

## Medical Case Report

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# A comprehensive rehabilitation of a young individual with post-tuberculosis triple knee deformity: A case report

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## Abstract

Triple knee deformity is one of the rare clinical conditions seen in patients with tubercular infection of the knee. The sequelae post-tuberculosis (post-TB) affect various systems, causing joint destruction, chronic inflammation, and soft tissue involvement. One of the post-TB complications is triple knee deformity, characterised by valgus, external rotation, flexion, and subluxation of the knee. Tuberculosis is an endemic infection majorly affecting individuals in developing countries. The infection affects long bones, and the common clinical features include cough, loss of appetite, blood in vomit, and others. We present a twelve-year-old boy who was diagnosed with triple knee deformity, and he was managed with corrective osteotomy followed by physiotherapy. The patient had a history of TB infection, which was treated with a complete regimen of medications. He showed an improvement in strength and range of motion following physiotherapy and Ilizarov's fixation to correct the maximum deformity. We concluded that a well-tailored physical therapy program focusing on maintaining and improving the strength of the knee and hip musculature could help in regaining the functional independence of an individual and play a significant role in maintaining the activity level of the individuals and prevention of secondary complication of immobility.

**Keywords:** Triple Knee Deformity, Tuberculosis, Physical Therapy

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## INTRODUCTION

Tuberculosis (TB) is an endemic disease in developing countries. Although TB of the knee is rare, millions of individuals develop active infection worldwide. About 10.4 million people develop TB infection, out of which approximately 1.4 million deaths are recorded per year. The common clinical features of TB include loss of appetite, fever, cough, and haemoptysis [1]. Most of the newly diagnosed cases are commonly pulmonary TB, and it also affects various organs, bones, and joints. Diseases related to tuberculosis, most of the time, are misdiagnosed as malignancies or bacterial infections due to their similarity to other conditions. One of the most common

complications of tuberculosis of the knee is triple knee disease (TKD) [2]. Triple knee deformity is described as valgus, external rotation, flexion deformity of the knee along with posterior subluxation of the tibia, and this presentation is usually seen in patients with post-tuberculosis sequelae of the knee, rheumatoid arthritis, and sometimes in post-traumatic incompletely reduced old neglected dislocated knee [3-5]. The Common clinical presentation of patients includes swelling, local rise in temperature, and stiffness. Abnormalities are seen on the radiographs; soft tissue swelling is initially evident, while bony changes are prominent in later stages. We hereby present a 12-year-old boy with a deformity of the left knee, which was fixed at 110° of knee flexion on the left side. Given that Triple deformity of the knee is a rare sequela of TB, the case report aimed to assess the effectiveness of physical therapy in such patients.

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## CASE

A twelve-year-old boy with a deformity of the left knee and who was unable to walk independently reported to the orthopaedic department (Figure 1). The patient was unable to perform daily activities. An X-ray (Figure 2) and other investigations were advised, which led to the diagnosis of triple knee deformity of the left knee. The patient's parents reported a history of TB infection in the previous four years, during which the patient completed the entire treatment regimen. The deformity was managed with corrective osteotomy and external Ilizarov's fixation. The patient was referred to the physical therapy ward following the surgery for further management. The patient was examined supine, lying with the anterior superior iliac spine (ASIS) on both sides at the same level; the patient was vitally stable and conscious, alert, and oriented to time, place, and person. The left leg of the patient was deformed, and the Ilizarov fixator was applied over the left knee. There was no open wound present. On examination, there was mild atrophy of the hamstrings and calf muscle. The ranges of motion of the right lower limb joints were full and functional, while the range of motion of the left hip musculature was full, with complete loss of range at the left knee due to the fixator. The ranges of motion of the left lower limb are shown in Table 1. A spasm was present over the anterior aspect of the left thigh. The strength of the right lower limb was assessed using manual muscle testing, which was full and functional, while the strength of the left knee muscles was not assessable.



Figure 1. Pre-operative Knee deformity showing triple knee deformity on the left side.

