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EFFECTIVENESS OF ACTIVE CYCLE OF BREATHING TECHNIQUEAND SLOW EXPIRATION WITH GLOTTIS OPENED IN LATERAL POSTURE [ELTGOL] ON QUALITY OF LIFE AND FUNCTIONAL CAPACITY IN SUBJECTS WITH BRONCHIECTASIS

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ABSTRACT

Background and Objective: Bronchiectasis is associated with impairment of the mucociliaryescalator and retention of secretions within the bronchial tree. There are so many physiotherapy treatment techniques has been proposed as an adjunctto conventional therapy to treat Bronchiectasis but both ACBT and ELTGOL techniques have been showed improvement in subjects with Bronchiectasis and the literature is limited on their comparison Hence need of the study arises. The objective of this study was to compare the effectiveness of ACBT and ELTGOL on improving the Quality Of Life and increasing Functional Capacity in subjects with Bronchiectasis. **Methods:** A Prospective study design. 60 subjects with age group between 45-75 years. In Group -A subjects (n=30) were treated with Active Cycle of Breathing Technique where asin Group-B subjects (n=30) received ELTGOL Training. **Results:** Independent 't' test was used to compare the mean significance difference between continuous variables. Paired 't' test was used to assess the Statistical significance differencebetween pre and post test scores. Where as in between groups comparison ELTGOL showed better improvement compared to Active Cycle Of Breathing Technique. **Conclusion:** After Four weeks of Intervention both Trainings showed significant improvement in 6-Mintue Walk Test and SF-36 Questionnaire. However, ELTGOL found to be more effective when compared to Active Cycle Of Breathing Technique. Findings from this study, can be recommended that ELTGOL training can be prescribed to the Bronchiectasis subjects.

KEYWORDS: Bronchiectasis, Functional Capacity, Quality of life, SF -36 Questionnaire,6- Minute Walk Test, Active Cycle Of Breathing Technique, ELTGOL.

INTRODUCTION

Bronchiectasis is an illness defined by the abnormal and irreversible expansion of the bronchus. The destruction of the airway walls occurs dueto infection and recurrent inflammations, resulting in impaired clearance with aggregation of secretions in the affected areas and bacterial colonization.[1]

Recent evidence revealed that Bronchiectasis is more common in women and elderly populations causing an increased burden on health care. The incidence of bronchiectasis is 2-5patients per 1000 population. It is more common in elderly and older frailer patients tend to have more symptomatic disease. In recent survey of 5.6 million patients, a prevalence of 52 per 1,00,000 adults, with a prevalence of 272 per 1, 00,000 for elderly aged >75 years.[2]

In Asia bronchiectasis prevalence rate is 7 %. A recent Indian study (n=680) identified post –infection (41%) to be the primary cause for bronchiectasis.[3-4]

Aetiology of bronchiectasis primary cause is idiopathic and secondary causes are post infectious: necrotizing pulmonary infections, mycobacterium tuberculosis, adenovirus, measles, fungi, bronchial obstructions: Intrinsic: stenosis from scarring, broncholiths, foreign body, tumour, Extrinsic: diseased lymph nodes, aneurysm, Impaired mucociliary clearance: cystic fibrosis, primary ciliary dyskinesia, young syndrome,

Structural airway abnormalities: mounier- Kuhn syndrome, Williams-camp bell syndrome, pulmonary sequestration, trachea bronchomalacia, tracheal bronchi, Systemic diseases: rheumatoid arthritis, systemic lupus erythematous, Marfan syndrome, relapsing polychondritis, ankylosing spondylitis, sarcoidosis, alpha1 -anti trypsin deficiency and yellow nails syndrome.[5-6]

Bronchiectasis is characterized by airway inflammation. The inflammation appears to arise a combination of immune deficiency and persistent infections. Illness is related to retained inflammatory secretions and microbes that cause obstruction and damage to the bronchus and recurrent infections. Bronchial wall is infiltrated by lymphocytes which may form lymphoid follicles. Bronchiectasis is a heterogeneous condition because of the long –term nature of the disease is hard to clear the factor in the pathogenesis.[7-8]

