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Case Report

# Isolated Avulsion of the Distal Head of the Adductor Magnus: A Case Report

Nikhil Patel[1]*, Griffin Harris[1], Emily Johnson[2], Daniel Quintero[1], Tanner Harrah[1], Lee Kaplan[1], and Jean Jose[1]

[1]University of Miami Leonard Miller School of Medicine Miami, FL, USA

[2]Florida International University Herbert Wertheim College of Medicine Miami, FL, USA

*Corresponding author

Zachary Herman, Department of Orthopedic Surgery, PGY3, Orthopedic Surgery Resident, USA, Tel: 7245162858

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**Abstract**

In the present case, we describe the first reported instance of a non-contact distal adductor Magnus avulsion injury in a collegiate Division I football player. Upon presentation, a 22-year-old male was found to have acute posterolateral corner injury with partial-thickness tears of the fibular collateral ligament (FCL), biceps femoris tendon (BFT), and popliteus tendon (PT). Appropriate management was completed. Two months later, despite no contact or a specific injury after participating in gameplay, the presentation worsened to an acute full-thickness tear of the ischiocondylar (hamstring) portion of the adductor magnus tendon distally from its insertion at the adductor tubercle on the medial condyle of the femur, with surrounding hemorrhage. In this article, we discuss the potential mechanism of injury, provide imaging findings, and discuss management practices regarding avulsion injuries. Further, we emphasize the importance of treatment and full recovery for athletes prior to return to avoid reinjury or placing themselves at greater risk. To the authors' knowledge, the pathology described in this study has not been reported previously.

## ABBREVIATIONS

MCL: Medial Collateral Ligament; FCL: Fibular Collateral Ligament; BFT: Biceps Femoris Tendon; PT: Popliteus Tendon; MPFL: Medial Patellofemoral Ligament

## INTRODUCTION

The adductor complex resides in the medial compartment of the thigh. It serves as the primary adductor of the hip's lower extremity due to forces applied to the medial and posterior femur. This complex is composed of the adductor longus, adductor brevis and adductor magnus. These share a similar region of origin on the pubis and ischium but have different insertions along the femur. The adductor longus and adductor brevis have insertions at the linea aspera on the posterior aspect of the femoral shaft. The adductor brevis also inserts onto the lesser trochanter of the femur. On the other hand, the adductor Magnus has two heads: an oblique head, also known as the pubofemoral or adductor portion, and a vertical head, also known as the ischiocondylar or hamstring portion. These two heads have unique insertions. The larger of the two heads of the adductor Magnus, the adductor portion, behaves like the adductor longus and brevis. It is a large, deep, fan-shaped muscle that inserts primarily along the linea aspera. The hamstring portion is narrower and inserts at the adductor tubercle, which lies on the medial condyle and has a fibrous expansion from the adductor tubercle to the linea aspera.

Muscle injuries to the adductor complex are relatively common as these muscles can become overstretched or torn due to strain, unable to be tolerated by the muscle or tendons if not adequately conditioned before vigorous activity [1]. Typically, this results from fatigue, overuse, or improper muscle use. Sixty to ninety percent of injuries to the adductor complex are isolated adductor longus strains [1]. Strains of the adductors are commonly characterized as groin pain as they tend to occur at the origin of the muscle.

A much more infrequent pathology of the adductors is avulsion fractures. Avulsion fractures are unicortical fractures that occur secondary to soft tissue retraction, which results in a segment of bone breaking at the attachment of the tendon or ligament. Regarding avulsion fractures involving the adductors, the pathology may occur at the origin or insertion of muscles at its tendinous attachment. The most common location reported for avulsion fractures of the adductors, to the authors' knowledge reported in the literature is at the origin of the inferior pubic rami [2-6]. Thirty-seven cases have been published regarding proximal adductor longus avulsion at the inferior pubic rami with variable involvement of the adductor brevis and adductor magnus [2-8]. Distal avulsions are even rarer, with only one case

occurring at the insertion of the adductor longus and one at the insertion of the adductor magnus. Coincidently, both occurred following skiing-related traumatic injury [1,8].

