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Comprehensive rehabilitation after supracondylar comminuted femur fracture managed with ORIF plate in osteosynthesis: A case report

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ABSTRACT

Accidents on the highway as well as falls have become more common with the expansion of the transportation and construction industries. Patients have traditionally been instructed to use protective weight-bearing during the early rehabilitation phase following a well-fixed distal femoral fracture. *Clinical finding:* The patient had complained of pain and swelling over the thigh's lateral surface and unable to flex the knee joint and inability to bear weight on left lower limb pain on NPRS 8/10 on movement and on rest 6/10. *Diagnosis:* The X-ray reveals that comminuted supracondylar femur fracture and the CT report reveal that comminuted displaced fracture in the distal end of the femur, extending to involve lateral, medial condyles, inter condylar region and the articular margin. *Conclusion:* In this case, the rehabilitation routine helped the patient regain functional independence at home and at work by reducing pain and tenderness while also improving range of motion, muscle strength and endurance.

Keywords: Femur fracture, Supracondylar comminuted fracture, Physiotherapy rehabilitation, case report.

1. INTRODUCTION

As a result of these factors, supracondylar femur fractures are becoming more severe and common. A distal femoral metaphysis fracture, which is where the femoral condyle cancellous bone meets the diaphyseal cortical bone, is known as a femoral supracondylar fracture (Andrenelli et al., 2021; Sasun et al., 2022). An inter condylar zone connects the condyles to the articular surfaces and a supracondylar region connects the Meta diaphyseal junction to the condyles in the distal femur (Kochar et al., 2021).

Supracondylar femur fractures are difficult to treat (Somaiya et al., 2022). Indirect stress on a bent knee is the most frequent mechanism and direct trauma from crushing occurs less frequently (Ehlinger et al., 2013). Younger individuals are more likely to participate in high-intensity events like traffic

accidents than older people and persons with osteoporosis are to be involved in low-energy events like falls from a standing position. The three primary types of fractures are explained by the distal femur's structure. Because of the nature of the distal femur, surgical therapy is the sole method for stabilizing the fracture (Purushe et al., 2021). The possibility of non-surgical treatment is relatively uncommon (Ehlinger et al., 2013). Devices using mono axial and poly axial locking plate systems showed high rates of implant union and few implant-related problems. Better than the characteristics of the particular plate design were good reduction, a mechanically sound design and consideration of the regional fracture biology (Kanakaris et al., 2019).

Supracondylar femoral fractures present an orthopaedic surgeon with a difficult task 110 supracondylar fractures that had been treated with traction, casting and various internal fixations were the subject of a 1967 study (Shah and Agashe, 2020). Particularly in the younger patient, who may also have significant soft tissue injury, a thorough examination of the entire limb is required (Nawkhare et al., 2022). Particularly in the younger patient, who may also have significant soft tissue injury, a thorough examination of the entire limb is required (Phansopkar et al., 2020). Particularly in the younger patient, who may also have significant soft tissue injury, a thorough examination of the entire limb is requiring (Purushe et al., 2021).

2. CASE DESCRIPTION

A 17 years old girl student by occupation had complaint of pain and swelling over the left leg inability to bear the weight. Patient was apparently Alright 8 days back. On 4th February at 4 pm she was riding back with her friend back to home after exam. When they were suddenly met with an accident and she fell down as she was conscious and then another person from the accident site took her back to her home by two-wheeler. Then as she had a severe pain and swelling at her lower left leg her father took her to the nearby local hospital after she referred for tertiary hospital. Then her parents brought her to hospital casualty by car at the same night of accidents (after 6 hours) for the treatment. Where they advised her to get admitted and then she was admitted to hospital. In 2 days, investigations were done and X-ray revealed fracture over left lower leg and managed with medications and skeletal traction was applied for 2 day and then operated for it (ORIF) on 7th February and was transferred to the female orthopedic surgery ward on 8/2/2022 and referred to physiotherapy on 9 /2/2022 for the further treatment.

