Characteristics of Patients with Discoid Medial Meniscus and Surgical Outcomes: A Multi-center Study in South Korea

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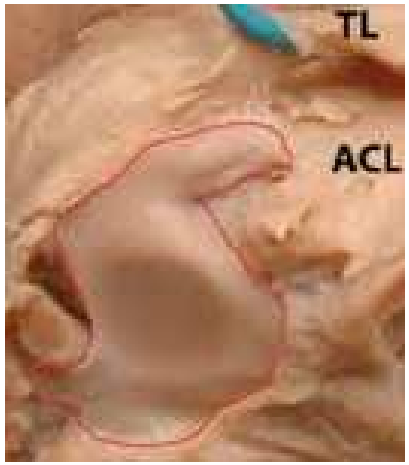
Disclosure of Conflict of Interest

- We have nothing to declare for this study

Introduction

- The discoid meniscus is a rare congenital anomaly
  - ✓ Hypertrophic meniscal tissue
  - ✓ Decreased content of collagen fibers with a more disorganized course than the normal meniscus
  - ✓ Thicker and wider covering the tibial plateau

→ ***Prone to tearing from shear stresses***



- Previous studies have mostly investigated on discoid lateral meniscus (DLM) and showed its clinical significance of diagnosis and treatment
- Unlike DLM, there is a lack of literature on the discoid medial meniscus (DMM) due to its extremely low incidence.
- **Purpose**
  - ✓ Thus, a retrospective multi-center study was conducted to report the characteristics of patients with DMM in South Korea and their clinical results after surgical treatment.

Papadopoulos et al., KSSTA, 2009
https://thekneespecialist.com.au/2020/02/16/discoid-meniscus/

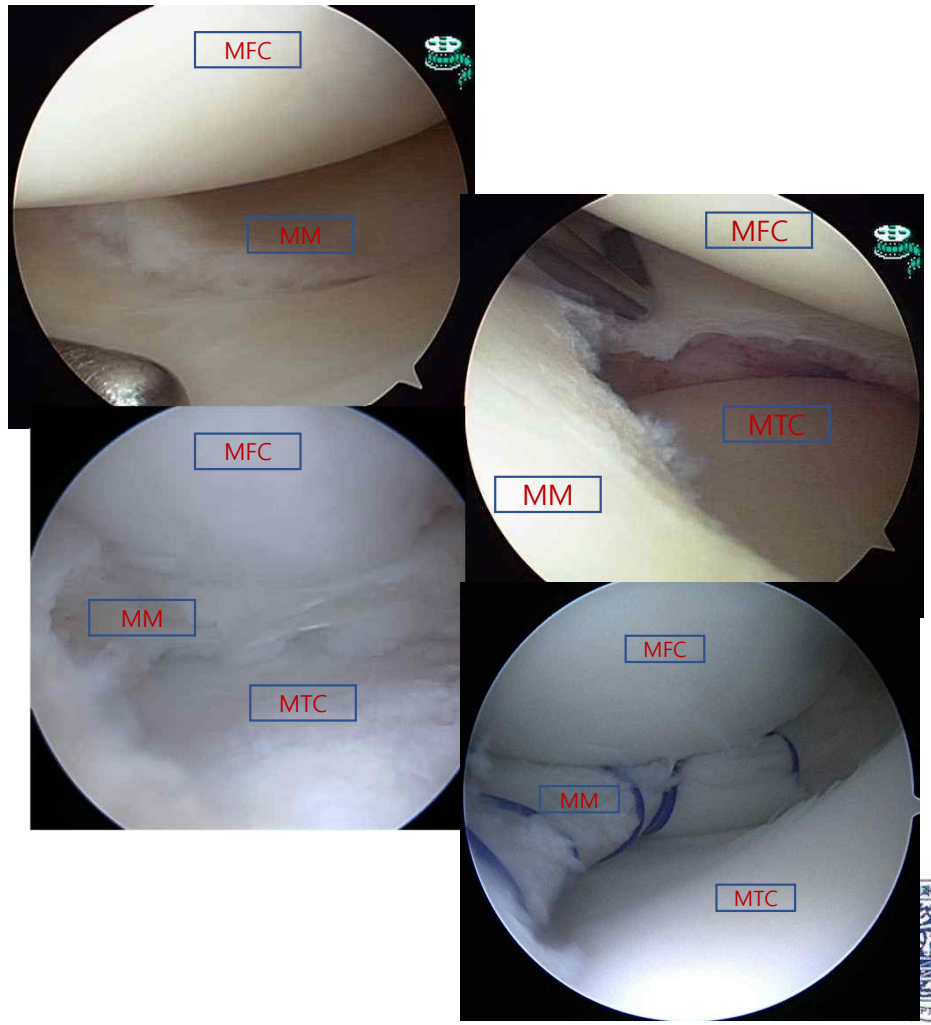
Study design

- Multicenter study
  - ✓ 9 separate training institutions
- Retrospective cohort review
  - ✓ From Apr. 2010 to Mar. 2024
  - ✓ Data collected from patient records and operative reports
- Inclusion criteria
  - ✓ Underwent arthroscopic surgery
  - ✓ Diagnosed DMM confirmed through direct surgical observation via arthroscopy
  - ✓ Presumed diagnosis of DMM by indirect means such as MRI was excluded

