

Physiotherapy Management After Debridement for Right Ankle Bone Tuberculosis: A Case Report

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Abstract

Background: Osteoarticular tuberculosis of the ankle is uncommon and may cause pain, restricted range of motion (ROM), muscle weakness, and functional limitations. Physiotherapy may help address these postoperative impairments following surgical debridement.

Objective: To describe physiotherapy management and short-term clinical changes following debridement for right ankle bone tuberculosis.

Methods: This case report involved a 26-year-old man with right ankle bone tuberculosis who had undergone internal fixation, debridement, and fixation removal. Physiotherapy was provided in six sessions between April 15 and May 22, 2026. Interventions included transcutaneous electrical nerve stimulation, therapeutic ultrasound, passive and active ROM exercises, blood flow restriction with quadriceps setting, and strengthening exercises. Pain, ankle ROM, muscle strength, lower limb circumference, and scar characteristics were assessed before and after intervention using the Visual Analogue Scale, goniometry, Manual Muscle Testing, and Vancouver Scar Scale.

Results: Pain during movement and palpation decreased from 6/10 to 4/10, while resting pain decreased from 3/10 to 1/10. Ankle ROM increased across all measured movements. Hip and knee muscle strength improved from 3/5 to 4/5, while ankle strength remained 3/5. The Vancouver Scar Scale score decreased from 9 to 4.

Conclusion: Six physiotherapy sessions were accompanied by reduced pain, improved ankle ROM, increased hip and knee muscle strength, and improved scar characteristics. These observations are descriptive and cannot establish treatment effectiveness or causality.

Keywords

Osteoarticular tuberculosis; Ankle tuberculosis; Physiotherapy; Postoperative rehabilitation; Range of motion; Muscle strength.

Introduction

Tuberculosis (TB) remains a major global health problem and continues to cause substantial morbidity despite advances in diagnosis and treatment. Although pulmonary disease is the most common manifestation, TB may also involve extrapulmonary sites, including the musculoskeletal system. Osteoarticular tuberculosis occurs when *Mycobacterium tuberculosis* affects bone, synovial tissue, or adjacent joint structures and may result in progressive tissue destruction and long-term functional impairment when diagnosis or treatment is delayed.¹⁻³ Musculoskeletal involvement is considerably less common than pulmonary disease, and its clinical presentation may be nonspecific, particularly during the early stages. Patients may experience gradually progressive pain, swelling, stiffness, and impaired joint function without prominent systemic manifestations, which can contribute to delayed recognition and treatment.^{1,2,4,5}

The foot and ankle are uncommon sites of osteoarticular TB. The relatively infrequent occurrence of disease in this anatomical region, together with heterogeneous clinical and radiological manifestations, may complicate diagnosis and delay appropriate management.⁶⁻⁸ Previous reports have described progressive bone and cartilage destruction, joint stiffness, deformity, and impaired weight bearing or mobility in patients with foot and ankle TB, particularly when diagnosis or treatment is delayed.^{6,8} A recent scoping review of adult foot and ankle TB also indicated that the available evidence remains limited and is predominantly derived from retrospective observational studies, with substantial heterogeneity in reported clinical and surgical management.⁶ These limitations indicate a continuing need for clinically detailed reports that describe patient presentation, treatment course, and rehabilitation following surgical management.

Management of osteoarticular TB generally requires control of the underlying infection together with management of structural and functional consequences. Antitubercular therapy remains the principal treatment, while surgical intervention may be considered according to the extent of tissue involvement, complications, diagnostic requirements, or response to conservative management.^{6,9} Surgical procedures such as debridement may subsequently be followed by pain, restricted joint mobility, reduced muscle activation, muscle weakness, tissue changes, and limitations in physical activity. These impairments may result from the underlying disease as well as surgical tissue disruption, postoperative protection, reduced loading, and changes in habitual activity.^{6,8} Consequently, postoperative rehabilitation should be guided by the patient's documented impairments and clinical status rather than by a standardized assumption regarding recovery.

