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## Development of an aneurysmal bone cyst of the femur head in a young patient: A case report

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### Abstract

We report development of an aneurysmal bone cyst (ABC) that was located in the femur head in an 23-year-old male. Over a period of time, the ABC showed local progression, with destruction of the bone, which led to an abrupt loss of function of the left hip. Final decision regarding the therapeutic approach was total hip arthroplasty with femoral reconstruction with a prosthesis. Following this treatment, the patient's outcome was favourable, with complete recovery of function.

**Keywords:** Aneurysmal bone cyst, young patient, CTX; PINP; Vitamin D

### 1. Introduction

Aneurysmal bone cyst (ABC) is an osteolytic benign tumour, which is usually situated in the metaphysis of long bones and mostly encountered in patients younger than 20 years old<sup>[1]</sup>. The structure of this tumour is poorly organised, with vascular gaps separated by fibrous membranes composed of fibroblasts, giant multinucleate cells, and osteoclasts, which represent a multi-chamber aspect<sup>[1, 2]</sup>. The cells in ABC have an osteoclast-like phenotype (CD51<sup>+</sup>, CD14<sup>-</sup>, cathepsin K<sup>+</sup>, TRAP<sup>+</sup>) and are responsible for lacunar resorption<sup>[3]</sup>.

Most ABCs are diagnosed during childhood or adolescence<sup>[4]</sup>. Most causes of ABC are unknown and are usually discovered by accident, following some type of trauma. If ABC has a large dimension, it tends to deform the anatomy of the affected region. When the aneurysmal cyst is increased in volume, the main symptom may be nonspecific pain in the concerned area. All bones can be affected by this pathology, but the proximal femur is most frequently involved<sup>[5]</sup>. From a histopathological point of view, ABC can be classified into three types: conventional (vascular) type, which is a rapidly growing, extensive, damaging lesion, leading to cortical breach and soft tissue aggression; solid type, and a third mixed type of the other two types<sup>[6]</sup>.

The most commonly used radiological investigation for ABC is plain radiography. Radiography often reveals an extensive tumour-like osteolytic lesion, located in the metaphyseal area of the long bones, with no invasion of the growth cartilage, and is well separated from the adjacent soft tissues<sup>[7]</sup>. Magnetic resonance imaging scans regularly show an extensive tumour with eccentric osteolysis and a polylobulated aspect with fluid-fluid levels<sup>[6]</sup>. The differential diagnosis for an aneurysmal cyst can be essential bone cyst, giant cell tumour, osteoblastoma, and telangiectatic osteosarcoma<sup>[2]</sup>. A biopsy is mandatory for an aneurysmal cyst because telangiectatic osteosarcoma needs to be considered as a differential diagnosis.

The classic procedure for ABC is a direct approach with opening of the cyst and its curettage. However, because of the high recurrence rate associated with this type of treatment (11-31%)<sup>[8]</sup>, local adjuvant therapies are added to the procedure. These therapies include surgical cryotherapy<sup>[9]</sup>, alcohol sclerotherapy<sup>[10]</sup>, selective arterial embolization<sup>[11]</sup>, and use of denosumab<sup>[12]</sup>. Denosumab is an innovative therapeutic approach, which inhibits osteoclast function, and can have positive effects on the development of ABCs. The purpose of treatment is to stop extension of the lesion, prevent pathological bone fractures, reduce relapse, and most importantly, stop pain<sup>[1]</sup>.

