

## Multimodal Physiotherapy Management Following Total Hip Arthroplasty in Seronegative Rheumatoid Arthritis: A Case Report

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### Abstract

**Background:** Seronegative rheumatoid arthritis (SRA) is characterized by the absence of serological biomarkers, making diagnosis and treatment challenging. Delayed diagnosis may lead to progressive joint destruction, functional impairment, and the need for total hip arthroplasty (THA), particularly in young adults.

**Objective:** To describe the clinical characteristics, multimodal physiotherapy management, and short-term clinical outcomes of a patient with SRA following THA.

**Methods:** This single-patient case report was prepared in accordance with the CARE guidelines. A 27-year-old man with SRA following THA presented with multiple musculoskeletal pain, restricted joint range of motion (ROM), muscle weakness, and functional limitations. Clinical outcomes included pain intensity measured using the Visual Analogue Scale (VAS), ROM assessed with a universal goniometer, muscle strength evaluated by Manual Muscle Testing (MMT), and leg length measurement. The patient underwent two outpatient physiotherapy sessions comprising infrared radiation, transcutaneous electrical nerve stimulation, manual therapy, stretching, active-assisted and active ROM exercises, muscle strengthening, and low-intensity aerobic exercise based on the Frequency, Intensity, Time, and Type (FITT) principle.

**Results:** Following the intervention, pain intensity decreased under all assessment conditions, while ROM improved in the cervical spine, left shoulder, right hip, and both knees. Muscle strength and leg length remained unchanged, and no adverse events were observed.

**Conclusion:** Multimodal physiotherapy contributed to early pain reduction and improved joint mobility in this patient with SRA following THA. Longer rehabilitation and studies with larger sample sizes are needed to confirm these findings.

### Keywords

Arthroplasty, Replacement, Hip; Pain; Physical Therapy Modalities; Range of Motion, Articular; Rheumatoid Arthritis.

### Introduction

Rheumatoid arthritis (RA) is a chronic systemic autoimmune disease characterized by persistent synovial inflammation that may result in pain, joint stiffness, swelling, progressive cartilage and bone destruction, and permanent disability if not managed appropriately. Beyond joint damage, RA is associated with a wide range of extra-articular manifestations and systemic comorbidities that substantially impair patients' physical function and quality of life. Consequently, RA affects not only the musculoskeletal system but also contributes to activity limitations, reduced social participation, and an increasing global disease burden.<sup>1</sup> The prevalence and burden of RA continue to rise worldwide, making it one of the most significant chronic inflammatory diseases, particularly among individuals of working age.<sup>2</sup>

One of the greatest clinical challenges in RA management involves patients with seronegative rheumatoid arthritis (SRA), who do not exhibit the two principal serological biomarkers, namely rheumatoid factor (RF) and anti-citrullinated protein antibodies (ACPA). The absence of these biomarkers complicates the diagnostic process because the clinical manifestations of SRA frequently overlap with those of other inflammatory musculoskeletal disorders.<sup>3</sup> Although patients with SRA often present with clinical features similar to those of seropositive RA, differences in disease characteristics, patterns of joint involvement, and therapeutic responses continue to pose important diagnostic and management challenges.<sup>4</sup> Furthermore, the lack of serological markers may delay fulfillment of the RA classification criteria, requiring more extensive joint involvement before diagnosis is established. As a result, initiation of disease-modifying antirheumatic drugs (DMARDs) may be postponed, thereby increasing the risk of disease progression, structural joint damage, and long-term functional disability.<sup>5,6</sup>

In advanced stages of RA, persistent inflammation may lead to severe joint destruction requiring surgical intervention, including total hip arthroplasty (THA) when substantial hip involvement is present. Hip joint involvement is associated with chronic pain, restricted range of motion (ROM), impaired gait, and diminished functional capacity. Patients with RA undergoing THA represent a distinct clinical population because systemic inflammatory activity, immunosuppressive therapy, and musculoskeletal alterations may adversely influence postoperative recovery. Previous studies have demonstrated that these patients are at increased risk of perioperative complications, highlighting the importance of disease control and optimization of physical condition before and after surgery.<sup>7</sup> In addition, a systematic review reported higher complication rates following THA in patients with RA than in those without RA, emphasizing the need for multidisciplinary perioperative management to improve clinical outcomes.<sup>8</sup> Consequently, postoperative rehabilitation constitutes an essential component of recovery, aiming to reduce pain, restore joint mobility, improve muscle strength, and optimize functional performance.<sup>9</sup>

