CASE REPORT

Giant cell tumour of the patella with local recurrence: successful management with excision, curettage and artificial bone grafting

Timothy Mark Morris,¹ Zakareya Gamie,¹ Kanishka Milton Ghosh,¹ Kenneth Samora Rankin²

¹Newcastle Upon Tyne Hospitals NHS Foundation Trust, Newcastle Upon Tyne, UK
²Newcastle University, Newcastle upon Tyne, UK

Correspondence to
Kenneth Samora Rankin,
k.s.rankin@ncl.ac.uk

Accepted 31 January 2018

SUMMARY

Primary patellar neoplasms are rare, comprising 0.12% of primary bone tumours; thus, no standardised treatment related to staging exists. 70%–90% of primary patellar neoplasms are benign or intermediate with giant cell tumour (GCT) being the most common. GCTs are locally aggressive, have a high recurrence rate and metastasise in 1%–2%. We report the case of a 23-year-old man with histologically confirmed recurrent GCT of the patella to demonstrate that aggressive surgical management options described in the literature, such as patellectomy with or without complex reconstruction, may be excessive and cause patients undue morbidity. Initially, the patient underwent intralesional curettage with excellent recovery, but presented again with a local recurrence within a year. A further definitive operation was performed which included excision of the inferior pole followed by curettage of the patellar body and artificial bone grafting. The patient made a good recovery and at 5-year follow-up has maintained good function.

BACKGROUND

Anterior knee pain is a common presentation in general and orthopaedic practices. Most cases are attributable to trauma, patellar maltracking or degenerative disease. Rarely, focal patellar lesions are discovered which are either incidental or require further investigation. Intraosseous primary patellar neoplasms are rare comprising only 0.12% of primary bone tumours; 70%–90% are benign with giant cell tumour (GCT) being the most common.^{1,2}

Singh *et al* reviewed the English literature and only discovered 136 cases of tumour or tumour-like patellar lesions.² The most common malignant patellar neoplasms are metastases, the most common primary malignant tumour is osteosarcoma and the most common non-neoplastic lesions are brown tumours of hyperparathyroidism.^{2,3} Comprehensive physical, radiographic and histological examination is required for diagnosis to ensure appropriate treatment. Nonetheless, due to the rarity of these lesions, no standardised management related to staging exists.³ Some reports describe aggressive surgical management including wide excision via patellectomy and reconstruction with a cadaveric allograft comprising: patella, patellar tendon and a portion of the tibial tubercle.³ While such strategies reduce the risk of local recurrence, the functional

outcomes will be poor, particularly in young active patients.

We present a local recurrence of GCT of the patella successfully treated with marginal excision and curettage to demonstrate that more aggressive surgical management may be unnecessary. We have over 5 years of follow-up data, the longest in the literature, demonstrating a good clinical outcome.

CASE PRESENTATION

A 23-year-old man was referred to The North of England Bone and Soft Tissue Tumour Service following a plain radiograph suggestive of a locally aggressive primary bone tumour. Features of this lesion included a relatively well-defined expansile area of radiolucency in the inferior pole of the left patella with cortical thinning (*figure 1*).

He attended the orthopaedic oncology clinic with intermittent symptoms of knee pain, swelling and 'giving way' but no history of trauma. Initial examination revealed a small effusion and exquisite tenderness over the inferior pole of his patella and the entire length of the patellar tendon. There was no restriction of movement or bursal swelling. Further investigation, by CT scan, revealed a lytic area involving the inferior pole of the patella. Differential diagnosis included: GCT, aneurysmal bone cyst (ABC), fibrous dysplasia and chondroblastoma. An open biopsy was undertaken via a medial parapatellar incision to access the inferior pole; this revealed only reactive changes and subsequent

Figure 1 August 2010—plain radiograph on initial presentation.