Surgical technique

- Diagnosed DMM via arthroscopy
- Partial meniscectomy
- Subtotal meniscectomy
- Combined with meniscal repair

Based on meniscal quality, tear pattern, and surgeons' preference

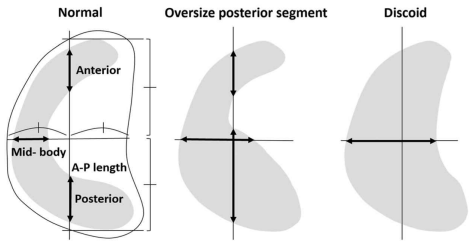


Evaluation

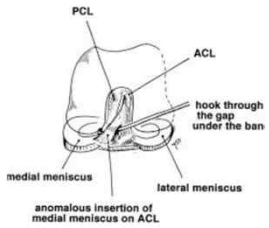
- Patients' characteristics
  - ✓ Age, Sex, Site, BMI
  - ✓ **Symptom duration** (time to surgery from symptom onset)
  - ✓ Follow-up period
- **Main clinical symptoms**
  - ✓ Pain, mechanical symptoms
- **Bilaterality**
  - ✓ Presence of unilateral or bilateral meniscal abnormalities
  - ✓ Diagnosis via MRI or surgical confirmation
- Pre- and post-operative evaluation
- Range of motion
- PROMs
  - ✓ Lysholm score
  - ✓ IKDC subjective score
  - ✓ HSS
  - ✓ Tegner activity scale
- Failure
  - ✓ Medial MAT or revision surgery for MM or subsequent surgery due to medial compartment pathology
  - ✓ Consider re-operation due to symptom aggravation

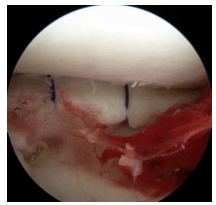
Arthroscopic evaluation

- Classification
  - ✓ Incomplete DMM (oversize posterior segment)
  - ✓ Complete DMM
- DMM tear
  - ✓ Presence of tear
  - ✓ Tear extension (PH, MB, AH)
  - ✓ Tear pattern (horizontal, complex, etc.)
- Cartilage status
  - ✓ ICRS grade 0 / 1-2 / 3-4



- Presence of anomalous insertion of ACL to MMAH
- Amount of meniscectomy
  - ✓ Partial/ Subtotal/ Total
- Meniscal repair
  - ✓ Repair or not
  - ✓ Technique: all-in side / outside-in/ inside-out
  - ✓ Suture materials
  - ✓ Healing enhancement





Araki et al., JOSR, 2022
Cha JG et al., BJR, 2008
Rainio et al., Arthroscopy, 2002

Patients' characteristics

Variables	DMM
Patients (knees)	32 (32)
Age at injury, years	24.9 ± 11.3 (9 – 53)
Sex, (Male : Female)	28 : 4
Site, (Right : Left)	17 : 15
BMI, kg/cm^2	26.1 ± 4.0 (15.5 – 35.8)
Main symptoms, n (%)	
Pain	30 (93.8)
Locking	6 (18.8)
Giving way	1 (3.2)
Symptom duration, months	26.9 ± 34.9 (0.5 – 100)
Follow-up period, months	26.4 ± 32.5 (2.0 – 141.0)

Results

Bilaterality

- Of 32 DMMs, 16 knees (50%) had MRI or arthroscopic evaluation on the contra-lateral knee
  - ✓ Normal MM: 1/16 (6.3%)
  - ✓ Discoid morphology of MM: 15/16 (93.7%)
    - ✓ Incomplete : 3/16 (18.8%)
    - ✓ Complete: 12/16 (75.0%)
  - ✓ OP. history on the contra-lateral knee for DMM
    - ✓ 7/32 cases (21.9%)

Clinical outcomes

- All clinical outcomes including ROM, Tegner activity scale, Lysholm, IKDC subjective, and HSS scores significantly improved after the surgery in patients with DMM.
- Failure
  - ✓ Revision surgery due to medial compartmental pathology (n=0)
  - ✓ Consider operation due to symptom aggravation **(n=5, 15.6%)**

