Recap of the Knee Cap: A "Leave Alone" Lesion

A 13-year-old male with no past medical history presented with anterior left knee pain for 1 year. He had been playing rugby regularly for the past 1 year. There was no history of trauma, although the pain was worse with physical activity. Physical examination revealed mild tenderness at the superior pole of the patella. Frontal radiograph of the left knee (Fig. 1A), skyline radiograph of both knees (Fig. 1B) and magnetic resonance imaging (MRI) of the left knee (Fig. 2) are provided. What is the diagnosis?

A. Chondroblastoma
B. Brodie's abscess
C. Osteochondritis dissecans
D. Dorsal defect of the patella
E. Metastasis

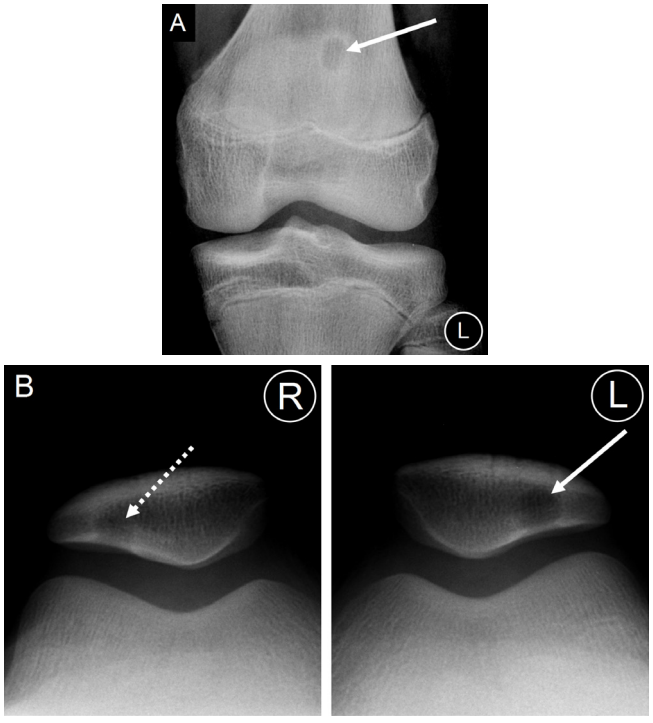

Fig. 1. Frontal radiograph of the left knee (A) and skyline radiographs of both knees (B).

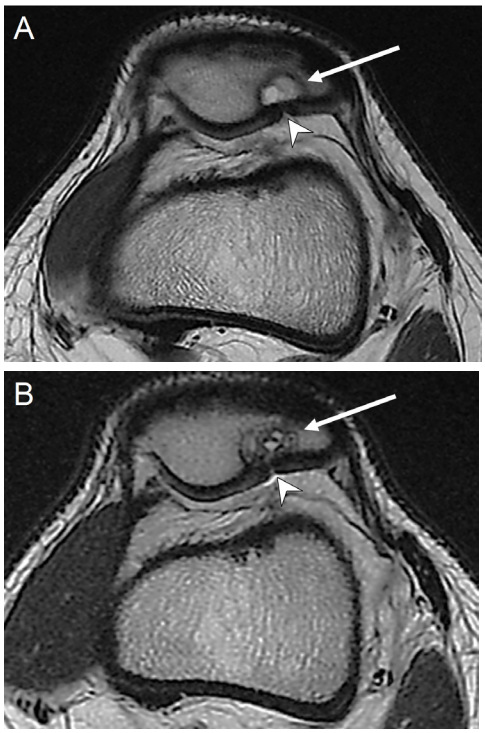

Fig. 2. Axial T2W images of the left knee at the time of presentation (A) and at follow-up MRI 1 year later (B).

