

Curettage through a wide cortical window for treatment of a primary aneurysmal bone cyst of the patella

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Abstract

A 27-year-old man presented with intermittent right knee pain for 1 year with no previous trauma. Physical examination revealed only tenderness over the patella. Typical fluid–fluid levels were visible on magnetic resonance imaging (MRI), which highly suggested aneurysmal bone cyst (ABC) of the patella. After removal of a large window of thin cortical bone, curettage and bone grafting followed by cerclage wiring was performed. Histology confirmed the initial diagnosis of primary ABC of the patella. At the final follow-up visit at 71 months after surgery, the patient had normal joint activity with no pain or evidence of recurrence. Previous publications indicated patellectomy in the initial series, but curettage and bone grafting have more recently provided excellent results and good graft incorporation in most cases, even for aggressive lesions. In our patient, thorough curettage and bone grafting through a wide cortical window followed by cerclage wiring fixation and figure-eight sutures was a successful treatment option for primary ABC of the patella without articular disruption.

Keywords

Patella, bone cysts, aneurysmal, curettage, treatment, case report

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Introduction

An aneurysmal bone cyst (ABC) is a benign aggressive lesion that consists of a lobulated blood-filled cavity, which was first described by Jaffe and Lichtenstein in 1942. ABC of the patella is rare, accounting for less than 1% of all ABC cases,¹ and it includes two types: primary cysts occurring without any precedent lesion, and secondary cysts following preexisting lesions such as giant cell tumor, chondroblastoma, telangiectatic osteosarcoma, and osteoblastoma.

Case report

In February 2011, a 27-year-old man presented with intermittent right knee pain for 1 year with no previous trauma. On physical examination, there was no swelling or signs of local inflammation in the right knee, but there was tenderness over the patella and a full range of active motion. Laboratory test results including hemoglobin, C-reactive protein (CRP), and the erythrocyte sedimentation rate (ESR) were all within normal ranges.

A lateral radiograph of the right knee showed a radiolucent lesion that occupied greater than 80% of the patella with a thin cortex and septations (Figure 1(a)). An axial computed tomography (CT) scan demonstrated an osteolytic lesion with cortical thinning and concealed a cortical breach and endosteal scalloping (Figure 1(b)). Sagittal magnetic resonance imaging (MRI) revealed a large multi-loculated lesion with a high intensity on a T2-weighted image with typical fluid–fluid levels and a thin cortex with an anterior crack, but it was limited to the periosteum and there was no new periosteal bone formation. Normal patellofemoral cartilage structure was also seen (Figure 1(c)). All radiological images highly suggested ABC of the patella.

Intraoperatively, a transverse arc surgical approach was used, and apparent

varices were seen over the anterior patella surface, but no cortical bone destruction or tissue mass was found. After removal of a 2.5-cm × 3.5-cm bone window in the anterior patella, a separated cystic lesion filled with serosanguinous fluid was observed. The subchondral bone was found to be very thin. After thorough curettage of the lesion and phenol cauterization, the defect was packed with a combination of autologous cancellous bone that was taken from the iliac crest and synthetic bone substitute (Wright Medical, Arlington, TN, USA). The bone window was then closed using the big bone segment of the patella, which was removed and also previously curetted and cauterized with phenol, and then fixed with cerclage wiring and figure-eight sutures (Figure 1(d)). Histological examination revealed cavernomatous spaces that were lined with endothelial cells and contained red blood cells and capillaries, which confirmed the initial diagnosis (Figure 1(e)).

Postoperatively, the knee was immobilized in a brace for 2 weeks followed by gradually quadriceps strengthening and joint mobilization exercises. Two months later, the patient experienced no pain and had a normal range of knee movement. After 1 year, the cerclage and figure-eight wires were removed under local anesthesia in an outpatient small operation room. At the final follow-up visit 71 months after surgery, the patient had no complaints and the bone graft remained well-incorporated without signs of local recurrence (Figure 2).

The patient provided written informed consent for publication of this report. This was a retrospective case report, and therefore, institutional review board approval was not required.

