Surgical Treatment Of Aneurysmal Bone Cyst In AL- Najaf City: A retrospective study on 33 patients

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ABSTRACT

Aneurysmal bone cyst is not uncommon benign tumor among children and adolescent, specially in the second decade of life.

Many pathological studies divided aneurysmal bone cysts into primary and secondary types. The primary aneurysmal bone cysts have been reported to arise almost every bone of both axial and appendicular skeleton, most often around the knee joint, where as secondary aneurysmal bone cyst superimposed on a preexisting lesions.

Aims of the study:
1- To study the frequency of tumor according to anatomical sites.
2- To study the most common types according to Cappana classification.
3- To identify the best surgical techniques, dealt with such tumor.

Patients and Methods:
A retrospective study done at Al-Sadder Teaching Hospital, Orthopedic Department, between 1992-2006.

There were 33 patients diagnosed as aneurysmal bone cysts after X-ray evaluation and histopathological study.
There were 20 female, 13 male with mean age 13.4 years (8-21 years).

The lesions were evaluated by plain radiography preoperatively assessed according to Cappana and Associates. Postoperative follow up after surgery for 24 months taken into account the type of surgery and the postoperative complication.

The results:
From 33 patients there were 20 female (60.6%), and 13 male (39.4%), and most of those patients complaining of pain (84.8%), swelling of affected part (75.8%) and there were 13 patients presented with pathological fractures, and there were 2 patients had neurological symptoms.

The main involved bone was the tibia (7 cases) about 21.2% and followed by the humerus (5 cases).
According to Cappana classification the active type most common type where manifested in 19 cases (57.6%).
According to complication, the recurrence of the cyst postoperatively occurred in 9 cases (27.3%), Which was the most challenging complication.

Introduction:
Aneurysmal bone cyst is probably a non-neoplastic vasocystic tumor of unknown origin engrafted on either a previously normal bone or a preexisting lesion. It's multiloculated, radiolucent, eccentric lesion that expand the bone, giving it a (blown out) appearance.

Histologically, it shows mesenchymal tissue-lined cysts containing blood.

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Aneurysmal bone cysts are believed to be reactive lesions caused by some hemodynamic disturbance in the rich capillary network of the host bone resulting in an expansile destructive process, this hypothesis was based on observation that intracystic manometric pressure measurements were similar to arterial pressure.\(^{(4,9)}\)

Controversy exists as to whether aneurysmal bone cysts are truly a distinct pathologic entity or a secondary phenomenon superimposed on a preexisting lesion.\(^{(2)}\)

In up to 50% of cases a preexisting lesion can be identified. The most common of these is giant cell tumor, fibrous dysplasia, osteoblastoma, and chondroblastoma.\(^{(4)}\)

Primary aneurysmal bone cyst typically occur in the second decade of life. They have been reported to arise in almost every bone of both the axial and the appendicular skeleton, most often about the knee and in the vertebral column.\(^{(1,7)}\)

Patients and Methods:

We reviewed retrospectively 33 patients who had been diagnosed as osteolytic bony lesions and diagnosis confirmed as aneurysmal bone cyst based on the results of histopathological studies after surgical treatment (curaration, curation with bone graft or excision of the bone segment with tumor). This study done at Al-Sadder Teaching Hospital, Orthopaedic Department, between 1992-2004. There were 20 females and 13 males, the mean age 13.4 years, (8-21 years). The lesions were evaluated by plain radiography preoperatively and assessed according to Capanna and associates, Table 1.\(^{(1,5)}\)

Table 1: Capanna radiological classification of aneurysmal bone cyst\(^{(1,5)}\)

<table>
<thead>
<tr>
<th>Number</th>
<th>Type of lesion</th>
<th>Radiological findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-</td>
<td>Inactive</td>
<td>Complete periosteal shell with intraosseous margin defined by a sclerotic rim of reactive bone</td>
</tr>
<tr>
<td>2-</td>
<td>Active</td>
<td>Incomplete periosteal shell and a sharply defined intraosseous border</td>
</tr>
<tr>
<td>3-</td>
<td>Agressive</td>
<td>No evidence of reparative osteogenesis, no periosteal shell, ill-defined endosteal margin</td>
</tr>
</tbody>
</table>

Postoperative follow up for about 24 months where evaluation and biostatistical analysis taken into account the types of surgery and radiological features of tumor, regarding the recurrence of the lesion, other possible complications and return to normal daily activity.

The Results:-

From 33 patients who had aneurysmal bone cyst, there were 20 female patients (60.6%), and 13 male patients, (39.4%), with an average age 8-21 years old, the mean 13.4 years.