Findings and Diagnosis

The frontal (Fig. 1A) and skyline (Fig. 1B) radiographs demonstrate an 8 mm, well defined, ovoid, lucent lesion with a narrow zone of transition (solid arrow) at the dorsal superolateral pole of the left patella. There is a thin sclerotic rim with no matrix calcification. Radiographic features are non-aggressive with no periosteal reaction, cortical break or pathological fracture. A similar lesion (dashed arrow) is seen at the right patella on the skyline radiograph (Fig. 1B). On MRI (Fig. 2A), the lesion corresponds to a well defined, subchondral osseous defect (solid arrow), which is T2W-hyperintense to cartilage with no surrounding marrow oedema. There is an overlying full-thickness chondral fissure (arrowhead). The chondral surfaces are otherwise smooth and no other abnormality is noted. Imaging features (dorsal

Answer: D

superolateral location, non-aggressive imaging features and bilaterality) are consistent with a dorsal defect of the patella (DDP).

The patient defaulted subsequent follow-up. He re-presented a year later with persistent anterior knee pain, now involving both knees, for which MRI was performed. In the left knee (Fig. 2B), the subchondral defect now shows intermediate signal (solid arrow) suggestive of in-filling of reparative tissue but remains stable in size. The overlying chondral fissure (arrowhead) is stable. In the right knee (Fig. 3A), there is a similar lesion (solid arrow) with overlying chondral fissure (arrowhead), although marrow oedema (dashed arrow, Figs. 3B and 3C) is also noted around the subchondral defect. The patient's symptoms improved with conservative treatment, which comprised physiotherapy and activity modification.

Discussion

DDP is an unusual condition (0.3%-1.0% of the population) first described by Caffe and Keats in the early 1970s.[1-4] It is most frequently seen in the second decade of life with no gender predilection, and is bilateral in up to one-third of cases.[1,3-5] It manifests as a well defined lucency with sclerotic rim at the superolateral patella on radiographs, and is often incidentally discovered during the evaluation of knee pain or injury.[1-6] Similar features of dorsal subchondral location, sclerotic border and well defined margins can be demonstrated to greater detail on CT.[2,7,8] Its origin is unclear, but most believe that it relates to anomalous ossification, akin to the formation of a multi-partite patella.[1,3,4] Both DDP and accessory ossification centres, eg. bipartite patella, are found at the superolateral quadrant of the patella.[2,3] At this location, strong traction at the vastus lateralis muscle insertion may also play a contributory role by causing chronic stress-related changes, with deformity in the cartilaginous precursor and subsequent delay in ossification.[3,9] This is supported by the increased tendency to lateral patellar subluxation seen in some patients.[3,5,10] Histopathology shows a non-specific mixture of woven bone, fibrovascular tissue and debris with no evidence of inflammation or neoplasm.[4,5,10,11] It is asymptomatic in most patients and recognised as one of the classic "do not touch" lesions in radiology, typically with no need for further invasive diagnostic or therapeutic procedures.[1,4,5]

