Avulsion fracture of anterior cruciate ligament from femoral attachment in a skeletally mature patient – A case report

Raghu Nagaraj[1], Tarun Bali[2], Malhar N Kumar[3]

ABSTRACT

Introduction: Avulsion of femoral attachment of anterior cruciate ligament (ACL) has been described in skeletally immature population, but has not been reported till now in adults with mature skeleton. This injury occurs due to high energy trauma. **Case report**: We are presenting a rare case of avulsion fracture of femoral attachment of ACL in a skeletally mature 20-year adult male. Patient presented to us 4 weeks following the injury and the injury had been missed in the earlier evaluation performed elsewhere. Due to the delay in presentation, the bone fragment reattachment was not technically feasible and the instability was managed with arthroscopic ACL reconstruction using Bone-Patellar tendon-Bone graft fixed with biodegradable interference screws. **Conclusion**: Avulsion injuries occur more often on the side of the tibial eminence and most surgeons are familiar with these injuries. Femoral avulsion injury has not been reported in adults till now. It is important to be aware of femoral side avulsions also since early diagnosis offers the possibility of reattachment of avulsed bone fragment. Delayed diagnosis leads to retraction and softening/resorption of the avulsed bone fragment and requires ACL reconstruction with patellar tendon or hamstring grafts.

Keywords: ACL injury; ACL reconstruction; anterior cruciate ligament tear; bony avulsion of ACL

[1]Consultant Orthopedic and Arthroscopic Surgeon, [2]Fellow in Arthroscopy and Sports Medicine, [3]Consultant Orthopedic Surgeon
HOSMAT Hospital, McGrath Road, Bangalore, India,
Corresponding author mail: docmnkumar@gmail.com

Conflict of interest: None

INTRODUCTION

Femoral avulsions of the ACL have been reported infrequently in skeletally immature individuals where the ligaments are strong and the physical insertion of ACL is weak. Nine cases have been reported in skeletally

immature patients till now, with youngest patient being 3yrs of age and oldest being 13 yrs. [1-11] There has been no report of femoral attachment avulsion in skeletally mature individuals. We are reporting a case of avulsion of the femoral attachment of the ACL in a 20 year old male patient. To the best of our knowledge, this injury has not been reported before.

CASE REPORT

A 20-yr old male patient presented to the hospital with pain, swelling, instability of right knee joint and difficulty in walking for 4 weeks following a fall from a two-wheeler. Patient had fallen down from a motor-cycle and landed on the pavement on his right knee resulting in varus and internal rotation injury to the right knee joint.

Knee examination revealed positive patellar tap, positive Lachmann test with soft end point. Range of motion was 10 degrees to 120 degrees. Plain radiographs of the knee joint showed a loose intra – articular bone fragment (Figure 1 and 2).

Figure 1 - Antero-posterior view of knee joint

Figure 2 – Lateral view of knee joint showing loose Intra articular bone fragment

MRI of right knee showed avulsion tear of ACL ligament from the femoral side (figure 3) and CT scan right knee showed fracture of bony attachment of ACL on femoral side (2.0 x 1.5 cm), lying in intercondylar notch (figure 4).

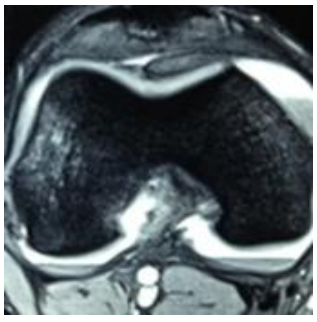

Figure 3 - MRI (T2-weighted) axial section showing avulsion of ACL attachment at the femoral side

Figure 4 - CT scan coronal view showing fracture of medial wall of lateral condyle of femur at the attachment of ACL

Pivot shift test was positive on examination under anesthesia. On arthroscopic evaluation, lateral notch was empty with a crater on posterior and medial wall of lateral femoral condyle (the site of attachment site of ACL) (figure 5). A displaced bone fragment was found in the area of the intercondylar notch and it was attached to the avulsed end of the ACL. A longitudinal tear of the posterior third of the lateral meniscus was also noted during arthroscopy.

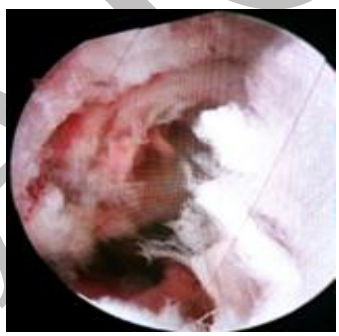

Figure 5 – Arthroscopic finding of empty notch with crater on the medial wall of lateral condyle at the ACL attachment site

As the injury was one month old and bone fragment was lying loose in the intercondylar notch, it was decided to proceed with ACL reconstruction using bone-patellar tendon-bone graft (BPTB) with removal of avulsed bone piece and preparation of lateral condylar area (notchplasty) (figure 6).

