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Case Report

Osteochondral femoral anterior cruciate ligament avulsion in a 13 years old patient: a case report

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ABSTRACT

Anterior cruciate ligament (ACL) injury, is one of the most common injuries occurring in young active patients. Regarding pediatric group, ACL avulsion is the most common form of injury in contrast to adults, whose injury pattern is described as mid-substance injury. Tibial avulsion of ACL is the most common form of avulsion in pediatrics, while osteochondral femoral avulsion is considered rare entity. Our case report is about a 13-year-old pediatric male patient, sustained injury over his right knee during soccer game in March 2023. Immediately after injury, patient described having giving way, associated with severe pain. 2 days after initial injury, patient and his family noticed that his giving way continued to occur. Upon presentation to clinic, physical examination raised suspicion to have ACL injury, magnetic resonance imaging (MRI) and computed tomography (CT) confirmed osteochondral femoral origin avulsion of ACL. After reviewing literature, decision was to go for ACL repair through femoral origin avulsion fracture fixation using suture pullout technique secured with two anchors fixed through lateral femoral cortex to avoid physis injury while reaming femoral and tibial tunnels used for graft reconstruction. On follow up, excellent functional outcome regarding knee stability and range of motion. We conclude that although femoral-sided repair using suture pullout technique carried higher risk of failure than ACL reconstruction, this method shows excellent functional outcome, and can be used in cases of osteochondral femoral avulsion in pediatric group to avoid risk of physis injury in such age group.

Keywords: Osteochondral femoral ACL avulsion, Femoral sided suture repair, Knee stability

INTRODUCTION

Anterior cruciate ligament (ACL) injury, is one of the most common injuries occurring in young physical active patients. Regarding pediatric age group, ACL avulsion injury is the most common form of injury in contrast to adult age group whose injury form is described to be mid-substance ACL injury. Tibial avulsion of ACL is the most common form of such avulsion in pediatrics, while osteochondral femoral avulsion is considered to be a rare entity and rarely to be clinically reported.[1,3,5] Our case report is about a 13-year-old pediatric male patient, sustaining an osteochondral femoral ACL avulsion injury.

CASE REPORT

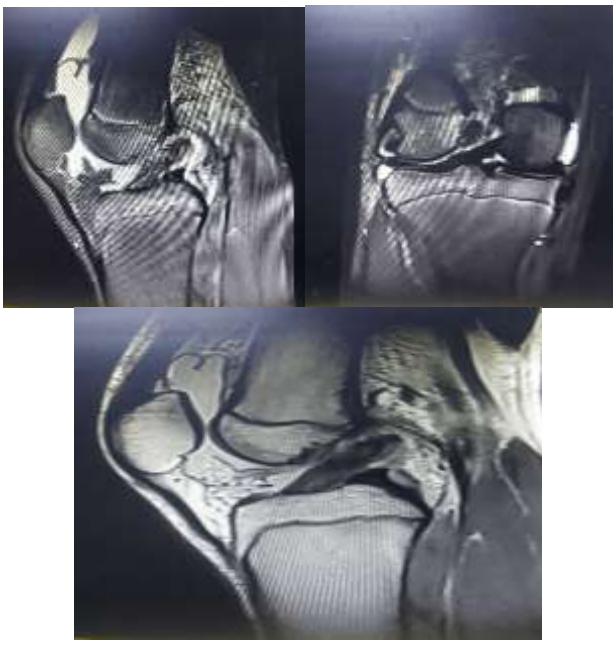
This a 13-year-old boy who sustained an injury over his right knee during a soccer game in March 2023. Regarding the trauma mechanism, patient reported being tackled by an opposing player during running down with the ball.

Immediately after injury, patient described having knee giving way, associated with severe pain. Patient could not have the whole-time match and asked to leave the game.

2 days after initial injury, patient and his family realized that medical intervention should take place due to the fact

that his giving way continued to occur during those 2 days. Upon his presentation to clinic, physical examination showed a mild right knee effusion with anterolateral knee tenderness. Regarding range of motion passive range of motion (ROM) was about near full extension and 100 degrees flexion. Lachman test was positive with no end point, but pivot shift and McMurray tests were not able to be elicited because of pain status of patient and his muscles guarding.

