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Physiotherapy Management of Post-Tuberculosis Lung Disease with Cardiopulmonary Comorbidity: A Case Report

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Abstract

Background: Post-tuberculosis lung disease (PTLD) is associated with persistent respiratory impairment, which may be exacerbated by cardiopulmonary comorbidities such as cardiomegaly and pleural effusion. These conditions contribute to dyspnea, reduced thoracic expansion, and limited functional capacity. Physiotherapy plays an important role in improving respiratory efficiency and functional performance.

Objective: To provide clinically relevant insight into physiotherapy management in a patient with PTLD and cardiopulmonary comorbidity.

Methods: This study was a single-case report based on a clinical physiotherapy record. A 59-year-old male presented with a 3-month history of persistent cough, dyspnea, and difficulty expectorating sputum. Assessment included physical examination, thoracic expansion measurement, Borg Dyspnea Scale, modified Medical Research Council (mMRC), vital signs, chest radiography, laboratory findings, and medication review. The intervention consisted of nebulizer therapy, breathing exercises, and chest mobility exercises with symptom-based progression. Clinical outcomes were monitored descriptively across six sessions.

Results: Baseline findings showed respiratory rate 24 breaths/min, heart rate 108 beats/min, thoracic expansion 2.0–2.1 cm, mMRC grade 2, and walking tolerance <10 m. Across six sessions, respiratory rate decreased from 24 to 20 breaths/min and heart rate from 108 to 92 beats/min. Thoracic expansion improved from 2.0–2.1 cm to 2.4–2.5 cm. Blood pressure remained stable. These changes indicate a clinically meaningful improvement in breathing control and chest wall mobility.

Conclusion: Individualized physiotherapy incorporating breathing exercises, chest mobility training, and graded functional activity may improve respiratory parameters and functional tolerance in patients with PTLD and cardiopulmonary comorbidity.

Keywords
Pulmonary Tuberculosis; Cardiomegaly; Pleural Effusion; Dyspnea; Exercise Therapy; Physical Therapy Modalities

Introduction

Pulmonary tuberculosis remains a major global health challenge, not only due to its acute infectious burden but also because of its long-term consequences after treatment completion.[1] Recent evidence indicates that a substantial proportion of tuberculosis survivors continue to experience persistent respiratory impairment despite microbiological cure.[1–3] This condition, now widely recognized as post-tuberculosis lung disease (PTLD), encompasses a spectrum of structural and functional abnormalities affecting the airways, lung parenchyma, pleura, and pulmonary vasculature.[4] PTLD has been reported to affect a considerable proportion of tuberculosis survivors and is associated with ongoing morbidity, reduced quality of life, and increased healthcare burden.[5]

Pathophysiologically, PTLD is characterized by residual fibrosis, airway distortion, pleural thickening, and reduced lung compliance, which together contribute to impaired ventilation and gas exchange.[6] These alterations often manifest clinically as dyspnea, chronic cough, fatigue, and decreased exercise tolerance.[6–9] In addition, patients frequently experience limitations in daily activities and reduced participation in social and physical functions.[10,11] Importantly, these impairments persist even when standard clinical indicators such as oxygen saturation appear relatively stable at rest, highlighting the need for functional assessment beyond resting parameters.[12,13]

The clinical complexity of PTLD is further exacerbated when accompanied by cardiopulmonary comorbidities such as cardiomegaly, pulmonary congestion, and pleural effusion.[14] In such cases, multiple physiological mechanisms interact, including altered ventilatory mechanics, reduced thoracic compliance, impaired gas exchange, and increased cardiovascular load. [6–9,15] These interactions may lead to inefficient breathing patterns, increased work of breathing, early fatigue, and significant reduction in exercise tolerance.[6] From a clinical perspective, this multifactorial burden requires a comprehensive management approach that simultaneously addresses respiratory, mechanical, and functional impairments.[6,15]

Patients with chronic pulmonary impairment commonly demonstrate upper chest-dominant breathing patterns, increased reliance on accessory respiratory muscles, and restricted thoracic expansion.[16] Although these compensatory mechanisms may initially support ventilation, they ultimately reduce breathing efficiency and increase energy expenditure during activity. [6–9,15,17] Furthermore, pleural involvement and fibrosis may contribute to asymmetrical chest movement and reduced thoracic mobility, which are strongly associated with decreased walking capacity and impaired functional independence. These findings underscore the importance of interventions targeting both respiratory mechanics and functional performance.[18]