In addition to pharmacological therapy and surgical management, physiotherapy plays a fundamental role in the comprehensive treatment of RA. The 2022 American College of Rheumatology (ACR) guideline strongly recommends structured

exercise as a core non-pharmacological intervention and emphasizes the role of physiotherapy and occupational therapy in preserving physical function, reducing symptoms, and improving quality of life.<sup>10</sup> Similarly, the European Alliance of Associations for Rheumatology (EULAR) recommends individualized physical activity and therapeutic exercise programs for patients with inflammatory rheumatic diseases according to their clinical status and functional capacity.<sup>11</sup> Recent meta-analytic evidence further indicates that exercise therapy may reduce pain, fatigue, and disease activity, although improvements in muscle strength and walking ability remain inconsistent across studies.<sup>12</sup> Likewise, a recent systematic review concluded that structured physiotherapy interventions can improve physical function in individuals with RA, although the magnitude of improvement depends largely on the extent of structural joint damage and disease duration before rehabilitation is initiated.<sup>13</sup>

This case report describes a 27-year-old man with SRA who developed extensive polyarticular involvement requiring THA at a remarkably young age. This uncommon clinical presentation illustrates the complexity of disease progression and the rehabilitation challenges encountered in young adults with chronic inflammatory arthritis. Therefore, this case report aimed to describe the patient's clinical characteristics, multimodal physiotherapy management, and early clinical outcomes following postoperative rehabilitation after THA.

## Methods

This study was designed as a single-patient case report and prepared in accordance with the CARE (CAsE REport) guidelines. It describes the physiotherapy management of a patient with seronegative rheumatoid arthritis (SRA) who underwent postoperative rehabilitation following total hip arthroplasty (THA). A 27-year-old man was diagnosed with SRA in July 2024 after experiencing progressive symptoms since July 2021. Because of severe hip joint destruction caused by chronic inflammatory arthritis, he underwent THA in November 2024. The diagnosis was established based on the clinical presentation of chronic inflammatory polyarthritis, supported by an elevated C-reactive protein (CRP) level of 91.0 mg/L, a normal rheumatoid factor (RF) level of 13.5 IU/mL, and radiographic findings of the cervical spine, wrists, and knees that were consistent with chronic inflammatory arthritis (Figure 1). Following surgery, the patient participated in a structured postoperative physiotherapy rehabilitation program, and postoperative radiographic evaluation confirmed satisfactory implant positioning (Figure 2). At the time of the initial physiotherapy assessment, the patient continued to report generalized musculoskeletal pain, particularly during physical activity and upon waking in the morning, which substantially limited his functional independence and reduced his quality of life. Pharmacological management consisted of disease-modifying antirheumatic drugs (DMARDs), including leflunomide, corticosteroids, folic acid, and vitamin D.



**Figure 1.** Radiographic Findings of the Cervical Spine, Wrists, and Knees Demonstrating Chronic Inflammatory Arthritic Changes



**Figure 2.** Postoperative Hip Radiograph Following Total Hip Arthroplasty

The initial physiotherapy assessment was conducted at Emphysio Clinic, Makassar, Indonesia, on 16 September 2025. Clinical examination revealed postural asymmetry, generalized muscle atrophy, pain involving multiple musculoskeletal regions, and restricted range of motion (ROM) affecting the cervical spine, shoulders, wrists, hips, and knees. Muscle strength assessment demonstrated grades ranging from 3/5 to 4/5 on Manual Muscle Testing (MMT) across most muscle groups. Functional evaluation indicated that the patient was unable to perform an independent sit-to-stand transfer.