The majority of patients with aneurysmal bone cyst presented with pain (84.8%), and swelling 75.8%, and there were 39.4% of patients have been complaining of pathological fractures.
There were 2 patients presented with neurological symptoms due to nerve compression, one patient had right lower limb radiculopathy and the other had wrist drop due to radial nerve, Table 2.

<table>
<thead>
<tr>
<th>Number</th>
<th>Clinical Presentation</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-</td>
<td>Pain</td>
<td>28</td>
<td>84.8%</td>
</tr>
<tr>
<td>2-</td>
<td>Pathological Fracture</td>
<td>13</td>
<td>39.4%</td>
</tr>
<tr>
<td>3-</td>
<td>Swelling</td>
<td>25</td>
<td>75.8%</td>
</tr>
<tr>
<td>4-</td>
<td>Neurological Symptoms</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a- Wrist drop</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>b-Sciatica</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>5-</td>
<td>Backache</td>
<td>4</td>
<td>12.1%</td>
</tr>
</tbody>
</table>

The anatomical distribution of aneurysmal bone cyst occurred mainly in long bones, specially in the tibia, where there were 7 cases (21.2%), and followed by humerus, 5 cases (15.2%), then femur, 4 cases (12.1%), As showed in table (3).

<table>
<thead>
<tr>
<th>Number</th>
<th>Anatomical sites of cyst</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-</td>
<td>Humerus</td>
<td>5</td>
<td>15.2%</td>
</tr>
<tr>
<td>2-</td>
<td>Femur</td>
<td>4</td>
<td>12.1%</td>
</tr>
<tr>
<td>3-</td>
<td>Tibia</td>
<td>7</td>
<td>21.2%</td>
</tr>
<tr>
<td>4-</td>
<td>Fibula</td>
<td>2</td>
<td>6%</td>
</tr>
<tr>
<td>5-</td>
<td>Pelvis</td>
<td>2</td>
<td>6%</td>
</tr>
<tr>
<td>6-</td>
<td>Vertebral Column</td>
<td>3</td>
<td>9.1%</td>
</tr>
<tr>
<td>7-</td>
<td>Calcaneum</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>8-</td>
<td>Metacarpal</td>
<td>3</td>
<td>9.1%</td>
</tr>
<tr>
<td>9-</td>
<td>Phalanges</td>
<td>3</td>
<td>9.1%</td>
</tr>
<tr>
<td>10-</td>
<td>Radius</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>11-</td>
<td>Ulna</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>12-</td>
<td>Metatarsal</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>33</strong></td>
<td><strong>99.8%</strong></td>
</tr>
</tbody>
</table>

According to capanna et al, most of cases of aneurysmal bone cysts radiologically evaluated as active cyst (57.6%), where as the inactive cyst only presented in 12.1%, table (4)

(135)

Table (4) radiological classification of the cyst
<table>
<thead>
<tr>
<th>number</th>
<th>Radiological classification</th>
<th>frequency</th>
<th>percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-</td>
<td>Inactive</td>
<td>4</td>
<td>12.1%</td>
</tr>
<tr>
<td>2-</td>
<td>Active</td>
<td>19</td>
<td>57.6%</td>
</tr>
<tr>
<td>3-</td>
<td>Aggressive</td>
<td>10</td>
<td>30.3%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>33</td>
<td>100%</td>
</tr>
</tbody>
</table>

The major postoperative complications were the recurrence of aneurysmal bone cysts that necessitate a second operation (curettion with adjuvant therapy such as bone cement). The recurrence of cyst occurred in 9 cases (27.3%). Whereas the transformation to other pathological condition appeared in only one case, which presented 4 years later as giant cell tumor, table (5).

Table (5) Postoperative complications of aneurysmal bone cysts.

<table>
<thead>
<tr>
<th>Number</th>
<th>Types of complications</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-</td>
<td>Recurrence of cyst</td>
<td>9</td>
<td>27.3%</td>
</tr>
<tr>
<td>2-</td>
<td>Infection</td>
<td>2</td>
<td>6%</td>
</tr>
<tr>
<td>3-</td>
<td>Growth defect</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>4-</td>
<td>Transformation to Giant cell tumor</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>5-</td>
<td>Neurological deficit</td>
<td>2</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15</td>
<td>45.3%</td>
</tr>
</tbody>
</table>

According to the types of surgery, the majority of recurrence of cyst occurred after curettion without bone graft, which happened in 7 cases of 16 operations, (43.8%), whereas there were no recurrence in two cases where the type of operation was bone segment excision including the tumor, table (6).

Table (6) Distribution of postoperative recurrence according to the types of surgery.