Physiotherapy may contribute to the management of postoperative impairments by addressing joint mobility, muscle function, pain, and progressive physical activity when clinically appropriate. Exercise based rehabilitation is widely used to manage reduced mobility and muscle weakness in musculoskeletal conditions, although exercise selection, intensity, progression, and safety should be individualized according to the patient's condition.¹⁰ Modalities such as transcutaneous electrical nerve stimulation (TENS),

therapeutic ultrasound, and blood flow restriction (BFR) exercise may also be incorporated into rehabilitation according to specific clinical objectives and safety considerations.¹¹ However, evidence supporting these interventions is largely derived from other musculoskeletal or postoperative populations and cannot automatically be extrapolated to patients recovering from osteoarticular TB. In particular, the clinical complexity associated with previous infection, surgical intervention, tissue healing, and loading restrictions requires cautious interpretation of rehabilitation outcomes.

Postoperative scar characteristics may also be relevant when surgical intervention involves a mobile anatomical region such as the ankle. Changes in scar vascularity, pigmentation, pliability, and height can be assessed using structured clinical instruments such as the Vancouver Scar Scale (VSS).¹² Although scar assessment provides information regarding postoperative tissue characteristics, changes in scar appearance should be interpreted within the broader clinical context rather than as an isolated indicator of rehabilitation success. In the present case, scar characteristics were assessed together with pain, ankle range of motion (ROM), muscle strength, and lower limb circumference to provide a broader description of the patient's postoperative condition.

Despite existing reports concerning the diagnosis and medical or surgical management of foot and ankle TB, detailed descriptions of postoperative physiotherapy remain limited.^{6,8} Existing literature has predominantly addressed diagnostic challenges, antitubercular treatment, surgical indications, and structural outcomes, whereas detailed descriptions of rehabilitation interventions and repeated impairment based clinical assessments are less frequently reported.^{6,8} This evidence gap is clinically relevant because rehabilitation after surgical treatment of osteoarticular TB may require consideration of the patient's previous disease, surgical history, tissue condition, pain, joint mobility, muscle function, and tolerance to progressive activity. A detailed case description may therefore provide useful clinical information while recognizing that observations from a single patient cannot establish treatment effectiveness.

The present case report describes the physiotherapy management of a 26-year-old man following debridement for bone tuberculosis involving the right ankle. The report focuses on documented postoperative impairments and short-term changes in pain, ankle ROM, muscle strength, lower limb circumference, and scar characteristics during six physiotherapy sessions. The case also describes the application of multimodal physiotherapy, including TENS, therapeutic ultrasound, ROM exercises, BFR combined with quadriceps setting, and strengthening exercises. By presenting the clinical course and outcome measurements within a defined treatment period, this report aims to contribute a clinically focused description of postoperative rehabilitation in an uncommon presentation of osteoarticular TB. The findings are interpreted descriptively and are not intended to establish causality, treatment effectiveness, or generalizability to other patients.

Methods

This report describes a single patient case of physiotherapy management following surgical treatment for bone tuberculosis involving the right ankle. The case report was prepared with reference to the CARE guideline to improve the completeness and transparency of clinical case reporting.¹³ Relevant intervention components were described in accordance with the principles of the Template for Intervention Description and Replication (TIDieR), including the intervention rationale, treatment components, delivery, and adherence.¹⁴ No patient recruitment or sampling procedure was performed because the report concerned one clinically documented case.

The patient was a 26-year-old man who worked as a self-employed worker and received physiotherapy at the Physiotherapy Department of RSUP Tadjuddin Chalid Makassar. The diagnosis of right ankle bone tuberculosis was documented in the patient's medical record and was supported by radiological findings. Radiological diagnosis was recorded on December 14, 2024. The patient subsequently underwent internal fixation on February 3, 2025, debridement on January 26, 2026, and fixation removal on April 5, 2026. Initial physiotherapy was performed on April 15, 2026, and the assessment and intervention period extended until May 22, 2026. At the beginning of physiotherapy, the patient presented with postoperative pain, restricted ankle movement, reduced muscle strength, visible lower limb atrophy, and mobility limitations. The patient used an axillary crutch during mobility.

The clinical sequence was documented as follows: radiological diagnosis of right ankle bone tuberculosis on December 14, 2024, internal fixation on February 3, 2025, debridement on January 26, 2026, fixation removal on April 5, 2026, initial physiotherapy assessment on April 15, 2026, six completed physiotherapy sessions, and post intervention assessment on May 22, 2026. Eight physiotherapy sessions were planned, of which six were completed. Two planned sessions were missed because the patient was sick. No modification of the treatment program was documented during the intervention period because the patient's recorded problems showed a stagnant progression. No adverse events were reported during the documented physiotherapy sessions.

