

Research Article / Araştırma Makalesi

Surgical Management of Symptomatic Discoid Meniscus; Treatment Modalities and Functional Outcomes  
Semptomatik Diskoid Menisküsün Cerrahi Yönetimi; Tedavi yöntemleri ve fonksiyonel sonuçlar

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**Abstract:** The aim of the study was to evaluate the treatment modalities and the outcomes of patients operated on for discoid meniscus, and to compare the patients results with the existing literature. The study included 24 patients with discoid meniscus who underwent surgery between 2012 and 2022. Patients with incidentally discovered asymptomatic discoid meniscus were not included in the study. The diagnosis of the patients was made based on pain or mechanical symptoms accompanied by pain and X-Ray + MRI evaluation. Watanabe classification was used for macroscopic classification, and perioperative operation data of the patients were documented. The Oxford Knee Score was used for pre- and postoperative clinical evaluation. The average age of the 24 patients was 18.1. Eleven patients had right knee discoid meniscus, and five had a bilateral discoid meniscus. The most common symptom was pain (79%). Lateral discoid meniscus was detected in 22 patients (91%). Watanabe Type 1 was the most commonly observed macroscopic variant (41%). Tear were found in 10 patients. All patients underwent arthroscopic saucerization. There was a significant improvement in the Oxford Knee scores in the first postoperative year. The long-term outcomes of symptomatic discoid meniscus are quite good. Surgery should be recommended for patients with predominant mechanical symptoms and pain. Reshaping the meniscus and repairing instability are the main goals of surgery.

**Keywords:** Discoid meniscus, Saucerization, Treatment modalities

**Özet:** Bu çalışmanın amacı diskoid menisküs nedeniyle opere edilen hastalarda uygulanan tedavi yöntemlerini sunmak, hasta sonuçlarını değerlendirmek ve sonuçları literatür ile karşılaştırmaktır. Çalışmaya 2012-2022 yılları arasında opere edilen 24 diskoid menisküs hastası dahil edildi. İncidental saptanan asemptomatik diskoid menisküse sahip hastalar çalışmaya dahil edilmedi. Hastaların tanısı ağrı veya ağrının eşlik ettiği mekanik semptomlar ve X-Ray + Mr değerlendirme ile konuldu. Klinik değerlendirme de preop ve post op Oxford Knee skoru kullanıldı. 24 hastanın yaş ortalaması 18.1 idi. On bir hastada sağ diz diskoid menisküsü ve beşinde bilateral diskoid menisküs vardı. En sık semptom ağrıydı (%79). 22 hastada (%91) lateral diskoid menisküs saptandı. Watanabe Tip 1 en sık gözlenen makroskobik varyanttı (%41). 10 hastada yırtık saptandı. Tüm hastalara artroskopik saucerization uygulandı. Ameliyat sonrası 1. yılda Oxford Knee skorlarında anlamlı düzelme oldu. Semptomatik diskoid menisküsün uzun vadeli sonuçları oldukça iyidir. Baskın mekanik semptomları ve ağrısı olan hastalarda cerrahi önerilmelidir. Menisküsün yeniden şekillendirilmesi ve instabilitenin onarılması cerrahinin ana hedefleridir.

**Anahtar Kelimeler:** Diskoid menisküs, Yeniden şekillendirme, Tedavi yöntemleri

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## **1. Introduction**

Discoid meniscus (DM) is the most common malformation of the meniscus, characterized by a central hypertrophy and a larger diameter than normal, leading to disruption of the characteristic “C” configuration and causing instability(1). It mostly affects the lateral meniscus, but can also rarely occur in the medial meniscus (2, 3). DM has a lower collagen content and a disrupted vascular structure due to the lack of meniscofemoral ligaments and a pathological development (4-6).

Its collagen architecture and instability caused by the lack of meniscofemoral ligaments make the discoid meniscus susceptible to tears (7), which can either be asymptomatic or symptomatic depending on associated hypermobility or meniscal tears. Diagnosis includes patient history, physical examination, plain radiography, and magnetic resonance imaging (MRI), while arthroscopic evaluation confirms the shape and stability of the meniscus (8). Treatment aims to reshape the meniscus and repair associated tears or stabilize the instability (2).

This study aims to present the management, treatment algorithms and clinical outcomes of patients we treated with this rare pathology.

## **2. Materials and Methods**

This study retrospectively reviewed data from all cases of discoid meniscus between 2012 and 2022, with at least 12 months of follow-up. The study was conducted according to the Helsinki Declaration.

### ***Patient Evaluation***

Patients were mainly evaluated based on their symptoms and surgical decisions were made according to three stages: First, no treatment was recommended for incidental discoid menisci, and patients were followed annually; Second, patients with short-term pain and no tears on MRI were followed up; Third, patients with at least 6 months of pain and mechanical symptoms (snapping, limitation, swelling) underwent surgical treatment (2).

