

Bipartite Patella: MR imaging characteristics and frequency

I. M. Omar¹, M. Schweitzer²

¹Radiology, Thomas Jefferson University Hospital, Philadelphia, PA, United States, ²Radiology, New York University Hospital for Joint Diseases, New York, New York, United States

Background: Bipartite patella has been described as a developmental variation, usually involving the superolateral aspect of the patella, in which peripheral, accessory ossification centers fail to fuse with the main cartilaginous anlage as it ossifies [1]. It has been reported in 2 to 3 % of the population [2]. Occasionally, bipartite patella can be a source of anterior knee pain particularly in adolescents and young adults [1]. Although the radiographic findings of this entity have been previously described [3], there is sparse literature describing its MR characteristics.

Purpose: To utilize magnetic resonance imaging to determine the incidence, the age and gender dependence and MR characteristics of bipartite patella.

Materials and Methods: First, we examined T1-W, T2-W, contrast-enhanced and MR arthrographic images from 50 patients to evaluate the site and morphology of the bipartite fragments, the continuity of the adjacent cartilage and the signal characteristics of the synchondrosis. 27,944 knee MRIs were performed at our institution over a six-year period. We found the total number of knee MRIs in each age group to assess the age-related incidence. We then reviewed 400 knee magnetic resonance studies to determine the MR incidence of bipartite patella.

Results: Of the 50 patients with bipartite patella 38 (76%) were males. Age-related incidence of bipartite patella showed 0.45% patients were 11 to 20 years of age, 0.61% were 21 to 30 years of age, 0.37% were 31 to 40 years of age, 0.28% were 41 to 50 years of age, 0.30% were 51 to 60 years of age and 0.11% were 61 to 70 years of age. Nearly all (45 of 50) patellae were associated with a single patellar cartilage bridging both the larger and smaller fragments. Three (6%) demonstrated cartilage only on the major fragment, 1 (2%) showed a fracture of the patellar cartilage associated with a pseudarthrosis and 1 (2%) showed a fracture of the cartilage at the synchondrosis in a patient with traumatic disruption of the lateral portion of the quadriceps tendon. Seven (14%) patellae were tripartite. There was a defect in the patellar cartilage at or near the synchondrosis in 11 (22%) patients. The smaller fragment was almost always located in the superolateral aspect of the patella (47 of 50). In the remaining three patients it was purely lateral. In addition, the smaller fragment was dysmorphic in 43 (86%) patients. Thirteen (26%) patients demonstrated changes of mild edema at the synchondrosis. In the remaining 37 (74%) patients the T1-W and T2-W signal resembled normal hyaline cartilage. There was a pseudarthrosis in seven (14%) cases. Edema was detected in the marrow of both fragments adjacent to the synchondrosis in 22 (44%) studies. Bipartite patella was seen in 3 (0.7%) of 400 patients.

Conclusions: Bipartite patella is seen most frequently in younger male patients. It is commonly observed in the superolateral quadrant where traction by the vastus lateralis muscle [4] and a relatively tenuous vascular supply compared to the inferior pole of the patella [4, 5] may predispose the patella to avulsion injury during development. In addition, the strong association with a single patellar cartilage bridging the fragments suggests both fragments arise from a single ossification center. Together, these findings indicate trauma, which may incompletely heal, may be the most likely etiology for this entity. We frequently found the patellar fragments were dysmorphic. There is no data in the literature explaining this appearance. However, we might speculate a smaller, avulsed patellar fragment might ossify with different morphology and at different times compared with the main fragment due to changes in blood supply and hyperemia or relative hypoxia. Abnormal edema in the synchondrosis and in the adjacent bone marrow was seen in a large segment of the examined group and may reflect abnormal motion that can be a source of anterior knee pain in young adults. The lower MR frequency than that quoted in the literature for radiography is surprising, but may be related to population bias in either group.

References:

1. Ireland ML, Chang JL. Acute Fracture Bipartite patella: case report and literature review. *Med Sci Sports Exerc* 1994; 27(3): 299-302.
2. Weaver JK. Bipartite patellae as a cause of disability in the athlete. *Am J Sports Med* 1977; 5(4): 137-143.
3. Ball OG. Radiologic Seminar CXXXV: bipartite patella. *J MSMA* 1974; 15(1): 18-20.
4. Van Holsbeeck M, Vandamme B, Marchal G, Martens A, Victor J, Baert AL. Dorsal defect of the patella: concept of its origin and relationship with bipartite and multipartite patella. *Skeletal Radiol* 1987; 16:304-311.
5. Brick GW, Scott RD. Blood Supply to the Patella: Significance in Total Knee Arthroplasty. *J Arthroplasty* 1989; Suppl: S75-S79.

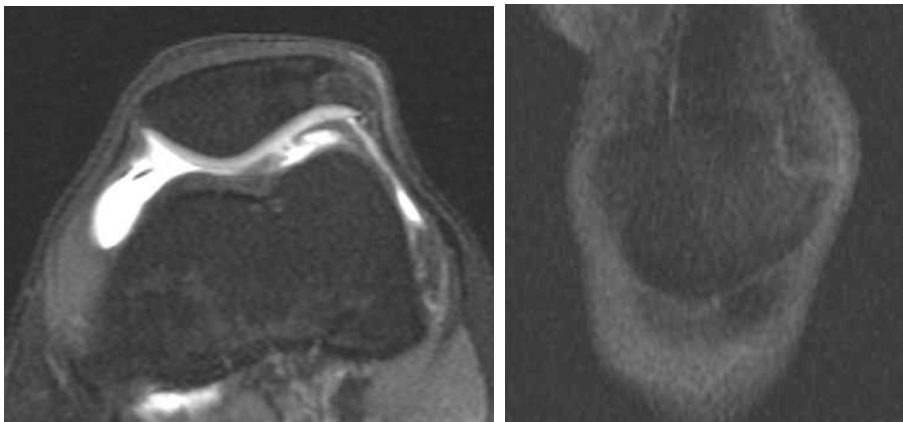


Figure 1: Axial and coronal fat-suppressed T2-W images from an indirect arthrogram of the left knee show a bipartite patella. A single patellar cartilage bridges the two fragments and there is mild perisynchondral edema.