

# Para-articular osteochondroma: Role of diagnostic imaging

LOW Soo Fin, LAU Chee Kong, Suraya AZIZ, Radhika SRIDHARAN

Department of Radiology, Universiti Kebangsaan Malaysia Medical Centre,  
Kuala Lumpur, Malaysia

## ABSTRACT

Para-articular osteochondroma (PAOC) is a subtype of extra-skeletal chondroma. This is a rare slow growing benign soft tissue tumour which arises from the adjacent joint and without continuity with the bone. The knee joint is the most frequent site of involvement, particularly at the infra-patellar fossa. We report two cases of para-articular osteochondroma of the knee joint. Based on the imaging features, the diagnosis of para-articular osteochondroma was made and confirmed by histopathological examination. Meticulous clinical-pathologic and imaging evaluation allows recognition of this entity. The imaging findings and the differential diagnoses are highlighted.

**Keywords:** Para-articular osteochondroma, extra-skeletal chondroma, magnetic resonance imaging

## INTRODUCTION

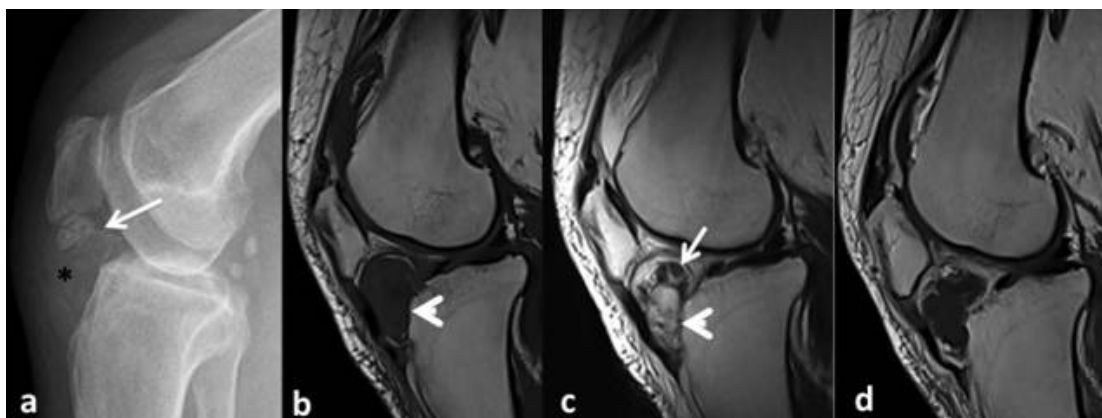
Extra-skeletal chondroma is a rare benign soft tissue tumour and can manifest in three different variants: synovial chondromatosis, para-articular chondroma and soft tissue chondroma.<sup>1</sup> Of these, synovial chondromatosis is the most common type.<sup>2</sup> Para-articular chondroma is a subtype which arises in the soft tissue adjacent to the joints but without continuity with the bones. Here, we report two patients with para-articular osteochondroma of the knee joint and discuss the role imaging.

## CASE REPORT

**Case 1:** A 56-year-old woman presented with right knee pain and fullness for the past three years, which had progressively worsened in the past two weeks. She denied any history of trauma to the knee. The patient was diagnosed to have right knee osteoarthritis during the initial presentation based on her clinical symptoms and knee radiographs. She was given oral analgesics for symptomatic pain relief. Nonetheless, the knee pain persisted and was not relieved by analgesia or rest.

Physical examination revealed fullness and tenderness at the right infra-patellar fossa. The right knee flexion was limited to 100° and associated with knee crepitus. However, there was no bony deformity and the patellar tap was negative. Blood investigations were

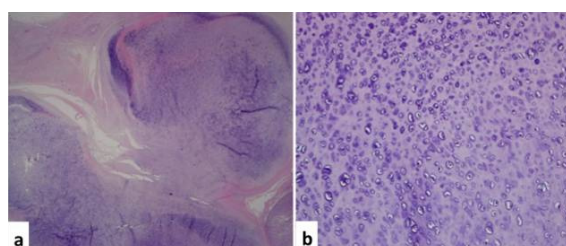
**Correspondence author:** LOW Soo Fin  
Department of Radiology, Universiti Kebangsaan  
Malaysia Medical Centre,  
Jalan Yaacob Latif, Bandar Tun Razak,  
56000 Cheras, Kuala Lumpur, Malaysia.  
Tel: +603-9145 6439, Fax: +603-9145 6682  
E mail: soofinlow@gmail.com



