Symptomatic Complete Discoid Medial Meniscus Completely Coalesced With the Anterior Cruciate Ligament: a Case Report

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Technical note

Keywords: Discoid medial meniscus, Anterior cruciate ligament, Arthroscopy, Case report

Posted Date: May 11th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-499382/v1>

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Abstract

Rationale: Complete discoid medial meniscus is an extremely rare abnormality of the knee joint whose meniscus has a discoid shape rather than a normal semilunar one. Several medial meniscus anomalies including anomalous insertion have been reported in the literature. This report presents a rare case of symptomatic complete discoid medial meniscus whose anterolateral (apical) portion was completely coalesced with the ACL. MRI, radiographic and arthroscopic findings in the medial compartment are to be submitted.

Patient concerns and diagnoses: A 29-year-old male presented with intermittent pain and swelling of the right knee for 2 years. Based on radiographic, MRI and physical examination findings, he was diagnosed with discoid medial meniscus tears.

Interventions and outcomes: Arthroscopic saucerization were performed for the torn discoid medial meniscus of the right knee. Arthroscopic examination revealed a complete discoid medial meniscus and the anterolateral (apical) portion of which was completely coalesced with the ACL. Careful Probing of the meniscal surface revealed there was a longitudinal tear extending from the tibial spine to the midportion of the meniscus. Arthroscopic saucerization of the discoid meniscus were performed After closely cutting the meniscus around the ACL. The patient reported a satisfactory results at the 12-month follow-up.

Lessons: Complete discoid medial meniscus is an extremely rare abnormality, and this case presents the third complete discoid medial meniscus whose anterolateral (apical) portion was completely coalesced with the ACL. The current case we present strongly supports the theory that ACL and meniscus were differentiated from the same mesenchyme.

1. Introduction

Discoid meniscus is an abnormality of the knee whose meniscus has a discoid shape rather than a normal semilunar one. It was first described in the lateral meniscus by Young[1] in 1889 in a cadaver specimen, while Cave and Staple[2] found that there was also discoid medial meniscus in 1941. Discoid medial meniscus is an extremely rare abnormality with a reported incidence of 0.03–0.3%.[3, 4] Several medial meniscus anomalies including discoid variants and anomalous insertion have been reported in the literature.[3–5] However, only two reports of medial discoid meniscus completely coalesced with anterior cruciate ligament (ACL) has been reported previously in the literature.[6, 7] This report presents a case of symptomatic complete discoid medial meniscus completely coalesced with the ACL. Arthroscopic, standing anteroposterior radiographs and magnetic resonance imaging(MRI) views of the lesions are included.

2. Case Presentation

A 29-year-old man presented to our institution complaining of intermittent pain and swelling of the right knee for 2 years. The patient reported onset of the pain was insidious but gradually became worse during

the past 3 months. He did not recall receiving any specific trauma.

Physical examination revealed a moderate degree of effusion and mild quadriceps atrophy with tenderness of the medial joint line. The range of motion of the right knee was from 0° to 130°. The McMurray test was positive, and no ligament instability was noted. The left knee was asymptomatic.

Standing anteroposterior radiography showed an increased medial joint space, squaring of the medial femoral condyle, and cupping of the medial tibial plateau in the right knee (Fig. 1). Coronal MRI of right knee revealed that the entire weight-bearing portion of medial compartment was occupied by a square shape of low signal intensity. T2-weighted images showed liner higher signals in the medial meniscus, which reaches the articular surface at the midportion of the meniscus. What's more, the ACL was found completely coalesced with the anterolateral (apical) portion of the medial meniscus through 3 sequential cuts of image. These signals were interpreted to be a discoid medial meniscus with longitudinal tear and intrameniscal degeneration accompanied by abnormal coalescence with the ACL (Fig. 2).

