

A Bucket-Handle Tear in a Discoid Lateral Meniscus: A Case Report and Literature Review

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Abstract

Objective: Bucket-handle tears constitute about 10% of all meniscal tears. We aimed to report a case of a bucket-handle tear in a lateral discoid meniscus due to sports injury and to review the current pertaining literature.

Case Report: A 32-year-old male presented with pain, intermittent swelling, clicking and locking symptoms of his right knee for 3 months following a twisting injury while playing football. On physical examination, there were neither effusion, redness, nor scars. He had tender medial and lateral joint lines with a full range of motion. Radiograph of the knee showed widened lateral joint space and medial joint space narrowing. MRI showed increased thickness and flattening of the lateral meniscus with loss of the natural bow-tie configuration reflecting the presence of discoid meniscus. There was signal alteration within the meniscal substance extending across the entire lateral compartment indicating the presence of a tear. Diagnostic arthroscopy confirmed the presence of a bucket-handle tear in the discoid lateral meniscus. Partial meniscectomy with saucerization of the discoid lateral meniscus was performed. Postoperatively, early active range of motion with non-weight bearing mobilization was started. At 6 months postoperatively, the pain has resolved and he had no more locking or clicking symptoms.

Conclusion: Satisfactory outcome of injured patients with a bucket-handle tear in a discoid meniscus can be obtained through arthroscopic partial meniscectomy with saucerization and early rehabilitation.

Keywords: Bucket-handle; Meniscus tear; Discoid; Partial meniscectomy; Saucerization

Introduction

The menisci are crescent-shaped structures made of fibrocartilage, which provide deepening for the articulation between the femoral and tibial articular surfaces. The peripheral edge of menisci is thick and convex, while the inner edge is thin and concave. Each meniscus is connected to the proximal articular surface of the tibia by the anterior and posterior horns [1]. The menisci work as a shock-absorber and distribute forces equally through the knee. Their peripheral zones are vascularized from the fibrous capsule and synovial membrane, while the inner edges are avascular. The medial menisci are C-shaped, broader posteriorly and semicircular in shape. The lateral menisci are smaller and more freely movable than medial menisci and form four-fifths of a circle [2,3]. The menisci provide also neuromuscular control by the nerve endings embedded within their edges [4].

A discoid meniscus is an uncommon type of meniscus. Its incidence estimated from 0.4% to 17% for the lateral meniscus and 0.06% to 0.3% for the medial meniscus [5]. Discoid meniscus is thick and less vascular; compared to the normal menisci and their peripheral attachment is loose. Consequently, it is more liable to mechanical or shear stress, which may necessitate surgical management [6]. Watanabe et al. [7] described three types of discoid meniscus (complete, incomplete, and the Wrisberg-type). The Wrisberg-type has a deformed posterior menisco-tibial attachment, so the meniscus is liable to anterior dislocation.

Meniscal injury is a leading cause for the functional deterioration. Meniscal tears are the most common injuries to the knee. Traumatic meniscal tears are responsible for significant pain and loss of function. Infrequently, traumatic meniscal tears are bilateral [8]. Accurate diagnosis of a meniscal tear is important for reducing morbidity and achieving proper treatment. Meniscal damage alters the biomechanics across the knee joint by increasing axial and shear stresses, eventually leading to early degenerative osteoarthritis [9].

A discoid lateral meniscus is not an uncommon anomaly of a morphologically thickened meniscus [10,11]. Albeit a discoid lateral meniscus considered a pain generator e.g. 'snapping knee syndrome', symptoms primarily appear if a discoid lateral meniscus is injured [12,13]. The discoid meniscus have been initially reported by Young in 1889, since then multiple reports followed through [14]. Nevertheless, most of the reports described only a narrow age group (mainly juvenile), unlike the situation in which we report this case in an adult patient [15,16]. For a long time, the menisci were managed as an inessential appendage and excised once started being symptomatic. However, as proved by long standing studies, meniscectomy per se is disappointing. A conservative approach for the meniscal tear management has been developed over the past few decades. The importance of meniscal preservation has been emphasized, as it has been understood the role of menisci in weight bearing, stabilization, and energy absorption [17].

Nowadays, with our sound understanding of the meniscal function by biomechanical studies and advances in arthroscopic surgery, surgical management has dramatically changed. In general, arthroscopic partial meniscectomy or meniscal repair is acceptable based on clinical assessment of the tear. Recently, efforts are applied to study the replacement and/or regeneration of the meniscus in an effort to restore function [18]. Shifting toward meniscal preservation led us to new surgical techniques including meniscal transplant [19].

