SSR Institute of International Journal of Life Sciences
ISSN (O): 2581-8740 | ISSN (P): 2581-8732
Ambulgekar *et al.*, 2026
doi: 10.21276/SSR-IIJLS.2026.12.5.9

Case Report

open access

Primary Aneurysmal Bone Cyst of the Calcaneum in a 30-Year-Old Female: A Rare Case Managed with Extended Curettage and Bone Grafting

Rajesh K Ambulgekar[1], Veer Pradip Ramchandra[2]*, Quadri Muzammil Hasan Tajammul Hasan[3], Raunak Ranjan[2], Sameer Gahane[2], Amit Yerne[2]

[1]Professor and Head, Department of Orthopaedics, Dr. Shankarrao Chavan Government Medical College, Vishnupuri, Nanded, Maharashtra, India

[2]Junior Resident-3, Department of Orthopaedics, Dr. Shankarrao Chavan Government Medical College, Vishnupuri, Nanded, Maharashtra, India

[3]Assistant Professor, Department of Orthopaedics, Dr. Shankarrao Chavan Government Medical College, Vishnupuri, Nanded, Maharashtra, India

***Address for Correspondence:** Dr. Veer Pradip Ramchandra, Junior Resident-3, Department of Orthopaedics, Dr. Shankarrao Chavan Government Medical College, Vishnupuri, Nanded, Maharashtra–431606, India
E-mail: veerpradip5555@gmail.com

Received: 10 Jun 2026/ Revised: 17 Jul 2026/ Accepted: 16 Aug 2026

ABSTRACT

Background: Aneurysmal bone cyst (ABC) is a benign but locally aggressive osteolytic lesion characterized by blood-filled cystic spaces. It accounts for approximately 1% of primary bone tumors and commonly affects the metaphyseal regions of long bones. Calcaneal involvement is rare and may present diagnostic challenges because of its unusual location and similarity to other benign cystic lesions. This case describes a primary ABC of the calcaneum in an adult patient.

Methods: A 30-year-old female presented with persistent pain and swelling over the left heel for six months. Clinical examination revealed mild swelling and superficial tenderness. Plain radiography, computed tomography (CT), and magnetic resonance imaging (MRI) were performed. The lesion was evaluated for its size, location, internal characteristics, and surrounding bone changes. Extended curettage followed by reconstruction with an autologous bone graft was performed, and the excised tissue was subjected to histopathological examination.

Results: Imaging demonstrated a well-circumscribed cystic lesion measuring 2.1 × 2.3 × 2.0 cm in the anterior half of the calcaneus, with surrounding bone marrow edema and characteristic fluid-fluid levels on MRI. Simple bone cyst and ABC were considered as the principal differential diagnoses. Histopathological examination confirmed an aneurysmal bone cyst. The patient underwent extended curettage and autologous bone grafting with favorable postoperative clinical outcome.

Conclusion: Primary ABC of the calcaneum is an uncommon lesion requiring careful clinical, radiological, and histopathological assessment. Extended curettage with autologous bone grafting provides an effective treatment option with favorable functional outcomes. Awareness of this rare presentation may facilitate early diagnosis and appropriate management.

Key-words: Aneurysmal bone cyst, Calcaneum, curettage, Bone grafting, Fluid-fluid level, Heel pain

How to cite this article
Ambulgekar RK, Ramchandra VP, Tajammul-Hasan KMH, Ranjan R, Gahane S, et al. Primary Aneurysmal Bone Cyst of the Calcaneum in a 30-Year-Old Female: A Rare Case Managed with Extended Curettage and Bone Grafting. SSR Inst Int J Life Sci., 2026; 12(5): 10735-10740.

Access this article online
https://iijls.com/

INTRODUCTION

Aneurysmal bone cyst (ABC) is a benign, expansile, blood-filled cystic lesion of bone first described by Jaffe and Lichtenstein in 1942 [1]. Despite its benign histological nature, ABC exhibits locally aggressive behavior and may cause cortical expansion, thinning, and destruction. The lesion accounts for approximately 1% of all primary bone tumors and has an incidence of 0.14 per 100,000 population [2].

