to improvement in chest expansion , lung volume , activation of intercostal muscle , increasing of ribs mobility and prevent muscle weakness and increase joint mobility and prevent DVT , the program was applied included : Activating and releasing of respiratory muscles, positioning, percussion on chest to improve air way clearance , passive ROM of all limbs to prevent muscle atrophy , Mobilization to elbow and knee and ankle.

## **INTRODUCTION**

A set of interstitial lung disorders (ILDs) known as interstitial pulmonary fibrosis produce inflammation and fibrosis of the lung interstitium, which impairs gas exchange. Depending on the disease, the trachea, bronchi, bronchioles, alveoli, and pleura may also be impacted. The clinical, radiological, pathologic, and physiologic findings of the majority of these disorders serve as indicators of their severity. There are several typical causes: Environmental and occupational exposures: Pneumoconiosis caused by inorganic materials and related professions (Asbestos: plumbers, shipyard, and construction workers; Beryllium: aerospace, mining, and coal miners; Carbon dust: silica miners and sandblasters; Silica: silica mining and sandblasting; Chromium: metal and chemical manufacturers). chemicals that are organic and cause hypersensitive pneumonitis. lung damage brought on by drugs Interstitial pulmonary fibrosis may result from a variety of medications. Common drugs include amiodarone, antineoplastic substances, beta-blockers, methotrexate, nitrofurantoin, statins, and radiation therapy are examples of common medications. Systemic lupus erythematosus (SLE), Systemic sclerosis, Rheumatoid arthritis, Antisynthetase syndrome, Polymyositis/dermatomyositis, and Mixed connective tissue disease are more connective tissue diseases (CTD). Additionally, there are some systemic diseases such sarcoidosis, alveolar proteinosis, lymphangiomyomatosis, granulomatosis with polyangiitis, and illness caused by antibodies to the glomerular basement membrane.

## **SUBJECTES AND METHODS**

For three sessions, chest physical therapy treatment was used. 1 Session includes a day. breathing exercises, posture, percussion on the chest to increase airway clearance, passive range of motion exercises for all limbs to prevent muscle atrophy, and joint mobilisation for the elbow, knee, and ankle. For three sessions, chest physiotherapy management was used. 1 Session\day. The lesson lasts 45 minutes in total. the RP treatments that are advised for seriously unwell patients receiving hospital care in the ICU.

For use in clinical settings, we separated the suggested physiotherapy interventions into two categories: active interventions, which are for patients who can follow instructions, and passive interventions, which are for patients who cannot. These categories were primarily based on the level of consciousness. The main objectives of RP are to reduce the negative effects that critical illness and intubation have on the respiratory system, to regain physical and respiratory independence, to stop the need for further reliance on mechanical ventilation and subsequent hospitalisations, and to enhance the quality of life for the patient.

First and foremost, this is accomplished by lowering the patient's reliance on the ventilator, lowering secretion retention, atelectasis, and pneumonia, maintaining or increasing lung volume, improving regional or global ventilation and compliance, improving ventilation/perfusion match, lowering airway resistance and work of breathing, and improving oxygenation. The maintenance and enhancement of respiratory and peripheral muscle strength are equally important.

Activation of Intercostal muscles. (5 minute ) :intercostal muscle stimulation through gentle massaging using finger pads.



Fig. 1. Activation of Intercostal muscles.

Joint mobilization : ( 5 minute ) For elbow and knee stiff joints.

Diaphragmatic assisted exercise ( 5 minute ) Diaphragmatic assisted mainly in expiration by gentle pushing on diaphragm at end of expiration ( both hand fingers laterally on lower ribs with both thumbs on xiphoid process giving gentle pushing at end of expiration).



Fig. 2. Diaphragmatic assisted exercise.