The clinical outcomes included pain intensity, joint ROM, muscle strength, and leg length. Pain intensity was assessed using the Visual Analogue Scale (VAS), joint ROM was measured using a universal goniometer, muscle strength was evaluated using MMT, and leg length was measured using a standard measuring tape. All measurements were performed before the first treatment session and repeated after completion of the second session using identical procedures. The VAS has demonstrated excellent reliability for measuring pain intensity, the universal goniometer has shown good validity and reliability for assessing joint ROM, and MMT has demonstrated acceptable clinical reliability for evaluating muscle strength.<sup>14–16</sup> Functional outcomes were not evaluated using a standardized functional assessment instrument and therefore were not included among the study outcome measures.

The patient received two outpatient physiotherapy sessions, each lasting approximately 45–60 minutes. The intervention program was individualized according to the findings of the initial assessment while considering the patient's chronic inflammatory condition, postoperative THA status, restricted ROM, muscle weakness, and exercise tolerance. The multimodal physiotherapy program consisted of infrared radiation (IRR), transcutaneous electrical nerve stimulation (TENS), manual therapy, stretching exercises, active-assisted and active ROM exercises, muscle strengthening exercises, and low-intensity aerobic exercise using a stationary bicycle. All interventions were delivered individually, and treatment intensity was adjusted according to the patient's pain response and overall clinical condition. The detailed intervention protocol is presented in Table 1.

**Table 1.** Multimodal Physiotherapy Intervention Protocol

| Intervention                                          | Description                                                                                                                                                                                                      | Dosage                                                            |
|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| Infrared radiation (IRR)                              | The patient was positioned prone while luminous infrared radiation was applied to the cervical region, hamstrings, and gastrocnemius muscles as a preparatory modality before therapeutic exercise.              | Distance approximately 30 cm; low intensity; 10 min               |
| Transcutaneous electrical nerve stimulation (TENS)    | Vacuum electrodes were placed over the cervical and shoulder regions while the patient remained in the prone position. Continuous-mode TENS was administered for pain modulation.                                | 100 Hz; intensity adjusted according to patient tolerance; 15 min |
| Manual therapy                                        | Muscle release and friction techniques were applied to the upper trapezius, erector spinae, iliopsoas, hamstrings, pectoralis major, sternocleidomastoid, and quadratus lumborum muscles.                        | Moderate pressure according to patient tolerance; 15 min          |
| Stretching                                            | Static stretching was performed for muscle groups with reduced flexibility, including the upper trapezius, erector spinae, iliopsoas, hamstrings, pectoralis major, sternocleidomastoid, and quadratus lumborum. | Hold for 15–30 s; 1 set × 3 repetitions                           |
| Box exercise                                          | Performed in the sitting position to facilitate activation and motor control of the sternocleidomastoid and upper trapezius muscles.                                                                             | Hold for 10 s; 1 set × 3 repetitions                              |
| Strengthening exercises                               | Progressive strengthening exercises targeting the iliopsoas, tensor fasciae latae, and hamstrings were performed in the supine and side-lying positions using manual resistance.                                 | 3 sets × 10 repetitions                                           |
| Clamshell exercise                                    | Hip abductor strengthening exercise to improve hip stability following THA.                                                                                                                                      | 3 sets × 8 repetitions                                            |
| Active-assisted and active ROM exercises (AAROM–AROM) | Active-assisted ROM followed by active ROM exercises for the cervical spine, shoulders, wrists, hips, and knees according to patient tolerance.                                                                  | 3 sets × 10 repetitions                                           |
| Stationary bicycle                                    | Low-intensity aerobic exercise using a stationary bicycle to improve exercise tolerance.                                                                                                                         | Level 1; 5 min                                                    |

All treatment sessions were administered by a licensed physiotherapist experienced in musculoskeletal rehabilitation. The same intervention protocol was implemented during both treatment sessions, whereas exercise intensity, number of repetitions, and overall treatment tolerance were adjusted according to the patient's clinical response and symptom severity. No modifications were made to the intervention protocol throughout the intervention period, and the patient completed both treatment sessions without interruption or adverse events. The chronological progression of the patient's clinical course from symptom onset to the final physiotherapy evaluation is summarized in Table 2.

