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Rehabilitation for femoral retroversion an uncommon phenomenon post supracondylar femur fracture - A case report

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ABSTRACT

The most frequent cause of the malrotation of the femur, which frequently goes undiagnosed, is supracondylar femur fractures. This case describes a 55-year-old man who had a supracondylar femur fracture in his right lower limb. Because of the neglect, the patient has an external rotation deformity. An external rotation deformity was present in the right lower limb. This patient received physiotherapy treatment. The exterior rotation deformity needed to be corrected was the major priority. Exercises with resistance bands, Mulligan Mobilization, and Myofascial Release Technique were used. The Lower Extremity Functional Scale, the SF36 for Quality of Life, and Manual Muscle Testing were only a few of the outcome measures used. When scores were compared before and after physiotherapy, a significant positive effect was seen. The external rotation deformity of the hip can be treated with physiotherapy, which also helps the patient's quality of life. The patient's condition and quality of life were significantly enhanced by the treatment plan we adopted to fix the External Rotation Deformity.

Keywords: Supracondylar fracture, Femoral Retroversion, Case Report, Mulligan Mobilisation, Rehabilitation, Quality of Life.

1. INTRODUCTION

Supracondylar femur fractures are complicated injuries that can be difficult to treat and come with risks (Chachar et al., 2018). These fractures often occur in two distinct groups and are caused by two distinct modes of injury. First, in young adults following high-energy trauma (60 percent males under 40 years; accidents and sports injuries), and second, in the senior population following low-energy trauma (60 percent females, older than 60 years; falls sprains etc.,) (Gill et al., 2017) with a prevalence rate of about 0.4 percent (Kochar et al., 2021). The authors describe the treatment of supracondylar femur fractures with ORIF using indirect reduction techniques (Bolhofner et al., 1996) out of

which ORIF with femur interlock nail and Dynamic Compression Plate was considered to be the most usual method.

A supracondylar fracture with a femoral shaft malrotation of 30° or more resulted in frontal plane malalignment (Gugenheim et al., 2004). Malrotation is the most prevalent cause of malformation, yet usually goes unnoticed in part due to the difficulties of precisely evaluating rotation and the variance in normal anatomy (Lindsey and Krieg, 2011). Due to this, External Rotation deformity is quite common in such patient's. For the treatment of a Supracondylar sfemur fracture with External Rotation deformity, we have used a variety of physiotherapy techniques. Correction of the external rotation deformity was the main focus. Myofascial Release Technique, Myofascial Release Technique of Leg Pull, Stretching of Internal Rotators of Hip, Mulligan Mobilisation, Muscle Energy Technique, Passive and Active Range of Motion activities, and Resistance band Strengthening Exercises were among the interventions employed.

2. PATIENT INFORMATION

This case is reporting a 55-year-old male with right hand dominance who is a farmer by occupation. Patient appeared to be fine until he was involved in a road traffic collision on August 18, 2020, incurring injuries to his head, chest, and right lower limb. The patient was also admitted to the hospital for Sub Arachnoid Haemorrhage and Sub Dural Haemorrhage and was treated conservatively. A supracondylar femur fracture occurred in the patient's right lower limb. On the 27th of August 2020, the patient underwent Open Reduction Internal Fixation with femur interlock nail and Dynamic compression plate under general anaesthesia for which he was given physiotherapy sessions and home exercise program was prescribed before discharge for the same. On 16th of December 2020, patient again got admitted to Acharya Vinoba Bhave Rural Hospital with the chief complaint of pain and stiffness in right knee along with difficulty in weight bearing over the right lower limb since16 months. After sustaining head trauma, the patient has developed generalised weakness. The patient has an external rotation deformity as a result of the patient's neglect. Patient was referred to physiotherapy on 17th December 2020 after which daily sessions were employed. Physiotherapy was discontinued on 28th of March 2021. Home Program was given and follow-up was taken on 26th of June 2021.