ABCs predominantly affect individuals in the first two decades of life, with 75–90% of cases occurring before

doi: 10.21276/SSR-IIJLS.2026.12.5.9

the age of 20 years [3]. A slight female predominance has been reported in some series. The metaphyseal regions of long bones are the most commonly affected sites, with the distal femur, proximal tibia, humerus, and fibula being frequent locations [4]. The spine and pelvis are involved in approximately 15% and 9% of cases, respectively.

The occurrence of ABC in the calcaneum is exceptionally rare, constituting only 1.6% of all reported ABC cases [5]. The unusual location and nonspecific clinical manifestations, particularly heel pain and swelling, may result in diagnostic difficulty and delayed recognition. Because several benign and malignant lesions can present with similar symptoms, a combination of clinical assessment and appropriate imaging is essential. The presence of fluid-fluid levels on magnetic resonance imaging (MRI), resulting from the settling of blood products within the cystic cavities, is highly suggestive of ABC [6].

The etiology of ABC remains debated. Although traditionally considered a primary neoplastic lesion, current evidence suggests that ABC may also represent a reactive process secondary to trauma, hemorrhage, or an underlying primary bone lesion such as giant cell tumor, chondroblastoma, or osteoblastoma [7]. Primary ABCs are characterized by rearrangements of the USP6 gene on chromosome 17q13, whereas secondary ABCs generally lack this genetic alteration [8]. Histopathological examination therefore remains important for establishing the definitive diagnosis and distinguishing ABC from other cystic or giant-cell-rich lesions.

The standard treatment for ABC involves extended curettage with or without adjuvant therapy, including phenol, cryotherapy, or argon beam coagulation, followed by reconstruction with bone grafting or cementation [9]. Alternative treatment modalities include selective arterial embolization and sclerotherapy with polidocanol. Systemic therapy with denosumab may also be considered in selected cases, particularly when lesions are surgically inaccessible or associated with considerable morbidity [10].

Calcaneal ABCs require particular consideration because of the unique anatomy and weight-bearing function of the calcaneum. Adequate removal of the lesion while preserving structural integrity is essential to achieve satisfactory functional recovery. Early recognition and appropriate treatment may help prevent progressive bone destruction and reduce the risk of recurrence.

We present a rare case of primary aneurysmal bone cyst of the calcaneum in a 30-year-old female, detailing the clinical presentation, radiological evaluation, surgical management, and histopathological confirmation. The case emphasizes the diagnostic challenges associated with this uncommon location and highlights the role of combined clinical, radiological, and pathological assessment in establishing an accurate diagnosis.

CASE PRESENTATION

Patient Information- A 30-year-old woman presented to the Orthopaedic Outpatient Department with pain and swelling over the left heel for six months. The pain had gradually increased and was more prominent during weight-bearing and walking, causing difficulty in ambulation. There was no history of preceding trauma, fever, night pain, constitutional symptoms, or significant weight loss. Her past medical and family histories were unremarkable.

Clinical Examination- On examination, the patient was afebrile and clinically stable. Local examination revealed mild diffuse swelling over the left calcaneal region with superficial tenderness. The overlying skin was normal, without erythema, ulceration, sinus formation, warmth, or crepitus. Ankle and subtalar movements were preserved, although terminal movements were painful. Distal neurovascular examination was normal.

Radiological Evaluation- Plain radiographs demonstrated a well-defined expansile lytic lesion involving the anterior half of the calcaneus, with a narrow zone of transition and thinned but intact cortical shell. There was no periosteal reaction or pathological fracture. MRI revealed a well-defined cystic lesion measuring 2.1 × 2.3 × 2.0 cm, with surrounding bone marrow edema and characteristic fluid-fluid levels. There was no pathological fracture or soft-tissue extension (Fig. 1)**.**

Differential Diagnosis- A simple bone cyst and aneurysmal bone cyst (ABC) were considered as the principal differential diagnoses. Giant cell tumor, chondroblastoma, osteoblastoma with secondary ABC-like changes, and telangiectatic osteosarcoma were also considered. However, the characteristic fluid-fluid levels and absence of aggressive features favored ABC.

doi: 10.21276/SSR-IIJLS.2026.12.5.9

Fig. 1: Preoperative clinical photograph showing mild swelling over the left heel in lateral and anteromedial views.

