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CASE REPORT

COMBINED TIBIAL AVULSION OF ANTERIOR AND POSTERIOR CRUCIATE LIGAMENT OF KNEE JOINT: A CASE REPORT

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ABSTRACT: Avulsion fractures of tibial intercondylar eminence is a rare injury mainly affecting the pediatric population between 8 to 14 and is even rarer in adults with very few cases reported in literature. It occurs with high energy trauma in adults and may be associated with knee dislocation and neurovascular injuries. A 30 yr old male presented with a painful swollen left knee, limited knee motion, and difficulty with weight bearing after a history of fall from motorcycle. Imaging revealed Type 3 Meyers and McKeever tibial spine avulsion of both ACL and PCL. A two staged surgical procedure was performed: (a) Arthroscopic reduction and fixation with headed cannulated screw of ACL tibial fragment; (b) ORIF with headed cannulated screw of PCL tibial fragment via posterior approach to knee. Good functional outcome and early mobilization was achieved. Diagnostic arthroscopic helps to evaluate the condition of the cruciate ligaments as well as fracture bed. Simultaneously fixation of ACL fragment with cannulated screw can be done, which is a simpler procedure to suture fixation. ORIF of PCL fragment in a staged manner has helped to address the injury in a detailed manner achieving goal of anatomical reduction and early mobilization.
KEYWORDS: Tibial spine avulsion, ACL, PCL, arthroscopy, knee, instability.

INTRODUCTION: Anterior cruciate ligament (ACL) tibial avulsion fractures are relatively uncommon injuries with an incidence of approximately 3 per 100, 000/year (Only 1–5% of ACL injuries in adults). Posterior cruciate ligament (PCL) injuries reportedly have an incidence that varies between 3% of all ligament injuries in the general population and 37% of all ligament injuries in an emergency room trauma setting.

These injuries (PCL) typically occur at the tibial attachment and may encompass either a small area at the posterior region of the attachment or a large area that extends anteriorly and outside of the PCL attachment.

There is a 38.3% incidence of PCL tears in acute knee injuries, and 56.5% of these PCL injuries occur in multiple trauma Patients. Of these PCL injuries, 45.9% are combined Anterior cruciate ligament (ACL) –PCL tears, and 41.2% Are PCL–posterolateral corner tears. Only 3% of acute PCL injuries seen in the trauma center are isolated for all acute knee injuries.

But avulsion fractures of tibial intercondylar eminence is a rare injury mainly affecting the pediatric population between 8 to 14 and is even rarer in adults with very few cases reported in literature.

It occurs with high energy trauma in adults and may be associated with knee dislocation and neurovascular injuries.

Mechanism of combined ACL + PCL Injuries: Hyperextension can injure the ACL, and this mechanism can also tear the posterior cruciate ligament (PCL).

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A contact mechanism can disrupt the ACL; this typically involves a force to the lateral knee with a resultant valgus load while the foot is planted. Contact injuries may increase the likelihood of damage to the collateral ligaments, PCL, or extensor mechanism.

History and clinical Evaluation: A 30 yrs old male presented with a painful swollen left knee (hemarthrosis), limited knee motion, and difficulty with weight bearing after a history of fall from motorcycle. Examination revealed abnormal anterior and posterior translation with greater than 10 mm of pathologic posterior tibial displacement. The Lachman test and pivot shift phenomenon were positive. Aspiration of the knee demonstrated hemarthrosis.

Imaging: Evaluation with plain radiography, CT scan and MRI suggested – Type 3 Meyers and McKeever tibial spine avulsion of both ACL and PCL.

Figure A: Preoperative radiographs of left knee in AP and Lateral views.

Figure A

Figure B: Showing CT Scan with 3D reconstruction of left knee.

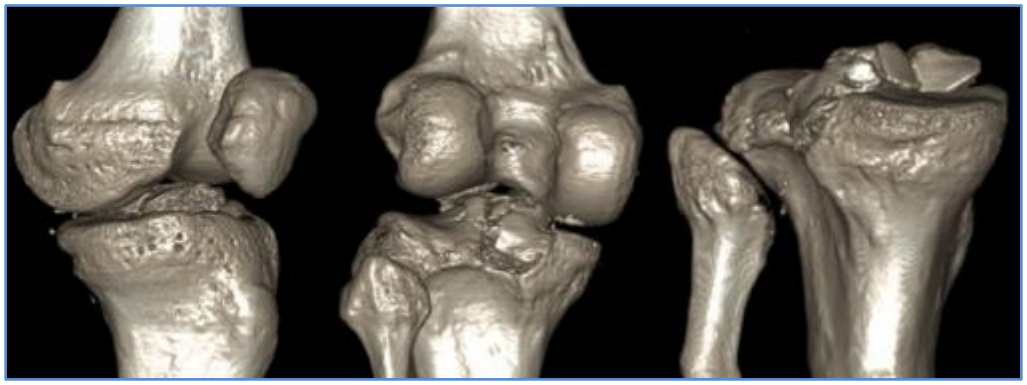

Figure B

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Figure C: Showing CT Scan (Plain) of left knee.

