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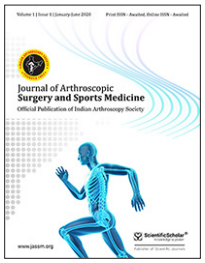

Case Report

An unusual case of isolated iliotibial band avulsion fracture

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ABSTRACT

Iliotibial band (ITB) avulsions are usually associated with severe lateral injuries of the knee joint or knee dislocations. Isolated ITB avulsion injuries are very rare. We present here a case of surgically treated isolated ITB avulsion fracture.

Keywords: Iliotibial band avulsion, Avulsion fracture, Iliotibial band

INTRODUCTION

The knee is a complex joint with various soft tissues working in a synchronous fashion to maintain its stability while in motion and also while standing. The lateral aspect of the knee joint is stabilized by different combinations of muscles, tendons, and ligaments. The iliotibial band (ITB) and the capsule are the main structures responsible for maintaining the stability of the anterolateral aspect of the knee.

The ITB is a strong fibrous structure. It is an extension of the fascia lata and inserts at Gerdy's tubercle on the anterolateral aspect of tibia.[1]

ITB avulsion is commonly seen with dislocated knees and complete posterolateral disruption injuries and a concomitant injury to the anterior cruciate ligament (ACL) is usually present.[1]

Isolated ITB avulsion fractures are rarely seen.

We present here an interesting case of isolated ITB avulsion fracture in a middle-aged active male patient.

HISTORY

A 50-year-old male presented to us with mild knee joint instability. He had a history of fall while jumping from a height of 4 feet, 3 weeks prior, and had suffered a direct impact on the lateral aspect of his left knee joint. He was able to stand up and walk with a limp after the injury, but perceived a mobile bony fragment in his knee on the outer aspect. He developed mild pain and joint swelling the next day. He was able to achieve relief from pain by taking over-the-counter anti-inflammatory medicines.

PHYSICAL EXAMINATION

On inspecting the knee, there was no effusion. There was a distinct bony crepitus on the lateral aspect with a mobile fragment on palpation of the joint. There was also moderate lateral tenderness. The patient had a full range of motion. Lachman test, anterior and posterior drawer test were negative, so was the pivot shift test. There was no mediolateral laxity. There was no distal neurovascular deficit.

For further diagnosis, imaging studies (plain radiograph, 2D and 3D CT scan) were done.

Diagnosis of bony avulsion of ITB insertion at Gerdy's tubercle was made using plain radiograph and confirmed on the CT scan.

Figure 1: 2D CT coronal cut of a 50-year-old male showing fracture marked by arrow.

Figure 2: MRI showing the fracture fragment.

In [Figure 1], 2D CT coronal cut showing fracture.

An MRI was also done to rule out other soft-tissue injury. All other ligamentous structures were found to be intact and we further confirmed our diagnosis.

In [Figure 2], MRI coronal cut showing fracture.

The patient was explained about the problem and open reduction with internal fracture fixation was advised.

Surgical findings

In [Figure 3], intraoperative picture showing the fragment.

- A small lateral hockey stick incision was made centered over Gerdy's tubercle
- Sharp dissection was done to separate the fragment with ITB attached to it
- The fragment had a small intra-articular component – almost 5 mm was covered by the articular cartilage
- The lateral meniscus was lifted off, the fragment was reduced under vision and secured with ×2 cancellous cannulated screw with bicortical compression
- Closure was done in layers.

Post-operative images are as follows.

[Figure 4] shows post-operative X-ray.

Post-operative rehabilitation

- The patient was allowed non weight-bearing mobilization in a long rigid knee brace for 2 weeks
- Gentle ROM exercises and weight-bearing were started from the 3rd week, as tolerated by the patient

Post-operative findings

- At 2 weeks: There was no effusion. The operative wound had completely healed. Clips were removed
- At 6 weeks: The patient was comfortably bearing his full weight with full ROM.

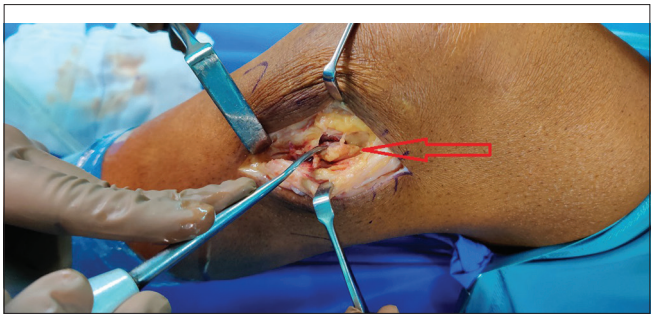

Figure 3: Intraoperative picture showing the fragment marked by arrow.