Positioning (10 minutes ) Body placement is one of the therapies that is most frequently used in the crucial area. The physiological justification for shifting a patient's position is to avoid potential complications from prolonged immobility, such as dependent airway closure and atelectasis, pooling and stagnation of pulmonary secretions, and subsequent infection. When lying flat, dependent regions' lung volumes may decrease over their functional residual capacity, which can cause airways to close causing atelectasis. The outflow of secretions is hampered at the same time that airway resistance rises, primarily as a result of abdominal and chest wall compression. Additionally, it has been discovered that the supine position, as opposed to the head-up position, may be a risk factor for pulmonary aspiration of gastric contents in patients receiving MV. Additionally, the semirecumbent or upright position (bed head at 45 degrees) can reduce respiratory rate, WOB, and heart work while increasing tidal volume and inspiratory flow rate, as well as prevent pulmonary aspiration, improve V/Q matching, lung volumes, and mucociliary clearance. Prone posture, which enhances V/Q matching and oxygenation, redistributes oedema, and boosts functional residual capacity, has emerged as a key tool in the management of ARDS patients. Placing the diseased lung highest improves V/Q matching and facilitates drainage from lung segments in patients with unilateral lung disease . Placing the diseased lung uppermost facilitates drainage from lung segments and enhances V/Q matching in patients with unilateral lung illness. With the use of specialised beds, continuous lateral rotational therapy (CLRT) can be achieved. These beds spin along the longitudinal axis, up to an angle of 60° onto either side, with a pre-set speed and degree of

rotation. Endobronchial secretions are expelled. It's crucial for physicians and physiotherapists to correctly diagnose the issue and choose the best strategy to speed up sputum clearance because several processes can be to blame for secretions retention. It is usually advisable to ensure proper systemic hydration and optimal airway humidification in intubated and mechanically ventilated patients in order to prevent mucus tenacity, which leads to adhesion and the development of atelectasis. Either an active humidifier or a passive humidifier can provide the proper humidification. On the other hand, it is not advised to regularly administer sodium chloride or N-acetyl cysteine. Finally, percussions—a technique that, when used by a skilled practitioner, has been shown to be beneficial in encouraging the mobilisation of secretions—are connected to postural drainage. The chest wall over the afflicted portion of the lung is clapped with cupped hands during percussions (Andrews et al. 2013). In patients who are mechanically ventilated, this combination of approaches has been demonstrated to improve lung collapse (Chen et al. 2009). Vibrations can be used manually or mechanically to compress the chest wall with a high frequency as an alternative to percussions.

**Mobilization** The patient is typically confined to bed and may not be cooperative due to sedatives during the acute phase of a serious illness. Skeletal muscular weakness, disuse atrophy, and deconditioning are all known to be serious issues brought on by prolonged bed rest. In addition to being exacerbated by medications like neuromuscular blockers and steroids, this serious condition is also made worse by neuromyopathy and starvation. Early patient mobilisation does, in fact, improve the strength of the respiratory and periphery muscles, and it increases the amount of time that patients are ventilated-free among those who have received MV

In addition to improving alveolar ventilation and ventilation/perfusion (V/Q) matching and optimising oxygen delivery, mobilisation acts as a gravitational stimulus to maintain or restore the body's natural circulation and fluid distribution. Early mobilisation is possible even in patients who are unconscious or under sedation, and algorithms and procedures have been suggested as a guide for identifying patients who are eligible for mobilisation and delivering the best possible care.

**Muscular training ( 10 minutes )** All weak muscles discovered after examination have passive ROM. exercising the ankle pump can avoid DVT. As was previously mentioned, critically ill patients are frequently need to spend extended periods of time in bed, which leads to progressive deconditioning and the development of generalised muscle weakness. A sizable fraction of ICU patients frequently exhibit ICUAW. Skeletal muscles make up the majority of this deficiency, but respiratory muscles and the diaphragm may also be significantly affected. ICUAW restricts daily activities and postpones recovery and rehabilitation. Deconditioning, disuse atrophy, sepsis, multiple organ dysfunction syndrome, systemic inflammatory response syndrome, hyperglycemia, and drugs (corticosteroids and neuromuscular blocking agents) are the main causes of it. Ventilator-induced diaphragmatic dysfunction is a condition where the diaphragm's structure and function are negatively impacted by the MV itself. The respiratory

muscle endurance of patients who receive extended MV does indeed decline, and they run the risk of developing respiratory muscle fatigue. One of the key factors in weaning failure is respiratory muscle weakness, namely the mismatch between muscular strength and the strain placed on the respiratory system.

percussion: ( 10 minutes) Historically, postural drainage has involved positioning the patient so that gravity can help move mucus from the lungs' outer edges to their core airways. It is also acceptable to adopt modified postural drainage, which involves avoiding head-down postures and draining the lower lobes horizontally. Patients with gastroesophageal reflux have benefited from this modified form of postural drainage. Additionally, when getting postural drainage with percussion, patients with moderate or severe lung illness frequently have oxygen desaturation..