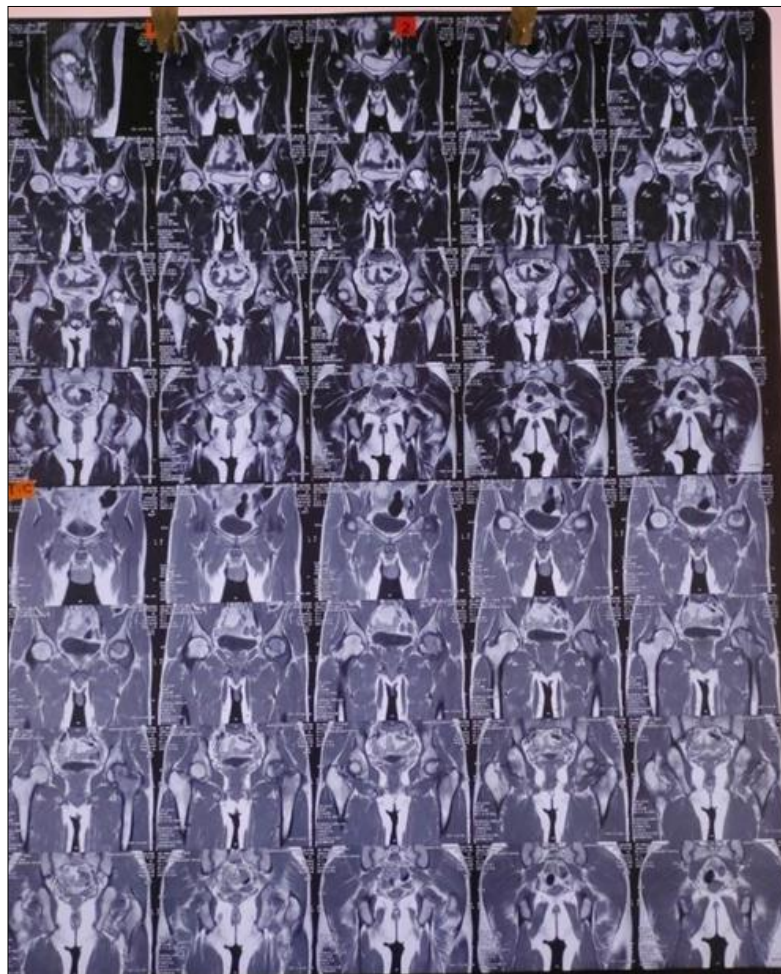
**Case presentation**

We report a case of a 23-year-Male who presented to the Orthopedic Department for diffuse pain of the left hip. His medical and family history was unremarkable. This was associated with pain-related decreased mobility of the hip.

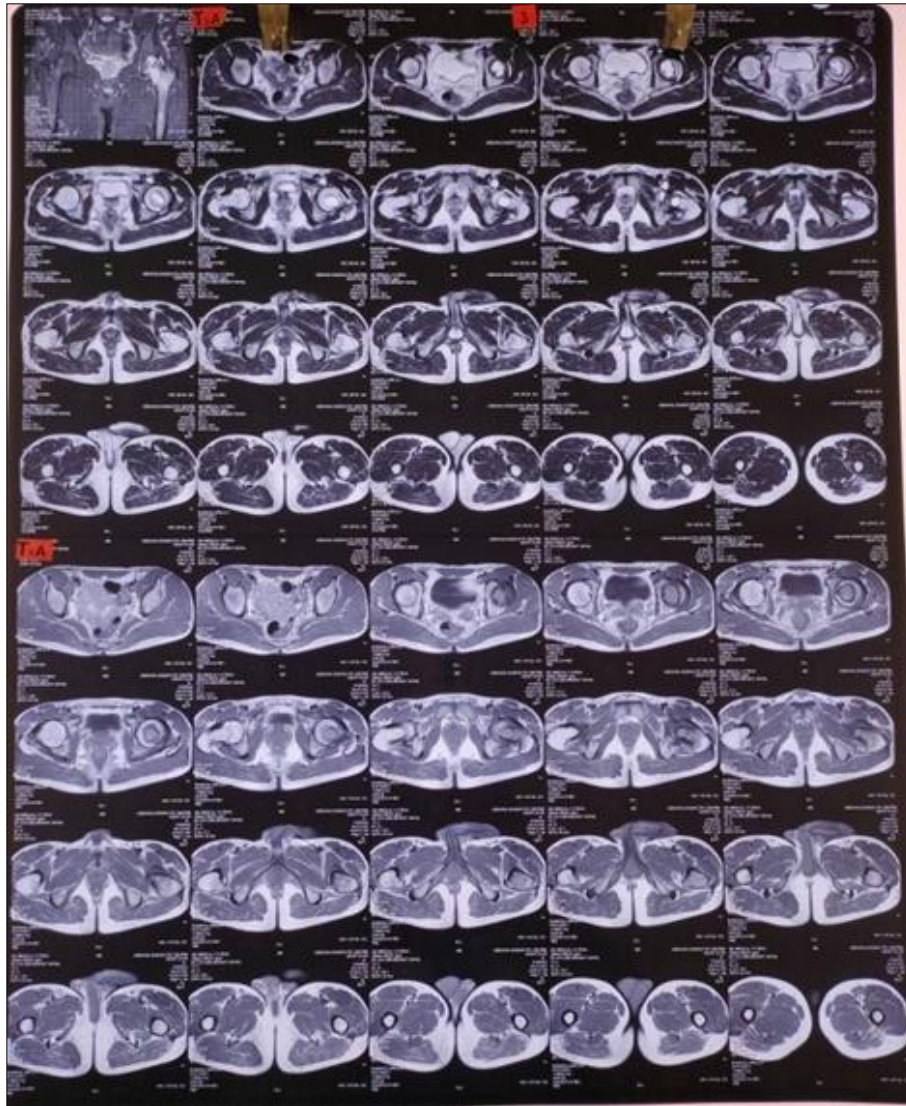
The patient has difficulty to walking digital radiography of the left hip in the frontal and lateral views showed an extensive osteolytic lesion in femur head. MRI finding s/o chondroblastoma or fibrous dysplasia.