The initial clinical assessment included vital signs, observation, palpation, mobility assessment, pain, ankle range of motion (ROM), muscle strength, lower limb circumference, and postoperative scar characteristics. Baseline vital signs were blood pressure of 120/87 mmHg, heart rate of 76 beats/min, and respiratory rate of 20 breaths/min. Observation identified a postoperative scar at the right ankle, localized swelling around the metatarsal region, and tenderness around the right ankle. Pain intensity was assessed using the Visual Analogue Scale (VAS). The patient was interviewed and directed to describe the intensity of pain using the VAS. Pain was assessed during movement, palpation, and at rest before and after the physiotherapy program. The specific length of the VAS instrument and detailed standardized verbal instructions were not available in the clinical documentation.

Ankle ROM was assessed using a goniometer with the patient positioned in supine lying. For dorsiflexion and plantarflexion, the fulcrum was positioned at the lateral malleolus. For inversion and eversion, the fulcrum was positioned at the talus or the midpoint between the medial and lateral malleoli. Measurements were obtained before and after the intervention. The documented procedure did not provide additional details regarding the stationary arm, moving arm, or exact stabilization procedure; therefore, these details are not specified in this report.

Muscle strength was assessed using Manual Muscle Testing (MMT) with the standard 0 to 5 ordinal grading system. The assessed muscle groups included the hip flexors, hip extensors, knee flexors, knee extensors, ankle dorsiflexors, and ankle plantarflexors. Muscle strength was assessed at baseline and after completion of the physiotherapy program. Specific details regarding the patient's position for each individual muscle group, stabilization technique, and exact resistance application were not available in the treatment documentation and were therefore not added to the present report.

Lower limb circumference was measured using a measuring tape. For thigh measurement, the reference point was the midline based on the measured thigh length, whereas the calf circumference was measured at the most prominent part of the muscle belly. Measurements were recorded for the right lower limb and compared as documented in the clinical assessment. The confirmed baseline value for the lower right limb circumference was 28 cm. Because the source documentation contained an inconsistent post intervention value in the previous manuscript, the circumference measurement was not used to infer changes in muscle mass, hypertrophy, or reduction of atrophy. The measurement procedure and the confirmed source value were retained without introducing an unsupported interpretation.

Postoperative scar characteristics were assessed using the Vancouver Scar Scale (VSS). The assessment was performed under sufficient lighting to allow visualization of the scar without inappropriate dark or bright areas. The assessment considered vascularity, color changes or pigmentation, scar pliability or elasticity, and scar size or height as documented during the clinical assessment. The VSS score was recorded before and after the physiotherapy intervention. The total VSS score was used for descriptive comparison, while individual domain scores were not available in the clinical record.

Physiotherapy was provided by a Physiotherapy Professional Student under close supervision by a physiotherapist. The intervention was directed toward the documented impairments of pain, restricted ankle movement, reduced muscle strength, lower limb atrophy, and postoperative tissue characteristics. The program consisted of transcutaneous electrical nerve stimulation (TENS), therapeutic ultrasound, passive and active ROM exercises, blood flow restriction (BFR) combined with quadriceps setting, and strengthening exercises.

TENS was applied with a frequency of 50 Hz using an intermittent pulse. The electrodes were placed over the quadriceps to activate the quadriceps muscle, which had been identified as hypotrophic, with the therapeutic target of improving muscle activation. The available treatment record did not provide a separate numerical value for electrical intensity or pulse duration; therefore, these parameters were not inferred. The documented TENS application was used as an adjunct to the strengthening component of the rehabilitation program.

Therapeutic ultrasound was applied to the talocrural joint using a frequency of 3 MHz and an intensity of 1.2 W/cm² for 5 minutes. The ultrasound was administered after the postoperative wound had healed. The documented rationale was to stimulate tissue repair at the ankle joint following debridement. The available clinical information did not provide further details regarding the ultrasound mode or specific device model; these parameters were therefore not added.

