International Journal of Biomedical Research
ISSN: 0976-9633 (Online); 2455-0566 (Print)
Journal DOI: 10.7439/ijbr
CODEN: IJBRFA

Original Research Article

Aneurysmal bone cysts in unusual sites: MR imaging features

N L N Moorthy[1], Lalithkumar Balla[*2], K. Priyanka[3] and Shruthi S[3]

Professor[1], Post graduate Resident[2], Senior Resident[3], Department of Radio Diagnosis, Gandhi Medical College & Hospital, Secunderabad, Telangana state, India.

***Correspondence Info:**
Dr. Lalith kumar Balla,
Post Graduate Resident,
Department of Radio Diagnosis,
Gandhi Medical College & Hospital,
Secunderabad, Telangana state, India.
E-mail: lalithballa@gmail.com

Abstract

Aneurysmal bone cyst (ABC) is a common benign expansile bone lesion involving metaphysis of long bones in young people. They arise denovo or in association with preexisting various bone tumours. The common sites of predilection include long bones, spine, pelvis. The lesion has characteristic radiological and imaging features. In the present study we report the MR imaging features of ABC in atypical sites.

Keywords: Aneurysmal bone cyst, hemorrhagic cyst, fluid-fluid levels.

1. Introduction

Jaffe and Lichtenstein described ABC as slow growing bone lesion containing blood filled cysts. The etiology is still not known [1]. The most common age of presentation is below 20yrs. Though metaphysis is most common site of involvement, it can also occur in diaphysis, cortexetc. ABC can be primary or secondary(in association with underlying bone lesion like fibrous dysplasia, giant cell tumour, osteoblastoma, chondroblastoma, chondromyxoid fibroma, simple bone cyst, hemangioma, osteosarcoma, malignant fibrous histiocytoma, eosinophilic granuloma, non ossifying fibroma, angiosarcoma) and the variants include solid aneurysmal bone cyst, soft tissue aneurysmal bone cyst[2]. The most common sites of involvement include distal femur, tibia, fibula, humerus, posterior elements of vertebrae, pelvis. The typical plain radiograph features of the lesion are an expansile metaphyseal lytic mass with well defined margin and sclerosis. In the pelvis the lesion appear as osteolytic mass with bone expansion involving the innominate bone. Though plain radiograph is usually sufficient for diagnosis, CT scan is occasionally done to assess the cortical margins. On MR ABC presents as well defined lytic mass with fluid-fluid levels. The cause of fluid-fluid levels within the lesion is due to sediment of blood. Though the expansile cystic mass is classical of ABC, such an appearance is also noted in simple bone cyst, chondroblastoma, fibrous dysplasia, brownstumour, osteosarcoma.

2. Case Series

We present a series of five cases involving different sites of the body. All the patients presented in second and third decade, with pain and swelling at the involved site. There was no history of trauma. Clinical examination revealed bony hard swelling with tenderness, not associated with neurological deficit. Various imaging modalities namely X-ray, CT, MRI showed expansile osteolytic lesion with thin sclerotic margin and fluid-fluid levels in the involved bone. All cases confirmed as ABC on histological examination which showed blood filled spaces with multinucleated giant cells and spindle cell stroma (Figure 6, 7 & 8).

Case 1 was a 40 year old male with ABC involving petrous part of right temporal bone (Figure 1). Case 2 was a 12 year old male with ABC arising from left scapula (Figure 2). Case 3 was a 26 year old male with ABC involving right ischial tuberosity (Figure 3). Case 4 was a 26 year old female with ABC of 5th metacarpal (Figure 4). Case 5 was a 19 year old male with ABC involving capitate of left hand (Figure 5). Clinical features and MR imaging findings are summarized in table 1.

Table 1: Clinical features and MR imaging findings

	Age	Site	Clinical Features	MR Imaging Findings
Case 1	40 year old male	Petrous part of right temporal bone	Progressive painless swelling on temporal bone	Well defined, extra axial altered signal intensity mass lesion is seen in the left petrous temporal bone, lesion is hypo intense on T1, hyper intense on T2 and partially suppressed on FLAIR images, with multiple cystic areas and few fluid-fluid levels.
Case 2	12 year old male	Left scapula	Painful swelling on the back On Examination-tender and bony hard swelling	Well defined lytic expansile lesion noted involving upper part of body of left scapula and spinous process, acromion of left scapula showing multiple fluid-fluid levels
Case 3	26 year old male	Right ischial tuberosity	Progressive painfull swelling in the buttock No neurological deficit.	Focal well defined altered signal intensity lesion measuring 2.4 x 1.8cm is seen in ischium on right side which is heterogenous on T1W images and hyperintense on T2W and STIR images.
Case 4	26 year oldfemale	5th metacarpal	Painless swelling of palm. Tender bony hard swelling.	Well defined lytic expansile lesion noted involving 5th metacarpal with multiple cystic areas and fluid-fluid levels within.
Case 5	19 year old male	Capitate	Restriction of movements of left hand since 3 months with progressive swelling associated with tenderness	Focal well defined lytic lesion in capitates hyperintense on T2,STIR,hypointense on T1 with adjacent marrow edema showing fluid-fluid levels within

