Case study

AN EARLY COMPREHENSIVE PHYSIOTHERAPY APPROACH TOWARDS RECONDITIONING OF PATIENT WITH EMPYEMA THORACIS: A CASE STUDY

Abstract:

Pulmonary tuberculosis is considered among the most common air-borne respiratory disease. TB is found almost all over the globe but it is also curable and preventable. However, it frequently has several negative consequences on the lung, which affects the patient's exercise tolerance capacity, everyday activities, and, ultimately, quality of life. The PTB is frequently associated with various subsequent problems. Few of which are presented in this case, along with their management. The current case involves a 36-year-old girl who had a history of pulmonary tuberculosis and was re-diagnosed with it, albeit with difficulties. She initially suffered pleural effusion, for which therapeutic tapping was performed, but it later progressed to empyema thoracis. She underwent thoracocentesis, which involved draining the fluid and breaking the fibrous septations, followed by the insertion of ICD drainage. Medical management was successful, but to return the patient to her normal daily routine activities without any signs of dyspnea or fatigue, a comprehensive rehabilitation program incorporating various respiratory techniques was devised, which proved to be an effective protocol in improving the patient's respiratory condition.

Keywords: Empyema, tuberculosis, thoracocentesis, pleural effusion**,** physiotherapy management

Introduction:

Tuberculosis (TB) is an infectious disease caused by the bacteria Mycobacterium tuberculosis (MTB). Pulmonary tuberculosis (TB) remains a major global health challenge in the twenty-first century. It is the world's second-leading infectious killer, trailing only COVID-19 (but ahead of HIV/AIDS). It has affected people of all ages and from all nations. However, it is both treatable and avoidable. Eight nations account for two-thirds of all new TB cases, with India leading the way. The cumulative prevalence of bacteriologically positive pulmonary tuberculosis was 295.9 per 100,000 people (1). TB sequelae cause structural lung damage, as

well as physiological impairment, which causes disability, respiratory discomfort, and a reduction in exercise capacity (2).

The current case was diagnosed with empyema following TB. Empyema is an accumulation of pus in the pleural cavity that usually develops as a result of pre-existing lung disease(3), such as tuberculosis in this case. It is most usually caused by the direct spread of infection into the pleural space in a patient with mycobacterium tuberculosis-induced pulmonary tuberculosis. X-rays and CT scans are commonly used to confirm a diagnosis. On computed tomography imaging, a thick, calcific pleural rind and rib thickening around loculated pleural fluid suggest tuberculous empyema. The pleural fluid is extremely purulent and positive for acid-fast bacilli on smear. Pleural space drainage and anti-tuberculous chemotherapy were used to treat the condition(4). The most common method of pleural space drainage used is thoracocentesis, followed by ICD drainage. However, respiratory physiotherapy care is required to increase the patient's lung vital capacity and limit the likelihood of additional problems. Physiotherapy management assists the patient in regaining his quality of life and returning to his regular daily routine.

Patient information:

A 36-year-old female was diagnosed with sputum-positive pulmonary tuberculosis 2 years back. She has been treated with the complete 6-month AKT regimen. But Before 2 months, she was again tested sputum positive for pulmonary tuberculosis and received a CAT-1 DOTS regimen. For 2 months she was experiencing the symptoms of left-sided chest pain, along with grade I dyspnoea on the MMRC scale, low-grade intermittent fever, cough with mucopurulent expectoration, and weight loss and was taken to the private hospital and was diagnosed with left-sided pleural effusion for which thoracocentesis was done and 1 litre of thick yellow-coloured pleural fluid was drained. The patient was then referred to our hospital for decortication surgery. Once the patient became sputum negative, she underwent medical thoracoscopy for empyema and approx. 300 ml of pus was drained, thick septations in apical, middle, and lower lobe were broken and an ICD was inserted. The patient has had a history of biomass exposure for the last 10-15 years and she is a tobacco chewer for 15 years.

