



## EFFECTIVENESS OF ELTGOL TECHNIQUE VERSES POSITIVE EXPIRATORY PRESSURE TECHNIQUE ON PULMONARY FUNCTION AND QUALITY OF LIFE IN SUBJECTS WITH BRONCHIECTASIS

### Physiotherapy

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### ABSTRACT

Bronchiectasis is a disease that results in abnormal and permanent dilatation and distortion of proximal and medium sized bronchi caused by weakening or destruction of the elastic and muscular components of bronchial wall. As review of various studies indicated that ELTGOL technique and positive expiratory pressure (PEP) technique improves pulmonary function. Hence The Aim of the study is to compare the effectiveness of ELTGOL technique and Positive Expiratory Pressure (PEP) technique on pulmonary function and quality of life in subjects with bronchiectasis. Total of 74 subjects selected, out of those 64 subjects were included who met the inclusion criteria and willing to participate in the study after obtaining the consent form were included. these 64 subjects are divided into two groups by sample of convenience .in which 4 subjects are drop out dropped from the study due to change in the medication, the study was completed with the sample of 60 subjects. Both groups performed intervention for 1 hour a day 5 days a week for 4 weeks. The outcomes of the study were FEV1/FVC ratio and SF36 Questionnaire. paired T test was used to access statically significance between pre and post test scores within the groups, independent t test was used to access statistical significance between pre and post test score between the groups. statistical analysis of the data revealed that ELTGOL technique group has more difference when compare to positive expiratory pressure group.

### KEYWORDS

Eltgol Technique, Postive Expiratory Pressure, Fev1/fvc, Sf 36 Questionarie, Bronchectasis

### INTRODUCTION

Bronchiectasis is a medical condition characterized by the persistent and anomalous widening and deformation of the larger bronchial passages, stemming from the weakening or impairment of the elastic and muscular elements of the bronchial wall.<sup>1</sup>

Approximately 566 in 100000 people in highly income countries suffering from bronchiectasis. In Asia, bronchiectasis is commonly encounter diseases 1.2% of prevalence estimate in subject age of 40 years and older patients in India were younger median age 56years 44-66 years suffering with bronchiectasis<sup>2</sup>. A meta-analysis of 6 observation studies found that the prevalence of bronchiectasis was 54.3% (range 25.6%- 69%) more common in males or 1.62,95% or 1.15 to 2.28) and with a greater smoking history weighted means difference 4.63 pack years, 95% CL 1.61 to 7.65 pack years<sup>3</sup>.

Bronchiectasis has a number of causes which include idiopathic, post infective, e.g.: childhood whooping cough, an insult to airway of some other kind e.g.: aspiration of gastric contents and smoke inhalation Exaggerated immuno-response e.g.: allergic bronchopulmonary aspergillosis<sup>4</sup>.

The recent literature suggested that the bronchiectasis patients might slow a variety of pathophysiology abnormalities including restrictive or mixed patterns isolated air trapping or even normal lung function<sup>7</sup>.

The predominant symptoms include sputum production dyspnea, fatigue, fever and weight loss<sup>5</sup>.The initial investigation of bronchiectasis focusing particularly on High Resolution Computed Tomography features that allow recognition of specific causes<sup>6</sup>.T

he medical treatment plan for the bronchiectasis patients should include medical treatment of exacerbations, anti-inflammatory therapies maintenance of antibiotics if required, attention to general clinical care including education on nutrition, maintenance a healthy life style, receiving appropriate vaccinations (against influenza and pneumococcal infections) and airway clearance therapies.

Effective clearance of mucus from the airways may break the vicious cycle of disease process by decreasing the stagnation of mucous and mucous plug formation with an associated bacterial colonization, recurrent infection and inflammation.

Chest physiotherapy has been used form many years and a number of techniques are available for mobilizing secretions such as Postural drainage, Active Cycle Breathing Technique, Autogenic drainage, Oscillatory Positive Expiratory Pressure devices and high frequency chest wall oscillation.

The bronchiectasis experiences chronic cough and sputum production and required the prescription of airway clearance techniques The most common airway disease techniques are ELTGOL (L'expiration lente totale glotte ouverte en decubitus lateral) and PEP (Positive Expiratory Pressure Technique).

