

# Post Operative Physiotherapy Rehabilitation In Case Of Tibial Spine Fracture With ACL Avulsion:- A CASE STUDY

**Komal Chauhan, Dr. Sandip Parekh, Hiral Parmar**

MPT Scholar, Parul Institute of Physiotherapy,  
Parul University Vadodara Gujarat 390019  
*chauhkomal8600@gmail.com*

Assistant Professor, Parul Institute of Physiotherapy,  
Parul University Vadodara Gujarat 390019  
*sandip.parekh28008@paruluniversity.ac.in*

MPT Scholar, Parul Institute of Physiotherapy,  
Parul University Vadodara Gujarat 390019  
*hiral.parmaar@gmail.com*

**Abstract:** Introduction: Avulsion fractures of tibial spine, leading to interruption of anterior cruciate ligament. These fractures are also known as tibial eminence fractures or ACL avulsion fractures. These injuries are usually seen in children aged between 8-13 years and are usually sports related injuries occurring especially during cycling and skiing. In adults these injuries are usually related to high energy trauma usually road traffic accidents. Clinical Findings: After taking proper informed consent patient was examined in lying position. Affected lower limb in full extension, swelling was present over the knee joint. Scar mark was present on the anterior aspect of leg extending from just below the tibial tubercle to mid shaft region. On palpation, local temperature was not raised. Tenderness was present with grade 2. On neurologic assessment it was found to be normal. Discussion: In this case report we are discussing a case of a 20 year old male with fracture of tibial spine fracture with ACL avulsion managed with. The primary goal of physiotherapy management was to prevent secondary complications and make the patient independent for which rehabilitation protocol was planned which included Ankle pumping exercises, Muscle setting of quadriceps, hamstrings, hip abductors, Multiple angle isometric of hamstring, Prone knee bending, Patellar mobilization, Maitland mobilization, Grade 3 joint mobilization, Closed chain exercises include bridging, partial squats, step ups, step downs, heel raises. Conclusion: physiotherapy plays an important role in rehabilitation of patient with tibial spine fracture.

**Keywords:** Avulsion fractures, Anterior Cruciate Ligament, physiotherapy

## INTRODUCTION:

Avulsion fractures of tibial spine, leading to interruption of anterior cruciate ligament. These fractures are also known as tibial eminence fractures or ACL avulsion fractures. These injuries are usually seen in children aged between 8-13 years and are usually sports related injuries occurring especially during cycling and skiing. In adults these injuries are usually related to high energy trauma usually road traffic accidents.[1] ACL injuries can occur from both contact and noncontact mechanisms. The common contact mechanism is a direct blow to lateral side of knee leading in valgus force of knee. The common noncontact mechanism is rotational mechanism in which external rotation of tibia occurs on the planted foot. The second most common noncontact mechanism is forceful hyperextension of the knee[2]. The ACL is put at high danger during both varus and internal rotation moments. When the knee is externally rotated typical ACL injury occurs. The second most common injury occur in athlete when the knee is in 10-30° of flexion that is the knee is in valgus position when the athlete takes off from the planted foot and internally rotates with the aim of immediately changing direction [3]. Poncet in 1875 first described tibial eminence fracture as an avulsion fracture of ACL from its attachment [4]. Since tibial spine avulsion of ACL is high velocity injury in adult, there may be associated substance injury of ACL. A meticulous inspection of ACL fibers on MRI would give an idea about the substance injury.

This may be a deciding factor in decision making; either fixation of fragment is feasible or a formal ACL reconstruction has to be performed [5]. CT-scan helps us to assess the size and shape of the fragment and also to identify the breaking up and comminution of the fragment [6].