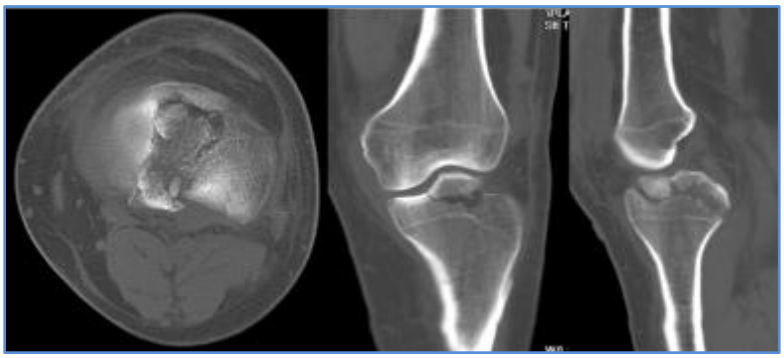

Figure C

Figure D: Showing coronal and sagittal views of MRI of left knee.

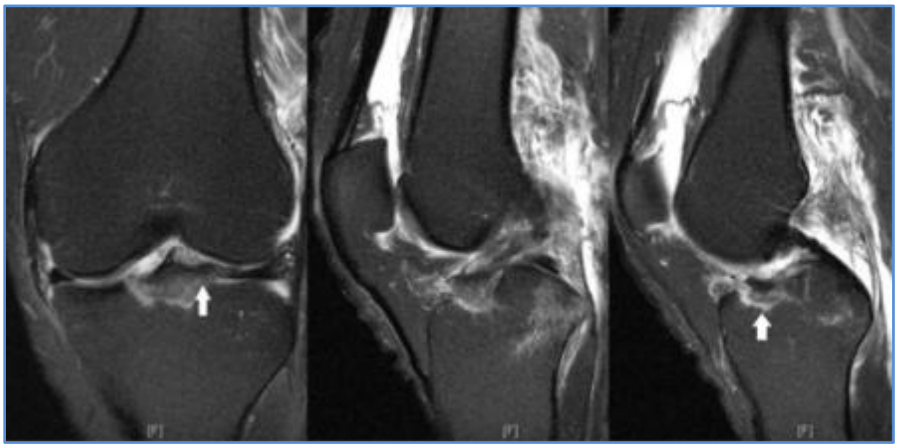

Figure D

Surgical Intervention: A two staged procedure was performed:

1. Arthroscopic reduction and fixation with headed cannulated screw of ACL tibial fragment:

- Diagnostic arthroscopy was performed.
- The fat pad is debrided to ensure that adequate visualization of the fracture was obtained. The fracture piece was elevated and evaluated for comminution.
- Fracture bed was debrided of any hematoma that would impede reduction with curettes and an arthroscopic shaver.
- The anterior horns of the medial and lateral menisci were evaluated to ensure they would not block reduction.
- Reduction was performed with the knee in a semi-extended position
- A Kirschner wire was inserted percutaneously to assist in holding the reduction
- Once the guide wire was inserted and its position checked radiographically, a cannulated drill was used to drill the outer cortex and a cannulated headed compression screw was inserted over the wire.

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Figure E: Showing intraoperative arthroscopic view.

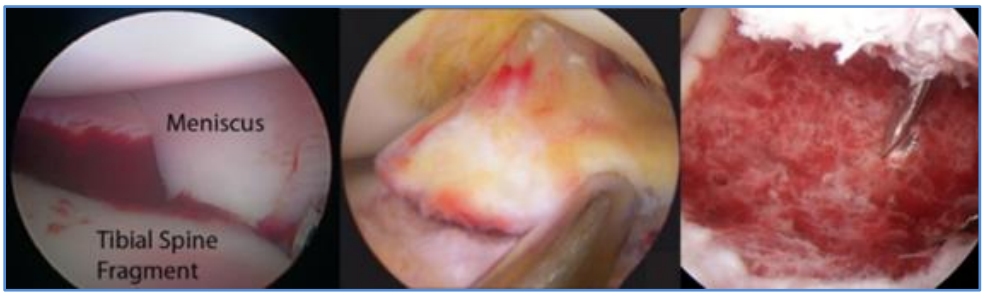

Figure E

Figure F: Showing arthroscopically fixed screw for ACL fragment.

Figure F

1. ORIF with headed cannulated screw of PCL tibial fragment via posterior approach to knee (Described by Brackett and Osgood; Putti; Abbott and Carpenter).

Figure G: Showing intraoperative and postoperative radiographs of screw fixation of PCL fragment by ORIF.

