

# Aneurysmal bone cyst of the greater trochanter: evaluation of surgical outcome of 17 cases

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## ABSTRACT

**Background:** Aneurysmal bone cyst is a benign, aggressive lesion that occurs in childhood and early adulthood. It usually affects the metaphysis of long bones. The aims of this study were to report clinical and radiological outcome following operative treatment of aneurysmal bone cyst of greater trochanter of femur and assess functional outcome by the Musculoskeletal Tumour Society (MSTS) Rating scale for the lower extremity.

**Methods:** This Quasi-experimental study included 17 patients radiologically and histologically diagnosed as having aneurysmal bone cyst involving the greater trochanter of femur from 2015 to 2022. All cases were curetted, chemical cauterization with 5% phenol done and autogenous cortico-cancellous bone graft were added to fill the osseous defect. The patients were followed-up at 6 weeks and then 3 monthly for 1<sup>st</sup> year, 6 monthly for 2<sup>nd</sup> and 3<sup>rd</sup> year and yearly thereafter. In each follow-up, the recurrence, post-operative complications were documented and MSTS scoring was done.

**Results:** The mean age of the patients were 14.5 years; 9 (53%) were female and 8 (47%) were male. The mean follow-up period for the patients was 3.6 years. There were 3 (18%) recurrences and 2 (11.8%) cases developed superficial surgical site infection. The average MSTS score on final follow-up was 22.6.

**Conclusion:** Aneurysmal bone cyst of the greater trochanter is common in second decade among females. Treatment with extended intralesional curettage, chemical cauterization with 5% phenol and application of autogenous bone graft has less than 18% chance of recurrence. Furthermore, there is acceptable radiological bone graft incorporation and average MSTS score on final follow-up suggest a good functional outcome.

**Key words:** aneurysmal bone cyst, greater trochanter, outcome.

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## INTRODUCTION

Aneurysmal bone cysts (ABCs) are benign, non-neoplastic bone lesions that was first described in 1942 by Jaffe and Lichtenstein.<sup>1</sup> ABCs are locally aggressive and occurs in childhood and early adulthood. In more than 80% cases, the lesion occurs in patients younger than twenty years. It usually affects metaphysis of long bones. Patients usually complain of pain in the affected region and sometimes pathological fractures can be observed. In plain radiographs an osteolytic lesion can be found; the magnetic resonance imaging shows cystic formations with typical fluid-filled levels due to blood sedimentation. It has to be diagnosed by biopsy and histopathological examinations.<sup>2</sup>

Aneurysmal bone cysts are described as primary when they arise de novo (no precursor bone lesion is identified) and as secondary when a pre-existing osseous lesion can be identified.<sup>3</sup> Common lesion sites include the femur, tibia, fibula, humerus, skull and posterior elements of the spine.<sup>4</sup> The femur (especially the metaphysis) is involved in 16-22% of patients.<sup>5</sup>

Surgical management consists of intra-lesional curettage of the tumour and structural support of the defect using either an autogenous or allogenic, cancellous or cortical bone graft or synthetic bone substitute with or without additional internal fixation.<sup>6</sup> Local recurrence rate described in the literature as higher as 50% has been described after intralesional curettage.<sup>7</sup>

The aims of this study were to report the clinical, radiological and functional outcome following surgical treatment of ABC of the Greater Trochanter and asses functional outcome by the MSTS Rating scale for the lower extremity.

## METHODS

This is a Quasi-experimental study of 17 patients with primary ABC done in NITOR, Dhaka, between 2014 and 2022. Ethical clearance for the study was obtained attach scan copy according to the declaration of Helsinki and informed consent was obtained before the surgery. The patients were selected by convenient sampling technique and diagnosis was made based on

