Dorsal Defect of the Patella in a Teenage Male Football Player

A Case Report and Differential Diagnosis of Lytic Patellar Lesion

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Keywords: patella; dorsal defect; patellofemoral pain; osteochondritis dissecans; chondroblastoma

Dorsal defect of the patella (DDP) is a well-documented yet infrequently observed osteolytic lesion on the superolateral aspect of the patella, primarily occurring in the second and third decades of life.[§] The plain radiographic appearance of DDP is typically a round radiolucent lesion with a peripheral sclerotic margin. On a magnetic resonance imaging (MRI) fluid-sensitive series, DDP is demonstrated as a hyperintense focal contour abnormality. Often asymptomatic, DDP is frequently discovered as an incidental finding in up to 75% of cases.[5,9,13,15,17,18] This often occurs when investigating etiologies of symptomatic differential diagnoses, such as osteochondritis dissecans, meniscal tears, ligamentous injury, chondromalacia, and patellar instability.[1,3,5,7,11,13,15,19]

CASE REPORT

A 15-year-old male football player presented to the orthopaedic clinic after sustaining a right knee injury approximately 12 hours earlier. Ambulating using crutches, the patient was unable to bear weight without pain and noted swelling over the knee. The mechanism was a noncontact injury when running. Trying to change direction, he planted the foot, felt a "pop," and was unable to continue playing. Past medical history was significant for knee problems, specifically reporting "floating kneecaps." Physical examination showed diffuse tenderness anterolaterally over the knee with an equivocal McMurray test. There was no effusion and there was no patellar apprehension with medial or lateral translation up to 2 quadrants. The patient had a 1A Lachman (symmetric to opposite side) and normal pivot shift and anterior drawer testing. There was no instability to varus or valgus stress at 0° and 30° of knee flexion. Posterior drawer, posterior sag, and quadriceps active tests were all negative.

Plain radiographs revealed a skeletally immature patient with a round, well-circumscribed lesion in the superolateral quadrant of the patella, with a diameter of roughly 9.4 mm. The patient underwent a noncontrast MRI of the right knee for further evaluation due to the acuity and severity of the knee injury, feeling a "pop," and the patient and his parents subjectively noting swelling in the knee and an inability to return to play after the injury. The MRI revealed focal articular cartilage and subchondral bone marrow signal abnormality in the superolateral aspect of the patella, with the characteristic appearance of a dorsal defect of the patella (Figure 1). No meniscal injury was identified on the MRI. The patient returned 6 weeks later for a repeat evaluation of the pain over the right anterolateral aspect of the patella. A diagnostic and therapeutic intra-articular injection of 5 mL of 1% lidocaine without epinephrine, 5 mL of 0.5% ropivacaine without epinephrine, and 1 mL of 40 mg/mL Depo-Medrol (Pfizer) was offered and performed. After the injection, the patient reported mitigation of pain before it resolved entirely. The patient was instructed to continue with patellofemoral

[§]References 1, 3, 5, 7-9, 11, 13-15, 18, 19.

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The authors declared that they have no conflicts of interest in the authorship and publication of this contribution.

The Orthopaedic Journal of Sports Medicine, 4(9), 2325967116665580
DOI: 10.1177/2325967116665580