Discussion

The development of primary ABC in the patella is rare. An English literature review (Table 1)^{1–23} indicated that there

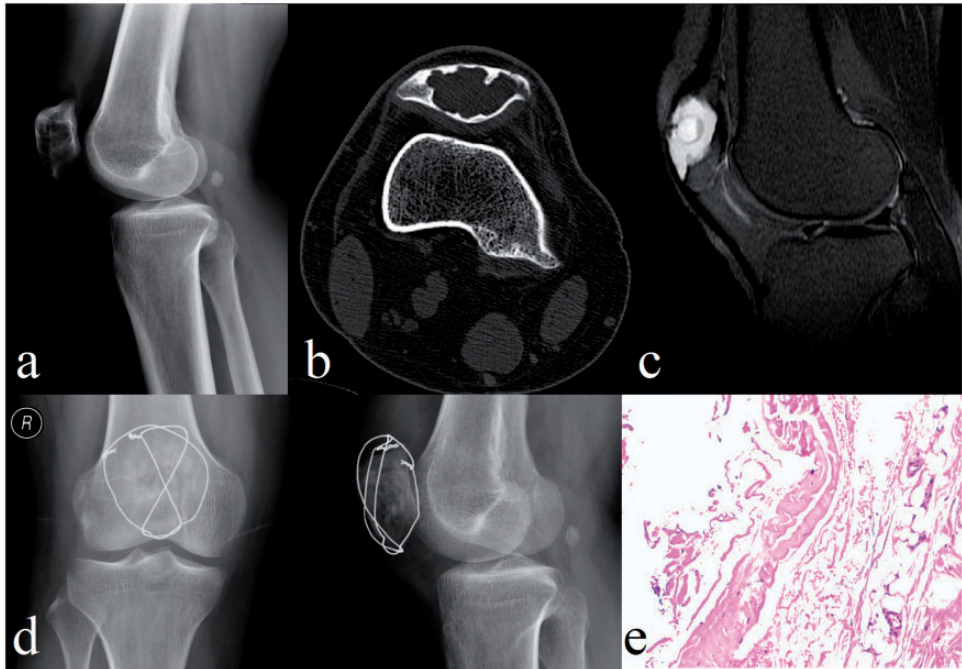


Figure 1. (a) Lateral radiograph showing a radiolucent lesion occupying greater than 80% of the patella with a thin cortex and septations. (b) Axial computed tomography (CT) scan showing an osteolytic lesion with cortical thinning, a suspicious breach in the subchondral bone on the lateral articular facet, and endosteal scalloping. (c) Sagittal magnetic resonance imaging (MRI) showing a multi-loculated lesion with high intensity on a T2-weighted image with a typical fluid–fluid level and thin cortex with an anterior crack, which is limited to the periosteum. (d) Anteroposterior and lateral radiographs showing satisfactory bone graft and cerclage wiring fixation of the patella 2 days postoperatively. (e) Histological feature showing cavernomatous spaces lined with endothelial cells and containing red blood cells and capillaries making up the aneurysmal bone cyst. (hematoxylin–eosin stain; original magnification $\times 20$).

were only 25 reported cases of primary ABC of the patella, including the present case, over the past 60 years.

Most primary ABC of the patella occur in patients who are younger than 20 years old, and there is a slight female predominance; ABC is often associated with a coincidental history of trauma and subsequent pain and swelling.¹⁵ However, Table 1 shows that the cysts are mostly found in men (19 cases) and only 7 of 25 cases were younger than 20 years, bringing the average age to 25 years (range, 9 to 56 years), which is appreciably higher than the previous report. There also seems to be a slight

preponderance of non-trauma patients, which suggests that trauma is probably the excitant, but not the originator of the ABC's pathological process.

Although bone scans may assist with the diagnosis of ABC of the patella, it is accepted that CT and MRI are particularly useful in delineating the expansile osteolytic lesions, with a thin shell of cortical bone and multi-loculated cavities. The presence of a fluid–fluid level and intralesional septations on MRI are typical radiologic features for this lesion.¹² The diagnosis of primary ABC of the patella was finally confirmed by histopathology. Because the