The patient underwent arthroscopy of his right knee under general anesthesia with standard portals and instrumentation. The medial tibia plateau was completely covered by complete type of discoid medial meniscus, and the anterolateral apical portion of medial meniscus was completely coalesced with the ACL. Careful Probing of the meniscal surface revealed there is no discontinuity existed between the discoid medial meniscus and the ACL, and there was a longitudinal tear extending from the tibial spine to the midportion of the meniscus (Fig. 3). After closely cutting the meniscus around the ACL with electric cutters, saucerization of the discoid meniscus was pursued with a standard duckling and meniscal cutter (Fig. 4).

The patient was encouraged to perform isometric exercises immediately, ranges of motion exercise was started on the first post operative day and partial weight bearing was allowed within 3 days. During a 12-month follow-up, the patient reported no symptoms, and he had returned to his daily and sports activities, including football, basketball and jogging.

3. Discussion And Conclusions

Discoid medial meniscus is an extremely rare anomaly with an estimated incidence of 0.03–0.3%[8–11], and this case represents the third discoid medial meniscus completely coalesced with ACL. Different speculations and hypotheses about the etiology of discoid meniscus have been explained but not yet been completely ascertained[11–14]. Smillie[12] postulated that the meniscus existed as a cartilaginous disc at an early stage of development, and that the congenital discoid meniscus was attributable to the congenital developmental arrest leading to resorption processing failure of the central meniscus at varying stages of embryologic development. Kaplan[13] found in an embryological study that the meniscus did not appear to be a discoid form at any stage of normal development of the fetus. Discoid menisci was a definite pathologic entity that developed under specific conditions, he concluded, and it was resulted from hyper-mobility on the unstable meniscal attachment of the posterior horn. Clark and Ogden[11] found that both the medial and lateral meniscus showed a semilunar shape in the early

stages of prenatal development. But mild to moderate instability (absence of the meniscofemoral attachment) may result in filling in of the central area of the meniscus.

Owing chiefly to the work of Gardner and O'Rahilly[15], it is now clear that, the cruciate ligaments and meniscus were developed at stage 19–20 (approximately 7 postovulatory weeks) of fetal development. Bardeen and Lewis[16] observed fetal knee development and recorded the sequence of differentiation as follows: menisci, capsule, cruciate ligaments, patella, and ligamentum mucosum. Thus stated that the meniscus and the ACL are differentiated directly from the same blastema. McDermott[17] stated that ACL and menisci develop from the same blastema in the midline of the joint which separate from each other and form a mass of semilunar young fibroblasts attached to the capsule and the ACL during the 9th to 10th week of fetal development.

The third discoid medial meniscus completely coalesced with ACL presented in this paper supports the hypothesis that ACL and meniscus were differentiated from the same mesenchyme. At a specific time during developing, There must be some factors that lead to the failure of separation of ACL and meniscus and, as a result, the apical and central portion of the medial meniscus fails to be absorbed, and remains a discoid shape coalesced to the ACL.

Discoid medial meniscus are likely to be much less mobile and its anterolateral apical portion was completely coalesced with the ACL, which may further reduce the mobile range of meniscus. Such type of meniscus is easily torn constantly under the weight load of the condyle. The complex and altered stress on the superior and inferior surfaces of the complete discoid medial meniscus, combined with a much less mobility may eventually lead to a horizontal tear in this case. Currently, the treatment of discoid medial meniscus is similar to discoid lateral meniscus, which is usually performed with arthroscopic saucerization of the discoid meniscus.

Abbreviations

Anterior Cruciate Ligament, ACL

Magnetic resonance imaging, MRI

Declarations

Ethics approval and consent to participate

Not applicable.

Consent to publish

Written informed consent was obtained from the patient for publication of this case report with accompanying images.

Availability of data and materials

All data generated or analysed during this study are included in this published article.

Competing interests

All authors have read and approved the content and had no conflicts of interest. There are no ethical/legal conflicts involved in the article.

Funding

This research did not receive any specific grant from funding agencies in the public.

Authors' Contributions

GJ, and TX carried out the data collection, literature review and drafting of the manuscript. ZW and YZ contributed to the drafting of the manuscript and aided in the literature review. HQ, DL, and JD participated in the data collection and the drafting of the manuscript. YC help to draft the manuscript and revised the final version of the manuscript. All authors read and approved the final manuscript.