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Received April 02, 2019; **Accepted** April 30, 2019; **Published** May 09, 2019

Citation: Asiri FA, Al-Ahaidib A, Al-Ahaidib A (2019) A Bucket-Handle Tear in a Discoid Lateral Meniscus: A Case Report and Literature Review. Clin Med Case Rep 3: 126.

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We aimed to report a case of “bucket-handle” tear in a discoid lateral meniscus following a sports injury. A comprehensive review of the current literature was also performed.

Case Report

A 32-year old male presented with pain, intermittent swelling, clicking and locking symptoms of his right knee for 3 months following a twisting injury while playing football. Previously, he had chronic right knee pain but without locking symptoms for 2 years. He is not known to have any other medical illnesses. On physical examination, there were neither effusion, redness, nor scars. He had medial and lateral joint line tenderness with a full range of motion. Results of ligamentous examinations were within normal. Radiograph of the knee showed widening of lateral joint space and narrowing of medial joint space (Figure 1). Magnetic Resonance Imaging (MRI) showed increased thickness and flattening of the lateral meniscus with loss of the normal

configuration of bow-tie reflecting the presence of a discoid meniscus. In addition, there was signal alteration within the meniscal substance extending across the entire lateral compartment indicating the presence of a tear (Figure 2).

Subsequently, the patient was taken to the operating room and diagnostic arthroscopy confirmed the diagnosis of a bucket handle tear in complete-type discoid lateral meniscus (Figure 3). There was also a grade 3 chondral defect on the medial femoral condyle. We performed partial meniscectomy with saucerization of the discoid lateral meniscus (Figure 4). A micro-fracture was done for the chondral defect at medial femoral condyle.

The patient was discharged from the hospital on the 1st day postoperatively. He started an early active range of motion with non-weight bearing mobilization as per postoperative rehabilitation

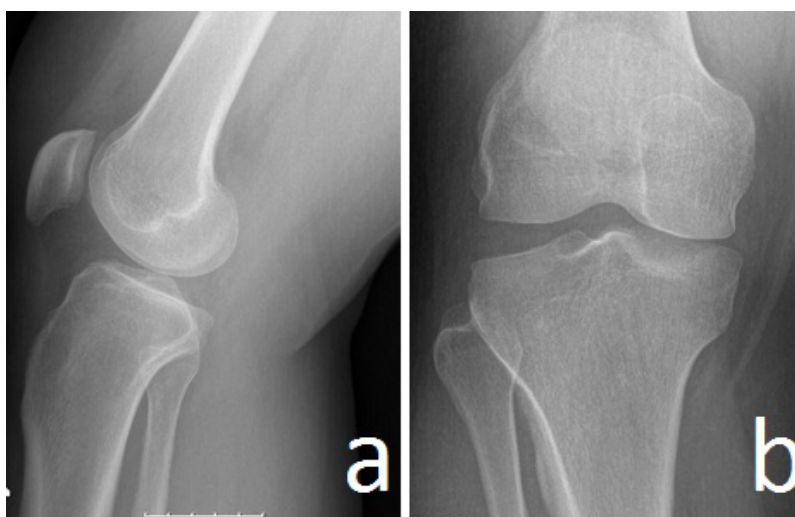


Figure 1: Lateral (a) and Anteroposterior (b) Radiographs of the right knee showing widening of the lateral joint space and subsequent genu varus deformity.