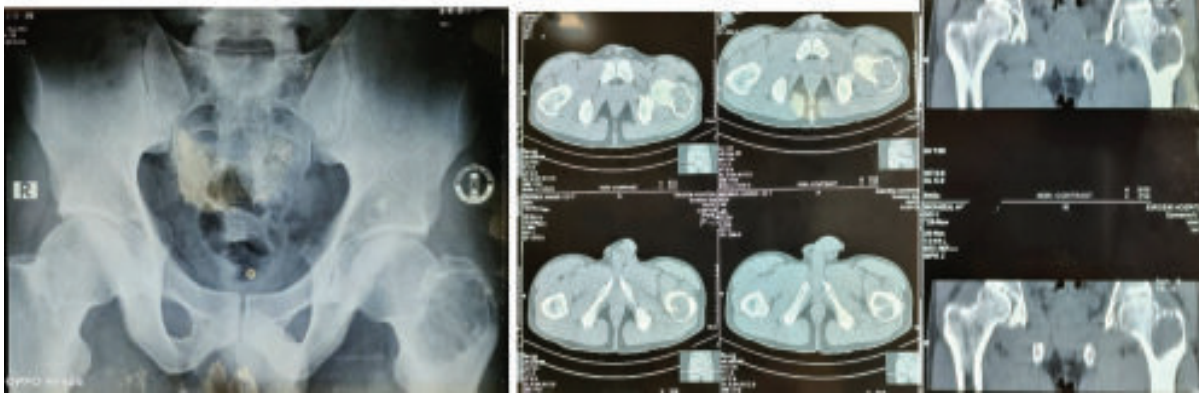
radiological and histological criteria. All the patients underwent extended intralesional curettage through a lateral approach.

The following treatment modality was performed: A cortical window over the lesion as large as the lesion itself was created and the bulk of tumour was scooped with large curets. The cavity was enlarged back to normal host bone in each direction. The cavity left after curettage, was filled with 5% phenol and kept for 30s. Then phenol was sucked out and 70% methyl alcohol was applied and kept for 40s. Then alcohol was sucked out and cavity washed with Normal saline. The whole procedure was repeated 4 times. Surrounding soft tissue was protected by Normal saline-soaked gauge before initiation of chemical cauterization. Then autogenous cortico-cancellous bone graft was applied to fill-up the defect after curettage. In 4 patients, bone graft was harvested both from iliac crest and fibula as the defect was large whereas in 13 patients only iliac crest was enough to fill the defect. Necrotic materials were sent for histopathology which proved to be primary ABC.

The mean follow-up period was 3.6 years. Radiographs were taken on 1<sup>st</sup> post-operative day, after 6 weeks and then 3 monthly for 1<sup>st</sup> year, 6 monthly for 2<sup>nd</sup> and 3<sup>rd</sup> year and yearly thereafter. After surgery, patient was allowed non-weight bearing crutches for 10-12 weeks. Thereafter partial weight-bearing allowed for 8-12 weeks and then full weight-bearing depending on radiographic findings on follow-up. In each follow-up, the recurrence, post-operative complications were documented and MSTS scoring was done.

## RESULTS

Total number of patients were 17. There were 8 (47%) male and 9 (53%) female patients. Their average age was 14.5 years. Pain at the site of the lesion was the main symptom and average duration of symptom was 10 months. 13 out of 17 patients (76.5%) needed autogenous cortico-cancellous bone graft harvested from iliac crest whereas 4 (23.5%) needed bone graft from both iliac crest and fibula due to large cavitory defect (Table 1) (Figure 1,2).