3. CLINICAL FINDINGS

The physical examination was carried out after the patient gave his informed consent. On general examination, the patient appeared to be awake, cooperative, and well-oriented in terms of time, location, and person.During the examination, the patient was in supine lying. Pulse rate was 70 beats/min and respiratory rate was 18 breaths/min. On Observation, there was no pallor, icterus, and clubbing, cyanosis, and oedema feet. After that, a systemic examination was performed. On examination of the central nervous system, no abnormalities were discovered; higher mental processes were intact, and the patient was well oriented to time, place, and person. The following were discovered during a musculoskeletal assessment. The following findings were discovered during an examination of the right lower limb. On inspection, a healed suture scar of 8*2 cm, 4*2 cm, was present over the lateral aspect of the right thigh; a healed suture scar of 4*1 cm was evident over the greater trochanter of the right hip. On palpation, the local temperature was normal; there was no tenderness over the thigh or knee; the right lower limb was kept in external rotation, on passive internal rotation the movement was restricted indicating an External Rotation Deformity; there was a 3 cm shortening over the right side; the ROM is listed in table 1. Fig 1 and fig 2 depicts the External rotation deformity of the patient.

Table 1 presents range of motion of the joints.

Joint	Active ROM (in degrees)	Passive ROM (in degrees)
Hip joint		
hip flexion	0 to 90	0 to 100
hip extension	0 to 30	0 to 40
hip abduction	0 to 30	0 to 35
hip adduction	45 to 30	45 to 25
hip internal rotation	0	0
hip external rotation	30 to 45	0 to 45
Knee joint		
knee flexion	0 to 50	0 to 60
knee extension	135 to 50	135 to 40
Ankle joint		
ankle dorsiflexion	0 to 20	0 to 30
ankle plantarflexion	0 to 30	0 to 35

Figure 1 and 2 displays the External rotation deformity of the hip.

Diagnostic assessment

Diagnostic testing was done using MRI, X ray and Lipid Profile. MRI revealed Subdural Subarachnoid Bleed of 3.2 mm thickness. X ray of Lower Limb revealed Comminuted Supracondylar Femur Fracture managed with Interlocking Nail and Dynamic Compression Plate. Without trouble or difficulties, the x-ray was taken. Figure 3 depicts the X-ray after the surgery. The orthopaedic doctors indicated and stated that the deformity is irreversible. Figure 4 represents the X-ray just after bone grafting. The matter was referred to the physiotherapy department. Figure 5 depicts an X-ray following two month follow up. To address the deformity, we employed our physiotherapy techniques, which yielded a very good result.

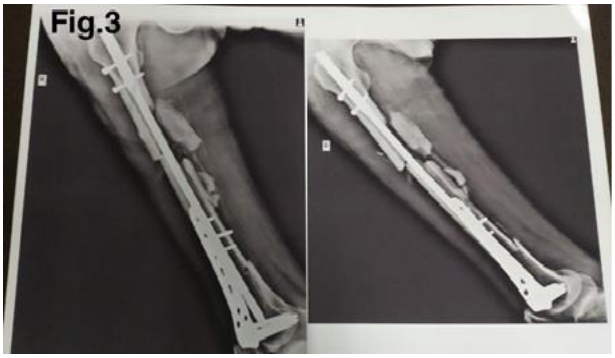

Figure 3 shows an X-ray produced on January 10, 2020, just after surgery

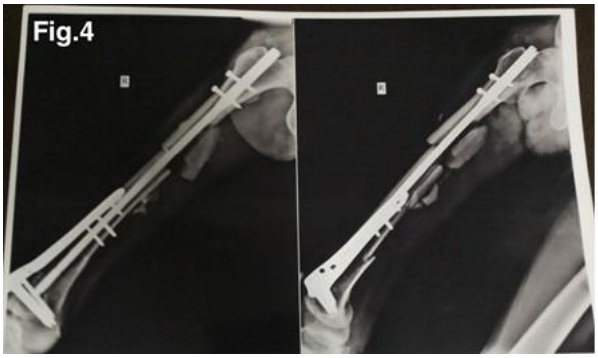

Figure 4 depicts an X-ray taken on October 27, 2020, following Bone Grafting.