## Patient information:-

A 20 year old male residence of vadodara visited orthopaedics department who referred him for physiotherapy came with complained of pain and difficulty in performing knee movement as well as unable to bear weight on the affected extremity. He presented history on 20th injury to his right leg after which is started experiencing pain, swelling, increase temperature and inability to bear weight on his right leg. There was no history of bleeding at that time. Car driver called ambulance. His friend took him to ashirvad hospital through ambulance. Their investigation was done in the form of X-ray and diagnosed right tibial spine avulsion fracture with ACL tear and advised for information. But he denied for operation because he want to consult with his family doctor. On same day his friend took him to arihant hospital. Their doctor aspirate the blood and prescribed medication and knee brace and advised for operation after 1 week. During that period pain was present, he can walk with partial weight bearing. His relative suggested for PSH. On 23rd octomber,2021 he came to PSH through car and here again investigation was done in the form of X-ray and CT scan and

diagnosed of right tibial spine avulsion fracture with ACL tear. On 28th Oct, surgery was done in the form of arthroscopic ACL avulsion fixation through pin and two loop wire at right tibia. After 2 days he get discharge and advised for physiotherapy treatment at home. After 1.5 month he visited to orthopaedic and advised for physiotherapy treatment. On 16th December physiotherapy treatment was started in the form of ankle toe movement, static glutei, static quadriceps, knee ROM, patellar mobilization and continuous passive movement.

**Clinical findings:-**

The patient was examined in supine lying position after taking written consent from the patient. involved lower limb in full extension, swelling was present over the knee joint. On the anterior aspect of leg extending from just below the tibial tubercle to mid shaft region, scar was present. On palpation, local temperature was not increased. Tenderness was present with grade 2 above the scar. On neurologic assessment it was found to be normal.

**IMAGING**



*Figure 1 x-ray of patient with right tibial shine fracture with ACL avulsion*

Range of motion  
Range of motion of bilateral upper limb was full.

**Table 1: pre-rehab ROM**

	Right	
	Active	Passive
Hip flexion	0°-90°	0°-110°
Hip abduction	0°-50°	0°-55°
Hip adduction	50°-0°	55°-0°
Knee flexion	0°-25°	0°-28°
Knee extension	25°-0°	28°-0°

*Manual muscle testing:-  
Table 2: pre muscle strength*

	Grade
Hip flexors	3
Hip abductors	3
Hip adductors	2
Knee flexors	3
Knee extensors	3

**Timeline**

Events	Date
Fall from bike	20 <sup>th</sup> October, 2021
Diagnosed with avulsionfractures with tibial spine	20 <sup>th</sup> October, 2021
Open reduction andinternal fixation usingintramedullary nailing	28 <sup>th</sup> October, 2021
Physiotherapy management	16 <sup>th</sup> December ,2021

**Management:-**

0-4 weeks:- maximum protection phase goal of physiotherapy interventions during the early phase was to decrease pain, swelling, and then gently begin with an activity. Physiotherapy was started early with the brace on beginning from day one in the state of immobilization. Patient was encouraged to perform toe movements of affected leg, ten repetitions for several times in a day.

5-8 weeks:- moderate protection/ controlled motion phase swelling was there at this time. There was presence of pain and was managed via use of ice pack for 10- 15 minutes. It had helped to induce relaxation and decrease pain. In this phase we mainly concentrate on increasing ROM of hip, knee along with improving flexibility and most crucial, the strengthening of muscles of lower extremity of operated side. Rehabilitation goals during the intermediate phase are to attain full ROM (full knee extension and 1250 to 1350 flexion) improve lower extremity strength and muscular endurance; ambulate without assistive device and protective brace using a normal gait pattern; continue to improve neuromuscular control, proprioception, and balance.

**Treatment protocol for intermediate phase:**

- Minimal pain and swelling
- Crotherapy for 15 minutes
- Full active knee extension (no extensor lag)
- Ankle pumping exercises
- Muscle setting of quadriceps, hamstrings, hip abductors

- Multiple angle isometric of hamstring
- Prone knee bending
- Patellar mobilization
- Maitland mobilization
- Grade 3 joint mobilization
- Closed chain exercises include bridging, partial squats, step ups, step downs, heel raises.
- Open chain exercises for knee extension/flexion against light-grade elastic resistance.
- Posterior capsule stretch of knee
- Tendon walking
- One leg standing
- Cycling

9-12 weeks:- Known as minimum protection The advanced phase of rehabilitation and preparation for a return to a preinjury level of activity begins at about 9 to 24 weeks postoperatively. The main aim is to further increase strength, endurance, and power; further enhance neuromuscular control and participate in progressively demanding functional activities.

Treatment protocol for minimum protection phase:

- No knee pain or joint effusion
- Full, active knee ROM
- Progressive resisted exercise with an emphasis on eccentric training.
- Closed chain strengthening
- Plyometrics
- Return to activity

**Table 3:** post muscle strength

	Grade
Hip flexors	4 <sup>+</sup>
Hip abductors	4 <sup>+</sup>
Hip adductors	4 <sup>+</sup>
Knee flexors	4 <sup>+</sup>
Knee extensors	4 <sup>+</sup>

**Table 4:** post-rehab ROM

	Right	
	Active	Passive
Hip flexion	0°-120°	0°-120°
Hip abduction	0°-55°	0°-55°
Hip adduction	50°-0°	55°-0°
Knee flexion	0°-110°	0°-120°
Knee extension	110°-0°	120°-0°

## DISCUSSION:

In this case report we are discussing a case of a 20 year old male with fracture of tibial spine fracture with ACL avulsion managed with. The primary goal of physiotherapy management was to prevent secondary complications and make the patient independent for which rehabilitation protocol was planned which included Ankle pumping exercises, Muscle setting of quadriceps, hamstrings, hip abductors, Multiple angle isometric of hamstring, Prone knee bending, Patellar mobilization, Maitland mobilization, Grade 3 joint mobilization, Closed chain exercises include bridging, partial squats, step ups, step downs, heel raises. Poncet in 1875 first described tibial eminence fracture as an avulsion fracture of ACL from its attachment [4]. The incidence of tibial spine fractures in adults is increasing, and they are associated with high velocity injury. Mitchel and colleagues reported that 59% of their displaced tibial spine avulsion fractures ACL injuries.[7] Recently, a number of studies has been conducted to better understand these injuries. As displaced tibial spine tend ACL to become lax, the patient complains with instability. At present, these injuries are considered as ACL injury similar rather than the bony injuries. Thus restoring of ligament tension has become the primary aim of treatment.[7]

## CONCLUSION:

Tibial spine fracture with ACL injury are common but should be manage properly as both the structure as it aids in providing stability of the knee joint. ACL prevent anterior translation of tibia so after surgical management physiotherapy should be advised to prevent secondary complications.

## CONSENT:

As per international standard or university standard, patient written consent has been collected and preserved by the author.

## REFERENCES:-

- [1]. Vikram Sapre and Vaibhav Bagaria Tibial Spine Avulsion Fractures: Current Concepts and Technical Note on Arthroscopic Techniques Used in Management of These Injuries
- [2]. Olsen OE, Myklebust G, Engebretsen L, Bahr R. Injury mechanisms for anterior cruciate ligament injuries in team handball: a systematic video analysis. Am J Sports Med 2004 Jun;32(4):1002-12. doi: 10.1177/0363546503261724. PMID: 15150050.
- [3]. MEYERS MH, McKEEVER FM. Fracture of the intercondylar eminence of the tibia. J Bone Joint Surg Am. 1959 Mar;41-A(2):209-20; discussion 220-2. PMID: 13630956.
- [4]. Oostvogel HJ, Klasen HJ, Reddingius RE. Fractures of the intercondylar eminence in children and adolescents. Arch Orthop Trauma Surg. 1988;107(4):242-7. doi: 10.1007/BF00449677.

PMID: 3408321

- [5]. Waters PM, Skaggs DL, Flynn JM. Rockwood and Wilkins fractures in children. Lippincott Williams & Wilkins; 2019 Feb 11.
- [6]. Skak SV, Jensen TT, Poulsen TD, Stürup J. Epidemiology of knee injuries in children. Acta Orthop Scand. 1987 Feb;58(1):78-81. doi: 10.3109/17453678709146348. PMID: 3577744.
- [7]. Amit Joshi, Singh Nagmani, Bibek Basukala Tibial Spine Avulsion of Anterior Cruciate Ligament: Current trend and Management 2019 july.

### Authors Profile



AUTHOR 1 received the bachelor of physiotherapy from parul institute of physiotherapy in 2020. She now pursuing MPT degree in musculoskeletal and sport specialization in parul institute of physiotherapy.



Author 2 PhD, Assistant professor, parul institute of physiotherapy, parul university



AUTHOR 3 received the bachelor of physiotherapy from parul institute of physiotherapy in 2020. She now pursuing MPT degree in musculoskeletal and sport specialization in parul institute of physiotherapy