Discoid Lateral Meniscus

Prevalence of Peripheral Rim Instability

Kevin E. Klingele, MD, Mininder S. Kocher, MD, MPH,† M. Timothy Hresko, MD,† Peter Gerbino, MD,† and Lyle J. Micheli, MD†*

Abstract: The purpose of this study was to determine the prevalence of peripheral rim instability in discoid lateral meniscus. A consecutive series of 112 patients (128 knees) (mean age 10.0 years [range 1 month to 22 years]) who underwent arthroscopic evaluation and treatment of a discoid lateral meniscus between 1993 and 2001 was reviewed. Of those discoid menisci classified intraoperatively (n = 87), 62.1% (n = 54) were complete discoid lateral menisci and 37.9% (n = 33) were incomplete discoid lateral menisci. An associated meniscal tear was present in 69.5% (n = 89) of all knees studied. Overall, 28.1% (n = 36) of discoid lateral menisci had peripheral rim instability: 47.2% (n = 17) were unstable at the anterior-third peripheral attachment, 11.1% (n = 4) at the middle-third peripheral attachment, and 38.9% (n = 14) at the posterior-third peripheral attachment. Thirty-one of the 36 unstable discoid menisci underwent repair of the peripheral meniscal rim attachment. One patient underwent a complete, open meniscectomy. Peripheral rim instability was significantly more common in complete discoid lateral menisci (38.9% vs. 18.2%; $P = 0.043$) and in younger patients (8.2 vs. 10.7 years; $P = 0.002$). The frequency of peripheral instability mandates a thorough assessment of meniscal stability at all peripheral attachments during the arthroscopic evaluation and treatment of discoid lateral meniscus, particularly in complete variants and in younger children.

Key Words: discoid meniscus, meniscus, children

(*J Pediatr Orthop* 2004;24;79–82)

Since the description of discoid lateral meniscus by Young in 1889, multiple classification systems have been proposed.[1,3–5,10,13,15–17,20,26,30,32] The classification system most widely used is that of Watanabe et al, who described three types of discoid lateral menisci based on arthroscopic appearance.[30] In this classification, discoid menisci with normal peripheral attachments are either type I (complete) or type II (incomplete). Type III discoid menisci, the so-called Wrisberg ligament type, are described as lacking posterior capsular attachments with the exception of the posterior meniscofemoral ligament, thus producing the classic "snapping knee" syndrome.[8]

Recent reports, however, have identified much variability with respect to not only the size and shape of the lateral menisci, but also to peripheral stability and attachment.[13,14,19,31] Other classification systems have been proposed, categorizing lateral meniscal variants as stable or unstable, regardless of discoid shape or the presence of a posterior meniscofemoral attachment.[14] Such variability has made it difficult to discern the true prevalence of instability in discoid lateral menisci.

Complete meniscectomy of discoid lateral meniscus is avoided due to the development of early degenerative changes.[19,24,29] Most authors now recommend repair of a detached posterior or peripheral attachment, with saucerization of the discoid morphology depending on the underlying meniscal shape and presence of a meniscal tear.[9,11–13,19,25,27,28,31]

The purposes of this study were to characterize and to determine the prevalence of peripheral rim instability in discoid lateral menisci.

METHODS

All patients who underwent treatment of symptomatic discoid lateral meniscus between 1993 and 2001 by the Sports Medicine Division of a tertiary care children's hospital were reviewed. A consecutive series of 128 knees in 112 patients was identified. Mean age at the time of surgery was 10.0 years (range 1 month to 22 years). There were 46 male patients (41.1%) and 66 female patients (58.9%). Forty-nine percent (n = 63) of the procedures were performed on the right knee, 51% (n = 65) on the left. Sixteen patients (14.3%) had bilateral procedures.

Medical records, operative reports, and intraoperative arthroscopic photos were reviewed to document patient demographics, discoid meniscus morphology (complete vs. incom-

Study conducted at Children's Hospital, Boston, Massachusetts.

From the *Department of Orthopaedic Surgery, Columbus Children's Hospital, Greater Ohio Orthopaedic Surgeons, Inc., Columbus, Ohio; †Department of Orthopaedic Surgery, Children's Hospital, Boston, Massachusetts.

