

# Structured Pulmonary Rehabilitation in a Patient with Post Tuberculosis Bronchiectasis and Endobronchial Carcinoid

PURVA GULRANDHE<sup>1</sup>, VISHAKHA TAYADE<sup>2</sup>, VISHNU VARDHAN<sup>3</sup>

## ABSTRACT

Pulmonary Tuberculosis (TB) has the potential to harm the lungs over long-term owing to complication such as bronchiectasis. However, authors hereby reported a case of endobronchial carcinoid, for which there was a need for a tailored and planned physiotherapy intervention to address such a challenging condition. Loss of lung functions, a decline in exercise tolerance, and/or chronic respiratory symptoms due to TB-related interstitial and structural alterations have been identified as sequelae to pulmonary TB. A 52-year-old female presented with the chief complain of breathlessness of grade 3 on the Modified Medical Research Council (MMRC) scale, chest pain over left-side radiating to the neck, and cough with expectoration. She had loss of appetite and high-grade fever and was diagnosed with endobronchial carcinoid with upper and middle lobe consolidation with cystic bronchiectasis. The patient received pharmacological treatment with bronchodilators, mucolytics, antibiotics, and non opioid analgesics. The goals of physiotherapeutic management included secretion removal, relieving dyspnoea, providing relaxation, enhancing exercise capacity through impacts on aerobic capacity and, management of disease, and Quality of Life (QoL) improvement. The structured rehabilitation programme was found to be effective at the end of eight weeks. Clinical improvement was observed in the patient but complete rehabilitation was not able to achieve due to the patient's socioeconomic condition.

**Keywords:** Acapella, Physiotherapy, Post pulmonary tuberculosis sequelae

## CASE REPORT

A 52-year-old female was presented in the Department of Cardiovascular and Respiratory Physiotherapy, apparently alright two months before the onset of breathlessness, grade 3 on the MMRC scale [1], chest pain over left-side radiating to the neck, and cough with expectoration. She had a history of pulmonary TB before two years and was managed with six months of anti-tubercular medication treatment. The patient attended a nearby hospital where she was primarily treated before being referred to tertiary care hospital because she had been complaining of high-grade fever, cough with expectoration, loss of appetite, and vomiting for 15 days. Investigations included, Contrast-Enhanced Computed Tomography (CECT) thorax which revealed consolidation in left lung upper and lower lobes and tubular-cystic bronchiectasis within, and bronchoscopy report revealed endobronchial growth. After investigations, the patient was diagnosed with post TB bronchiectasis along with endobronchial carcinoid and was referred to the Department of Physiotherapy. The patient also received pharmacological treatment with bronchodilators, mucolytics, antibiotics and non opioid analgesics.

**Physiotherapy intervention:** Physiotherapy intervention was aimed at clearing retained secretion, improving ventilation, increasing lung capacity, providing relaxation, relieving dyspnoea reducing the work of breathing, while carrying out activities of daily living, and promoting pulmonary rehabilitation.

**Patient education:** The patient's family members were made aware of the patient's condition and the necessity of the physical therapy session. The patient was made aware of the harmful effect of tobacco consumption and was advised to discontinue. The therapist discussed sets and repetitions, while demonstrating various breathing exercises and other exercises [Table/Fig-1,2]. The patient was educated about exercise adherence and follow-up. Active limb mobility exercises were taught to the patient. The detailed rehabilitation regimen is shown in [Table/Fig-3].



[Table/Fig-1]: Patient performing spirometry.  
[Table/Fig-2]: Patient performing Active Cycle of Breathing Technique (ACBT) (Thoracic expansion). (Images from left to right)

**Follow-up and outcomes:** Dyspnoea was rated using the MMRC scale, and perceived exertion was rated using the borg rating of perceived exertion scale for post-mobilisation dyspnoea. Two minutes walk test was used to assess functional capacity of the patient and World Health Organisation (WHO)-QoL (physical function) rated the patient's QoL. The patient was called for follow-up of one month with three sessions a week. The patient showed mild improvement in functional capacity. Dyspnoea grading showed a difference from 3 to 1 and the patient was able to walk without discomfort. There was a moderate improvement in spirometry. Scoring of all the outcome measure and follow-up scores are given in [Table/Fig-4].