Clinical Finding

Patient had complaint of pain and swelling over lateral aspect of thigh. Tenderness is present over the sutured site grade 2. Scar examination, the total 29 suture were present as shown in Figure1, Range of Motion of Knee flexion, Knee Extension slightly restricted and painful of which the table shows (before and after treatment range was taken). Table 1 shows the results of the evaluation of Manual Muscle Testing (MMT) in the range of motion that was available (evaluation was done before and after treatment). Lower extremity functional scales and barthel index were used as an outcome measure pre and post treatment (Table 2).

Figure 1 Showing the post-operative scar

Follow up and outcome

Table 1 Manual muscle testing and affected side range of motion (pre and post rehabilitation grades)

Movement	Pre-rehab AROM	Pre-rehab PROM	Post-rehab AROM	Post-rehab PROM
Hip Flexion	0-5	0-20	0 -60	0-90
Hip Abduction	0-20	0-30	0-60	0-70
Knee Flexion	0-10	0-15	0-100	0-110
Knee Extension	10-0	15-0	100-0	110-0

Manual Muscle Testing	Pre-rehab grade	Post-rehab grade
Knee Flexor	Weak and painful (according to RIC)	4
Knee Extensor	Weak and painful (according to RIC)	4

Table 2 Outcome measures

Outcome measure	Pre-rehab score	Post-rehab score
Lower Extremity functional scales	3/80	36/80
Barthel Index	35/100	62/100

Timeline of the current episode

A 17-year-old woman was identified as having a supracondylar comminuted distal third femur fracture on the left side on February 4, 2022 and surgery was scheduled for February 7 for an ORIF with plate osteosynthesis (Figures 2). On February 22, 2022, physiotherapy rehabilitation began and the patient was discharged on March 4, 2022.

Figure 2 Showing the post- operative X-ray managed with buttress plate and 6 dynamic compression screws

Investigation

X-ray

The X-ray and MRI reveal that comminuted supracondylar femur fracture (Figure 3). TIMELINE OF CT Report- left knee joint. CT report reveals that comminuted displaced fracture in distal end of femur, extending to involve lateral, medial condyles, inter condylar region and the articular margin.

Figure 3 Showing pre-operative investigation report

Physiotherapy management (post-operatively)

Phase 1 (0-4 week)

The physiotherapist's role includes a significant amount of patient education.

Physical activity, independence and self-management are all important factors in achieving successful rehabilitation outcomes.

Positioning-Foot end elevation to prevent swelling

Prevention of Secondary Complications

Examine the wound for signs of erythema and infection.

Erythema and infection are checked on the wound.

Keep an eye out for symptoms of compartment syndrome in the legs.

Improve Range of Motions

Starting with the hip, knee and ankle, gentle active range of motion exercises are performed.

The goal is to achieve 60-90 degrees of flexion and full extension at the knee joint. The CPM machine also started for 30 minutes to reduce joint stiffness and improve ROM.

To Improve Strength of Muscles

Exercises like gluteal sets or isometrics are advised to maintain the hip musculature's strength. Isometric quadriceps exercise may be advised with the patient lying supine in bed with the knee completely extended.

Static quads, static rams (10 repetitions with 5 sec hold 3 sets gradually progressed to 10 sec holds with 20 repetitions 2 sets) gluteus activation exercises-10 repetitions twice.

Unilateral pelvic bridging starting with 5 repetitions gradually progressed to 10 repetitions.

To strengthen the quadriceps, straight-leg raising exercises are recommended (10 repetitions)

We started strengthening the unaffected side with a half-kilogram weight cuff, in addition upper-limb strengthening with a weight cuff (10 repetitions 3 set)

Phase 2 (4-8 week)

The second phase's goal was to maintain the first phase's results while also increasing the range and strength of the knee and hip joints.

Phase one exercises were resumed, but the number of repetitions was increased to 15.

Heel slides were offered to increase range. Heel slides require the patient to move their lower limbs while keeping their heel on the mattress and flexing their hips and knees. 20 minutes spent sitting by the bed.

Dynamic quad active assisted initially then progress to active (10 repetitions with 3 sec hold 3 sets gradually progressed to 5 sec holds with 20 repetitions 2 sets).