Surgical Management- After appropriate preoperative evaluation and informed consent, surgical treatment was planned. Under spinal anesthesia, a direct lateral approach was used to expose the calcaneal lesion. A cortical window was created under fluoroscopic guidance. On entering the cavity, dark hemorrhagic fluid was encountered, with multiple blood-filled spaces separated by thin fibrous septa, grossly suggestive of an ABC (Fig. 2).

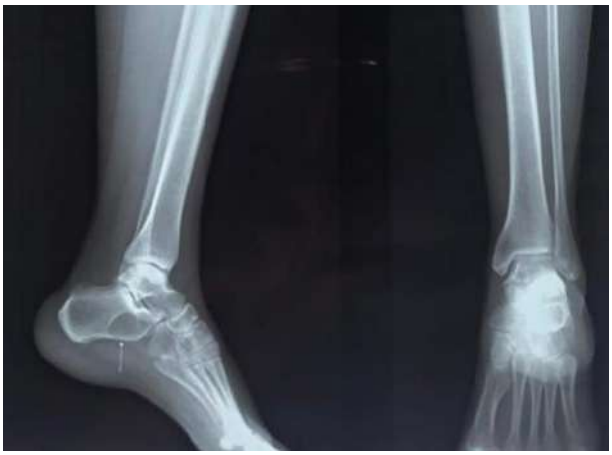

Fig. 2: Preoperative anteroposterior and lateral radiographs of the left ankle showing a well-defined expansile lytic lesion involving the anterior half of the calcaneus.

Extended intralesional curettage was performed using curettes of different sizes, with meticulous removal of the cyst lining and pathological tissue. The curetted material was collected for histopathological examination (Fig. 3). The cavity was subsequently thoroughly irrigated with normal saline.

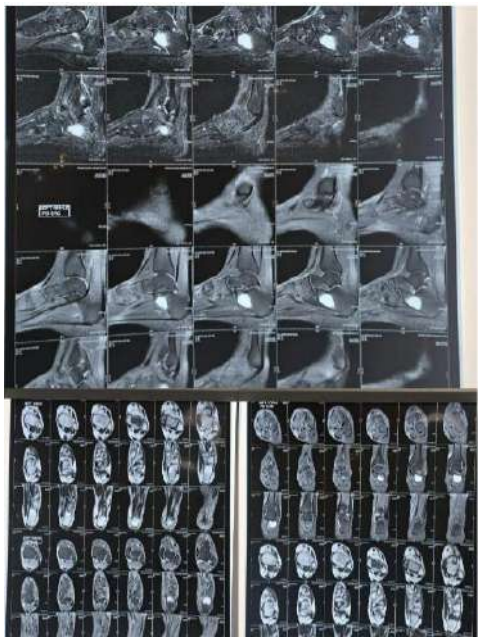

Fig. 3: MRI showing a cystic lesion in the anterior calcaneus with fluid-fluid levels.

Reconstruction

The resulting cavity was filled with commercially available G BONE allograft bone chips to restore structural integrity and facilitate bone healing. The soft tissues were closed in layers, and the limb was immobilized in a below-knee plaster splint (Fig. 4).

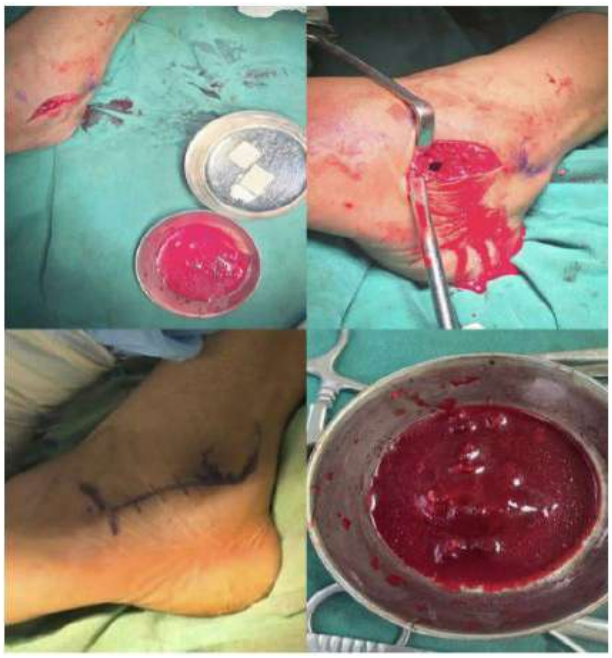

Fig. 4: Intraoperative photographs showing exposure of the calcaneal lesion, evacuation of cystic contents, and wound closure.