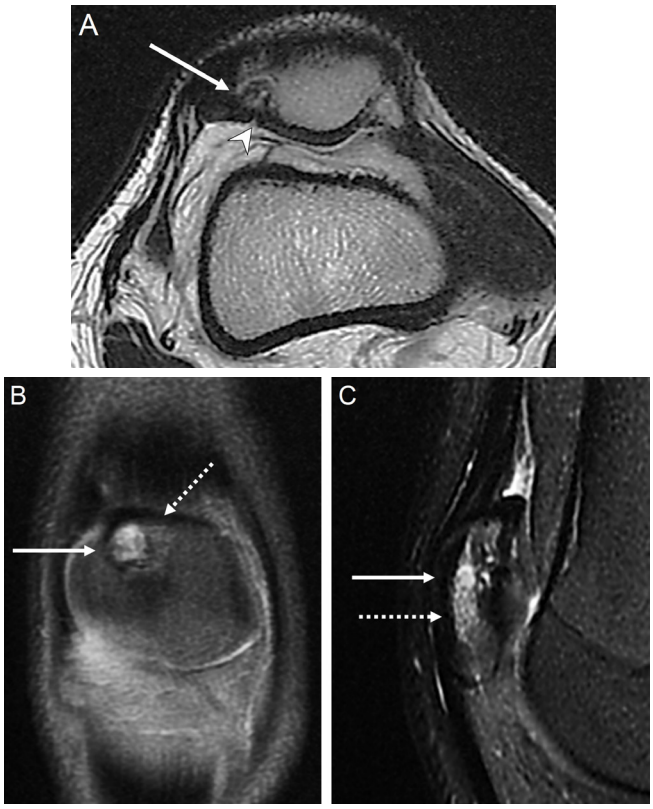

Fig. 3. Axial T2W image of the right knee (A). Coronal fat-suppressed PD-weighted (B) and sagittal fat-suppressed T2W (C) images of the right knee demonstrate marrow oedema (dashed arrows) around the subchondral defect (arrow).

Initial reports of DDP described intact overlying cartilage.[1,4,6,12] However, with the advent of MRI, there have been reports of overlying chondral abnormalities with DDP, ranging from chondral thickening and inhomogeneity with hyperintense streaks, invagination of cartilage into the subchondral defect, to chondral fissures.[5,7,8,10,12] These chondral abnormalities appear to be associated with anterior knee pain, such as in our case, and have been correlated with chondromalacia on arthroscopy.[5,7,8,10,12] In selected patients with persistent symptoms, or when the diagnosis is unclear, arthroscopic curettage of DDP has been reported to show good results.[3,10-12] However, conservative therapy suffices for the vast majority of patients.[4,5,7,8]

Recently, Kwee et al reported a first case of bone marrow oedema on MRI associated with DDP.[13] It was thought that the development (and subsequent resolution) of oedema correlated with the patient's symptoms. In our patient, the presence of oedema appeared to be associated with symptoms in the right knee, although this was not the case on the left.

The natural history of DDP is spontaneous involution with sclerosis over a variable time course.[3-5] In their patient, Kwee et al demonstrated gradual "filling in" of the chondral defect on MRI over 8 months.[13] Similar findings were seen in our patient, in whom intermediate-signal reparative tissue appeared in the left-sided DDP after 1 year. This likely correlates with histological findings of fibrovascular connective tissue filling the defect in curettage specimens.[4,10,11] This may represent an earlier phase of the healing process, usually demonstrated on radiographs as

sclerotic involution.[3-5]

Differentials of DDP include osteochondritis dissecans, chondromalacia patellae, bone tumours such as chondroblastoma or enchondroma, and Brodie's abscess.[5] Distinction from these entities is usually possible due to the characteristic location of DDP, bilaterality (if present) and imaging and clinical features.[2,4,12] Osteochondritis dissecans usually occurs at the medial patellar facet and rarely at the superolateral aspect, and demonstrates an osteochondral fragment, which may be displaced.[4,5] Chondromalacia patellae also typically occurs on weight- or stress-bearing surfaces, although chondral abnormalities have been shown to occur with DDP as mentioned earlier.[5,7,8,12] Accurate characterisation of these findings is important due to implications on therapeutic intervention. Chondroblastomas commonly cause periosteal reaction and marked surrounding marrow and soft tissue oedema.[14] Enchondromas and Brodie's abscesses are rare in this location, with the former demonstrating intact overlying cartilage and the latter typically demonstrating intense uptake on radionuclide bone scans.[4,5]

Conclusion

DDP is one of the skeletal "do not touch" lesions. Recognition of this entity will help avoid unnecessary invasive diagnostic or therapeutic procedures. A minority of these patients may be symptomatic from the DDP, possibly related to associated chondromalacia or marrow oedema, but often respond well to conservative therapy. For these patients, MRI is useful in demonstrating any associated chondral defect or marrow oedema, and to exclude other concomitant pathology.

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