The efficacy of PEP therapy in a stable clinical state or during an acute exacerbation ACTs in bronchiectasis. The primary aim of this review was to determine the effects of PEP therapy compared with other ACTs (Airway Clearance Techniques) on health-related quality of life (HRQOL), rate of acute exacerbations, and incidence of hospitalization in individuals with stable or an acute exacerbation of bronchiectasis<sup>8</sup>.

Additional objectives encompassed assessing the impact of Positive Expiratory Pressure therapy on physiological parameters and clinical indicators when compared to alternative Airway Clearance Techniques (ACTs) in individuals with bronchiectasis, whether in a stable state or during an acute exacerbation.

An approach known as ELTGOL (L'expiration Lente Totale Glotte Ouverte en Decubitus Lateral) has been introduced as a method to facilitate the clearance of secretions in hyper secretive patients<sup>8</sup>. Among the potential benefits of this technique are the improvement of peripheral airway clearance and dyspnea, and the reduction in disease exacerbations. ELTGOL entails the execution of gradual expirations while keeping the glottis open, starting from the functional residual capacity (FRC) and progressing to the residual volume (RV).

This technique is carried out with the individual positioned in the lateral decubitus stance, with the affected lung positioned as the dependent lung<sup>11</sup>. Despite this is a simple and low- cost resource, there is little evidence about its efficacy and physiological effects in hyper secretive patients. As far as our awareness extends, there have been no studies conducted to investigate the effects of ELTGOL in individuals with bronchiectasis<sup>9</sup>.

Spirometry is one of the more common tests of lung function. Forced spirometry maneuvers gauge an individual's ability to exhale forcefully from total lung capacity (TLC) to residual volume (RV) and, on occasion, their capacity to inhale vigorously back to TLC. The primary parameters of forced spirometry are the FEV1/FVC ratio, the FEV1 (forced expiratory volume in 1 second) and FVC<sup>10</sup>.

Health-related quality of life (HRQoL) is commonly used as an outcome measures. Various multi-item questionnaires are employed to assess Health-Related Quality of Life (HRQoL) in patients. Among these, the Medical Outcomes Study 36-Item Short Form (SF-36) health survey stands out as it provides a comprehensive evaluation of patients' perceived health status, covering a wide range of physical and emotional health domains. Notably, the SF-36 is the most widely utilized generic tool for assessing HRQoL worldwide, extending its utility to patients with conditions like cancer. SF-36 is a reliable and valid instrument for assessment of Health-Related Quality of Life in hyper secretive patients<sup>8</sup>.

## METHODOLOGY

**Study Design:** Experimental pre-test post-test design, comparative in nature.

**Study Population:** Subjects with Bronchiectasis

### Study Setting:

Subjects were recruited from general medicine, pulmonology department in Konaseema institute of medical sciences and research foundation, Amalapuram India

### Ethical Clearance:

Ethical clearance was taken from institutional ethical committee, Konaseema institute of medical sciences (B.P.T & M.P.T), Amalapuram.

### Study Duration:

The study was conducted during the period December 2021 to December 2022

**Intervention Duration:** 4 weeks

**Sampling Design:** Sample of convenience

### Study Sample:

Total of 72 subjects were selected, out of which 66 subjects were included who met the inclusion criteria and willing to participate in the study after obtaining the consent form. These 66 subjects are divided into two groups by sample of convenience. In which 5 subjects dropped from the study due to exacerbations and change in medication. Remaining 1 person made to leave the study to divide the groups equally. The study was completed with the sample of 60 subjects. Two groups: GROUP-A: 30 Patients, GROUP- B: 30 patients 24 Group-A: 30 subjects were assigned to this group and were trained eltgol techniques Group-B: 30 patients were assigned to this group and were trained using positive expiratory pressure technique.