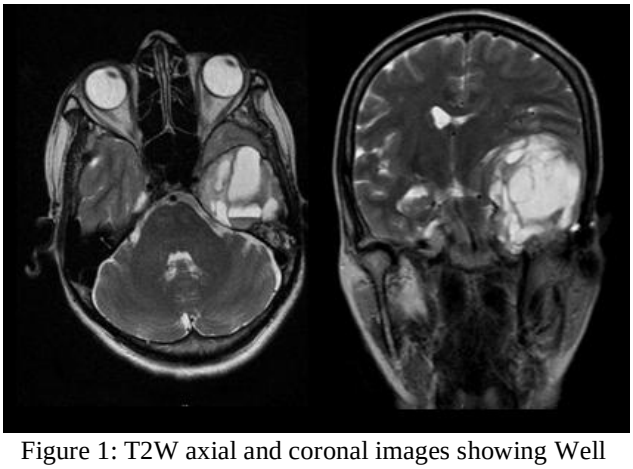

Figure 1: T2W axial and coronal images showing Well defined, extra axial hyper intense mass lesion seen in the left petrous temporal bone with multiple cystic areas, few fluid-fluid levels within.

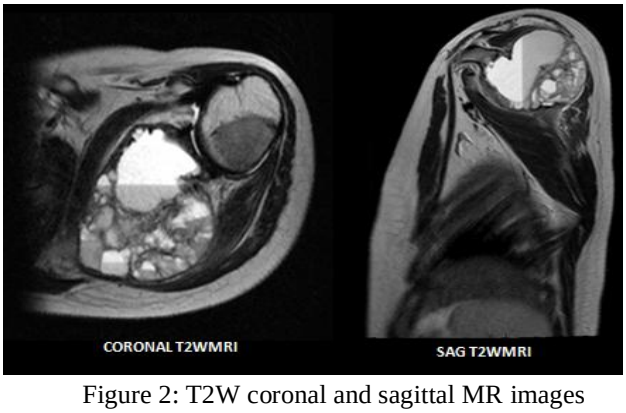

Figure 2: T2W coronal and sagittal MR images showing Well defined lytic expansile lesion noted involving upper part of body of left scapula and spinous process, acromion of left scapula with multiple fluid – fluid levels.

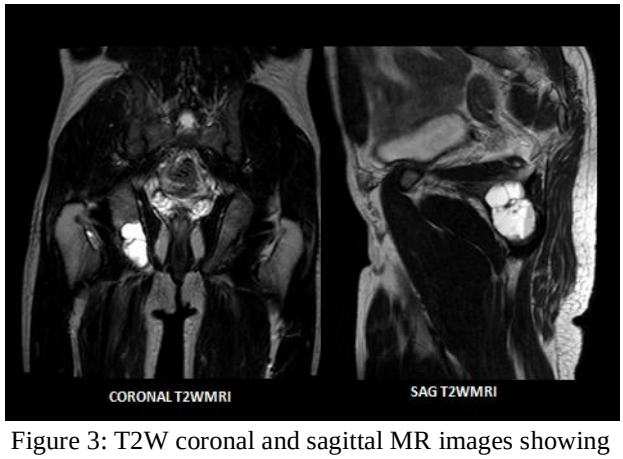

Figure 3: T2W coronal and sagittal MR images showing Focal well defined hyperintense lesion in ischium on right side with fluid –fluid levels.

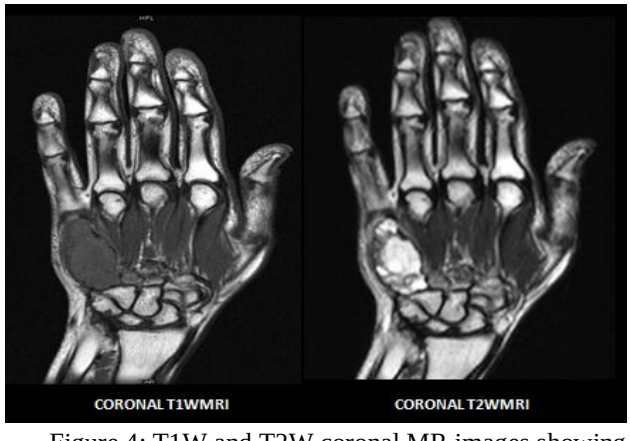

Figure 4: T1W and T2W coronal MR images showing well defined lytic expansile lesion noted involving 5th metacarpal which is hypointense on T1 and hyperintense on T2 with multiple cystic areas and fluid- fluid levels within

