



Post-operative Physiotherapeutic Rehabilitation in a Rare Case of Avulsion Fracture of Tibial Attachment of Posterior Cruciate Ligament: A Case Report

Yukta J. Budhwani¹, Pratik Phansopkar¹, Om C. Wadhokar^{1*} and Neha Chitale¹

¹*Department of Musculoskeletal Physiotherapy, Ravi Nair Physiotherapy College, Datta Meghe Institute of Medical Sciences, Sawangi Meghe, Wardha, Maharashtra, India.*

Authors' contributions

This work was carried out in collaboration among all authors. Author YJB took the, authors PP and OCW assisted in documenting the case and planning treatment, authors YJB, PP and OCW contributed equally in documenting the case report. All authors read and approved the final manuscript.

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Case Report

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ABSTRACT

Avulsion fractures of tibial attachment of PCL are not observed very often. PCL injuries are uncommon; especially those involving tibial aspect/fragment are rare. On the basis of the site of damage: Hyperflexion, Hyperextension, Pretibial trauma, etc. are the considered causes of injury. Injury to the PCL results changes in the kinematics of the knee. Changes in contact pressure have been demonstrated in both the patellofemoral and the medial tibiofemoral compartments after sectioning of the PCL, with significant increase in joint forces. This alteration in the normal kinematics may explain the tendency for the development of degenerative changes in the above mentioned compartments after PCL injury. Physiotherapy plays a very vital role in the treatment and management of such cases. Here, we report a case of a 25year old young man who was admitted to Acharya Vinobha Bhave Rural Hospital (AVBRH), Datta Meghe Institute of Medical Sciences (DMIMS), Deemed to be University (DU), with an alleged history of slip and fall from two-wheeler due to RTA sustaining injury to the right limb, particularly on the knee and further complained of pain & swelling over the knee along with difficulty in walking. On examination and

*Corresponding author: E-mail: wadhokarom@gmail.com;

investigation it was diagnosed as the case of avulsion fracture of tibial attachment of PCL. And so was operated and treated with open reduction and internal fixation (ORIF). Thereafter, was referred to the Physiotherapy Department for further rehabilitation. The purpose of this study is to: Discuss the epidemiology & Operative method. Discuss the physiotherapeutic management and rehabilitation of PCL tears and their outcomes.

Keywords: RTA; pain; antalgic gait; posterior cruciate ligament (PCL); PCL facet; tear; avulsion; fracture.

1. INTRODUCTION

Posterior aspect of tibia and lateral femoral condyle has a ligamentous structure inserted known as posterior cruciate ligament complex [1]. It has two functional bands i.e. anterolateral and the posteromedial band that develop tension as the knee is flexed and extended, respectively [2]. Basically, The primary restraint to the posterior translation of tibia is PCL and a secondary restraint to external rotation is also PCL [3]. PCL injuries' concern has expanded more in the last few years. Even though advances are there controversy are also there concerning aspects of the assessment and treatment of PCL injuries [4].

Rupture of the PCL usually takes place due to direct trauma on the tibia's posterior aspect and on knee with hyperflexion and the foot in plantarflexion. Dashboard injury is found to be the most important cause of PCL injuries at the tibial insertion. When proximal tibia experiences posterior directed force then dashboard injury occurs. Other causes may include hyperextension of the knee or combined rotational forces. Sometimes, this may also involve the tibial component leading into the tibial condyle's avulsion fracture which is less common. In accordance to the rarity of these cases, the management of PCL involving avulsions, have become a topic of discussion [5].

2. CASE PRESENTATION

We report a posterior cruciate ligament tibial condyle's mediated avulsion fracture with the tibial insertion of the PCL wherein, a 25year old young male was brought to AVBRH, complaining of pain & swelling over the knee joint and difficulty in walking with alleged history of slip and fall from a two wheeler sustaining injury to the right lower limb. Pain was sudden in onset and gradually progressive in nature associated with swelling. The patient had no head injury, no seizures, no ENT bleeding or vomiting following

the event. Necessary investigations confirmed that PCL's avulsion fracture at tibial attachment. An open reduction internal fixation (ORIF) was done. Followed by the surgery, limb was immobilised with a long knee brace and was then given reference to Physiotherapy Department for further management.

3. GENERAL EXAMINATION

3.1 On Observation

Patient was in supine lying with both ASIS at same level, Scar of size 1*2cm was present on right knee's anteromedial aspect. Healed abrasion of size 1*3cm was present on right knee's anteromedial aspect. Swelling was present over the knee. No limb length discrepancy was observed.

3.2 On Palpation

Local temperature was not raised. Medial joint tenderness was present. Suprapatellar, Parapatellar and Infrapatellar fullness was present. Anterior drawer test was negative. Posterior drawer test was positive.

3.3 Range of Motion

Range of motion of bilateral upper limb was full.

Bilateral lower limb range of motion is mentioned in Table 1.

Manual Muscle Testing:

Grade 5 strength is present in bilateral upper limb.

Lower limb Strength in mentioned in Table 2.

Special Tests:

- Lachman's test was positive.
- McMurrays test was negative.
- Varus and Valgus test negative.

Table 1. Pre rehab ROM

Joint	Left active (in degrees)	Left passive (in degrees)	Right active (in degrees)	Right passive (in degrees)
Hip				
Flexion	0-115	0-125	0-110	0-115
Extension	0-110	0-115	0-110	0-115
Abduction	0-40	0-45	0-35	0-40
Adduction	40-0	45-0	40-0	45-0
Medial rotation	0-40	0-45	0-40	0-45
Lateral rotation	0-40	0-45	0-40	0-45
Knee				
Flexion	0-120	0-125	0-110	0-115
Extension	125-0	130-0	110-0	115-0
Ankle				
Plantar flexion	0-45	0-50	0-45	0-50
Dorsiflexion	0-15	0-20	0-15	0-20
Inversion	0-30	0-35	0-30	0-35
Eversion	0-20	0-25	0-20	0-25

Timeline

Events	Date
Fall from bike	September 3, 2020
Diagnosed with avulsion fracture of tibial attachment of PCL	September 4, 2020
Open reduction and internal fixation	September 10, 2020
Physiotherapy Management	September 11, 2020

3.4 Medical Management

Surgical management through Open reduction and internal fixation (ORIF) was done.

The patient was started with painkiller, anti-inflammatory and antibiotic drugs.

After which the patient was immobilised by a long knee brace and then was referred to Physiotherapy department for further management.

Post-operative investigation is done to anticipate the recovery (Fig. 1).



Fig. 1. Showing the AP and lateral view of the knee

3.5 Management

Short Term Goals:

- Reduce pain and swelling.
- Increase range of motion and maintain it.
- Increase strength.
- Promote early mobility.
- Enable patient to carry out the ADL'S independently.

Long Term Goals:

- Promote walking.
- Static and dynamic balance.
- Independent ADL'S.
- Ergonomics.

Rehabilitation:

- **Phase 1 (zero to four weeks):**
In the initial phase the main aim was to protect the healing bone and the adjoining soft tissue structures. A long knee brace was given to the patient post the surgery. After a week the brace was unlocked in order to minimise the adverse effects of immobilisation. Early ROM and static exercises for quadriceps and hip along with the calf were started limiting the patellofemoral joint compression and posterior tibial translation. It was ensured that the knee was stabilised by a pillow under it to provide protection against posterior tibial sagging. Therapeutic exercises like Prone flexion and extension passively, Straight Leg Raise, Hip abduction and adduction, Ankle Toe Movement, Stretching for hamstrings, exercise with elastic band for calf, progressing to calf raise with full knee extension in standing [6].

- **Phase 2 (four to twelve weeks):**
In this phase the goal was to Increase Range of flexion, Restore gait pattern and to Continue exercises from phase 1. So, the brace was unlocked for activities and discontinued after 8weeks. Therapeutic Exercises like Wall slides exercises (0-45 degrees), Mini-squats (0-45 degrees), Leg press for hamstrings (0-60 degrees), exercises for hip including flexion, abduction, adduction, extension from neutral with knee fully extended, etc were given till the eighth week, after which, Seated calf raises and Leg press (0-90 degrees) were given till the 12th week [7].

- **Phase 3 (three to six months):**
Here the goal was to maintain the range and strength gained in first two phases and to prevent functional loss, progress functionally and prevent patellofemoral irritation, improve functional strength. Closed kinetic exercises were given in this phase to balance proprioception training and for edurance treadmill training was given.

- **Phase 4 (sixth month- full activity):**
Maintaining strength, endurance and function is the ultimate goal which was achieved by combining the exercise therapy program with the exercises ranging from simple to complex pattern along with activities like running, jumping, jogging, figure of eight, backward walking, etc.

3.6 Post Rehabilitation Assessment

Table 2 showing pre and post rehabilitation muscle strength.

Table 3 showing pre and post Range of motion assessment.

Table 2. Pre and post muscle strength

Muscle tested	Left(pre)	Left(post)	Right(pre)	Right(post)
Hip flexors	4	5	3	5
Hip extensors	4	4	3	4
Hip abductors	4	4	3	5
Knee extensors	4	4	3	4
Knee flexors	4	5	2	5
Ankle dorsi flexors	4	4	4	4
Ankle plantar flexors	4	4	4	4

Table 3. Showing pre and post Range of motion assessment

Joint	Left active (in degrees)	Left passive (in degrees)	Right active (in degrees)	Right passive (in degrees)
Hip				
Flexion	0-120	0-125	0-115	0-125
Extension	0-110	0-115	0-110	0-115
Abduction	0-40	0-45	0-40	0-45
Adduction	40-0	45-0)	40-0	45-0
Medial rotation	0-40	0-45	0-40	0-45
Lateral rotation	0-40	0-45	0-40	0-45
Knee				
Flexion	0-125	0-130	0-125	0-130
Extension	125-0	130-0	125-0	130-0
Ankle				
Plantar flexion	0-45	0-50	0-45	0-50
Dorsi flexion	0-15	0-20	0-15	0-20
Inversion	0-30	0-35	0-30	0-35
Eversion	0-20	0-25	0-20	0-25

4. DISCUSSION

Fradin Mirzatoloei mentioned in a study with posterior dislocation of hip along with PCL avulsion, they started with physical therapy only. Which include quadriceps strengthening and improvement in knee ROM month post physical therapy the patient had 120* of knee ROM with no contracture. Post twelve month the patient showed normal hip and knee ROM with no rotator instability [8]. L Willinger et,al, Conducted a study in which they included the patient with fixation of bony avulsion of PCL by suture bridge and physiotherapy the results of the study showed and significant improvement in the patient condition [9]. Philipp Forkel et, al, Conducted a review study in which arthroscopic fixation of tibial PCL avulsion fracture with suture was treated with physical therapy. The results showed a 6 weeks physical therapy rehabilitation showed a good improvement in the patient's condition [10]. The planned physical therapy programme was helpful in reducing the kinesiophobia in patient [11]. Physiotherapeutic intervention used to improve the overall condition of the patient [12]. Range of motion exercises initially passive then active followed by soft tissue stretching [13]. Early patient education is utmost important and lack of patient awareness can lead to complications [14]. In such pandemic era the follow up and exercise prescription can be done using telephone [15]. Many of the related studies have reflected on similar aspects [16-19].

5. CONCLUSION

In this particular report, we discussed a case of a 25year old young man who was diagnosed with

the Avulsion fracture of the tibial attachment of PCL and was treated with physiotherapy and its interventions post-surgically. The physiotherapeutic rehabilitation was designed in such a manner that it not only helped to improve the patient's ADLs but also improve the strength, endurance and function then even before. Even though the management of PCL tear and its associated fractures are still controversial, physiotherapy showed remarkable progress in our patient.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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