Magnetic resonance imaging (MRI) was obtained demonstrating a large lateral femoral condyle contusion with an ACL disruption at its femoral origin (Figures 1a-c).



Figures 1: (a), (b) and (c) Injured anterior cruciate ligament through an avulsion fracture, in addition to having large amount suprapatellar effusion. Moreover, bone marrow edema is seen as well in usual locations associated with ACL injury; lateral femoral condyle and posterior tibia.

For better illustration of the bony injury, a computed tomography (CT) scan was done, confirming to have an ACL avulsion at the proximal attachment through having bony avulsion fracture of the posteromedial aspect of the lateral femoral condyle within the intercondylar notch (Figure 2a and b).

According to this history, physical examination and radiological evaluation and regarding patients age and physis consideration and after reviewing the literature for the best options for management, the decision was taken to go for ACL repair and avulsion fracture fixation through femoral-sided repair using suture pullout technique secured with two anchors fixed through lateral femoral cortex.

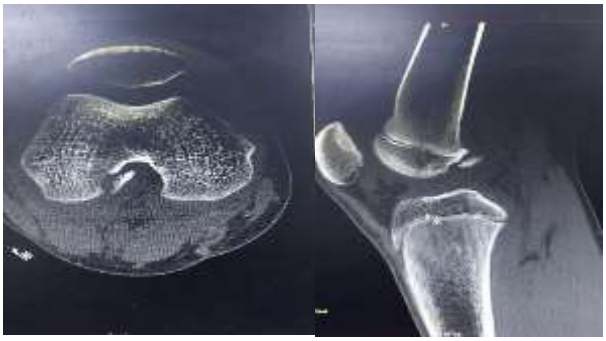


Figure 2: Comminuted femoral avulsion fracture from the lateral portion of the intercondylar notch (a) axial view, and (b) sagittal view.

Methods and surgical technique

The usual management of ACL injury is done through ACL reconstruction mainly using autografts as semitendinosus and gracilis muscles tendons, bone patellar tendon bone allograft or allografts. In this 13-year-old pediatrics patients, the ACL whole substance was avulsed from its femoral origin, so we managed this patient through femoral-sided repair using suture pullout technique which was done using two sutures passing through the proximal ligamentous bony avulsion of the ACL passing through 2.4-mm lateral femoral condyle tunnels and secured with two anchors fixed through lateral femoral cortex.[2] This surgical technique is well described in the literature in many studies.[2,11] Moore et al described this technique as well in their study.

At the beginning, on ACL probing it was found to be lax (Figure 3). Mid substance and tibial origin were found intact.

Figure 3: Lax ACL on probing.

Bony femoral avulsion at site of ACL attachment was identified at medial aspect of the lateral femoral condyle (Figure 4).

To retract the proximal ACL at site of its femoral origin, 2 cinch stitch sutures were applied at the proximal ligamentous bony junction of ACL through the anteromedial portal (Figure 5). The ACL bony footprint

was prepared then through debriding interposed hematoma and periosteum.

Figure 4: Bony femoral avulsion at site of ACL attachment was identified at medial aspect of the lateral femoral condyle.

Figure 5: 2 cinch stitch sutures were applied at the proximal ligamentous bony junction of ACL.

After that 2 tunnels with a diameter of 2.4-mm were prepared through lateral femoral condyle using 2.4-mm pins to reduce the risk of physeal injury, and through those passing k wires passing stitches applied to shuttle the repair sutures through femoral tunnels.

The ACL sutures were sequentially passed through the femur and out of the lateral femoral cortex, and by tensioning done over repair sutures reduction of the fragment was achieved.

To secure our repair, 2 anchors were applied over the lateral femoral cortex to augment the pullout sutures applied through the avulsed ACL.

Finally, after suturing and fixation are done, probing of ACL showed stable fixation with no anterior translation or laxity over the repaired ACL (Figure 6).

Post-operative CT was done to confirm the anatomical reduction of femoral foot print of the avulsed ACL after suture repair was carried out (Figure 7).

Figure 6: Probing of ACL showed stable fixation with no laxity over the repaired ACL.

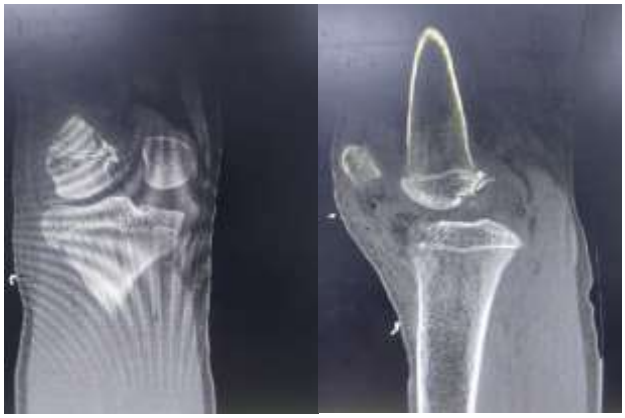


Figure 7: Post-operative CT confirming the anatomical reduction of femoral foot print of the avulsed ACL after suture repair was carried out.

Post-operative rehabilitation

A hinged-knee brace locked in extension during ambulation and limited to 90 degrees of flexion while no weight bearing was applied immediately on day 1 post repair. This protocol of using the hinged knee brace was continued for the first 6 weeks after surgery in addition to isometric quadriceps exercises including mainly straight leg raises which has started immediately postoperative as well. After 6 weeks, we returned back to our standard ACL protocol of physiotherapy.

DISCUSSION

Osteochondral femoral ACL avulsion is a rare injury. While reviewing the literature, our review reveals 2 cases of cartilaginous and 5 osteochondral avulsion fractures from the femoral origin of the ACL.[1] Few studies in the literature described such injury, some of them describe the technique of femoral-sided repair using suture pullout technique for such avulsion injury rather than graft reconstruction in which we avoid physis injury while reaming femoral and tibial tunnels used for graft reconstruction.[1-3,5,11]

While doing a comparison between our adopted technique of avulsion fracture fixation and repair with the regular ACL reconstruction technique, we found after reviewing the literature that the technique of repair through suture pullout avoids the possible threat of physis injury which could occur while tunnels reaming and preparation of the ACL graft.[8,9] So, the repair technique still provides a safe approach for physis in ACL patients.

Potential complication related to ACL repair rather than reconstruction could include failure of fixation, growth disturbance, nonunion, stiffness, residual laxity, and retear.

Our review for literature showed a high failure rate for patients having soft tissue ACL avulsion undergoing repair, but it was found that there was no reporting for a failure in those having ACL bony femoral avulsion pediatric patient underwent repair and fixation, and this is true because the surgical technique itself aims to restore anatomical reduction of the avulsed osteochondral femoral foot print, thus allowing this osteochondral avulsed piece to locate in its anatomical position, and keeping in mind that this avulsed ligament has a bony component, then this will give a much higher chance to induce bony healing for the avulsed ACL.[2]

Growth disturbance is associated much more with reconstruction technique rather than suture repair for ACL. Drilling by a 2.4-mm holes is attempted to minimize the risk of growth disturbance, smaller 2.4 mm k wire diameter will lead to much less damage to physis in comparison to an 8 or 9 mm (according to possible graft size) drill bit used while preparation of femoral and tibial tunnel for ACL reconstruction.[2,5]

On our short term follow up (5 months of follow up), no apparent postoperative complications were observed. No evidence of early growth disturbance was recorded and documented using AP and lateral X-rays. Physical examination showed stable knee though negative Lachman and pivot shift tests. Full range of motion of knee was gained again.

CONCLUSION

Although femoral-sided repair using suture pullout technique carried higher risk of failure than ACL reconstruction, this method still shows excellent functional outcome regarding knee stability and range of motion, and can be used in such cases of osteochondral femoral avulsion in pediatric age group to avoid the risk of physis injury in such age group.

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