

# Post-injury painful and locked knee

Ioannis I. Daskalakis<sup>1,2</sup>, Apostolos H. Karantanas<sup>1,2</sup>

<sup>1</sup>Department of Medical Imaging, University Hospital, Heraklion, Greece

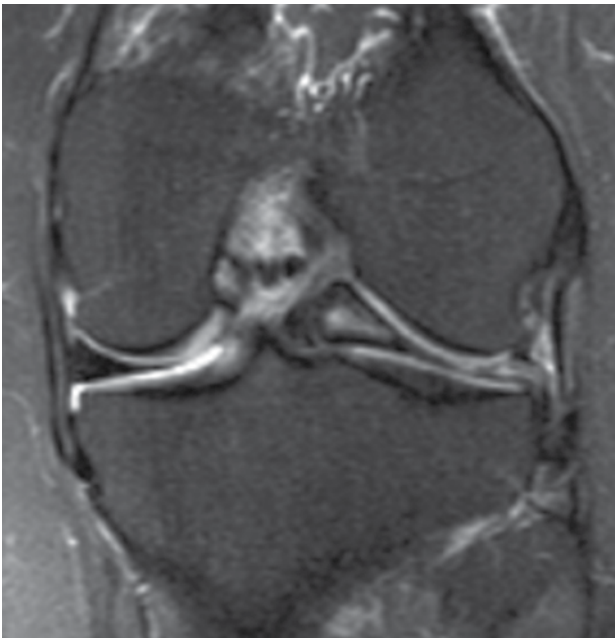
<sup>2</sup>Department of Radiology, University of Crete, Heraklion, Greece

SUBMISSION: 23/11/2017 | ACCEPTANCE: 19/3/2018

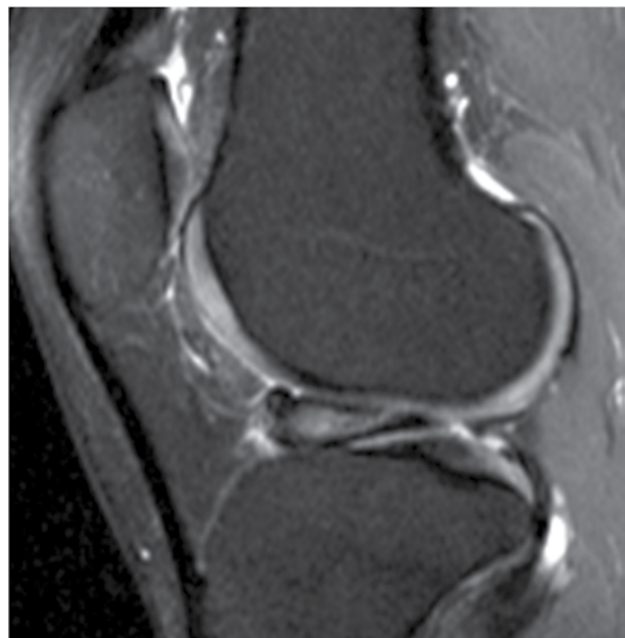
## PART A

A 27-year-old female felt sudden pain on the lateral knee joint, following a rotational dance figure, with subsequent locked joint. Physical examination on the following day

disclosed tenderness along the lateral joint line and joint locking with an audible and painful "clunk" on extension. Magnetic Resonance (MR) images are shown (**Figs. 1-5**).



