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ORIGINAL ARTICLE

# Study of Effect of Chest Physical Therapy in Patients with Chronic Obstructive & Acute Suppurative Lung Diseases

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## ABSTRACT

**Background:** In airway diseases, decline in pulmonary functions, mucus hypersecretion and airway clearance always remain a big problem. Manual chest physiotherapy techniques involving chest percussion, vibration and shaking have long been used in the treatment of respiratory conditions. There is limited study of CPT effectiveness in these diseases. We applied different CPT techniques in different respiratory conditions to understand its effectiveness.

**Objective:** The goal of this study is to know the effectiveness of different chest physical therapy techniques in patients with chronic obstructive , acute suppurative lung diseases and also to educate these patients about the benefits of bronchial hygiene therapy, breathing exercises and other protocols of chest physical therapy along with conventional treatment

**Settings:** This study was done in chest physiotherapy department of Gulab devi chest hospital from june 2012-dec 2012. .

**Method:** This study includes 51 subjects(n=51) with mean age 45 years, out of which 18 patients were with COPD and 15 with br.asthma and they were diagnosed on the basis of clinical & spirometric findings PEFR, FEV1, FVC &FEV1/FVC ratio. Bronchiectasis, pneumonia and lung abscess diagnosed in 11, 4 and 3 patient respectively on the basis of clinical judgementct, CXRs PA & CT scan chest. CPT techniques like aerosol therapy,bronchial hygiene therapy( BHT), postural drainage purcussion vibration(PDPV), active cycle breathing(ACB), and different cuff & huff techniques were applied for 1week and observe the effect after 7days.

**Results:** In COPD patients ,SaO2 improved from 89% to 98% in about 88% patients, sputum clearance in 70% and dyspnea improved in 67% of patient but there was no marked improvement in FEV1 & PEFR.In 65% of asthma patients SaO2 improved from 90 to 97% and PEFR in 80% of patient. While in bronchiectasis ,pneumonia and lung abscess sputum load decrease in 80%, 75% and 66% of patient respectively.WBCs count normalized in 75% of patient, (12500/ul to 10500/ul).

**Conclusion:** There is a positive effect of chest physiotheray (CPT) in all respiratory diseases which ae associated with hypersecretion or retention of sputum and dysponea. It makes prognosis better. .

**Key words:** Respiratory care of lung diseases; suppurative lung diseases; Chest physiotherapy; lung abscess; Postural drainage; COPD; pneumonia. .

## INTRODUCTION

The spectrum of chronic obstructive lung diseases is broad and includes asthma and the COPD which are most common, cystic fibrosis and bronchiectasis are less common entities. [1] The normal production and clearance of sputum in health is most important thing, which is impaired in respiratory conditions.. In these diseases the normal clearance mechanism is impaired which causes accumulation of secretion and risk of infection..In chronic bronchitis and B.E main aim of treatment is to improve the removal of secretion[..2-6] However asthma

is not associated with hypersecretion in which CPT is applied to improve SaO2 and reduce the level of dyspnea. In bronchiectasis and COPD single and short term treatment is inadequate for better prognosis[70] (one has to use repeated courses of antibiotics & other treatment modalities),while in case of pneumonia, broncheactasis & lung abscess there is massive sputum production & respiratory care (postural drainage) is required to clear sputum .Chest physiotherapy should be offered to patient with chronic obstructive & acute supportive lung diseases with the aim of management of shortness of breath, symptoms control, airway clearance, lung function (PFR/FEV1) & SaO2 improvement.[8]

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CPT is also used in patient with obstructive lung diseases to prevent complications.

## METHOD

The confirmed cases of chronic obstuctive & acute suppurative conditions who reffered in chest physiotherapy department of Gulab devi chest hospital from june 2012-dec 2012 were selected .