None of the authors received financial support for this study.

Reprints: Kevin E. Klingele, MD, Department of Orthopaedic Surgery, Columbus Children's Hospital, Greater Ohio Orthopaedic Surgeons, Inc., 259 Taylor Station Road, Columbus, OH 43213 (e-mail: kklingele@goosi.com).

plete), the presence or absence of meniscal tear, and peripheral rim stability. Peripheral rim stability was assessed following saucerization of the discoid meniscus by systematic probing, with evidence of hypermobility and peripheral detachment of the remnant meniscus. If peripheral instability was noted, the site of hypermobility and peripheral detachment was documented.

Univariate associations with instability were analyzed using the Student *t* test for continuous data and the Fisher exact test for categorical data. All reported *P* values are two-tailed, with an alpha level of 0.05 indicating statistical significance.

RESULTS

Discoid meniscus morphology, complete or incomplete, was documented in 87 of the 128 discoid menisci. Of these, 62.1% (n = 54) were described as complete (Fig. 1) and 37.9% (n = 33) as incomplete (Fig. 2). Discoid morphology was not documented in 41 of the 128 knees. Eighty-nine of the 128 knees (69.5%) had a meniscal tear.

Peripheral rim instability was present in 28.1% (n = 36) of all discoid menisci following saucerization. Seventeen (47.2%) were unstable along the anterior-third peripheral attachment site, 4 (11.1%) at the middle-third peripheral attachment, and 14 (38.9%) at the posterior-third peripheral attachment. One patient had complete detachment at all peripheral sites, requiring a complete, open meniscectomy. Thirty-one unstable discoid menisci underwent repair of the peripheral attachment via arthroscopic (n = 26) or combined arthroscopic and mini-open (n = 5) techniques (Fig. 3). Various outside-in (n = 15), inside-out (n = 14), and all-inside (n = 2) meniscal repair techniques were used.

Peripheral rim instability was significantly more common in complete discoid menisci than incomplete discoid menisci (38.9% vs. 18.2%; $P < 0.05$). Unstable discoid menisci presented at a significantly younger age (8.2 years vs. 10.7 years; $P < .05$) but did not demonstrate an increased proportion of meniscal tears ($P > 0.05$) or a sex predilection ($P > 0.05$).

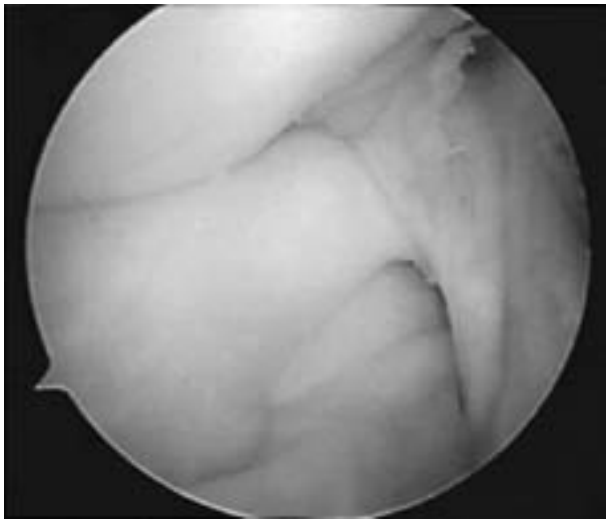

FIGURE 1. Arthroscopic view of a complete discoid lateral meniscus.

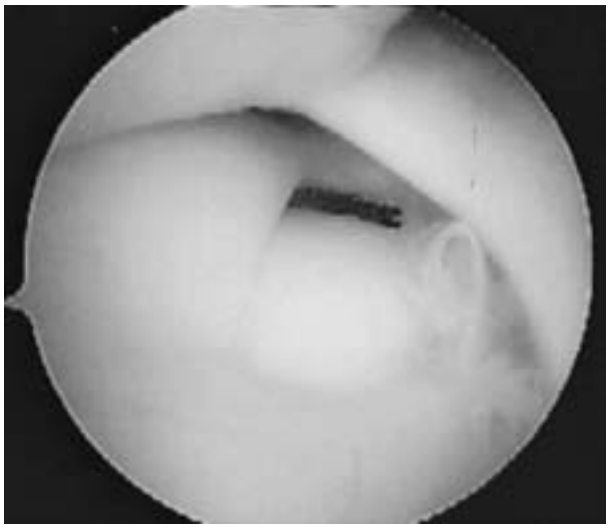

FIGURE 2. Arthroscopic view of an incomplete discoid lateral meniscus without associated meniscal tear.

