

Test yourself—knee pain after falling

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Part II

Diagnosis

Semimembranosus tendon avulsion with concomitant anterior cruciate ligament (ACL) tear.

Discussion

The semimembranosus muscle originates at the posterolateral aspect of the ischial tuberosity. Distally, the semimembranosus tendon divides into five anatomically distinct tendinous branches, each inserting into the posteromedial region of the knee [1]. The insertion sites include the infraglenoid tubercle of the posteromedial tibial plateau, the posterior capsule, the posterior horn of the medial meniscus, and a portion of the capsule deep to the medial collateral ligament [2]. The function of the semimembranosus muscle is flexion and medial rotation of the knee [3]. The anterior cruciate ligament (ACL) attaches proximally to the posteromedial aspect of the lateral femoral condyle and courses anteromedially to insert anterior to the intercondylar eminence [4]. Functionally, the ACL can be divided into an anteromedial

bundle and posterolateral bundle, which prevent anterior translation and internal rotation of the tibia, respectively [2, 4].

An avulsion fracture of the semimembranosus insertion site is a rare, but a highly specific, ancillary finding of cruciate ligament injury [2]. Radiographic findings demonstrate an avulsion fracture of the posteromedial tibial plateau, which is mildly superiorly displaced (Fig. 1). Magnetic resonance (MR) imaging of the knee confirms the avulsion of the semimembranosus central tendon at its insertion on the infraglenoid tubercle of the posteromedial tibial plateau (Fig. 2). Additional findings include a complete ACL tear and bone contusions in the lateral aspect of the knee joint (Figs. 3, 4).

In a retrospective review of patients with acute knee injury, 100% of patients with abnormalities of the posteromedial tibial plateau of the semimembranosus insertion site had an associated complete ACL tear [2]. These abnormalities included fractures of the posteromedial tibial plateau or bone bruises and avulsions of the semimembranosus tendon insertion site. Some of these patients lacked bone contusions in the lateral compartment of the knee. This, as well as the lack of bone marrow edema in the medial femoral condyle, may help distinguish semimembranosus avulsions from other bone marrow contusion patterns of the knee. Prior to this case, only three other studies of avulsion fractures of the semimembranosus insertion site and ACL tear had been described [2, 5, 6]. An avulsion fracture of the posterior medial plateau is not necessarily indicative of ACL injury, however, as a single case of a posterior cruciate ligament tear with semimembranosus avulsion has been reported [7].

The exact mechanism of injury of cruciate ligament tears and semimembranosus avulsion is debated. Cadaveric

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studies have shown that by applying a varus force to a flexed knee, the fracture of the posteromedial tibial plateau at the semimembranosus insertion site occurs after the ACL has been torn [5]. However, Chan et al. have proposed a mechanism in which a valgus force applied to the tibia causes external rotation and anterior subluxation leading to an ACL tear and subsequent avulsion fracture of the posteromedial tibial plateau [2].

The identification of an avulsion fracture of the semimembranosus on radiographs is a rare finding. In the study by Chan et al., a fracture fragment could be identified on the lateral radiograph in only 1 of 10 patients with posteromedial plateau injury. The lateral projection in the case presented here failed to identify the avulsed fragment. Instead the avulsion is identified on the oblique view. Thus, in addition to anteroposterior and lateral views, oblique views of the knee may be beneficial in identifying this injury. In conclusion, we present a case of semimembranosus tendon avulsion with associated ACL tear. Although rare, it is highly specific for the diagnosis of an anterior cruciate ligament tear with only one isolated case report of posterior cruciate ligament tear.

Disclosure The authors declare they have no conflicts of interest.

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