

# The Role of Pulmonary Rehabilitation in Pulmonary Tuberculosis and Pneumothorax on Functional Activity: a Case Report

Rachmawati Samiah, Ridwan Mochammad, Nugroho Eko, Rahma Erinda, Ainurridlo Virginia

**Abstract:** Exertional dyspnea is among the most frequently experienced symptoms of pulmonary disease and leads to physical disability and functional impairment. Secondary pneumothorax is one of pulmonary tuberculosis (TB) complication and also life threatening. Pulmonary rehabilitation is proven effective for decreasing exertional dyspnea and improving functional activity. The goal is to improve the inspiration capacity. A 24-years-old female with pulmonary tuberculosis on OAT and left pneumothorax with shortness of breath (SOB). She came first with bedridden (METS 1), pulmonary function, exertional dyspnea with Borg Scale (9), chest expansion 1 cm, single-breath counting (SBC) test 17 s, SpO2 95%, BI 30. The pulmonary rehabilitation programs were deep breathing, chest expansion exercise and cardiorespiratory endurance training using ergocycle. After 1 week got pulmonary rehabilitation there were improvement of SOB, Borg Scale, chest expansion, SBC test, and Barthel Index. Patient came to hospital with wheelchair and standing with parallel bar (METS 1,2). The Borg Scale was improved (8), chest expansion was improve to 1,2 cm, SBC test was improved to 20 s and BI 60. After 3-week, patient were undergo 6-MWT (120 m, METS 2,76) with Borg Scale 7, chest expansion 2 cm, SBC test was 23 s, and BI 85. Pulmonary rehabilitation programs is great to improve respiratory function & functional activity, even in the condition of patients with pneumothorax that have not improved in outpatient with SOB dt. Pulmonary Tuberculosis and Pneumothorax.

**Keywords:** Pulmonary rehabilitation, lung tuberculosis, pneumothorax.

## I. INTRODUCTION

Exertional dyspnea is among the most frequently experienced symptoms of pulmonary disease and leads to physical disability and functional impairment. Pneumothorax is a condition in which there is air in the pleural cavity. Pneumothorax is divided into two, spontaneous that occurs without trauma or other causes, and traumatic that occurs due to direct or indirect trauma to the chest, including iatrogenic pneumothorax.<sup>1</sup> Around the 19th

century it was found that TB was one of the main causes of pneumothorax.<sup>2</sup> Spontaneous pneumothorax is divided into primary pneumothorax and secondary pneumothorax. Secondary pneumothorax is one of pulmonary tuberculosis (TB) complication and also life threatening.<sup>3</sup>

Pulmonary rehabilitation is a therapy given to patients who have lung disease and the patient's family. The goals of pulmonary rehabilitation are improvement in cardiopulmonary function, prevention and treatment of complications, increased understanding of the disease, increased patient responsibility, for self-care and compliance with medical treatment, improvement in quality of life, capacity for activities of daily living, and return to work. Interventions can include exercise, respiratory muscle rest and support, education, emotional support, oxygen, airway secretion clearance, and promoting compliance with medical care. These goals are appropriate for any patients with diminished respiratory reserve whether due to obstructive or intrinsic pulmonary diseases (oxygenation impairment) or neuromuscular weakness (ventilatory impairment).<sup>4</sup> Pulmonary rehabilitation has been found to be a safe, effective, and beneficial program in controlling breathing and cough, reducing dyspnea, improving patient pulmonary function capacities and quality of life.<sup>5,6</sup>

Study conducted by Cheng found that pulmonary rehabilitation had good effect for autonomic function, quality of life, and also exercise capacity.<sup>7</sup> A number of participants were included in the rehabilitation program for 12 weeks, with 2 sessions per week. Before give rehabilitation program, each participant was given training & education about breathing exercise, proper use of medications and self management skills. After that, for increasing endurance on lower extremity, patient must do ergocycle. Another study from Riario-Sforza proved that out-patient pulmonary rehabilitation improving patient exercise tolerance in patient with mild COPD. Physical exercise, respiratory muscle training, upper extremity and trunk exercise are pulmonary rehabilitation program that we can give. The improvement can be checked by the 6-minute walking test which shown an increasing in walking distance.

## II. CASE REPORT

A 24-years-old female with pulmonary tuberculosis on OAT and left pneumothorax with shortness of breath (SOB). At the first visit she came with bedridden (METS 1),

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pulmonary function, exertional dyspnea with Borg Scale (9); chest expansion 1 cm; single-breath counting (SBC) test 17 s; SpO<sub>2</sub> 95%, BI 30; CXR results show pneumothorax sinistra and military TB.

The outpatient pulmonary rehabilitation program consisting of deep breathing exercise, chest expansion exercise and cardiorespiratory endurance training for once a week under supervision and home-based pulmonary rehabilitation. After 1 week got pulmonary rehabilitation program there were improvement of SOB, Borg Scale, chest expansion, SBC test, and Barthel Index. Patient came to hospital with wheelchair and standing with parallel bar (METS 1,2). The Borg Scale was improved to 8, chest expansion was improve to 1,2 cm, SBC test was improve to 20 s and BI 60. After 3 week, patient were undergo 6-MWT (120 m, METS 2,76) with Borg Scale 7, chest expansion 2 cm, SBC test was 23 s, and BI 85.