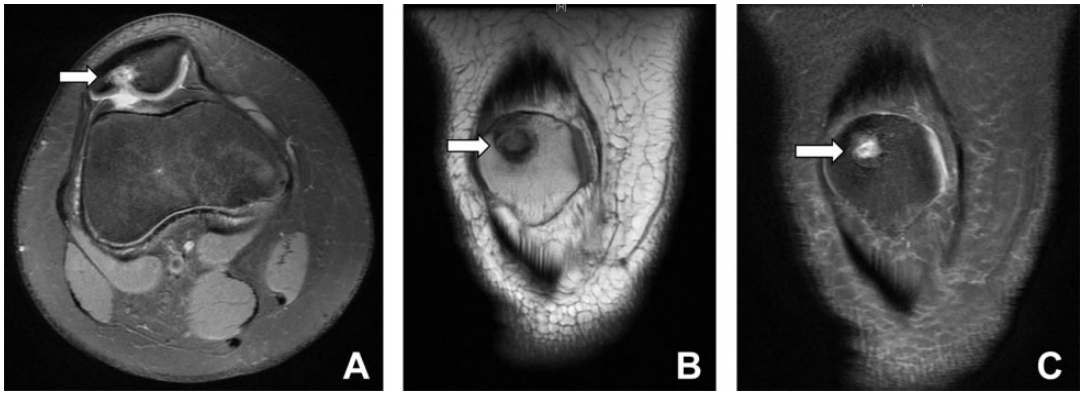

Figure 1. Dorsal defect of the patella in the right knee (arrow) of a 15-year-old male. (A) Axial T2-weighted magnetic resonance image (MRI) showing a hyperintense focal contour abnormality in the superolateral aspect of the patella. Articular cartilage overlying the bony defect appears to be intact. (B) Coronal T1-weighted and (C) T2-weighted MRI showing a hypointense and hyperintense round lesion with sclerotic margins in the superolateral aspect of the patella.

exercises and at 4 weeks' follow-up had returned to sports and activities without restriction or recurrence of pain.

DISCUSSION

Dorsal defect of the patella is an uncommon entity observed in the knee, frequently seen as an incidental finding observed while investigating other potential sources of pain. Using plain radiographs, it is expressed in only approximately 0.3% to 1% of the general population.[9,18] Up to 25% to 33% of those cases were bilateral in presentation.[5,9] The role of sex in prevalence of DDP is conflicting.[5,9,13] While Johnson and Brogdon[9] reported 83% of their cases to be females, Haswell et al[4] and Goergen et al[5] found 75% and 100% of their cases to be males. Although the etiology of DDP has yet to be well established, it has been associated with issues of delay and failure in the ossification process. This lends itself well to the preponderance of younger patients seen with this defect.[9] Furthermore, DDP has been described in some studies to coincide with bipartite (BP) and multipartite (MP) patella.[4,11,17,18] This relationship in abnormal ossification has been linked to the avascular environment of the superolateral aspect of the patella. Additionally, the chronic trauma of muscular stress induced by the insertion point of the vastus lateralis on the patella has been proposed to contribute to plastic deformity in that area.[17,18]

Differential Diagnosis

Two common differential diagnoses for DDP are osteochondritis dissecans (OCD) and chondroblastoma.[6,10] A chondroblastoma is similar from a radiographic presentation, described by Singh et al[16] as osteolytic and round or lobulated with a well-defined sclerotic rim of reactive bone. The common occurrence of both OCD and chondroblastoma in the second decade of life is concurrent with what is described in the literature for DDP.[6,10,16] The primary factor that sets DDP apart from OCD is the bony fragment that is often present in addition to its varied shape and location on the patella.[10,14,15] Its location on the convexity of the patella and tendency to present toward the medial rather than lateral facet are principally what differentiate DDP from OCD.[4] There are other differentiating factors that can be used to determine the correct diagnosis in patients presenting with DDP, OCD, and chondroblastoma of the patella (Table 1).[2,12] Our case showed no bone fragment or cleavage line. The rounded osteolytic lesion measuring approximately 9.4 mm in diameter was congruent with the average noted by Haswell et al,[4] and it presented in the signature area of the patella associated with DDP (Figure 2).

Imaging

When visualizing DDP, plain radiographs give a clear image of a round radiolucent lesion with a peripheral sclerotic margin in the superolateral aspect of the patella. On an MRI fluid-sensitive series, DDP is demonstrated as a hyperintense focal contour abnormality. In the presence of persistent symptoms, this imaging technique is helpful in evaluation of defects in the articular cartilage.[13] Though DDP is primarily asymptomatic, some studies have shown that in cases where articular cartilage in-folds into the bony perforation or where the articular surface is disrupted by the defect in underlying bone, DDP can become symptomatic and may need to be treated surgically.[3,5,8]