To cite: Morris TM, Gamie Z, Ghosh KM, *et al*. *BMJ Case Rep* Published Online First: [please include Day Month Year]. doi:10.1136/bcr-2017-221275

Figure 2 February 2011—plain radiograph following first (curettage only) procedure.

CT-guided biopsy was necessary to access a more representative zone of the lesion. The lower pole was accessed using a Bonopty needle set and found to be entirely cystic containing blood. The biopsy samples were histologically proven to be GCT and the lesion was retrospectively given a grading of Campanacci II. Consequently, intralesional curettage via medial arthrotomy (a conventional treatment for this lesion) was completed within a month of the biopsy and he was discharged within 3 days of admission (figure 2). Initial recovery was excellent: wound healing was unproblematic, the extensor mechanism was intact and, following complete wound healing, his patella was non-tender.

Within a year of initial curettage, he experienced symptoms suggestive of recurrence namely: pain and swelling over the anterior aspect of the knee and therefore MRI was performed (figure 3). This revealed: expansion of the mid and distal thirds of the patella and normal marrow signal superiorly, with reduced T1 and relatively low T2 signal in the inferior pole and expansion into Hoffa's fat pad. Incidentally, a small long-standing

Figure 3 December 2011—a sagittal T1 image with the recurrent lesion in the expanded inferior pole of the patella demonstrating low signal. White arrows indicate the giant cell tumour expanding out of the inferior pole of the patella.

Figure 4 February 2012—postoperative radiograph following excision of the inferior pole and curettage of the midpatella.

non-ossifying fibroma in the distal femur was noted. The MRI appearances were in keeping with recurrence and, therefore, further surgery was undertaken since the initial curettage had seemingly failed to comprehensively eliminate the primary lytic lesion.

Excision of the inferior pole (leaving the patellar tendon intact), curettage and artificial bone grafting into the residual cavity in the body of the patella, with a calcium sulfate–calcium phosphate composite graft (Pro-Dense, Wright Medical), was performed. During the operation, the soft tissue extension was excised with a cuff of Hoffa's fat pad to reduce the risk of recurrence. The extensor mechanism was repaired by suturing the patellar tendon to the medial retinaculum. The postoperative radiograph demonstrates excision of the inferior pole of the patella (figure 4). Samples obtained intraoperatively confirmed GCT histologically. Pain control requirements were minimal during his 3-day admission, requiring only weak opioid therapy. Recovery was satisfactory with good wound healing; a cast brace was applied and, over the following 3-½ months, flexion was increased with concomitant physiotherapy to facilitate supervised flexion and increase quadriceps strength.

There is now over 5 years of follow-up without evidence of recurrence. Following excision, curettage and artificial bone grafting, he recommenced work within a year without difficulty and has subsequently had a good functional outcome with only minor weakness, paraesthesia over the lateral aspect of the knee and moderate crepitus. Subsequent radiographs have demonstrated no evidence of recurrence and gradual incorporation of the graft while MRI has confirmed that the patellar tendon is in continuity with the retinacular fibres that run over and around the body of the patella, indicating satisfactory healing. In October 2016, over a year after he was discharged from routine follow-up, he presented again with increased pain, and examination revealed effusion and tenderness over the medial patellar facet. The patient understandably feared recurrence; however, MRI concluded that his symptoms resulted from mild patellofemoral osteoarthritis (figure 5). His symptoms resolved with physiotherapy.

INVESTIGATIONS

In chronological order:

- Plain radiographs.

Figure 5 December 2016—graft fully incorporated with no recurrence.

- ▶ CT scan.
- ▶ Open biopsy via a medial parapatellar incision to access the inferior pole.
- ▶ Histological examination.
- ▶ CT-guided biopsy using a Bonoptoy needle set.
- ▶ Histological examination.
- ▶ MRI.
- ▶ Histological examination.
- ▶ Plain radiographs at clinic visits.
- ▶ MRI.

DIFFERENTIAL DIAGNOSIS

- ▶ GCT.
- ▶ ABC.
- ▶ Fibrous dysplasia.
- ▶ Chondroblastoma.