Two important evaluations were made based on preoperative MRI findings. First, the presence of any associated tears was examined. Second, MRI findings were searched for peripheral instability (such as absence of capsule insertions, increase in T2 signal due to the absence of coronal ligaments that simulate peripheral rupture, and anterior displacement of the posterior horn of the meniscus (9).

### ***Surgical Plan***

During arthroscopic treatment of a discoid meniscus, the following steps are taken: evaluation of the macroscopic shape of the discoid meniscus using the Watanabe classification(1), evaluation of stability and associated tears(2), meniscus saucerization to preserve the majority of the meniscus and mimic the shape of a normal meniscus and the peripheral thickness must be maintained within the range of 5-8 mm(3), repair of appropriate tears with sutures(4), and lastly evaluation and repair of peripheral stability of the meniscus(5)(All-inside for posterior and lateral tears, outside-in for anterior tears)(Figure 1).

### ***Post-Operative Rehabilitation***

Patients who underwent isolated discoid meniscus saucerization were allowed to bear full weight immediately after surgery. Physical therapy started 2-4 weeks after surgery, and gradual return to sports was allowed in 8-10 weeks. Patients who underwent saucerization plus meniscus repair were allowed to partially bear weight with crutches for 4-6 weeks after surgery. Full weight-bearing and progressive range of motion were allowed after 6-8 weeks. Physical therapy started in 2-4 weeks, and return to sports was usually postponed to 10-12 weeks after surgery.

## **3. Results**

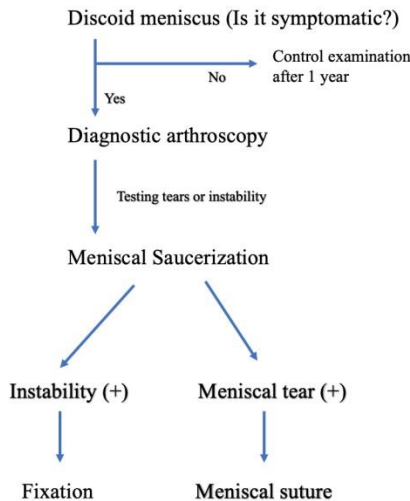
A total of 24 patients who underwent surgery with a diagnosis of discoid meniscus in our clinic were included in the study (Table 1). Seventeen patients with incidentally discovered discoid meniscus were followed

up and called for annual check-ups. The average age of 12 female and 12 male patients was 18.1 (range 7-37). All of them had pain or a mechanical problem accompanied by pain. Lateral discoid meniscus was present in 22 patients and medial discoid meniscus in 2 patients (Figure 2). Thirteen patients were amateurly involved in contact or non-contact sports.

Ten knees had Watanabe Type 1 (W1), nine knees had Watanabe Type 2 (W2), and five knees had Watanabe Type 3 (W3) discoid meniscus. All patients underwent partial meniscectomy (saucerization). One patient had accompanying congenital coxa vara, and valgisation osteotomy was performed in different sessions (Figure 3). Fourteen patients had accompanying meniscal tears, and meniscal repair was performed after saucerization. In six patients, unstable tears were detected, and meniscal fixation was applied after saucerization (Figure 4). The

average preoperative Oxford knee score of the 24 patients was 31.2 (range, 24-39). The average score of patients with detected tears was 30 (range, 25-37), and the average score of patients without detected tears was 31(range, 26-35±). There was no significant difference between the groups ( $p=0.923$ ). There was no significant difference between Watanabe Types 1-3 in terms of preoperative Oxford knee scores ( $p=0.734$ ).

No postoperative infection was observed in any patient, and all patients adhered to the physical therapy process. Postoperative 1st, 6th month, and 1st-year Oxford scores were 29.2, 38.4, and 42.5, respectively (Figure 5). Re-tear occurred in 2 patients. No neural deficits were observed in any patient at the final follow-up. Although there was a 10°–15° flexion contracture in two patients (8%) and a minimal extension deficiency of less than 10° in one patient (4%) at the last follow-up, no significant ROM deficiency was observed.



**Figure 1.** Management scheme of discoid meniscus patients



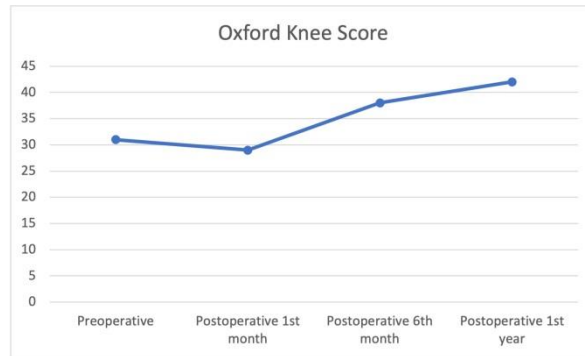
**Figure 2.** **a:** Coronal T2 sequence MRI showing 12-year medial discoid meniscus structure  
**b:** Sagittal T2 sequence MRI showing medial 12-year discoid meniscus structure  
**c:** Coronal T1 sequence MRI showing lateral 13-year discoid meniscus structure  
**d:** Sagittal T1 sequence MRI showing lateral 13-year discoid meniscus structure



