

Case Report

J Chin Med Assoc

2004;67:369-372

Bilateral Dorsal Defect of Patellae with Patellar Hypoplasia and Patellofemoral Malalignment

Yi-Luan Huang^{1,2}
Lee-Ren Yeh^{1,2}
Clement KH Chen^{1,2}
Huay-Ben Pan^{1,2}
Chien-Fang Yang^{1,2}

Dorsal defect of the patella (DDP) is an uncommon but well-documented disease entity. We report a case of bilateral DDP with patellar hypoplasia and patello-femoral malalignment. Detailed imaging features including radiographic, magnetic resonance imaging, and computed arthro tomographic appearances, are described.

¹ Department of Radiology, Kaohsiung Veterans General Hospital,

² National Yang-Ming University, School of Medicine, Taipei, Taiwan, R.O.C.

Key Words

computerized tomography;
dorsal defect of patella;
hypoplasia;
magnetic resonance imaging;
patella

The dorsal defect of the patella (DDP) is an uncommon but well-documented disease entity. It was reported to appear in early life, usually affecting the superolateral quadrant of the patella. DDP is considered in association with bipartite patellae (BP), or the multipartite patellae (MP). All of them are usually considered normal skeletal variants related to abnormality of the ossification process. Some authors proposed a common pathogenic mechanism in which an abnormal muscle strain might be involved. We report a case of bilateral DDP associated with patellar hypoplasia and patellofemoral malalignment. To our knowledge, this association has not been reported in the literature.

CASE REPORT

A 23-year-old man who presented to our Orthopedic Clinic complaining of bilateral knee pain while jogging

occasionally. Since childhood, he found that his patella often slap his femoral condyle while exercise. He visited many orthopedic clinics and subluxation of patella was told. He denied a history of major trauma or any systemic diseases in the past.

This was a robust young male without acute distress and with normal vital signs. The general physical examination was unremarkable. Joint examination disclosed slapping of patellae against femoral condyles on flexion and extension of both knees. The stability test for cruciate ligaments was negative. There was no local heat, tenderness, swelling or deformity. The physical examination of other joints and routine laboratory studies were unremarkable.

Routine views of both knees demonstrated symmetric well-defined circular radiolucent lesions, 7 mm in diameter, with sclerotic margin in the superolateral quadrant of patellae. (Figs. 1A and 1B) The patella was pebble-shaped and with decreased anteroposterior thickness

Received: August 20, 2003.
Accepted: January 12, 2004.

Correspondence to: Clement KH Chen, MD, Department of Radiology, Kaohsiung Veterans General Hospital, 386, Ta-Chung 1st Road, Kaohsiung 813, Taiwan.
Tel: +886-7-342-2121 ext 6238; Fax: +886-7-346-8301; E-mail: khchen@isca.vghks.gov.tw

on Merchant's view. The angle formed by medial and lateral facet of patella measured 149° on the left side and 155° on the right side (greater than 140°). In addition, there was obvious lateral tilting of left patella (Fig. 1C).

He was referred to our department for evaluation of patellar lesions and internal derangement of the knee. MR imaging studies of both knees obtained with a 1.5-T imager (Sigma; GE Medical Systems, Milwaukee) in-

