SHORT COMMUNICATION

Discoid LaterL Meniscus: A Concise Literature Update

E. Carlos Rodriguez-Merchan, MD, PhD

Research performed at the Department of Orthopedic Surgery, La Paz University Hospital-IdiPaz, Madrid, Spain

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Abstract

Discoid lateral meniscus (DLM) is the most frequent congenital variant of the lateral meniscus, which is prone to degeneration and tears, and frequently causes knee osteoarthritis. The purpose of this article has been to analyze the publications made during 2023 on DLM. The main conclusions of the analysis were as follows: MRI assessment might be helpful to diagnose DLM and detect the presence of instability: two main factors in the decision to perform surgery. Arthroscopic assessment should be utilized in conjunction with MRI findings for complete DLM diagnosis. Restoring the normal shape, retaining adequate width and thickness, and ensuring the stability of the remnant DLM is essential to sustaining the physiological function of the meniscus and preserving the knee. Partial meniscectomy with or without repair should be the first-line treatment when feasible, given that the clinical and radiological long-run results of total or subtotal meniscectomy are worse.

Level of evidence: III

Keywords: Discoid, Diagnosis, Lateral, Meniscus, Results, Treatment

Introduction

Discoid lateral meniscus (DLM) is the most frequent congenital variant of the lateral meniscus, which is prone to degeneration and tears, and frequently causes knee osteoarthritis.[1]

The aim of this paper has been to analyze the publications made during 2023 (from January 1 to July 21) on DLM. For this purpose, a search was performed in PubMed dated 21 July 2023 using "discoid meniscus 2023" as the keyword. We found 25 articles, of which 20 were finally analyzed because they were directly related to the title of this article.

Main body

[Table 1] shows the most important information from the publications analyzed in this article.[1-20] Campbell et al presented an algorithm for treatment of DLM and discussed future directions for the comprehension and management of this condition [Figure 1].[20]

Table 1. Articles on discoid lateral meniscus (DLM) published in PubMed from January 1, 2023 to July 21, 2023

AUTHORS [REFERENCE]	N (p / k)	METHODS	RESULTS	ADVERSE EVENTS	CONCLUSIONS
You et al [3]	50 p / 50 k	Children aged under 14 with unilaterally symptomatic bilateral discoid lateral meniscus experiencing arthroscopic meniscoplasty were analyzed. Patients were either experienced meniscoplasty on the painful side, with the asymptomatic side conservatively managed (cohort 1) or experienced meniscoplasty on both sides concurrently (cohort 2). Functional results were assessed utilizing the Lysholm score and Ikeuchi score. Relative cost was calculated by the Kruskal-Wallis test. The occurrence of symptoms was analyzed by the Kaplan-Meier model.	For the average Lysholm scores, cohorts 1 and 2 of the previously asymptomatic side were 90.86 and 92.62. For the painful side, the Lysholm scores were 91.38 and 95.71. Regarding the mean cost of treatment, a substantial difference was found between cohort 1 and 2. The Kaplan-Meier survival analysis of the occurrence of symptoms exhibited no statistical difference between the 2 cohorts, and the terminal survival rates in the 2 cohorts were 86.2% and 81%, respectively.	None	Conservative management yielded the same clinical outcomes as the concurrent meniscectomy, with a potential of longer mean survival time and lower demand of cost in treatment.