doi: 10.21276/SSR-IIJLS.2026.12.5.9

Histopathological Examination- Histopathological examination showed multiple blood-filled cystic spaces separated by fibrous septa containing fibroblasts, capillaries, multinucleated osteoclast-like giant cells, and hemosiderin-laden macrophages. No significant cytological atypia or malignant features were identified, confirming the diagnosis of aneurysmal bone cyst.

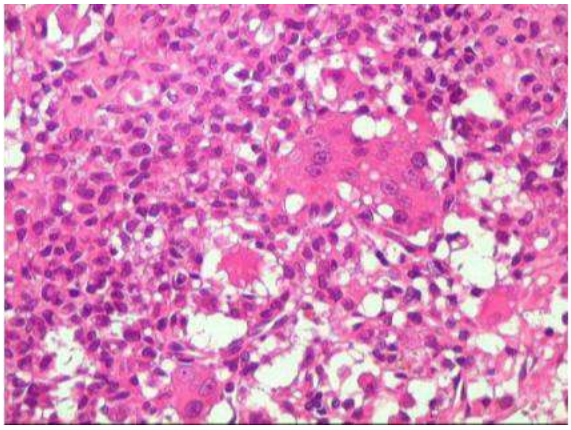

Fig. 5: Histopathological examination showing blood-filled spaces with fibrous septa and multinucleated giant cells, consistent with aneurysmal bone cyst.

Follow-up

The postoperative course was uneventful, with primary wound healing and no postoperative complications. At three-month follow-up, the patient was pain-free, had full ankle and subtalar movements, and was able to walk without a limp. Follow-up radiographs demonstrated progressive incorporation of the bone graft with restoration of calcaneal architecture and no evidence of recurrence.

DISCUSSION

Aneurysmal bone cysts (ABCs) are benign but locally aggressive, blood-filled cystic lesions that can occur in almost any bone, with a predilection for the metaphyseal regions of long bones [11]. Calcaneal involvement is exceptionally uncommon, with only sporadic cases reported in the literature [5,12]. This unusual location may create diagnostic difficulty because the clinical and radiological features can overlap with several other calcaneal lesions.

ABC accounts for approximately 1% of all primary bone tumors and has an incidence of 0.14 per 100,000 population [2]. Approximately 75–90% of cases occur before 20 years of age [3]. Our patient was 30 years old, representing an atypical age presentation. The slight female predominance reported in some series was also consistent with our case. Thus, ABC should remain a diagnostic consideration even in older patients when characteristic imaging features are present.

The pathogenesis of ABC remains incompletely understood. Primary ABCs are associated with USP6 gene rearrangements and overexpression, whereas secondary ABCs may develop in association with trauma, hemorrhage, or underlying lesions such as giant cell tumor, chondroblastoma, or osteoblastoma [7,8]. In the present case, there was no history of trauma or known underlying bone lesion, and the clinical, radiological, and histopathological findings supported a primary ABC.

Calcaneal ABC usually presents with nonspecific symptoms including chronic heel pain, swelling, tenderness, and difficulty with weight-bearing [13]. Our patient presented with progressive heel pain and swelling for six months, associated with difficulty in walking. Such an insidious presentation may lead to diagnostic delay, particularly when systemic symptoms are absent.

Radiographs typically show a well-defined expansile lytic lesion with cortical thinning and a narrow zone of transition [14]. MRI is particularly useful for assessing the internal architecture and extent of ABC. Fluid-fluid levels are a characteristic feature resulting from the separation and settling of blood products of different densities within the cystic cavities [6]. In our patient, MRI demonstrated a well-defined 2.1 × 2.3 × 2.0 cm cystic lesion in the anterior calcaneus with surrounding bone marrow edema and characteristic fluid-fluid levels. These findings strongly favored ABC.