Exercise therapy included active range of motion exercises for the hip, knee, and ankle, together with strengthening exercises. The documented strengthening program included quadriceps setting, straight leg raises, bicycle crunches, clamshell exercises with resistance, and side lying leg raises using a resistance band. Quadriceps setting was performed for 15 seconds for three sets, while the other documented strengthening exercises were performed for 10 repetitions for three sets. Exercises were performed according to the patient's clinical tolerance. The program was supplemented by blood flow restriction during quadriceps setting.

For BFR exercise, the cuff was positioned proximally on the thigh, approximately 2 to 3 cm below the greater trochanter. The documented cuff width was 13 cm. Limb occlusion pressure (LOP) was estimated using the formula 1.3 multiplied by systolic blood pressure. Before application, screening was based on the patient's vital signs, with no documented signs of deep vein thrombosis or markedly elevated blood pressure. During treatment, the patient's condition was monitored by asking about numbness, tingling, changes in skin color, and increased pain. No such symptoms were reported during the documented monitoring. The treatment record did not document a separate formal termination threshold beyond monitoring for these symptoms.

A home exercise program was also prescribed. The patient was instructed to perform active ROM exercises for the hip, knee, and ankle two to three times per day. Partial weight bearing gait training was prescribed twice daily. The patient's adherence to the home exercise program was documented as compliant. Supervised physiotherapy was conducted during the six completed sessions, while the home program was intended to support continued exercise between treatment sessions.

Outcome data were analyzed descriptively by comparing baseline and post intervention measurements. The evaluated outcomes were pain intensity, ankle ROM, muscle strength, lower limb circumference, and VSS score. Absolute changes between baseline and post intervention assessments were reported where applicable. No inferential statistical analysis was performed because the report involved a single patient; consequently, p values, confidence intervals, and estimates of statistical significance were not calculated. The observed changes were interpreted descriptively and were not considered evidence of causality or treatment effectiveness.

Written informed consent was obtained from the patient for publication of the case report and relevant clinical information. The patient also provided consent for publication of clinical images. The case did not require formal research ethics approval because it was considered a case report that did not involve experimental research or procedures that altered the patient's clinical care. Nevertheless, ethical principles concerning patient privacy and confidentiality were applied throughout preparation of the report. All potentially identifying patient information was omitted from the manuscript.

Results

The patient completed six of the eight physiotherapy sessions planned during the treatment period from April 15 to May 22, 2026. Two planned sessions were not completed because the patient was sick. The post intervention assessment was performed using the same outcome domains as the initial assessment, including pain intensity, ankle range of motion (ROM), muscle strength, lower limb circumference, and postoperative scar characteristics. No modification of the physiotherapy program was documented during the treatment period, and no adverse events were reported. The observed changes are presented descriptively because this single case did not permit inferential statistical analysis. The changes in the clinical outcomes are summarized in Table 1.

Table 1. Clinical outcomes at baseline and post intervention assessment

Outcome	Parameter	Baseline	Post intervention	Observed change
Pain, VAS	During movement	6/10	4/10	-2 points
Pain, VAS	On palpation	6/10	4/10	-2 points
Pain, VAS	At rest	3/10	1/10	-2 points
Ankle ROM	Dorsiflexion	15°	37°	+22°
Ankle ROM	Plantarflexion	35°	40°	+5°
Ankle ROM	Inversion	10°	30°	+20°
Ankle ROM	Eversion	5°	15°	+10°
Muscle strength, MMT	Hip region	3/5	4/5	+1 grade
Muscle strength, MMT	Knee region	3/5	4/5	+1 grade
Muscle strength, MMT	Ankle region	3/5	3/5	No change
Lower limb circumference	Upper right limb	32 cm	32 cm	No change
Lower limb circumference	Lower right limb	28 cm	28 cm	No change
Scar characteristics, VSS	Total score	9	4	-5 points

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

Pain was assessed during movement, palpation, and at rest. Ankle ROM was assessed for dorsiflexion, plantarflexion, inversion, and eversion. Muscle strength was assessed in the hip, knee, and ankle regions using Manual Muscle Testing (MMT). Lower limb circumference and postoperative scar characteristics were also compared between the initial and post intervention assessments.