**Figs. 1:** a) A plain radiograph in lateral view of the right knee showing a soft tissue opacity (\*) in the Hoffa's fat pad with foci of calcifications within (arrow), and MRI images showing; b) an infrapatellar lobulated mass (arrow head) which is hypointense on T1-weighted, c) intermediate signal on T2-weighted and d) enhancing peripherally in post-gadolinium sequence.

unremarkable. Radiographs of the right knee showed soft tissue opacity in the Hoffa's fat pad, with no significant erosion or remodelling of the adjacent tibia. There were foci of calcifications within. The lateral view of the right knee showed osteoarthritic changes with multiple intra-articular loose bodies (Figure 1a). Magnetic resonance imaging (MRI) of the knee revealed a lobulated mass in the infrapatellar fat pad that was hypointense on T1-weighted images and intermediate signal on T2-weighted images (Figures 1b, 1c and 1d). The mass measured 3.6cm x 5.2cm x 4.9cm. It showed peripheral enhancement with multiple foci of calcifications internally. Based on the location and imaging findings of the lesion, para-articular osteochondroma was considered to be the most likely diagnosis.

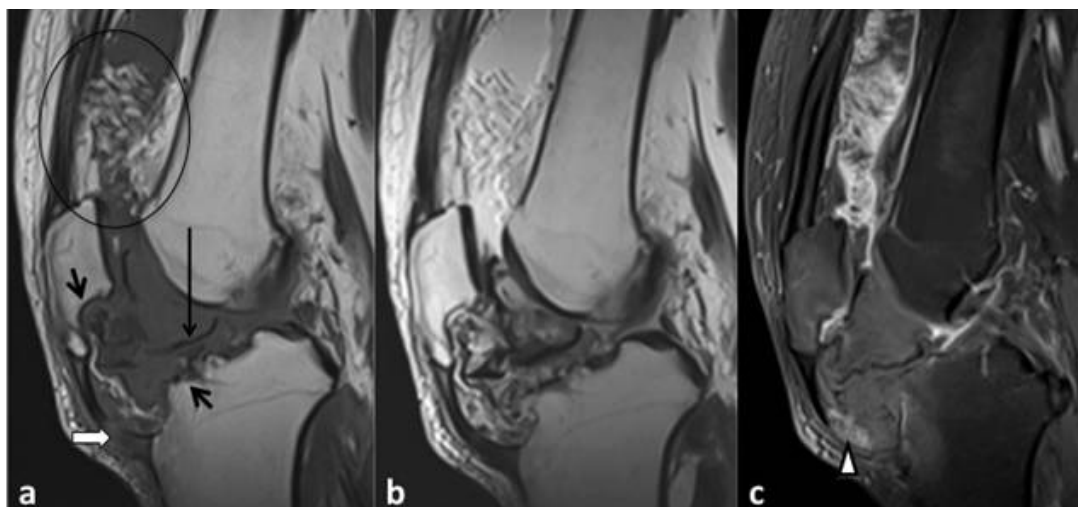
The patient subsequently underwent excisional biopsy of the right infra-patellar mass. Intra-operatively, a tan-coloured extra-synovial cartilaginous mass with nodular surface was removed and sent for histopathological examination (HPE). HPE showed nodules of variable cellular cartilage tissue covered by



**Figs. 2:** a) Histological section shows nodular areas of cartilage and b) chondrocytes are within the lacunar spaces.

fibrous layer and partly bony tissue (Figure 2a). The chondrocytes were situated within the lacunar spaces and the nuclei were round and small (Figure 2b). Some lacunar spaces were without cells. There was no mitosis or malignancy seen. The HPE diagnosis was consistent with extra-skeletal osteochondroma. The final diagnosis of para-articular osteochondroma of the right knee was made. Post-operatively, she regained full range of movement in her right knee and there was no crepitus or tenderness. The patient was symptom-free and remained under our follow-up without any sign of recurrence.