The standard of treatment for avulsion injuries is nonoperative management consisting of rest and rehabilitation [9]. However, the scarcity of evidence-based data detailing proper management has questioned this approach, with some surgeons preferring suture anchor fixation while others opt for physical therapy [8].

## CASE PRESENTATION

A 22-year-old male collegiate division 1 football player with a past medical history of a right knee football-related injury reports to our tertiary care clinic with an inability to ambulate.

Nine weeks prior to the injury in question, the patient sustained a medial force to the right knee during gameplay (Figure 1).

MRI obtained at the time of injury demonstrated an acute posterolateral corner injury with partial-thickness tears of the fibular collateral ligament (PCL), biceps femoris tendon (BFT), and popliteus tendon (PT) (Figure 2). The patient was diagnosed with posterolateral corner injury without a complete tear, and conservative management was initiated. We recommended abstinence from all sports activity and refrain from bearing weight on his right leg for two weeks. At follow-up, the patient was examined and demonstrated no instability to varus or valgus stress at 0 or 30 degrees of flexion and no point tenderness over the lateral collateral ligament; all other exam findings were similarly normal. At this time, we recommended incremental intensification of activity, beginning with jogging on an anti-gravity treadmill and pool exercises. The patient returned to total sports activity at four weeks post-injury with a playmaker brace. Bracing was discontinued at week 6.

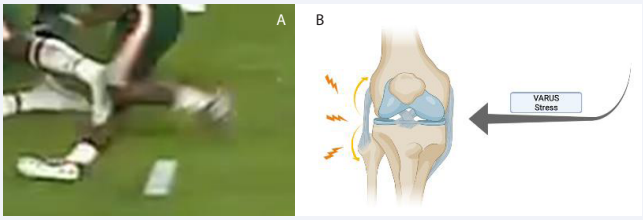


**Figure 1** A: Screenshot of gameplay footage depicting the moment patient (P) experienced varus stress to the right knee. B: is a pictograph demonstrating the varus stress vector and the consequential strain to the lateral collateral ligament.

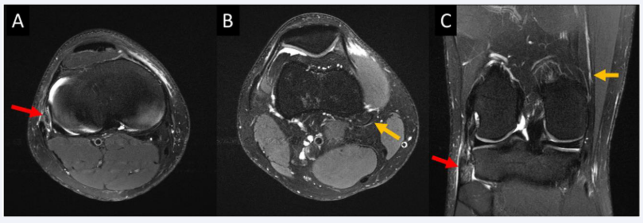


**Figure 2** Acute posterolateral corner injury Axial (A and B) and coronal (C) fat-suppressed proton density MRI of the knee demonstrating partial-thickness tear of the fibular collateral ligament and biceps femoris tendon at their distal conjoined insertions into the fibular head (red arrows). Notice the intact insertion of the ischiocondylar (hamstring) portion of the adductor magnus tendon (yellow arrows).

On week 8, the patient reported to the postgame clinic a day after gameplay with concerns of right medial knee pain and an inability to bear weight. The patient described no specific injury during gameplay, and no contact events were identified on a review of the in-game video replay. The patient described progressive pain throughout the game but was able to continue playing. He denied any locking, popping, or loosening sensations in the knee.

A focused exam of the right lower extremity showed the lower extremity to be neurovascularly intact with no skin disruption. No swelling or appreciable joint effusion was present. Range of motion was limited at flexion to 80 degrees and with normal extension to negative 5 degrees. Extreme apprehension was present to full extension of the knee, and the patient had a stable Lachman, Anterior drawer, and Posterior drawer exam. There was no evidence of gapping with valgus or varus stress, no quadriceps atrophy, and strength was 5/5 on extension and 5/5 on flexion.