The differential diagnosis of a lytic calcaneal lesion includes simple bone cyst, giant cell tumor, chondroblastoma, osteoblastoma, enchondroma, and telangiectatic osteosarcoma [15]. Although fluid-fluid levels strongly suggest ABC, they are not completely specific and may occur in other lesions. Secondary ABC-like changes may accompany primary tumors, particularly chondroblastoma [16]. In the present case, the well-defined margins, absence of aggressive cortical destruction, periosteal reaction, and soft-tissue extension favored a benign lesion. Histopathological examination was therefore essential for definitive confirmation.

Treatment aims to relieve pain, prevent pathological fracture, achieve local control, and preserve the

doi: 10.21276/SSR-IIJLS.2026.12.5.9

structural integrity of the weight-bearing calcaneus. Extended curettage with or without adjuvant therapy followed by bone grafting or cementation remains a commonly used treatment [9,17]. Other options include selective arterial embolization, sclerotherapy, denosumab, and cryotherapy, particularly for large, recurrent, or surgically inaccessible lesions [18–22]. In our case, extended curettage with bone grafting was selected because the lesion was relatively small, accessible, and amenable to complete removal. Adequate reconstruction is particularly important in the calcaneus because of its weight-bearing function.

Complete removal of the cyst lining during extended curettage is important for reducing recurrence. Adjuvant techniques such as phenol, cryotherapy, or argon beam coagulation may further improve local control but can cause injury to surrounding tissues [23]. In our patient, adjuvant therapy was not used because thorough curettage could be achieved and the lesion was relatively small.

Histopathology demonstrated blood-filled cystic spaces separated by fibrous septa containing fibroblasts, capillaries, multinucleated osteoclast-like giant cells, and hemosiderin-laden macrophages, without significant atypia or malignant features [24]. These findings confirmed the diagnosis of ABC and helped exclude malignant mimics.

Recurrence remains an important concern following treatment, particularly after incomplete curettage. Recurrence rates after curettage and grafting have been reported at approximately 10–20%, with variation according to lesion location, age, surgical technique, and use of adjuvant therapy [25]. Our patient remained clinically and radiologically recurrence-free at three months, with progressive graft incorporation and restoration of calcaneal architecture. However, longer follow-up is necessary to exclude late recurrence.

The present case shares the typical features of previously reported calcaneal ABCs, including chronic heel pain, an expansile lytic lesion, fluid-fluid levels on MRI, and successful management with curettage and bone grafting [5,13,26]. Its distinctive features were the patient's relatively older age of 30 years and the small lesion confined to the anterior half of the calcaneum. The main limitations were the short follow-up period and absence of USP6 genetic testing. Nevertheless, the combination of characteristic imaging, complete curettage, bone graft reconstruction, and histopathological confirmation resulted in a favorable short-term functional outcome.

CONCLUSIONS

Primary aneurysmal bone cyst of the calcaneus is a rare benign lesion that should be considered in patients presenting with persistent heel pain and swelling. Accurate diagnosis requires correlation of clinical, radiological, and histopathological findings, with characteristic fluid-fluid levels on MRI providing an important diagnostic clue. Extended intralesional curettage followed by bone grafting offers effective local control and satisfactory functional recovery in appropriately selected cases. Although favorable short-term outcomes can be achieved, prolonged clinical and radiological follow-up remains essential for early detection of recurrence and assessment of sustained functional recovery.

CONTRIBUTION OF AUTHORS

Research concept- Veer Pradip Ramchandra, Raunak Ranjan
Research design- Veer Pradip Ramchandra, Amit Yerne
Supervision- Rajesh K Ambulgekar, Quadri Muzammil Hasan Tajammul Hasan
Materials- Raunak Ranjan, Sameer Gahane
Data collection- Veer Pradip Ramchandra, Raunak Ranjan
Data analysis and interpretation- Rajesh K Ambulgekar
Literature search- Sameer Gahane, Amit Yerne
Writing article- Veer Pradip Ramchandra, Raunak Ranjan, Sameer Gahane, Amit Yerne
Critical review- Rajesh K Ambulgekar, Quadri Muzammil Hasan Tajammul Hasan
Article editing- Sameer Gahane, Amit Yerne
Final approval- Rajesh K Ambulgekar, Quadri Muzammil Hasan Tajammul Hasan