Pulmonary rehabilitation has emerged as a key component in the management of PTLD. Contemporary evidence indicates that structured rehabilitation programs, including breathing exercises, airway clearance techniques, thoracic mobility training, and graded physical activity, can improve lung function, exercise capacity, and quality of life in this population.[19] Additionally, systematic

reviews have demonstrated that pulmonary rehabilitation can produce meaningful improvements in functional outcomes such as walking distance and symptom burden, although the overall evidence base remains limited and heterogeneous.[20]

Despite growing recognition of the importance of rehabilitation, significant gaps remain in the literature. Current evidence is largely derived from cohort studies, small-scale interventions, or generalized pulmonary rehabilitation programs, with limited focus on complex cases involving combined PTLD and cardiopulmonary comorbidities.[21] Furthermore, there is a lack of detailed case-based evidence describing individualized physiotherapy strategies, clinical reasoning, and outcome monitoring in patients with overlapping pulmonary and cardiovascular impairments.[19] This gap is particularly relevant in clinical practice, where treatment must be tailored to patient-specific limitations, comorbidities, and tolerance levels.

In the Indonesian context, several reports have described physiotherapy interventions in pulmonary tuberculosis and related conditions; however, these studies remain largely descriptive and lack critical comparison with international evidence.[22] As a result, there is still a need for clinically detailed reports that integrate current scientific evidence with practical physiotherapy management in complex cardiopulmonary cases. However, most available reports from Indonesia remain descriptive and lack critical integration with international evidence, limiting their contribution to evidence-based clinical practice.[22]

Therefore, this study aims to provide clinically relevant insight into physiotherapy management in a patient with post-tuberculosis lung disease accompanied by cardiomegaly, congestive pulmonum, and pleural effusion. By presenting a detailed clinical description and intervention approach, this case report seeks to contribute to the limited evidence base and support the development of individualized, evidence-informed physiotherapy strategies in patients with combined cardiopulmonary impairment.

Methods

This study was a single-case report derived from an anonymized clinical physiotherapy record at RSUD Dungus Madiun. The report was prepared in accordance with the CARE (CAse REport) Guidelines to ensure completeness and transparency in clinical reporting.[23] The design was descriptive and non-analytical, focusing on clinical presentation, physiotherapy management, and outcome progression without inferential statistical testing. All key components recommended by the CARE checklist were considered in reporting this case.

The subject was a 59-year-old male who presented with a three-month history of persistent cough, dyspnea, and productive sputum with difficulty expectorating. The patient had been diagnosed with post-tuberculosis lung disease, cardiomegaly, congestive pulmonum, and right pleural effusion based on clinical and radiological findings. Physiotherapy referral was indicated due to reduced exercise tolerance, impaired breathing pattern, and difficulty performing basic functional activities.

Baseline assessment was conducted using standard physiotherapy examination procedures, including observation, palpation, percussion, and auscultation, complemented by objective measurements and functional evaluation. Vital signs included respiratory rate, heart rate, blood pressure, and peripheral oxygen saturation (SpO_2). Thoracic expansion was measured using a tape measure at three anatomical levels (axilla, intercostal space 4, and intercostal space 6) to assess chest wall mobility.

Dyspnea was evaluated using the Borg Dyspnea Scale and the modified Medical Research Council (mMRC) scale. Both instruments are widely used and have demonstrated acceptable validity and reliability in assessing breathlessness and functional limitation in patients with chronic respiratory disease.[17,24] Functional capacity was assessed based on walking tolerance and the patient's ability to perform basic activities of daily living. Additional data were obtained from chest radiography, laboratory findings, and medication records to support clinical reasoning and safety considerations.

The physiotherapy intervention program consisted of nebulizer therapy, breathing exercises, and chest mobility exercises. Nebulizer therapy was administered three times daily using bronchodilator solution (2.5 mL per session) for 5–10 minutes to facilitate airway clearance and reduce dyspnea prior to exercise. Breathing exercises included breathing control, diaphragmatic breathing, pursed-lip breathing, sustained maximal inspiration, and segmental breathing. These exercises were performed twice daily, with an initial dosage of 5 repetitions per set, 2 sets per session, lasting approximately 10–15 minutes. Exercise intensity was maintained at a low-to-moderate level based on symptom tolerance.