Treatment

Nonoperative treatment is initially recommended for a patient with symptomatic DDP. This issue often resolves itself with a reduction in physical activity, allowing for an alleviation in pain and symptoms after a short period of up to 2 to 3 months.[1,4,5,9,10,13,15,18,19] In cases where symptomatic DDP persists or differential diagnosis cannot be determined, studies have shown that biopsy and arthroscopy are effective in relieving patients of their pain.[3,8,17] In cases

TABLE 1
Differentiating Factors Used to Determine the Correct Diagnosis in Patients With DDP, OCD, and Chondroblastoma of the Patella[a]

	DDP	OCD	Chondroblastoma
Age at presentation	Second and third decades	10 and 40 y	Predominantly in young patients (<20 y)[c]
Sex predilection	Conflicting reports in literature	2:1 male to female ratio[b]	More common in males[c]
Location on the patella	• Superior • Lateral facet	• Convexity of the patella • Tendency to present toward the medial	
Size	• Stable • May spontaneously resolve	• Stable • May spontaneously resolve	• Slow growing/enlarges • Does not resolve
Radiographic prevalence	0.3%-1%		
Bilateral	25%-33%		
Asymptomatic	75%	+/− Pain	Painful lesion
Radiographic appearance	• Subchondral location • Round • Radiolucent lesion • Peripheral sclerotic margin • No bony fragment	• Involves articular cartilage/subchondral bone • Usually has a bony fragment	• Nonarticular, does not involve cartilage • Round or lobulated • Osteolytic, can be expansile • Well-defined sclerotic rim of reactive bone
MRI appearance, fluid-sensitive sequences (T2, STIR)	Hyperintense focal subchondral contour abnormality	Hyperintense chondral and subchondral signal	Hyperintense signal in lesion with diffuse perilesional edema/high signal
MRI appearance, other sequences (T1)	Low signal	Low signal	Low signal
Other factors	May coincide with bipartite and multipartite patella		

[a]DDP, dorsal defect patella; MRI, magnetic resonance imaging; OCD, osteochondritis dissecans; STIR, short TI inversion recovery.
[b]Michael et al.[12]
[c]Erickson et al.[2]

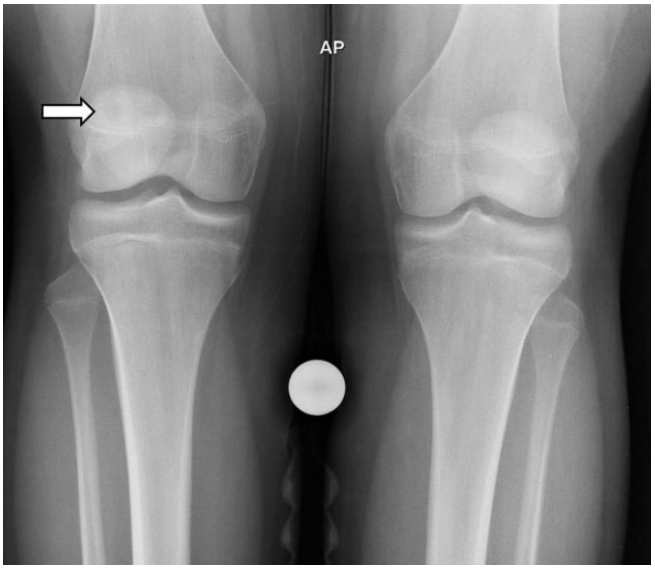

Figure 2. Weightbearing anteroposterior (AP) radiograph of the right knee showing a dorsal defect of the patella in the superolateral aspect of the patella in the right knee (arrow).

describing an open or arthroscopic surgical approach, combinations of curettage, bone graft, and retinacular release have been observed to mitigate symptoms.[3,8,17]

CONCLUSION

Although DDP is commonly asymptomatic and an incidental finding, it should not be overlooked when it exists in a patient with knee pain, especially if they are in their second or third decade of life. When considering differential diagnoses, the identifying features of a round lytic lesion in the superolateral aspect of the patella are usually diagnostic. While plain radiographs provide a clear visualization of DDP, MRI will allow for a more comprehensive assessment of both the integrity of the bone as well as the overlying articular cartilage and other intra- and extra-articular structures.

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