International Journal of Research and Review
Volume 11; Issue: 4; April 2024
Website: www.ijrrjournal.com
Case Series *E-ISSN: 2349-9788; P-ISSN: 2454-2237*

Anterior Cruciate Ligament Reconstruction in Tibial Eminence Avulsion Fracture: A Case Series

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DOI: https://doi.org/10.52403/ijrr.20240403

ABSTRACT

Introduction: Ruptures of the anterior cruciate ligament (ACL) are common orthopedic injuries, especially among patients participating in sports. Anterior cruciate ligament (ACL) avulsion fracture or tibial eminence avulsion fracture is a type of avulsion fracture of the knee. This article describes several cases of ACL rupture management with eminence avulsion.
Case report: This case series describes 3 cases of ACL tear with eminence avulsion. The first patient was a 31-year-old female with right knee pain since 6 months ago after a traumatic fall from a motorcycle. The second patient, a 16-year-old girl with a history of bending her legs inward during exercise. The third patient is a 49-year-old female with a history of accidents and complaints of knee pain. All three patients found ACL tear accompanied by an avulsion fracture on the tibial eminence and then undergo ACL reconstruction.
Discussion: The most common mechanism of trauma, which leads to a disruption of ACL, is a trauma forcing the knee in hyperextension combined with valgus-external rotation. At times, these lesions can occur in adults; in this instance, the main cause is high-energy trauma, such as road accidents. Based on case reports and previous research, the management approach in this case is still debatable in children and adults and requires a specific approach in each case.
Conclusion: The management of ACL reconstruction in patients with tibial eminence avulsion involvement is still a challenge for orthopedic surgeon. Given the rarer cases, a different approach is needed in young and adult cases. Each case requires proper management to improve the patient's functional outcome and their quality of life.

Keywords: anterior cruciate ligament reconstruction, avulsion fracture, tibial eminence avulsion

INTRODUCTION

Injuries to the Anterior Cruciate Ligament (ACL) are among the most prevalent knee injuries seen in orthopedic practice, frequently necessitating surgery to restore joint stability and function. Despite the fact that the majority of ACL tears manifest as mid-substance tears, tibial eminence avulsion fractures present a unique challenge in a subset of cases. These avulsions, which are characterized by the detachment of the ACL from its tibial attachment site, represent a unique clinical scenario requiring special surgical considerations.1

The incidence of tibial eminence avulsion fractures in ACL injuries is uncommon, accounting for only 3-5% of all ACL ruptures. This rarity, in conjunction with the involved complex anatomy and

biomechanics, makes the diagnosis and treatment of these cases particularly challenging. Surgeons confronted with these injuries must navigate a delicate balance between addressing both the ACL rupture and the avulsed tibial fragment to achieve optimal outcomes in terms of joint stability, range of motion, and long-term function. The ACL reconstruction in ACL rupture and tibial eminence avulsion at the challenges surgeons face when dealing with this unique injury pattern.2 These challenges include balancing the treatment of the ACL rupture and addressing the avulsed tibial fragment while striving for optimal outcomes in terms of joint stability, range of motion, and long-term function.3

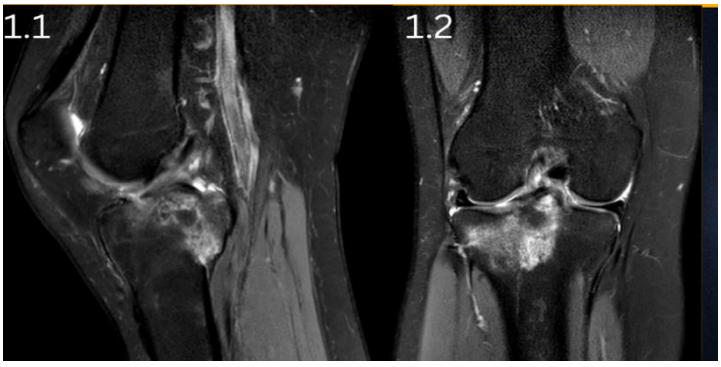
The purpose of this case report is to illuminate the complexities of ACL reconstruction in the context of tibial eminence avulsion. We detail the preoperative evaluation, surgical technique, postoperative care, and rehabilitation strategies for a patient with this specific injury pattern. In addition, we discuss the difficulties, potential complications, and outcomes associated with this uncommon injury, providing orthopedic surgeons with valuable insights for managing similar cases.