Chest mobility exercises included thoracic expansion exercises and gentle thoracic mobilization aimed at improving chest wall flexibility and symmetry. These were performed twice daily with 5 repetitions per set, 2 sets per session, for approximately 5–10 minutes. Intervention selection was based on evidence supporting pulmonary rehabilitation strategies in post-tuberculosis lung disease, particularly for improving breathing efficiency, reducing dyspnea, and enhancing functional capacity.[7–9,17,24–26]

A structured progression and regression strategy was applied to ensure safety and adaptability. Progression involved gradual advancement from basic breathing control to diaphragmatic and pursed-lip breathing, followed by thoracic expansion and functional activities such as sit-to-stand and short-distance walking. Regression criteria included a Borg dyspnea score greater than 4, SpO_2 below 90%, or early onset of fatigue, in which case exercise intensity and duration were reduced. This symptom-guided approach is consistent with recommended practice in cardiopulmonary physiotherapy.[24,26]

The intervention timeline was conducted over six physiotherapy sessions. Each session included pre-intervention assessment, supervised physiotherapy intervention, and post-session monitoring. A home program was also prescribed, consisting of diaphragmatic breathing, pursed-lip breathing, thoracic expansion exercises, effective coughing techniques, and light functional activities such as sit-to-stand and short indoor walking.

To provide a clear overview of the sequence and progression of the physiotherapy intervention, the patient's clinical timeline is presented chronologically based on treatment sessions. This presentation aims to highlight the stages of intervention, from the initial phase to discharge preparation, while illustrating the progression of exercises tailored to the patient's condition and tolerance. The detailed intervention timeline is presented in Table 1.

Table 1. Clinical Timeline of Physiotherapy Intervention

Phase	Session(s)	Description of Intervention
Initial phase	Session 1	Comprehensive assessment and initiation of breathing control and nebulizer therapy
Early intervention phase	Sessions 2–3	Addition of diaphragmatic breathing, pursed-lip breathing, and gentle thoracic expansion exercises
Progression phase	Sessions 4–5	Increased exercise repetitions and introduction of functional activities such as sit-to-stand and short-distance walking
Final phase	Session 6	Consolidation of exercise program and preparation for discharge with a structured home program

Clinical monitoring focused on changes in respiratory rate, heart rate, blood pressure, oxygen saturation, thoracic expansion, and symptom response. Outcome data were recorded across six sessions (T1–T6) to observe trends in cardiopulmonary response

and chest mobility. Because this was a descriptive case report, data analysis was performed qualitatively by comparing baseline and follow-up values and identifying clinically meaningful changes over time.

Ethical considerations were addressed in accordance with institutional and international standards for case reporting. Written informed consent was obtained from the patient for the use of anonymized clinical data. This study did not require formal ethical committee approval because it involved a retrospective description of routine clinical care without additional intervention or risk. This approach is consistent with international guidance for case reports, provided that patient confidentiality and informed consent are ensured. No inferential statistical analysis was performed, and all findings were interpreted descriptively based on observed clinical trends.

Results

At the initial physiotherapy assessment, the patient presented with combined respiratory and functional limitations that interfered with daily activities. The main complaints included a three-month history of persistent cough, dyspnea, and difficulty expectorating sputum. These symptoms were accompanied by markedly reduced activity tolerance, as the patient reported breathlessness during minimal exertion, particularly when walking short distances.

Physical examination demonstrated findings consistent with increased respiratory workload. Observation revealed a barrel-shaped chest, bilateral lower limb edema, chest-dominant breathing pattern, and use of accessory respiratory muscles, particularly the right sternocleidomastoid. The inspiration-to-expiration ratio was 1:1. The patient required oxygen supplementation via nasal cannula at 3 L/min. Palpation showed symmetrical vocal fremitus but asymmetrical thoracic movement with left-sided lag. Percussion findings included sonor notes at bilateral intercostal space (ICS) 2, dullness at right ICS4, and bilateral dullness at ICS6. Auscultation revealed vesicular breath sounds without added sounds.

Vital signs at baseline indicated increased cardiopulmonary demand, with a respiratory rate of 24 breaths/min, heart rate of 108 beats/min, blood pressure of 135/75 mmHg, and SpO_2 of 99% with oxygen support. Thoracic expansion was limited, measuring 2.0 cm at the axilla, 2.1 cm at ICS4, and 2.0 cm at ICS6. Functional assessment showed that the patient was unable to walk more than 10 meters due to dyspnea. The modified Medical Research Council (mMRC) dyspnea grade was 2, and the Borg Dyspnea Scale score at rest was 1.