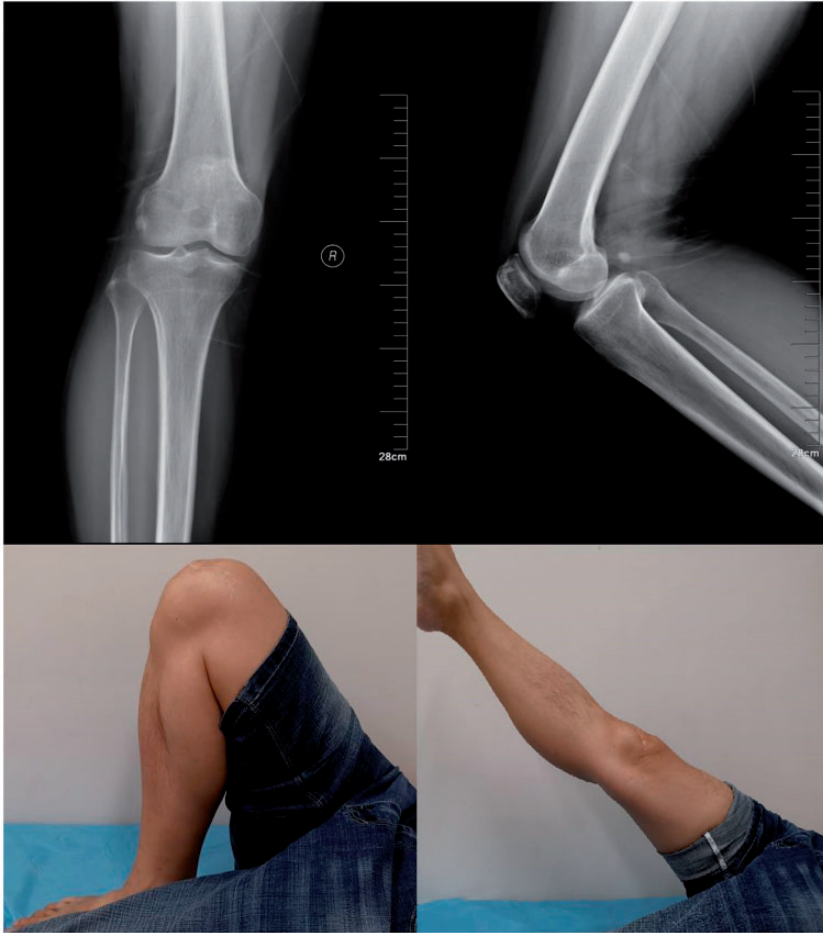


Figure 2. At a follow-up visit 71 months after surgery, the patient had no complaints and the bone graft remained well-incorporated without signs of local recurrence.

characterized features were visible on MRI, a benign patella tumor was considered, so we did not perform an open biopsy preoperatively to exclude any malignancy.

Most published cases describe “latent” (stage I), “active” (stage II), or aggressive (stage III) lesions based on the Enneking staging system for benign skeletal tumors.⁹ Treatment of primary ABC of the patella includes partial or total patellectomy, incisional curettage with bone grafting, and arthroscopic excisional biopsy of the cyst and curettage, followed by filling the

cavity with bone cement at a second stage.²⁰ Based on our review, among these nine cases that were before Mercuri et al.’s report in 1991,⁹ total patellectomy was performed in seven patients and partial patellectomy was performed in one patient. Since then, there have been no patients who were treated with patellectomy even for aggressive (stage III) lesions, except for those reported in the recent publications by Saoji et al.²¹ in 2014 and Çetinkaya et al. in 2016.²³ Patellectomy was most frequently used in the initial patients, but this seemed

Table 1. Literature review of primary ABC of the patella.

| Study | No. of patients | Sex/age (years) | Trauma | Site | Fracture | Duration (months) | Treatment | Follow-up (months) | Recurrence |
|---------------------------------|-----------------|-----------------|---------|------|----------|-------------------|------------------|--------------------|------------|
| Besse et al. ² | 1 | M/15 | N/A | R | No | N/A | TP | N/A | N/A |
| Copeland et al. ³ | 2 | M/22, M/29 | No, Yes | L, R | No, No | 3, 24 | TP, TP | 50, 4 | No, No |
| Linsche and Dahlin ⁴ | 1 | M/15 | Yes | L | No | 12 | TP | 120 | No |
| Park and Chung ⁵ | 1 | M/22 | Yes | L | No | 36 | TP | 24 | No |
| Srivastava et al. ⁶ | 1 | F/30 | Yes | L | Yes | 6 | TP | 41 | No |
| Faris et al. ⁷ | 1 | M/22 | Yes | L | No | 1 | C+BG | 24 | No |
| Mapelli et al. ⁸ | 1 | M/33 | Yes | N/A | No | N/A | PP | N/A | No |
| Mercuri et al. ⁹ | 1 | M/31 | N/A | N/A | No | N/A | TP | 25 | N/A |
| Pevny and Rooney ¹⁰ | 1 | F/15 | No | R | No | 3 | C+BG | N/A | N/A |
| Castro and Irwin ¹ | 1 | M/14 | Yes | L | No | 5 | C+BG | N/A | N/A |
| Kumar et al. ¹¹ | 1 | F/16 | N/A | L | N/A | N/A | N/A | N/A | N/A |
| Oh et al. ¹² | 1 | M/30 | No | R | No | 10 | C+BG | 18 | No |
| Nydyck et al. ¹³ | 1 | M/11 | Yes | L | Yes | N/A | C+BG | 10 | No |
| Reddy and Sathi ¹⁴ | 1 | F/27 | No | L | No | 9 | C+BG+CW | 48 | Yes |
| Balke et al. ¹⁵ | 1 | M/56 | No | L | Yes | 2 | C+BC | 17 | No |
| Hsaio et al. ¹⁶ | 1 | M/24 | No | L | No | 6 | C+BG | 12 | No |
| Traoré et al. ¹⁷ | 1 | F/28 | No | N/A | No | 12 | C+BG | 31 | No |
| Arrouda et al. ¹⁸ | 1 | M/9 | No | R | No | 3 | C+BG | 10 | No |
| Plaikner et al. ¹⁹ | 1 | M/23 | Yes | L | Yes | N/A | C+BG | 1.5 | No |
| Sandokji ²⁰ | 1 | M/43 | No | R | No | 3 | arthroscopy C+BC | 60 | No |
| Saoji et al. ²¹ | 1 | M/20 | No | R | No | 4 | TP | 48 | No |
| Henderson et al. ²² | 1 | M/33 | No | L | No | N/A | C+BG | 24 | No |
| Çetinkaya et al. ²³ | 1 | F/32 | No | L | No | N/A | TP | 22 | No |
| Current study | 1 | M/27 | No | R | No | 12 | C+BG+CW | 71 | No |