### Recording Materials

Spirometry Assessment  
Perform Data Collection  
Form

### Materials Used

Positive expiratory pressure  
Treatment table  
Bed sheet  
Pillows  
Data collection chart

### Criteria:

#### Inclusion Criteria:

- Bronchiectasis patients are clinically diagnosed by Pulmonologist
- Age group between 30-60 years
- Clinically stable patients with no exacerbation of bronchiectasis
- Both genders are included
- Unilateral lung involvement

#### Exclusion Criteria:

- History of pneumothorax

- Raised in intracranial pressure
  - Active hemorrhage with hemodynamic instability
  - Recent history of myocardial infraction
  - Recent spinal injuries
  - Active cases of tuberculosis
  - Anxious patients who do not tolerate position changes
- OUTCOME MEASURES

### Pulmonary Function Test : Spirometry

**Quality Of Life:** SF 36 Quality of Life Questionaries

### Procedure

#### Group A: ELTGOL Technique

In the ELTGOL technique, the volume of the dependent lung is reduced by placing the Subject in the lateral decubitus position and by limiting breathing to expiratory reserve volume. This phenomenon leads to a reduction in the overall cross-sectional area of the peripheral airways, which are the main sites for mucus production. Since maximum airflow velocity is inversely proportional to airway diameter, the subjects were first asked to breathe normally. Following this, the participants were instructed to take slow breaths from the functional residual capacity (FRC) to residual volume, utilizing a mouthpiece to ensure the glottis remained open. This technique aimed to reduce airway compression. Simultaneously, during the slow expiration phase, a physiotherapist applied gradual abdominal compression, similar to a left chest wall compression, to enhance lung deflation. This process was repeated in three sets of ELTGOL. Each was composed of 10 slow and deep expirations. A 2-minute rest interval was interposed between each set of maneuvers. During this rest period, the subject maintained the right lateral position.<sup>12</sup>

#### Group B: PEP (Positive Expiratory Pressure technique)

Physiotherapy by PEP was performed with the Astra Meditec PEP system consisting of a mask and a one- way valve to which a resistor is attached at the expiratory orifice. A manometer inserted just proximal to the expiratory resistor was used to determine which resistor would create a steady PEP of 10 to 20 cms H<sub>2</sub>O during mid-expiration. The patient then used this resistor during treatment. Treatment was carried out in a sitting position; the subject inhaled and exhaled through the mask 15 times (approximately 2 minutes). Inhalation was tidal volume, and expiration was slightly active against the mask. The subject then removed the mask and performed 2 or 3 forced expirations followed by a cough to clear secretions that had been mobilized to the central airways. This procedure was followed by a 1- to 2- minute period of relaxed, controlled breathing. The previously described sequence was repeated 6 times and required approximately 20 minutes to complete. The subjects were instructed to perform the regimen twice daily. 13 Post test measurements were taken after completing 4 weeks period.

### Outcome Measure

#### Pulmonary Function

Pulmonary function was performed by using a portable electronic spirometer, to assess FEV1/FVC ratio

### Statistical Analysis

Statistical analysis was performed by using spss software version 21.0 and Microsoft excel-2007 descriptive statistical data were presented in the form of mean  $\pm$  standard deviation and mean differences percentages were calculated and presented.

### With In Groups :

Paired "t" test was performed to assess the significant difference statically in the mean value of with the groups to evaluate FEV1/FVC ratio & SF 36 Questionnaire.

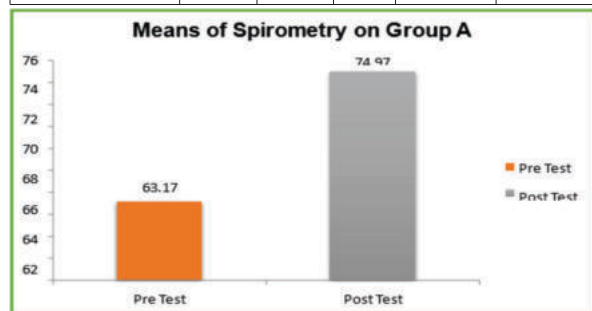
### Between The Groups :

independent "t" test was performed to analyses the significant difference in mean value between the groups for FEV 1/FVC ratio and SF 36 Questionnaire.

For all statistical analysis p-value (<0.05) was considered Significant. All 60 subjects completed the entire study programmers defined by 4 weeks outcome measures are pulmonary function and SF 36 questionnaire.