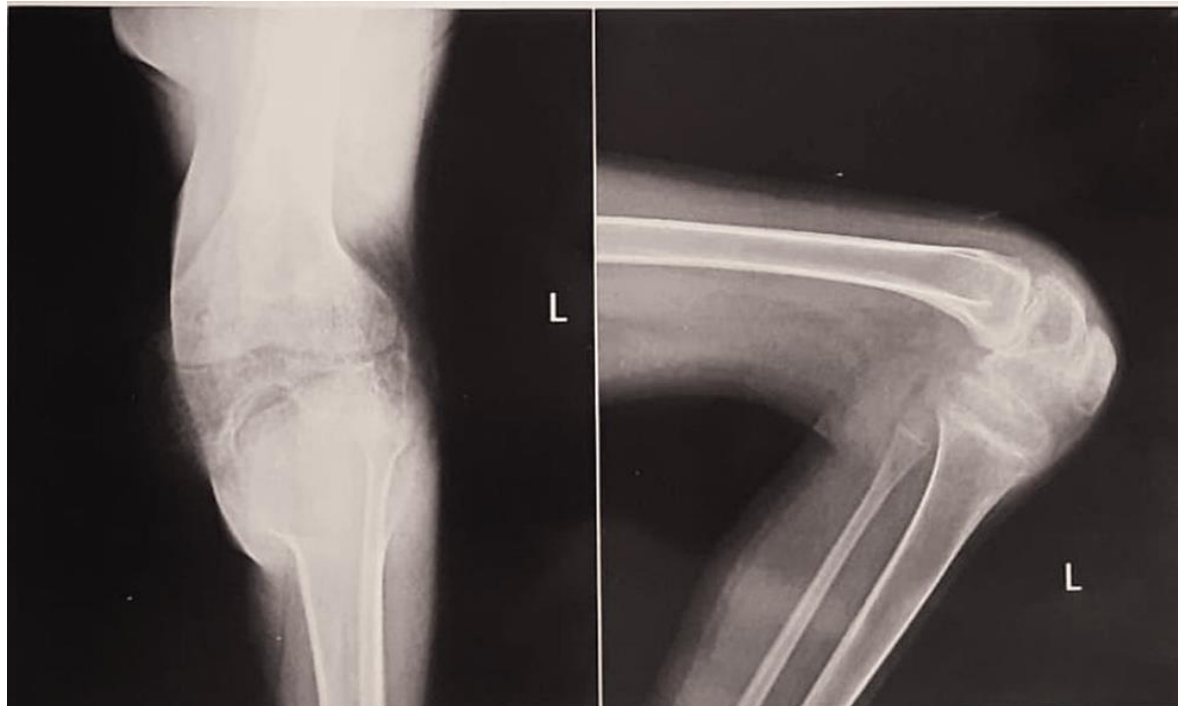


Figure 2. X ray of the left knee showing deformity on the anteroposterior (AP) and lateral aspects.



Figure 3. Completely extended knee after successful surgery and physical therapy.

Table 1. Range of motion of the left lower limb

Joint	Movement	Range of Motion
Hip	Flexion	0-90 <sup>0</sup>
	Extension	0-30 <sup>0</sup>
Knee	Abduction	0-45 <sup>0</sup>
	Flexion	90 <sup>0</sup> fixed deformity
Ankle	Extension	-
	Plantarflexion	0-30 <sup>0</sup>
	Dorsiflexion	0-25 <sup>0</sup>

Table 2. Manual Muscle Testing for muscle strength assessment

Joint	Muscles	Manual Muscle Testing
Hip	Flexors	4/5
	Extensors	4/5
	Abductors	4/5
Knee	Flexors	Weak and painless (resisted isometric contraction)
	Extensors	Weak and Painless (Resisted Isometrics Contraction)
Ankle	Plantarflexors	3/5
	Dorsiflexors	3/5