Figure 5 illustrates an X-ray taken on January 8, 2020, following a two-month follow-up.

Therapeutic interventions

The therapeutic regimen's main objective is to boost the patient's quality of life by reducing femoral retroversion, which was causing the hip's external rotation deformity. Physiotherapy's short-term aims were to educate the patient, relax tight tissues, improve hip and knee joint range of motion, restore hip joint mobility, and develop muscular strength. Physiotherapy's long-term aims were to maintain the released structures' flexibility, maintain the joint's functional range of motion, enhance muscular endurance, and improve the patient's quality of life by reintroducing him to his regular activities and allowing him to perform his ADL's. We designed a treatment regimen for 12 weeks. Table 2 represents the treatment protocol followed for week 1 to week 4. Table 3 represents the treatment protocol followed for week 5 to week 8. Table 4 represents the treatment protocol followed for week 9 to week 12. We recorded the outcome measures pre- treatment and post – treatment in order to evaluate the effectiveness of our treatment regimen. Table 5 represents the outcome measure scores before and after the treatment.

Table 2 illustrates the treatment protocol for week 1 to 4

Intervention	Number of sets given	Progression
Patient Education	Counselling session is given to patient and his family members.	If the patient has any questions, they will be answered.
Myofascial release along with Cold Therapy	Three sessions are held on alternate days. The hamstrings are the muscle that is released.	Week 1 – 3 sessions alternately given. Week 2 to 4 – 3 sessions were given continuously i.e. each day one session.
Muscle Energy Technique	The technique of reciprocal inhibition was applied. There were four repetitions in each set.	Week1 – 1 set (4 reps) Week 2 – set (6 reps) Week 3 and 4 – 1set (8 reps)
Passive Range of Motion Exercises	The hip and knee range of motion were performed passively. The exercises were completed in three sets of ten repetitions each. Active assisted movements were done in weeks three and four.	Week 1 – 3 sets (10 reps) Week 2 – 3 sets (12 reps) Week 3 and 4 – 3 sets active assisted movements were performed of 10 repetitions each.
Mulligan Mobilisation	Hip Distraction, (MWM) and (SMWM) are given. One set including 10 glides are applied.	Week 1 –1 set (10 glides) Week 2–1 set (10 glides) Week 3 –1 set(12 glides) Week 4 – 1 set (12 glide)
Strengthening Exercises	A weight cuff of half a kilogramme is employed. There were three sets of ten repetitions each.	Week 1 – 3 sets(10 reps) Week 2 – 3 sets(10 reps) Week 3 – 4 sets(10 reps) Week 4 – 4 sets(10 reps)

Table 3 illustrates the treatment protocol for week 5 to 8

Intervention	Number of sets given	Progression
Patient Education	If there are any questions, they are counselled and answered.	If there are any questions, they are counselled and answered.
Muscle Energy Technique	The technique of reciprocal inhibition was applied. There were four repetitions in each set.	Week 5 – 1 set (8 reps) Week 6 – 2 set (8 reps) Week7and8– 2set(8 reps)
Passive Range of Motion Exercises	Active assisted range of motion exercises is performed. 3 sets of 10 repetitions are performed.	Week 5 – 3 sets (10reps) Week 6 – 3 sets (12reps) Week 7 and 8 – 3 sets 15 reps each.
Mulligan Mobilisation	Hip Distraction, (MWM) and (SMWM) are given. One set including 10 to 12 glides are applied.	Week 5 –1 set (12 glides) Week 6 –1 set (12 glides) Week 7 –1 set (12 glides) Week 8 – 1 set (12 glide)
Strengthening Exercises	A one-kilogram weight cuff is utilised. There were three sets of ten repetitions each.	Week 5 –3 sets (10 reps) Week 6 –3 sets (10 reps) Week 7 –4 sets (10 reps) Week 8 –4 sets (10 rep)