### Table-1: Means of Group A Spirometry

Group A	Tests	Mean	S.D.	T-Value	P-Value
SPIROMETRY	Pre	63.17	6.22	11.65	0.000
	Post	74.97	6.67		



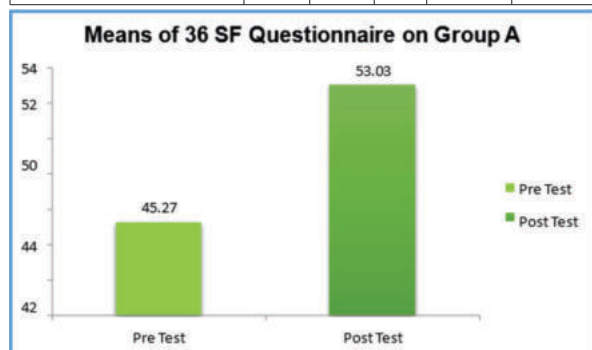
**Graph-1: Means of Spirometry on Group A**  
Comparisons of mean scores of pre and post test values of pulmonary function experimental group A

#### Result:

the above table and graph shows significant improvement in pulmonary function GROUP A (P value=0.000)

**Table-2: Means of Group A SF 36 Questionnaire**

Group A	Tests	Mean	S.D.	T-Value	P-Value
SF 36 QUESTIONNAIRE	Pre	45.27	3.46	17.20	0.000
	Post	53.03	2.82		



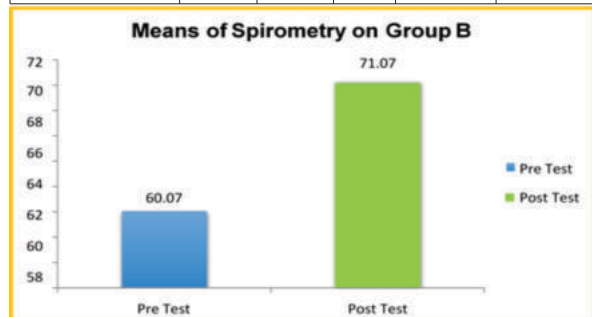
**Graph-2: Means of 36 SF Questionnaire on Group A**  
Comparisons of mean scores of pre and post test values of quality of life experimental group A

#### Result:

the above table and graph shows significant improvement in quality of life GROUP A (P value=0.000)

**Table-3: Means of Group B Spirometry**

Group B	Tests	Mean	S.D.	T-Value	P-Value
SPIROMETRY	Pre	60.07	3.51	14.42	0.000
	Post	71.07	5.15		



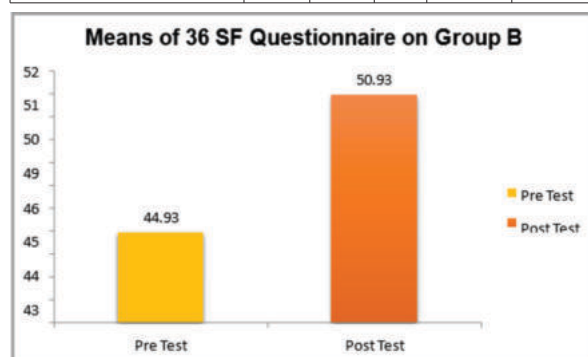
**Graph-3: Means of Spirometry on Group B**  
Comparisons of mean score of pre and post values of pulmonary function of experimental group B

#### Result:

the above table and graph shows significant improvement in pulmonary function GROUP B (P value=0.000)

**Table-4: Means of Group B 36 SF Questionnaire**

Group B	Tests	Mean	S.D.	T-Value	P-Value
36 SF QUESTIONNAIRE	Pre	44.93	3.23	11.99	0.000
	Post	50.93	3.72		



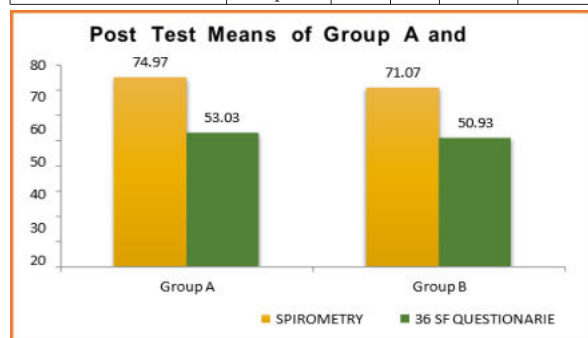
**Graph-4: Means of 36 SF Questionnaire on Group B**  
Comparisons of mean scores of pre and post test values of quality of life in experimental group B