Table 3. Physical Therapy Rehabilitation regimen

Goal	Intervention	Dosage	Rationale
To Reduce Pain	Cold Fermentation	10 min, twice daily	Pain Reduction is achieved by pain gait mechanism
To Prevent Limb edema	Elevation and ankle toe movement, isometric exercises	30 repetitions every two hourly	Due to elevation the gravity assisted drainage of the fluids. Ankle toe movement leads to contraction of the calf muscle which assists. The isometric contraction of the muscles help in fluid drainage
To maintain tissue extensibility	Gentle stretching exercises	30 seconds hold 3 repetitions	To prevent adhesion formation
To reduce muscle spasm	Myofascial release technique	1 minute thrice daily	To break the adhesion formed in the muscles
To Prevent atrophy of the muscles	Strengthening with one kg weight cuff	10 repetitions for each movement twice daily	To maintain the available strength and improve the strength further.
To maintain available range of motion	Range of motion exercises for bilateral lower limb and upper limb	10 repetitions twice daily	To maintain and improve normal range of motion
Pre crutch training	Strengthening of latissimus, triceps, wrist extensors, grip strengthening	10 repetitions, twice daily	To strengthen the extensors of the upper limb for easy ambulation using walker.
To prevent pulmonary complications	Active cycle of breathing technique Deep breathing exercises and spirometer	10 repetitions every two hourly	To maintain and improve lung compliance and prevent pulmonary complication

The strength assessment for the hip and ankle of the right lower limb is mentioned in Table 2. The patient was diagnosed with tuberculosis in March 2015, and he reported to the orthopaedic department on December 25, 2020. The patient was operated for triple knee deformity on January 5, 2021, while the physical therapy commenced on January 10, 2021. He was discharged on January 25, 2021. The first follow-up was recorded on April 4, 2021, while the second follow-up was taken on December 20, 2021. A radiograph was done to confirm the diagnosis, as stated in Figure 2, with a classical presentation of the triple knee deformity.

The management of the patient started with the education of the parents regarding the importance of medication, exercise, and infection prevention. The parents were taught how to perform the exercises at home. The management goals of the treatment are mentioned in Table 3. The treatment was given twice daily. The patient visited the hospital every month to assess the wounds, muscle strength, and range of motion, and the overall independence was assessed using the functional independence measure. The reassessment was done for a range of motion and muscle strength every time the patient visited the hospital. The range of motion of the patient remained unchanged, while the strength of the muscle, which was 4, improved to 5 using manual muscle testing, whereas no change in the strength of the knee was seen. On the other hand, complete straightening was achieved, as shown in Figure 3.

## DISCUSSION

Ilizarov's limb fixation is helpful in gaining the desired amount of manipulation at a desired rate and rhythm. This external fixator holds the segments of the bone firmly after osteotomy. This is commonly used for paediatric patients [6]. A survey was done, which emphasised various treatment approaches used for patients with Ilizarov's fixation. The survey concluded that patients with Ilizarov's fixator require good orthopaedic Physical therapy during the initial phase to avoid musculoskeletal complications [7]. Green et al. conducted a study on Physical Therapy during Ilizarov fixation. They concluded that any factors leading to a decline in the walking capacity of the patient, such as sepsis, pain, and contracture in various conditions, must be corrected. During lengthening, deformity correction, etc., such conditions may lead to subluxation and dislocation. To avoid such complications, intense physical therapy, dynamic and static splinting, and proper positioning are advised [8].

## Conclusion

A child diagnosed with triple knee deformity resulting from TB showed good improvement in muscle strength and knee range of motion following its management with Ilizarov's external fixator, medication and physical therapy. We conclude that physical therapy plays a crucial role in the prevention of complications in post-operative cases.

## DECLARATIONS

### Ethical consideration

The patient's relatives were informed about the case, and oral consent was obtained.

### Consent to publish

All authors agreed on the content of the final paper.

### Funding

None

### Competing Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

### Author contributions

OCW conceptualised the case report, assessed the patient, and drafted the report. Final approval for the manuscript was obtained from NVC and TJP.

### Acknowledgement

None

### Availability of data

The data used in this study are publicly available on the DHS website (<https://www.dhsprogram.com>).

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