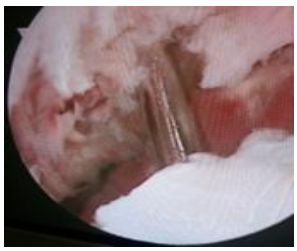

Figure 6 - Arthroscopic guide wire insertion for ACL reconstruction by trans-tibial technique

DISCUSSION

Most of reported cases of femoral avulsions of ACL have been due to high velocity trauma such as skiing. [1-10] Attitude of the limb at the time of injury suggests the knee was subjected to flexion, internal rotation and varus stresses, resulting in avulsion of femoral attachment of ACL with posterior horn tear of lateral meniscus. In many of the previously reported cases, the injury was considered to be a tibial-end avulsion in the pre-operative phase. Femoral-end avulsion was recognized only intra-operatively leading to difficulties in decision making regarding management, often resulting in two surgical procedures. [1-10]

It is recommended that bony avulsion of ACL attachment should be fixed as soon as possible (via arthrotomy or arthroscopy) using pullout sutures after curettage of the floor of the crater. Our patient had presented one month following injury with significant displacement of the bone fragment towards the intercondylar notch. Therefore, it was decided to proceed with arthroscopic removal of displaced bone piece and ACL reconstruction with BPTB and bio-interference screws through trans-tibial technique. Patient was mobilized on the day following the operation. At 3 months follow-up, Lachmann test was negative and the range of motion was 0-135 degrees.

CONCLUSION

To the best of our knowledge, this is the first report of femoral-end ACL avulsion in a skeletally mature, adult patient. Patients presenting with ACL injury with loose bone piece lying in the notch may pose difficulties in diagnosis and management. Surgeons are more familiar with tibial side avulsions of the ACL but femoral side avulsion may be missed due to lack of familiarity with this rare injury. It is essential to maintain high index of suspicion

about this type of injury which can also happen in adult, skeletally mature patients.

These patients can be managed early with open /arthroscopy assisted fixation of the avulsed fragment to achieve bony union. In cases where the location of the injury is unclear, CT scan may be useful in the detection of femoral-end avulsion and in better pre-operative planning. Delayed diagnosis may preclude the possibility of reattachment of bony fragment due to retraction and softening/resorption of the fragment.

REFERENCES

1. Bengtson H and Giangarra .C, "Osteochondral avulsion fracture of the Anterior Cruciate Ligament femoral origin in a 10 year old child : a case report," Journal of Athletic Training, vol. 46, no. 4, pp. 451–455, 2011
2. Bradley G.W, Shives .T.C , and Samuelson .K.M , "Ligament injuries in the knees of children,"Journal of Bone and Joint Surgery—Series A, vol. 61, no. 4, pp. 588–591, 1979.
3. Corso S.J and Whipple .T.L, "Avulsion of the femoral attachment of the anterior cruciate ligament in a 3-year-old boy," Arthroscopy, vol. 12, no. 1, pp. 95–98, 1996.
4. Eady J.L , Cardenas .C.D , and Sopa .D , "Avulsion of the femoral attachment of the anterior cruciate ligament in a seven-year-old child. A case report," Journal of Bone and Joint Surgery—Series A, vol. 64, no. 9, pp. 1376–1378, 1982.
5. Kawate K, Fujisawa. Y , Yajima. H , Sugimoto. K , Tomita.Y , and Takakura .Y , "Avulsion of the cartilaginous femoral origin of the anterior cruciate ligament in a three-year-old child: a case report with a thirteen-year follow-up," Journal of Bone and Joint Surgery—Series A, vol. 86, no. 8, pp. 1787–1792, 2004
6. Lakshmanan P, Sharma .A, Dixit .V , Lyons .K , and Fairclough .J.A , "Avulsion of anterior cruciate ligament from femoral condyle: an unusual case report and a review of the literature,"Knee Surgery, Sports Traumatology, Arthroscopy, vol. 14, no. 11, pp. 1176–1179, 2006
7. Robinson S.C and Driscoll .S.E , "Simultaneous osteochondral avulsion of the femoral and tibial insertions of the anterior cruciate

ligament. Report of a case in a thirteen-year-old boy," Journal of Bone and Joint Surgery—Series A, vol. 63, no. 8, pp. 1342–1343, 1981

8. Tohyama H Kutsumi .K, and Yasuda .K, "Avulsion fracture at the femoral attachment of the anterior cruciate ligament after intercondylar eminence fracture of the tibia," American Journal of Sports Medicine, vol. 30, no. 2, pp. 279–282, 200
9. Uhorchak J.M , White .P.M, and Scully .T.J, "Type III-A tibial fracture associated with simultaneous anterior cruciate ligament avulsion from the femoral origin," American Journal of Sports Medicine, vol. 21, no. 5, pp. 758–761, 1993.
10. Wasilewski . S.A and Frankl . U, "Osteochondral avulsion fracture of femoral insertion of anterior cruciate ligament. Case report and review of literature," American Journal of Sports Medicine, vol. 20, no. 2, pp. 224–226, 1992.