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Case Report

Physiotherapy Section

Effectiveness of Short-term Pulmonary Rehabilitation in a Patient with Rheumatoid Arthritis Associated Interstitial Lung Disease: A Case Report

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ABSTRACT

Interstitial Lung Diseases (ILDs) comprise a heterogeneous group of chronic conditions characterised by lung parenchymal involvement with different degrees of inflammation and fibrosis resulting in impaired gas exchange. Rheumatoid arthritis is commonly associated with ILD. Pulmonary-rehabilitation plays a significant role in Rheumatoid Arthritis associated ILDs (RA-ILD). A 37-year-old female patient came to the respiratory medicine department with a complaint of breathleness since 11-years, cough along with expectoration since one year, neck pain, generalised weakness since one-month and diagnosed as acute exacerbation of ILD-associated with rheumatoid arthritis with cor pulmonale. Tailor-made pulmonary rehabilitation which includes early mobilisation active breathing exercises, incentive spirometry, exercise training (aerobic, resisted and flexibility) and airway clearance techniques was given for a period of two-weeks. Follow-up assessments were performed after two weeks and after four weeks of telerehabilitation (i.e., at six weeks from baseline) to evaluate the overall treatment outcomes using the following outcome measures -Modified Medical Research Council dyspnoea grading scale, Six Minutes Walking Distance (6MWD), St. George Respiratory Questionnaire-SGRQ and Hospital Anxiety And Depression Scale (HADS). The primary physiotherapeutic outcomes were reduction in dyspnoea and improvement in functional capacity and quality of life. Findings of this case report indicate that short term pulmonary rehabilitation is feasible and effective in patients with RA-ILD and showed significant improvement in the aerobic capacity, cardiorespiratory symptoms and quality of life of the patient with RA-ILD Despite combined pulmonary and musculoskeletal limitations, the patient demonstrated meaningful improvements in functional capacity and dyspnoea. The findings emphasise the feasibility and clinical value of early, time-efficient pulmonary rehabilitation in RA-ILD.

Keywords: Chronic disease, Connective tissue disease, Dyspnoea, Exercise therapy, Functional capacity, Physical therapy modalities

CASE REPORT

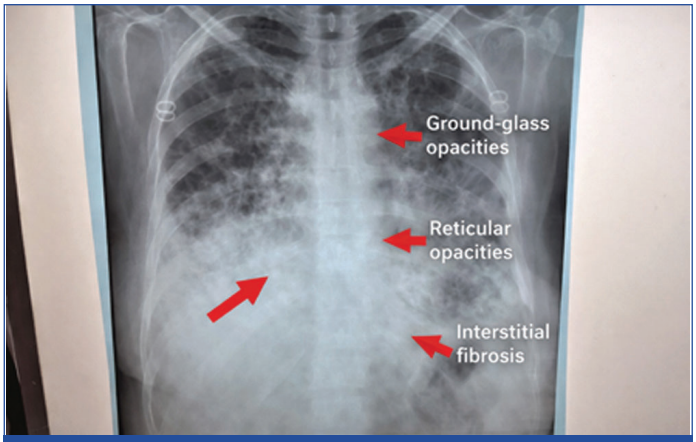
A 37-year-old female patient presented to the Department of Respiratory Medicine with the chief complaints of progressive dyspnoea, productive cough, generalised limb pain, neck and back pain, and bilateral upper and lower limb swelling for the past one week. She had difficulty performing Activities of Daily Living (ADLs) and was unable to walk more than 100 meters due to breathlessness during the same period.

The patient was apparently asymptomatic 11-years-ago. She then gradually developed progressive dyspnoea, which worsened on exposure to dust and *chulha* smoke, along with a productive cough and generalised limb pain, neck pain, and back pain. She sought treatment at a local hospital in, where investigations including a chest X-ray, High-Resolution Computed Tomography of the (chest) thorax (HRCT) and Pulmonary Function Tests (PFTs) were performed. She was diagnosed with RA-ILD, as she was a known case of rheumatoid arthritis for the past 12 years. Her condition gradually worsened over time, and she has had frequent hospital admissions, over the last four years. The patient again presented to the hospital with a sudden onset of dyspnoea, productive cough, generalised limb pain, neck and back pain, and bilateral upper and lower limb swelling, following which she reported to hospital. Her past medical history revealed pulmonary tuberculosis eight years ago. The family history was significant, as her mother had ILD. The patient had a history of prolonged exposure to *chulha* smoke for approximately seven years.