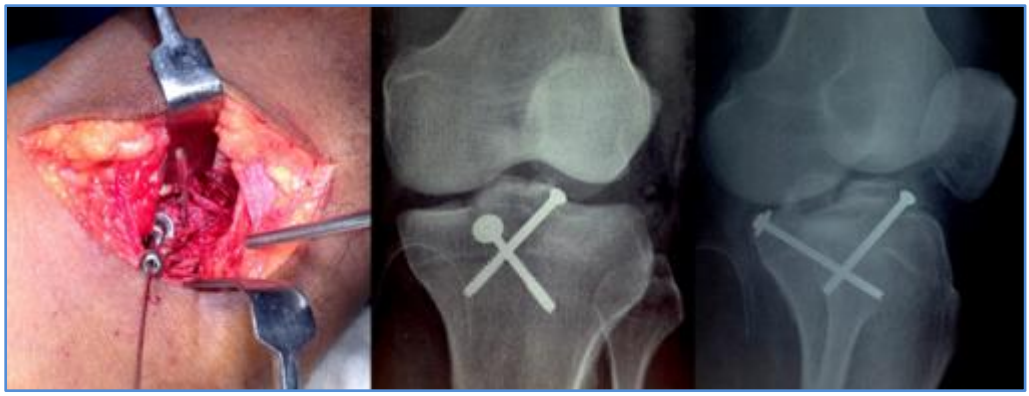

Figure G

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OUTCOME:

Figure H: 6 months follow-up radiographs and ROM of knee.

Figure H

- Patient was able to return to sedentary work by 2 weeks post-operatively.
- At 6 weeks postoperatively, he was capable of partial weight bearing as tolerated in the hinged knee brace (When locked in extension).
- Patient returned to limited sports and moderate labor by 9 months postoperatively wearing a functional knee brace.

DISCUSSION: Tibial spine avulsion has been equated to midsubstance rupture of cruciate ligament by many authors as the subchondral bone fails and elongation of ligaments occur.

Hence lead to various treatment modalities from ORIF to arthroscopic reduction and fixation with variety of methods to complete reconstruction of ligaments.

Rubinstein et al found the posterior drawer test in conjunction with palpating anterior tibial step-off to be 96% accurate, 90% sensitive, and 99% specific, with an inter observer grade agreement of 81% in diagnosing PCL insufficiency.

Plain radiographs should include standing antero-posterior Views of both knees, 30-degree antero-posterior axial Views of both patellas, and intercondylar notch views.

The fracture is best seen on lateral and notch views, CT scanning allow refined definition of the fracture anatomy.

Meyers and McKeever classification is based on the degree of displacement and is widely used to classify fractures and to guide treatment. Zaricznyj later modified this classification to include a fourth type— comminuted fractures of the tibial spine

Magnetic resonance imaging has a high diagnostic accuracy in acute PCL injuries and is helpful in assessing tear location in the cruciate and collateral ligaments.

MRI of acute PCL injuries has been found to be 99% to 100% sensitive and specific in documenting acute PCL tears.

The goal of treatment of a tibial spine avulsion is anatomic reduction.

Modern treatment is based on fracture type. Fractures that are able to be reduced can be treated closed. Hinged and displaced fractures that do not reduce require open or arthroscopic reduction with internal fixation.

Meniscal or intermeniscal ligament entrapment under the displaced tibial eminence fragment can be common and may be a rationale for considering arthroscopic or open reduction in displaced tibial spine fractures

Closed treatment is typically used for type 1 fractures and for type 2 or 3 fractures that can be successfully reduced closed. Aspiration of the hematoma is performed first, and closed reduction is achieved by placement of the knee in full extension or 20 to 30 degrees of flexion.

Intervention in window period of 14 to 21 days post-acute injury is optimum for repair and augment of torn ligaments as well as anatomical repair of meniscal fragments and avulsion fractures.

The surgeon should select either an arthroscopic or an open technique for tibial avulsion fractures based on experience.

In general, it is relatively straightforward to use an arthroscopic approach for cannulated screw fixation for ACL tibial avulsion fractures.

For PCL tibial avulsions especially with small bony ragments that require a combination of sutures and bone fixation, an open posterior tibial approach is favored by many authors because it provides good exposure and allows for secure fixation.

CONCLUSION: Most studies have shown that the overall prognosis of tibial eminence fractures is good to excellent if satisfactory reduc-tion is achieved.

But poor results may occur after eminence fractures associated with unrecognized injuries to the collateral ligaments.

Diagnostic arthroscopic helps to evaluate the condition of the cruciate ligaments as well as fracture bed. Simultaneously fixation of ACL fragment with cannulated screw can be done, which is a simpler procedure to suture fixation.

ORIF of PCL fragment in a staged manner has helped to address the injury in a detailed manner achieving goal of anatomical reduction and early mobilization.

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