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# Effect of early physiotherapeutic interventions as an adjunct to surgical approach in a case of chronic femoral osteomyelitis: A case report

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## ABSTRACT

Chronic osteomyelitis is identified as long-run infection of the bone, characterized by the sequestration, fistula and necrotic bone formation. A 27-year-old male diagnosed with chronic right femoral osteomyelitis and intramedullary abscess formation was treated with debridement and saucerization. Following surgery, he had complaints of pain over his right knee and thigh, difficulty in activities of daily living and transfers, fatigue, a lack of strength and restricted knee movements. A personalized physiotherapy protocol was formed based on the needs of the patient. The Numerical Pain Rating Scale, Functional Independence Measure and Fatigue Severity Scale were taken as the primary outcome measures. Following physiotherapy, there was definitive improvement in all the primary outcomes, including range of motion and muscle strength. Thus, early physiotherapy rehabilitation after surgery plays a major role in a successful recovery.

**Keywords:** Osteomyelitis, physiotherapy, rehabilitation, surgical treatment, inflammation

## 1. INTRODUCTION

Nelaton (1834) was the first to coin the term "osteomyelitis" (Phansopkar et al., 2020). Chronic osteomyelitis is characterized by long-term infection of the bone, followed by the formation of sequestrum and fistula and the presence of necrotic bone. It is commonly seen after comminuted and infected open fractures with damaged soft tissues treated by open reduction and internal fixation, as well as after prosthetic joint replacement surgery (Pande, 2015; Lindbloom et al., 2014; Ma et al., 2018). The signs and symptoms of osteomyelitis include chronic pain, limp, muscle spasms, fever, discharge oozing out of a wound and sinus tracts. It can also recur after a dormant

phase (Phansopkar et al., 2020; Pande, 2015).

The surgical interventions include sequestrectomy, saucerization, curettage and excision of the infected bone and at last, amputation for a long-standing discharging sinus (Phansopkar et al., 2020). Physiotherapy is effective in the post-surgical phase to relieve post-operative pain and prevent complications (Phansopkar et al., 2020). A personalized physiotherapy protocol was formed based on the patient's needs and the duration after the surgery. The outcomes were reassessed and the results were noted.

## 2. CASE REPORT

**Patient Description**

A 27-year-old male farmer residing in a village, had a history of minor trauma over the Right knee, 1 month back by the handle of the plow, which was followed by swelling and pain which gradually increased over time. It was intermittent and dull aching in nature and aggravated on knee movements. The pain slowly progressed to the whole anterior aspect of thigh and the patient started having difficulty in cross-leg sitting and squatting and severe pain in weight-bearing due to which he was not able to stand and walk. He also had on-and-off episodes of fever, fatigue, weakness and weight loss of 5-7 kg within one month. With all these complaints he consulted a local hospital where only symptomatic treatment was done, but as there was no improvement, he visited Dhiraj General Hospital (DGH) on 10/10/2022.

The patient is a known case of Sickle cell disease and β- Thalassemia. He also had a history of open reduction and internal fixation of left radius fracture 19 years back and pus aspiration from right mid-shaft aspect of femur five years back. Investigations were done in the form of Complete blood count (CBC), bacteriology reports, X-rays and Magnetic Resonance Imaging (MRI) and diagnosed as Chronic Osteomyelitis of Right femur. Clinical microbiology and bacteriology reports showed plenty of pus cells but no organism was isolated. X-ray of the Right Hip joint and femur was suggestive of thickening of cortex in middle and distal aspects of femur (Figure 1).

MRI was suggestive of intramedullary abscess formation. Cortical thinning was noted in the posterior bony cortex just above the femoral shaft with focal bony defect appreciated in the posterior bony cortex just above the femoral condyle through which fluid in the medullary cavity was communicating with soft tissue. All these findings were suggestive of acute on chronic osteomyelitis (Figure 2). Hematology profile indicated increased total White Blood Cell (WBC) count, neutrophils and lymphocytes, decreased Mean corpuscle volume (MCV) and Mean corpuscular hemoglobin (MCH). Surgery was done in the form of debridement and saucerization on 12/10/2022 and was given intermittent skin traction.