Corresponding Author: E. Carlos Rodriguez-Merchan, Department of Orthopedic Surgery, La Paz University Hospital-IdiPaz, Madrid, Spain

Email: ecrmerchan@hotmail.com

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Table 1. Continued

Kambara et al [4]	1 p / 1 k	A 41-year-old man presented with continuous swelling of the knee 6 months after arthroscopic meniscal repair and partial meniscectomy carried out for lateral discoid meniscal tear. The initial surgical procedure was carried out at another center. Four months after the procedure, swelling of the knee was detected when he resumed running.	At his initial visit to our center, intra-articular blood accumulation was found via arthrocentesis. A second arthroscopic examination carried out 7 months after the initial procedure demonstrated healing of the meniscal repair site and synovial proliferation. The suture materials detected during the arthroscopy were removed. Histological examination of the resected synovial tissue demonstrated inflammatory cell infiltration and neovascularization. Besides, a multinucleated giant cell was detected in the superficial layer. After the second arthroscopic surgery, the hemarthrosis did not recur, and the individual was able to resume running without symptom 18 months post-surgery.	None	Bleeding from the proliferated synovium at or near the periphery of the lateral meniscus was considered to be the cause of the hemarthrosis as a rare adverse event after arthroscopic meniscal repair.
Saliba et al [5]	1 p / 1 k	These authors presented the case of siblings with lateral discoid menisci, discovered by knee magnetic resonance imaging (MRI), reinforcing the case for the existence of familial discoid menisci.	The children's father reportedly had a discoid meniscus as well, but confirmation was impossible due to his country of origin's poor record keeping.	None	This publication presented further case of discoid menisci happening within families.
Yang et al [6]	118 p / 154 k	Middle-aged and elderly individuals with painful discoid lateral meniscus who underwent arthroscopy or conservative treatment were analyzed, including 76 individuals (96 knees) in the arthroscopy cohort (cohort 1) and 42 individuals (58 knees) in the conservative treatment cohort (cohort 2).	There was no substantial difference in age, gender, and body mass index between the two cohorts. Compared with cohort 2, the symptoms duration in cohort 1 was longer, the incidences of discoid lateral meniscus injury and mechanical symptoms were higher, and the visual analog scale (VAS) score and Lysholm score prior to treatment were worse, with substantial differences. VAS score and Lysholm score before and after treatment were compared. The individuals in both cohorts were followed up 66.3 months on average. The follow-up time of cohort 1 and cohort 2 was (65.9) months and (67) months respectively, with no substantial difference. At last follow-up, in either cohort 1 or cohort 2, the VAS score and Lysholm score substantially improved when compared with those prior to treatment. The differences of VAS score and Lysholm score in cohort 1 before and after treatment were substantially better than those in cohort 2.	