**Table 2.** Timeline of the Patient's Clinical Course

| Date              | Clinical Event                                                                                                                                                                |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| July 2021         | Onset of generalized musculoskeletal pain following a febrile episode. The patient continued participating in futsal training for two consecutive days despite symptom onset. |
| July 2021         | Initial medical evaluation suggested an immunological disorder with suspected inflammatory myopathy.                                                                          |
| 2022              | The diagnosis was revised to muscular dystrophy. Medical treatment and physiotherapy resulted in temporary functional improvement.                                            |
| 2023              | The patient's condition gradually deteriorated with increasing pain and declining functional capacity. Physiotherapy was discontinued for approximately one year.             |
| July 2024         | A definitive diagnosis of seronegative rheumatoid arthritis was established based on clinical, laboratory, and radiographic findings, and physiotherapy was resumed.          |
| November 2024     | Total hip arthroplasty was performed because of severe hip joint destruction.                                                                                                 |
| 16 September 2025 | Initial physiotherapy evaluation and first treatment session.                                                                                                                 |
| 18 September 2025 | Second physiotherapy session and reassessment of all clinical outcome measures.                                                                                               |

This case report was based on routine clinical practice and did not involve any intervention beyond the standard physiotherapy management provided to the patient. According to the original clinical documentation, formal institutional ethics approval was not required. Permission to prepare this case report was obtained from the physiotherapist responsible for the patient's management. Written informed consent for publication of anonymized clinical information and radiographic images was also obtained from the patient. All potentially identifiable information was removed to ensure patient confidentiality and privacy in accordance with established ethical principles for case report publication.

## Results

All clinical outcome measures were reassessed after completion of the two physiotherapy sessions using the same measurement procedures applied at baseline. No adverse events or treatment-related complications were reported throughout the intervention period. The clinical outcomes before and after the intervention are presented in Table 3.

**Table 3.** Clinical Outcomes Before and After the Physiotherapy Intervention

| Outcome               | Parameter                            | Baseline (T1) | Post-intervention (T2) |
|-----------------------|--------------------------------------|---------------|------------------------|
| Pain (VAS)            | At rest                              | 2             | 0                      |
|                       | On pressure                          | 8             | 5                      |
|                       | During movement                      | 6             | 4                      |
| Muscle strength (MMT) | Cervical spine, wrist, hip, and knee | 3–4/5         | 3–4/5                  |
| Leg length (cm)       | Right                                | 83.5          | 83.5                   |
|                       | Left                                 | 85.0          | 85.0                   |
| Range of motion (ROM) | Cervical flexion                     | 25°           | 30°                    |
|                       | Cervical rotation                    | 45°           | 55°                    |
|                       | Left shoulder flexion                | 160°          | 170°                   |
|                       | Right hip flexion                    | 90°           | 105°                   |
|                       | Right knee flexion                   | 90°           | 105°                   |
|                       | Left knee flexion                    | 110°          | 115°                   |

**Abbreviations:** VAS, Visual Analogue Scale; MMT, Manual Muscle Testing; ROM, range of motion.

Pain intensity decreased across all assessment conditions following the intervention. The VAS score at rest decreased from 2 to 0, pain on pressure decreased from 8 to 5, and pain during movement decreased from 6 to 4. Improvements in joint ROM were observed in multiple anatomical regions. Left shoulder flexion increased from 160° to 170°, right hip flexion improved from 90° to 105°, right knee flexion increased from 90° to 105°, and left knee flexion improved from 110° to 115°. Cervical ROM also demonstrated improvement, with flexion increasing from 25° to 30° and rotation from 45° to 55°. In contrast, muscle strength remained unchanged at grades 3/5 to 4/5 on MMT, and no changes were observed in leg length measurements.

In addition to the objective clinical findings, the patient reported that attendance at physiotherapy sessions depended on disease activity. During periods of disease flare, severe pain and functional limitations prevented participation in rehabilitation. Following completion of the two treatment sessions, the patient reported reduced pain and greater comfort during joint movement, which increased his motivation to continue the rehabilitation program whenever his clinical condition permitted.