TREATMENT

Initial operation: intralesional curettage, via medial arthrotomy.

Definitive operation: excision of the inferior pole (leaving the patellar tendon intact), curettage of the patellar body and artificial bone grafting with calcium sulfate–calcium phosphate composite graft (Pro-Dense, Wright Medical).

OUTCOME AND FOLLOW-UP

- ▶ Had a local recurrence of GCT after initial surgery which required a second definitive operation.
- ▶ Since then has had no signs of recurrence and has maintained good function.
- ▶ Experienced an episode of increased pain at 5-year follow-up, effusion and tenderness over the medial patellar facet but this was found to be due to mild patellofemoral arthritis. This resolved with physiotherapy.

DISCUSSION

Aetiology+prevalence

GCTs typically occur at a metaphysis in the lower limbs although epiphyses may be involved.^{4 5} They are rare with an estimated incidence of 1 in 1 000 000 and 50% occur around the knee.^{6 7} GCTs are more common in Southern India and China, have a slight female predilection, despite patellar lesions predominating in males and arise in skeletally mature adults, with 80% occurring

Table 1 The Campanacci grading system for giant cell tumours based on radiological appearances

Campanacci grading system ^{7 12 14}	
Grade	Description
I (latent)	<ul style="list-style-type: none"> ▶ Well-defined margins ▶ Sclerotic ring ▶ Intact cortex
II (active)	<ul style="list-style-type: none"> ▶ Relatively well-defined lesion without sclerotic ring ▶ Reactive, thinned and expansive bone without cortical breakage ▶ Pathological fracture may be observed
III (aggressive)	<ul style="list-style-type: none"> ▶ Poorly defined edges ▶ Permeative pattern ▶ Cortical breakage due to destruction ▶ Soft tissue involvement

between 20 and 45 years old.^{2 6 8 9} The patella as a site for GCT is rare. Yoshida *et al* reviewed 32 years of bone neoplasm data and reported that only 1.47% of GCTs occurred in the patella.⁵ Despite this, GCT accounts for 33% of benign/intermediate primary patella neoplasms.¹⁰

Presentation and diagnosis

Anterior knee pain, exacerbated by rest, and swelling are the most common symptoms of patellar GCT; indeed, our patient demonstrated both.^{5 10} Nevertheless, diagnosis is often delayed due to the rarity of the diagnosis and the fact that anterior knee pain is more commonly due to conditions such as chondromalacia patella and patellar tendonitis.^{2–7 11} Thorough clinical examination is required as signs include: tenderness, swelling, effusion, crepitus and reduced range of movement.^{6 10} Further clinical examination, both at initial presentation and postoperatively, is vital to evaluate recovery and, in this case, improved range of movement was a key parameter during rehabilitation.

Radiography

Typically, modalities are used in conjunction to distinguish GCT from other lesions. The most common modalities used are plain radiography, MRI and CT.^{8 10} GCTs of the patella are usually large, expansile, osteolytic lesions with cortical thinning; other features include: septations within the lesion, pathological fracture and, occasionally, the classical 'soap bubble' appearance.^{2 4 8 10} Features that distinguish GCT from other lesions include larger size and a geographic pattern of destruction.^{2 9} Both the Campanacci system (table 1), for GCTs specifically, and Enneking staging, for benign musculoskeletal tumours, guide treatment based on radiological appearance.^{12–14} MRI and CT may reveal an abnormal extension of the patella, and potentially adjacent tissues, often with sclerosis present.¹⁰

Histology and laboratory

Laboratory findings are usually normal, as in this case. Nonetheless, Song *et al* noted that alkaline phosphatase and erythrocyte sedimentation rate (ESR) may be elevated in GCT.¹⁰