**Figure-1 (a). Preop. X-ray:** Lytic lesion Greater trochanter (left)

**Figure-1 (b). CT scan Axial and Coronal section:** Greater trochanter lesion(left).

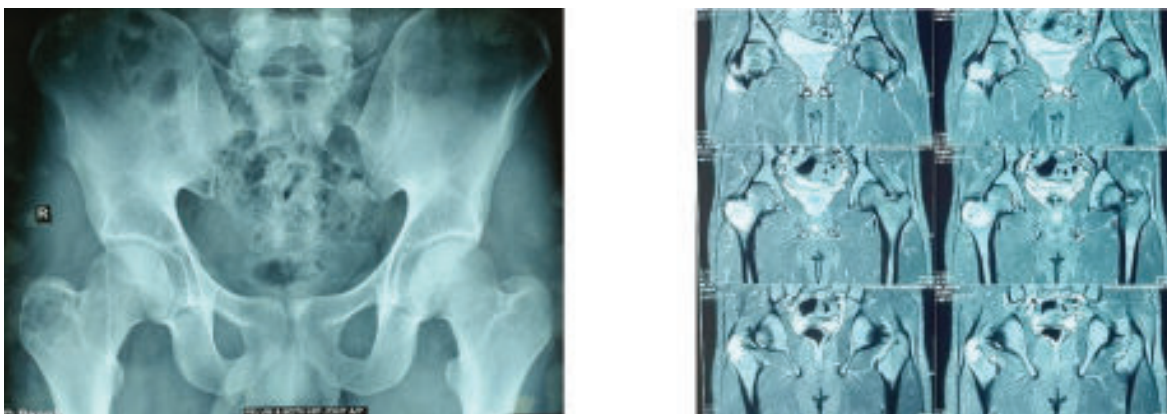


(c) 1<sup>st</sup> postop

(d) After 1 year

(e) After 7 years

**Post-operative X-rays:** After intra-lesional curettage and autogenous bone graft (harvested from iliac crest and fibula)



**Figure-2. (a) Preop. X-ray:** Lytic lesion Greater Tr. (Right) (b) **MRI Coronal section** of hip joints(T2 weighted image)



(c) 1<sup>st</sup> postoperative

(d) After 3 wks.

(e) After 1 year

**Post-operative X-rays:** After intra-lesional curettage and autogenous bone graft (harvested from iliac crest)

**Table I.** Demographics, treatment provided, clinical and radiological outcome of patients

Case	Age (yrs.)	Sex	Duration of symptom (months)	Treatment (Curettage & Bone graft) Bone graft site:	Recurrence	Postoperative complication	Follow-up period (yrs.)
1	24	M	16	Iliac crest & Fibula	None	None	7
2	14	F	8	Iliac crest	None	None	6
3	13	F	10	Iliac crest	None	Superficial wound infection	6
4	11	M	9	Iliac crest	After 8 months	None	5
5	12	M	9	Iliac crest	After 1 year	None	5
6	20	M	15	Iliac crest & Fibula	None	None	4
7	16	F	11	Iliac crest	None	None	4
8	10	F	9	Iliac crest	None	Superficial wound infection	4
9	12	M	11	Iliac crest	None	None	3
10	19	F	10	Iliac crest & Fibula	None	None	3
11	15	M	10	Iliac crest	After 10 months	None	3
12	11	M	9	Iliac crest	None	None	3
13	14	F	8	Iliac crest	None	None	2
14	13	F	9	Iliac crest	None	None	2
15	10	F	11	Iliac crest	None	None	2
16	11	F	16	Iliac crest	None	None	1
17	22	M	10	Iliac crest & Fibula	None	None	1
	Mean		Mean				Mean:
	14.5yrs		10 months				3.6yrs

Recurrence was seen in 3 male (18%) patients. Their age was 11, 12 and 15 years and the recurrence were identified after 8 months, 1 year and 10 months respectively. There was pain at the operated site and radiology revealed lytic lesion. Re-operated with extended intralesional curettage and autogenous contralateral iliac and ipsilateral fibular bone graft was used. (Previously graft was harvested from the iliac crest of the same side only).

Subsequent follow-up and radiology showed no further evidence of recurrence. Two patients (11.8%) had superficial wound infection and was treated with debridement and antibiotics according to culture/sensitivity report. The average follow-up duration for the patients was 3.5 years. The mean MSTS rating scale score was 22.6 till last follow-up (Table II).