Further investigations were carried out, including chest X-ray, HRCT thorax, PFT, Complete Blood Count (CBC), Magnetic Resonance Imaging (MRI), and Ultrasonography (USG) of the abdomen [Table/Fig-1,2]. She was diagnosed with an acute exacerbation of RA-ILD. Oxygen therapy along with appropriate medical management was initiated, and a referral for physiotherapy was also given. Medical treatment included nebulised levosalbutamol, nebulised budesonide (0.5 mg), injection dyphylline, injection amoxicillin, tablet acetylcysteine 600 mg, tablet hydroxychloroquine 200 mg, tablet methotrexate 15 mg, injection pantoprazole 15 mg, injection paracetamol, and folic acid.

Name of investigations	Findings
Rheumatic factor RA (quantitative)	40 IU/mL
HRCT thorax	There were multiple small patchy areas of honey combing, reticular opacities and fibrosis noted in the hemithorax. Mild tractional bronchiectasis changes noted. F/s/o Interstitial Lung Disease (ILD) UIP pattern.
Chest X-ray	Reticular opacities noted diffusely involving bilateral lung fields with mild tracheal deviation on right.
Pulmonary Function Test (PFT) (Spirometry)	FEV_1 - 5.96 (% Change) FVC - 4.84 (% Change) FEV_1/FVC - 1.08 (% Change) FEF_{25-75} - 12.12 (% Change)
Haematology profile	Hb - 12 CRP - 4.5

[Table/Fig-1]: List of investigations.
FEV_1: Forced expiratory volume in 1 second; FVC: Forced vital capacity; FEV_1/FVC: Ratio of forced expiratory volume in 1 second to forced vital capacity; FEF_{25-75}: Forced expiratory flow between 25% and 75% of forced vital capacity Hb: Hemoglobin; CRP: C-reactive protein



[Table/Fig-2]: Chest X-ray.

On observation, the patient was on six litres per minute of O_2 via face mask. Her breathing pattern was thoracoabdominal in nature. She also used accessory respiratory muscles. The trachea was centrally positioned, tactile vocal fremitus was normal across all lung zones and chest percussion note was dull on bilateral middle and lower lung zones. Vital signs examination revealed tachycardia (PR-114 BPM) and tachypnoea (RR-26 BPM). The patient's (SpO_2) was 96% on 6 litres of oxygen and 92% on RA. Chest expansion was reduced at all three levels (axillary - 2.5 cm, nipple - 2 cm, xiphisternal - 2.5 cm). Auscultation findings on the first day revealed B/L (Bilateral air entry) air entry adequately present all over lung zones, with crackles sounds heard in both lower lung zones.

Intervention

A customised treatment plan was developed and implemented for the patient for two weeks. This was followed by a structured telerehabilitation program for the subsequent four weeks, during which the patient received supervised virtual sessions, individualised exercise progression, and regular monitoring to ensure adherence, safety, and optimal functional outcomes. A comprehensive summary of these interventions is provided in [Table/Fig-3]. The patient underwent a short-term pulmonary rehabilitation program aimed at improving respiratory function, exercise tolerance, and quality of life in RA-ILD. Patient education was provided regarding the disease condition and the importance of pulmonary rehabilitation to relieve dyspnoea pursed-lip breathing, dyspnoea-relieving positions, energy conservation techniques, and relaxation training sessions were given. Airway clearance was facilitated through the Active Cycle of Breathing Technique (ACBT) and postural drainage positioning. To improve ventilation, diaphragmatic breathing, segmental breathing, thoracic expansion exercises, and incentive spirometry were given. Muscle strengthening exercises for upper and lower limbs were performed according to American College of Sports Medicine (ACSM) guidelines [1] using resisted training at moderate intensity.

S. No.	Goals	Physiotherapy intervention	Repetitions
1	Patient education	To explain the present condition and the advantages of a physical rehabilitation program to the patient	NA
2.	To reduce dyspnoea	Pursed lip Breathing Dyspnoea-relieving positions Energy conservation technique. Relaxation Training.	5 Reps* 2 sets
3	To mobilise and remove secretions.	Active Cycle of Breathing Technique (ACBT) postural drainage	Five cycles
4	To improve ventilation	Diaphragmatic breathing. Segmental Breathing. Thoracic expansion exercise. Incentive Spirometry	5 Reps*2 Sets
5	To improve muscle strength	Resisted exercise Frequency,- 3 times/day Intensity- 40% of 1 RM Time-15 Min Type-weight cuff	10 reps × 1 set (Major Muscles of UL and LL)
6	To improve aerobic capacity	Aerobic Exercise. Frequency-5 times/day Intensity-11-13 RPE Time-15 Min Type-Walking	NA
7	To improve the QOL of the patient	The home exercise regimen includes deep breathing exercises, mobility exercises for the upper and lower limbs, and ambulation	Twice a day

[Table/Fig-3]: Treatment summary.

