Radiology for the surgeon

Musculoskeletal case 35

Presentation

A 34-year-old man was referred to an orthopedic surgeon after twisting his right knee. He had ongoing pain and locking and could not fully extend the joint.

Physical examination revealed marked tenderness along the medial joint line and reduced passive and active joint extension. Plain radiographs showed no abnormality, so he underwent MRI (Fig. 1, Fig. 2, Fig. 3, Fig. 4).

What is the diagnosis?

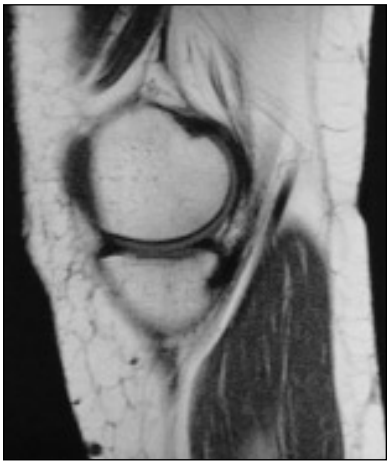

FIG. 1.

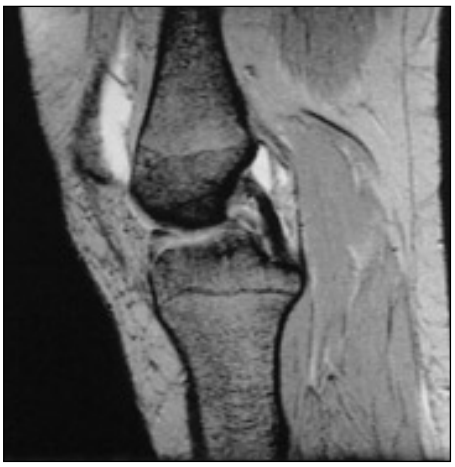

FIG. 2.

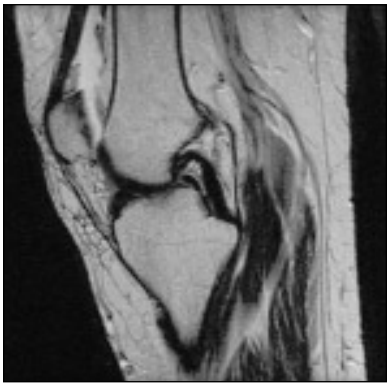

FIG. 3.

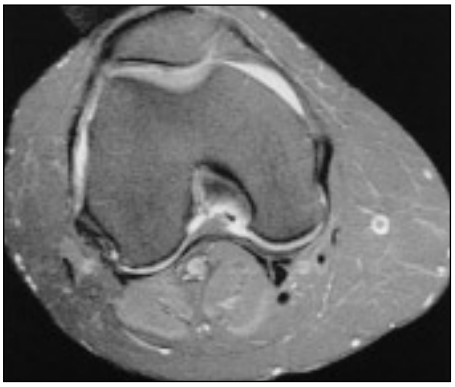

FIG. 4.

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Diagnosis

Bucket-handle tear of medical meniscus — the double PCL sign

The T_1-weighted images demonstrated marked truncation and foreshortening of the medial meniscus, particularly posteriorly (Fig. 5, arrow). The characteristic "bow-tie" was not appreciable on 2 successive sagittal images. Sagittal T_2 and oblique sagittal T_2 fast spin-echo images showed a linear hypointensity anteroinferior to, and paralleling, the PCL (Fig. 6, arrow, Fig. 7, arrow). Axial T_2-weighted imaging demonstrated a free markedly hypointense fragment in the intercondylar notch (Fig. 8, arrow).

A bucket-handle tear is an important type of meniscal injury and nearly always involves the medial meniscus. Typically, there is an oblique or vertical tear in the posterior horn that extends longitudinally through the body of the meniscus toward the anterior horn, and displacement of the inner meniscal fragment creates the "handle,"[1] as seen schematically in Figure 9 and Figure 10. A clinical history of locking or lack of full extension is common, as in our case.