As shown in Table 1, pain scores decreased across all three assessment conditions. Pain during movement decreased from 6/10 at baseline to 4/10 after the intervention, while pain on palpation showed the same reduction from 6/10 to 4/10. Resting pain decreased from 3/10 to 1/10. These changes represent reductions in the recorded pain scores over the observation period and were not subjected to statistical testing.

An increase in measured ankle ROM was observed across all four assessed movements. Dorsiflexion increased from 15° to 37°, representing an absolute increase of 22°. Inversion increased from 10° to 30°, while eversion increased from 5° to 15°. Plantarflexion increased from 35° to 40°, representing the smallest absolute change among the assessed ankle movements. These measurements indicate greater recorded ankle mobility at the post intervention assessment than at baseline.

Muscle strength changes differed according to the anatomical region assessed. Hip muscle strength increased from grade 3/5 to 4/5, and knee muscle strength also increased from 3/5 to 4/5. In contrast, ankle muscle strength remained at grade 3/5 at both assessments. Therefore, the observed increase in muscle strength was limited to the hip and knee regions and did not include the ankle musculature.

The circumference of the upper right lower limb remained unchanged at 32 cm at both assessment points. The corrected circumference of the lower right limb was 28 cm, and no change was reported between baseline and post intervention assessment. Because the source documentation had previously contained an inconsistent value of 38 cm, the corrected value of 28 cm was used in the final presentation. Accordingly, no conclusion regarding increased muscle mass, hypertrophy, or reduction of atrophy was derived from the circumference measurement.

The total Vancouver Scar Scale (VSS) score decreased from 9 at baseline to 4 after the intervention, corresponding to a descriptive reduction of 5 points. This change indicates a lower recorded VSS score at the post intervention assessment. However, individual domain scores were not available in the clinical documentation; therefore, changes in specific domains such as vascularity, pigmentation, pliability, or scar height could not be quantified separately.

The treatment adherence data showed that six of eight planned physiotherapy sessions were completed, corresponding to the documented treatment exposure during the study period. Two sessions were missed because the patient was sick. The patient was also prescribed a home exercise program consisting of active ROM exercises for the hip, knee, and ankle two to three times daily and partial weight bearing gait training twice daily. Adherence to the home exercise program was documented as compliant.

No adverse events were reported during the documented physiotherapy treatment. The treatment program was not modified during the intervention period because the patient's documented problems were considered to show a stagnant progression. The absence of documented adverse events should be interpreted within the context of the available treatment records and does not constitute evidence regarding safety beyond the documented treatment period.

Discussion

This case report describes short term clinical changes observed during a six session physiotherapy program in a patient following debridement for bone tuberculosis involving the right ankle. The main observed findings were reductions in pain, increases in measured ankle range of motion (ROM), improvement in hip and knee muscle strength, and a reduction in the total Vancouver Scar Scale (VSS) score. In contrast, ankle muscle strength remained unchanged, and lower limb circumference showed no change after correction of the previously inconsistent measurement. These findings should be interpreted as descriptive changes occurring during the observation period rather than evidence that physiotherapy caused the observed improvements. The patient's clinical course may also have been influenced by postoperative recovery, previous surgical procedures, disease management, changes in activity, and other factors that were not independently controlled in this case.

Osteoarticular tuberculosis involving the foot and ankle is uncommon, and detailed evidence concerning postoperative rehabilitation remains limited. Previous literature has primarily addressed diagnostic features, medical treatment, surgical management, and structural outcomes rather than standardized physiotherapy protocols.^{6,8} A recent scoping review has also indicated that the evidence concerning adult foot and ankle tuberculosis remains limited and heterogeneous, with much of the available literature consisting of retrospective studies.⁶ This limited evidence base makes individual clinical reports potentially useful for describing rehabilitation practices and short term clinical observations, although such reports cannot determine treatment effectiveness. The present case therefore contributes primarily to the clinical description of postoperative impairment assessment and rehabilitation rather than to comparative evidence of a specific treatment approach.