None	Arthroscopy and conservative treatment had a satisfactory mid-term efficacy on painful discoid lateral meniscus in middle-aged and elderly individuals. However, the improvement of symptoms and function of arthroscopy was substantially better than that of conservative treatment. For middle-aged and elderly painful discoid lateral meniscus individuals with unsuccessful conservative treatment for 6 months, severe clinical symptoms, long duration of symptoms, and combined with mechanical symptoms, arthroscopy should be indicated even if they are complicated with early osteoarthritis.
Kato et al [7]	1 p / 1 k	A 14-year-old boy who experienced left knee pain after twisting his knee at school was sent to our hospital. He had limited extension of -10°, lateral clicking, and pain on the McMurray test in the left knee and complained of slight clicks in the right knee. MRI results for both knees showed discoid medial and lateral menisci.	Surgery was carried out on the symptomatic left knee. Arthroscopically, a Wrisberg-type discoid lateral meniscus and an incomplete-type medial discoid meniscus were confirmed. The symptomatic lateral meniscus was saucerized and sutured.	None	The boy was doing well 2 years after the surgical procedure.
Nishino et al [8]	86 k	Medical records of individuals with discoid lateral meniscus or normal lateral meniscus were retrospectively reviewed using MRI. Discoid lateral meniscus cases were divided into symptomatic and asymptomatic cohorts. The midbody meniscal extrusion was measured using mid-coronal MRI. The relationship between meniscal extrusion and MRI findings, including the meniscofemoral ligament, meniscotibial ligament (MTL), intrameniscal signal intensity of the peripheral rim, meniscal shift, and skeletal maturity, was assessed. Eighty-six knees with discoid lateral meniscus (63 symptomatic) were analyzed. The control cohort included 31 individuals.	The symptomatic cohort exhibited substantially greater meniscal extrusion (mean discoid lateral meniscus: 1mm, asymptomatic discoid lateral meniscus: 0.1mm, and normal lateral meniscus: 0.3mm) and had a substantially higher prevalence of MTL loosening and intrameniscal signal than the other two cohorts. In the symptomatic cohort, multivariable linear regression analysis demonstrated that MTL loosening and intrameniscal signal were independent associated factors.	None	Lateral meniscus extrusion was substantially more frequent in individuals with symptomatic discoid lateral meniscus than in those with asymptomatic discoid lateral meniscus or a normal lateral meniscus. MTL loosening and intrameniscal high-signal intensity on MRI were independently associated with meniscal extrusion.

