Learning objectives:
- To recognise normal meniscal anatomy on standard knee MRI sequences.
- To be able to confidently recognise a tear on a given case.
- To review anatomical structures and normal variants that may mimic a tear.
- To recognise normal meniscal anatomy on standard knee MRI sequences.
- To be able to confidently recognise a tear on a given case.

THE MENISCI ON MRI: Pearls and Pitfalls or the Radiology Registrar
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ANATOMY
The menisci function to increase joint stability, absorb shock and distribute axial load. Standard sequences of the knee include PD, PD fat-saturation, and T1 weighted imaging.

Types of Tear

PEARLS
A meniscal tear can be diagnosed on MRI if there is a high intra-mensical signal in contact with an articular surface on either two consecutive or two orthogonal image slices. In many cases the injured meniscus will demonstrate an abnormal shape.

Figure 2: A tear can be confidently diagnosed if an abnormal high signal (arrows) is seen within the meniscus in either a) 2 consecutive slices or b) 2 orthogonal slices.

TEAR MIMICS

PITFALLS
Displaced tear bucket handle tear; Schematic (left) and PD fat sat sagittal (right) of a Bucket handle tear. This is a vertical displaced meniscal tear (usually medial) which gives characteristic imaging findings. The displaced fragment can flip medially anterior to the PCL, producing a double PCL sign is seen (arrow) and anterior to the anterior horn, producing the double delta sign is seen [*].

Figure 3: Schematic adapted from Skalski, shown 2017.

A normal variant prone to tears

Figure 4: The discoid meniscus is identified if 3 or more sagittal slices (a) show bridging of anterior and posterior horns (more than three bow ties) and is >15mm in width (b). This normal variant is prone to tears. (C) shows a discoid meniscus associated with a complex posterior horn tear.

Figure 8: Medial oblique meniscofemoral ligament. This is an intermeniscal ligament (a), which can appear as the double PCL sign (b) mimicking a bucket handle tear.

Summary
Certain anatomical structures and normal variants can mislead the radiologist in training into overcalling tears.

- Awareness of these pitfalls and the pearls highlighted in this presentation are key to accurate diagnosis.

References
- Drake et al. 2017. Schematic adapted from classic bow tie appearance (c).
- Sherif 2017.
- Humphrey (anterior to the PCL) and Wrisberg (posterior to the PCL).
- Humphrey 2003. A “ruffled” appearance of the inner margin of a meniscus (a). On coronal (b), this may mimic a small radial tear. The example above shows also a horizontal tear.
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Figure 6: Meniscal flounce
- A focal ossification of the posterior horn of medial meniscus. The lesion follows bone MRI signals (a; sagittal PD fat sat and b; T1 shown in this case) and this helps distinguish between a meniscal tear.

Figure 7: Meniscofemoral ligament. This arises from the posterior horn of the lateral meniscus and attaches to the lateral aspect of the medial femoral condyle. It splits into two bands at the PCL, named Humphrey (anterior to the PCL) and Wrisberg (posterior to the PCL).

Figure 5: Transverse meniscal ligament. This ligament connects the anterior horns of both menisci (arrow), and crosses Hoff’s fat pad, mimicking an anterior horn tear.