**Fig 1:** X-ray showing lytic leision in left femur head







**Fig 2:** MRI showing lytic lesion in left femur head



**Fig 3:** Post of xray after complete excision of lytic lesion with prosthetic replacement

MRI finding s/o breach in femoral head and acetabulum involvement prosthesis of the proximal femur and total hip arthroplasty. For hip arthroplasty, we used so, we decided to perform radical treatment for the tumour. We chose to excise the tumour. We used a reconstructive a total une-mented prosthesis. Post op resected head send to histopathology lab and reports s/o diagnosis of aneurysmal bone cyst. On post op day 1 the patient's recovery was favourable and full range of motion of left hip achieved and patient was fully weight

bearing.

### Discussion

Although the initial treatment of our patients was in accordance with surgical protocols, development of the ABC was atypical. In our case, there was rapid progression of the lesion, leading to massive bone destruction. In our case, the pain experienced by the patient was resilient to medication and there was total loss of function.



**Fig 4:** Intraoperative photographs showing the macroscopic appearance of the lesion

Block resection has the best outcome and the lowest rates of relapse for ABC, providing the best control over the lesion. However, this method has the highest morbidity rate because of intra- and postoperative complications, such as massive haemorrhage, a high risk of infection, post-resection persistent pain, shortening of the limb, growth defects, and muscular hypotonia [13]. Considering the high risk of local complications associated with open surgery [14, 15], many surgeons choose less invasive techniques, such as sclerotherapy and embolization [16, 17].

Embolisation is a minimally invasive technique that devascularises the tumour. Embolisation can promote healing of the tumour and reduce intra- and postoperative complications of open surgery, offering the surgeon a better approach in cases of total resection [18]. Embolisation for ABC has a recurrence rate of 39% to 44% associated with cysts that are larger than 5 cm. Repeated embolisation can have favourable outcomes in recurrent lesions but in our case there is MRI finding s/o breach in femoral head and acetabulum involvement so we decided for radical treatment Rossi et al. [8] showed that 102 patients with ABC treated by selective arterial embolisation with N-2-butyl-cyanoacrylate had a healing rate of 81.8% and a complication rate of 4.5%. They also concluded that, to be effective, this procedure must be performed by an experienced practitioner with good technical skills.

Sclerotherapy is a minimally invasive therapeutic procedure for ABC with good long-term results. This therapy slows development of the cyst and also lowers the risk of relapses. The most commonly used substances for sclerotherapy are Ethibloc, 9-Aetoxisclerol, doxycycline, pure alcohol in a liquid or gel state, and liquid nitrogen [9]. Considering the high risk of soft tissue necrosis due to pure alcohol, this procedure is not indicated in cases where imaging data reveals

a cortical break as in our case [21].

With regard to the standard treatment for ABC, reconstruction of the affected area with a tumour prosthesis of the femur and total arthroplasty of the hip is infrequent. This method is reserved for aggressive malignant tumours with a fulminant evolution.