Pain decreased by 2 points during movement, palpation, and rest during the reported treatment period. From a clinical perspective, reduced pain may allow greater tolerance of joint movement and therapeutic exercise. However, this case did not include a comparator, repeated measurements throughout the intervention, or a validated minimal clinically important difference specifically established for postoperative ankle tuberculosis. The observed reduction therefore cannot be classified as a treatment effect or attributed to a particular intervention. Furthermore, the physiotherapy program involved several modalities and exercise components delivered together, preventing separation of the individual contribution of TENS, therapeutic ultrasound, exercise therapy, or BFR. The reduction may also have occurred as part of the natural postoperative recovery process.

Ankle ROM increased in all four assessed directions, with the largest changes observed in dorsiflexion and inversion. Dorsiflexion increased by 22°, inversion by 20°, eversion by 10°, and plantarflexion by 5°. Restoration of ankle mobility is clinically relevant because osteoarticular tuberculosis may involve progressive joint and bone destruction, stiffness, and functional restriction when disease is delayed or extensive.^{6,8} The observed increases may have been associated with repeated joint movement, exercise participation, reduced pain, progressive use of the limb, or ongoing postoperative recovery. Nevertheless, the case design does not permit determination of which factor contributed to the observed ROM changes, and the findings should not be interpreted as evidence supporting a specific ROM protocol for ankle tuberculosis.

Muscle strength demonstrated a nonuniform pattern across the assessed anatomical regions. Hip and knee muscle strength increased from grade 3/5 to 4/5, whereas ankle muscle strength remained at grade 3/5. This pattern indicates that the recorded improvement in strength was limited to the proximal lower limb and did not extend to the ankle musculature, which was the primary affected region. The persistent ankle weakness may reflect continuing local impairment, pain related inhibition, postoperative tissue condition, limited loading tolerance, or the relatively short observation period. These explanations remain speculative because the case did not include direct measures of muscle activation, loading capacity, or repeated functional performance. The results therefore

support reporting strength outcomes according to anatomical region rather than describing generalized improvement in lower limb strength.

BFR was incorporated with quadriceps setting as part of the strengthening program. Evidence from musculoskeletal rehabilitation suggests that BFR can be used with low load exercise to provide a training stimulus when higher external loading is undesirable or poorly tolerated.^{15–17} However, much of this evidence originates from orthopedic, postoperative, or sports rehabilitation populations rather than patients with osteoarticular tuberculosis. The application of BFR in this case therefore represents a component of individualized rehabilitation rather than an intervention whose effectiveness can be established from the observed outcomes. Appropriate screening and monitoring are particularly relevant when BFR is used, and the documented treatment included assessment of vital signs before application and monitoring for numbness, tingling, changes in skin color, and increased pain during treatment.^{15,18} No such symptoms were reported during the documented sessions. Nevertheless, the available record does not provide sufficient information to determine the independent safety or therapeutic contribution of BFR in this patient.

The total VSS score decreased from 9 to 4 during the observation period. This reduction represents a descriptive change in the recorded scar assessment, but it should not be interpreted as evidence that physiotherapy directly altered scar biology. Postoperative scar characteristics can change naturally with tissue maturation and may be influenced by surgical factors, healing time, mechanical loading, and individual biological variability.¹⁹ In addition, individual VSS domain scores were not available, limiting interpretation of whether the change was primarily related to vascularity, pigmentation, pliability, height, or several domains simultaneously. The VSS finding should therefore be considered as one component of the overall postoperative assessment rather than a standalone indicator of treatment success.

The corrected lower limb circumference measurements showed no change, with the upper right limb remaining at 32 cm and the lower right limb remaining at 28 cm. This finding differs from the earlier manuscript version, which contained a post intervention value of 38 cm. The corrected value eliminates the previously reported 10 cm increase and prevents an unsupported interpretation of increased muscle mass or reversal of atrophy. Circumference measurements may be affected by measurement location, positioning, tissue characteristics, and measurement technique, emphasizing the importance of clearly defined anatomical landmarks and consistent procedures.²⁰ In this case, the available measurements support only the conclusion that no change was documented after correction of the recorded value.

The six completed sessions represented the documented treatment exposure, with two of eight planned sessions missed because the patient was sick. The home exercise program consisted of active ROM exercises for the hip, knee, and ankle performed two to three times daily and partial weight bearing gait training twice daily, with adherence documented as compliant. This additional exercise exposure should be considered when interpreting the observed changes because the outcomes cannot be attributed solely to supervised treatment sessions. The case also demonstrates the importance of reporting adherence and missed sessions when describing a rehabilitation intervention, particularly when the treatment dose is relatively short.²¹ Such information improves transparency but does not overcome the limitations inherent to a single case.