Clinical findings:

On examination, the patient was afebrile with stable vitals, pulse rate of 90 beats/min, respiratory rate of 20 beats/min, blood pressure of 110/70mmhg, and oxygen saturation of 98%. The patient was thin built due to weight loss in the last few months. Inspection findings

revealed the reduced chest movement on the left side along with increased use of accessory muscles thereby increasing the work of breathing. There was an incision mark in the 4th intercostal space on the left side made for thoracoscopy and the insertion of intercostal drainage. On palpation, chest excursion confirmed the reduced chest expansion on the left side. On percussion, there was decreased resonant sound on the left side as compared to the right side as well as on auscultation there was decreased breath sound on the left side along with bronchial breath sounds on the right side.

Table 1. Timeline:

Events	**Dates**
Date of admission	16/09/2021
Date of decortication surgery	30/09/2021
Date of physiotherapy referred	30/09/2021
Date of discharge	13/10/2021
Date of follow up	23/10/2021

Investigation:

HRCT scan findings revealed discrete centrilobular nodules with a surrounding tree in bud appearance and patchy areas of alveoli in the right upper and middle lobe. Thick-walled cavitary lesion noted in right apical segment measuring 46mm in size with a maximum wall thickness of 12mm. Reduced lung volume on the left side with crowding of ribs and shift of mediastinum towards the left side. loculated collection with multiple septations and pleural thickening noted in the left pleural cavity with multiple air foci within it, s/o empyema. Multiple fibrotic stranding was noted in the bilateral lung parenchyma.

X-ray scan findings: -

A posteroanterior view chest x-ray of the patient revealed the cavitary lesion on the right lung along with pleural effusion and fibrotic stranding on the left lung. Pneumothorax is also visible on the left side of the chest.

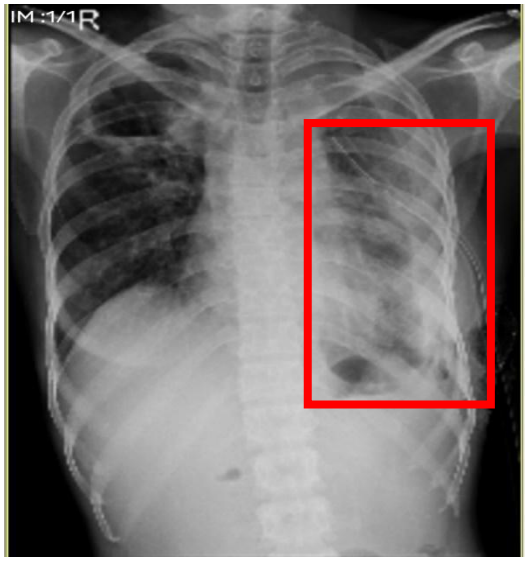

Fig 1. X-ray scan

Table 2. Outcome measures scales:-

Scales		Scores
Numerical pain rating scale		8/10
MMRC dyspnea scale		Grade II
WHO-QOL	Physical functioning	51/100
	Emotional functioning	78/100
	Social functioning	85/100
	Environmental functioning	75/100

Therapeutic intervention:

Pharmaceutical management:

CAT-I DOTS regimen (Rifampicin, Pyrazinamide, Ethambutol, Isoniazid), Inj. Ceftriaxone 1gm, Inj. Metronidazole 100ml, Inj. Gentamicin 80mg, Tab Domperidone, and pantoprazole 40mg, Tab paracetamol and tramadol, Syrup of cetirizine and phenylephrine 10ml BD.

Physiotherapy management:

As soon as the ICD tube was removed, physiotherapy management was commenced with the goals of improving the patient's ventilation, exercise tolerance capacity, clearing of the

airways, reducing the work of breathing, and promoting relaxation. It aids the patient to perform daily living activities without any fatigue and dyspnea.

Patient's education:

The patient and her relatives were counseled about her condition, her prognosis, the importance of physiotherapy management, and all the precautions to be taken. Active limb exercises along with deep breathing exercises were taught to the patient. The patient was also counseled to stick to the taught regimen and visit for the follow-ups.