Its main clinical features are excessive cough, sputum production, narrowing airways, fatigue, chest pain, difficulty in breathing, decreased exercise tolerance is present in many patients, fever, wheeze, abnormal breath sounds lassitude, decreased lung function and exacerbation.[9]

Investigations of bronchiectasis is chest X-ray, high resolution CT, pulmonary function test, MRI, sputum microscopy eosinophils and culture.[10-11]

Pharmacological management for bronchiectasis is bronchodilators, antibiotics, mucolytic agents. Surgical management double-lung transplantation, lung transplantation, pulmonary lobectomy. Bronchiectasis had excessive sputum production there are many techniques to clearthe secretions various like postural drainage, positive expiratory pressure (PEP), autogenic drainage, flutter device, acapella device.[12-14]

Airway clearance techniques helps to removing secretions by air way clearance techniques has been recommended in those patients with chronic productive cough, mucus plugging on chest-CT and air way clearance techniques are expected to change the viscoelastic properties of secretions, increase gas-liquid relationships and facilitate secretions removal. These effects arebased on fluctuations in pulmonary volumes pressures and expiratory flows, the effect of gravity, or the application of compressive or vibratory forces, depending on the techniques used.[15]

Active Cycle Of Breathing Technique is used to facilitate the excessive secretions from the lungs. It is a combination of exercises it consists of 3 phases: breathing control, deep breathing exercises and huffing. Active Cycle Of Breathing technique can decrease narrowing of airways, increase oxygen saturation and improve alveolar ventilation.[16-17]

ELTGOL consists of performing slow expiration with open glottis from functional residual volume to the residual capacity in lateral posture. Therapist should behind the subject and exerted a thoracic and abdominal pressure while doing expiration. Slow expiration with glottisopened in the lateral posture is an air way clearance technique whose result is founded on increasing airflow resistance and air flow- mucus interface by deteriorating the diameter of theperipheral airways of the inferolateral lung. This decrease in diameter consequences from the weight of the superolateral lung and mediastinum from inferolateral hemidiaphragm displacement in a cephalad direction due to compression of the viscera and from slowexpiration which discusses the added benefit of avoiding airway collapse.[18-19]

The 6-Minutes Walk Test is widely used to measure change in functional exercise capacity following a pulmonary rehabilitation with the primary outcome reported being the distance walked. It is also a reliable and safe tool to assess the functional status of patients suffering from chronic cardiac and pulmonary diseases. It is also useful in detecting the effectiveness ofdifferent forms of treatment for these patients.

Typically, this test is directed in an enclosed inside condor, free of interferences, and subjectsare asked to cover as much distance as they can walk in 6 minutes. This environment is non- natural and individual do on a daily source.[20-24]

The 36-item Short Form Health Survey Questionnaire (SF-36) is a very popular tool for assessing Health Related Quality of Life. A PubMed search by means of the term SF-36 healthsurvey found 9722 items.[25]

MATERIALS AND METHODS

Study Design: Prospective study

Ethical Clearance and Informed Consent: The study protocol wasapproved by the Ethical Committee of GSL Medical College (Annexure- I) the Investigator explained the purpose of the study and given the subject information sheet.

The participants were requested to provide their consent to participation in the study (Annexure-II). All the participants have been secured.

Study Population: Subjects clinically diagnosed as bronchiectasis by the pulmonologist.

Study Setting: The study was conducted at Department of Respiratory Medicine, GSL Medical College and General Hospital, Rajamahendravaram, Andhra Pradesh, India.

Study Duration: The study was conducted during the period between July 2020 toJune 2021.

Sampling Method: Systematic Sampling

Intervention Duration: 4 weeks of training programme in which includes Active Cycle Of Breathing Technique and Slow Expiration With Glottis Opened In Lateral Posture [ELTGOL]

Sample Size: A Total number of 120 subjects with Bronchiectasis were screened. In that 60 subjects were recruited who are willing to participate in the study, Recruited participants were explained the purpose and relevance of the study. Those willing to volunteer were included inthe study after obtaining informed consent. All the eligible participants were consecutively randomised to either Active Cycle Of Breathing or slow expiration glottis opened in lateral posture [ELTGOL] training with 30 subjects in each group.

