Displaced Medial and Lateral Bucket Handle Meniscal Tears With Intact ACL and PCL

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abstract

Bucket handle lesions are vertical longitudinal tears in the meniscus that may displace centrally into the respective medial or lateral compartment, frequently causing mechanical symptoms, including pain, perceived instability, and mechanical locking. Bucket handle meniscal tears are most commonly from a traumatic etiology and are frequently found with concomitant anterior cruciate ligament (ACL) injuries. Multiple imaging signs and associations have been described for the diagnosis of bucket handle meniscus tears, including coronal truncation, absent bow tie sign, double posterior cruciate ligament (PCL), double ACL, displacement of the bucket handle fragment, and disproportionate posterior horn signs. Among meniscal pathology encountered on magnetic resonance imaging or during arthroscopy, bucket handle meniscal tears are infrequent occurrences. Furthermore, the occurrence of displaced medial and lateral bucket handle tears found on imaging and during arthroscopy is very uncommon and is only sparsely reported in the literature. When displaced medial and lateral bucket handle meniscal segments are visualized within the intercondylar notch along with the ACL and PCL, the radiologic findings are referred to as the “quadruple cruciate” sign or the “Jack and Jill lesion.” Of the few case reports described in the literature, only one noted displaced medial and lateral bucket handle meniscus tears with an intact ACL and PCL. The current case report outlines a similar rare case of the quadruple cruciate sign: displaced medial and lateral bucket handle meniscal tears located within the intercondylar notch and an intact ACL and PCL. [Orthopedics. 2015; 38(8):e738-e741.]
Bucket handle meniscal tears are uncommon occurrences, accounting for 10% to 26% of meniscal pathology found during arthroscopy, with medial tears occurring more frequently than lateral tears.1-4 Bucket handle lesions are created by a vertical longitudinal tear in the meniscus that may displace centrally into the respective medial or lateral compartment, frequently causing mechanical symptoms, including pain, perceived instability, and mechanical locking. Injuries that produce both medial and lateral bucket handle meniscus tears commonly also result in cruciate ligament injury. The few case reports of identified displaced medial and lateral bucket handle meniscus tears often noted either completely or partially torn cruciate ligaments.5-8 In 2010, the first case report of displaced medial and lateral bucket handle meniscus tears with a discoid lateral meniscus and intact anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL) was described.9 This case report describes the second reported case of displaced medial and lateral bucket handle meniscus tears with intact ACL and PCL.

**Case Report**

A 41-year-old man had acute left knee pain after a noncontact twisting injury that occurred during sporting activity approximately 6 weeks before evaluation. He noted antecedent knee pain before this injury without a specific traumatic etiology. Medical history was unremarkable, with no previous orthopedic evaluations. Physical examination showed a mechanical block to extension, grade 1A Lachman maneuver, negative posterior drawer sign, and stability to varus and valgus stresses. Magnetic resonance imaging (MRI) scan showed medial and lateral bucket handle meniscus tears displaced into the intercondylar notch, intact ACL and PCL, and an osteochondral lesion of the posterior lateral femoral condyle (Figure 1). Coronal MRI scans showed a quadruple cruciate sign, with medial and lateral bucket handle meniscus tears seen within the intercondylar notch adjacent to the intact ACL and PCL. Sagittal MRI images showed a double ACL sign, with a displaced lateral bucket handle meniscus tear seen parallel and inferior to the course of the ACL, as well as a double PCL sign, with a medial bucket handle meniscus tear parallel and inferior to the course of the PCL. The patient elected to undergo arthroscopy.

Arthroscopy was performed and began with a structured diagnostic evaluation (Figure 2). Degenerative medial and lateral bucket handle meniscus tears were visualized at the base of the intercondylar notch. The cruciate ligaments were intact.

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**Figure 1:** Magnetic resonance imaging scans of the knee obtained preoperatively showing simultaneous medial and lateral meniscal bucket handle tears (quadruple cruciate sign). Coronal T2 image showing a diminutive medial meniscal body with a flipped meniscal fragment (arrowhead) into the intercondylar notch. The lateral meniscus is absent, and there is a large meniscal flipped fragment into the intercondylar notch (short arrow). An additional lateral femoral condylar osteochondral lesion (long arrow) is seen (A). Sagittal T1 image of the lateral intercondylar notch showing the double posterior cruciate ligament sign. The more cranial structure is the normal posterior cruciate ligament (arrowhead), and the more inferior structure (arrow) is the displaced medial meniscal fragment (B). Sagittal T1 image of the medial intercondylar notch showing the double anterior cruciate ligament sign. The more cranial structure is the normal anterior cruciate ligament (arrowhead), and the more inferior structure (arrow) is the displaced lateral meniscal fragment (C). Axial T2 image showing medial (arrow) and lateral (arrowhead) bucket handle meniscus tears displaced into the intercondylar notch (D).
on inspection. The lateral bucket handle fragment was adherent to the tibial insertion of the ACL and was not freely mobile. However, the medial bucket handle meniscus tear could be reduced with a blunt probe. Outerbridge grade 3 to 4 articular cartilage changes were found over the lateral femoral condyle, consistent with the osteochondral injury previously noted on MRI. Given the patient’s age, irreducible lateral medial bucket handle meniscus tear, and extensive degeneration of the medial bucket handle meniscus tear, partial medial and lateral meniscectomy without repair was performed.