In paediatric patients, finding implants that have the right size for the age group is difficult. Additionally, development of a discrepancy in lower limb length during growth leads to a series of re-interventions on the implant to elongate it [23, 24]. Because of the small size of paediatric patients, they would benefit from a custom-made endo-prosthesis. Additionally, in pathologies where removal of large portions of the skeletal structure is required, a customized implant would be a possible solution. Unfortunately, we do not have this therapeutic option in our clinic the system that we used in our patient was a modular system that enabled the femoral component to be extended. Successive embolisation excluded the possibility of using a vascular bone graft because of insufficient arterial sources for grafting. In our patient, total arthroplasty of the hip was preferred over bipolar hemiarthroplasty. The reason for this is because, occurrence of laminar coxitis is frequent, and revision of the implant might be required in the near future with rehabilitation [25]. Dysplasia, which appears in the remodelling phase, can produce superoexternal migration of the prosthesis and muscular imbalance between the hip's adductors and abductors. 26 In a study on 111 patients who underwent total hip replacement before 20 years old, the 10-year survival rate (without revision) was 70%, and the complications of osteolysis and atrophy were observed [27].

### Harris Hip Score (HHS)

**Patient Name:** Mohit

Table 1: Pain

None or ignores it	+44
Slight, occasional, no compromise in activities	+40
Mild pain, no effect on average activities, rarely moderate pain with unusual activity; may take aspirin	+30
Moderate pain, tolerable but makes concession to pain. Some limitation of ordinary activity or work. May require occasional pain medication stronger than aspirin	+20
Marked pain, serious limitation of activities	+10
totally disabled, crippled, pain in bed, bedridden	+0

**Affected Hip: Left**

Table 2: Sitting

Comfortably in ordinary chair for one hour	+5
On a high chair for 30 minutes	+3
Unable to sit comfortably in any chair	+0

Table 3: Enter public transportation

Yes	+1
No	+0

Table 4: Stairs

Normally without using a railing	+4
Normally using a railing	+2
In any manner	+1
Unable to do stairs	+0

Table 5: Limp

None	+11
Slight	+8
Moderate	+5
Severe	+0

Table 6: Put on Socks and Shoes

With ease	+4
With difficulty	+2
Unable	+0

Table 7: Support

None	+11
Cane for long walks	+7
Cane most of the time	+5
One crutch	+3
two canes	+2
two crutches or not able to walk	+0

Table 8: Distance Walked

Unlimited	+11
Six blocks	+8
two or three blocks	+5
Indoors only	+2
Bed and chair only	+0
With ease	+4
With difficulty	+2
Unable	+0

Table 9: Absence of Deformity (All yes = 4, Less than 4 = 0)

Less than 30 fixed flexion contracture	---
Less than 10 fixed abduction	---
Less than 10 fixed internal rotation in extension	---
Limb length discrepancy less than 3.2cm	---

**Range of motion** (\* indicates normal)

Flexion (\*140): \_ Abduction (\*40): \_\_\_\_\_ Adduction

(\*40): \_\_\_\_\_ External Rotation (\*40): \_\_\_\_\_ Internal Rotation (\*40): \_

**Scoring Guide****Range of Motion****Total range of motion**

211 --- 300 = 5 points

161 --- 210 = 4 points

101 --- 160 = 3 points

61 --- 100 = 2 points

31 --- 60 = 1 point

0 --- 30 = 0 points

**Range of motion score: 5****Total Harris Hip Score****Harris Hip Score:** Summation of points**Pre op****Harris hip score:** 20+5+11+8+3+1+2+2+0+2=56**Post op****Harris Hip Score:** 44+11+11+5+1+4+4+4+4+5=93 Points**Conclusions**

The therapeutic plan that was applied to our patient was in accordance with the latest treatment protocols of block resection and prosthetic replacement as a final solution.

Repeated embolisation can achieve local tumour control, even in ABCs that show progression after the first embolisation. However, in the present case, severe local symptomatology and massive destruction of the proximal third of the femur led to a radical therapeutic approach.

Even though there is a standard treatment protocol for ABC, which uses a minimally invasive procedure, treatment should be individualised for each patient. A radical therapeutic approach prevents the risks of local recurrence and pathological fractures.

**Declaration of conflicting interest**

The authors declare that there is no conflict of interest.

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**Conflict of Interest**

Not available

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