Table 1. Continued

Suzuki et al [9]	1 p / 1 k	These authors presented a pediatric case of symptomatic bilateral complete discoid medial menisci	NA	NA	This article highlighted the efficacy of arthroscopic partial meniscectomy with or without peripheral suture on symptomatic complete discoid medial menisci based on 5-year excellent clinical and functional outcomes.
Grassi et al [10]	9 p / 9 k	Nine cases of Wrisberg variant type III discoid lateral menisci were found based on patient's history and clinical examination. Knee MRIs were reviewed to exclude the presence of type I-II discoid meniscus (complete or incomplete) or bucket handle tears and general arthroscopic criteria. For the Wrisberg variant discoid lateral meniscus were applied for the final diagnosis. All cases presented similar peculiar clinical, radiological, and arthroscopic features, which led to the diagnosis of hypermobile Wrisberg variant of lateral discoid meniscus.	NA	NA	Lateral discoid meniscus is responsible for symptoms such as pain, popping and knee locking; furthermore, subtle but peculiar MRI and arthroscopic characteristics can be found. Considering the possibility of repeated dislocation and relocation, diagnosis can be challenging, and a high grade of suspicion should be used, especially in young individuals, bilateral symptoms, and absence of trauma.
Niu et al [2]	44 p /45 k	The hypothesis of the study was that surgeons experienced in treating discoid lateral meniscus were able to reliably interpret discoid lateral meniscus pathology utilizing MRI. The level of evidence of this study was 3. Knee MRI scans from 44 individuals (45 knees) were selected from a pool of surgically treated individuals with discoid lateral meniscus. Five reviewers (fellowship-trained pediatric sports medicine surgeons) carried out independent review of each MRI scan utilizing the PRiSM Discoid Meniscus Classification. Inter- and intraobserver reliability of the rating factors-primary (width, height, presence of peripheral instability or tear) and secondary (location of instability or tear, tear type)-was evaluated.	Interobserver reliability in evaluating most primary and secondary characteristics ranged from significant (meniscal width) to moderate (peripheral instability, anterior instability, posterior instability, and posterior tear). Intraobserver reliability for most characteristics ranged from significant (peripheral instability, presence of tear, anterior instability, posterior instability, and posterior tear) to moderate (meniscal width, anterior tear, and tear type). Notable exceptions were presence of tear, anterior tear, and tear type-all with fair interobserver reliability. Height had poor interobserver reliability and fair intraobserver reliability.	NA	Orthopedic surgeons reliably interpreted MRI scans utilizing the PRiSM Discoid Meniscus Classification for the majority of discoid lateral meniscus characteristics but vary in their evaluation of height and presence and type of tear. MRI assessment might be helpful to diagnose discoid by width and identify the presence of instability: two major factors in the decision to proceed with surgery. Arthroscopic assessment should be utilized in conjunction with MRI findings for complete discoid lateral meniscus diagnosis.
Liu et al [11]	48 p / 53 k	A retrospective review was performed by categorizing individuals into 2 cohorts depending on whether a splint immobilization was adopted postoperatively: for group 1 (30 individuals, 31 knees), rehabilitation began early without splint immobilization after surgery, and for group 2 (18 individuals, 22 knees), a knee splint was immobilized for 2 weeks.	The Lysholm scores of group 1 (62.94) was higher than that of group 2 (46.68) measured 4 weeks following surgery, but there was no difference at 8 weeks, and both cohorts had similar time to return to normal activities.	None	For discoid lateral meniscus individuals who experienced isolated saucerization, short-run splint immobilization did not substantially help alleviate postoperative pain. There was a comparable time-course for return to normal activities in both study cohorts.
Nishino et al [12]	32 p / 36 k	Nishino et al tried to quantify meniscal status with MRI T2 mapping before and after arthroscopic reshaping surgery for discoid lateral meniscus. They analyzed individuals experiencing arthroscopic reshaping surgery for symptomatic discoid lateral meniscus with ≥ 2-year follow-up. MRI T2 mapping was carried outed preoperatively and at 1 and 2 years postoperatively. T2 relaxation times of the anterior and posterior horns of both menisci and of the adjacent cartilage were evaluated. The mean age at surgery was 13.7 years (range 7-24), and the mean follow-up duration was 31 months. Saucerization alone was carried out on five knees and saucerization with repair on 31 knees.	Preoperatively, the T2 relaxation time of the anterior horn of the lateral meniscus was substantially longer than that of the medial meniscus. T2 relaxation time substantially diminished at 1 and 2 years postoperatively. Evaluations of the posterior horn were comparable. The T2 relaxation time was substantially longer in the tear versus non-tear side at each time point. There were substantial correlations between the T2 relaxation time of the meniscus and that of the corresponding area of the lateral femoral condyle cartilage.	NA	The T2 relaxation time of symptomatic discoid lateral meniscus was substantially longer than that of the medial meniscus preoperatively, and it diminished 2 years after arthroscopic reshaping surgery. The meniscal T2 relaxation time of the tear side was substantially longer than that of the non-tear side. There were substantial correlations between the cartilage and meniscal T2 relaxation times at 2 years after surgery.