#### Result:

the above table and graph shows significant improvement in quality of life GROUP B (P value=0.000)

**Table-5: Post Test Means of Group A and Group B.**

Scales	Post Tests	Mean	S.D.	T-Value	P-Value
SPIROMETRY	Group A	74.97	6.67	2.53	0.014
	Group B	71.07	5.15		
36 SF QUESTIONNAIRE	Group A	53.03	2.82	2.46	0.017
	Group B	50.93	3.72		



**Graph-5: Post Test Means of Group A and Group B**

Comparisons of mean scores of post test means of eltgol technique in between two groups

#### Result:

the above table and graph shows significant improvement in GROUP B (P value= 0.000)

#### DISCUSSION

The aim of this study was to compare the effectiveness of two techniques, ELTGOL (Expiratory Lung Volume Recruitment with Oscillatory PEP) and Positive Expiratory Pressure (PEP), in improving pulmonary function and quality of life in individuals with bronchiectasis. The four-week protocol evaluated these outcomes using the Short Form-36 (SF-36) Questionnaire for quality of life and pulmonary function tests before and after treatment.

The results of the study demonstrated significant improvements in both pulmonary function and quality of life for both groups, in addition to conventional physiotherapy. However, it is important to note that the ELTGOL technique showed superior results (P-Value < 0.000) compared to Positive Expiratory Pressure. This led to the acceptance of the alternate hypothesis.

Bronchiectasis is a chronic respiratory disease characterized by symptoms such as cough, sputum production, and frequent chest infections, all of which significantly affect the quality of life. Most individuals with bronchiectasis exhibit an obstructive pulmonary

function defect. However, those with limited disease can maintain their pulmonary function, while those with diffuse and severe disease may have restrictive or mixed impairments. This study focused on individuals for whom recovery is crucial for their well-being and social life.

It's worth noting that regular exercise has been associated with a reduced risk of hospitalization for individuals with bronchiectasis and a decrease in morbidity and mortality.

The ELTGOL technique involves reducing the volume of the dependent lung by placing the individuals in a lateral decubitus position and limiting their breathing to the expiratory reserve volume. This reduces the total cross-sectional area of the peripheral airways where mucus primarily accumulates, as maximum airflow velocity is inversely proportional to airway diameter.

The study's results demonstrated statistically significant improvements in the FEV1/FVC ratio and quality of life in the ELTGOL group after four weeks of therapy. This is consistent with a study by Bellone et al., which compared the efficacy of various chest physiotherapy techniques, including ELTGOL, on subjects with exacerbated chronic bronchitis.

The other group in this study used Positive Expiratory Pressure (PEP), a device that provides back pressure to the airways during expiration. This may improve mucus clearance by building up gas behind the mucus via collateral ventilation and temporarily increasing functional residual capacity, thus decreasing the work of breathing.

The results for the PEP group also showed significant improvements in the FEV1/FVC ratio and SF-36 questionnaire scores after four weeks of therapy. This aligns with a study conducted by Annemarie L. Lee, which compared positive expiratory pressure therapy with other airway clearance techniques.

In summary, this study established that ELTGOL techniques, when combined with conventional physiotherapy, significantly improve pulmonary function and quality of life in individuals with bronchiectasis. This may be attributed to the use of the infra-lateral decubitus position, which aids in the gravitational clearance of secretions, and the practice of slow expiration. In contrast, PEP may be somewhat less effective in clearing secretions because it may not achieve the expiratory airflow necessary to mobilize secretions proximally, as indicated by its low PEFr/PIFR (Peak Expiratory Flow Rate/Peak Inspiratory Flow Rate) ratio.

Based on the analysis of this study, it can be concluded that a four-week ELTGOL training program is more effective in improving pulmonary function and quality of life in individuals with bronchiectasis compared to the Positive Expiratory Pressure technique.

## CONCLUSION

This study concludes that ELTGOL Technique along with conventional Physiotherapy are effective when compared to Positive Expiratory Pressure along with conventional Physiotherapy in improving Pulmonary Function and Quality of Life in subjects with Bronchiectasis

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