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The predictive validity of comprehensive pulmonary rehabilitation in patient with usual interstitial pneumonia and concomitant respiratory complications: A case study

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ABSTRACT

Usual interstitial pneumonia is the most frequent and fatal of the idiopathic interstitial pneumonias which had a radiological and/or histological characteristic. Dyspnoea with exertion, a dry cough, and, eventually, respiratory failure are all signs of lung parenchyma damage and fibrosis. Pleural and pericardial effusions develop as a result of a disease. The 41-year-old female patient in this case had been suffering from MMRC grade 1-2 dyspnoea for the past 10 years, which had progressed to grade 3 and a dry cough for the previous 7 days. According to chest radiography, interstitial pneumonia (Usual Interstitial Pneumonia/UIP), bilateral pleural effusion, pericardial effusion and cardiomegaly features of pulmonary arterial hypertension were suggested. The ILD was relieved by medical intervention, but our goal was to increase pulmonary ventilation and oxygenation, airway hygiene, exercise tolerance, and breathing work so that the patient could return to his normal activities without difficulty. To accomplish the patient's goals, a comprehensive pulmonary rehabilitation strategies was developed and implemented over the course of a month. Among the therapies were breathing exercises, airway clearance procedures, physical mobility activities, and posture retrained. On both the MMRC dyspnoea rating scale and the WHO-QOL, the patient showed significant functional improvement. It has also been proven in this case that medicinal management combined with pulmonary rehabilitation will lead to significant outcomes.

Keywords: Usual interstitial pneumonia, Pleural effusion, pericardial effusion, pulmonary arterial hypertension, pulmonary rehabilitation

1. INTRODUCTION

Interstitial lung disease represents a set of more than 200 parenchymal respiratory disorders, the majority of which are categorized as uncommon

(Cottin et al., 2018). Idiopathic pulmonary fibrosis is the most well-defined and severe of the idiopathic interstitial pneumonias. It is explained by a radiographic and/or pathologic characteristic of UIP. This isn't the same as IPF because it can be linked to various clinical conditions as medication toxicity, collagen vascular disease, chronic hypersensitivity pneumonitis, familial IPF, Hermansky–Pudlak syndrome, and asbestosis (Wuyts et al., 2014). Gradual fibrosis and thickening of the lung parenchyma cause symptoms such as dyspnoea during exercise, persistent cough, and, ultimately, airway obstruction. Lung parenchymal fibrosis is a self-sustaining illness that impairs lung capacity, causes respiratory problems, and reduces wellbeing. IPF is a difficult disease with many unknowns, including pathogenesis and clinical outcome making an early and precise diagnosis is challenging, as is forecasting how an illness will progress. They do not, however, fully represent the care of all IPF patients due to the disease's complicated trajectory. In the European Union, pirfenidone is the only drug licensed for the management of mild to moderate IPF. Canada, Japan, India, and China have all approved it for IPF (Kreuter et al., 2014).

A medical condition can cause pleural effusions (Mulroy, 2008). A variety of illnesses can induce collection of fluid in the pleural area, but the cause is unknown in 20% of patients. Pleural effusion as the first symptom in a patient who has no other symptoms can be difficult to diagnose (Froudarakis, 2008). The development of appropriate diagnostic models requires an understanding of the diagnostic value of pleural fluid testing (Ferreiro et al., 2020). Pericardial effusion is fluid that collects between the heart and the pericardial sac. The most prevalent cause of pericardial effusion is infection (viral or tuberculosis). If fluid builds up quickly in the pericardial region, such as during chest trauma, it can compress the heart and induce circulatory failure (cardiac tamponade). Although the majority of them aren't harmful, they can occasionally cause the heart to work inefficiently (Walker et al., 2020).

The blood pressure in the arteries that run from your heart to your lungs is increased when you have pulmonary arterial hypertension (PAH). It's not the same as having high blood pressure all of the time. PAH causes your lungs' small arteries to tighten or obstruct. Your pulmonary blood pressure will rise as blood has a difficulty passing through them. To pump blood through those arteries, your heart has to work harder, and your heart muscle weakens as a result. In the long run, it might lead to heart failure (Hassoun, 2021).