Radiological examination supported the clinical findings. Chest radiography demonstrated cardiomegaly, left suprahilar fibrosis, cephalization, right pleural effusion, and post-tuberculosis changes. Laboratory findings showed elevated levels of SGOT, SGPT, ureum, creatinine, and random blood glucose. Although these findings did not contraindicate physiotherapy, they indicated the need for careful monitoring and low-to-moderate intensity intervention. To provide a structured overview of baseline clinical findings and physiotherapy-related problems, the data are summarized in Table 2.

Table 2. Baseline Clinical Findings and Physiotherapy Problem Summary

Domain	Clinical Findings	Physiotherapy Implication
Chief complaint	Persistent cough (3 months), dyspnea, productive sputum with difficult expectoration	Requires airway clearance, breathing support, and graded activity
Medical diagnosis	Cardiomegaly, congestive pulmonum, right pleural effusion, post-TB lung disease, bilateral leg edema	Requires cautious cardiopulmonary physiotherapy and monitoring
Observation	Barrel chest, chest-dominant breathing, accessory muscle use (right SCM), nasal cannula 3 L/min	Indicates increased work of breathing and need for breathing retraining
Palpation	Symmetrical vocal fremitus, asymmetrical thoracic movement (left lag)	Indicates reduced thoracic expansion and need for mobility training
Percussion	Sonor at ICS2; dullness at right ICS4 and bilateral ICS6	Suggests altered pulmonary condition
Auscultation	Vesicular breath sounds, no added sounds	Supports exercise-based intervention
Vital signs	RR 24 breaths/min, HR 108 beats/min, BP 135/75 mmHg, SpO_2 99%	Indicates increased cardiopulmonary demand
Thoracic expansion	Axilla 2.0 cm; ICS4 2.1 cm; ICS6 2.0 cm	Indicates restricted chest mobility
Functional capacity	Walking tolerance <10 m; mMRC grade 2; Borg 1	Indicates reduced endurance and functional limitation
Radiology	Cardiomegaly, fibrosis, cephalization, pleural effusion, PTLD	Confirms structural impairment
Laboratory	Elevated SGOT, SGPT, ureum, creatinine, glucose	Requires monitoring during intervention
Medication	Erdobat, codeine, Arsinal, Gastrinal	May influence symptoms and exercise tolerance

The patient underwent physiotherapy intervention across six sessions (T1–T6), during which key cardiopulmonary parameters and thoracic expansion were monitored. The purpose of this longitudinal observation was to describe changes in physiological response and chest wall mobility during the intervention period. The progression of objective outcomes across sessions is presented in Table 3.

Table 3. Outcome Progression Across Six Physiotherapy Sessions

Outcome	T1	T2	T3	T4	T5	T6
Respiratory rate (breaths/min)	24	23	22	22	21	20
Heart rate (beats/min)	108	103	98	96	94	92
Blood pressure (mmHg)	135/75	134/75	132/74	130/74	128/74	126/74
Thoracic expansion – Axilla (cm)	2.0	2.1	2.2	2.3	2.3	2.4
Thoracic expansion – ICS4 (cm)	2.1	2.2	2.3	2.4	2.4	2.5
Thoracic expansion – ICS6 (cm)	2.0	2.1	2.2	2.3	2.3	

Across the six sessions, gradual changes were observed in cardiopulmonary parameters and thoracic expansion. Respiratory rate decreased from 24 breaths/min at T1 to 20 breaths/min at T6. Heart rate showed a progressive reduction from 108 beats/min to 92 beats/min. Blood pressure remained stable throughout the intervention period. Thoracic expansion demonstrated incremental increases at all measurement levels, from 2.0–2.1 cm at baseline to 2.4–2.5 cm at the final session. Overall, these changes suggest a clinically meaningful improvement in cardiopulmonary efficiency and chest wall mobility over the intervention period.

Additional subjective outcomes were documented to complement the objective findings. Although session-by-session Borg Dyspnea Scale scores were not consistently recorded, clinical notes indicated a reduction in perceived breathlessness during activity over the intervention period. The mMRC dyspnea grade remained at level 2 during early sessions; however, functional improvement

was observed as the patient tolerated longer activity duration with reduced symptom limitation. These findings should be interpreted cautiously due to incomplete serial documentation.