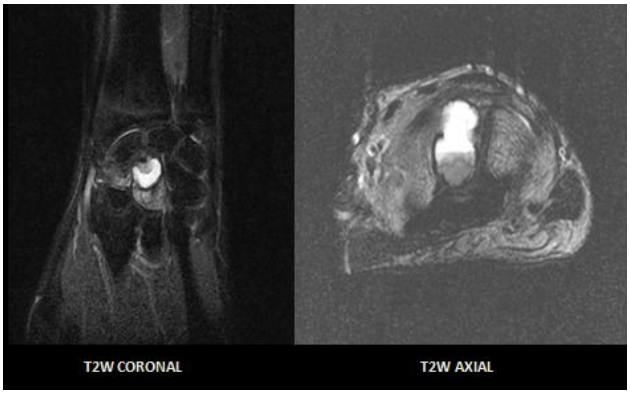

Figure 5: T2W coronal and axial images showing focal well defined lytic lesion in capitates hyperintense on T2, with adjacent marrow edema showing fluid fluid levels within.

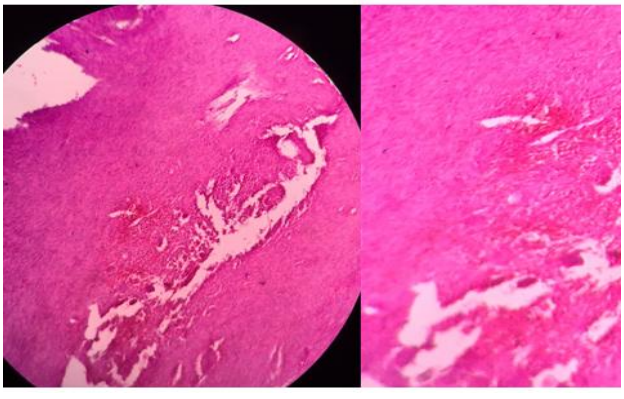

Figure 6: Histopathology of the cyst from scapula shows Blood filled spaces with spindle cell stroma.

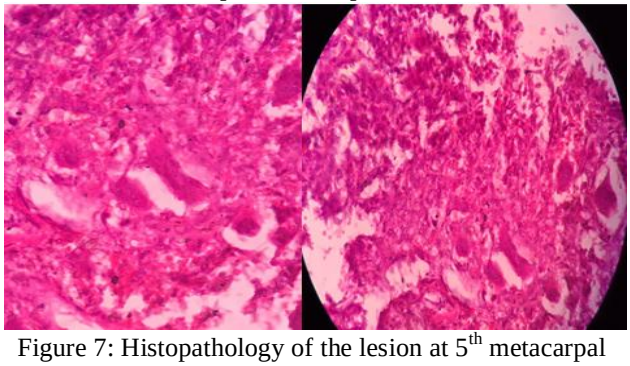

Figure 7: Histopathology of the lesion at 5th metacarpal shows clusters of multinucleated giant cells with loose spindle stroma.

Figure 8: Histopathology of the lesion at capitate showing blood filled spaces and few multinucleated giant cells with spindle cell stroma.

3. Discussion

Aneurysmal bone cysts are common primary bone tumours accounting for1-6% of bone tumours. More than 80% of cases involve long bones, spine and flat bones. Tibia was the most common site affected in a study of 897 cases of ABC [3]. The most common presentation of ABC include mass, swelling and pathological fracture(in 8% of cases). The clinical course, radiological features and pathological changes in series of ABC has been reported in literature by multiple studies [4-8]. Umesh *et al* [9] described the radiological and pathological correlation in ABC developing at unusual sites like calcaneum, mandible and clavicle. Other rare isolated involvement in unusual sites described include mandible, maxilla [10], thoracicspine, sacrum [11], 5th metacarpal [12], scapula [13], petrousbone[14], temporal bone[15], capitates[16]. 15% of primary spine neoplasms are aneurysmal bone cysts. ABC involving cervical spine were described by Jung min lee [17], Hay MC [18].

ABC has to be differentiated from unicameral bone cyst which looks similar on imaging studies as treatment and prognoses of the two conditions are different [2].

Radiologically ABC has similar features as giant cell tumour (GCT), however it always arise after the closure of growth plate and GCT is aepi-metaphyseal lesion. Telangiectatic osteosarcoma strongly simulates ABC on biopsy and has to be differentiated only on molecular biology using fluorescence *in situ* hybridization.

The presence of fluid-fluid levels within the lesion on both CT and MRI is itself not diagnostic. However ABC has to be considered strongly provided the lesion is filled with cysts of variable signal intensities with surrounding thin hypointense rim. Most of the ABC involving jaw are associated with ossifying fibroma.