DISCUSSION

Variability exists in the shape, size, and degree of stability in discoid lateral meniscus.[13,14] This variation makes the determination of discoid type and stability difficult to identify. In this series, we identified hypermobility with peripheral detachment in 28.1% of symptomatic discoid menisci that presented for surgical evaluation and treatment. Anterior detachment was most commonly seen. Multiple studies have shown that discoid menisci are more prone to mechanical and shear stress because of their thick, less vascular structure and in some cases underlying loose peripheral attachments.[7,18] Our findings would seem to support this theory, as peripheral instability was significantly more common in the complete discoid menisci and was present at various peripheral attachments depending on the suspected area of greatest mechanical stress to the discoid meniscus. As stated by Woods and Whelan, the classic Wrisberg-type discoid meniscus would then most likely represent a simple peripheral detachment rather than a true congenital lesion.[31]

The reported proportion of Wrisberg-type discoid menisci has been documented as 0% to 33% in multiple studies.[8,11,12,15,28] Similar studies, however, have reported non-Wrisberg variants of discoid menisci with unstable peripheral attachments and hypermobility.[6,11,13,14,23,31] Bellier et al reported on the arthroscopic treatment of 19 lateral discoid menisci; 12 patients were described as having hypermobile posterior horns but intact peripheral attachments.[6] Similarly, Pel-

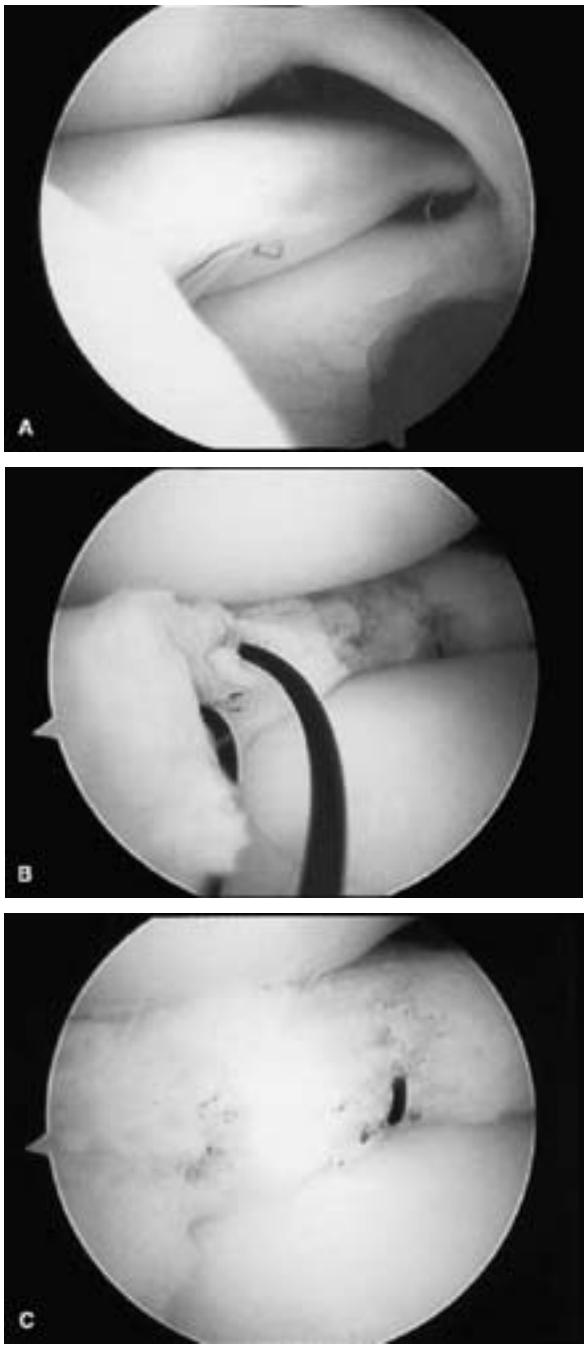

FIGURE 3. (A) Arthroscopic view of a complete discoid meniscus prior to saucerization. (B) Following saucerization, repair of posterolateral peripheral rim instability. (C) Stable peripheral rim achieved.