Then diagnosis made on the basis of clinical assessment ,spirometery, CXRs and Ctscan while they were admitted in the hospital After diagnosis different techniques of chest physiotherapy were applied and assessment was made pre and post treatment. Then sputum production, level of dysponea and SaO2 was measured in all these subjects, at baseline, at 3rd day and 1st week.

Inclusion & exclusion criterion: Only those pts were included in the study who were stable & willing for chest physiotherapy

Chest physical therapy of COPD & asthma patient

In these patients diagnosis is made on the basis of FEV1 & PEFR. In asthmatics aerosol therapy and breathing exercises were taught. Breathing exercises in the management of asthma have been taught including sustained maximal inspiration (SMI), diaphragmatic breathing and basal chest expansion exercises.

In COPD including chronic bronchitis retention of secretion is main problem with bronchospasm. So, breathing exercises along with bronchial hygiene therapy is beneficial. In chronic bronchitis, postural drainage, coughing and breathing exercise improved airway clearance but positioning alone is ineffective. Different cough manures may even be effective in patients who do not expectorate. Postural drainage (positioning, percussion, vibration and shaking) carry secretions from peripheral parts to central airways and cough help to clear central airways.

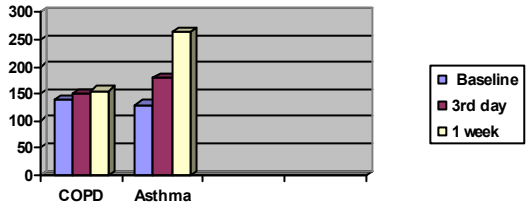
## RESULTS

The CPT techniques applied in asthmatics and COPD patient showed different results. In COPD patients Sao2 improves and sputum clearance is enhanced but no marked improvement in PEFR and FEV1.

### CPT techniques for asthmatics & COPD patients

Nebulization (aerosol therapy) with bronchodilators and mucolytics improve clearance of secretions. In COPD patient it was found that chest percussion provided a small increase in mucus transport, but that it had no more benefit than cough and positioning. Researchers found a higher clearance rate and high sputum weight of expectorated sputum after application of different CPT interventions.Forced expirations and coughing are most effective and important part of CPT in such diseases.. Cough may even be effective in patients who do not expectorate sputum.[8]

**Fig:** PEFR measurement in asthma & COPD patients.




### CPT in bronchiectasis

It is a condition of permanent dilatation and destruction of bronchial wall with impaired ciliary's function which results in accumulation of secretion and infection. Therefore postural drainage is essential for patient with productive cough. Aerosol therapy with bronchodilators and mucolytics / N.saline for the treatment of bronchospasm and liquefaction & removal of thick tenacious secretion. Breathing exercises to increase ventilation, improve chest expansion and lung compliance. Study trials in bronchiectasis evaluated the effect of postural drainage plus percussion. These protocols are applied of CPT applied in bronchiectasis. In case of dry bronchiectasis postural drainage is not beneficial and vigorous coughing may increase the possibility of hemoptysis.

## RESULTS

After 1week study of 11 patient 9(80%) patient showed effective secretion clearance and improvement in SaO2 and dyspnea control. 7(63%) patients are well satisfied and 4(36%) patients are only satisfied with their treatment.

### Protocol of CPT in Bronchiectasis

Main aim of CPT is to clear thick tenacious secretions. The aerosol therapy with normal saline liquefy the thick secretions, reduce viscosity and enhance removal of secretions. Postural drainage is use of various patient positions to

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orient,secretion filled bronchi with the expectation that the gravity can assist their drainage. Nine postural positions have been described with time depending upon the quantity, viscoelasticity and adhesiveness of mucus. chest Percussion is clapping of chest with cupped hand with movement at wrist joint and shaking is coarse movement applied to rib cage during expiration[9]. Vibrations can replace percussion and shaking when contraindicated. Directed cough then taught to clear central airways. Forced expirations are as effective as cough in patient with bronchiectasis and COPD even though patient effort is less with forced expirations.

