

CASE REPORT

ISOLATED TEAR OF POSTEROLATERAL BUNDLE OF ANTERIOR CRUCIATE LIGAMENT

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Anterior cruciate ligament injuries are very commonly encountered during routine MRI reporting and various signs have been described for their identification. However, the diagnosis of isolated bundle tears is difficult using MRI, thus can be easily overlooked, especially isolated tear of posterolateral bundle. We present a case of a young male with “Gap” and “Footprint” signs on MRI knee joint, which are considered highly specific of posterolateral ACL bundle tear.

Keywords: Anterior cruciate ligament; Posterolateral bundle; Foot print sign; Gap sign; ACL partial tear.

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INTRODUCTION

Anterior cruciate ligament (ACL) is a commonly injured ligament of knee joint, with the incidence of its injury ranging from 10–38% in different studies.^{1,2} It has also been suggested in various studies that partial tears, if undetected and untreated, can progress to complete tears of ACL in a significant proportion of cases due to eventual necrosis of the remaining intact fibres.¹ Furthermore untreated partial ACL tears can also damage articular cartilage or menisci.¹ ACL is formed of two distinct anatomical and functional bundles, the anteromedial (AM) bundle and the posterolateral (PL) bundle.^{3,4} Keeping in mind the recent advances in selective bundle reconstruction and preservation of residual fibres,^{5,6} there is an increased need for the radiologists to be familiar with not only the signs of partial ACL tear on MRI, but also to be able to suggest with confidence which bundle is likely to have been torn.

CASE REPORT

Our case is a 28 years old male, presented in orthopaedics outpatient department with left knee symptoms. He sustained sports injury to his left knee 1 year back and now was complaining of laxity at the knee joint. He was referred to radiology department with the clinical diagnosis of partial ACL tear. MRI of left knee joint was performed without using intravenous contrast, with images obtained in axial, coronal and sagittal planes.

The key imaging finding in MRI was laxity of posterolateral bundle of ACL with discontinuity of fibres at its femoral and tibial attachments. High signals were appreciated between the medial aspect of lateral femoral condyle and lateral aspect of intact ACL fibres (anteromedial bundle), consistent with the Gap sign (Figure-1). There was incomplete coverage of lateral aspect of interspinous area of tibia by ACL attachment, known as the Footprint sign (Figure-2).

Anteromedial bundle of ACL was intact with continuous fibres from tibial to femoral attachment (Figure-3).

No other meniscal or collateral injury was detected, apart from mild joint effusion in suprapatellar recess. The case was referred back to orthopaedics with the diagnosis of isolated posterolateral bundle tear of ACL. Due to patient's refusal to undergo surgery, he was referred to physiotherapy department.

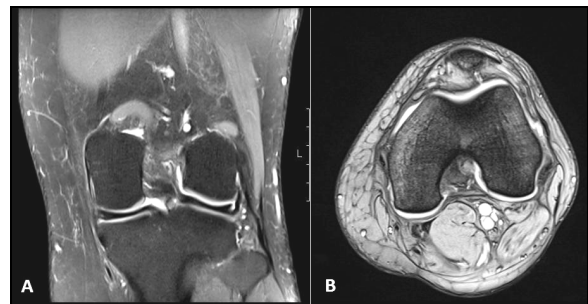


Figure-1: Gap sign - High signal (fluid) between the medial aspect of lateral femoral condyle and lateral aspect of ACL on coronal (A) and axial (B) proton density fat suppressed images.

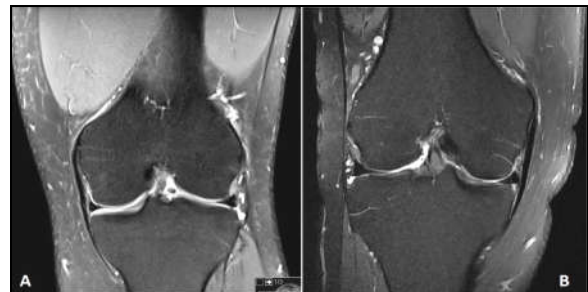


Figure-2: Footprint sign - Incomplete coverage of lateral half of interspinous area of the tibia demonstrated in image (A) in comparison with normal attachment of anterior cruciate ligament fully covering the interspinous region demonstrated in image (B).

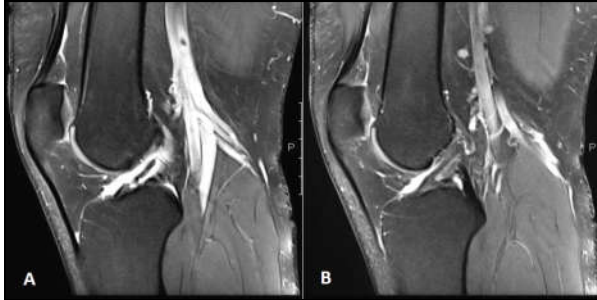


Figure-3: Proton-density sagittal image showing torn posterolateral bundle of anterior cruciate ligament (A) and intact anteromedial bundle fibres (B)

DISCUSSION

ACL fans out at its tibial insertion, which is the basis of its anatomic distinction into two bundles. The AM bundle is more sagittally oriented and inserts on anteromedial aspect of foot print, while PL bundle inserts on posterolateral aspect.^{4,7} The two bundles also differ in their lengths and widths, AM bundle being longer and slightly thicker than the PL bundle.³ The primary function of AM bundle is to prevent anterior tibial translation, while PL bundle stabilizes the knee, especially during rotation.⁷ Owing to different tension patterns during knee extension and flexion, each bundle is prone to injury by different mechanism and presents with different symptoms.⁵

Partial ACL tears are common and can present with non-specific symptoms, like recurrent pain, swelling or lax movements. Specific symptoms of isolated AM bundle tear are anterior instability of knee mimicking complete ACL tear. While PL bundle tear presents with rotational instability, as these fibres are rotatory stabilizers of knee.¹

MRI, to date, remains the best non-invasive imaging modality to assess structural integrity of ACL.⁵ Well recognized MRI features of full thickness tear being discontinuity or abnormal orientation of ACL, anterior tibial translation, uncovering of posterior horn of lateral meniscus, buckling of PCL and bone contusions.⁸

However, diagnosing specific bundle tear is very difficult even on MRI, especially PL bundle injury.⁹ This difficulty is due to the fact that PL bundle is shorter, thinner and more obliquely oriented than AM bundle, thus difficult to evaluate on MRI. Sometimes special oblique coronal sequences may be necessary for its optimal evaluation.⁵

Coronal and axial images demonstrate two signs which are highly suggestive of PL bundle injury. The “Gap sign” is presence of high signal on PD FS images between the medial aspect of lateral femoral condyle and lateral aspect of ACL. This can be seen in both coronal and axial images. Intact ACL completely fills the lateral wall of femoral notch adjacent to lateral femoral condyle. The “Footprint sign” is the incomplete coverage of lateral part of interspinous area of tibia by distal ACL attachment. This sign can only be seen in coronal images. Intact ACL fans out at its tibial attachment to cover the entire interspinous area.⁹

These signs correlate with the course and position of PL bundle, thus indicating absence of PL bundle if fibres are not seen in these locations. The presence of one or both of these signs has a high sensitivity for isolated PL bundle tear.⁹

Both these signs are subtle findings and should be actively looked for to avoid PL bundle injuries. MRI can help the surgeon in accurate localization of injury to a specific bundle, thus can be very helpful in preoperative planning.^{4,5}

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