**Case 2:** A 56-year-old man presented with two years history of painless right knee swell-



**Figs. 3:** Magnetic resonance imaging of the right knee; a) Sagittal view of the infrapatellar mass is hypointense on T1-weighted (long black arrow) and causes pressure erosion and bony remodelling of the postero-inferior surface of the patella and anterior intercondylar area of the tibia (short black arrows) as well as tendinopathy of the patella (white arrow). In the suprapatellar fossa, there is incidental finding of lipoma arborescens (circle); b) the lesion has a heterogeneous intermediate signal on T2-weighted with c) minimal peripheral enhancement (white arrowhead) in T1-weighted post-gadolinium sequence. Curvilinear hypointense signal (long arrow as shown in Fig. 3a) within the lesion represents the calcified cartilage.

swelling. His past medical history was unremarkable and no definite trauma event was recalled. A plain radiograph showed a soft tissue opacity distending the infra-patellar fossa with opacity distending the infra-patellar fossa with intra-lesional curvilinear calcifications. MRI demonstrated an infrapatellar mass measuring 8.3cm x 3.6cm x 5.7cm. It was hypointense on T1-weighted images and intermediate signal on T2-weighted images with minimal peripheral enhancement. The mass had caused pressure erosion with bony remodelling of the postero-inferior surface of the patella and the anterior inter-condylar area of tibia (Figures 3). In the supra-patellar fossa, there was an incidental finding of lipoma arborescens. A trucut biopsy of the mass was performed and revealed benign cartilage and bony tissue. Correlating to the imaging findings, the features were suggestive of a para-articular osteochondroma. In view of the HPE findings and the benign

nature, the patient declined surgery and subsequently defaulted treatment.

## DISCUSSION

Para-articular chondroma is a subtype of extra-skeletal chondroma. The knee joint (76%) is the most frequent site of involvement, particularly at the infra-patellar fossa. Other potential sites of involvement are the foot (19%) and ankle (5%). It has a male preponderance (M:F, 7:2) with a broad range of age presentation, from 14 to 75 years.<sup>3</sup>

The pathogenesis of extra-skeletal chondroma is controversial; the initial theory for its occurrence is due to osteochondral metaplasia of the fibrous joint capsule and adjacent soft tissue.<sup>4</sup> Some authors postulate that extra-skeletal chondroma is attributed to metaplasia from mesenchymal tissue or repeated trauma.<sup>5, 6</sup> If the metaplasia progresses to ossification, the term extraskeletal oste-

enchondroma is used. The term extra-skeletal osteochondroma or extra-skeletal chondroma is used depending on the proportion of bone and cartilage formation in the lesion.<sup>2, 7</sup> Hence, the term para-articular osteochondroma (PAOC) was used in our cases due to the significant proportion of ossification in the lesions.

Pathological examination of PAOC is characteristic. Grossly, it is characterised by a solitary extra-synovial cartilaginous mass of varying size, ranging from 2 cm to 10 cm.<sup>2</sup> Histologically, it is not synovial in origin.

Generally, the imaging features of the majority of these soft tissue masses in plain radiograph are non-specific. On plain radiograph, PAOC appears as a well-circumscribed, lobulated mass with varying degrees of ossification.<sup>8</sup> These features may present in other soft tissue tumours as well. Depending on the size of the tumour, it may cause pressure erosion and bony remodelling of the adjacent bone owing to its slow growth rate. Computed tomography is helpful to depict intralesional calcifications and adjacent bone reaction. Nevertheless, the superior contrast resolution of MRI to assess soft tissue mass is unrivalled. On MRI, PAOC exhibits isointense signal on T1-weighted images and inhomogeneous intermediate signal on T2-weighted images. The ossified components appear as hypointense foci in all sequences. The chondroid component of the lesion is hypointense on T1-weighted images and hyperintense on T2-weighted images. The mass may show variable degree of peripheral enhancement. Patellar tendinopathy with bony erosion of the tibial condyle and patella were observed in the second patient (**Case 2**), owing to the

size of the mass and resultant chronic pressure effect. Association between lipoma arborescence and PAOC is not documented. The presence of lipoma arborescence in Case 2 is most likely coincidental.