<table>
<thead>
<tr>
<th>Number</th>
<th>Types of surgery</th>
<th>Frequency</th>
<th>Percent</th>
<th>Recurrence</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-</td>
<td>Curettion without bone graft</td>
<td>16</td>
<td>48.5%</td>
<td>7</td>
<td>43.8%</td>
</tr>
<tr>
<td>2-</td>
<td>Curettion with bone graft</td>
<td>13</td>
<td>39.4%</td>
<td>2</td>
<td>15.4%</td>
</tr>
<tr>
<td>3-</td>
<td>Bone segment excision</td>
<td>2</td>
<td>6%</td>
<td>0</td>
<td>100%</td>
</tr>
</tbody>
</table>

Aneurysmal bone cysts in the lower limbs.

- A: Proximal tibia
- B: Proximal femur
- C: Iliac bone

Figure (2) Aneurysmal bone cyst

- A: Proximal humerus
- B: Proximal humerus with involvement of epiphysis

Figure (3) Aneurysmal bone cyst

- A: Second metacarpal
- B: Proximal Phalanx of ring finger

After recurrence

Figure (4) Aneurysmal bone cyst treated by curruration and bone cement

Discussion:
Since its introduction by Jaffe & Lichtenstien in 1950, the term aneurysmal bone cyst has been accepted throughout the world. Although the lesion to which it refers is neither an aneurysm nor a bone cyst, this non-neoplastic lesion mimics a tumor-like process because of its proliferative nature.\(^{(2,9)}\)

It's made up of channels or laculae that usually contain blood, but some spaces contain blood-tinged or even clear fluid.\(^{(4)}\)

Most of the studies agreed that aneurysmal bone cyst occurred most commonly in the second decade of life. Leithner et al study\(^{(17)}\) was showed median age 13 years, and we agreed with this study, where as in the study done by Rizzo et al the median age was 9.8 years, and this might related to the fact that Rizzo et al\(^{(19)}\) studied only the juxtaphyseal aneurysmal bone cyst.

Although many studies agreed with us that this lesion more common in girls and women than in boys and men\(^{(3,16,18)}\) there were other studies showed significant increase in male than girls.\(^{(19,22)}\).

Bollini et al\(^{(6)}\) showed that the main presenting symptoms are swelling and pain, where as pathological fractures presented in 29.6%, and in our study pathological fractures occurred in 39.4%, and this might be related to the routine school medical examination applied in the western countries this medical primary care not presented in our country.

Casadei et al\(^{(8)}\) study showed significant increase in the cases that presented with pathological fractures (67%), this might be occurred due to the fact the study done on long bone only.

Most of the studies were showed that the more common bone involved was tibial bone, in the study done by Van loon et al\(^{(20)}\) tibia presented by 38.4%, Rizzo\(^{(19)}\) study 40%, we still agreed that tibia involved more common than other bones.

Vandertop et al\(^{(21)}\) showed that 20% aneurysmal bone cyst presented in the vertebral column mainly in the posterior arch, Derosa et al\(^{(16)}\) showed 24% of spinal involvement, where as in our study only 9.1% of cases had spinal involvement, this might be related to that many of patients consulted neurosurgeon rather than orthopedic department.

Casadei et al\(^{(8)}\) showed that the tarsal bone rarely involved in the aneurysmal bone cyst (6%), and we agreed with them because only one case of our study had calcaneal involvement.

Rizzo et al\(^{(19)}\) study on radiological evaluation of aneurysmal bone cyst according to campanacci classification showed that most of aneurysmal bone cyst classified as type 2 (active), 53.3% and in our study we agreed with them in spite of we used the capanna classification, the active cyst in our study 57.6%.

McCarthy et al\(^{(25)}\) showed 13.3% and Kufa\(^{(14)}\) showed 20%, the recurrence of cyst after the first operation, while in our study the recurrence rate higher (27.3%) and this because we used many methods of treatment, but we still agreed with many studies that the curettage alone had the higher chance for recurrence where as addition of bone graft would decrease the incidence of recurrence.

Bollini et al\(^{(8)}\) showed 12.9% developed postoperative neurological complications, where as in our study only 6% developed neurological complication and this might be related to the types of operations as their used aggressive surgical resection and reconstruction.

Rizzo et al\(^{(19)}\) showed that one case developed growth retardation, and we agreed with them that although the cysts developed in metaphyseal region near the growth plate, it rarely affect the growth of the bones.

**Conclusions:**

The study agreed with most of other studies over the world in that aneurysmal bone cysts most often occurred in long bones specially the tibia.
Also we agreed with the others in that, the active forms was the most common type.

**References:**