**Figure 1** X-ray of right hip joint and femur showing thickening of cortex in middle and distal aspect of femur

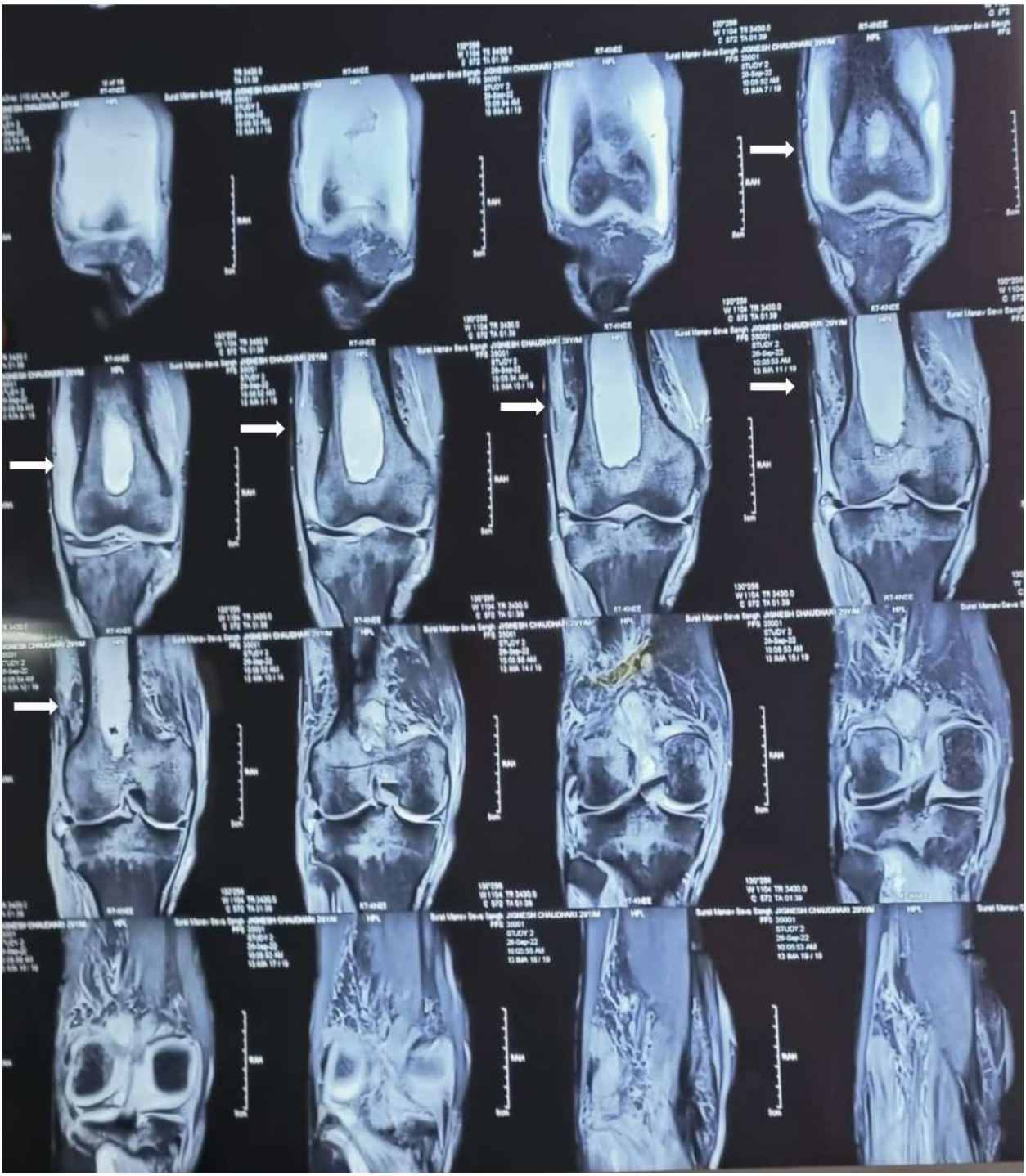

**Figure 2** MRI findings suggestive of intramedullary abscess formation

Post-surgery patient was treated with Intravenous antibiotics, antiplatelet and analgesics and was referred for physiotherapy on 13/10/2022. The patient had complaints of pain over the right leg at the site of surgery, difficulty in activities of daily living and transfers, fatigue, lack of strength and restricted knee movements post- surgery for which physiotherapy was given. The patient was discharged on 26/10/2022. The timeline of events is given (Table 1).

**Table 1** Timeline of events

| Events | Date of events |
|---|---|
| Trauma | 10/09/2022 |
| Date of admission | 10/10/2022 |
| Date of surgery | 12/10/2022 |

| | |
|---|---|
| Physiotherapy reference | 13/10/2022 |
| Date of discharge | 26/10/2022 |

## 3. CLINICAL FINDINGS

After taking informed consent from the patient, a detailed physiotherapy examination was done. On examination, the patient had knee joint effusion and five degrees of knee flexion were noted (Figure 3, 4).

Pain was present on Right knee joint, anterior aspect which was dull aching in nature and Numeric pain rating scale (NPRS) was 7/10 during activity and 5/10 on rest. There was no localized raise in temperature. Grade 2 tenderness was present around the incision site. Limb length measurements and patellar mobility was normal. Girth measurement showed one cm difference at midpoint of patella suggestive of knee joint effusion. End- range extension lag was present mainly because of quadriceps weakness (Figure 5).