Other possible differential diagnoses include synovial chondromatosis, synovial sarcoma, soft tissue sarcoma and heterotopic ossification. Synovial chondromatosis is a benign lesion which occurs predominantly in adult males during their third to fifth decades. It is usually found within or near a joint and the knee is the commonest site affected. This condition has pathognomonic radiographic features of multiple intra-articular chondral bodies with 'ring-and-arc' chondroid mineralisation. It exerts extrinsic erosion on both sides of the joint.<sup>9</sup> MRI shows features of osteocartilaginous tumour but lacks specificity to make a diagnosis. Therefore, HPE is crucial to elicit the exact diagnosis.

Synovial sarcoma is a slow growing malignant soft tissue tumour which predominantly occurs in the younger age group, ranging from 15 to 40 years of age and has equal affliction in both genders. It tends to occur close to a large joint, and the lower limb is the commonest site of involvement.<sup>10</sup> Calcifications may have been seen in up to 30% of cases and this tumour may erode the adjacent bone. Distinct from PAOS, the calcifications in synovial sarcoma are neither osteoid nor chondroid in origin. Moreover, synovial sarcoma exhibits significant enhancement either in diffuse, heterogeneous or peripheral forms.<sup>10</sup> The likelihood of synovial sarcoma is down the list due to the age of presentation of the patients and the lack of characteristic MRI features.

Heterotopic ossification is abnormal mineralisation of extra-skeletal soft tissue. It is a common condition, mostly preceded by varying degrees of trauma. Occasionally, it increases in size and mimics a soft tissue mass. It typically presents as a painful enlarging mass. The classic imaging feature on plain radiograph is a mineralised rim with central lucency. A clear plane to the adjacent bone without bony erosion is characteristic. The mineralised component is a prominent finding on imaging. On MRI, fatty marrow signal is demonstrated in the centre of the heterotopic ossification, but this is not seen in PAOC.

In conclusion, PAOC is a slow growing soft tissue mass and the infra-patellar fat pad is the most commonly involved site. Excision of the PAOC is adequate treatment for complete removal of the tumour. Tumour recurrence is rarely reported. It is possible to distinguish a malignant tumour from a benign one preoperatively. Meticulous clinical-pathologic and imaging evaluation allows recognition of this entity.

## REFERENCES

- 1:** Rizzello G, Franceschi F, Meloni MC, et al. Para-articular osteochondroma of the knee. *Arthroscopy.* 2007; 23:910.e1-4.
- 2:** Samardziski M, Foteva M, Adamov A, Zafiroski G. Intracapsular and para-articular chondroma of knee: a report of four cases and review of the literature. *Radiol Oncol.* 2006; 40:205-9.
- 3:** Maheshwari AV, Jain AK, Dhammi IK. Extraskeletal paraarticular osteochondroma of the knee--a case report and tumor overview. *Knee.* 2006; 13:411-4.
- 4:** Jaffe HL. Tumours and tumorous conditions of the bones and joints. Philadelphia: Lea and Febiger. 1958; 558-67.
- 5:** Gulati Y, Maheshwari A, Sharma V, Mattoo R, Arora D, Gupta N. Extraskeletal osteochondroma of the thigh: a case report. *Acta Orthop Belg.* 2005; 71:115-8.
- 6:** Sakai H, Tamai K, Iwamoto A, Saotome K. Para-articular chondroma and osteochondroma the infrapatellar fat pad: a report three cases. *Int Orthop.* 1999; 23:114-7.
- 7:** Helpert C, Davies AM, Evans N, Grimer RJ. Differential diagnosis of tumours and tumour-like lesions of the infrapatellar (Hoffa's) fat pad: pictorial review with an emphasis on MR imaging. *Eur Radiol.* 2004; 14:2337-46.
- 8:** Lim SC, Kim YS, Kim YS, Moon YR. Extraskeletal osteochondroma of the buttock. *J Korean Med Sci.* 2003; 18:127-30.
- 9:** Murphey MD, Vidal JA, Fanburg-Smith JC, Gajewski DA. Imaging of synovial chondromatosis with radiologic-pathologic correlation. *Radiographics.* 2007; 27:1465-88.
- 10:** Murphey MD, Gibson MS, Jennings BT, Crespo-Rodríguez AM, Fanburg-Smith J, Gajewski DA. From the archives of the AFIP: Imaging of synovial sarcoma with radiologic-pathologic correlation. *Radiographics.* 2006; 26:1543-65.