To provide a structured overview of the intervention process, the clinical course of physiotherapy was organized chronologically according to treatment sessions. This approach allows a clearer understanding of how the intervention progressed from initial assessment to discharge preparation, while illustrating the gradual advancement of exercise intensity and functional activities in accordance with the patient's tolerance and clinical response. The summarized clinical course is presented in Table 4.

Table 4. Clinical Course of Physiotherapy Intervention

Phase	Session(s)	Description of Intervention
Initial phase	Session 1	Baseline assessment and initiation of breathing control and nebulizer therapy
Early intervention phase	Sessions 2–3	Introduction of diaphragmatic breathing and thoracic expansion exercises
Progression phase	Sessions 4–5	Progression of exercise intensity and introduction of functional activities
Final phase	Session 6	Consolidation of intervention and preparation for discharge with a home program

No adverse events were reported during the intervention period. All sessions were completed with symptom-guided modification based on patient tolerance.

Discussion

This case report describes a patient with post-tuberculosis lung disease (PTLD) accompanied by cardiomegaly, congestive pulmonum, and pleural effusion, presenting with dyspnea, impaired thoracic expansion, and reduced functional capacity. The findings highlight the complex interaction between structural pulmonary damage and cardiovascular burden, which together contribute to breathing inefficiency and exercise intolerance.[1–3,7,8]

The baseline clinical presentation reflects increased work of breathing and impaired ventilatory mechanics. The patient demonstrated chest-dominant breathing, use of accessory respiratory muscles, and limited thoracic expansion, indicating reduced ventilatory efficiency. From a physiological perspective, these findings are consistent with decreased lung compliance and altered respiratory muscle function commonly observed in PTLD.[6–9] Residual fibrosis and pleural involvement may restrict lung expansion and reduce elastic recoil, leading to shallow breathing patterns and increased respiratory effort.[6,8] This inefficiency increases oxygen demand during activity and contributes to early fatigue, even in low-intensity tasks.

The observed improvement in respiratory rate and thoracic expansion across sessions suggests enhanced breathing control and chest wall mobility following physiotherapy intervention. A reduction in respiratory rate from 24 to 20 breaths/min may indicate improved ventilatory efficiency and reduced respiratory distress. Similarly, increased thoracic expansion at multiple anatomical levels reflects improved chest wall compliance and more effective recruitment of respiratory muscles. These findings align with previous studies demonstrating that breathing exercises and thoracic mobility training can enhance ventilation distribution and reduce dyspnea in patients with chronic respiratory disease.[17,24–26]

The presence of cardiomegaly and congestive pulmonary adds an important dimension to the patient's functional limitation. Cardiomegaly is associated with increased cardiac workload and reduced cardiac efficiency, which may impair oxygen delivery during physical activity. In addition, pulmonary congestion may lead to interstitial fluid accumulation, reducing lung compliance and impairing gas exchange.[7,8] These mechanisms contribute to exercise intolerance and explain why patients may experience significant dyspnea despite relatively preserved resting oxygen saturation. The interaction between pulmonary and cardiovascular dysfunction in this case underscores the need for an integrated rehabilitation approach that addresses both systems simultaneously.

The gradual reduction in heart rate observed during the intervention period may reflect improved cardiovascular adaptation to activity. Although this case did not include formal exercise testing, a decrease in resting heart rate is often interpreted as improved autonomic balance and reduced physiological stress during activity.[24,26] This trend supports the role of graded physiotherapy in enhancing cardiopulmonary efficiency, even in patients with complex comorbidities.

The physiotherapy program implemented in this case incorporated key components of pulmonary rehabilitation, including breathing exercises, chest mobility training, and graded functional activity. Breathing control and diaphragmatic breathing were used to reduce upper chest dominance and improve ventilatory efficiency, while pursed-lip breathing helped prolong expiration and reduce air trapping.[17,24–26] Segmental breathing and sustained maximal inspiration facilitated localized chest expansion, particularly in areas affected by fibrosis or pleural restriction. These mechanisms collectively contribute to improved ventilation and reduced work of breathing.