These tears, despite their size and significance, are often overlooked on MRI, probably because of a combination of the parallel orientation of the tear in relation to the sagittal image plane and because the peripheral nondisplaced portion of the meniscus may have only a subtle truncated or foreshortened appearance.[2] The most reliable sign is reported to be a displaced fragment of meniscus. Four imaging signs of displaced fragments have been described, namely the double PCL sign, the flipped meniscus sign, the fragment in intercondylar notch sign and the absent bow-tie sign.[1,3]

The double PCL sign consists of an intercondylar meniscal fragment of low-signal intensity located in the same sagittal plane as the PCL, with the meniscal fragment lying inferior and parallel to the PCL. The parallel low-intensity bands can also be appreciated on coronal images but are correspondingly smaller since they are imaged end-on in their transverse diameter.[4] Unlike the flipped meniscus fragment in notch and absent bow-tie signs, it is nearly always associated with bucket-handle tears of the medial meniscus,[3,5] although it has been described in association with lateral tears.[1] It has been proposed that this is because the more laterally located anterior cruciate ligament acts as a barrier to lateral meniscal fragments.[3]

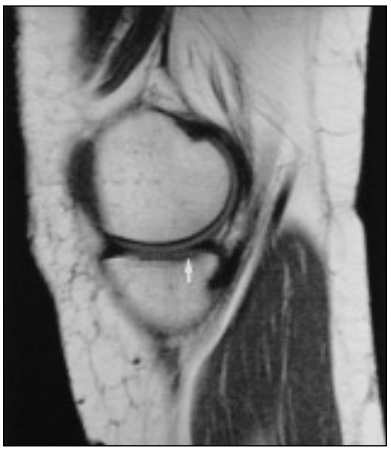
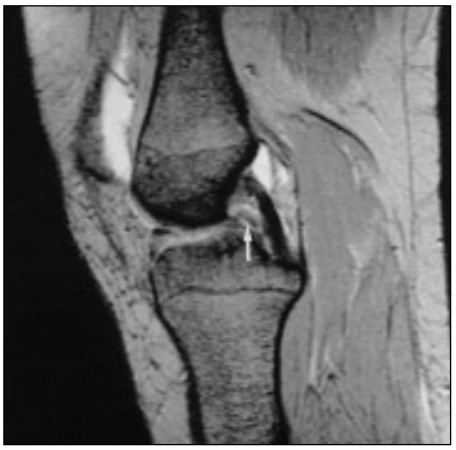


FIG. 5.



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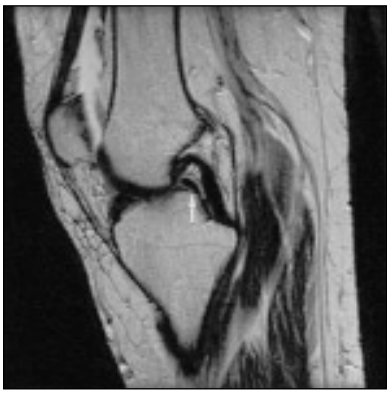

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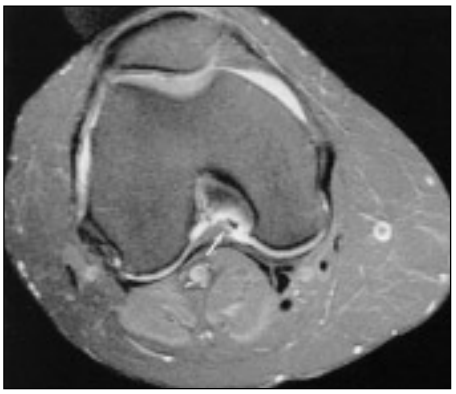

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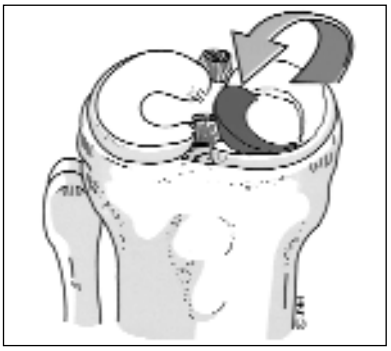

FIG. 9.

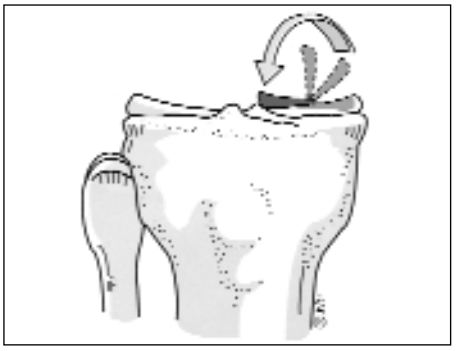

FIG. 10.

Bucket-handle tears are generally managed by arthroscopic resection of the displaced fragment.

Competing interests: None declared.

References

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