**Fig. 1.** Coronal fat suppressed PD-W MR image.

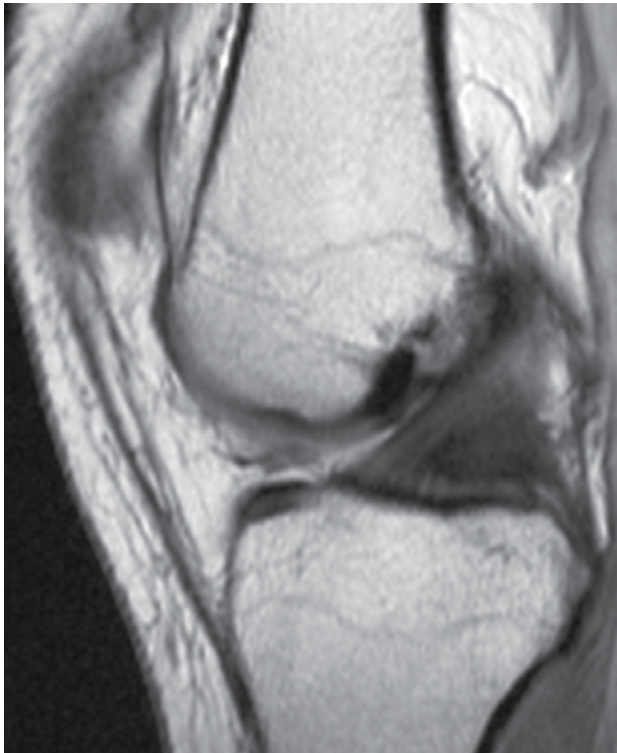


**Fig. 2.** Sagittal fat suppressed PD-W MR image.



CORRESPONDING  
AUTHOR,  
GUARANTOR

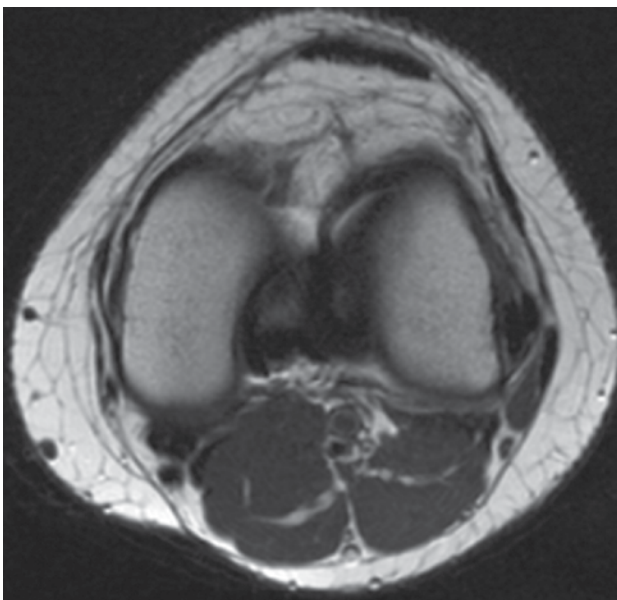
Apostolos H. Karantanas,  
Professor of Radiology, University of Crete, Voutes 71110, Heraklion, Greece,  
Email: akarantanas@gmail.com



**Fig. 3.** Sagittal PD-W MR image.



**Fig. 4.** Sagittal PD-W MR image.



**Fig. 5.** Axial T2-W MR image.

## PART B

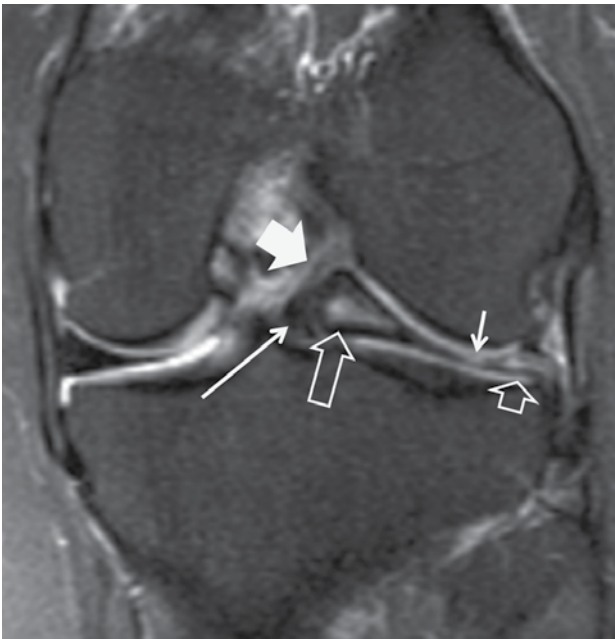
**Diagnosis: Complex tear of a discoid lateral meniscus**

Discoid meniscus (DM) of the knee is defined as a normal variant in which the meniscus has a shape of a disk and is usually thickened with a resulting greater coverage of the tibial articular surface. As a result, asymmetric loading forces are applied onto the knee joint, leading to meniscal degeneration and tears. The reported prevalence of discoid meniscus varies between 1% and 3% and is more common on the lateral side [1]. The discoid morphology is classified as complete (type I), incomplete (type II) and meniscofemoral ligament type or Wrisberg variant (type III) [1]. The latter is the rarest subtype and refers to absence of capsular attachments allowing the meniscus to move and sublux.