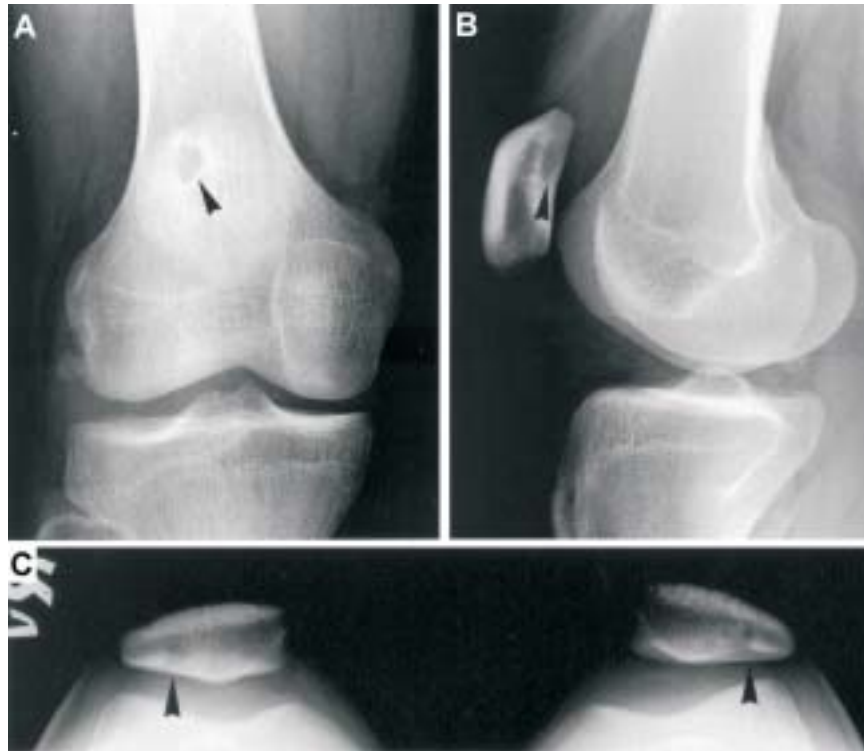


Fig. 1. Dorsal defect of patella in a 23-year-old man with patellar hypoplasia and patello-femoral malalignment. Frontal radiograph (A) and lateral radiograph (B) demonstrate well-defined circular radiolucent lesion with sclerotic margin in the superolateral aspect of right patella. The same finding is present on the left knee. Merchant's view (C) of both knees shows pebble-shaped hypoplastic patellae. The angle formed by the articular surface of medial and lateral facet is greater than normal value (140°) on both sides. There is lateral tilting and subluxation of left patella.



Fig. 2. Dorsal defect of patella in a 23-year-old man. Axial spin echo (SE) T1-weighted (1A, TR/TE 450/15), fat-suppressed fast spin echo (FSE) T2-weighted (2B, 4500/84), and fat-suppressed spoiled gradient-recalled echo (SPGR) image (2C, 55/8) show that the patellar dorsal defect is replaced by soft tissue of similar signal intensity as the surrounding articular cartilage.

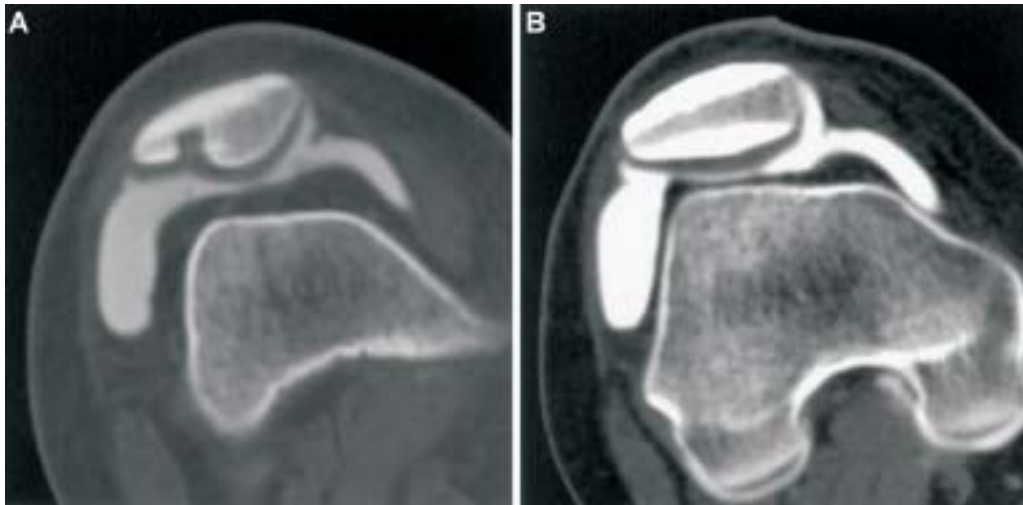


Fig. 3. Dorsal defect of patella in a 23-year-old man. Axial computed arthrographic image of left patella at upper level (A) also demonstrate cartilage-like tissue replacing the bone defect. The overlying articular cartilage is preserved despite focal small depression or dimpling of the articular surface overlying the bone defect. There is no evidence of contrast medium imbibition in the cartilage over the bone defect. Axial image on the middle and the lower portion of left patella (B) clearly demonstrate pebble-shaped hypoplastic patella with increased facet angle.

cluded axial spin echo (SE) T1-weighted (450/15) [repetition time msec/ effective echo time msec] and sagittal T2-weighted (5200/82) imaging, axial fat-suppressed fast spin echo (FSE) T2-weighted (4500/84 and 5200/84) imaging, coronal fat-suppressed proton density (2500/42) and sagittal FSE proton density (3350/13) imaging, as well as axial fat-suppressed spoiled gradient-recalled echo (SPGR)(55/8) imaging. The bone defect was replaced by compensatory hypertrophic cartilage-like soft tissue, which manifested low signal intensity on both T1-weighted and T2-weighted images and heterogeneous signal intensity on SPGR images. In addition, focal step-off of the smooth articular surface of lateral facet was noted (Fig. 2).

Single-contrast computed arthrography of both knees were performed using a 16-slice spiral CT scanner (SOMATOM Sensation 16, Siemens, Forchheim, Germany) after the MR imaging studies for correlative evaluation of articular surface. Image postprocessing included maximum intensity projection (MIP) and multiplanar reconstructions (MPR) for the dorsal defect of patella. It was filled with soft tissue of similar CT attenuation to adjacent articular cartilage and characterized by enfolding of the cartilage with focal depression and step-off of the articular surface (Fig. 3). Both axial radiograph in 30 degrees knee flexion and axial CT-arthrographic images showed dysplastic change of the patellae manifesting

atrophic medial facet, shallow patellar articular surface with enlarged angle between medial and lateral facets.