lacci et al reported on 47 discoid menisci, 4 of which (8.5%) were hypermobile.[23] In contrast, Hayashi et al[11] reported 5 cases in a series of 53 discoid lateral menisci with peripheral detachment and instability. Three complete and two incomplete discoid menisci were described as having extensive meniscal tears that extended to the peripheral rim, causing detachment and instability. All five cases were treated with complete meniscectomy.

Historically, the recommended treatment of hypermobile, Wrisberg-type discoid menisci was complete meniscectomy. Some studies have shown acceptable short-term results following complete discoid meniscectomy[2,11]; however, with further study and intermediate-term results, meniscal preservation is now preferred because of early arthrosis associated with meniscectomy.[19,21,22,24,25,29,31] Rosenberg et al presented a case report of arthroscopic attachment of the free posterior edge of a normal-shaped Wrisberg-type discoid meniscus with a good result at 1-year follow-up.[25] Woods and Whelan described four patients with discoid lateral menisci and no posterior attachments; open repair was performed in all patients, with three of four excellent results at 37.5-month follow-up.[31] In addition, Neuschwander et al described seven patients with lateral meniscal variants and absent posterior attachments; four of six patients were treated with arthroscopic repair and obtained excellent results.[19] With modern arthroscopic equipment and various meniscal repair techniques, the majority of unstable discoid menisci in this series were able to be secured peripherally. We have found suture repair via inside-out or outside-in technique preferable to all-inside meniscal repair devices to achieve peripheral stability in these cases. Subsequent follow-up studies will determine whether such repairs heal or maintain stability in the long term. Nonetheless, saucerization of complete and incomplete discoid lateral menisci must be accompanied by an extensive and careful assessment of peripheral rim stability. With treatment of hypermobility, the goal of meniscal preservation can more easily be achieved.

CONCLUSIONS

We advocate the classification of discoid lateral menisci based on type of discoid (complete vs. incomplete), peripheral rim stability (stable vs. unstable), and presence or absence of a meniscal tear. The prevalence of peripheral detachment in a consecutive series of symptomatic discoid lateral menisci was found to be 28.1%. This emphasizes the need for careful arthroscopic assessment of stability during the evaluation and treatment of discoid lateral menisci, particularly in complete variants and younger children.

REFERENCES

1. Aglietti P, Bertini FA, Buzzi R, et al. Arthroscopic meniscectomy for discoid lateral meniscus in children and adolescence: a ten year followup. *Am J Knee Surg*. 1999;12:83–87.
2. Aichroth PM, Patel DV, Marx CI. Congenital discoid lateral meniscus in children: a followup study and evaluation of management. *J Bone Joint Surg [Br]*. 1991;73:932.
3. Albertsson M, Gillquist S. Discoid lateral meniscus: a report of 29 cases. *Arthroscopy*. 1998;4:211–214.
4. Andrish J. Meniscal injuries in children and adults: diagnosis and management. *J Am Acad Orthop Surg*. 1996;4:231–237.