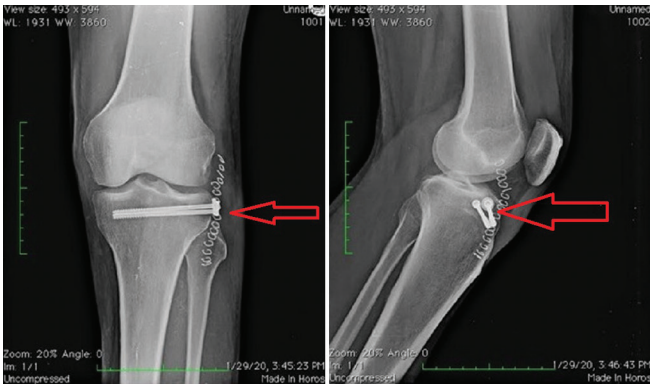

Figure 4: Post-operative X-ray: AP and lateral showing fixation marked by arrow.

DISCUSSION

The anterolateral complex of the knee is formed by three distinct layers. Layer 1 (outermost) is formed by the superficial layer of the ITB. The superficial ITB or the Kaplan fibers have a distinct attachment to the distal femoral metaphysis and femoral condyle. The deep layer originates from the Kaplan fibers proximally and forms the 2nd layer. The two layers blend together distal to the lateral femoral epicondyle and are reinforced by the capsulo-osseous layer. This band then continues with the fascia of lateral gastrocnemius and biceps femoris. Layer 3 consists of the anterolateral capsule with mid-third capsular or the anterolateral ligament.[2]

The ITB is a longitudinal fibrous sheath running along the lateral aspect of the thigh. Proximally, it originates at the anterolateral iliac tubercle portion of the external lip of the iliac crest. It receives fascial contributions from the deep fascia of the thigh, gluteus maximus, and tensor fascia lata. Distally, it spans the lateral aspect of the knee and inserts into Gerdy's tubercle on the proximal tibia. It has a major contribution in providing anterolateral stability to the knee.[3]

Functionally, ITB participates in abduction of hip through contraction of the gluteus maximus and TFL.

Role of ITB in knee depends on its position

In 0–30 degrees of flexion – it lies anterior to lateral femoral condyle and acts as active extensor of the knee joint.

30–90 – ITB lies posterior to lateral femoral epicondyle and acts as an active knee flexor muscle.[4]

Proposed mechanism of injury

Based on the history, the injury seems to result from a combination of direct and indirect forces. There may have been a violent contraction of the tensor fascia lata or gluteus maximus which pulled ITB and led to Gerdy's tubercle avulsion. There was only mild effusion after the injury. Interestingly, despite the injury, he was able to bear his full weight and felt no knee instability immediately after the fall.

Isolated ITB avulsion is a rarity and there is only a single case report published in literature till date, to the best of our knowledge.[5]

In 2015, Fay *et al.* published a case report of ITB avulsion fracture in the American Society of Emergency Radiology. They described the findings in a 49-year-old female who presented with the left knee injury following a motor pedestrian accident. On radiographs, they had found a large ossific fragment along the later aspect of the knee with an apparent donor site from the anterolateral tibia. There was associated lipohemarthrosis and widening of lateral compartment. Their differentials included a Segond fracture, an arcuate complex avulsion fracture, and an IT band avulsion fracture. The ITB avulsion fracture was favored because of the anterolateral tibial donor site. On MRI, there had been other ligamentous injuries that included a complete rupture of the ACL, complete tear of the proximal fibular collateral ligament (FCL), tear of the origin of popliteus tendon, Grade II sprain of the proximal MCL, and a sprain of the posterior capsule. There was also an impacted fracture of the medial tibial plateau posteriorly with a radial tear of the medial meniscus.

Injuries affecting the lateral compartment are relatively lesser when compared to the medial compartment.[1] Biomechanically, it has been shown that lateral compartment injuries are more disabling as they have been shown to bear greater load during the gait cycle. As a result, if there is any injury to the lateral compartment, the varus angulation of the knee increase in full extension during the stance phase since the lateral structures get stretched.

Imaging studies play an important role in diagnosing the type of injury and help in identifying the exact cause. While plain radiographs are the standard first-line investigation, MR images help in pinpointing the exact etiology if there is any confusion due to the close proximity of structures responsible for lateral avulsion fractures.