Table 1. Continued

Yokoe et al [13]	1 p (1 k) + 6 k models	Subject-specific finite-element models of the knee joint of an individual with discoid lateral meniscus were developed from CT and MRI. To assess the effect of partial meniscectomy on the contact stress in the lateral tibiofemoral joint, 6 knee models were created in the study (the native discoid lateral meniscus, and 5 partially meniscectomized discoid lateral menisci (according to the preserved width of the meniscus: 12 mm, 10 mm, 8 mm, 6 mm, and 4 mm).	As the volume of resected discoid lateral meniscus increased, higher contact stress was applied to the lateral tibiofemoral joint. Greater contact stress was applied to the preserved lateral meniscus than to the native discoid lateral meniscus.	NA	From a biomechanical point of view, the native discoid lateral meniscus was the most protective against lateral tibiofemoral contact stress in comparison to partially meniscectomized discoid lateral menisci.
Diao et al [14]	Systematic review	In a systematic review with level 4 of evidence Diao et al compared postoperative clinical results of discoid meniscus tear procedures such as saucerization with or without repair with those of non-discoid meniscus tears such as meniscectomy or repair in skeletally mature individuals with no concomitant injuries.	A total of 2213 patients were included with a mean age of 38.6 years (range: 9-64.4). The mean follow-up time was 54.1 months (range: 1-234) and the average percentage of female participants was 46.8%. The mean change between preoperative and postoperative Lysholm scores ranged from 21-39, 7.4-24.1, and 24.2-48.4 in the discoid, non-discoid meniscectomy, and non-discoid repair cohortss, respectively. The mean change in Tegner scores ranged from 0 to 2.3, 1.3, and 0.4-1.3 in the discoid, non-discoid meniscectomy, and non-discoid repair cohorts, respectively.	Revision percentages for discoid procedures, non-discoid meniscectomies, and non-discoid meniscus repairs ranged from 3.2 to 44%, 8.3 to 56%, and 5.9 to 28%, respectively. The most frequent reasons for revision were acute trauma and persistent pain.	Discoid saucerization procedures with or without repair led to similar Lysholm scores as non-discoid repair procedures, and similar IKDC scores and revision percentages compared to non-discoid meniscectomy or repair procedures. Individuals experiencing discoid procedures seemed to have slightly higher Tegner activity scores compared to individuals experiencing non-discoid procedures.
Yang et al [1]	NA	Expert consensus	Restoring the normal shape, retaining adequate width and thickness, and ensuring the stability of the remnant meniscus is essential to sustaining the physiological function of the meniscus and preserving the knee.	NA	Partial meniscectomy with or without repair should be the first-line treatment when feasible, given that the clinical and radiological long-run results of total or subtotal meniscectomy are worse.
Wang et al [15]	8 p / 8 k	In a study with level 3 of evidence Wang et al compared the long-run clinical and radiological outcomes of meniscal allograft transplantation (MAT) for discoid lateral meniscus individuals with MAT for non-discoid lateral meniscus individuals and meniscectomy for discoid lateral meniscus individuals and, thus, to determine whether discoid lateral meniscus individuals were suitable candidates for MAT. Eight MAT cases in discoid lateral meniscus individuals were identified (discoid MAT cohort), six MAT cases in non-discoid lateral meniscus individuals (non-discoid MAT cohort) and ten total meniscectomy cases in discoid lateral meniscus patients (discoid meniscectomy cohort) were matched as controls. Subjective assessments, postoperative radiography and MRI were performed at 5 years and 10-14 years, respectively. Joint degeneration was evaluated by the Kellgren-Lawrance (KL) degree and joint space width (JSW). MRI with T2 mapping sequences was utilized to quantitatively assess degeneration of the joint cartilage and shrinkage of the allografts.	There was no difference in Lysholm, IKDC, Tegner or VAS scores amongst the discoid MAT, non-discoid MAT and discoid meniscectomy cohorts at the final follow-up. No revision surgery was carried out in any MAT individual. The JSW narrowing in the discoid MAT cohort was better than that in the discoid meniscectomy cohort (0.8 mm versus 2.1 mm) and worse than that in the non-discoid MAT cohort (0.1 mm). The KL progression of the discoid MAT cohort was less than that of the discoid meniscectomy cohort (1.3 versus 2.3). The discoid meniscectomy cohort had worse cartilage lesion progression than the discoid MAT and non-discoid MAT cohorts. The allograft width of the discoid lateral meniscus individuals shrank more than that of the non-discoid individuals at the meniscus midbody (3.6 mm versus 6.2 mm).	NA	Compared to meniscectomy, MAT accomplished similar long-run symptom alleviation and superior chondroprotection in discoid meniscus individuals. Despite more graft shrinkage, the results of MAT in discoid meniscus individuals were comparable to those in non-discoid meniscus individuals. Consequently, discoid lateral meniscus individuals might be suitable candidates for MAT procedures.