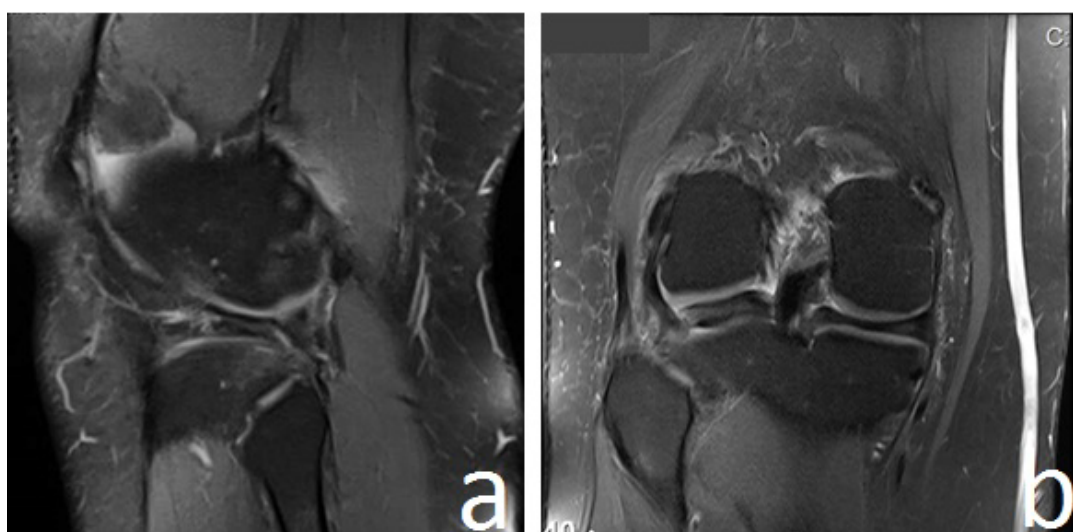


Figure 2: MRI showing in the coronal PDFS image (a) the lateral meniscus of increased thickness with high signal within its substance reflecting tear within a discoid meniscus. In the sagittal image (b) The tear is seen extending all the way through the discoid meniscus.

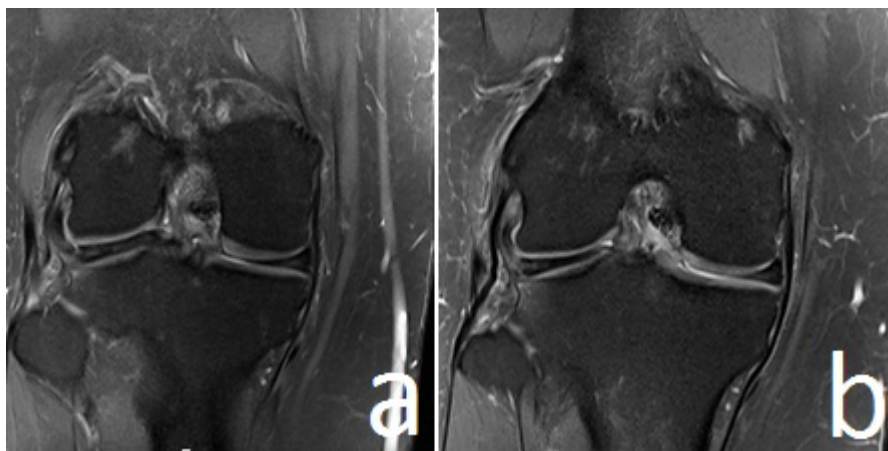


Figure 3: (a) and (b), T2-weighted coronal MRI showing lateral discoid meniscus with a tear and otherwise normal medial meniscus.

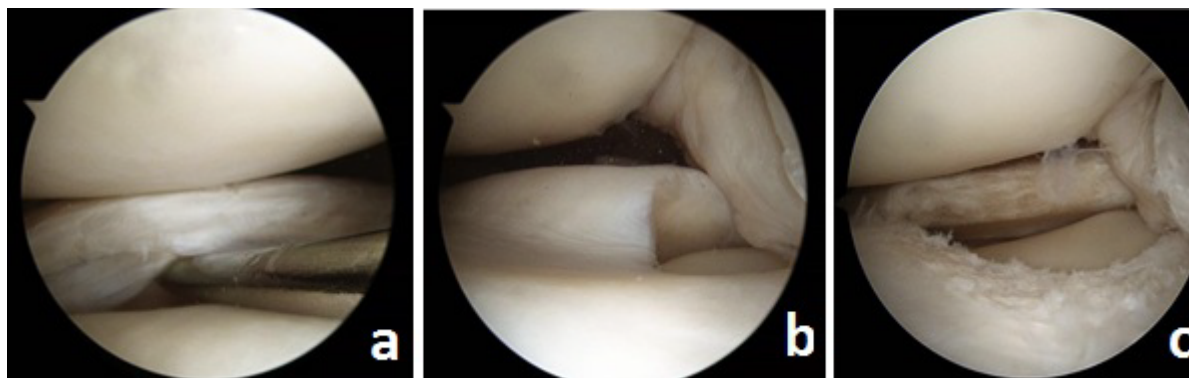


Figure 4: (a) Arthroscopic examination of the right knee showed lateral discoid meniscus with bucket handle tear (as by probe). (b) An arthroscopic image showed lateral discoid meniscus after excising the bucket handle tear. (c) An arthroscopic image showed a lateral meniscus after saucerization and partial meniscectomy.

protocol. At the most recent 6-month follow-up, his pain has much decreased and he had no more locking or clicking symptoms.