## Discussion

This case report describes the clinical course of a 27-year-old man with seronegative rheumatoid arthritis (SRA) who developed progressive joint destruction requiring total hip arthroplasty (THA) at a relatively young age. The clinical significance of this case extends beyond the surgical procedure itself, highlighting the uncommon combination of early disease onset, seronegative status, and extensive polyarticular involvement. In most young adults, musculoskeletal disorders can generally be managed conservatively; therefore, the need for THA in this patient reflects an aggressive disease course associated with substantial structural joint damage. Hip involvement was accompanied by abnormalities affecting the cervical spine, shoulders, wrists, and knees, indicating widespread musculoskeletal impairment. This presentation is consistent with findings from a longitudinal cohort study demonstrating that large-joint involvement progresses throughout the course of rheumatoid arthritis regardless of rheumatoid factor status. Interestingly, patients with seronegative disease may experience a risk of major joint involvement comparable to, or even greater than, that observed in seropositive disease.<sup>17</sup> These findings suggest that extensive hip involvement in the present case most likely reflected systemic disease progression rather than isolated degenerative joint pathology.<sup>9</sup>

The patient's seronegative status also represents an important diagnostic challenge. The absence of RF and anti-citrullinated protein antibodies (ACPA) often complicates the diagnostic process because the clinical manifestations of SRA overlap considerably with those of other inflammatory musculoskeletal disorders. Nevertheless, the absence of serological biomarkers should not be interpreted as indicating a milder disease phenotype.<sup>3</sup> In the present case, disease progression ultimately resulted in severe structural joint destruction requiring THA during early adulthood. This clinical course emphasizes that diagnostic and therapeutic decision-making should primarily rely on comprehensive clinical assessment and functional impairment rather than serological findings alone.<sup>4</sup> Compared with older patients undergoing THA for degenerative osteoarthritis, younger patients with RA present unique clinical challenges because persistent systemic inflammation, previous immunosuppressive therapy, and compromised periarticular tissue quality may adversely affect postoperative recovery and increase the risk of complications, including delayed tissue healing and postoperative infection.<sup>7</sup> Consequently, postoperative rehabilitation for patients with SRA should be individualized and should address not only the operated hip but also the broader systemic manifestations of the disease.<sup>9,10</sup>

At the initial physiotherapy evaluation, the patient demonstrated restricted ROM across multiple joints together with generalized muscle weakness, with MMT grades ranging from 3/5 to 4/5. These findings are consistent with rheumatoid sarcopenia, a condition characterized by the progressive loss of skeletal muscle mass and strength secondary to chronic systemic inflammation rather than physiological aging.<sup>18</sup> Consequently, rehabilitation in this case extended beyond postoperative recovery and focused on improving overall physical capacity that had gradually declined throughout the disease course. Following two physiotherapy sessions, the patient experienced meaningful reductions in pain and improvements in joint ROM, whereas muscle strength remained unchanged. This pattern is consistent with the expected trajectory of recovery after THA, in which pain relief and restoration of mobility generally precede measurable improvements in muscle strength and neuromuscular performance. Therefore, the absence of early improvement in muscle strength should not be interpreted as treatment failure but rather as a reflection of the different rates of physiological adaptation among musculoskeletal tissues.<sup>19</sup>

The observed reduction in pain was likely attributable to the complementary effects of the multimodal physiotherapy program. Transcutaneous electrical nerve stimulation (TENS) may have reduced pain through modulation of nociceptive transmission at the spinal level and activation of endogenous analgesic mechanisms, thereby facilitating greater participation in therapeutic exercise.<sup>13</sup> Infrared radiation served as an adjunctive modality by producing thermal effects that enhanced local circulation and promoted soft tissue relaxation, potentially improving tolerance to active movement during the early phase of rehabilitation.<sup>20</sup> Furthermore, the improvement in right hip flexion from 90° to 105° represents an encouraging clinical finding because restoration of hip mobility following THA in patients with RA is influenced not only by the surgical procedure but also by the long-standing effects of chronic inflammation and periarticular stiffness.<sup>9,19</sup> Progressive joint mobilization together with active-assisted and active ROM exercises may therefore have improved tissue extensibility and movement tolerance without provoking adverse events during the intervention period.<sup>21</sup>