Diagnosis of GCT of the patella is commonly made through needle or open bone biopsy.^{6 8 10} Histological examination in this case from the final curettage and excision of inferior pole procedures revealed the typical findings of GCT of bone: large hypernucleated osteoclasts (giant cells) surrounded by stroma, mitotic figures, bone tissue calcification and, in aggressive cases, hyperchromatism (figure 6).^{10 15} Histological reports in this case also revealed aggregates of haemosiderin-laden macrophages

Figure 6 Multinucleated hyperchromatic giant cells (black arrows) are surrounded by stromal cells.¹⁶

and admixtures of numerous multinucleated giant cells on a background of uniform mononuclear cells. This case required two biopsies to confirm the diagnosis, demonstrating the importance of close correlation between radiological and histological findings.

Overall management options

Treatment of GCTs, like other patella neoplasms, is poorly described due to the paucity of cases and available literature regarding patellar GCTs mainly comprising case reports. Denosumab, a human monoclonal antibody and receptor activator of nuclear factor kappa ligand (RANKL) antagonist, offers medical treatment based on the fact that the giant cell formation is driven via overexpression of RANKL from the resident stromal cells.^{6 15} Consequently, in patients with lesions at a difficult anatomical site to deal with surgically, such as the sacrum, a 3–6-month course of denosumab is increasingly used prior to surgical intervention, as it inhibits giant cell differentiation, and subsequent bone destruction.^{6 16} Denosumab also reduces pain, decreases the size of a lesion and increases the success of surgical management.^{6 16} Nevertheless, jaw osteonecrosis and atypical stress fractures of long bones are recognised side effects; thus, if lesions can be managed surgically with minimal morbidity, surgery remains the first-line therapy.¹⁶

Surgical management

Patellectomy is the most common treatment modality for patellar GCTs and is increasingly used as Campanacci grade increases.^{3 17–25} Patellectomy is favoured for Campanacci grade III and malignant lesions.^{3 4 10 11 20 23 25} Nevertheless, this produces significant morbidity due to loss of muscle strength, for example, and reconstruction of the extensor apparatus is typically necessary, often involving allografts or autografts and myocutaneous flaps.^{3 10 17 19–23 25} Despite this, several authors have published reports of patellectomy for less aggressive lesions which may be excessive given the current report and some other reported cases that have used curettage with excellent outcomes.^{4 5 7 18 21 25–31}

Incongruity exists throughout the literature regarding whether adjuvant therapy should be employed as similar numbers of papers elect for each option. Adjuvant therapy typically includes chemical or electrical cauterisation.^{7 26 27 29 31} Commonly, the defect is then filled by either bone cement or a bone graft;

however, outcomes are comparable regardless of adjuvant therapy use.^{3–7 10 11 17 25–32}

Prognosis and complications

Prognosis of these tumours is favourable with 5-year survival rates over 90%; however, some patients present with a primary malignant form of GCT and recognised complications include local recurrence and intra-articular spread of the tumour.^{3 5–8 16 20 33} Recurrence rates are as high as 65% despite aggressive management and, therefore, reducing morbidity throughout management is favourable.⁷ GCTs are the most common precursor for secondary ABC development and 5%–10% of GCTs may develop into sarcoma.^{4 7} Metastasis, possibly by haematogenous dissemination, is observed in 1%–2% with the lungs being the most common secondary site but rare reports exist of metastasis to regional lymph nodes, other bones, mediastinum, skin and brain.^{2 3 8 15 19 23 34 35}

CONCLUSION

In summary, we present the case of a 23-year-old man with recurrent GCT of the patella which demonstrates that aggressive treatments, such as patellectomy, may be excessive. A favourable outcome was achieved following excision of the inferior pole and curettage of the patellar body resulting in an acceptable clinical outcome for the patient. This is supported by over 5 years of follow-up since his last operation, the longest in the literature, and excellent postoperative function.