**Broncho pneumonia and lung abscess**

This type of pneumonia is most common , especially in elderly patient and much more frequent than lobar pneumonia. The radiograph show's patchy shadows. As there is no consolidation or pleural inflammation causing pleuritic chest pain, CPT is not contraindicated. Postural drainage, breathing exercises and cuffing and huffing techniques are beneficial in these patients.

Lung abscess is also associated with massive sputum production that requires CPT. The CXRs (lateral view) is needed to establish the exact position of abscess. Positioning and gentel vibrations assist drainage but percussion should be avoided as there is possibility of heamoptysis.

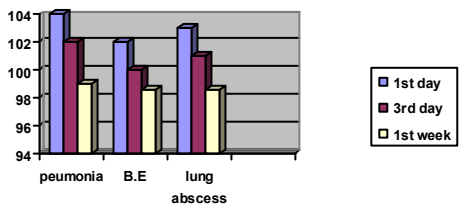
## RESULTS

The problem of massive sputum load in pneumonia and lung abscess resolve in 75% & 66% patients respectively. WBC is normalize in 50% and SaO2 improve in all patients (100%). Fever normalize to baseline.

| **Pneumonia patient** | **WBCs count** | | **Diffuse CXRs shadows** | |
|---|---|---|---|---|
| | Baseline | After1week | At present | At 1week |
| 1<br>2<br>3<br>4 | $12.5*10^3$<br>$14*10^3$<br>$11.8*10^3$<br>$12*10^3$ | $10.6*10^3$<br>$11.o*10^3$<br>$10.2*10^3$<br>$10.5*10^3$ | Present<br>//<br>//<br>// | Still +ve<br>//<br>clear<br>not clear |
| Lung abscess | Baseline | At 1week | 1 day | At 1week |
| 1<br>2<br>3 | $13.8*10^3$<br>$12.5*10^3$<br>$13.4*10^3$ | $10.3*10^3$<br>$10.1*10^3$<br>$11*10^3$ | Opacity R lung (AFlevel)<br>Opacity lower<br>Opacity in R mid lobe with air fluid level | Not clear<br>Abscess start to heal<br>X-ray clear |

**CPT in pneumonia & lung abscess**

Postural drainage is most important part of CPT in patient with pneumonia and lung abscess. Position should be according to anatomy of the lung segments for proper drainage of mucuprulent sputum. Breathing exercises are also beneficial in patient with bronchial pneumonia to reduce work of breathing and proper oxygenation.




Fig; temperature measurements of patient with acute lung diseases & bronchiectasis.

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**Table1:** Dysponea SaO2 & Sputum in patients pre &post CPT intervention.

| Disease | Level of dysponea | | Mean SaO2 | | Amount of sputum | |
|---|---|---|---|---|---|---|
| | Before intervention | After 1 week | Baseline | After 1week | At 1day | After 1week |
| COPD | G-4 | G-2 | 89% | 98% | 2-3spoon full | Scanty |
| Asthma | G-3 | G-1 | 91% | 99% | Scanty /Nil | NO |
| Bronchiectasis | G-3 | G-2 | 87% | 96% | 3spoon-1/2cup | 1spoon full |
| Br.pneumonia | G-3 /G-4 | G-1 | 85% | 98% | 1/2 cup | Scanty |
| Lung abscess | G-2 /G-1 | G-1 | 98% | 97% | 1/2- full cup | Scanty |

Dysponea grades: G-1= no breathlessness.
G-2= mild breathlessness on severe exertion.
G-3=severe breathlessness on mild exertion.
G-4= breathlessness at rest.