The unaffected side was strengthened with a 1 kg weight cuff and the upper limbs were strengthened with a weight cuff. (10 repetitions 2 set)

In this phase, the process of non-weight bearing ambulation began.

Phase 3 (8-12 week)

Phase 3 was designed to help the individual become self-sufficient.

Hip flexion and hip abduction exercises will be given by increasing repetition.

At this point, the patient will go from not bearing any weight to light weight bearing to complete weight bearing walking.

The patient can stand or shift weight with the use of a walker or crutches a two-point gait supported by a walker or crutch that does not place any weight on the injured limb.

A two-point gait supported by a crutch or walker, without placing any weight on the injured extremity

When it comes to wearing trousers, the patient is instructed to start with the affected extremity and then move on to the unaffected leg.

3. RESULT

The patient was self-sufficient and could carry out her tasks with little oversight. Her NPRS score decreased as well during rehabilitation. And as was discussed above, improvements were noted in the outcome measure.

4. DISCUSSION

In this article, we look at a case involving a female teenager. Who was having problems moving her leg due to a comminuted supracondylar femur fracture maintaining range of motion while enhancing knee flexion and extension was the main objective of physiotherapy treatment (Consigliere et al., 2019). According to Table 2, which compares the pre- and post-scores of the lower extremity functional scale and barthel index, this rehabilitation helped the patient regain the greatest amount of range of motion and to improve their functional skills and helps the patient to achieve independence. Eleven publications described how their patients were treated with continuous passive motion machines (CPMs) in the initial stages of rehabilitation. According to five articles, CPM started for all patients immediately following surgery (Smith et al., 2009). Only light weight-bearing was allowed for the first 8 to 12 weeks after surgery (Smith et al., 2009).

Andrenell et al., (2021) they carried out a study on patients who had just undergone surgery and subjects were randomized to either receive normal physical therapy (VTG) alone or conventional therapy + visuomotor training (CG). In just eight weeks, the participants had 40 one-hour training sessions. The Lower Extremity Functional Scale (LEFS) improved in contrast to the minimum clinically important difference at four weeks after randomization (MCID). After orthopedic surgery, the recovery of lower limb

motor function and pain relief appear to be accelerated by a novel rehabilitation strategy that integrates visuomotor training with traditional physical therapy (Andrenelli et al., 2021).

In one study, the incidence of infection, knee range of motion and distal femur fracture union were evaluated between early and delayed Anderson open type III fracture repair. In total, 70 patients with ages ranging from 20 to 60 had Gustilo Anderson open type III-A fractures. This study found that early ORIF of a distal femur type IIIA fracture is superior to delayed ORIF after first debridement in terms of infection, knee range of motion and union (Hussain et al., 2021).

This article's objective was to assess the clinical effectiveness of employing a medial aided plate and a lateral locked plate in combination to treat intra-articular comminuted distal femoral fractures. Ten cases of distal femur fractures with intra-articular extension were managed using a single anterior midline incision open reduction, internal fixation and dual column plating. An efficient and secure treatment option for intra-articular distal femoral fractures is dual plate fixation using an anterior midline approach with just one incision. Anatomical reduction, proper exposure, straight forward fracture fragment treatment and stable femoral distal fracture repair are only a few advantages (Garg et al., 2021).

5. CONCLUSION

Supracondylar femoral fracture is a difficult to treat condition that can lead to a variety of complications. Individuals with supracondylar femur fractures require the services of a physiotherapist for rehabilitation and management. In this case, the patient was able to achieve functional independence at home and at work because to the rehabilitation regimen's increase in range of motion, muscle strength and endurance as well as the reduction of discomfort and soreness.

Author's contribution

The concept, assessment and evaluation, data collection, analysis and interpretation all benefited most from the work of RZ, PD and PP.

Abbreviations

AROM-Active Range of Motion
PROM-Passive Range of Motion
ORIF-Open Reduction Internal Fixation
CPM-Continuous Passive Machine

Informed consent

The consent was obtained from the patient to prepare the case report.

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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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