Chest mobility exercises also played a critical role in improving thoracic expansion. In patients with PTLD and pleural involvement, reduced chest wall compliance is a major limiting factor for ventilation.[7,8] Gentle thoracic mobilization and expansion exercises may improve rib cage mobility, enhance ventilation distribution, and support functional breathing patterns. The progressive increase in thoracic expansion observed in this case is consistent with these physiological effects. The observed increase in thoracic expansion (approximately 0.4–0.5 cm across measurement sites) is comparable to findings from previous pulmonary rehabilitation studies, which reported modest but clinically relevant improvements in chest wall mobility following structured breathing and mobility interventions.[17,24–26]

Another important aspect of this case is the use of symptom-guided progression. The intervention was adapted based on Borg dyspnea score, oxygen saturation, and fatigue response, ensuring patient safety while allowing gradual improvement. This approach reflects current recommendations in cardiopulmonary physiotherapy, which emphasize individualized treatment based on patient tolerance and clinical response.[24,26] The absence of adverse events in this case further supports the safety of this strategy in medically complex patients.

When compared with previous studies, the findings of this case are consistent with the reported benefits of pulmonary rehabilitation in PTLD. Systematic reviews and clinical studies have demonstrated improvements in exercise capacity, dyspnea, and quality of life following rehabilitation interventions.[9,17,24–26] However, most existing studies focus on homogeneous patient populations and do not specifically address cases with combined cardiopulmonary comorbidity. Therefore, this case contributes to the literature by providing detailed clinical insight into physiotherapy management in a more complex clinical scenario.

Despite its clinical relevance, this case has several limitations. First, the study design was limited to a single case, which restricts generalizability. Second, although serial data were available for several physiological parameters, not all outcomes particularly subjective measures such as Borg and mMRC were consistently recorded across sessions. Third, functional capacity was assessed descriptively without standardized outcome measures such as the six-minute walk test, which limits objective evaluation of functional improvement. These limitations highlight the need for more comprehensive and standardized outcome assessment in future studies. In addition, the absence of standardized functional outcome measures, such as the six-minute walk

test, and incomplete serial recording of subjective measures (Borg and mMRC) may introduce measurement bias and limit the robustness of outcome interpretation.

From a clinical perspective, this case emphasizes the importance of individualized physiotherapy in patients with PTLD and cardiopulmonary comorbidity. Rehabilitation programs should address not only respiratory symptoms but also underlying mechanical and cardiovascular factors that contribute to functional limitation. Integrating breathing exercises, chest mobility training, and graded activity, along with close monitoring, may help improve patient outcomes and prevent further deconditioning.

Future research should focus on larger-scale studies and controlled trials to evaluate the effectiveness of physiotherapy interventions in patients with PTLD and complex comorbidities. In addition, the use of standardized outcome measures and longer follow-up periods would strengthen the evidence base and support clinical decision-making in this population.

Conclusion

This case report demonstrates that individualized physiotherapy incorporating breathing exercises, chest mobility training, and graded functional activity can improve respiratory parameters and functional tolerance in a patient with post-tuberculosis lung disease and cardiopulmonary comorbidity. Observable improvements in respiratory rate, heart rate, and thoracic expansion indicate enhanced breathing efficiency and cardiopulmonary response during the intervention period.

From a clinical perspective, these findings highlight the importance of a symptom-guided and integrated physiotherapy approach that addresses both respiratory mechanics and cardiovascular burden. Careful monitoring and progressive adjustment of exercise intensity are essential to ensure safety and optimize functional outcomes in patients with complex cardiopulmonary conditions.

Further research involving larger sample sizes, standardized functional outcome measures, and controlled study designs is recommended to strengthen the evidence base for physiotherapy management in post-tuberculosis lung disease with comorbid conditions.

Author Contribution

First Author: Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Writing original draft, Visualization.
Second Author: Supervision, Validation, Methodology, Writing review and editing, and Final approval of manuscript.
Third Author: Investigation, Resources, Clinical supervision, Validation, Writing review and editing.

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Conflict of Interest Statement

The authors declare no conflict of interest.

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Ethics Statement

This case report was prepared in accordance with the CARE Guidelines for clinical case reporting. Written informed consent was obtained from the patient for the use of anonymized clinical data for academic and publication purposes.
All identifying information has been removed to ensure patient confidentiality. This report describes routine clinical care without additional intervention or risk; therefore, formal ethical approval was not required in accordance with institutional policy and international guidance for case reports.

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