In the majority of DM cases, pain is the main symptom. Demonstration of "clunk" or "snapping knee" on

physical examination and lateral joint space widening on plain radiographs are typical but not constant findings. Most of the tears involving the DM are peripheral or horizontal cleavage [2] with only case reports showing the presence of bucket-handle tears [3]. Anterior displacement of the torn posterior horn has been described in DM type III [1]. Non displaced tears of DM are diagnosed with MRI using the same criteria as in non-discoid menisci. MRI can accurately depict the abnormal morphology of a DM but its ability to reveal a tear is lower as compared to regular meniscal tears [2, 4]. Treatment options on bucket-handle tears currently include partial resection-meniscoplasty and repair [5].

Bucket-handle tear consists of a vertical or oblique tear in the posterior horn that extends longitudinally through the body and anterior horn [6]. The inner me-



**Fig. 1.** Coronal fat suppressed PD-W MR image showing the lateral meniscal tear (thin arrow), the "handle" (long open arrow) representing meniscal tissue flipped medially into the intercondylar notch and displacing the anterior cruciate ligament (thick arrow) and the "bucket" (short open arrow). The displaced anterior horn is also shown (long thin arrow). High signal intensity within the flipped posterior horn results from cystic degeneration.



**Fig. 2.** Sagittal fat suppressed PD-W MR image showing the anteriorly flipped posterior horn with an appearance of cystic degeneration (open arrow). The posterior horn is missing. The popliteomeniscal fascicles are intact (thin arrows).

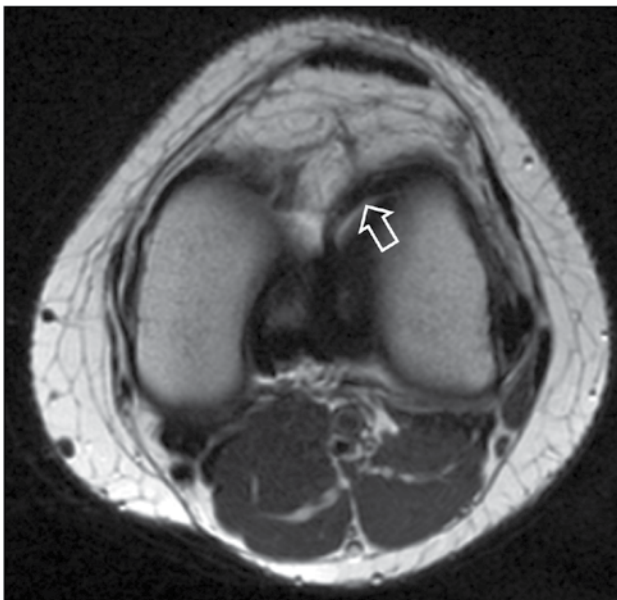




**Fig. 3.** Sagittal PD-W MR image showing the intact anterior cruciate ligament (arrow).



**Fig. 4.** Sagittal PD-W MR image showing the "anterior flip" sign consisting of the large and displaced posterior horn (arrow) and the anterior horn anteriorly (long arrow).



**Fig. 5.** Axial T2-W MR image demonstrates the anteriorly displaced anterior horn (arrow).



## KEY WORDS

MR imaging/diagnosis; discoid meniscus; meniscal tear/complex

meniscal fragment is often displaced into the intercondylar notch, creating the "handle". Lateral meniscus (Lm) bucket-handle tears are rare and may be missed on MRI [7]. In addition, in a patient with a torn meniscus and contemplated repair, time from injury to surgery is important. Delayed imaging to a torn meniscus leads to meniscal resection rather than repair. Thus, prompt diagnosis, guided by the typical clinical demonstration supported with imaging is mandatory. There are a number of signs that can lead to the diagnosis of a bucket-handle tear of a meniscus with or without discoid morphology. The first is a "free fragment displaced" away from the tear, usually into the intercondylar notch [8]. A second sign is the "anterior flip" sign, where the posterior horn is flipped just posterior to the anteriorly displaced anterior horn [9, 10]. The "absent bow tie" sign and the "double posterior cruciate ligament" sign are accurate for the medial meniscus bucket-handle tears but are not valid for Lm ones. The "double anterior cruciate ligament" sign is caused by a displaced fragment of the meniscus, but its prevalence is unknown. In the case of a torn lateral DM, the conventional criteria, i.e. transverse width >14 mm, for assessing a discoid meniscus, cannot be applied.

In the case presented herein, the following encountered imaging findings have educational value (Figs.

1-5): 1. The anterior cruciate ligament is intact and there is no joint effusion, 2. There is "anterior flip" sign due to anterior displacement of the posterior horn which is missing, 3. The popliteomeniscal fascicles, which are usually absent when the posterior horn flips anteriorly, are intact and 4. The presence of diffuse abnormal signal within the torn and displaced meniscal segment is the result of cystic degeneration. The presence of "anterior flip" sign in a large meniscus raised the possibility of the presence of DM type III. The MRI report suggested Lm bucket-handle tear, probably of a DM, because of the large meniscal mass and the rather early degeneration demonstrated with the increased intrameniscal signal. Arthroscopy confirmed the imaging findings related to type II DM.

The treatment of a bucket-handle tear includes arthroscopic repair which, in our case, was inside-out suturing with partial resection, in an attempt to reduce the meniscal size close to normal. Prognosis is excellent and is related to young age, adequate blood supply and proper rehabilitation. MRI is very accurate for diagnosing bucket-handle tears and enables the radiologist to provide the orthopaedic surgeon with all useful information for treatment planning. **R**

**Conflict of interest**

*The authors declared no conflicts of interest.*

## REFERENCES

1. Singh K, Helms CA, Jacobs MT, et al. MRI appearance of Wrisberg variant of discoid lateral meniscus. *AJR Am J Roentgenol* 2006; 187(2): 384-387.
2. Ryu KN, Kim IS, Kim EJ, et al. MR imaging of tears of discoid lateral menisci. *AJR Am J Roentgenol* 1998; 171(4): 963-967.
3. Cosgarea AJ, Ryan A. Repair of a bucket-handle tear of a complete discoid lateral meniscal incarcerated in the posterolateral compartment. *Am J Sports Med* 2000; 28 (5): 737-740.
4. Silverman JM, Mink JH, Deutsch AL. Discoid menisci of the knee: MR imaging appearance. *Radiology* 1989; 173(2): 351-354.
5. Fujikawa K, Iseki F, Mikura Y. Partial resection of the discoid meniscus in the child's knee. *J Bone Joint Surg Br* 1981; 63-B(3): 391-395.
6. Audingoz U, Firat AK, Atay OA, et al. MR imaging of meniscal bucket-handle tears: a review of signs and their relation to arthroscopic classification. *Eur Radiol* 2003; 13(3): 618-625.
7. Makdissi M, Eriksson KO, Morris HG, et al. MRI-negative bucket-handle tears of the lateral meniscus in athletes: a case series. *Knee Surg Sports Trumatol Arthrosc* 2001; 14(10): 1012-1016.
8. Wright DH, De Smet AA, Norris M. Bucket-handle tears of the medial and lateral menisci of the knee: value of MR imaging in detecting displaced fragments. *AJR Am J Roentgenol* 1995; 165(3): 621-625.
9. Ahn JH, Yim SJ, Seo YS, et al. The double flipped meniscus sign: unusual MRI findings in bucket-handle tear of the lateral meniscus. *Knee* 2014; 21(1): 129-132.
10. Blankenbaker DG, De Smet AA, Smith JD. Usefulness of two indirect MR imaging signs to diagnose lateral meniscal tears. *AJR Am J Roentgenol* 2002; 178(3): 579-582.



READY-MADE  
CITATION

Daskalakis II, Karantanas AH. Post-injury painful and locked knee. *Hell J Radiol* 2018; 3(3): 54-59.