CASE REPORT

Challenges in imaging and histopathological assessment of a giant cell tumour with secondary aneurysmal cyst in the patella

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SUMMARY

The patella is an uncommon site for all primary and metastatic bone tumours and primary intra-osseous tumours of the patella are very rare. A majority of the patella tumours are benign. We report a patient with a sudden onset swelling and pain of the right knee following a staircase fall. The plain radiograph showed an expansile multiseptated patella lesion and it was further assessed with an MRI. The radiological findings and the initial histopathological features from a limited sample were suggestive of a primary aneurysmal bone cyst. However, the final histopathological diagnosis from a more adequate specimen was a giant cell tumour with a secondary aneurysmal bone cyst.

INTRODUCTION

Primary bone tumour in the patella is very uncommon. Among the most frequently encountered primary osteolytic lesions in the patella are giant cell tumour (GCT), chondroblastoma and aneurysmal bone cyst (ABC).¹ We present a rare case of a GCT with secondary ABC in the patella. Despite each primary bone tumour having its own characteristic radiological appearance, it is difficult to distinguish primary ABC from the secondary ABC based on radiology imaging alone. The aim of this case report is to highlight the importance and challenges of both imaging and histopathological assessment in an attempt to arrive at a correct diagnosis.

CASE PRESENTATION

A 23-year-old man was presented with a sudden onset of right knee swelling and pain after a fall from a few steps of staircase. He was unable to bend his right knee and had limited range of movement. He admitted to having a similar history 3 months ago after playing football but was treated conservatively.

On clinical assessment, the anterior aspect of the right knee was swollen and the range of movement of the right knee was limited. A bedside knee joint aspiration was performed and about 60 mL of blood was aspirated. The initial clinical diagnosis was traumatic haemarthrosis of the right knee and the suspicion of an ipsilateral quadriceps tendon tear.

INVESTIGATIONS

The coagulation profile and other blood investigations were unremarkable. The right knee radiograph was obtained and showed an expansile,

Figure 1 Right knee radiograph in lateral view shows a multiseptated expansile lytic lesion in the patella. The patella cortex is thinned-out. There is a cortical break at the ventral aspect of the patella in keeping with pathological fracture (arrow). The homogeneous opacity in the right supra-patellar region is consistent with a knee effusion (asterisk).

multi-septated lytic lesion in the right patella (figure 1). There is endosteal scalloping and thinning of the cortex.

An ultrasound of the right knee was performed to rule out the quadriceps tendon tear. The ultrasound showed haemarthrosis in the suprapatella fossa. The patella was enlarged with cortical break suggestive of a pathological fracture. However, no evidence of quadriceps tendon tear was detected.

An MRI of the right knee was performed. There was an expansile lesion replacing the marrow of the entire right patella (figure 2). It was hypo-intense on T1-weighted sequence and hyper-intense on T2-weighted sequence. There were multiple thin-walled cysts with blood fluid interface of different signal intensities. At post gadolinium administration, there was enhancement of the

To cite: Low SF, Hanafiah M, Nurismah MI, et al. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2013-200790

Figure 2 MRI of the right knee in sagittal view. (A) T2-weighted image shows an expansile lesion replacing the marrow of the entire right patella. There are multiple thin wall cysts with blood fluid interface of different signal intensities (asterisk). (B) T1-weighted fat suppressed post gadolinium image shows enhancement of the septae and wall of the lesion but no enhancement within the cysts.

septae and wall of the lesion but no enhancement within the cysts. In addition, there was endosteal scalloping with thinning of the cortex. A cortical break was demonstrated at the antero-superior aspect of the patella in keeping with a pathological fracture. There was also moderate knee joint effusion. A provisional diagnosis of a primary ABC was made in view of no enhancing solid component within the lesion.

TREATMENT

He underwent curettage and bone grafting 1 week after the MRI appointment. A medial para-patellar incision was made to expose the patella. Intra-operatively, the patella mass was homogeneously bloody simulating an ABC. Curettage of the mass was performed and the patella was packed with bone graft and closed with a tension band wire.

Sample was sent for analysis. The initial frozen section of a limited sample size showed features compatible with an ABC, giving an initial provisional diagnosis of a primary lesion.

Further histopathological analysis of the entire specimen revealed a final diagnosis of a GCT with secondary ABC (figure 3). The tumour tissue fragments were composed of sheets of neoplastic ovoid cells with ill-defined cytoplasm representing

Figure 3 Histology image shows giant cell tumour (right) with aneurysmal bone cyst-like areas (left) (H&E stain, $\times 10$).

multinucleated giant cells, interspersed with rather uniformly distributed numerous osteoclast-like giant cells. The adjacent tissue fragments showed multiple blood-filled cystic spaces separated by fibrous tissue containing reactive bone rimmed by osteoblasts.

OUTCOME AND FOLLOW-UP

He was followed-up at the orthopaedic clinics for 2 years with no demonstration of tumour recurrence.

DISCUSSION

The patella is the largest sesamoid bone in the body. It is an uncommon site for all primary and metastatic bone tumours. Primary intra-osseous tumours of the patella are very rare and account for about 0.12% of all primary bone tumours.² A majority of the patella tumours are benign with chondroblastoma, GCT and ABC being the most common diagnoses.¹ Other differential diagnoses of a patella lesion include metastasis, lymphoma, paget's disease, osteosarcoma, chondrosarcoma, osteomyelitis, gout, brown tumour, osteoma and solitary bone cyst.² Anterior knee pain and swelling are the most frequent symptoms of a patellar tumour. In the present case, the patient had two episodes of knee swelling with mild pain following knee injuries.