A second MRI demonstrated an acute full-thickness tear of the ischiocondylar/hamstring portion of the adductor magnus tendon distally from its insertion at the adductor tubercle on the medial condyle of the femur with surrounding hemorrhage and acute sprain of the medial collateral ligament. Further, the second MRI re-demonstrated the patient's posterolateral corner injury, as detailed above, with additional scarring since the prior MRI (Figure 3).

## MANAGEMENT

We began treatment with physical therapy for one week concurrently with oral diclofenac 25 mg. The protocol utilized was a modified version of the Ueblacker et al., protocol [11], including deduction training as specified in weeks (1-3) and

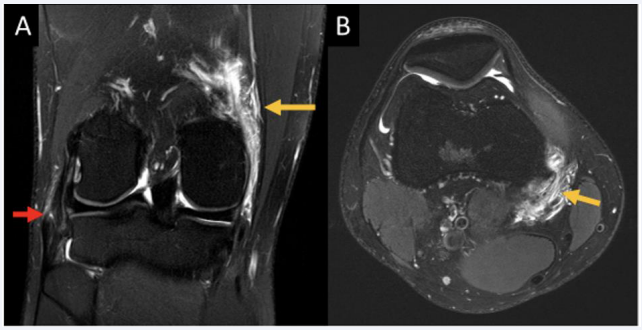


**Figure 3** Acute adductor magnus injury: A) Axial and B) coronal fat-suppressed proton density MRI of the knee two months after the prior study demonstrated a healing partial-thickness tear of the fibular collateral ligament and of the biceps femoris tendon at their distal conjoined insertions (red arrow). There is now an acute full-thickness tear of the ischiocondylar (hamstring) portion of the adductor magnus tendon distally from its insertion at the adductor tubercle on the medial condyle of the femur, with surrounding hemorrhage.

an additional focus on thigh extensor complex strengthening. On day seven, the patient was reassessed and challenged with resistance to running. The following week, the patient returned to full play with a dynamically stabilizing knee brace. The patient has continued to use a stabilizing brace and will be challenged with multi-directional sprinting without the brace in five weeks. The patient was asked to return to the clinic if there is any new or worsening pain or if he experiences biomechanical symptoms such as locking.

## DISCUSSION

To our knowledge, only one previous case of an isolated distal adductor tubercle avulsion fracture of the adductor magnus has been reported [1]. The case report of adductor magnus avulsion fracture occurred in isolation in a 20-year-old male involved in a skiing-related accident. The case report details the avulsion of the adductor tubercle with tearing of the adductor magnus at the myotendinous junction. While our patient has other pathology, including posterolateral corner injury, as previously discussed, these other pathologies were found to have occurred before the adductor magnus avulsion and were neither aggravated nor re-injured. When the patient subsequently had a second knee injury, the only noted acute injury was the distal insertion of the adductor magnus ischiofemoral component at the adductor tubercle with an associated medial collateral ligament (MCL) sprain. We have developed [2] potential mechanisms of injury.

The adductor tubercle is situated caudal to the medial epicondyle of the femur. This insertion site is specific to the hamstring portion of the adductor magnus. Yet, it is near other ligaments and tendons of the posterior medial corner of the knee. Directly anterior to the adductor tubercle is the medial patellofemoral ligament (MPFL), which is responsible for patellar stability during flexion. Inferior to the adductor tubercle lies the tibial collateral ligament, the primary static stabilizer of the knee. The insertion of the medial head of the gastrocnemius muscle lies posteriorly and is responsible for flexing the leg at the knee joint. A possible mechanism of injury parallels what was described in Iqbal et al. and assumes a traumatic injury occurred that was not captured on video replay [1]. Valgus-directed trauma to the knee, while flexed with eccentric contraction of the adductor magnus, can lead to our athlete placing more stress on the hamstring portion of the adductor, causing an increased eccentric force and subsequent avulsion at the adductor tubercle.

## CONCLUSION

In conclusion, football is an explosive sport with many sudden changes in direction and lower-extremity contact between players. Athletes may be unable to pinpoint an exact time of injury. Still, the nature of the game may have precipitated the avulsion fracture discussed in this study.

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