Table 1. Continued

Kinoshita et al [16]	110 p / 110 k	In a study with level 3 of evidence Kinoshita et al tried to differentiate knee joint morphology between individuals with and without a discoid lateral meniscus, as a function of skeletal maturity, using MRI. This was an analysis of MRIs of the knee for 110 individuals, 6-49 years of age. Of these, 62 were in the open physis cohort (38 with a discoid lateral meniscus) and 48 in the closed physis cohort (23 with a discoid lateral meniscus). Several morphological parameters were measured: anterior obliquity of the lateral tibial plateau (AOLTP), posterior obliquity of the lateral tibial plateau (POLTP), the lowest point of the lateral femoral condyle (LPLFC), and the posterior lateral condylar angle (PLCA).	Regardless of skeletal maturity, a discoid lateral meniscus was associated with a greater inclination of the POLTP, lateralization of the LPLFC, and smaller PLCA for all compared to that of the control. In the discoid lateral meniscus cohort, the inclination of the AOLTP and the POLTP were substantially smaller and the LPLFC was more lateral in the closed physis cohort than in the open physis cohort. In the control cohort, the inclination of the POLTP was larger and the PLCA smaller in the open than in the closed physis cohort.	NA	Kinoshita et al identified a characteristic knee morphology among individuals with a complete discoid lateral meniscus using MRI, which was observed before physeal closure and persisted after skeletal maturity. They also noted lateralization of the LPLFC in the presence of a discoid lateral meniscus, with an increase in lateralization with skeletal maturation.
Lei et al [17]	859 p / 859 k	In a study with level 3 of evidence Lei et al investigated whether a torn discoid lateral meniscus was associated with more varus alignment than a torn semilunar lateral meniscus (SLM), and whether the lower-extremity alignment associated with a torn discoid lateral meniscus changes with age. Individuals who experienced arthroscopic knee surgery for a torn lateral meniscus were included. Individuals (n = 436) with a torn discoid lateral meniscus (confirmed on arthroscopy) were allocated to the discoid lateral meniscus cohort; those (n = 423) with a torn SLM were allocated to the SLM cohort. The mechanical axis deviation (MAD), hip-knee-ankle angle (HKA), mechanical lateral distal femoral angle, and medial proximal tibial angle were compared between the 2 cohorts. Besides, the correlation of the HKA and MAD with age was assessed within the discoid lateral meniscus cohort. All baseline characteristics were well balanced between the 2 cohorts.	The discoid lateral meniscus cohort had substantially more varus alignment than the SLM group (MAD: 3.6 mm versus 1.1 mm, respectively; HKA: 179.1° versus 179.9°, respectively). Within the discoid lateral meniscus cohort, the MAD and HKA had a weak correlation with age.	NA	Individuals with a torn discoid lateral meniscus had more varus knee alignment than those with a torn SLM, and this trend did not increase with age after minimizing the effects of osteoarthritis. Therefore, surgical treatment might not be adequate for asymptomatic discoid lateral meniscus.
Al Saedi et al [18]	1 p /1 k	Al Saedi et al presented a 13-year-old boy with a history of left knee pain after a fall. The pain was stabby in nature with a decrease in range of motion in the left knee and positive McMurray and Apley's tests on examination.	The boy was treated by arthroscopic saucerization, and the procedure was successful.	None	The boy had a good postoperative result after two months of follow-up.
Anderson et al [19]	21 p / 22 k	In a study with level 4 of evidence Anderson et al reported the clinical manifestations and surgical treatments of discoid medial menisci in children from multiple centers in North America. They hypothesized that symptoms and signs, arthroscopic findings, operative treatments, and results were similar to those for symptomatic discoid lateral menisci. They analyzed individuals with a diagnosed discoid medial meniscus confirmed at surgery across 8 children's hospitals between January 2000 and June 2021. The literature on discoid lateral menisci was reviewed and summarized for comparison.	A total of 21 individuals (9 female, 12 male) with 22 discoid medial menisci were identified. The mean age at the time of diagnosis was 12.8 years. The most frequent symptoms and signs were locking and/or clunking, present in 12 of 22 knees (55%), similar to that reported in individuals with discoid lateral menisci. Twelve discoid medial menisci were complete (55%); 8, incomplete (36%); and 2, indeterminate (9%). Tears were found in 13 knees, most frequently horizontal cleavage (54%). Five discoid medial menisci were unstable (23%): 3 for posterior tears and 2 for rim insufficiency. All 22 knees experienced arthroscopic saucerization, and of the 13 torn menisci, 7 (54%) were repaired. The mean follow-up was 2 years. High percentages of peripheral instability were also found in case series of individuals with discoid lateral menisci.	Four knees experienced reoperation. All knees that needed reoperation had experienced repair for a posteriorly located tear. There was a substantial association between surgical repair and need for reoperation	Patient presentations and treatments for those with discoid medial menisci were similar to those published for patients with discoid lateral menisci. Knees with discoid medial menisci also showed instability attributed to peripheral insufficiency and posterior tears. Tears were present in over half of knees with discoid medial menisci, and reoperation was more frequent in knees that experience repair of tears than those without repair.