Fig. 3. Percussion

## RESULTS

Applying physiotherapy management leads to improvements airway clearance and improve O2 saturation, mobility of elbow joint and knee Joint , activating of intercostal muscle , releasing of hyperactive neck muscles.

Assessment of vital signs before and after physiotherapy management

	Before	After
<b><u>HR</u></b>	129 beat\min	115 beat\min
<b><u>RR</u></b>	34\min	24\min
<b><u>BP</u></b>	140\90	130\80 mmHg
<b><u>Temp</u></b>	37	37
<b><u>SPO2</u></b>	95	98

Table (1)

### Assessment of Local chest examination before and after physiotherapy management

	<u>Before</u>	<u>After</u>
<u>Inspection</u>	✓ <b>Dyspnea:</b> lung dyspnea (Grade 3) ✓ <b>Accessory neck muscle:</b> very weak	✓ <b>Dyspnea:</b> improvement lung dyspnea.( Grade 1) ✓ <b>Accessory neck muscle:</b> more flexibility .
<u>Palpation</u>	- No chest deformity - Neck muscle spasm	- No chest deformity - Increase neck muscle flexibility.
<u>Percussion</u>	Dull	Slightly less Dullness

**Table (2)**

### Assessment of PROM and Muscle tone before and after physiotherapy management

	<u>PROM</u>				<u>Muscle Tone</u>			
	<u>Before</u>		<u>After</u>		<u>Before</u>		<u>After</u>	
	<u>Rt</u>	<u>Lt</u>	<u>Rt</u>	<u>Lt</u>	<u>Rt</u>	<u>Lt</u>	<u>Rt</u>	<u>Lt</u>
<u>Hip</u>					Atrophy		Atrophy	
<u>Knee</u>	143	145	151	153	Weakness of knee extensors	Weakness of knee extensor	Slightly weakness	Slightly weakness
<u>Ankle</u>								
<u>Shoulder</u>					Hypertonicity	Hypertonicity	Normal	Normal
<u>Elbow</u>	120	122	145	147	Weakness of elbow flexors	Weakness of elbow flexors	Slightly weakness of elbow flexors	Slightly weakness of elbow flexors
<u>Wrist</u>								

**Table (3)**

## DISCUSSION

This study was conducted to determine the effect of looked at the impact of chest physical therapy on patient in ICU. The activation of intercostal muscles helps to increase chest expansion and chest mobility, and after recording these results, we noticed improvement in this case. and workout with diaphragmatic assistance. Ventilation is efficient and the oxygen consumption of the muscles of ventilation is low during relaxed (tidal) breathing when the diaphragm is working properly in its role as the major muscle of inspiration. The mechanical work of breathing (oxygen consumption) and ventilation efficiency both suffer when a patient heavily relies on the auxiliary muscles for inspiration. In order to facilitate the clearing of respiratory secretions, the prevention of pressure sores and ventilator-acquired pneumonia, and the improvement in lung capacity and oxygenation, it is crucial to switch positions often during mechanical ventilation. For patients with a critical illness in the ICU setting, early mobilization seems to reduce the occurrence of ICU-AW, enhance functional ability, increase the number of ventilator-free days, and raise the percentage of patients who are discharged to

their homes. In order to promote airway clearance, respiratory physiotherapists utilize the manual technique of percussion, which involves moving secretions from one or more lung segments to the central airways. An energy wave is created when a region is pounded, and it travels to the lungs and airways.

## **CONCLUSION**

Early physiotherapy intervention for ICU patients with IPF leads to improvement in chest expansion , lung volume , activation of intercostal muscle , increasing of ribs mobility and prevent muscle weakness and increase joint mobility and prevent DVT.

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