## DISCUSSION

Rare neuroendocrine tumours known as carcinoid tumours often affect younger persons and have little potential to metastasize. Central airway obstruction is the primary cause of presenting symptoms. For a long period, patients are symptom-free [2]. The

Goal	Intervention	Dosage	Rationale
To clear retained secretions	Active cycle of breathing technique	Three repetitions twice a day	Loosen and moves secretion centrally.
	Autogenic drainage	Two repetitions twice a day	Move secretions from the smaller airways to the larger airways.
	Acapella	Two times a day	Airway secretion mobilisation to supplement a patient's mucus mobilisation and expectoration.
	Huffing or forced expiratory technique	Three times a day	Unstick the mucous from the airway walls.
To relieve dyspnoea	Deep breathing	10 repetitions x2 sets twice a day	Improves exchange of gases.
	Dyspnea relieving position	Whenever felt breathless	Facilitate efficient breathing.
To increase inspiratory muscle strength	Diaphragmatic breathing	Every two hourly, 10 repetitions	Strengthen the diaphragm
	IMT device	Every four hourly, 8-10 repetitions	Increase the inspiratory muscle's performance
To prevent lung collapse	Incentive spirometer [Table/Fig-1]	2-4 times a day, five repetitions- two sets with a three-sec hold	Facilitate a sustained slow deep breath
To provide relaxation	Box breathing	Two repetitions x two sets twice a day	Return breathing to its normal rhythm
	Progressive muscle relaxation	Once a day	Relaxation is induced by contracting and relaxing muscles
To increase exercise tolerance	Aerobic exercise training	20 minutes five days a week for four week	Enhance aerobic performance

[Table/Fig-3]: Rehabilitation protocol.

Outcome	1 <sup>st</sup> day of referral	Day of discharge	1 <sup>st</sup> follow-up	2 <sup>nd</sup> follow-up	3 <sup>rd</sup> follow-up	4 <sup>th</sup> follow-up
Dyspnea MMRC	3	2	2	1	1	1
Post mobilisation PRE	5	3	3	2	2	1
Two minute walk test	110 m	190 m	200 m	215 m	235 m	250 m
WHO-QoL	58	77	77	80	82	84
Incentive spirometer	<600 cc without hold	600 cc with 3 second hold	600 cc with 5 second hold	600 cc with 8 second hold	900 cc without hold	900 cc with 2 second hold

[Table/Fig-4]: Outcome measure and follow-up.

PRE: Perceived extension, WHO-QoL: World health organisation quality of life

majority of individuals with post-tubercular sequelae report persistent respiratory symptoms, as well as, radiographic and spirometric abnormalities [3]. Pulmonary Rehabilitation (PR) is a programme that consists of self-management, education, and exercise that is personally administered and strictly monitored. International standards advocate PR due to the substantial evidence that it enhances functional capacity, exercise tolerance, and overall health. A pre and post intervention study by Jones R et al., concluded pulmonary rehabilitation to be clinically valuable with improvement in respiratory outcomes, QoL and exercise capacity [4].

A randomised controlled trial on the use of high-intensity inspiratory muscle training in individuals with non cystic fibrosis bronchiectasis demonstrated higher exercise capacity and beneficial impacts on social aspects of QoL in addition to respiratory muscle strength and endurance [5]. Lee AL et al., concluded in their review that positive expiratory pressure therapy would seem to have a comparable influence symptoms of breathlessness, sputum expectoration, lung volumes and Health Related QoL (HRQoL) when prescribed during an acute exacerbation within a stable clinical state compared to other Airway Clearance Technique (ACT) [6]. Patel S et al., described in a propensity-matched control study that bronchiectasis patients showed improvements in exercise capacity and comparable completion rates along with health status outcomes as patients with Chronic Obstructive Pulmonary Disease (COPD) which supports the regular clinical provision of pulmonary rehabilitation [7]. In a randomised controlled study on the impact of progressive relaxation techniques on clinical symptoms and self-efficacy in lung cancer patients, Kirca K and Kutlutürkan S concluded that these techniques may be useful for promoting symptom management and boosting self-efficacy [8]. Ucgun H et al., conducted a randomised comparative study of breathing and aerobic exercises on video game-based exercise in adolescents and children with non cystic fibrosis bronchiectasis and discovered that while, breathing video game-based exercise further increases respiratory muscle strength, aerobic video game-based exercise has extra benefits in enhancing peripheral muscle strength

and functional capacity. Additionally, both breathing and aerobic video game-based exercise were successful at enhancing balance, although none was better than the other [9].

Goal-oriented exercise protocol is found to be effective in such cases and duration of the treatment will depend upon the severity of the symptoms. The limitation to this may include irregular visit to the clinic for follow-up by the patient, which was seen in the present case.