**DISCUSSION**

The use of MRI offers a powerful tool in the diagnosis of bucket handle meniscus tears. As MRI technology continues to improve, imaging shows nearly 90% positive predictive value in diagnosing bucket handle meniscus tears.4 Multiple imaging signs and associations have been described for the diagnosis of these tears. These include coronal truncation, absent bow tie sign, double PCL, double ACL, displacement of the bucket handle meniscus tear fragment, and disproportionate posterior horn signs.

The double PCL sign, seen in displaced medial meniscus bucket handle tears, has high specificity, nearing 100%.1,2 The double PCL sign is classically described as a low signal band traversing anterior and parallel to the PCL on sagittal MRI views. The absent bow tie sign additionally shows high sensitivity for bucket handle meniscus tears. The normal meniscal width is approximately 9 to 12 mm, commonly resulting in 2 sagittal MRI cuts with the meniscal body in continuity. When the meniscal body is not seen in continuity on any MRI images or is seen on only 1 MRI image, this can be highly sensitive for bucket handle tears.10 Several of the described signs have been reliable and consistent in the diagnosis of bucket handle meniscus tears. The absent bow tie sign and the finding of a displaced fragment within the notch are both highly sensitive (88%-98%) for positive findings on arthroscopy.3,4 Dorsay and Helms11 reported the sensitivity of the absent bow tie and free fragment signs on MRI as 88% and 90.7%, respectively, when correlated with findings on arthroscopy. Other common findings have lower reported sensitivities, such as double PCL (32%), the double anterior horn sign (29%), and the coronal truncation sign (65%).3,4 The consistency of imaging findings can vary depending on the laterality of pathology. For example, the flipped meniscus sign was seen more often in medial bucket handle meniscus tears (44%) than in lateral tears (29%).1

Displaced medial and lateral bucket handle meniscal tears are relatively rare,5,8 However, ACL tears are a commonly associated pathology, and bucket handle meniscus tears occur in up to 39% of injuries resulting in ACL lesions.9 A previous traumatic event was reported in 74% of patients with bucket handle meniscus tears, and all patients with a bucket handle meniscus tear with a concomitant ACL tear noted a previous traumatic event.4 The etiology of bucket handle meniscus tears may not be purely traumatic, and histologic evaluation of meniscal tears in the avascular zone suggests increased degenerative changes, with changes in cellularity, collagen alignment, and overall organization noted in the region adjacent to the zone of injury for bucket handle meniscus tears found in ACL-intact knees compared with ACL-deficient knees.12 The etiology of bucket handle meniscus tears can affect the outcome of operative management.
Shelbourne and Carr noted reviewed their experience with meniscal repair vs partial meniscectomy of bucket-handle meniscus tears during ACL reconstruction and found no significant difference in subjective or objective outcomes, but noted superior subjective scores in repaired nondegenerative meniscal tears compared with repaired degenerative tears. However, excision of large bucket-handle meniscus tears may cause significant long-term morbidity. Pengas et al reported a 4-fold increased risk of radiographic arthritis in a 40-year follow-up of 30 patients previously treated with total meniscectomy, with all 30 patients reporting significant knee symptoms at follow-up. Further studies of bucket-handle meniscus tear repair with concomitant ACL reconstruction showed healing rates of more than 90% on second-look arthroscopy. Espejo-Reina et al reported repair of chronic meniscal tears (ie, >2 months from date of injury). They achieved complete healing in 83%, but also noted that bucket-handle meniscus tear repairs in patients with an intact ACL failed 21 times more frequently than repairs in patients undergoing simultaneous ACL reconstruction. The pathomechanics of the current patient’s injury are unclear, but are likely related to the reported noncontact twisting injury. The temporal relationship of the bucket-handle meniscus tears also remains in question. The irreducible lateral bucket-handle meniscus tear suggested chronic lateral meniscus pathology. Additionally, the intraoperative morphology of the lateral bucket-handle meniscus tear suggested a discoid precursor, increasing the risk of meniscal tear. Further, the tears appeared to have a significant degenerative component, as suggested by the intact ACL and PCL and the intraoperative findings. Although physical signs of a collagen disorder were not noted, an undiagnosed collagen disorder may be a potential risk factor.

The authors’ treatment approach for bucket-handle tears, including co-occurring medial and lateral bucket-handle meniscus tears, is to strongly consider repairing viable meniscus with peripheral tears occurring at the red-red zone, with simultaneous cruciate reconstruction as indicated. In the current case, the irreducible lateral bucket-handle meniscus tear and the extensively degenerative medial bucket-handle meniscus tear ultimately were not amenable to repair. This article described a case of displaced medial and lateral bucket-handle meniscus tears in a patient with intact ACL and PCL and provided a review of relevant imaging and operative management.

**REFERENCES**