Patient's perspective

In 2010, first symptoms presented as a painful knee and leg giving way while walking. An MRI scan revealed GCT, which was operated on in Jan of 2011 followed by physio, all seemed to be going well until about 10 months later when symptoms came back, another MRI scan confirmed GCT was back. In 2012 had another more invasive operation followed by physio once again. 5 years on all is well other than I do have a weakness in the knee and do not put any weight directly through the knee cap [I do not kneel on knee cap] for the main I manage very well other than the odd flair up of knee area swelling up and filling with fluid, because of this in Dec 2016 I was given an emergency appointment to have an MRI scan and all is well with the patella.

Learning points

- ▶ Primary patellar neoplasms are rare but mostly benign.
- ▶ Giant cell tumour has a high recurrence rate.
- ▶ Evidence demonstrates that outcomes are comparable regardless of whether adjuvant therapy is employed alongside intralesional curettage.
- ▶ Giant cell tumour of the patella can be treated successfully with intralesional curettage, excision and artificial bone grafting.
- ▶ Patellectomy with or without allograft reconstruction of the extensor mechanism may be excessive and cause patients undue morbidity.

Contributors TMM was involved in the planning, conduct, reporting, design of report, literature search, critical appraisal of literature, referencing, acquisition of data and images, analysis and interpretation of data, administrative tasks for submission, submission of report. ZG and KMG aided in the interpretation of the case and reviewed the document. KSR was involved in the surgery, conception,

planning, data and image acquisition, interpretation of data, correspondence with patient, reviewed document and submission of report.

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

© BMJ Publishing Group Ltd (unless otherwise stated in the text of the article) 2018. All rights reserved. No commercial use is permitted unless otherwise expressly granted.

