Case report

CONSERVATIVE REHABILITATION OF PARTIAL ANTERIOR CRUCIATE LIGAMENT TEAR FOR BETTER FUNCTIONAL OUTCOME- A CASE REPORT

ABSTRACT

One of the major ligaments in the knee joint is the anterior cruciate ligament (ACL). The ACL is necessary for appropriate knee joint mobility and mechanics. When the ACL is torn, patients may experience issues with their knee's function, as well as instability and the sensation of 'falling away' while walking. The anterior cruciate ligament acts as a main restraint on tibia-to-femur translation (anterior shear). Depending on the knee flexion angle, this function is given to either the anteromedial or posterolateral bundle. The posterolateral bundle is tense when the knee is near to full extension; however, when the knee flexes, the posterolateral bundle loosens and the anteromedial bundle tightens.

We discuss the case of a 32-year-old man who had a history of twisting his leg while jogging, resulting in a partial thickness ACL rupture and mild joint effusion along the periarticular surface of the right knee, which was identified by radiological symptoms and MRI.

Keywords: partial anterior cruciate ligament tear, joint effusion, periarticular surface, twisting, and conservative management.

INTRODUCTION

Anterior cruciate ligament (ACL) damage is a frequent traumatic injury that occurs during sports, accounting for approximately half of all knee ligament injuries(1). A partial ACL rupture is a common form of ACL damage, with 10 to 27 percent of isolated ACL lesions having this pattern.(2) There are three reasons to save these leftovers for the patient: biomechanical, circulatory, and proprioceptive benefits. A good grade fibre acts as graft protection during the healing process.(3) The vascularization of the ACL augmentation may be aided by the presence of periligamentous and endoligamentous arteries in the native ACL tissue. The remaining mechanoreceptors in the leftover ACL fibers may have a proprioceptive role.(4)

A partial ACL tear occurs when only a piece of the ACL is injured. The Anteromedial and Posterolateral bundles are found in the normal ACL. Only one of the two bundles was ripped in a partial damage(5). As a result, the second bundle is undamaged. Many patients with a partial ACL rupture may be able to resume their previous level of daily activities without experiencing buckling, instability, or giving away(6). However, recovering from an injury might take months, and completing the rehabilitation regimen is also required(7).

The concept of repairing only the ligament fibers that have been torn is considerably newer(8). A partial ACL tear is defined by a positive Lachman's test and a positive anterior drawer test with a hard endpoint, as well as modest differential laxity, MRI findings of hyper-intensity within the ACL fibers, and arthroscopic findings of a partial tear(9).

PATIENT INFORMATION

We present a case of a 32-year old male with a supposed history of twisting of leg while running dated on 03/09/2021, who came to Acharya Vinobha Bhave Rural Hospital (AVBRH) on 05/09/2021, with the complaints of pain and swelling over right knee. He also gave the history that pain was sudden in onset, gradually progressive in nature and dull aching type which got aggravated while walking and relieved by taking rest and medication. Patient is bio-engineer by occupation. Patient started running 40 days prior to injury. The necessary investigations such as radiological findings, MRI and special tests confirmed that he is suffering by partial ACL tear. Then, he was managed conservatively with brace,

analgesic medication and rest. The patient was prescribed with medication such as: vitamin-C tablet, pantoprazole, enzoflam tablet, limcee tab. , seroace-D tab. , pazom 40 tab. , proveron 50mg tab. , thymozen forte tab. The patient also gives the family history of father having hypertension and mother has thyroid issues. He was then referred to physiotherapy for further management. While walking the patient has the limping type of gait with stride and step length reduced (step length: 19.5cm and stride length: 31cm).

TABLE 1: Grading system of partial ACL ruptures. (3)

Table 1: Grading system of partial ACL ruptures.

Grade	Definition
1	Intact ACL sheet with haemorrhage of the synovial ACL tissue.
2	Ruptured synovial ACL sheet without extrusion of ACL tissue.
3	Ruptured synovial ACL sheet with extrusion of ACL tissue.
4	Partial rupture of one ACL bundle with 25-50% remaining ACL structure cave: in case of a two bundle partial ACL rupture, the percentage of the more injured bundle is used for classification.
5	Partial rupture of one ACL bundle with 10-25% remaining ACL structure cave: in case of a Two bundle partial ACL rupture, the percentage of the more injured bundle is used for classification.

TABLE 2: Timelines of events

A timeline of events related to patient's injury and treatment

Event	Dates
Twisting of leg while running	September 03, 2021
Conservatively managed by medication and rest	September 05, 2021
Confirmed Diagnosis with partial ACL tear on right knee	September 11, 2021
Referred to physiotherapy for further management	September 12, 2021

TABLE 2: Timelines of events

CLINICAL FINDINGS

In a supine posture, both shoulders were at the same level, he was inspected for his attitude. The right leg was abducted and slightly externally rotated, and the knee was slightly flexed with a cushion supporting the knee and ankle in plantarflexion. The right knee joint was seen to be swollen. Tenderness was palpable above the right knee joint's medial joint line (Grade 2). On the NPRS, he was likewise in pain with a score of six.

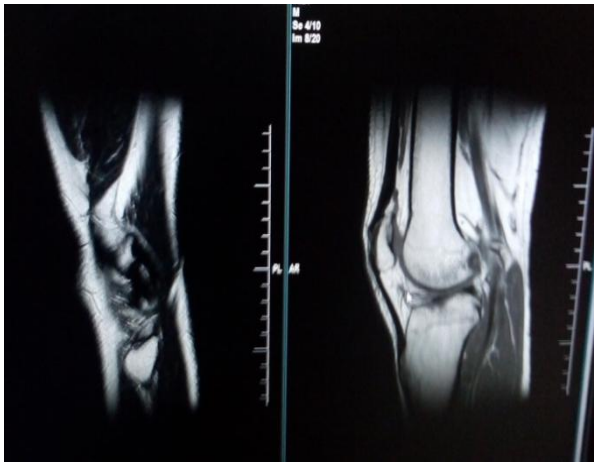
TABLE 3: Isometric Strength on date of examination (MMT)

Muscles	Right	Left
	Hip	
Flexors	3++	4
Extensors	3-	4+
Abductors	4+	4+
Adductors	4+	4+
	Knee	
Flexors	2++	4
Extensors	2-+	4
	Ankle	
Plantar flexors	3+	4+
Dorsi flexors	3+	4+
Invertors	3+	4+
Evertors	3+	4+

TABLE 4: Range of motion on date of examination: 12/09/2021

Joint	Right active	Right passive	Left active	Left passive
Hip				
Flexion	0- 100°	0-105°	0-115°	0-120°
Extension	0-15°	0-20°	0-25°	0-30°
Abduction	0-35°	0-40°	0-40°	0-45°
Medial rotation	0-25°	0-30°	0-40°	0-45°
Lateral rotation	0-25°	0-30°	0-40°	0-45°
Knee				
Flexion	0-90°	0-95°	0-120°	0-125°
Extension	90-0°	95-0°	120-0°	0-125°
Ankle				
Plantar flexion	0-25°	0-30°	0-45°	0-50°
Dorsi flexion	0-10°	0-15°	0-15	0-20°
Inversion	0-25°	0-30°	0-30°	0-35°
Eversion	0-05°	0-10°	0-10°	0-15°

FIG.1& 2:MRI lateral view of knee joint



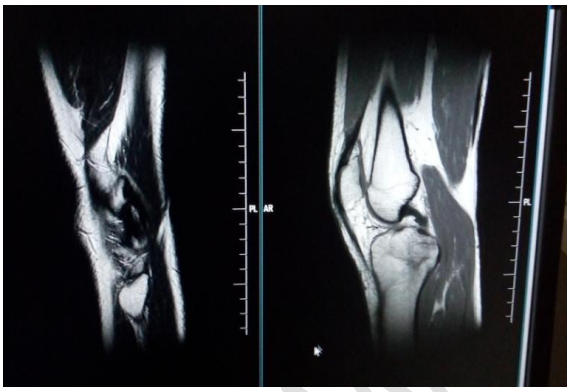


FIG.3: X-ray lateral view of knee joint

FIG.4: Patient knee joint after 10 days of physiotherapy

DIAGNOSTIC ASSESSMENT

A conservative management was given, patient was suggested to use knee brace for stability of the joint and was given analgesic for reducing pain and was referred to physiotherapy. The diagnosis was confirmed by MRI and radiological images. The special tests such as Lachman's test, anterior drawer test and varus stress test were positive.

The radiological impression was not as clear as it is a soft tissue injury and could not be seen in the X-RAY film.

MRI impression reveals T2/STIR hyperintensity in medial and lateral condyle of tibia s/o bony contusion. T2/PD fatsat hyperintensity along the ACL involving more than 50% of fibers with fraying along its tibial attachment s/o partial tear. Minimal joint effusion along the periarticular surface. The isometric strength and ROM was assessed and was found to be reduced, which is gradually improving with the phases of physiotherapy.

THERAPEUTIC INTERVATION:

Physiotherapy management was started early to avoid further loss of function in long run. The goal is to achieve maximum functional level without opting for any invasive procedure.

Phase 1: Day 1-7 (Immediate rehabilitation)

Goals: To reduce pain and swelling around joint, Increase range of motion of flexion extension, Make patient independent.Brace was given to patient in extension.Weight bearing was avoided and support of walking aids was given.Exercises were started like 1)ankle pump (10 rep), 2)complete knee extension is given passively by applying overpressure, 3)on day 5^{th} active assisted knee flexion upto 90°, 4)straight leg raise exercise with 5 rep of flexion, abduction and adduction, 5)isometric exercises of quadriceps and stretching of hamstring, 6) Continuous Passive Motion: - 0-45/50 degrees to increase ROM.

Phase 2: week 2-4 (Early rehabilitation)

Goals: Keep constant passive knee extension, slowly improve knee flexion range of motion, reduce bulging and discomfort, Increase Mobility for patella.

Week 2 management:-

Transitional hinged brace was used to allow the movements while protecting the joint. It was discontinued when the patient tolerates the condition at 2-3 wk. Walking aid was given to avoid weight bearing.Full ROM was maintained passively and 4-5 times stretching exercises were done regularly.Static quadriceps training for upto 10 rep, straight leg raise exercises for 5 rep, extension of 90-40 degrees, hamstring curls, patellar mobilization were started. To reduce swelling Cryotherapy was given for 20 minute and elevation of limb above heart level was suggested.

Week 3:-

Range of Motion (ROM) were progressed to resume arc of motion and elongation of muscles. The previous training program of 2nd week was progressed, with the goal of increasing passive ROM up to 0-115 degrees, static bicycling for range of motion and endurance program for eccentric quadriceps 40- 1000 , resistance exercise were started for progression (begin with 1 kg and addition of half kg each week). Walking aids were removed and full weight bearing was started. Weight shifts were performed to progress proprioception drills and neuromuscular regime.

Phase 3: 4^{th} – 10^{th} week (Ambulation period)

Goals : Maintain full range of motion of knee (0-125 degrees), Swelling Control Strengthen the lower extremity, Improve muscular control, proprioception, neural control and balance, Preserve limb attitude and its functionality, Range of Motion: Self-ROM (four to 5 reps everyday with the help of non - affected leg to maintain functionality, focus on maintaining 0° extension passively.

Week 4:

Exercises: Improve static strengthening program, extension of knee 90-400 (10 reps),Hamstrings strengthening (10 reps) and movement of hip towards and away from the body (10 reps).bending of hip and extension (10 reps), Bicycling to increase cardiac fitness and to improve range of motion. 30-degree wall squats for 10 reps were continued withby standing on one leg with help of support, Lateral lunges(10 reps), front steps-ups(10 reps) for proprioception and balance training.

Weeks 6:

All above exercises were continued. Side lunges (5 reps), side and front steps ups (5 reps), with agility drill and balance on tilt boards.

Week 8:

All above exercises will continue with basic polymetric.

Isokinetic exercise to increase the range of motion from 120 to 140 degrees. Bicycling for endurance training.

Week 10:

All above exercises will continue with basic polymetric. Isokinetic exercise to increase the ROM up to 120-140 degrees. Bicycling for endurance training along with stretching.

Phase 4: 10th to 16th week (Advance activity)

Goals : Strengthen the lower extremity normally, Increase power of muscle and the ability to endure, Increase muscular stability, Selected sport specific drills should be performed, Exercise: training should be continued with gradually increase in intensity.

Phase 5: Resume to running specific training week 16th-22nd

Goals: Slowly comeback to all sports which should be unrestricted, Reach and maintain the power and endurance Neuromuscular control should be normalized Advancement of skill program.

Exercises: exercises for strengthening should be maintained, muscular and neural control program.

Carry-out lower extremity drills, to improve speed and sudden change in direction training, training should be sport-specific.

TABLE 5: Progression in Isometric Strength week wise

ISOMETRIC STRENGHTHING EXERCISES (MMT) FOR RIGHT AFFECTED KNEE

Muscles	Week 1-3	Week 4-10	Week 10-22
Hip			
Flexors	3+	3+	4+
Extensors	3+	4-	4+
Abductors	3+	4-	4+
Adductors	3+	4-	4+
Knee			
Flexors	3-	3+	4-
Extensors	2+	3-	4-
Ankle			
Plantar flexors	3+	4-	4+
Dorsi flexors	3+	4-	4+
Invertors	4-	4+	4+
Evertors	4-	4+	4+

TABLE 6: Progression in Range of Motion week wise

RANGE OF MOTION FOR AFFECTED RIGHT KNEE

	Week 1-3		Week4-10		Week10-22	
Joint	**Active**	**Passive**	**Active**	**Passive**	**Active**	**Passive**
Hip						
Flexors	0-105°	0-110°	0-110°	0-115°	0-110°	0-115°
Extensors	0-20°	0-25°	0-20°	0-25°	0-20°	0-25°
Abductors	0-35°	0-40°	0-35°	0-40°	0-40°	0-45°
Medial rotation	0-25°	0-30°	0-30°	0-35°	0-30°	0-35°
Lateral rotation	0-25°	0-30°	0-30°	0-35°	0-30°	0-35°
Knee						
Flexor	0-95°	0-100°	0-100°	0-105°	0-110°	0-115°
Extensor	95-0°	100-0°	100-0°	105-0°	110-0°	115-0°
Ankle						
Plantar flexors	0-30°	0-35°	0-30°	0-35°	0-35°	0-40°
Dorsi flexors	0-10°	0-15°	0-10°	0-15°	0-15°	0-20°
Invertors	0-25°	0-30°	0-25°	0-30°	0-25°	0-30°
Evertors	0-05°	0-10°	0-10°	0-15°	0-10°	0-15°

DISCUSSION

According to recent studies, the most relevant findings is that young active patients with partial ACL tears are managed non-operatively. Nonoperative management has its own set of indications and outcomes, although the usual patient profile has shifted [6]. With improved lifespan, patient expectations for long-term sports involvement have risen enormously. Furthermore, patients are becoming increasingly aware of how much time they will be out of work or away from their sport, as well as how these time durations may differ between nonoperative and surgical treatments. [2]. In the studies according to some case reports it is seen that a patient of partial ACL tear may after a time lap progress into complete ACL tear even after physiotherapy management so, the case presented by us is find to reconstruct the torn fibers of the ligament without any arthroplasty. Arthroplasty is the current method given by studies in which if there is partial ACL tear the surgeon does the suturing of the ligament. When the surgical treatment is selected, the ACL is reconstructed by using tissues from somewhere else in the body. This process takes time and is yet to show a good result therefore, the patient treated by conservative management is slower in progression but shows the good result. Invasive

CONCLUSION

Patient showed a great co-operation during the therapeutic period and now the patient is able to maintain his consistency in his running practice. The outcome measures of physical therapy intervention progressed him in an enhanced athlete with return to his sport.

Informed Consent:

Written and Oral informed consent was obtained from the participant included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

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