Table 1. Continued

Campbell et al [20]	Review article	This article presented a comprehensive review on current knowledge of discoid lateral meniscus, focusing on pathology in parallel with surgical techniques and results.	These authors stated that a paradigm shift in surgical treatment of discoid lateral meniscus is taking place as knee surgeons are seeing more individuals with long-run sequelae of partial lateral meniscectomy, the standard treatment for discoid lateral meniscus for many years. Surgical management has evolved alongside the comprehension of discoid lateral meniscus pathology. A new classification system has been proposed and optimal surgical techniques described in recent years.	NA	Surgical treatment of discoid lateral meniscus must be tailored to individual pathology, which is variable within the diagnosis of discoid lateral meniscus. These authors presented an algorithm for treatment of discoid lateral meniscus and discussed future directions for the comprehension and management of this debilitating condition. This article highlighted up-to-date evidence and techniques in treatment of both acute discoid lateral meniscus tears and joint restoration after subtotal meniscectomy for discoid lateral meniscus.

N, number; p, patients; k, knees; MRI, magnetic resonance imaging, CT, computed tomography; IKDC, International Knee Documentation Committee. NA, Not available

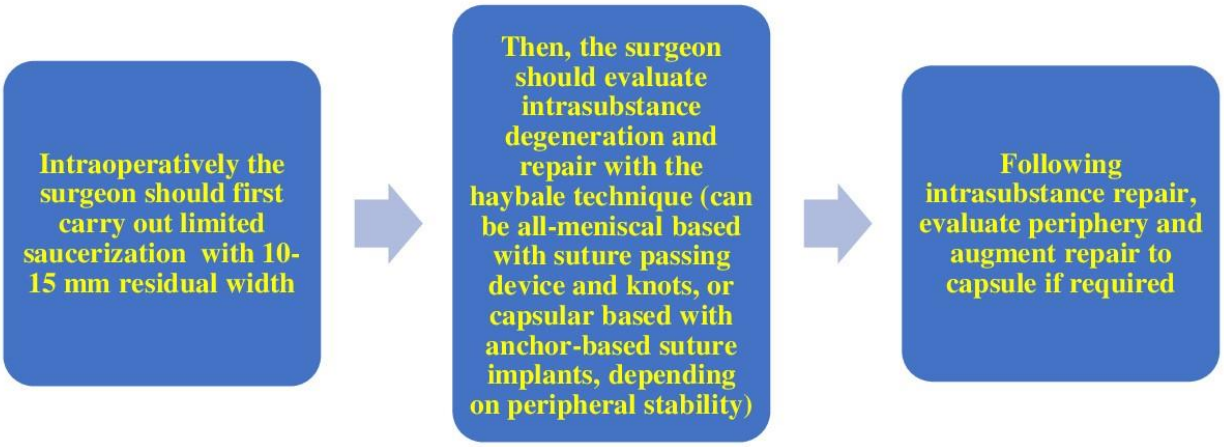

Figure 1. Algorithm for the management of discoid lateral meniscus reported by Campbell et al in 2023.[20]

Conclusion

Reestablishing the normal shape, the appropriate width and thickness, and ensuring the stability of the remnant DLM is crucial. Partial meniscectomy with or without repair should be the first-line surgical therapy when possible.

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E. Carlos Rodriguez-Merchan MD, PhD [1]

1 Department of Orthopedic Surgery, La Paz University Hospital-IdiPaz, Madrid, Spain

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