**Figure 3.** **a:** Leg length film (orthoroentgenogram) showing a 9-year-old male patient with bilateral coxa vara  
**b:** Postoperative anterior-posterior pelvis X-Ray  
**c:** MRI image of lateral discoid meniscus accompanied by bucket handle meniscus tear



**Figure 4.** **a:** Arthroscopic image of Watanabe Type 1 Medial discoid meniscus  
**b:** Evaluation with the help of a probe before saucerization  
**c:** Arthroscopic saucerization procedure  
**d:** Postoperative MRI image of medial discoid meniscus after saucerization



**Figure 5.** Oxford Knee score timeline diagram

#### 4. Discussion

Discoid meniscus is the most common malformation of the meniscus, which can occur in 3-5% of Western populations and up to 15% in Asian populations (10,11). Approximately 15-25% of cases are bilateral (12). Kaplan et al. proposed that DM caused by embryological developmental arrest rather than a lack of development of the menisiofemoral (Wrisberg) ligament (1,4). This explains the association between discoid meniscus and instability. However, this hypothesis is insufficient to explain the presence of medial discoid meniscus. The discoid meniscus becomes symptomatic due to its unstable and weak collagen content in conjunction with structural problems in its peripheral vascular structure (5,6). In our study, we additionally identified instability in 6 patients who did not have tears. In W3 cases, menisiofemoral ligaments are almost totally absent, and stabilization is essential.

Watanabe is a macroscopic shape classification, but the clinical presentation is much more complex. Type 1 and 2 patients are generally asymptomatic until a tear occurs, while type 3 patients experience mechanical symptoms caused by instability (13). Most of our patients had type 3 macroscopy and had persistent pain and mechanical symptoms. Similarly, Ahn et al. presented that patients with meniscal shift based on MRI were more likely to present with tears and require treatment (14). Therefore, treatment options should be determined based on discoid morphology

(complete or incomplete), peripheral stability (stable or unstable), and the presence or absence of meniscal tears.

Discoid menisci are usually asymptomatic unless they have unstable stabilization or a tear (15). We followed the patients we incidentally identified, and none of them had symptoms in the first year. There are no long-term studies explaining the natural course and progression of asymptomatic discoid meniscus without surgery. Asymptomatic patients were advised to continue their normal activities and seek urgent medical evaluation for symptoms related to the knee. Symptoms of symptomatic meniscus vary depending on the degree of stability, patient activity and age, and the presence of tears. In adolescents, an insidious onset without trauma and a painful or locked knee should raise suspicion. Unlike traumatic tears found in normal menisci, complex degenerative and bucket-handle tears are common, although we mostly encountered vertical tears in our patients (3). If left untreated for a long time, tears can cause cartilage erosion (16).

Biomechanically, 70% of the load in the lateral compartment of the knee is transmitted through the meniscus. When this is absent, the force directed to the joint increases by %200 (7). Therefore, in DM, the main goal of treatment is to preserve a stable meniscus with anatomy as close as possible to a normal meniscus. This consists of partial meniscectomy to absorb and distribute the load and removal of the central part of the

meniscus by saucerization to regain its “C” shape (17). If the meniscus shows peripheral instability, peripheral fixation should be added if possible, as clinical outcomes improve in patients who undergo peripheral fixation (18). We applied large peripheral stabilization in our patients after saucerization, and we observed a 10-point increase in the Oxford knee scores in the first year.

During repair, the surgeon should be careful and examine the presence of peripheral tears carefully from anterior to posterior. This may be difficult in pediatric knees, and use of all-inside or combined inside-out sutures may be necessary (8). Steinbacher et al. reported an 86% return-to-sport rate in patients treated with the all-inside technique (19). For lateral posterior horns rate internal and all-inside sutures have a similar stability (20). Depending on the cost, the surgeon may either one of the two techniques. In addition, the all-inside suture technique can be technically challenging, especially in pediatric patients with smaller knees. Due to the closeness to neurovascular structures, care must be taken, also for the depth of penetration (21).

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#### Ethics

**Ethics Committee Approval:** The study was approved by Marmara University Clinical Research Ethical Committee (Decision no: 09.2023.212 Date: 03.02.2023).

**Informed Consent:** The authors declared that getting consent from the patients was unnecessary because the study was a retrospective data analysis.

**Authorship Contributions:** Surgical and Medical Practices: OMT, Sİ, YŞ. Concept: YŞ, EK. Design: YŞ, OMT, AHÇ. Data Collection or Processing: OMB, ET, EK. Analysis or Interpretation: YŞ, EK AHÇ. Literature Search: AHÇ, YŞ, OMT. Writing: YŞ, Sİ, OMT.

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