The strengthening component of the rehabilitation program, including clamshell exercises, resistance training, and isometric exercises, was designed to address muscle weakness associated with chronic inflammation and prolonged physical inactivity. Previous evidence has shown that appropriately prescribed resistance exercise can improve physical capacity in patients with RA without exacerbating disease activity.<sup>12</sup> However, adaptations in muscle strength generally require a longer intervention period than improvements in pain and joint mobility. Consequently, the absence of measurable changes in MMT after only two treatment sessions was expected and should not diminish the potential long-term value of progressive strengthening exercises within a comprehensive rehabilitation program.<sup>19</sup>

Cervical involvement also represented an important aspect of this case. Impaired cervical proprioception in individuals with RA has been associated with deficits in postural control and reduced balance during both static and dynamic activities.<sup>22</sup> This observation reinforces the importance of adopting a comprehensive rehabilitation strategy that addresses the entire musculoskeletal system rather than focusing exclusively on the surgically treated joint.<sup>9,10</sup> Accordingly, rehabilitation for young patients with SRA following THA should involve close multidisciplinary collaboration among rheumatologists, orthopedic surgeons, and physiotherapists to optimize disease control, postoperative recovery, and long-term functional outcomes.<sup>9</sup>

Several limitations should be considered when interpreting the findings of this case report. First, the intervention consisted of only two physiotherapy sessions and therefore reflects only the patient's immediate clinical response rather than the long-term effects of rehabilitation. Second, as a single-patient case report, the findings cannot be generalized to the broader population of individuals with SRA. Third, functional outcomes were not evaluated using standardized functional assessment instruments, limiting

the objective evaluation of changes in functional performance following treatment. Despite these limitations, this case illustrates that SRA in young adults may progress to severe large-joint destruction requiring THA and highlights the importance of comprehensive functional assessment together with individualized, multidisciplinary rehabilitation to address the systemic manifestations of chronic inflammatory arthritis.<sup>9,17</sup>

## Conclusion

This case report demonstrates that seronegative rheumatoid arthritis (SRA) in young adults may progress to severe musculoskeletal involvement requiring total hip arthroplasty (THA), despite the absence of conventional serological biomarkers. The findings emphasize that disease severity should be evaluated comprehensively by considering clinical manifestations, the extent of joint involvement, and their impact on functional performance rather than relying solely on serological status.

The multimodal physiotherapy program implemented following THA was associated with early reductions in pain intensity and improvements in joint range of motion after two treatment sessions, whereas muscle strength remained unchanged during the short intervention period. These findings suggest that early postoperative physiotherapy may facilitate recovery of joint mobility and symptom control, while improvements in muscle strength are likely to require a longer rehabilitation period with progressive exercise.

From a clinical perspective, this case highlights the importance of individualized and multidisciplinary rehabilitation strategies for patients with SRA following THA. Comprehensive functional assessment, continuous monitoring of disease activity, and coordinated management involving rheumatologists, orthopedic surgeons, and physiotherapists may optimize postoperative recovery and support long-term functional independence and quality of life. Further prospective studies involving larger patient populations, longer follow-up periods, and standardized functional outcome measures are warranted to establish the effectiveness of multimodal physiotherapy in this patient population.

## Author Contribution

Syahdina Putri Arsyad: Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Visualization, Writing – original draft.

Irianto: Conceptualization, Methodology, Supervision, Validation, Writing – review & editing.

Aulia Masita: Investigation, Resources, Clinical management, Data curation, Writing – review & editing.

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## Conflict of Interest Statement

The authors declare that there are no conflicts of interest regarding the publication of this article.

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## Ethics Statement

This case report was conducted as part of routine clinical practice and did not involve any experimental intervention beyond standard physiotherapy management. According to the institutional policy applicable to this case report, formal ethical approval was not required. Written informed consent was obtained from the patient for publication of anonymized clinical information and radiographic images. All procedures were performed in accordance with the ethical principles of the Declaration of Helsinki and patient confidentiality was strictly maintained throughout manuscript preparation.

## Informed Consent Statement

Written informed consent was obtained from the patient for publication of this case report and all accompanying clinical information and radiographic images.

## Data Availability Statement

The data supporting the findings of this case report are available from the corresponding author upon reasonable request. The data are not publicly available because they contain information that could compromise patient privacy.

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