Aerobic training was prescribed in accordance with the ACSM guidelines. It was delivered in the form of brisk walking and was performed at a moderate intensity, corresponding to a perceived exertion level of 11-13 on the Borg Rating of Perceived Exertion scale. This intensity reflects light to somewhat hard effort, ensuring the exercise was safe, tolerable, and appropriate for the patient's functional capacity [1]. A home exercise program consisting of breathing exercises, limb mobility exercises, and ambulation was advised twice daily to promote long-term benefits.

A physiotherapeutic evaluation of the patient was performed on the first day and also after two weeks. In addition, telerehabilitation sessions were continued to ensure adherence to the pulmonary rehabilitation program. A follow-up assessment was again performed after four weeks of telerehabilitation, that is, at six weeks from baseline, to evaluate the overall treatment outcome. In the present case, clinical follow-up demonstrated progressive improvement in walking distance as measured by a symptom-limited exercise test that is (6MWT) that reflect enhanced physical endurance and reduction in ventilatory limitations. Significant reduction in breathlessness, evaluated using the (mMRC) dyspnoea scale Quality of life and functional status improvements were further substantiated by the (SGRQ), a disease-specific instrument validated in ILD populations as well· Improvement in SGRQ scores indicates a reduction in disease burden and enhancement of psychosocial well-being, mobility, and symptom control [Table/Fig-4] [2-5].

Outcome measures	Pre (Baseline)	Post (After 2 Weeks)	Post (Follow-up After 6 - weeks)
Modified Medical Research Council dyspnoea grading scale [2]	3	2	1
St. George Respiratory Questionnaire-SGRQ [3]	50	35	25
Hospital Anxiety and Depression Scale (HADS) [4]	12	10	8
6 MWT/symptom limited test [5]	120 m	340 m	410 m

[Table/Fig-4]: Outcome measures [2-5].

Ongoing exercise training was recommended to maintain improvements in dyspnoea, functional capacity, and quality of life. The patient was also encouraged to adhere to the prescribed physiotherapy and home exercise program and lifestyle modifications to sustain long-term benefits.

DISCUSSION

The ILDs comprise a heterogeneous group of chronic conditions characterised by lung parenchymal involvement with different degrees of inflammation and fibrosis resulting in impaired gas exchange and restrictive physiology. RA-ILD significantly contributes to illness and mortality in affected individuals from clinical perspective [5]. ILDs are frequently associated with RA. This case highlights a gradual and measurable improvement in a patient diagnosed with ILD, evidenced by both objective and subjective clinical parameters. These improvements align with previously reported benefits of pulmonary rehabilitation in ILD, even over short durations [6,7].

The physiological mechanisms behind these improvements are multifactorial. Exercise training enhances cardiovascular fitness,

skeletal muscle strength, and ventilatory efficiency, which in turn reduces the relative workload for given levels of activity. Additionally, structured breathing exercises may improve coordination of respiratory muscles reducing perceived breathlessness during effort, thereby facilitating deeper and more effective ventilation. Such mechanisms partly explain the marked increase in the 6-minute walk distance and reduction in dyspnoea rating in this patient. Reduced symptom burden occurs due to improved physical and psychosocial well-being, which is reflected in lower SGRQ scores. Structured exercise and telerehabilitation sessions provide routine, social interaction with healthcare providers, and reinforcement of coping strategies, all of which can reduce anxiety and depressive symptoms [8,9].

The findings of the present case report are in line with previous meta-analyses [9,10], which indicate that pulmonary rehabilitation in ILD typically yields mean improvements of approximately 30-45 m in the 6-minute walk distance compared with usual care, along with corresponding reductions in dyspnoea and improvements in quality of life. The improvements in SGRQ scores observed in this case also align with clinically meaningful changes reported in ILD intervention studies [11,12], demonstrating decreased symptom burden and enhanced health-related quality of life following pulmonary rehabilitation.

Several confounding factors should be noted. Ongoing medical therapy may have contributed to symptom and functional improvements, and the short 6-week intervention limits comparison with standard 8-12 week programs. While early gains were observed, long-term effectiveness is uncertain, emphasising the need for maintenance rehabilitation. The higher incidence of exercise-induced hypoxaemia, pulmonary hypertension, and cardiac arrhythmias in ILD patients, relative to those with other chronic lung conditions, highlights the importance of careful and safe monitoring during rehabilitation [13,14].

This case report contributes insights into the potential efficacy of the pulmonary rehabilitation in RA-ILD. The observed improvements in dyspnoea, exercise capacity, quality of life, and psychosocial well-being are clinically meaningful, supporting greater independence and reduced symptom burden. Long-term follow-up and maintenance programs are important to sustain these benefits, as functional gains may decline without ongoing physical activity and continued rehabilitation.

CONCLUSION(S)

Findings of this case report indicate that short-term pulmonary rehabilitation is feasible, safe and effective in patients with RA-ILD and showed significant improvement in the aerobic capacity, cardiorespiratory symptoms and quality of life of the patient with RA-ILD.

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