INCLUSION CRITERIA

- Moderate and sever sputum production in subjects withbronchiectasis diagnosed byphysician
- Patients of age between 45-75 years (Both Male and Female)
- Absence of respiratory failure
- Clinically stable patients with no evidence of exacerbations ofbronchiectasis
- No contraindication for physiotherapy interventions
- Rib fracture

EXCLUSION CRITERIA

- Osteoporosis
- Tuberculosis
- Neurological condition
- Recent history of haemoptysis and metastatic cancer
- Bronchial asthma
- Pneumothorax
- COVID-19 Patients.

OUTCOME MEASURES

Short From -36(SF-36) questionnaire was used to measure the Quality Of Life at baseline andat the end of 4 week.

6- Minute walk test was used to measure the Functional Capacity at the end of 4 week. SF- 36 QUESTIONNAIRE:[26-27]

Short Form 36 is a general health-related Quality-Of-Life tool, which has been used to measure quality of life in a variation of chronic medical conditions including COPD and asthma.

This 36-item measure is separated into the following 8 subscales providing data on 36 items: physical functioning [X items], social functions [II items], role limitations due to physical problems [IV items], role limitations due to emotional problems [III items], general mental health [V items], vitality and fatigue [IV items], pain [II items], general health perception [V items], and health transition [I item]. Items within subscales are summed up to deliver a total score extending from zero [negative health] to 100 [positive health].[30-31] higher scores indicate recovering Health Related Quality Of Life.

The score was done by using ONLINE Grading Computer. Our subjects completed SF-36, both at the period of base line assessment when they provided informed consent and at the completion of treatment session of 4 weeks. Assessments and scoring were completed at the end of the study period. Written informed consent was attained from each patient after providing detailed data on the nature of the study.

SIX-MINUTE WALK TEST[28]

This is simple, effortlessly reproducible and involves no apparatus. The Six -Minute Walk is the distance a subject can walk in 6 minutes along a level enclosed corridor. The subject may stop for a rest during the 6 minutes if needed, but on completing the test he should feel that he could not have walked any further. A rehearsal walk to learn the test procedure is important and the two walks should be done moreover on the same day with at least 20 minutes rest between them, or on two consecutive days. As the Six-Minute Walk is a self-paced exercise tolerance test it is significant that the subject should perform this trial alone. If the test is used at intermissions to assess the subject's response to treatment it should, if possible, be carried out at the same time of day and at the same time in relation to the management of any given bronchodilator drugs. Walking is familiar to all the Six-Minute Walk is a useful process of measuring sub-maximal exercise tolerance.

INTERVENTIONS

Total number of 60 subjects after fulfilled the inclusion criteria was taken by systemic sampling. All the subjects were explained about the condition and modes of assessment and written informed consent form were obtained from them and pre-test is done and divided into2 groups A and B active cycle of breathing technique group and ELTGOL group respectively and subjects were scheduled to attend exercise session 5 days a week for 4 weeks with exercise duration 15 mints. During the treatment intervention the patients were allowed to continue their pharmacological therapy.

Pre-test for functional capacity is done by six-minute walk test and quality of life is measured by SF-36 questionnaire before and after completion of intervention for both groups.

GROUP A: ACBT

The subject is allowed to be seated upright in a chair with back support. The upper airways are cleared of secretions by huffing. The therapist is to sit to the side and slightly behind the subjects close enough to hear subjects breathing. Subject's hand should be placed on

the abdomen to feel the work of respiratory muscles and the therapist hand placed on the upperchest to feel the secretions. Active cycle of breathing technique is an active breathing technique performed by the patient him or herself to clear the secretions, it is use to clear the airways and improve ventilation

ACBT contain 3 main phases

1. Breathing control
2. Deep breathing exercises
3. Huffing

Breathing control: the subject placed in well supported and relaxed in half lying position and Therapist hand was placed on the upper abdomen of the subject. As the subjects breathed hand was felt to rise up during inspiration and out during expiration. Breathing control given for 2to 3 seconds was followed by expiration with open glottis. When secretions have reached more proximal upper airways, a huff from a high lung volume was used to clear the secretions.