### III. RESULT AND DISCUSSION

An important problem for patients with interstitial lung disease is severe hypoxemia that requires high flow of oxygen with exercise to maintain adequate saturation for activity. It is important in this group to avoid the occurrence of chronic hypoxemia to prevent secondary pulmonary hypertension because the coexistence of interstitial lung disease and pulmonary hypertension can lead to very reduced life expectancy. The intensity of exercise is often limited to patients with interstitial lung disease due to oxygenation rather than dyspnea.<sup>9</sup>

Pulmonary rehabilitation in this case has been found to have beneficial effects for pneumothorax patients in reducing the symptoms of dyspnea, improve pulmonary function and quality of patient health. The pulmonary rehabilitation program that we carry out, in accordance with the recommendations of the British Thoracic Society guidelines.<sup>10</sup>

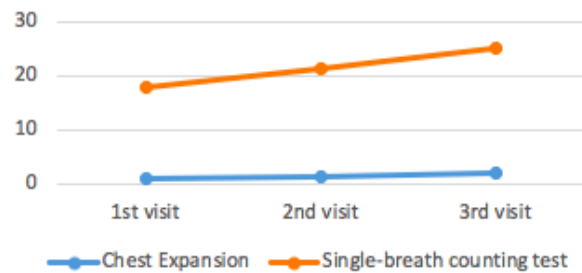
A home based pulmonary rehabilitation by Grobois, et al show that home exercise program that he gave for unselected COPD not only had effect in the short term, but this effectiveness also can exceed until the medium term (6 months) and the long term (12 months). Home-based PR have beneficial for outpatient management include activities, such as exercise conditioning, therapeutic education, and self-management.<sup>11</sup> Corresponding to our study, the aims of pulmonary rehabilitation in this study is to breathing control, strengthening the respiratory muscles, improving endurance and quality of life (increase of Barthel Index).

**TABLE 1: RESULT OF PULMONARY FUNCTION TEST AND QUALITY OF LIFE ASSESSMENT BEFORE AND AFTER PULMONARY REHABILITATION PROGRAM IN A PATIENT WITH PULMONARY TB & PNEUMOTHORAX.**

Pulmonary Function Test	Assessment before pulmonary rehabilitation program	Assessment after pulmonary rehabilitation program
Chest expansion	1 cm	1,2 cm

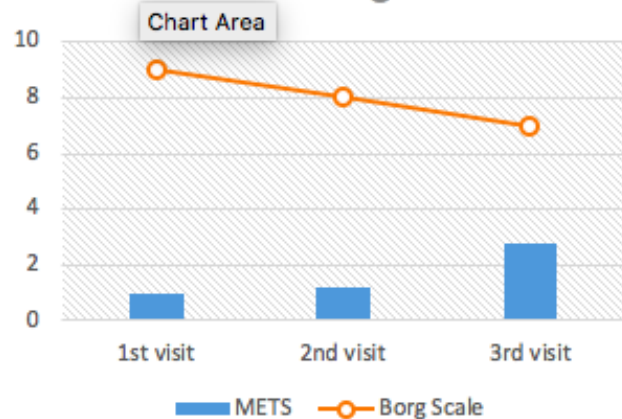
SBC test	17 s	23 s
Borg scale	9	7
METS	1	2,76
Quality of Life	Barthel Index: 30	Barthel Index: 85

**Chest Expansion & Single-Breath Counting Test**



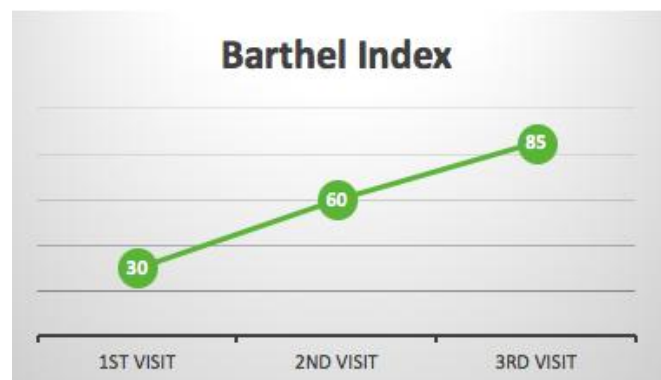
**Figure 1. Chest Expansion & Count Breathlessness Test**

**METS & Borg Scale**



**Figure 2. METS and Borg Scale**

**Barthel Index**



**Figure 3. Barthel Index**

### IV. CONCLUSION

Pulmonary rehabilitation programs in this case aims to breathing control, strengthen respiratory muscles, increase endurance that can lead to improve patient's pulmonary function capacities and quality of life.



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