**Figure 3** Attitude of the limb

**Figure 4** Attitude of the limb indicating knee flexion

Hamstrings tightness was also present and was 35 degrees measured by Active Knee Extension Angle. End feel for knee flexion was empty due to pain at the incision site and for extension; it was soft tissue stretch due to hamstrings and posterior capsule tightness. The range of motion (ROM), manual muscle strength (MMT), Functional Independence Measure (FIM) and Fatigue severity scale (FSS) were taken on the first day and at the time of discharge. Improvements were seen in all the outcome measures (Table 2, 3, 4). The patient progressed from non-weight bearing walking with a walker with minimal assistance to partial weight-bearing walking with a walker without any assistance.


**Figure 5** End-range extension lag

**Table 2** Outcome measures at baseline and discharge

| Outcome Measure | Baseline | Discharge |
|---|---|---|
| NPRS- Rest | 5/10 | 0/10 |
| NPRS- Activity | 7/10 | 4/10 |
| FIM | 77/126 | 104/126 |
| FSS | 52/63 | 43/63 |

**Table 3** Range of motion measurements at baseline and discharge

| Movements | | Baseline | | | | Discharge | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Left | | Right | | Left | | Right | |
| | | Active | Passive | Active | Passive | Active | Passive | Active | Passive |
| Hip | Flexion | 0-120˚ | 0-125˚ | 0-90˚ | 0-95˚ | 0-120˚ | 0-125˚ | 0-100˚ | 0-110˚ |
| | Extension | N/A | N/A | N/A | N/A | 0-35˚ | 0-37˚ | 0-30˚ | 0-33˚ |
| | Abduction | 0-40˚ | 0-45˚ | 0-37˚ | 0-45˚ | 0-40˚ | 0-45˚ | 0-40˚ | 0-45˚ |
| | Adduction | 0-20˚ | 0-20˚ | 0-20˚ | 0-20˚ | 0-20˚ | 0-20˚ | 0-20˚ | 0-20˚ |
| | Internal rotation | 0-30˚ | 0-35˚ | 0-15˚ | 0-18˚ | 0-30˚ | 0-35˚ | 0-20˚ | 0-25˚ |
| | External rotation | 0-40˚ | 0-43˚ | 0-30˚ | 0-35˚ | 0-40˚ | 0-43˚ | 0-40˚ | 0-42˚ |
| Knee | Flexion | Functionally 0-120˚ | | Functionally 0-90˚ | | 0-130˚ | 0-135˚ | 0-110˚ | 0-112˚ |
| | Extension | 120-0˚ | 120-0˚ | 90-45˚ | 90-10˚ | 130-0˚ | 135-0˚ | 110-20˚ | 112-0˚ |
| Ankle | Dorsi-flexion | Not assessed as it was under bandage | | | | Not assessed as it was under bandage | | | |
| | Plantar-flexion | | | | | | | | |
| | Inversion | | | | | | | | |
| | Eversion | | | | | | | | |

**Therapeutic intervention**

The patient received physiotherapy for 14 days regularly in the orthopedic inpatient ward by an orthopedic physiotherapist. The physiotherapy rehabilitation program is mentioned (Table 5).

**Table 4** Manual muscle strength assessment at baseline and discharge

| Movements | | Baseline | | Discharge | |
|---|---|---|---|---|---|
| | | Left | Right | Left | Right |
| Hip | Flexors | 4/5 | 3/5 | 5/5 | 4/5 |
| | Extensors | Functionally good | Functionally fair | 5/5 | 4/5 |
| | Abductors | Functionally good | Functionally fair | 5/5 | 4/5 |
| | Adductors | Functionally good | Functionally fair | 5/5 | 4/5 |
| | Internal rotators | 4/5 | 3/5 | 5/5 | 4/5 |
| | External rotators | 4/5 | 3/5 | 5/5 | 4/5 |
| Knee | Flexors | Functionally good | Functionally fair | 5/5 | 4/5 (within available range) |
| | Extensors | 4/5 | 2/5 | 5/5 | 3/5 |
| Ankle | Dorsi-flexors | Isometrically good | Isometrically fair | Isometrically good | Isometrically good |
| | Plantar-flexors | Isometrically good | Isometrically fair | Isometrically good | Isometrically good |
| | Invertors | Isometrically good | Isometrically fair | Isometrically good | Isometrically good |
| | Evertors | Isometrically good | Isometrically fair | Isometrically good | Isometrically good |