Discussion and Conclusion

Our case was a 32-year-old male, who presented with pain, intermittent swelling, clicking and locking symptoms of his right knee following a twisting injury. This presentation is comparable to that described by Skinner [20], who stated that meniscal tear is considered one of the most common knee injuries. The meniscal tears mostly develop from activities that leads to forcefully twisting or rotating the knee, especially when the pressure of body weight accommodated by the knee. A symptomatic torn meniscus causes swelling, pain, and stiffness and sometimes the inability to fully extend the knee. Thoreux et al. [21] added that meniscal tears occur less frequently among young patients aged less than 18 years. Han et al. [22] noted that bucket-handle tears constitute around 10% of all meniscal tears. The lateral meniscus is relatively loose compared to medial meniscus due to the interrupted capsule by the popliteal hiatus, which allows it to be more mobile. Therefore, the posterior horn of the lateral meniscus is prone to subluxation resulting in a displaced bucket-handle tear [6,23].

Plain radiographs and MRI of our patient suggested the presence of a co-existing bucket-handle tear of a discoid meniscus that was confirmed by arthroscopy. Lim et al. [24] noted that bucket-handle

tears of meniscus are highly demanding lesions for orthopedic surgeons as they require experience and a better arthroscopic visualization. MRI is considered the preferred imaging modality to evaluate cases with internal knee abnormalities [25]. Although arthroscopy is considered the gold standard diagnostic and therapeutic modality meniscal tears, MRI usually demonstrates higher sensitivity and specificity for the medial meniscus than for the lateral meniscus. Nguyen et al. [26] stressed that MRI is still highly accurate modality for meniscal injuries detection, with arthroscopic correlation. Nevertheless, Rubin [27] noted that a discoid meniscus can mask a bucket-handle tear leading to misinterpretation of bucket-handle tears at MR imaging. A discoid meniscus covers the tibial plateau partially or completely, allowing for more than two bow-tie segments to be present, even in the presence of a bucket-handle tear. The lateral meniscus is more commonly involved in bucket-handle tears. Operative management for our patient included partial meniscectomy with saucerization of the discoid meniscus. Adriani et al. [1] stated that arthroscopic saucerization permits the removal of the central portion, maintaining a stable residual periphery. Therefore, it represents the recommended management for symptomatic discoid meniscus. Rodeo [28] stated that the surgical management of bucket-handle tears involves partial meniscectomy or meniscal repair. However, Bender et al. [29] argued that meniscal preserving approach is favored to prevent subsequent osteoarthritis and to maintain joint

kinematics, especially in the athletic population. Multiple meniscal repair techniques have been described, and all involve the relocation of torn margins of meniscus to its normal anatomy. However, in our case the bucket handle was through the white-white zone, so we preferred to do partial meniscectomy rather than repair.

Atay et al. [30] reported superior clinical outcomes of partial meniscectomy in patients with the complete or incomplete discoid meniscus. Since Watanabe [31] proposed a classification for the discoid meniscus based on its morphology, many authors have utilized this classification in their reports. The percentage of the tear patterns have been reported in multiple studies. Smillie [13] stated that horizontal tear is the most frequent type presente in torn discoid meniscus, not the bucket handle tear. One case report was found for a large discoid medial meniscus with a bucket-handle tear that was treated by open partial excision following arthroscopy [32]. Another case was reported for a bucket-handle tear of a complete discoid lateral meniscus incarcerated in the posterolateral compartment which was treated by arthroscopic repair [33]. A third case report of a bucket-handle tear of a discoid lateral meniscus in a 6-year-old girl which was treated by arthroscopic subtotal meniscectomy [34].

Rehabilitation of our patient was started on the 1st day postoperatively by early active range of motion with non-weight bearing mobilization. Six months later, he got almost cured with decreased pain and no more locking and clicking symptoms. Irrgang stated that the traditional physical therapy protocol is partial weight bearing for the first four to six weeks with a brace locked in full extension and allowing passive range of motion limited from 0° to 90° for the first four weeks [35]. Pabian and Hanney added that in the accelerated approach to rehabilitation of meniscal repairs integrates unlimited flexion, hamstring muscle contraction, and weight-bearing in the early phase of rehabilitation [4].

In conclusion, a bucket-handle tear is not an uncommon injury. MRI is the preferred imaging modality to evaluate cases with internal knee derangements while arthroscopy is the gold standard modality for detection and management of meniscal tears including discoid meniscus tear. A good outcome can be obtained by performing partial meniscectomy with saucerization of the torn discoid meniscus and early rehabilitation.

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