Deep breathing exercises: the subject placed in a comfortable and supported half lying position and was asked to perform deep inspiration combined with 3 seconds hold before the passive relaxed expiration, deep breathing exercises was encouraged with proprioceptive stimulation by placing subjects or Therapist's hand over the chest when the movement was encouraged and these techniques helped in the clearance of secretions.

Huffing: the subject positioned comfortable in half lying position or high sitting position. The subject is asked to perform huff.[29-30]

GROUP B: ELTGOL

ELTGOL is an active – passive or active technique and the subject is positioned in lateral posture and the Therapist stand behind the subject and subject instructed to perform inspiration and ask the subject to do expiration slowly with open glottis at the same time Therapist apply infra-lateral abdominal compression and thoracic compression or subject can perform active technique. Subject is positioned in lateral decubiti's position and one pillow placed behind the right knee and another pillow placed at the abdomen and ask the patient to perform inspiration and slow expiration through open glottis.[31]

The study consists of 4 weeks of intervention which includes Active cycle of breathing technique in Group A and slow expiration glottis opened in lateral posture [ELTGOL] in Group.

B. The Outcome measurements are measured by using Short From -36(SF-36) questionnaire was used to measure the Quality Of Life and 6 minute walk test was used to measure the Functional Capacity at baseline and end of interventions. All the eligible Participants were consequently randomised into either Group A and Group B. During training programme all the subjects of the Both Groups Were allowed to continue their medical treatment.

STATISTICAL ANALYSIS

All statistical analysis was done by using SPSS software version 21.0 and Microsoft excel- 2007. Descriptive data was presented in the form of mean ± standard deviation and mean difference percentages were calculated and Presented.

Within the groups: Paired Student "t" test was performed to assess the statistical difference with in the groups for 6-Minute Walk Test and SF-36 Quality of life Questionnaire components from pre-test and post- test values.

Between the groups: Independent student "t" test was performed to assess the statistical significant difference in mean value between the groups for 6-Mintute Walk Test and SF-36 Quality of Life Questionnaire components.

For all statistical analysis, $P < 0.05$ was considered as statistically significant.

RESULTS

The aim of the study was to find the effectiveness of Active Cycle of Breathing Technique versus ELTGOL on Functional Capacity and Quality of life in patients with Bronchiectasis. The consort flow chart of the study showed the study organization in terms of Subjects Screening, Random allocation and analysis following the Intervention.

A total 120 subjects were screened for eligibility, amongst 60 subjects were included in the study trail. All the 60 subjects who met inclusion criteria have undergone baseline assessment and included subjects were randomized into two groups consisting 30 subjects in each group.

In this study, 30 participants completed training in Group-A and 29 subjects completed training in Group-B.

COMPARISION OF MEAN SCORES OF 6MWT PRE-TEST AND POST-TESTBETWEEN THE GROUPS

6MWT	*GROUPS*	MEAN	SD	P-VALUE	INFERENCE
PRE	Group A	341.567	14.06	0.000*	HIGHLY SIGNIFICANT
	Group B	356.97	16.88		
POST	Group A	362.07	14.40	0.000*	HIGHLY SIGNIFICANT
	Group B	381.07	19.33		

COMPARISON OF MEAN SCORES OF PHYSICAL FUNCTIONING (SF-36) PRE- TEST AND POST-TEST IN BETWEEN THE GROUPS

GROUPS	PHYSICAL FUNCTIONING	MEAN	SD	P-VALUE	INFERENCE
GROUP I	PRE	52.67	8.620	0.968	INSIGNIFICANT
GROUP II		52.79	15.096		
GROUP I	POST	72.80	10.121	0.000*	HIGHLY SIGNIFICANT
GROUP II		88.17	12.398		

COMPARISON OF MEAN SCORES OF ROLE LIMITATION DUE TO PHYSICAL PROBLEMS (SF-36) PRE- TEST AND POST- TEST IN BETWEEN THE GROUPS

GROUPS	RLP	MEAN	SD	P-VALUE	INFERENCE
GROUP I	PRE	26.07	11.206	0.825	INSIGNIFICANT
GROUP II		26.69	10.355		
GROUP I	POST	64.07	14.415	0.000*	HIGHLY SIGNIFICANT
GROUP II		81.45	14.537		