F, female; M, male; N/A, not available; PP, partial patellectomy; TP, total patellectomy; C, curettage; BG, bone grafting; BC, bone cement; CW, cerclage wiring.

to be overtreatment because in some patients, the articular cartilage surface below the patella was not affected.^{2,3,9} Currently, with a better understanding of primary ABC of the patella and reports of successful clinical outcomes, an increasing number of patients are being treated with curettage and bone grafting. Although the arthroscopic approach appears to be a less-invasive procedure, there is the potential for implantation of tumor cells into the articular cavity.

Based on Campanacci et al.,²⁴ when dealing with active or aggressive cysts, the curettage should not be limited to simply opening a wedge in the cortex, and it is necessary to remove a good area of the wall and saucerize the cavity. This viewpoint is consistent with that of Dorman et al.²⁵ Therefore, treatment selection depends on the size of the cyst and involvement of the articular surface. If the lesion is small, curettage with bone graft would suffice. However, for a larger cyst, curettage and bone grafting through a wide cortical window may be advised. If the lesion is associated with obvious articular disruption, partial or total patellectomy may be considered to avoid local recurrence. Similar to the case reported by Reddy and Sathi¹⁴ with Stage III ABC of the patella with cortical breakthrough that occurred because of improper treatment with curettage and autogenous bone grafting, the disease recurred. Additionally, because loss of the patella disturbs the biomechanics of the knee joint, which ultimately leads to early osteoarthritis,²⁶ maintenance of all or part of the patella should be attempted first in young patients without significant articular damage if they accept the risk that a recurrence will require a total patellectomy.

Because of cortical thinning with an anterior crack that was limited to the periosteum and the articular cartilage was still intact, our patient had an “active” (stage II) large cyst. Consequently, intralesional

curettage with bone grafting through a wide cortical window was performed. Cerclage and tension band wiring were then performed to protect the anterior tension of the patella to prevent patellar fracture. There are several advantages of the technique. First, the patient does not need to wear a cylinder cast postoperatively, which is conducive to early rehabilitation because of the rigid internal fixation. Second, a second surgery to remove the hardware is avoided. Finally, local recurrence seems to be reduced by a thorough curettage through a wide cortical window. Recurrence has been reported in other locations except if a wide resection is performed.²⁷ Therefore, because this technique was used, our patient regained normal knee joint function without pain, and the bone graft remained well-incorporated without evidence of recurrence at a longest follow-up of 71 months. This was the second longest follow-up duration that has been reported, behind the study by Linscheid and Dahlin.⁴

In conclusion, thorough curettage and bone grafting through a wide cortical window followed by cerclage wiring fixation and figure-eight sutures is a successful treatment option for primary ABC of the patella without articular disruption.

Declaration of conflicting interest

The authors declare that there is no conflict of interest.