In our patient's radiograph, there was a clear disruption of Gerdy's tubercle. A 2D CT scan was used to confirm the structures involved and the extent of involvement and a diagnosis of ITB avulsion fracture was made.

The following differential diagnoses were ruled out through imaging.

1. Segond fracture – This is the most commonly encountered avulsion fracture. It involves avulsion of the tibial insertion of the middle third of the lateral capsular ligament. Patients usually present with rotational instability in the anterolateral plane and lateral joint

pain. This injury is seen due to an abnormal varus stress and internal rotation of the knee[6]

On X-ray, an elliptical bone fragment is seen in the lateral, distal aspect of tibia (lateral capsular sign). On MR imaging, its association with ACL disruption and meniscal tear is extensively documented.[7]

[Figure 5] shows Segond fracture.

Reverse Segond fracture is an uncommon avulsion fracture affecting the medial tibia.

2. Arcuate complex avulsion fracture – Arcuate complex is the group of muscles and ligaments responsible for the stability of posterolateral knee. Its constituents include the FCL, biceps femoris, popliteus muscle and tendon, popliteofibular ligaments, fabellofibular and arcuate ligaments, and lateral gastrocnemius muscle

Arcuate avulsion fracture involves an avulsion of the insertion of popliteofibular, arcuate, and fabellofibular ligaments from the fibular styloid process. On a conventional anteroposterior knee radiograph, it is described as the "arcuate sign" because the avulsed bone fragment has a characteristic elliptic appearance with its long axis oriented horizontally. Such fractures occur when a varus force is applied to the externally rotated tibia or push on the anteromedial aspect of tibia in an extended knee or sudden hyperextension of the knee.

[Figure 6] shows arcuate avulsion.

3. Biceps femoris tendon avulsion fracture – The two heads of biceps femoris along with lateral collateral ligament form a conjoined tendon at their insertion which is attached to the lateral margin of the fibular head. An avulsion fracture of biceps femoris involves disruption of its tendon from the fibular head along with an irregular bone piece. On a conventional anteroposterior knee radiograph, it is routinely difficult to differentiate this from the arcuate sign because of its close proximity to the arcuate complex. In such cases, MR imaging helps in defining the etiology and type of the injury.[7]

[Figure 7] shows biceps femoris avulsion.

Our patient had only mild knee joint instability on presentation despite an ITB avulsion fracture. He was able to walk with a limp, which is a rarity as the ITB is vital to maintain anterolateral knee joint stability. This being a far peripheral fracture, the patient was able to walk for 3 weeks. However, he did feel some discomfort and instability for which he sought further assistance.

Despite a relative paucity of symptoms, this patient required adequate fixation and stabilization of the ITB as his knee joint would only worsen with time. Any delay in the procedure would have led to an increase in knee joint instability and would have predisposed the patient for further knee injury and early medial compartment degeneration.

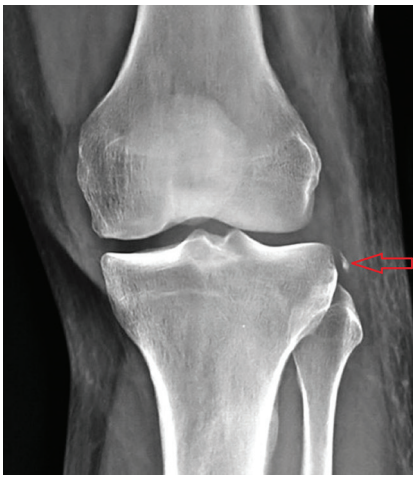

Figure 5: Segond fracture – tibial avulsion of LCL marked by arrow.

Figure 6: Arcuate complex avulsion marked by arrow.

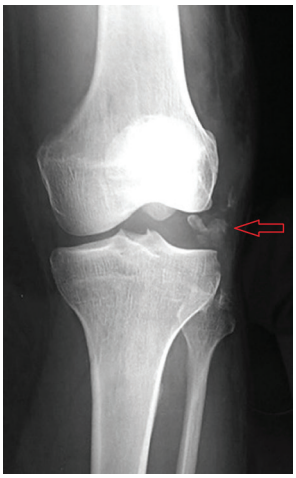

Figure 7: Biceps femoris avulsion marked by arrow

CONCLUSION

Even if the patient's complaints are not severe, it is vital to diagnose and promptly treat ITB avulsion fracture. It is important to be aware of this rare entity and differentiate it from other lateral avulsion fractures. This fracture needs to be fixed to restore the anterolateral stability of the knee.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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