To minimize the adhesion formation within the pleura:

Thoracic expansion exercises began early after the thoracocentesis procedure. The patient was asked to perform chest expansion 3 times a day for 10 minutes daily.

To regain full lung volume and capacity:

Deep breathing exercises such as diaphragmatic breathing, segmental breathing, and Incentive spirometer were given to the patient.

To clear the lung fields:

Manual chest percussion and manual chest vibration combined with various compliant positions were given to the patient for the drainage of secretions. The patient was also taught with the active cycle of breathing technique (ACBT) and was asked to perform 2-3 times per day as long as the patient's convenience and sense for the presence of secretions.

To maintain good posture and thoracic mobility:

The patient was advised to sit with equal weight distribution on the pelvis as well as maintain the shoulders level. Semi fowler position was promoted and was also advised to keep changing the position to avoid bed sores and facilitate secretion drainage.

To improve exercise tolerance:

A monitored graded exercise program was planned for the patient which commenced with bedside limb mobility exercises and involved walking, stair climbing, and pedocycle exercises for 10 minutes 3-4 times daily, which were gradually increased according to the patient's hemodynamic response and Rate of perceived exertion.

Follow up and Outcomes:

Physiotherapy protocol was designed for 2 weeks with 4 sessions a week in the hospital inpatient set-up. After 2 weeks once the patient has shown some improvement in the exercise tolerance capacity, she was discharged with a well-explained home exercise program and called for follow-up after 2 weeks.

Outcomes	**1st day of referral**	**At the time of discharge**	**Follow up**
Grade of dyspnea	II	I	I
RPE post mobilization	4	3	2
Six-minute walk test	180m	270m	400m
Numerical pain rating scale	7	1	0
WHO-QOL (Physical function)	51	80	85

Table 3: Shows Pre and post-rehabilitation Outcome measures

Discussion:

A chronic respiratory infectious disease has a negative impact on the lungs and their ability to ventilate. An infectious condition like pulmonary tuberculosis can cause a variety of consequences such as pleural effusion, empyema, pneumothorax, and so on (2). This case study describes a female patient who developed empyema as a post-TB consequence. The patient received therapeutic thoracocentesis and intercostal drainage, but intensive physiotherapy care was required to enhance the patient's lung ventilation and oxygenation capacity. Donna conducted a pilot study that supported pulmonary rehabilitation for patients with pulmonary TB (5).

It involved breathing exercises as well as chest clearance techniques. Deep breathing is the most commonly used lung expansion technique by chest physiotherapists in the treatment of patients with drained and non-drained pleural effusion (6). Breathing exercises involved diaphragmatic, segmental as well as pursed-lip breathing which helped to improve the ventilation by creating backpressure in the airways.

Postural drainage positions have been primarily used for the clearance of secretion along with percussion, vibration, coughing, and huffing techniques. Active cycle of breathing technique is also found more effective in clearing chest as compared to other conventional techniques (7).

The Jones research in Uganda developed a pulmonary rehabilitation program for adults with post-tuberculosis lung disease to assess the pre-and post-intervention outcomes (8). Their training program focused primarily on aerobic lower limb exercises, mainly on walking. They observed substantial changes in chest pain and hemoptysis, but the cough remains unaffected. They did not involve breathing exercises or lung-based treatments.

Walking was chosen as the principal exercise in the monitored graded exercise program (9) which was gradually increased in distance according to the patient's tolerance. Stair climbing and cycling were included eventually (10). The rehabilitation was carried out for 2 weeks in hospital when the patient was in bed and then a 2 week of the home exercise program was advised which the patient claims to follow and was called for a follow-up visit.

Conclusion:

Pulmonary rehabilitation has been shown to improve patient ventilation and reduce dyspnea. The patient was able to go about his everyday activities without feeling tired or out of breath. This case report describes an integrated and comprehensive post-thoracocentesis rehabilitation regimen. Although full recovery was not observed following rehabilitation, the improvements exhibited in enhancing the patient's lung vital capacity and exercise tolerance were substantially better.

Informed consent: Informed consent was taken from the patient for writing the case report.

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