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References

1. Castro MD and Irwin RB. Aneurysmal bone cyst of the patella. *Am J Orthop* 1996; 25: 717–719.
2. Besse BE, Dahlin DC, Ghormley RK, et al. Aneurysmal bone cysts: additional considerations. *Clin Orthop* 1956; 7: 93–102.
3. Copeland CX, Enneking WF and Robbins WJ. Aneurysmal bone cyst of the patella. A report of two cases. *Clin Orthop Relat Res* 1966; 45: 145–150.
4. Linscheid RL and Dahlin DC. Unusual lesions of the patella. *J Bone Joint Surg Am* 1966; 48: 1359–1366.
5. Park BM and Chung IH. Aneurysmal bone cyst. A case report. *Yonsei Med J* 1969; 10: 76–79.
6. Srivastava KK, Ahuja SC and Kochhar VL. Aneurysmal bone cyst of the patella. *Aust N Z J Surg* 1973; 43: 54–54.
7. Faris WF, Rubin BD and Fielding JW. Aneurysmal bone cyst of the patella. A case report. *J Bone Joint Surg Am* 1978; 60: 711.
8. Mapelli S and Giraldi A. Aneurysmal bone cyst of the patella. *Ital J Orthop Traumatol* 1984; 10: 267–270.
9. Mercuri M, Casadei R, Ferraro A, et al. Tumours of the patella. *Int Orthop* 1991; 15: 115–120.
10. Pevny T and Rooney RJ. Case report 876: aneurysmal bone cyst of the patella. *Skeletal Radiol* 1994; 23: 664–667.
11. Kumar R, Dasan B and Malhotra A. Aneurysmal bone cyst of the patella: three-phase bone scintigraphic findings and differential diagnoses. *Clin Nucl Med* 2000; 25: 1033–1034.
12. Oh JH, Kim HH, Gong HS, et al. Primary aneurysmal bone cyst of the patella: a case report. *J Orthop Surg* 2007; 15: 234–237.
13. Nydick JA, Herman MJ and De Chadarevian JP. An 11-year-old boy with a patella fracture. *Clin Orthop Relat Res* 2009; 467: 3365–3370.
14. Reddy NS and Sathi VR. Primary aneurysmal bone cyst of patella. *Indian J Orthop* 2009; 43: 216–217.
15. Balke M, Dedy N, Mueller-Huebenthal J, et al. Uncommon cause for anterior knee pain - Aggressive aneurysmal bone cyst of the patella. *Sports Med Arthrosc Rehabil Ther Technol* 2010; 2: 9.
16. Hsaio YM, Inoue M, Abe T, et al. Aneurysmal bone cyst of the patella. *J Hard Tissue Biol* 2011; 20: 161–164.
17. Traoré A, Doukouré B, Sie Essoh JB, et al. Primary aneurysmal bone cyst of the patella: a case report. *Orthop Traumatol Surg Res* 2011; 97: 221–224.
18. Arrouda M, Atarraf K, Chater L, et al. A rare location of aneurysmal bone cyst in children: the patella. *Int J Clin Pediatr* 2012; 6: 82–84.
19. Plaikner M, Gruber H, Henninger B, et al. Pathological fracture of the patella due to an atypical located aneurysmal bone cyst: verification by means of ultrasound-guided biopsy. *Arch Orthop Trauma Surg* 2016; 136: 315–319.
20. Sandokji A. Arthroscopic treatment of an aneurysmal bone cyst of the patella: a case report. *Int J Health Sci* 2015; 9: 79–82.
21. Saoji A, Saindane K, Godghate N, et al. Aneurysmal bone cyst of patella, a rare case report. *Saudi J Sports Med* 2014; 14: 165–167.
22. Henderson ER, Stein MI and Gebhardt MC. Aneurysmal bone cyst of the patella mimicking patellofemoral syndrome: a case report. *JBJS case connector* 2014; 4: e39–e35.
23. Çetinkaya M, Özer H, Selek HY, et al. Total patellectomy for patellar aneurysmal bone cyst. *Ekleml Hastalıklar Cerrahisi* 2016; 27: 175–178.
24. Campanacci M, Capanna R and Picci P. Unicameral and aneurysmal bone cysts. *Clin Orthop Relat Res* 1986; 204: 25–36.
25. Dormans JP and Pill SG. Fractures through bone cysts: unicameral bone cysts, aneurysmal bone cysts, fibrous cortical defects, and nonossifying fibromas. *Instr Course Lect* 2002; 51: 457–467.
26. Tan H, Yan M, Yue B, et al. Chondroblastoma of the patella with aneurysmal bone cyst. *Orthopedics* 2014; 37: e87–e91.
27. Brindley GW, Greene JF and Frankel LS. Case reports: malignant transformation of aneurysmal bone cysts. *Clin Orthop Relat Res* 2005; 438: 282–287.