We aim to improve patient outcomes and quality of life by contributing to the collective knowledge of orthopedic surgeons and enhancing their ability to effectively treat ACL ruptures with tibial eminence avulsion

CASE REPORT

Case 1

The subject of this case is a 31-year-old male who presented at our orthopedic clinic following a traumatic knee injury sustained in a motorcycle accident. The patient's medical history was unremarkable, with no previous knee injuries or significant medical conditions. He reported intense right knee pain, swelling, and an inability to bear weight on the injured limb immediately after the accident. The patient exhibited a noticeable anterior drawer sign and a positive Lachman test, indicating anterior instability of the knee. The range of motion was severely limited due to pain and instability. Radiographic and magnetic resonance imaging (MRI) evaluation revealed a complete anterior cruciate ligament (ACL) rupture associated with a tibial eminence avulsion fracture



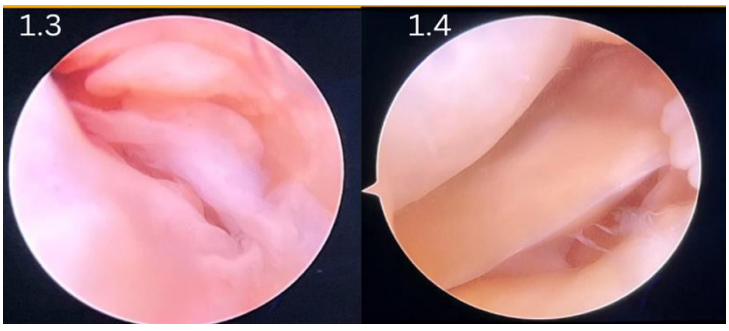


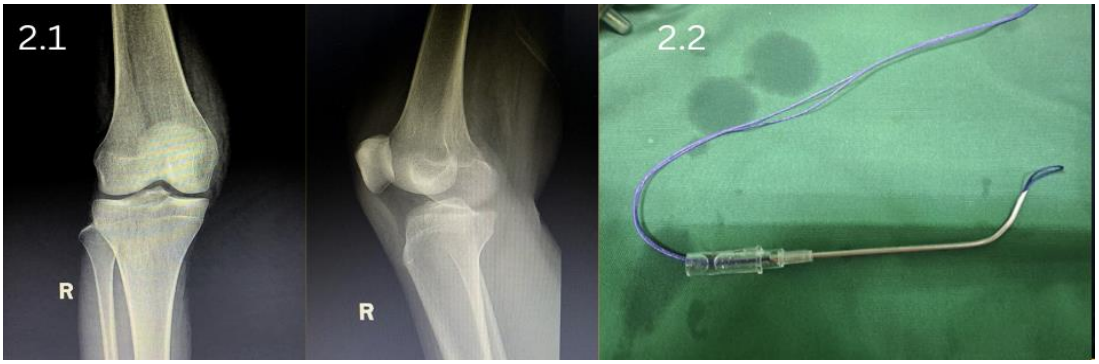
Figure 1. Sagittal and Coronal View of Patient 1 Right Knee shows ACL rupture with tibial eminence avulsion (1.1 and 1.2), Patient then undergo knee arthroscopy surgery with complete ACL rupture and other soft tissue structures were normal (1.3 and 1.4). Post operative x-ray was done to evaluate the knee alignment and screw position (1.5)

The patient underwent arthroscopic ACL reconstruction with excision of the tibial eminence avulsion fragment. The surgery was performed using a peroneus longus double bundle autograft. Arthroscopic examination confirmed the complete rupture of the ACL, and the avulsed fragment was excise and secured the graft to its anatomical position using bioabsorbable screws. The procedure was completed without complications.

Case 2

The subject of this case is a 16-year-old male, an active athlete, who presented to our orthopedic clinic with a history of a traumatic knee injury sustained during a rigorous exercise routine. The patient had no prior history of knee injuries or significant medical conditions. She reported immediate pain and instability in his right knee following an inward knee flexion during a dynamic exercise session. Further evaluation was completed by physician's. Clinical examination immediately raised suspicion of an ACL injury by the presence of a positive anterior drawer sign and Lachman's test. Radiographs and magnetic resonance imaging (MRI) were promptly non-completed tear of the ACL being visualized. The radiographs revealed tibial eminence fracture with no other bony abnormality were readily identifiable.

The patient underwent arthroscopic ACL reconstruction with reduction of the tibial eminence avulsion fragment. A peroneus longus autograft was used for the ACL reconstruction. Arthroscopic examination confirmed the non-complete ACL rupture, and non-complete avulsed of tibial fragment then it was carefully reduced and secured to its anatomical position. Subsequently, the peroneus longus tendon autograft was employed to reconstruct the torn ACL. The procedure was carried out without any intraoperative complications.



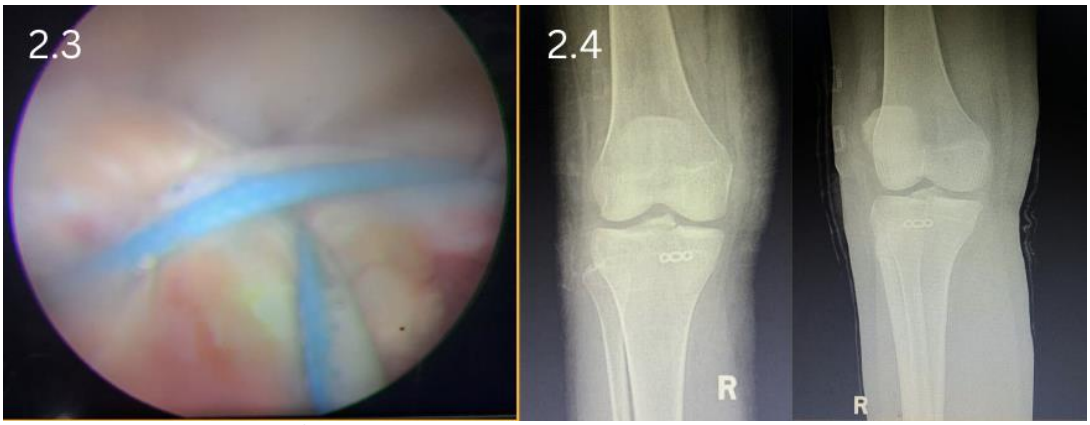


Figure 2. X-Ray AP and Lateral view of Patient 2 Right Knee shows tibial eminence avulsion in coalition with ACL rupture patient (2.1 and 2.2), Patient then undergo knee arthroscopy surgery with non-complete ACL rupture (2.3), Post operative x-ray was done to evaluate the knee alignment (2.4)

Case 3

The subject of this case is a 49-year-old female, who presented to orthopedic clinic with a history of a traumatic knee injury after motorcycle accident. She reported pain and instability in his left knee. Clinical examination immediately raised suspicion of an ACL injury by the presence of a hyperextension of the knee, positive anterior drawer sign and Lachman's test. Radiographs and magnetic resonance imaging (MRI) were promptly completed tear of the ACL being visualized with tibial eminence avulsion.

The patient then undergo arthroscopic ACL reconstruction of ACL rupture with the tibial eminence avulsion fragment. A peroneus longus autograft was used for the ACL reconstruction. Arthroscopic examination confirmed the complete ACL rupture, and avulsed of tibial eminence fragment then it was carefully reduced and secured to its anatomical position. This procedure performed without any intraoperative complications.

Figure 3. Preoperative clinical evaluation shows knee instability and hyperextension due to complete ACL rupture (3.1). Intra operative evaluation per arthroscopy shows complete ACL rupture with tibial eminence avulsion (3.2). Post operative evaluation performed to check knee stability (3.3). Post operative x-ray was done to evaluate the knee alignment and wire position (3.4)

DISCUSSION

Case presented to illustrate the clinical challenges associated with ACL ruptures accompanied by tibial eminence avulsion fractures. ACL injuries commonly cause patients to experience acute knee pain, edema, and reduced range of motion. But tibial eminence avulsions' special characteristics frequently make diagnosis difficult. In our case, a combination of clinical assessment, magnetic resonance imaging (MRI), and careful study of the patient's history was necessary for a correct diagnosis.1 In ACL damage situations, it is essential for orthopedic surgeons to maintain a high index of suspicion for tibial eminence avulsions because a misdiagnosis could lead to subpar treatment results.[2]

The surgical management of ACL ruptures with tibial eminence avulsion fractures necessitates a meticulous approach. In our case, we opted for arthroscopic ACL reconstruction with tibial eminence avulsion fragment fixation. This technique allowed us to address both components of the injury effectively. We utilized bioabsorbable screws to secure the avulsed fragment in its anatomical position, followed by ACL reconstruction using autograft tissue. The surgical strategy aimed to restore joint stability and optimize functional outcomes. It is worth noting that the choice of graft material and fixation methods may vary based on patient factors and surgeon preference, making individualized treatment plans essential.[3,4]

Postoperative care and rehabilitation play pivotal roles in achieving favorable outcomes. After surgery, our patient underwent a carefully tailored rehabilitation program.[5] Early range of motion exercises, followed by progressive strengthening and proprioceptive training, were key components of the rehabilitation protocol. Close monitoring of the patient's progress and milestones was essential to ensure the safe return to pre-injury activities. Successful rehabilitation relies on patient compliance and adherence to prescribed exercises, emphasizing the importance of patient education and engagement in the recovery process.[6,7]

The clinical outcomes of ACL reconstruction in ACL ruptures with tibial eminence avulsion are multifaceted. In our case, the patient experienced significant improvement in knee stability and range of motion. The achievement of near-normal functional capacity was a promising outcome. However, it is crucial to acknowledge the potential complications associated with this procedure, such as graft failure, infection, or loss of reduction of the avulsed fragment. Regular follow-up and vigilant monitoring are essential to detect and manage complications promptly.[8,9]

The case of ACL reconstruction in a patient with ACL rupture accompanied by tibial eminence avulsion has shed light on the complexities and nuances of managing this unique clinical scenario. The presented case underscores the challenges in diagnosis, the importance of surgical technique selection, and the pivotal role of postoperative care and rehabilitation. Looking forward, further research and the accumulation of clinical experience will continue to refine our understanding and treatment protocols for ACL ruptures with tibial eminence avulsion. This case contributes valuable insights to the existing body of knowledge, ultimately enhancing patient care and outcomes in these relatively rare but clinically significant cases.

CONCLUSION

ACL reconstruction in cases of ACL rupture with tibial eminence avulsion presents a

unique set of challenges and considerations. Successful outcomes depend on a multidisciplinary approach, including the surgeon's expertise and patient collaboration. Further research and the accumulation of clinical experience in managing such cases will contribute to refining treatment protocols and enhancing patient care in the future.

Declaration by Authors

Acknowledgement: None
Source of Funding: None
Conflict of Interest: The authors declare no conflict of interest.

REFERENCES

1. J.M. Uhorchak, P.M. White 3rd, T.J. Scully, Type III-A tibial fracture associated with simultaneous anterior cruciate ligament avulsion from the femoral origin, Am. J. Sports Med. 21 (Sep-Oct (5)) (1993) 758–761.
2. R.A. Agha, M.R. Borrelli, R. Farwana, The SCARE 2018 statement: updating consensus Surgical CAse REport (SCARE) guidelines, Int. J. Surg. 60 (Dec) (2018) 132–136.
3. M.H. Meyers, F.M. Mckeever, Fractures of the intercondylar eminence of the tibia, J. Bone Joint Surg. Am. 41–A (Mar (2)) (1959) 209–220, discussion 220-2. J.F. Griffith, G.E. Antonio, C.W. Tong, C.K. Ming, Cruciate ligament avulsion fractures, Arthroscopy 20 (Oct (8)) (2004) 803–812.
4. A.C. Johnson, J.D. Wyatt, G. Treme, A.J. Veitch, Incidence of associated knee injury in pediatric tibial eminence fractures, J. Knee Surg. 27 (Jun (3)) (2014) 215–219.
5. F. Chotel, S. Raux, F. Accadbled, R. Gouron, C. Pfirrmann, J. Bérard, R. Seil, Cartilaginous tibial eminence fractures in children: which recommendations for management of this new entity? Knee Surg. Sports Traumatol. Arthrosc. 24 (Mar (3)) (2016) 688–696.
6. F.1 Chotel, R. Seil, P. Greiner, M.M. Chaker, J. Berard, S. Raux, The difficult diagnosis of cartilaginous tibial eminence fractures in young children, Knee Surg. Sports Traumatol. Arthrosc. 22 (Jul (7)) (2014) 1511–1516.
7. H. Mizuta, K. Kubota, M. Shiraishi, Y. Otsuka, N. Nagamoto, K. Takagi, The conservative treatment of complete tears of the anterior cruciate ligament in skeletally immature patients, J. Bone Joint Surg. Br. 77 (1995) 890–894.
8. M.S. Kocher, J.T. Smith, B.J. Zoric, B. Lee, L.J. Micheli, Transphyseal anterior cruciate ligament reconstruction in skeletally immature pubescent adolescents, J. Bone Joint Surg. Am. 89 (2007) 2632–2639.

How to cite this article: Armansyah Nur Dewantara, I Gusti Ngurah Wien Aryana, Febyan. Anterior cruciate ligament reconstruction in tibial eminence avulsion fracture: a case series. *International Journal of Research and Review*. 2024; 11(4): 22-27. DOI: *10.52403/ijrr.20240403*

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