COMPARISON OF MEAN SCORES OF ROLE LIMITATIONS DUE TOEMOTIONAL PROBLEMS (SF-36) PRE-TEST AND POST-TEST IN BETWEEN THE GROUPS

GROUPS	RLE	MEAN	SD	P-VALUE	INFERENCE
GROUP I	PRE	36.99	12.892	0.300	INSIGNIFICANT
GROUP II		40.34	11.672		
GROUP I	POST	62.88	13.098	0.000*	HIGHLY SIGNIFICANT
GROUP II		80.43	15.031		

COMPARISON OF MEAN SCORES OF ENERGY/ FATIGUE (SF-36) PRE-TEST AND POST-TEST IN BETWEEN THE GROUPS

GROUPS	ENERGY/FATIGUE	SD	MEAN	P-VALUE	INFERENCE
GROUP I	PRE	56.27	12.315	0.135	INSIGNIFICANT
GROUP II		61.07	12.032		
GROUP I	POST	68.33	12.038	0.002	SIGNIFICANT
GROUP II		79.31	13.680		

COMPARISON OF MEAN SCORES OF EMOTIONAL WELL BEING (SF-36) PRE- TEST AND POST-TEST IN BETWEEN THE GROUPS

GROUPS	EMOTIONAL WELL BEING	MEANS	SD	P-VALUE	INFERENCE
GROUP I	PRE	54.33	8.747	0.772	INSIGNIFICANT
GROUP II		55.14	12.252		
GROUP I	POST	70.47	11.224	0.002	SIGNIFICANT
GROUP II		81.10	13.364		

COMPARISON OF MEAN SCORE OF SOCIAL FUNCTIONING (SF-36) PRE-TESTAND POST-TEST IN BETWEEN THE GROUPS

GROUPS	SOCIAL FUNCTIONING	MEANS	SD	P-VALUE	INFERENCE
GROUP I	PRE	58.10	9.611	0.254	INSIGNIFICANT
GROUP II		61.41	12.339		
GROUP I	POST	72.03	11.825	0.001	SIGNIFICANT
GROUP II		84.79	16.541		

COMPARISON OF MEAN SCORES OF PAIN (SF-36) PRE-TEST AND POST-TESTIN BETWEEN THE GROUPS

GROUPS	PAIN	MEAN	SD	P-VALUE	INFERENCE
GROUP I	PRE	67.15	11.238	0.869	INSIGNIFICANT
GROUP II		66.69	10.028		
GROUP I	POST	45.72	8.577	0.036	SIGNIFICANT
GROUP II		41.01	8.246		

COMPARISON OF MEAN SCORES OF GENERAL HEALTH (SF-36) PRE- TESTAND POST-TEST IN BETWEEN THE GROUPS

GROUPS	GENERAL HEALTH	MEAN	SD	P-VALUE	INFERENCE
GROUP I	PRE	42.90	10.131	0.174	INSIGNIFICANT
GROUP II		47.14	13.354		
GROUP I	POST	59.67	11.604	0.004	SIGNIFICANT
GROUP II		70.14	15.212		

DISCUSSION

The aim of this study was to inspect "The Effectiveness of Active Cycle Of Breathing Technique And ELTGOL on improving Quality Of Life and increasing Functional Capacity in subjects with bronchiectasis" a prospective study with 4 weeks protocol. In this study the subjects were assessed for Quality of Life and Functional Capacity by using Short Form -36 (sf-36) Questionnaire and 6-Mintue Walk Test respectively.

In this study the subjects were assessed for Bronchiectasis underwent either Active Cycle Of Breathing Technique or ELTGOL training which are performed for 4 weeks the parameters usually assessed before and after treatment training.

In this study (Group-A) Active Cycle Of Breathing Technique have showed statistically significant difference within the groups from Pre-test to Post-test values in improving the Quality of life and Functional Capacity in Subjects with Bronchiectasis.

In this study (Group-B) ELTGOL technique have showed statistically significant difference within the groups from Pre-test to Post-test values in improving Quality of life and Functional Capacity in Subjects with Bronchiectasis.