2. PATIENT INFORMATION

A 41-year-old woman with right-handed dominance and a farmer's occupation presented with complaints of MMRC grade 1-2 dyspneas that had progressed to grade 3 during the previous 10 years. She experienced a dry cough for 7 days and was brought to the Rural Hospital on 11/1/22, when an HRCT scan revealed that she had interstitial pneumonia (Usual Interstitial Pneumonia/UIP) Plural and pericardial effusions on both sides. Cardiomegaly features of pulmonary arterial hypertension. She's been exposed to biomass for the past 15 years. Her dust allergy was seasonal and worsened in the winter. She had lost weight (5-6 kg in 2 months) and had been losing her appetite for the past 7 days. She has been using homeopathic medication for the previous 4-5 years for numerous joint pains. She has been suffering from epigastric swelling for the past 25 years. On admission, the patient began symptomatic treatment and other supportive therapies. The patient's vital signs, hemodynamics, and neurological condition were all normal. The patient's treatment timeframe is illustrated in (Table 1). She was given a 7-day follow-up with CBC/LFT/KFT results, as well as physiotherapy and medications. The patient's main complaint when she came to the physiotherapy department, according to the MMRC, was dyspnoea grade 3, with a dry cough that had been present for the previous seven days. For symptoms such as joint discomfort and pulmonary complications, physiotherapy was initiated, which included breathing exercises, joint motion exercises and forced expiratory technique.

Table 1 depicts the patient's timeline during the treatment process.

Date of admission	11/01/22
Physiotherapy referral	11/01/22
Date of discharge	25/01/22
Date of follow up	1/02/22

3. CLINICAL FINDINGS

A physical examination was performed after the patient gave her informed consent. The patient was awake, cooperative, and well-oriented in terms of time, location, and person during the general assessment, with no focal neurological deficits. The patient was seen with ECG leads and in a semi-fowler's position. The patient's vital signs were 122 beats per minute, 24 breaths per minute, and 96 percent oxygen saturation in room air. There was grade 2 clubbing present. The patient was evidently showing thoraco-abdominal breathing. The shape of the chest was normal, the trachea appeared to be in a normal position, and chest

movements were bilaterally asymmetrical when the respiratory system was examined. Vocal fremitus on the right lower zone was reduced when palpated. Auscultation of breath sounds also demonstrated diminished air entry in both upper lobes, as well as bilateral crepitations. Furthermore, the first and second heart sounds were normal.

Diagnostic assessment:

CT thorax shows UIP pattern, bilateral mild pleural effusion and bilateral mild pericardial effusion. CT pulmonary angiogram reveals no obvious abnormalities.

HRCT scan of thorax

Macrocytic and microcytic honeycombing with interlobular septal thickening, tractional bronchiectasis and reticular opacities with diffusion emphysematous changes in bilateral lung suggest of interstitial pneumonia (UIP) (fig 1 and 2), bilateral pleural effusion and pericardial effusion. Cardiomegaly features of pulmonary arterial hypertension.



Figure 1 On 11/1/22 Chest PA view suggest of consolidation in bilateral lung fields.



Figure 2 On 1/2/22 Chest PA view suggest of reticular opacities in bilateral lung fields

Therapeutic Intervention*Pharmacological management*

INJ .CEFTRIAXONE 1gm IV BD, INJ .AMIKACIN 500mg IV BD, INJ. HYDROCOT 20 mg IV 8 hourly, TAB. PIRFENIDONE 801mg OD * 7 days then 801 mg BD * 2 days, TAB. PAN 40mg OD, TAB. SILDENAFIL 25mg TDS, TAB. ZINCOVIT OD, TAB PCM 500mg SOS, NEB. BUDECORT BD

Short term goal

- To educate the patient and family
- To alleviate joint discomfort
- To improve airways circulation
- To reduce work and breathing difficulties
- To enhance breathing pattern
- To remove secretions from the lungs

Long term goal

- To maintain short term goal
- Maintain airway clearance
- To increase fitness and exercise tolerance
- To improve functional capacity and quality of life

The patient's functional ability, range of motion, balance, and quality of life were all improved by physiotherapy intervention. The patient's goal was to be pain-free and able to resume his regular activities without becoming exhausted. The physiotherapy management's and patients' objectives were met in accordance with the custom-designed protocol. A three-week comprehensive intervention was devised to encourage long-term commitment to health-promoting behaviors. The goal of the inpatient rehabilitation was to reduce work and breathing problems, improve physical capability, prevent recurrence of symptoms, and allow for early ambulation. The patient's comfort was taken into account when performing the exercises to reach the goal.

Patient and family education

The patient was educated about his current condition, the importance of following the prescribed protocols, the importance of exercise adherence, and strategies for reducing dyspnea as part of the physiotherapy regimen. Breathing techniques such as pursed-lip breathing and diaphragmatic breathing are among them. The patient was described and represented properly, including their repetitions, sets, and durations.