## CONCLUSION(S)

In the presented case of post TB bronchiectasis along with endobronchial carcinoid, a structured rehabilitation programme was found to be effective and improvement was seen in the patient's QoL and lung's functional capacity. Clinical improvement was observed in the patient but complete rehabilitation was unable to achieve due to the patient's socioeconomic condition.

## REFERENCES

- [1] Hayata A, Minakata Y, Matsunaga K, Nakanishi M, Yamamoto N. Differences in physical activity according to mMRC grade in patients with COPD. *Int J Chron Obstruct Pulmon Dis.* 2016;11:2203-08.
- [2] Papaporfyriou A, Domayer J, Meilinger M, Firlinger I, Funk GC, Setinek U, et al. Bronchoscopic diagnosis and treatment of endobronchial carcinoid: Case report and review of the literature. *Eur Respir Rev.* 2021;30(159):200115. Available from: <https://err.ersjournals.com/content/30/159/200115>.
- [3] Aggarwal N, Ghosh T, Bhan M, Dwarakanathan V, Sethi P, Meena VP, et al. Post-tuberculosis sequelae and their correlation with quality of life: An observational study at a tertiary care center of north India [Internet]. *medRxiv*; 2021 [cited 2022 Sep 22]. Pp. 2021.10.04.21264524. Available from: <https://www.medrxiv.org/content/10.1101/2021.10.04.21264524v1>.
- [4] Jones R, Kirenga BJ, Katagira W, Singh SJ, Pooler J, Okwera A, et al. A pre-post intervention study of pulmonary rehabilitation for adults with post-tuberculosis lung disease in Uganda. *Int J Chron Obstruct Pulmon Dis.* 2017;12:3533-39.
- [5] Ozalp O, Inal-Ince D, Cakmak A, Calik-Kutukcu E, Saglam M, Savci S, et al. High-intensity inspiratory muscle training in bronchiectasis: A randomised controlled trial. *Respirology.* 2019;24(3):246-53. Doi: 10.1111/resp.13397. *Epub* 2018 Sep 12. *Respirology-Wiley Online Library* [Internet]. [cited 2022 Sep 15]. Available from: <https://onlinelibrary.wiley.com/doi/10.1111/resp.13397>.
- [6] Lee AL, Burge AT, Holland AE. Positive expiratory pressure therapy versus other airway clearance techniques for bronchiectasis. *Cochrane Database Syst Rev.* 2017;9:CD011699.

- [7] Patel S, Cole AD, Nolan CM, Barker RE, Jones SE, Kon S, et al. Pulmonary rehabilitation in bronchiectasis: A propensity-matched study. *Eur Respir J*. 2019;53(1):1801264.
- [8] Kirca K, Kutlutürkan S. The effect of progressive relaxation exercises on treatment-related symptoms and self-efficacy in patients with lung cancer receiving chemotherapy. *Complement Ther Clin Pract*. 2021;45:101488.
- [9] Uçgun H, Gurses HN, Kaya M, Cakır E. Video game-based exercise in children and adolescents with non cystic fibrosis bronchiectasis: A randomised comparative study of aerobic and breathing exercises. *Pediatric Pulmonology*. 2022;57(9):2207-17.

**PARTICULARS OF CONTRIBUTORS:**

1. Intern, Department of Cardiovascular and Respiratory Physiotherapy, Ravi Nair Physiotherapy College, Datta Meghe Institute of Medical Sciences, Wardha, Maharashtra, India.
2. Resident, Department of Cardiovascular and Respiratory Physiotherapy, Ravi Nair Physiotherapy College, Datta Meghe Institute of Medical Sciences, Wardha, Maharashtra, India.
3. Professor and Head, Department of Cardiovascular and Respiratory Physiotherapy, Ravi Nair Physiotherapy College, Datta Meghe Institute of Medical Sciences, Wardha, Maharashtra, India.

**NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:**

Dr. Vishnu Vardhan,  
Professor and Head, Department of Cardiovascular and Respiratory Physiotherapy,  
Ravi Nair Physiotherapy College, Datta Meghe Institute of Medical Science,  
Sawangi, Meghe, Wardha-442004, Maharashtra, India.  
E-mail: vishnuviwakarpt@gmail.com

**PLAGIARISM CHECKING METHODS:** [\[Lain H et al.\]](#)

- Plagiarism X-checker: Oct 19, 2022
- Manual Googling: Nov 30, 2022
- iThenticate Software: Dec 19, 2022 (5%)

**ETYMOLOGY:** Author Origin**AUTHOR DECLARATION:**

- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Sep 30, 2022**Date of Peer Review: **Nov 22, 2022**Date of Acceptance: **Dec 20, 2022**Date of Publishing: **Jun 01, 2023**