Acknowledgements

The authors thank Qiu-Xia Zhang for the assistance in editing figures.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

References

1. Mcfarland BL. The Disk-shaped External Semilunar Cartilage. *British Medical Journal*1936;1(3928):819-19.
2. Cave EF, Staples OS. Congenital discoid meniscus : A cause of internal derangement of the knee. *American Journal of Surgery*1941;54(2):371-76.
3. JM D, W DP, ME B, JM F, MJ F, SJ S. A series of ten discoid medial menisci. *Clinical orthopaedics and related research*1982;168(168):75-79.
4. Cho J. Bilateral complete discoid medial meniscus: a case report. *Journal of Knee Surgery*2011;24(1):67.

5. Twyman RS, Ferris BD. Congenital hypoplasia of the medial meniscus: A report of two cases. *Arthroscopy : the journal of arthroscopic & related surgery : official publication of the Arthroscopy Association of North America and the International Arthroscopy Association*1991;7(2):148-50.
6. Min BH, Ha HK, Khang SY. Medial discoid meniscus completely coalesced with the anterior cruciate ligament. *Arthroscopy-the Journal of Arthroscopic & Related Surgery*2001;17(7):1-5.
7. Joshi D, Jain V, Goyal A, Bahl V, Chaudhary D. Discoid medial meniscus completely coalesced with the anterior cruciate ligament. *Orthopedics*2013;36(11):1461-3.
8. Schonholtz GJ, Koenig TM, Prince A. Bilateral discoid medial menisci: a case report and literature review. *Arthroscopy : the journal of arthroscopic & related surgery : official publication of the Arthroscopy Association of North America and the International Arthroscopy Association*1993;9(3):315-7.
9. Ye SM, Qing Jiang MD. Review of discoid meniscus. *Orthopaedic Surgery*2011;3(4):219-23.
10. Berson BL, Hermann G. Torn discoid menisci of the knee in adults. Four case reports. *Journal of Bone & Joint Surgery American Volume*1979;61(2):303-4.
11. Clark CR, Ogden JA. Development of the menisci of the human knee joint. Morphological changes and their potential role in childhood meniscal injury. *Journal of Bone & Joint Surgery American Volume*1983;65(4):538-47.
12. Smillie IS. The congenital discoid meniscus. *Bone & Joint Journal*1948;30B(4):671-82.
13. Kaplan EB. Discoid lateral meniscus of the knee joint; nature, mechanism, and operative treatment. *Journal of Bone & Joint Surgery-american Volume*1957;44(1):77-87.
14. Soren A. On the etiology of congenital malformation of the meniscus. *Archives of Orthopaedic & Traumatic Surgery*1985;104(5):283-88.
15. Gardner E, O'Rahilly R. The early development of the knee joint in staged human embryos. *Journal of Anatomy*1968;102(Pt 2):289.
16. Bardeen CR, Lewis WH. Development of the limbs, body-wall and back in man. *American Journal of Anatomy*1901;1(1):1-35.
17. Mcdermott L. Development of the human knee joint. *Anatomical Record-advances in Integrative Anatomy & Evolutionary Biology*1997;248(2):269-78.

Figure

Figure 4 is not available with this version.

Figures

Figure 1

Standing anteroposterior radiographs of both knees. Radiography showed widened medial joint spaces of the right knee

Figure 2

The anterolateral portion of the meniscus was completely coalesced with the anterior cruciate ligament, yellow arrow indicates the tear of meniscus

Figure 3

Schematic diagram and arthroscopic image of disoid medial meniscus completely coalesced with the ACL. (a) Schematic diagram of disoid medial meniscus completely coalesced with the ACL. (b) Arthroscopic image of disoid medial meniscus completely coalesced with the ACL. (c) Longitudinal tear of medial meniscus. (d) Medial meniscus and ACL after saucerization of disoid meniscus