To reduce joint pain

The patient's concerns, such as dehydration, cold, and overexertion, were first managed in order to reduce pain. The patient was told to drink as much water as possible throughout the procedure. They were taught how to wear thermal clothing correctly and efficiently. The patient also complained of joint pain, for which she was advised to use a heating pad three times each day.

To improve ventilation

Increased ventilation to the affected area should be achieved through body posture. Sputum clearance was frequently aided by postural drainage with manual assistance, such as chest compression and vibrations. Deep breathing exercises were performed twice or three times each day (10 repetitions * 1 set).

To reduce work and difficulty of breathing

Localized thoracic expansion exercise shown in (fig 3), Breathing control and Relaxation techniques were given when a patient is able to relax; she may be able to avoid an allergic reaction. The onset of an episode is frequently preceded by a 'tickle' in the throat or a feeling of pressure in the chest. It can assist her avoid an attack if she's in the right position. The 'appropriate position' is determined by the patient's location and may entail leaning against a wall or the back of a chair.

Breathing re-education

The patient is taught to relax the shoulder girdle in a supported, posturally right position, such as crook half-lying. Breathing control is taught once secretions have been removed. If the patient has shortness of breath, respiratory control can be regained by starting with short breathing phases which progressively improves patient's breathing pattern.

To clear secretions from the lung fields

The active cycle of breathing technique aids in the clearance of pulmonary secretions, hence increasing the efficiency of the breathing process. It starts with breathing control (relaxed breathing), followed by deep breathing or chest expansion exercises (3-5 breaths), and forced expiration techniques - coughing and puffing technique (5 repetition* 1 set). They were instructed to practice for 10 minutes at least twice a day, preferably before eating and sleeping.



Figure 3 The patient was performing thoracic expansion exercise

To enhance tolerance to exercise and fitness

The patient should be mobilized as soon as possible, with active ROM exercises for bilateral upper and lower limbs performed 2 to 3 times per day (10 repetitions * 1 set) shown in (fig 4) and ambulation beginning with spot marching for 10 minute shown in (fig 5) progressed to short 10-minute walks that are gradually progressed in duration.



Figure 4 The patient was performing a ROM exercises of lower limb

To increase functional ability and overall quality of life

The 6-minute walk test was used to assess, according to ATS guidelines. The patient was instructed to walk as far as they could during the test. At the beginning and end of the program, patient performed 6 MWT for evaluation. If relevant, avoid second hand smoke, eating a healthy and diverse diet, exercising regularly, maintaining a modest weight to increase breathing capacity, taking steps to avoid catching diseases from others, avoiding pollution and dust exposure.



Figure 5 With assistance, the patient was spot marching.

Discharge was scheduled after two weeks, when the patient's hemodynamic stability had been reached. The patient was given a one-week organized home-based fitness program. The home-exercise program's primary goal was to improve one's health and fitness. All of the exercises were thoroughly described and demonstrated to the relatives, who were then requested to participate in them with the patient in order to encourage her to complete them. By tele-rehabilitating the patient/relative every week, the therapist raised the intensity of each activity. The outcome measurements were used to track how the patient's condition progressed (table 2).

Table 2 Follow-up and Outcomes

Outcomes	Day of admission	Day of discharge	Follow up
MMRC	Grade 3	Grade 1	Grade 1
WHO-QOL (Physical function)	55	75	80

4. DISCUSSION

Patients with mild pleural effusion and pericardial effusion who have interstitial lung disease have a good chance of recovery, according to this case study. The patient's joint discomfort, dyspnoea, and functional capacity were all improved by the course of the therapeutic interventions. Progressive fibrosis is a prevalent symptom of a variety of ILDs, and it's linked to increased morbidity and death. Individual ILDs with a progressive-fibrosing phenotype have unique clinical, radiological, and histological features, but they share many of the same characteristics as the typical fibrosing ILD with a progressive phenotype, IPF (Cottin et al., 2018). When dealing with an ILD patient, the most difficult tasks are diagnosing UIP and differentiating between unexplained UIP (the clinical correlate of IPF) and secondary UIP. While UIP is the radiological–pathological correlate of IPF by definition, the UIP pattern can be detected in a variety of illnesses, most notably CTD and chronic HP, however expert evaluation usually reveals important distinguishing features. Because various diseases have different causes of harm, treatment approaches and responses, and prognoses, it's vital to get the right diagnosis (Wuyts et al., 2014).