**Table II.** Calculation of mean MSTS score and t value (n=17).

Case	MSTS	$(x - \bar{x})^2$	Standard deviation (SD)	t test calculation
1	28	29.16	$SD = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$ $= \sqrt{\frac{240.3}{17 - 1}}$ $= 3.88$	$t \text{ test} = \frac{x - u}{sd \sqrt{n}}$ <p>where <math>u</math> is the calculated mean from previously published data. <math>u = 21</math>.</p> $t = \frac{22.6 - 21}{3.88 \sqrt{17}}$ $= 1.7$
2	28	29.16		
3	20	6.76		
4	17	31.36		
5	20	6.76		
6	24	1.96		
7	24	1.96		
8	20	6.76		
9	24	1.96		
10	28	29.16		
11	18	21.16		
12	18	21.16		
13	24	1.96		
14	24	1.96		
15	20	6.76		
16	18	21.16		
17	18	21.16		
n=17	Mean X = 22.6	Total=240.3	SD = 3.88	t = 1.7

The table t value (critical value) at 5% level of significance (df=16) is 2.12.

The calculated t value is less. (p>0.05)

Calculated Mean MSTS coincides with published literature.

## DISCUSSION

Aneurysmal bone cyst is a cystic and expanding vascular lesion and represents approximately 1% of all bone tumours.<sup>8</sup> Mean age of presentation is reported to be during early adulthood and reported mean age to be less than 15 years.<sup>2,3,9-11</sup> In our study, mean age was 14.5 years.

Male: Female ratio is 0.90 with slightly higher female predominance (53%) which coincides with the literature.<sup>1,7,9,11,12</sup> The average duration of symptoms varies from literature to literature; in our study it is 10 months.

Several studies over the last decade reveal that intralesional curettage with or without bone graft is still the predominantly used treatment.<sup>12-14</sup> Phenol is a non-selective cytotoxic agent, and when applied directly to the surface of curetted tumours, it destroys the remaining residual tumour and normal cells.<sup>14-16</sup> Quint et al.<sup>17</sup> reported on the systemic absorption and renal excretion of 5% phenol after it is applied into a bone cavity. They recommended limiting the concentration to 5% based on the potential for systemic effects (cardiac, renal and liver) if higher concentration is used. Use of autologous bone grafts appear with better results and have been considered as gold standard for filling the defects.<sup>18</sup> The cortical graft provides excellent structural support at the recipient site. The rich blood supply of the proximal femur is advantageous for vascularization of the non-vascularized cortical graft.<sup>18-20</sup> Autologous bone graft is rapidly incorporated, easily revascularized and, importantly, are not immunogenic.<sup>19,21</sup>

Rahman et al.<sup>1</sup> reported recurrence rate 20-30% in younger patients within 24 months. A 20% recurrence rate following curettage and phenol versus 41% with curettage alone was reported by Rapp et al.<sup>4</sup> The reported recurrences of ABCs ranges from 9% to 31%.<sup>4,9,10,12-14,22,24,25</sup> In our study, 3 patients (17.6%), had recurrence confirmed radiologically which coincides with the literature. To decrease recurrence, a wide exposure, extended intralesional curettage, use of local adjuvants and use of autogenous bone grafts is advocated.<sup>5,7</sup> All of the methods are used in our study, which proved to be beneficial to decrease the recurrence of the lesion.

Infection rate after curettage, chemical cauterization and autogenous bone graft ranges from 2-25% and other

related complications include-fracture, skin necrosis, neuropraxia and gas embolism.<sup>1,6,21</sup> 2 patients (11.8%) developed superficial skin infection and other complications mentioned in the literature was avoided as adequate immobilization and strict postoperative rehabilitation was followed with proper patient counselling. No data regarding mean follow-up period is available in the literature; in our study the mean follow-up period is 3.6 years.

The post-operative function was assessed by the MSTS rating scale as shown in Table II. Several studies concluded that MSTS scoring system has sufficient reliability, internal consistency and good performance. The overall validity and reliability of the system is acceptable.<sup>23, 26-28</sup> In our study, the mean MSTS score is 22.6 and this coincides with the calculated MSTS score of 21 by Happa et al.<sup>29</sup>

It can be concluded from the study that aneurysmal bone cyst of the greater trochanter of femur requires first line aggressive treatment in the form of extended intralesional curettage, chemical cauterization with 5% phenol and application of bone graft can prevent recurrence and provide good functional outcome.

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**Conflict of interest:** Nothing to declare.

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