The diagnosis of dorsal defect of patellae was made by radiologist according to its typical position and imaging features. Conservative treatment rather than aggressive surgical management was recommended because that the lesion was benign and the clinical symptoms were mild.

DISCUSSION

The DDP patella is an uncommon despite well-documented disease entity of the knee joint. In 1987, Holsbeeck *et al.* reported 6 DDP in a series of 2286 single radiographic examinations of the knee. The lesion manifests small circular osteolytic lesion with well-defined sclerotic margin at superolateral aspect of the patella on routine knee radiographs.¹ About 1/3 of the cases involve both knees and are most frequently found in adolescents.² There is no significant sex predominance.³ The lesion was considered an incidental finding on image studies. Most of the cases were treated conservatively. In a symptomatic case undergoing excision of the lesion and cancellous bone graft, Gamble JG demonstrated the histopathological findings of the DDP including fibrous

tissue, reactive woven bone, and streaky eosinophilic extracellular debris of the lesion.⁴

There is a paucity of literature describing the advanced imaging features of DDP. In our case, computed arthrotomography disclosed the subchondral defect of the DDP was replaced by soft tissue isodense to surrounding cartilage. The overlying cartilage of the defect has been retained despite focal depression and mild surface incongruence are observed. MRI also demonstrates compensatory hypertrophy of soft tissue replacing the bone defect. The soft tissue is heterogeneous in signal intensity, either isointense or hypointense to the signal intensity of the patellar cartilage.

DDP is most often considered a variant in the ossification process of the patella and being part of the spectrum of bipartite or multipartite patella. The factor of overstress of the patella at the insertion of vastus lateralis muscle during patellar ossification had also been raised by van Holsbeeck and Sueyoshi Y.^{1,5} In our case of DDP, pebble-shaped dysplastic change with decreased anteroposterior thickness of both patellae was found. The angle formed by medial and lateral facet of patella measured 149° on the left side and 155° on the right side. Normally, this angle measures no greater than 140°.⁶ The patello-femoral malalignment, more evident on the left side, was also found. We are not certain, however, about the relationship between the patellar dysplasia, malalignment and the pathogenesis of the DDP, which hasn't been reported in the literatures. In this case, the PF malalignment and DDP may be concurrent but unrelated events because the former is present only on the left side, while DDP is present on both sides. Nevertheless, we postulate that excessive lateral pressure, which underlies the PF malalignment, on the lateral aspect of the non-ossified patella during childhood, may predispose to chondral crack or fracture and subsequently resulting in bipartite patellae or DDP. However, more cases are necessary to associate patello-femoral malalignment with dorsal defect of patella.

Just like bipartite or multipartite patellae, the diagnosis of DDP can be made by its characteristic location and radiographic appearance. Confusion with other patellar lesions such as osteochondritis dissecans, osteochondral fracture, subchondral cyst, intraosseous ganglion and bone tumors is scarcely likely. DDP can be an incidental finding during evaluation of internal derangement in the knee joint or may be symptomatic, especially when incongruent articular surface is prominent. Conservative management is more often effective for isolated symptomatic DDP. For rare occasions, the symptomatic DDP can be treated by curettage and bone graft of the patellar defect.⁴

We report a case of bilateral symptomatic DDP with patellar hypoplasia and patello-femoral malalignment. The characteristic radiographic, computed arthrotomographic and MR features of this uncommon disease entity obviate confusion with other aggressive patellar abnormalities and unnecessary surgical management, especially for asymptomatic patients.

REFERENCES

1. van Holsbeeck M, Vandamme B, Marchal G, Martens M, Victor J, Baert AL. Dorsal defect of the patella: concept of its origin and relationship with bipartite and multipartite patella. *Skeletal Radiol* 1987;16:304-11.
2. Safran MR, McDonough P, Seeger L, Gold R, Oppenheim WL. Dorsal defect of the patella. *J Pediatr Orthoped* 1994;14:603-7.
3. Goergen TG, Resnick D, Greenway G, Saltzstein SL. Dorsal defect of the patella (DDP): a characteristic radiographic lesion. *Radiology*. 1979;130:333-6.
4. Gamble JG. Symptomatic dorsal defect of the patella in a runner. *Am J Sports Med* 1986;14:425-7.
5. Sueyoshi Y, Shimozaki E, Matsumoto T, Tomita K. Two cases of dorsal defect of the patella with arthroscopically visible cartilage surface perforations. *Arthroscopy*. 1993;9:164-9.
6. John PF, David SH. Disorders of the Patellofemoral Joint. 2nd edition. Baltimore & Williams & Wilkins, 1990:71-85.