5. Barnes CL, McCarthy RE, Vanderschilden JL, et al. Discoid lateral meniscus in a young child: case report and review of literature. *J Pediatr Orthop*. 1988;8:707–709.
6. Bellier G, Dupont JY, Larrain M, et al. Lateral discoid meniscus in children. *Arthroscopy*. 1989;5:52–56.
7. Clark CR, Ogden JA. Development of the menisci of the human knee joint: morphological changes and their potential role in childhood meniscal injury. *J Bone Joint Surg [Am]*. 1983;65:538.
8. Dickhaut SC, DeLee JC. The discoid lateral meniscus syndrome. *J Bone Joint Surg [Am]*. 1982;64:1068–1073.
9. Fleissner PR, Eilert RF. Discoid lateral meniscus. *Am J Knee Surg*. 1999; 12:125–131.
10. Fujikawa K, Iseki F, Mikura Y. Partial resection of the discoid meniscus in the child's knee. *J Bone Joint Surg [Br]*. 1981;63:391–395.
11. Hayashi LK, Yamaga H, Ida K, et al. Arthroscopic meniscectomy for discoid lateral meniscus in children. *J Bone Joint Surg [Am]*. 1988;70: 1495–1500.
12. Ikeuchi H. Arthroscopic treatment of lateral discoid meniscus: technique and long-term results. *Clin Orthop*. 1982;167:19–28.
13. Jordan M. Lateral meniscal variants: evaluation and treatment. *J Am Acad Orthop Surg*. 1996;4:191200.
14. Jordan M, Duncan J, Bertrand S. Discoid lateral meniscus: a review. *South Orthop J.* 1993;2:239–253.
15. Kaplan EB. Discoid lateral meniscus of the knee joint. *Bull Hosp Joint Dis*. 1955;16:111–124.
16. Kocher MS, DiCanzio J, Zurakowski D, et al. Diagnostic performance of clinical examination and selective magnetic resonance imaging in the evaluation of intraarticular knee disorders in children and adolescents. *Am J Sports Med*. 2001;29:289–296.
17. Kocher MS, Micheli LJ. The pediatric knee: evaluation and treatment. In: Insall S, ed. *Surgery of the knee*, 3rd ed. Philadelphia: Churchill Livingstone, 2001:1356–1397.
18. Nathan PA, Cole SC. Discoid meniscus: a clinical and pathological study. *Clin Orthop*. 1969;64:107113.
19. Neuschwander DC, Drez D, Finney TP. Lateral meniscal variant with absence of posterior coronary ligament. J. *Bone Joint Surg [Am]*. 1992; 74:1186–1190.
20. Ogata K. Arthroscopic technique: two-piece excision of discoid meniscus. *Arthroscopy*. 1997;13:666–670.
21. Parisian JS. *Arthroscopic surgery*. New York: McGraw Hill, 1988:120–121.
22. Patel D, Dimakopoulos P, Penoncourt P. Bucket handle tear of a discoid meniscus: arthroscopic diagnosis and partial excision. *Orthopedics*. 1986; 9:607–608.
23. Pellacci F, Montanari G, Prosperi P, et al. Lateral discoid meniscus: treatment and results. *Arthroscopy*. 1992;8:526–530.
24. Raber DA, Friederich NF, Buzzi R, et al. Discoid lateral meniscus in children: long term follow-up after total meniscectomy. *J Bone Joint Surg [Am]*. 1998;8:1579–1586.
25. Rosenberg TD, Paulos LE, Parker RD, et al. Discoid lateral meniscus: case report of arthroscopic attachment of a symptomatic Wrisberg-ligament type. *Arthroscopy*. 1987;3:277–282.
26. Smillie I. The congenital discoid meniscus. J. *Bone Joint Surg [Br]*. 1948; 30:671–682.
27. Stilli S, DiGennaro GL, Marchiodi L, et al. Arthroscopic surgery of the discoid meniscus during childhood. *Chir Degli Org Mov.* 1997;82:335.
28. Vandermeer R, Cunningham F. Arthroscopic treatment of the discoid lateral meniscus: Results of long-term follow-up. *Arthroscopy*. 1989;5:101–109.
29. Washington ER, Root L, Lierner U, et al. Discoid lateral meniscus in children-long term follow-up after excision. *J Bone Joint Surg [Am].* 1995;77:1357–1361.
30. Watanabe M, Takeda S, Ikeuchi H. *Atlas of arthroscopy*. Tokyo: Igaku-Shoin. 1978:88.
31. Woods GW, Whelan JM. Discoid meniscus. *Clin Sports Med*. 1990;9: 695–706.
32. Young RB. The external semilunar cartilage as a complete disc. In: Cleland J, Mackey JY, Young RB, eds. *Memoirs and memoranda in anatomy.* London: Williams and Norgate, 1889:179.