On histological examination, ABCs show the fibrous septa made of fibroblasts, myofibroblasts, giant cells, hemosiderin deposits, blood filled cysts, and fields of osteoid and woven bone. The cavernous blood filled cysts are not true vascular channels because they lack endothelial lining and the elastic tissue or smooth muscles that are found in walls of normal blood vessels [7].

Solid variant of ABC and giant cell reparative granuloma has similar histological features and are more common in small tubular bones of hand and feet.

The treatment options include wide excision with cement filling and intracystic injection of absolute alcohol. Local recurrence rate is 10-30% more common in first 2yrs of post operative period.

4. Conclusion

ABC are most common in longbones, pelvis, spine. There are many atypical sites. MRI is most

appropriate imaging for precise diagnosis. The combined use of plain radiograph and MRI is sensitive and specific in the diagnosis of ABC.

References

[1] Adam Greenspan Orthopedic imaging A Practical Approach, Wolters Kluwer/Lippincott Williams & Wilkin's, 5th edition, 2011: 667-76.

[2] Mascard E, Gomez-Brouchet A, Lambot K. Bone cysts: unicameral and aneurismal bone cyst. *Orthop Traumatol Surg Res*. 2015; 101(1 Suppl): S119-27.

[3] Schreuder HW, Veth RP, Pruszczynski M, Lemmens JA, Koops HS, Molenaar WM. Aneurysmal bone cysts treated by curettage, cryotherapy and bone grafting. *J Bone Joint Surg Br* 1997; 79:20-5.

[4] Vergel De Dios AM, Bond JR, Shives TC, McLeod RA, Unni KK. Aneurysmal bonecyst. A clinicopathologic study of 238 cases. *Cancer*. 1992; 69(12): 2921-31.

[5] Dabska, M. and Buraczewski, J. Aneurysmal bone cyst. Pathology, clinical course and radiologic appearances. *Cancer*, 1969; 23: 371–389.

[6] Martinez V, Sissons HA. Aneurysmal bone cyst. A review of 123 cases including primary lesions and those secondary to other bone pathology. *Cancer*. 1988; 61(11):2291-304.

[7] Liang-kuangchen, Hsu-yiChen, Hui-Ling-perng, Chin-Chu Wu *et al*. Imaging features and review literature of aneurysmal bone cysts, *Chin J Radio* 2005; 30: 269-75.

[8] Mankin HJ, Hornicek FJ, Ortiz-Cruz E, Villafuerte J, Gebhardt MC. Aneurysmal bone cyst: a review of 150 patients. *J Clin Oncol*. 2005 Sep 20; 23(27): 6756-62.

[9] Parashari UC, Khanduri S, Upadhyay D, Bhadury S, Singhal S. Radiologic and pathologic correlation of aneurysmal bone cysts at unusual sites. *J Can Res Ther* 2012; 8:103-5.

[10] Sun ZJ, Zhao YF, Yang RL, Zwahlen RA. Aneurysmal bone cysts of the jaws:analysis of 17 cases. J Oral Maxillofac Surg. 2010 Sep; 68(9): 2122-8.

[11] Ozdemir, Seymen *et al*. "Aneurysmal Bone Cysts of the Spine: Two Case Reports." *Korean Journal of Spine* 2014; 11 (4): 249–251.

[12] Ozyurek S, Rodop O, Kose O, Cilli F, Mahirogullari M. *Orthopedics*. 2009 Aug; 32(8).

[13] Megas P, Papathanassiou ZG, Kasimatis G, Papachristou DJ. Aneurysmal bone cyst of the scapula. A case report. *Acta Orthop Belg*. 2009 Oct; 75(5):684-9.

[14] Sayama CM, MacDonald JD. Aneurysmal bone cyst of the petrous bone: case presentation and review of the literature. *Pediatr Neurosurg*. 2010; 46(4):308-12.

[15] Gaurang V Shah, Mrugesh R., Primal S. Shah, Aneurysmal bone cyst of the temporal bone: MR findings, *AJNR* 1995:16.

[16] Najd Mazhar F, Moghimi Z, Yahyazadeh H, Shahverdi S. Aneurysmal bone cyst of the capitate: A rare case report. *Arch Iran Med*. 2014: 17(3): 211-214.

[17] Jung Min Lee, Seung Chul Rhim, Dong Ho Lee, Joon Seon Song, Aneurysmal Bone Cysts of the Cervical Spine, *The Nerve* 2016; 2(1): 10-12.

[18] Hay MC, Paterson D, Taylor TK, Aneurysmal bone cysts of the spine. *J Bone and Joint Surg Br* 1978; 60B: 406-411.