Arthroscopic findings

Variables	DMM (n=32)
DMM shape (normal : discoid shape)	19 : 13
Presence of tear (tear : no tear)	32 : 0
Tear pattern, n (%)	
Horizontal	16 (50%)
Complex	14 (43.8%)
- Horizontal + radial	7
- Horizontal + longitudinal	4
- Horizontal + flap	3
Peripheral instability	7 (21.9%)
Tear extension	
PH / PH to MB/ PH to AH	3/11/18
Cartilage status (medial compartment)	
MFC, ICRS grade (0/ 1-2/ 3-4)	21 / 9 / 2
MTP, ICRS grade (0/ 1-2/ 3-4)	25 / 6 / 1
Presence of anomalous insertion of ACL to MMAH	3 (9.4%)

Variables	DMM (n=32)
Amount of meniscectomy	
partial / subtotal / total	25 / 7 / 0
Meniscal repair	
repair / only meniscectomy	6 / 26
Repair technique	
all-in side/ out-side in/ inside-out/ combination	1/ 2/ 2/ 1
Healing enhancement	
Fibrin-clot augmentation	2

Subgroup analysis

Variables	Success (N=27)	Failure (N=5)	*P* value
Age, years	24.0 ± 10.6	29.4 ± 15.0	.339
BMI, kg/cm²			
<25 vs. ≥25	16 : 11	1 : 4	.161
Sex, M:F	24 : 3	4 : 1	.512
Symptom duration			
<6M vs. ≥6M	17 : 10	0 : 5	**.015**
Tear pattern			
Horizontal vs. Complex	14 : 13	2 : 3	>.999
Peripheral instability (Y:N)	6 : 21	1 : 4	>.999
Tear extension			
PH or PH-MB vs. PH-AH	13 : 14	1 : 4	.355
Cartilage status			
MFC, ICRS (0-1 vs. 2-3)	25 : 2	3 : 2	.105
MTP, ICRS (0-1 vs. 2-3)	26 : 1	2 : 3	**.008**
Meniscectomy			
Partial vs. Subtotal	23 : 4	2 : 3	**.057**

Conclusion

- Patients with DMM in South Korea showed male predominance and high rate of bilateral involvement.
- Similar to DLM, horizontal tears at posterior horns were common, whereas peripheral rim instability was uncommon, requiring meniscal repair.
- Clinical outcomes were favorable after the surgical treatment
  - ✓ Patients with symptom duration of more than 6 months, medial compartmental cartilage defects, and subtotal meniscectomy could be possible factors for failure after surgery
  - ✓ However, long-term osteoarthritic progression should be cautiously monitored, considering medial compartmental pathology

References

1. Lee BI, Lee YS, Kwon SW, et al. Bilateral symptomatic discoid medial meniscus: report of three cases. *Knee Surg Sports Traumatol Arthrosc.* 2007;15(6):739-743.
2. Zheng ZR, Ma H, Yang F, et al. Discoid medial meniscus of both knees: A case report. *World J Clin Cases.* 2022;10(25):9020–9027.
3. Song IS, Kim JB, Lee JK, Park BS. Discoid medial meniscus tear, with a literature review of treatments. *Knee Surg Relat Res.* 2017;29(3):237–242.
4. Dickason JM, Del Pizzo W, Blazina ME, et al. A series of ten discoid medial menisci. *Clin Orthop Relat Res.* 1982;(168):75–79.
5. Tachibana Y, Yamazaki Y, Ninomiya S. Discoid medial meniscus. *Arthroscopy.* 2003;19(7):E12–E18.
6. Akgun I, Heybeli N, Bagatur E, Karadeniz N. Bilateral discoid medial menisci: an adult patient with symmetrical radial tears in both knees. *Arthroscopy.* 1998;14(5):512–517.
7. Pinar H, Akseki D, Karaoglan O, et al. Bilateral discoid medial menisci. *Arthroscopy.* 2000;16(1):96–101.
8. Wang HD, Gao SJ. Bilateral discoid medial meniscus associated with meniscal tears and hypoplasia of the medial femoral condyle: a case report. *Medicine (Baltimore).* 2017;96(36):e8637.
9. Yang X, Shao D. Bilateral discoid medial meniscus: two case reports. *Medicine (Baltimore).* 2019;98(17):e15182.
10. Zhang K, Li Y, Wang Y, et al. Bilateral discoid medial menisci: a case report and review of the literature. *Medicine (Baltimore).* 2020;99(32):e21543.