In the present study 6-Mint Walk Test is used to asses Functional Capacity. The results showed that the Active Cycle Of Breathing Technique P value (0.000) of 6-Mintue Walk Test from pre-test to post-test are highly significant within the groups. The thoracic expansion and breath hold provides Optimal filling of obliterated airways of lung segments while avoiding excessive intrathoracic pressure which could compress the unstable airways. This technique shows an improvement in Functional Capacity on subjects with bronchiectasis. Our study supported by Sundus S, Memoona S, Muhammad IN, Rashid HN et al in their study.[32]

In this study Active Cycle Of Breathing Technique improve Quality Of Life and Functional Capacity in patients with bronchiectasis. The ACBT concentrating on standardizing the respiratory pattern, encouraging airway clearance and decreasing work ofbreathing. Along with this, it helps in improving the Quality of life, reducing breathlessness and in turn improves the Functional Capacity of the individual.[33] Our study supported by Thorat Y, Das A, Diwate A.et al.

ELTGOL Improve lung volumes from Functional residual capacity (FRC) to Residual Volume (RV) exhalation, then the slow expiration with open glottis improve ventilation-perfusion ratio and also it prevent lung damage. ELTGOL is performed in lateral decubitus position: the lung that reaches the finest clearance in the inferolateral lung ELTGOL acts on the central ones and FET allows to transfer the secretions which are already more proximal. Finally, the cough take away the secretions through the mouth. In that way, there is a therapeutic variety without aids, but only using inspiratory and expiratory flows[34] and this technique shows improvement in subjects Quality Of Life. Our study supported by Calabrese M, Sessa M, Aliberti M, Ciriello M, Palumbo R, Garofano M, Ciccarelli M et al.

The results shown that there is significant improvement in SF-36 Questionnaire Components in Both the groups. In Active Cycle Of Breathing Technique results shown that P value (<0.000) of physical functioning, P value(<0.000)Role Limitations due to physical problems, P value(<0.000) role Limitations due to Emotional Problems, P value (<0.000) of Energy / Fatigue, P value(<0.000) of Emotional well-being, P value (<0.000) of social functioning, P value (<0.000) of pain, P value (<0.000) of General health from pre-test to Post-test are highlySignificant within the groups.

The results shown that there is significant improvement in SF-36 Questionnaire Componentsin Both the groups. In ELTGOL results shown that P value (<0.000) of Physical functioning, Social Functioning, pain, P value (< 0.000) of role limitation due to physical problems, P value (< 0.000) of role limitation due to Emotional problems, P value (< 0.000) of Energy/ Fatigue, P value (<0.000) of general Health, Emotional Well Being respectively. This study shown the statistically Highly significant improvement in both mental components score and physical components Scores of SF-36 Questionnaire.

When compared between the groups Active Cycle Of Breathing Technique and ELTGOL technique shows statistically significant in Post values. The Result of the study shows that the ELTGOL is more effective than Active Cycle Of Breathing Technique to improve the Quality of life and Functional Capacity in Bronchiectasis subjects. The improvement in Group-B is more than Group-A and having statistically significant.

The study Proved that the ELTGOL technique shows the

effect on improving Functional Capacity and Quality of Life when lateral posture avoids gravitational pull the slow expiration helps to clear the secretions. This technique is effective in improving Quality of Life and Functional Capacity. Hence, we conclude that the patients with Bronchiectasis can achieve significant benefit using ELTGOL technique.

LIMITATIONS

- Lack of control group in the present study.
- Large number of dropouts
- No Blinding of the participants is present
- Lack of Follow up

RECOMMENDATIONS FOR FURTHER RESEARCH

- Further studies are recommended for long term follow-up
- The duration of the study can be increased to 6 weeks or 8 weeks.

CONCLUSION

The present study concluded that Four weeks of Interventions of Active Cycle Of Breathing Technique and ELTGOL training were shown significant improvements on Functional Capacity and Quality of life. However, more Percentage of improvement was found in subjects received ELTGOL training when compared to the Active Cycle Of Breathing Technique.

From the Findings of the present study, it can be recommended that ELTGOL is a suitable adjunct to Conventional Physiotherapy Treatment Techniques in subjects with Bronchiectasis.

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