A GCT is a bone tumour that is characterised by the presence of multinucleated giant cells. It is benign in majority, with risk of malignancy only seen in a very small proportion of cases. There are less than 1% of all GCTs in the skeletal system arising from the patella.³ In general, a GCT normally arises from the metaphysis of the long bones with epiphyseal involvement and growth towards the sub-articular region. The knee is the most frequent site for a GCT. However, it usually involves either the distal end of the femur or the proximal tibia. In plain radiograph, it is typically presented as an eccentric expansile lytic lesion with soap bubble appearance. It has no sclerotic margin or matrix of calcification within. The radiographic feature of the GCT of the patella is similar to elsewhere in the skeleton.²

ABC, on the other hand, is a benign cystic bony lesion that is composed of blood-filled spaces separated by connective tissue septa containing osteoclast-type giant cells, fibroblasts and reactive woven bone.⁴ ABC can arise de novo; as a primary lesion, or arise secondarily within a pre-existing bone lesion. Primary ABCs account for 1.4% of all primary bone tumours and the occurrence of primary ABC in patella is very uncommon.⁵ Approximately 30–50% of the ABC is secondary, which developed from a pre-existing lesion such as GCT, haemangioma, chondroblastoma, osteoblastoma, non-ossifying fibroma, fibrous dysplasia, chondromyxoid fibroma, eosinophilic granuloma, and osteosarcoma.⁶ Two theories of development of secondary ABC are proposed: vascular anomaly in a primary bone lesion or reactive bone growth causes a haemodynamic change.⁷ A GCT with secondary ABC is not an uncommon entity.

As far as the imaging of the secondary ABC is concern, only 20% had the typical radiological appearance while in the other 80%, the associated lesion dominated the radiological picture, particularly when it is malignant.⁸ Hence, histopathological confirmation is crucial in making the diagnosis. Histopathological results must be interpreted with great care as confusion regarding the diagnosis may still occur if the tissue sample is taken from a small biopsy or a limited sample. A similar problem was encountered by the present case during the initial gross assessment of the sample, where the result came back as a primary ABC. The exact diagnosis of GCT with secondary ABC was only revealed after histopathological evaluation of the entire tumour. Fortunately, the presence of secondary ABC has no significant

implications on the overall management or treatment outcome of the GCT.⁴ However, fear is when the concomitant pre-existing lesion is a malignant process, which should not be missed, as the approach of the management would have been completely different.

It is important to highlight that the correlation between the imaging and the histopathological findings are very crucial.⁸ In view of the limitation of a small biopsy sample, which may show the features of the ABC but not the underlying lesion, careful review of the imaging appearance is imperative to exclude the potentially missed malignant process with the ABC being secondary.

In MRI, the ABC has typical expansile appearance with lobulations and multiseptated cysts. The cysts are of variable signal, with surrounding rim of low T1 and T2 signal. An MRI is able to demonstrate the characteristic fluid–fluid levels as well as identify the presence of a solid component suggesting that the ABC is secondary. The fluid levels are due to settling of degraded blood products within the cysts. It is important to remember that the presence of fluid–fluid levels, although characteristic of ABC is by no means unique to it. Fluid–fluid levels are also seen in other benign and malignant lesions including GCT, chondroblastoma, simple bone cyst and telangiectatic osteosarcoma. However, the thin, well-defined margins of the ABC should help to distinguish it from these other lesions.

The presence of enhancing solid component usually indicates a diagnosis of secondary ABC with pre-existing tumour. On the contrary, absence of enhancing solid component may not be able to exclude a secondary ABC with pre-existing tumour. For instance, in the present study, no enhancing solid components were depicted on the MRI and mislead the initial MRI diagnosis of a primary ABC. The exact diagnosis of GCT with secondary ABC was only revealed after histopathological evaluation (HPE) of the entire tumour. We postulated that the lack of a solid component in this case was due to more aggressive cystic and haemorrhagic changes of the GCT. The solid component was not discernable on imaging but HPE examination successfully revealed scattered multinucleated giant cells.

The management of the GCT with secondary ABC in the patella depends on the stage of tumour. Curettage and bone grafting is recommended for a non-aggressive lesion. In contrast, a patellectomy is the option of choice for an aggressive lesion. In the present case, the absence of cortical disruption or tumour

extension beyond the cortex allowed the patient the option for curettage and bone grafting.

Learning points

- ▶ Both the imaging and histopathological analysis play important roles to assess a bony lesion in a patella.
- ▶ Familiarisation with the imaging appearances of the patella tumour is crucial in an attempt to make the initial diagnosis, particularly in excluding the underlying malignant process.
- ▶ Understanding of the potential pitfalls of histopathological assessment from a limited small sample, for example core biopsy, is imperative to avoid inaccurate diagnosis and inappropriate management of the lesion.
- ▶ Histopathological assessment of the entire specimen is needed to ascertain the final diagnosis, however may only be accessible following tumour resection.

Contributors All of the authors have equal contribution in drafting, writing, revising and completing the manuscript.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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