**Table 5** Therapeutic intervention

| Rationale | Treatment | Week-wise dosage | |
|---|---|---|---|
| | | 1st week | 2nd week |
| Patient education | Patient and his family member were educated about the condition, its recurrence rates and importance of exercises | Patient education was focused in both the weeks | |
| Relief of pain and muscular spasm | Cryotherapy | 20 min- BD-TD | - |
| Positioning to prevent deformities | Heel prop | When traction was removed | |
| Prevention of deep venous thrombosis | Ankle pump exercises | 20 repetitions- one set- BD | 20 repetitions- two sets- BD |
| Prevention of pressure sores | Log rolling to the unaffected side | Done every two hours | |
| Prevention of respiratory complications | Diaphragmatic breathing, Segmental breathing and spirometry | 10 repetitions with 10 seconds hold- one set- BD | 10 repetitions with 10 seconds hold- two sets- BD |
| Prevention of fatigue | Jacobson's relaxation technique | Given at the end of each session | |
| | Adequate pacing between all exercises | Focused in both the weeks | |
| Maintenance of muscle strength | Muscle setting exercises for quadriceps, glutei, hamstrings, abductors and adductors of hip | 10 repetitions with 10 seconds hold- one set- BD | 10 repetitions with 10 seconds hold- two sets- BD |

| | | | |
|---|---|---|---|
| Improvement of ROM and muscle strength | Active-assisted heel slides | 10 repetitions- one set- BD | 10 repetitions- two sets- BD |
| | Active-assisted straight leg raise in supine and side lying position | 10 repetitions with 10 seconds hold- one set- BD | 10 repetitions with 10 seconds hold- two sets- BD |
| | Hip extension in side lying position | 10 repetitions with 10 seconds hold- one set- BD | - |
| | Active-assisted straight leg raise in prone position | - | 10 repetitions with 10 seconds hold- one set- BD |
| | Active-assisted end-range knee extension in supine with pillow as prop | 10 repetitions with 10 seconds hold- one set- BD | 10 repetitions with 10 seconds hold- two sets- BD |
| | Unilateral bridging | 10 repetitions with 10 seconds hold- one set- BD | 10 repetitions with 10 seconds hold- two sets- BD |
| | Pendular exercises for the knee in high sitting position | 20 repetitions- one set- BD | 20 repetitions- two sets- BD |
| | Active-assisted knee extension in high sitting position | 10 repetitions with 10 seconds hold- one set- BD | 10 repetitions with 10 seconds hold- two sets- BD |
| | Seated pushups- crutch muscle strengthening | 10 repetitions with 10 seconds hold- one set- BD | 10 repetitions with 10 seconds hold- two sets- BD |
| | One legged standing- sound side | 10 repetitions with 10 seconds hold- one set- BD | 10 repetitions with 10 seconds hold- two sets- BD |
| | Heel raise on sound side with support | 10 repetitions with 10 seconds hold- one set- BD | 10 repetitions with 10 seconds hold- two sets- BD |
| | Weight shift to the affected side in standing | - | 20 repetitions- one set- BD |

*BD- twice a day, TD- thrice a day.

## 4. DISCUSSION

Physiotherapy helps in speedy recovery by preventing secondary complications and improving ROM, muscle strength, ambulation, and functional independence; hence, it must be involved in the management of chronic osteomyelitis (Mundada and Patil, 2022). Phansopkar et al., (2020) studied the effect of an early physiotherapy rehabilitation approach in acute tibial osteomyelitis, where the application of cryotherapy and other rehabilitation exercises improved muscle integrity and independence in daily activities. This study also utilized a similar approach which proved beneficial.

Vaidya et al., (2020) had seen the effects of physiotherapeutic exercises in a case of osteomyelitis accompanied by sickle cell disease where deep breathing exercises, relaxation and spirometry were prescribed. Our patient also had sickle cell disease and thalassemia, so focusing on the respiratory system proved to be fruitful.

While going through the shreds of evidence available about physiotherapy management in osteomyelitis, all the protocols focused less on fatigue. As our patient had sickle cell disease and thalassemia, pacing, relaxation exercises and exercises incorporated with breathing were added which proved beneficial and improvement was also seen on the Fatigue Severity Scale.

Thus, with the above-designed protocol, the patient's functional capacity improved and positive results were seen in all the outcome measures at the end of the treatment sessions.

## 5. CONCLUSION

The above study concludes that an early physiotherapy rehabilitation protocol mainly focused on the prevention of secondary complications like post-operative pain and effusion, pressure sores, chest prophylaxis, improvement of strength, range of motion and functional goals which is beneficial for the successful recovery of the patient.

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**Author contributions**

Tushara Nair: Planning the treatment protocol, treatment of patient and article writing.
Kumar GP: Language editing and reviewing the article.

**Informed consent**

Written and Oral informed consent was obtained from the patient included in the study. Additional informed consent was obtained the identifying information is included in this manuscript.

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**Conflict of interest**

The authors declare that there is no conflict of interests.

**Data and materials availability**

All data sets collected during this study are available upon reasonable request from the corresponding author.

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