REFERENCES

- Hedayati B, Saifuddin A. Focal lesions of the patella. *Skeletal Radiol* 2009;38:741–9.
- Singh J, James SL, Kroon HM, *et al.* Tumour and tumour-like lesions of the patella—a multicentre experience. *Eur Radiol* 2009;19:701–12.
- Malhotra R, Sharma L, Kumar V, *et al.* Giant cell tumor of the patella and its management using a patella, patellar tendon, and tibial tubercle allograft. *Knee Surg Sports Traumatol Arthrosc* 2010;18:167–9.
- Yu X, Guo R, Fan C, *et al.* Aneurysmal bone cyst secondary to a giant cell tumor of the patella: A case report. *Oncol Lett* 2016;11:1481–5.
- Yoshida Y, Kojima T, Taniguchi M, *et al.* Giant-cell tumor of the patella. *Acta Med Okayama* 2012;66:73–6.
- Bone cancer research trust. <https://www.bcrct.org.uk/information/information-by-type/giant-cell-tumor/>
- Escribano Rueda LC, Sánchez Gutiérrez SJ, Gómez-Rice A, *et al.* [Patellar giant cell tumour: presentation of a case and a review of the literature]. *Rev Esp Cir Ortop Traumatol* 2012;56:486–90.
- Casadei R, Kreshak J, Rinaldi R, *et al.* Imaging tumors of the patella. *Eur J Radiol* 2013;82:2140–8.
- Giant cell tumor of bone-orthoinfo - AAOS. <http://orthoinfo.aaos.org/topic.cfm?topic=a00080>
- Song M, Zhang Z, Wu Y, *et al.* Primary tumors of the patella. *World J Surg Oncol* 2015;13:163.
- Mercuri M, Casadei R. Patellar tumors. *Clin Orthop Relat Res* 2001;389:35–46.
- Campanacci M, Giunti A, Olmi R. [Metaphyseal and diaphyseal localization of giant cell tumors]. *Chir Organi Mov* 1975;62:29–34.
- Enneking WF. A system of staging musculoskeletal neoplasms. *Clin Orthop Relat Res* 1986;204:9–24.
- Histologic Findings. Giant cell tumor workup: imaging studies. <http://emedicine.medscape.com/article/1255364-workup>
- Hamann C, Lützner J, Wiecek K, *et al.* Pulmonary metastases due to a giant-cell tumor of bone. *J Clin Endocrinol Metab* 2012;97:3408–9.
- Sarcoma UK. <https://sarcoma.org.uk/sarcoma-types/giant-cell-tumour-bone>
- Agarwal S, Jain UK, Chandra T, *et al.* Giant-cell tumors of the patella. *Orthopedics* 2002;25:749–51.
- Baptista AM, Sargentini SC, Zumárraga JP, *et al.* Tumors of the patella: the experience of institute of orthopedics and traumatology at university of São Paulo, Brazil. *Acta Ortop Bras* 2016;24:151–4.
- Connell D, Munk PL, Lee MJ, *et al.* Giant cell tumor of bone with selective metastases to mediastinal lymph nodes. *Skeletal Radiol* 1998;27:341–5.
- Görmeli G, Görmeli CA, Maraş Özdemir Z, *et al.* [A patellar giant-cell tumor with soft tissue involvement: an alternative treatment method and review of the literature]. *Ekleml Hastalıkları Cerrahisi* 2015;26:110–5.
- Nab M, Halwai JA. A giant cell tumours of proximal radius and patella an unusual sites of presentation. *JK Science* 2003;5:3.
- Obrebski M, Ucieklak J, Wysocki M. [Giant cell tumor of the patella]. *Chir Narzadow Ruchu Ortop Pol* 1998;63:607–9.
- Qureshi SS, Puri A, Agarwal M, *et al.* Recurrent giant cell tumor of bone with simultaneous regional lymph node and pulmonary metastases. *Skeletal Radiol* 2005;34:225–8.
- Siddiqui MA, Ahmad M, Prakash Sathiadoss P, *et al.* Giant-cell tumor of the patella in a skeletally immature girl. *Pol Orthop Traumatol* 2014;79:88–91.
- Soomro Y, Hussain A. Giant cell tumour of patella. *J Pak Med Assoc* 1992;42:279–81.
- Shibata T, Nishio J, Matsunaga T, *et al.* Giant cell tumor of the patella: An uncommon cause of anterior knee pain. *Mol Clin Oncol* 2015;3:207–11.
- Wc L. Giant cell tumor of the patella: a case report. *Chin J Radiol* 1999;24:3.
- Marudanayagam A, Gnanadoss JJ. Secondary aneurysmal bone cyst of the patella: a case report. *Iowa Orthop J* 2006;26:144–6.
- Salgia A, Biswas S, Agrawal R, *et al.* Multicentric giant cell tumor around the knee. *Indian J Orthop* 2007;41:151–3.
- Song M, Dai W, Sun R, *et al.* Giant cell tumor of the patella with a secondary aneurysmal bone cyst: A case report. *Oncol Lett* 2016;11:4045–8.
- Wang IC, Shih HN, Hsueh S, *et al.* Giant-cell tumor of the patella: report of two cases. *Changgeng Yi Xue Za Zhi* 1998;21:338–42.
- Nydyck JA, Herman MJ, de Chadarevian JP. An 11-year-old boy with a patella fracture. *Clin Orthop Relat Res* 2009;467:3365–70.
- Ofluoglu O, Donthineni R. Iatrogenic seeding of a giant cell tumor of the patella to the proximal tibia. *Clin Orthop Relat Res* 2007;465:260–4.
- Bahri I, Ben Yahia N, Boudawara T, *et al.* [Giant-cell tumor of the patella with lung metastases: a case report]. *Rev Chir Orthop Reparatrice Appar Mot* 2003;89:361–6.
- Macdonald D, Fornasier V, Cameron J. Multicentric giant cell tumour involving the patella. *Can J Surg* 2001;44:222–3.

Copyright 2018 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <http://group.bmj.com/group/rights-licensing/permissions>.
BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Become a Fellow of BMJ Case Reports today and you can:

- Submit as many cases as you like
- Enjoy fast sympathetic peer review and rapid publication of accepted articles
- Access all the published articles
- Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow