Evolution of Osteochondritis Dissecans of the Lateral Femoral Condyle Combined with Discoid Meniscus

Erica Bulgheroni[1] Lorenzo Mattioli[2] Paolo Bulgheroni[3]

[1] Ospedale Valli del Noce, Cles, Italy
[2] Ospedale Civile di Bolzano, Bolzano, Italy
[3] Policlinico di Monza, Monza, Italy

Address for correspondence Erica Bulgheroni, MD, Viale De Gasperi, 38026, Cles, Italy (e-mail: ericabulgheroni@hotmail.it).

Joints 2017;5:114–117.

Abstract

The discoid meniscus is a rare anomaly of the knee that affects mostly the lateral meniscus and is often asymptomatic. The osteochondritis dissecans is a disorder of the subchondral bone and articular cartilage and occurs frequently associated with the discoid lateral meniscus. In the present case, we showed the evolution of this association related to surgical treatment. A patient with lateral knee pain and a magnetic resonance depicting a torn discoid lateral meniscus and osteochondritis dissecans of the lateral femoral condyle was treated with partial meniscectomy and meniscal sutures. After 1 year, the symptoms reappeared, and a new meniscal repair was performed to treat a bucket-handle tear, while cartilage was apparently intact. After 4 years, there was a new recurrence of symptoms, and the knee developed a valgus deformity. Cartilage was treated with microfractures, and a subsequent distal femoral osteotomy associated with lateral meniscal scaffold was performed. The patient was followed up clinically, with radiographs and magnetic resonance for 5 years with an improvement of the results up to 2 years and no signs of deterioration of results over time.

Keywords

- discoid meniscus
- knee
- osteochondritis dissecans
- meniscal scaffold
- cartilage

Introduction

The discoid meniscus is a rare anomaly of the knee that occurs in the younger population, with different symptoms. The discoid meniscus looks larger and has a different histological structure compared with the normal meniscus.[1,2] The first mention appeared in Young[3] and Dickhaut.[4] More frequent is the lateral involvement. The incidence is difficult to define given the frequent asymptomatic presentation.[5–9]

The osteochondritis dissecans (OCD) is characterized by the complete or partial separation of a fragment of cartilage and subchondral bone; usually in young patients.[10] Its incidence is relatively low.[11,12] The lateral femoral condyle (LFC) is interested in 13 to 16% of the cases.[10,13,14] The pathogenesis is debated.[10,15–21] It has been frequently observed the combination of discoid lateral meniscus with the OCD of the LFC.[22–25]

The case report described the evolution of these two diseases as consequence of the treatment in a young patient.

Case Description

A 10-year-old boy complained a right posterolateral knee pain and feeling of giving way of the knee during sports and walking with no history of trauma. Physical examination revealed pain at lateral palpation; the knee was normally aligned and stable, with a full range of motion. Magnetic resonance (MR) showed the presence of an OCD of the LFC. Arthroscopy revealed a longitudinal lesion of the discoid lateral meniscus with posterior detachment. Meniscal

DOI https://doi.org/10.1055/s-0037-1603673.
ISSN 2282-4324.

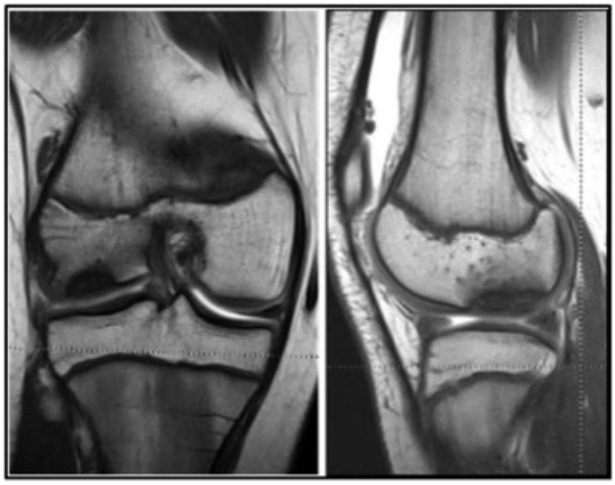

Fig. 1 MR scans show OCD of the LFC. LFC, lateral femoral condyle; MR, magnetic resonance; OCD, osteochondritis dissecans.

Fig. 3 Lateral opening-wedge distal femoral osteotomy.

regularization and posterior anchorage with one Fast-fix (Smith & Nephew, Andover, Massachusetts, United States) was performed. Cartilage lesions were not observed. After 1 year the knee pain during and after physical activity with effusion reappeared with pain on the lateral compartment. The OCD persisted on MR (►**Fig. 1**). The injured area appeared in area 4 in the anteroposterior radiographic view and in the C region in the sagittal view according to Cahill and Berg.[26] Arthroscopy showed a bucket-handle tear of the lateral meniscus without cartilage pathology; the meniscus was sutured with two Fast-fix, and the parameniscal region was sacrificed to favor bleeding. After 4 years, recurrence of pain occurred mainly under loading conditions with frequent episodes of effusion treated with arthrocentesis and anti-inflammatory therapy. Imaging showed the persistence of OCD of the LFC with the presence of an intra-articular loose body, and 16 degrees of valgus deformity of the knee. Arthroscopy confirmed a grade 4 OCD of the LFC (1 cm × 1.5 cm), almost complete absence of the meniscal body and a loose small cartilaginous fragment that was removed. Because of the limited size of the osteochondral lesion, microfractures were performed. A subsequent limb realignment and scaffolding of the lateral meniscus was planned after finishing the rehabilitation protocol. After 3 months the patient underwent a lateral opening-wedge distal femoral osteotomy (DFO) (7.5 degrees) (►**Fig. 2**) and partial meniscal replacement with a 4.5 cm meniscal scaffold (Actifit; Orteq, London, United Kingdom). The arthroscopic evaluation revealed a partial repair of the osteochondral defect (►**Fig. 3**).

Clinical assessment before the last surgery with Lysholm and Tegner scores, and the visual analog scale showed 72, 3, and 8 points, respectively. Follow-up evaluations at 1 year (100, 4, and 0 points, respectively) and 2 years (100, 7, and 0 points, respectively) showed a marked clinical improvement with a return to high-impact sports, such as rugby. Subsequent yearly evaluations showed no deterioration of results.

The radiographic evaluation performed at 3 years confirmed the complete healing of DFO and the maintenance of limb alignment. The DFO plate was then removed in combination with a second-look arthroscopy to assess the status of the meniscal scaffold and to perform a biopsy of the scaffold tissue. At the histological evaluation by polarized light

Fig. 2 Arthroscopic treatment of meniscal defect with the scaffold. Partial repair of the osteochondral lesion of the LFC can be seen. LFC, lateral femoral condyle.

microscopy, the scaffold was rich in roundish, large, and active cells, and smaller cell differentiated into chondrocytes; moreover, plasmacytes, macrophages, and rare lymphocytes as related to a foreign body reaction were observed.

Discussion

In 1982, Glasgow[27] first described the relationship between the OCD of the LFC and discoid lateral meniscus. Smillie[21] and Aichroth et al[24] recognized the meniscal tear among the causes OCD, and this association was confirmed in other studies.[25,28] The hypothesis is that damaged discoid meniscus produces abnormal contact forces on the weak growing osteochondral structures. On the contrary, many authors pointed out the association between intact discoid lateral meniscus and OCD of the LFC.[14,25] The peculiar meniscus ultrastructure would lead to an abnormal load transmission. In this context, meniscal regularization would be resolutive.[22]

OCD of the LFC has been reported following total meniscectomy for the discoid lateral meniscus.[12,29,30] Therefore, the meniscus may not be a determining factor. Meniscectomy, as known, causes a decrease of the contact area and an increase in pressure peak on the articular surface. In this case, OCD may be a consequence of meniscectomy. However, the OCD does not develop in all growing subjects undergoing meniscectomy so that other factors may be involved. There are no reported similar cases after partial meniscectomy.[31]

In some cases, there is a valgus alignment of the knee after meniscectomy, which could lead to a further increase in pressure forces the lateral compartment.[12,30] For this reason, patients who undergo this procedure should be monitored over time.

In our case, the patient came to our attention with an OCD documented only on imaging studies, probably due to the initial involvement of the deeper osteochondral layers. With the evidence of the meniscal tear and the posterior meniscal instability, we proceed to the partial meniscectomy and fixation of the posterior region as suggested.[32–35]

The new meniscal tear confirms that discoid meniscus is weaker than normal[1,2] and this would justify total meniscectomy of torn discoid meniscus, as suggested by some authors.[12,36] However, due to the importance of preserving the lateral meniscus to prevent the progression of osteoarthritis,[37–43] we tried to preserve as much tissue as possible using meniscal sutures. Although some literature is unanimous on the possible healing of osteochondral lesions after a partial meniscectomy,[22] in our case we observed the persistence of OCD on MR and patient's symptoms and the progression of valgus deformity. It is not possible to define exactly whether the partial meniscal resection determined this condition in such a young and active man or the presence of an abnormal and dysfunctional tissue. The osteochondral lesion highlighted during the third surgery was initially treated with microfracture, which is afunctional, and minimally invasive treatment.[30] However, on considering the young age of the patient, the active level, the progressive alteration of the mechanical axis with lateral overload and the almost complete absence of the lateral meniscus, a subsequent surgery was planned. With DFO, we tried to reduce overloading of the lateral compartment, thus allowing the scaffold implantation and protecting the repaired osteochondral lesion.

A careful follow-up of the patient through multiple clinical and serial radiographic evaluations allowed assessing no recurrence of symptoms, nor the onset of degenerative changes.

References

1 Cui JH, Min BH. Collagenous fibril texture of the discoid lateral meniscus. Arthroscopy 2007;23(06):635–641
2 Papadopoulos A, Kirkos JM, Kapetanos GA. Histomorphologic study of discoid meniscus. Arthroscopy 2009;25(03):262–268
3 Young RB. The external semilunar cartilage as a complete disc. In: Cleland J, MacKay JY, Young RB, eds. Memoirs and Memoranda in Anatomy. London, United Kingdom: Williams and Nortage; 1889
4 Dickhaut SC, DeLee JC. The discoid lateral-meniscus syndrome. J Bone Joint Surg Am 1982;64(07):1068–1073
5 Greis PE, Bardana DD, Holmstrom MC, Burks RT. Meniscal injury: I. Basic science and evaluation. J Am Acad Orthop Surg 2002; 10(03):168–176
6 Ikeuchi H. Arthroscopic treatment of the discoid lateral meniscus. Technique and long-term results. Clin Orthop Relat Res 1982; (167):19–28
7 Nathan PA, Cole SC. Discoid meniscus. A clinical and pathologic study. Clin Orthop Relat Res 1969;64(64):107–113
8 Jeannopoulos CL. Observations on discoid menisci. J Bone Joint Surg Am 1950;32-A(03):649–652
9 Dickason JM, Del Pizzo W, Blazina ME, Fox JM, Friedman MJ, Snyder SJ. A series of ten discoid medial menisci. Clin Orthop Relat Res 1982;(168):75–79
10 Aichroth P. Osteochondritis dissecans of the knee. A clinical survey. J Bone Joint Surg Br 1971;53(03):440–447
11 Lindén B. The incidence of osteochondritis dissecans in the condyles of the femur. Acta Orthop Scand 1976;47(06):664–667
12 Mizuta H, Nakamura E, Otsuka Y, Kudo S, Takagi K. Osteochondritis dissecans of the lateral femoral condyle following total resection of the discoid lateral meniscus. Arthroscopy 2001; 17(06):608–612
13 Hughston JC, Hergenroeder PT, Courtenay BG. Osteochondritis dissecans of the femoral condyles. J Bone Joint Surg Am 1984; 66(09):1340–1348
14 Deie M, Ochi M, Sumen Y, et al. Relationship between osteochondritis dissecans of the lateral femoral condyle and lateral menisci types. J Pediatr Orthop 2006;26(01):79–82
15 Fairbank HAT. Osteochondritis dissacans. Br J Surg 1933;21:67–82
16 Cahill BR, Phillips MR, Navarro R. The results of conservative management of juvenile osteochondritis dissecans using joint scintigraphy. A prospective study. Am J Sports Med 1989;17(05): 601–605, discussion 605–606
17 Anderson AF, Lipscomb AB, Coulam C. Antegrade curettement, bone grafting and pinning of osteochondritis dissecans in the skeletally mature knee. Am J Sports Med 1990;18(03): 254–261
18 Ficat P, Arlet J, Mazières B. Osteochondritis dissecans and osteonecrosis of the lower end of the femur. Value of bone marrow functional exploration [in French]. Sem Hop 1975;51(28): 1907–1916
19 Caffey J, Madell SH, Royer C, Morales P. Ossification of the distal femoral epiphysis. J Bone Joint Surg Am 1958;40-A(03):647–654, passim

20 Mubarak SJ, Carroll NC. Familial osteochondritis dissecans of the knee. Clin Orthop Relat Res 1979;(140):131–136
21 Smillie IS. Treatment of osteochondritis dissecans. J Bone Joint Surg Br 1957;39-B(02):248–260
22 Yoshida S, Ikata T, Takai H, Kashiwaguchi S, Katoh S, Takeda Y. Osteochondritis dissecans of the femoral condyle in the growth stage. Clin Orthop Relat Res 1998;(346):162–170
23 Irani RN, Karasick D, Karasick S. A possible explanation of the pathogenesis of osteochondritis dissecans. J Pediatr Orthop 1984; 4(03):358–360
24 Aichroth PM, Patel DV, Marx CL. Congenital discoid lateral meniscus in children. A follow-up study and evolution of management. J Bone Joint Surg Br 1991;73(06):932–936
25 Mitsuoka T, Shino K, Hamada M, Horibe S. Osteochondritis dissecans of the lateral femoral condyle of the knee joint. Arthroscopy 1999;15(01):20–26
26 Cahill BR, Berg BC. 99m-Technetium phosphate compound joint scintigraphy in the management of juvenile osteochondritis dissecans of the femoral condyles. Am J Sports Med 1983; 11(05):329–335
27 Glasgow MMS, Aichroth PM, Baird PRE. The discoid lateral meniscus: a clinical review. J Bone Joint Surg Br 1982;64:245
28 Fujikawa K, Tomatsu T, Matsu K, Koike A, Tanaka Y, Iseki F. Morphological analysis of meniscus and articular cartilage in the knee joint by means of arthrogram. J Jpn Orthop Assoc 1978;52:203–215
29 Räber DA, Friederich NF, Hefti F. Discoid lateral meniscus in children. Long-term follow-up after total meniscectomy. J Bone Joint Surg Am 1998;80(11):1579–1586
30 Hashimoto Y, Yoshida G, Tomihara T, et al. Bilateral osteochondritis dissecans of the lateral femoral condyle following bilateral total removal of lateral discoid meniscus: a case report. Arch Orthop Trauma Surg 2008;128(11):1265–1268
31 Baratz ME, Fu FH, Mengato R. Meniscal tears: the effect of meniscectomy and of repair on intraarticular contact areas and stress in the human knee. A preliminary report. Am J Sports Med 1986;14(04):270–275
32 Klingele KE, Kocher MS, Hresko MT, Gerbino P, Micheli LJ. Discoid lateral meniscus: prevalence of peripheral rim instability. J Pediatr Orthop 2004;24(01):79–82
33 Pascarella A, Rava M, Iervolino G, Muscetti R. Menisco discoide laterale apparentemente integro: contributo casistico. GIOT 2001;27:69–72
34 Atay OA, Doral MN, Leblebicioglu G, Tetik O, Aydingoz U. Management of Discoid Lateral Meniscus Tears: Observations in 34 Knees. Arthroscopy. J Relat Surg 2003;19(04):346–352
35 Adachi N, Ochi M, Uchio Y, Kuriwaka M, Shinomiya R. Torn discoid lateral meniscus treated using partial central meniscectomy and suture of the peripheral tear. Arthroscopy 2004;20(05):536–542
36 Schenck RC Jr, Goodnight JM. Osteochondritis dissecans. J Bone Joint Surg Am 1996;78(03):439–456
37 Lee DH, Kim TH, Kim JM, Bin SI. Results of subtotal/total or partial meniscectomy for discoid lateral meniscus in children. Arthroscopy 2009;25(05):496–503
38 Bargar WL, Moreland JR, Markolf KL, Shoemaker SC, Amstutz HC, Grant TT. In vivo stability testing of post-meniscectomy knees. Clin Orthop Relat Res 1980;(150):247–252
39 Levy IM, Torzilli PA, Gould JD, Warren RF. The effect of lateral meniscectomy on motion of the knee. J Bone Joint Surg Am 1989; 71(03):401–406
40 Levy IM, Torzilli PA, Warren RF. The effect of medial meniscectomy on anterior-posterior motion of the knee. J Bone Joint Surg Am 1982;64(06):883–888
41 Radin EL, de Lamotte F, Maquet P. Role of the menisci in the distribution of stress in the knee. Clin Orthop Relat Res 1984; (185):290–294
42 Fairbank TJ. Knee joint changes after meniscectmy. J Bone Joint Surg 1848;30:664–670
43 Walker PS, Erkman MJ. The role of the menisci in force transmission across the knee. Clin Orthop Relat Res 1975;(109):184–192