Pleural effusion is harder to predict since the pleura is a hidden compartment with no direct access. This delay in diagnosis could have serious side effects,' including insufficient treatment and a bad prognosis, as well as pain and a lower quality of life for the patient (Froudarakis, 2008). Pulmonary rehabilitation can help people with ILD, especially those with IPF; improve their exercise capacity, symptoms, and overall quality of life (Dowman et al., 2014). PR programs were commonly referred to ILD patients at a tertiary ILD facility. The program's individualized attention and session supervision, as well as the educational component and peer support provided by PR, were all highly praised. The most common concerns were accessibility and a lack of knowledge. More diverse PR models, as well as initiatives to raise patients' knowledge of the potential benefits of PR, are required (Hoffman et al., 2021).

5. CONCLUSION

The pulmonary rehabilitation program has been demonstrated to be successful, with clinically significant increases in exercise tolerance capacities and standards of living. This case study presents an integrated rehabilitation regimen for patients with usual interstitial pneumonia with pleural and pericardial effusions. Although the patient's full recovery did not occur during the rehabilitation program, the majority of the treatment goals were met, including clearing the airways to enhance ventilation and spo2, increasing the patient's exercising endurance potential, and reducing labor of breathing.

Abbreviation

- MMRC- Modified medical research council
- ILD- Interstitial lung disease
- IPF- Idiopathic pulmonary fibrosis
- UIP- Usual interstitial pneumonia
- PR- Pulmonary rehabilitation
- ROM – Range of motion

Author’s Contribution

To the data collection, protocol planning, implementation, and case report preparation, all authors have contributed their best.

Patient Perspective

The patient conveyed her satisfaction for the treatment they received.

Informed consent

The patient gave her informed consent verbally.

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Conflicts of interest

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

REFERENCES AND NOTES

- Cottin V, Hirani NA, Hotchkin DL, Nambiar AM, Ogura T, Otaola M, Skowasch D, Park JS, Poonyagariyagorn HK, Wuyts W, Wells AU. Presentation, diagnosis and clinical course of the spectrum of progressive-fibrosing interstitial lung diseases. *Eur Respir Rev* 2018; 27. <https://doi.org/10.1183/16000617.0076-2018>
- Dowman L, Hill CJ, Holland AE. Pulmonary rehabilitation for interstitial lung disease. *Cochrane Database Syst Rev* 2014; CD006322. <https://doi.org/10.1002/14651858.CD006322.pub3>
- Ferreiro L, Toubes ME, San José ME, Suárez-Antelo J, Golpe A, Valdés L. Advances in pleural effusion diagnostics. *Expert Rev Respir Med* 2020; 14: 51–66. <https://doi.org/10.1080/17476348.2020.1684266>
- Froudarakis ME. Diagnostic Work-Up of Pleural Effusions. *RESP* 2008; 75: 4–13. <https://doi.org/10.1159/000112221>
- Hassoun PM. Pulmonary Arterial Hypertension. *NEJM* 2021; 385: 2361–2376. <https://doi.org/10.1056/NEJMra2000348>
- Hoffman M, Mellerick C, Symons K, Glaspole I, Holland AE. Pulmonary rehabilitation for interstitial lung disease: Referral and patient experiences. *Chron Respir Dis* 2021; 18: 14799731211046022. <https://doi.org/10.1177/14799731211046022>
- Kreuter M, Kardos P, Hoffstein V. Management of idiopathic pulmonary fibrosis: selected case reports. *Eur Respir Rev* 2014; 23: 239–248. <https://doi.org/10.1183/09059180.00002014>
- Mulroy JF. Differential diagnosis of pleural effusions: a case study. *Dimens Crit Care Nurs* 2008; 27: 110–113. <https://doi.org/10.1097/01.DCC.0000286838.03345.b1>
- Walker C, Peyko V, Farrell C, Awad-Spirtos J, Adamo M, Scrocco J. Pericardial effusion and cardiac tamponade requiring pericardial window in an otherwise healthy 30-year-old patient with COVID-19: a case report. *J Med Case Rep* 2020; 14: 158. <https://doi.org/10.1186/s13256-020-02467-w>
- Wuyts WA, Cavazza A, Rossi G, Bonella F, Sverzellati N, Spagnolo P. Differential diagnosis of usual interstitial pneumonia: when is it truly idiopathic? *Eur Respir Rev* 2014; 23: 308–319. <https://doi.org/10.1183/09059180.00004914>