Comparison with control group: in control group 38 subjects(n=38) with mean age 47 years, out of which 15 patients were with COPD and 9 with br.asthma and they were diagnosed on the basis of clinical & spirometric findings PEFR, FEV1, FVC &FEV1/FVC ratio. Bronchiectasis, pneumonia and lung abscess diagnosed in 8, 3 and 3 patient respectively on the basis of clinical judgementct, CXRs PA & CT scan chest. These patients were treated according to GOLD , GINA & pakistan chest society guidelines with standard treatment without chest physical therapy

In COPD patients SaO2 improved from an average 85- 88% to 92% in about 80% of COPD patients, sputum clearance in 45% and dysponea improved in 55% of patient but there was also no marked improvement in FEV1 & PEFR.In 60% of asthma patients SaO2 improved from 90 to 95% and PEFR in 80% of patient. While in bronchiectasis ,pneumonia and lung abscess sputum load decrease in 60%, 55% and 45% of patient respectively.WBCs count normalized in 70% of patient, (11500/ul to 10000/ul).

If we compare both groups , there is marked difference in these two groups in term of improvement in SaO2 & dyspnea improvement ,sputum clearance & WBCs normalization

## DISCUSSION

This study was conducted in Gulab Devi hospital Lahore (2012). It is concluded that different techniques of chest physiotherapy in ch. Obstructive and acute supporative lung diseases provide different results. Overall results showed that CPT along with conventional treatment is beneficial to improve condition of patient. It makes prognosis better.

*Syed Shakil ur-Rehman, khalid Farooq Danish et al described that* The postural drainage combined with chest mobilization techniques are more effective in chronic suppurative lung diseases than the chest mobilization techniques

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used alone. The postural drainage physical therapy techniques are also efficacious in reducing the amount of sputum in patients with pneumonia combined with other techniques[10], this study is v much favouring our results.

The national strategy of COPD in England study described the effect of CPT techniques at six months post exacerbation of COPD (MATREX). The results of the MATREX do not support the routine use of CPT in the management of acute exacerbation of COPD. It is possible that CPT may have therapeutic value to COPD in specific circumstances[11].this observation is against our results.

R Gosselink in his study described that evidence exists to support the effectiveness of pursed lips breathing, forward leaning position, active expiration and inspiratory muscle training, but not for diaphragmatic breathing. Careful patient selection, proper and repeated instruction and control of the techniques, and assessment of the effects are necessary.[12] though in our study we did not use all these techniquies but common modalities of our & this study shoed same results

Garcia-Aymerich et al did study role of chest physiotherapy in chronic obstructive lung diseases in London UK. A broad range of treatment chosen by physiotherapist: breathing exercises; bronchopulmonary hygiene techniques and physical training of inspiratory and respiratory muscles. The breathing exercises can have a beneficial effect on health related quality of life in asthma. Role of CPT and pulmonary rehabilitation in the management of COPD is once again reinforced. Recent data from a cohort study demonstrate a protective effect of physical therapy on mortality and hospital admission in COPD[13]. Physiotherapy to enhance sputum clearance has been a longstanding mainstay of management and there is evidence that it improves cough, exercise tolerance and, in children, lung functions.[14] because of risk of silent aspiration, head-down sputum clearance techniques are now discouraged. Our study completely favouring these results.

There is evidence that physiotherapy & pulmonary rehabilitation and tailored exercise programs improve exercise tolerance in people with bronchiectasis[15] Patients with bronchiectasis affecting their exercise tolerance or activities of daily living should be referred for pulmonary rehabilitation and/or have a tailored exercise program developed in consultation with a physiotherapist. This may occur in the community using available local exercise facilities.Other forms of physiotherapy-based intervention including focused inspiratory muscle training have not shown benefit in bronchiectasis & COPD and are they are not advocated.[16-17] because our results are different to these results. M.P Murrey described that regular chest physiotherapy in non-cystic fibrosis bronchiectasis has small, but significant benefits and it scompareable with our study.[18] Conclusion

It is concluded that chest physiotherapy is effective in different respiratory conditions. Different CPT techniques have their role in number of chest diseases associated with mucus hypersecretion and hypoxemia. Chest physiotherapy should be a part of treatment in these respiratory conditions.

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