Table 4 illustrates the treatment protocol for week 9 to 12

Table 4. illustrates the treatment protocol for week 9 to 12		
Intervention	Number of sets given	Progression
Patient Education	If there are any questions, they are counselled and answered.	If there are any questions, they are counselled and answered.
Muscle Energy Technique	Reciprocal Inhibition Technique was used. One set was given with 4 repetitions.	Week 9 –2 sets (8 reps) Week 10 – 2 sets (8 reps) Week 11 and 12 – 3 sets 8 reps each.
Passive Range of Motion Exercises	Active range of motion exercises is performed. 3 sets of 10 repetitions are performed.	Week 9 –3 sets (10 reps) Week 10 –3 sets(12 reps) Week 11 and 12 – 3 sets of 15 reps each
Mulligan Mobilisation	Hip Distraction, (MWM) and (SMWM) are given. One set including 10 to 12 glides are applied.	Week 9 –1 set (12 glides) Week 10 –1 set(12 glides) Week 11 –1 set (12glides) Week 12 –1 set(12 glides)
Strengthening Exercises	We utilise a 2 kg weight cuff. There were three sets of ten reps each.	Week 9 –3 sets (10 reps) Week 10 –3 sets (10reps) Week 11 –4 sets (10reps) Week 12– 4 sets(10 reps)

Table 5 displays the outcome measures pre- and post-treatment scores.

Outcome measures	Pre- treatment score	Post – treatment score
Lower extremity function scale (LEFS)	24 / 80	50 / 80
SF 36 quality of life scale	30 / 100	60 / 100

Goniometry for ROM	Hip Adduction – 45 to 25 Hip Internal Rotation – 0	Hip Adduction – 45 to 15 Hip Internal Rotation – 0 to 35
Manual muscle testing	Hip muscles strength : 3/5	Hip muscles strength : 4/5

4. DISCUSSION

Femoral retroversion is a rotational or torsional malformation in which the femur (thighbone) turns backward (outward) in reference to the knee. Because the bottom fraction of the femur is attached to the knee, the knee is twisted outward in relation to the hip. Malrotation of the femoral component can cause flexion instability and patellofemoral maltracking, whereas malrotation of the tibial plate might cause a shift in the knee kinematics, leading to patellofemoral maltracking and inconsistencies with the femoral component (Yoon et al., 2021). MFR has been associated with significant improvements in pain, flexibility, and range of motion, as well as depression and quality of life (QOL) (Itotani et al., 2021). To increase hip ROM, physicians have lately begun to use joint mobilization and the Mulligan Concept (MC) mobilization with movement (MWM) approaches (Albertin et al., 2019).

Manheim and Lavett define moderate elongation of muscle contractile elements and inert structures as low-load continuous distraction or pulling of the leg by the therapist in a pattern of circumduction at the hip (Hanten and Chandler, 1994). Soft tissue or joint procedures used in the therapy of musculoskeletal dysfunctions are known as METs. According to Sherrington's law of reciprocal inhibition, hypertonic antagonists can reflexively inhibit their agonist muscle (Faqih et al., 2019). Similarly, passive to active range of motion exercises, as well as strengthening exercises with a weight cuff, are particularly effective in enhancing joint and muscle strength and ROM. The treatment of the external rotation deformity was our main focus.

As a result, we concentrated on developing a protocol that comprised therapies that would aid in the correction of the External Rotation Deformity.

5. CONCLUSION

This case study concludes that various physiotherapy techniques can be used to treat the external rotation deformity of the hip and improve the patient's quality of life. The treatment strategy we used to correct the External Rotation Deformity was quite effective.

Acknowledgement

We thank the patient who co-operated with us during his treatment and consented to publish his case report for future references and our teachers to motivate us to do so.

Authors' contributions

The case study was suggested by PP. KS was the one who took the initiative to conduct the case study. NC aided and directed KS through the research. All the authors read the manuscript before submitting. PP helped in carrying out the treatment regimen and guided throughout the study. The text was co-authored by all of the writers.

Informed consent

The patient provided written and oral informed consent.

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Conflicts of interest

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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