Several limitations should be considered when interpreting these findings. First, the single case design and absence of a comparator prevent causal inference and limit generalizability. Second, the observation period was short, and no long term follow up was available to determine whether the observed changes were maintained. Third, several measurement procedures, including the exact VAS format, some goniometric details, and specific MMT positioning and resistance procedures, were not fully documented in the original clinical record. Fourth, individual VSS domain scores were unavailable, limiting detailed interpretation of scar changes. Fifth, no validated ankle specific functional outcome measure or systematic gait assessment was available; therefore, improvements in activities of daily living, gait, balance, or overall functional status cannot be inferred. Finally, although no adverse events were reported in the available treatment documentation, the case cannot provide evidence regarding the broader safety profile of the interventions.

Despite these limitations, this case provides a clinically focused description of postoperative physiotherapy following surgical management of right ankle bone tuberculosis. Its primary value lies in documenting a multimodal rehabilitation approach together with repeated impairment-based assessments of pain, ankle mobility, muscle strength, limb circumference, and scar characteristics. The case also emphasizes the importance of accurate clinical timelines, transparent reporting of treatment exposure, reproducible measurement procedures, and cautious interpretation of short-term changes. These considerations are particularly relevant when rehabilitation is reported for uncommon musculoskeletal infections for which condition specific evidence remains limited.

Future research should use prospective designs with clearly documented diagnostic criteria, standardized rehabilitation protocols, repeated outcome assessments, and longer follow up periods. Validated functional measures should be incorporated alongside impairment-based outcomes to provide a broader assessment of recovery.²² Comparative studies are also needed to determine the feasibility, safety, and potential clinical contribution of specific rehabilitation components in patients recovering from osteoarticular tuberculosis. Until stronger evidence is available, physiotherapy should remain individualized according to disease status, surgical history, tissue healing, documented impairments, and the patient's response to progressive activity.²³

Conclusion

This case report describes short term clinical changes observed during six physiotherapy sessions in a 26-year-old man following debridement for bone tuberculosis involving the right ankle. Reductions in pain, increases in ankle range of motion, improvements in hip and knee muscle strength, and a reduction in the Vancouver Scar Scale score were observed during the treatment period. Ankle muscle strength remained unchanged, while the corrected lower limb circumference measurements showed no change.

These findings provide a descriptive account of postoperative physiotherapy in an uncommon presentation of osteoarticular tuberculosis. The observed changes cannot establish a causal relationship between the physiotherapy interventions and clinical improvement because of the single case design, absence of a comparator, short observation period, and use of multiple interventions. The findings should therefore not be interpreted as evidence of treatment effectiveness or generalized to other patients with osteoarticular tuberculosis.

The case highlights the importance of individualized postoperative physiotherapy based on documented impairments, together with systematic assessment of pain, joint mobility, muscle strength, and scar characteristics. Future studies should include prospective designs, standardized rehabilitation protocols, validated functional outcomes, systematic safety monitoring, and longer follow up to better characterize rehabilitation following surgical treatment of osteoarticular tuberculosis.

Author Contribution

Hanief Naufal Wajdi: Conceptualization, clinical assessment, physiotherapy intervention, data collection, data analysis, manuscript drafting, and manuscript revision.

Andi Rahmiani SP.: Supervision, clinical guidance, interpretation of clinical findings, and critical revision of the manuscript.

Masfufah: Clinical supervision, methodological guidance, and critical revision of the manuscript.

Rusli: Clinical supervision, interpretation of physiotherapy findings, and critical revision of the manuscript.

All authors reviewed and approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

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Conflict of Interest Statement

The authors declare that they have no conflicts of interest related to the preparation or publication of this case report.

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Ethics Statement

Formal ethical approval was not required for this case report because it did not involve experimental intervention or alteration of the patient's clinical care. Ethical principles concerning patient privacy and confidentiality were maintained throughout the preparation of the manuscript. Written informed consent was obtained from the patient for publication of the case report and relevant clinical information, including clinical images. All potentially identifying information was removed from the manuscript.

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