REFERENCES

[1] Jaffe HL, Lichtenstein L. Solitary unicameral bone cyst with emphasis on the roentgen picture, the pathologic appearance and the pathogenesis. Arch Surg., 1942; 44(6): 1004-25.
[2] Mankin HJ, Hornicek FJ, Ortiz-Cruz E, Villafuerte J, Gebhardt MC. Aneurysmal bone cyst: a review of 150 patients. J Clin Oncol., 2005; 23(27): 6756-62.

doi: 10.21276/SSR-IIJLS.2026.12.5.9

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

[4] Oliveira AM, Perez-Atayde AR, Inwards CY, et al. USP6 and CDH11 oncogenes identify the neoplastic cell in primary aneurysmal bone cysts and are absent in so-called secondary aneurysmal bone cysts. Am J Pathol., 2004; 165(5): 1773-80.

[5] Madani H, Hamzaoui A, Madani F, et al. Aneurysmal bone cyst of the calcaneus: a rare case report and review of the literature. Int J Surg Case Rep., 2024; 115: 109-13.

[6] Mahnken AH, Nolte-Ernsting CC, Wildberger JE, et al. Aneurysmal bone cyst: value of MR imaging and conventional radiography. Eur Radiol., 2003; 13(5): 1118-24.

[7] Kransdorf MJ, Sweet DE. Aneurysmal bone cyst: concept, controversy, clinical presentation, and imaging. AJR Am J Roentgenol., 1995; 164(3): 573-80.

[8] Oliveira AM, Hsi BL, Weremowicz S, et al. USP6 (Tre2) fusion oncogenes in aneurysmal bone cyst. Cancer Res., 2004; 64(6): 1920-23.

[9] Van Geloven TP, Van De Sande MA, Van Der Heijden L. The treatment of aneurysmal bone cysts. Curr Opin Pediatr., 2023; 35(1): 131-37.

[10]Puri A, Agarwal MG. Treatment of giant cell tumor of bone with denosumab: a systematic review. J Surg Oncol., 2021; 123(6): 1234-42.

[11]Dabezies EJ, D'Ambrosia RD, Chuinard RG, et al. Aneurysmal bone cyst after fracture: a report of three cases. J Bone Joint Surg Am., 1982; 64: 617-21.

[12]Burdorf B, Kesarla P, MacDonald W. Young female with calcaneal chondroblastoma & secondary aneurysmal bone cyst: case report. J Orthop Case Rep., 2025; 15(10): 160-63.

[13]Paik S, Bose T, Bhomwik S. Primary calcaneal aneurysmal bone cyst in a 5-year-old treated with serial polidocanol sclerotherapy: a case report. Int J Res Orthop., 2026; 12(2): 520-25.

[14]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): 2291-2304.

[15]Campanacci M, Capanna R, Picci P. Unicameral and aneurysmal bone cysts. Clin Orthop Relat Res., 1986; (204): 25-36.

[16]Springfield DS, Gebhardt MC, McMaster JH. Chondroblastoma: a review of seventy cases. J Bone Joint Surg Am., 1985; 67(5): 748-55.

[17]Schreuder HW, Veth RP, Pruszczynski M, et al. Aneurysmal bone cysts treated with curettage and cryosurgery: a retrospective study of 50 cases. J Bone Joint Surg Br., 1997; 79(1): 20-25.

[18]Rossi G, Rimondi E, Bartalena T, et al. Selective arterial embolization of 36 aneurysmal bone cysts of the skeleton with N-2-butyl cyanoacrylate. Skeletal Radiol., 2010; 39(2): 161-67.

[19]Topouchian V, Mazda K, Hamze B, et al. Aneurysmal bone cysts in children: complications of fibrosing agent injection. Radiol., 2004; 232(2): 522-26.

[20]De Cristofaro R, Biagini R, Boriani S, et al. Selective arterial embolization in the treatment of aneurysmal bone cyst and angioma of bone. Skeletal Radiol., 1992; 21(8): 523-32.

[21]Chakrapani SD, Grim K, Kaimaktchiev V, Anderson JC. Response of aneurysmal bone cyst to denosumab. Spine (Phila Pa 1976), 2013; 38(17): E1093-96.

[22]Marcove RC, Sheth DS, Takemoto S, Healey JH. The treatment of aneurysmal bone cyst. Clin Orthop Relat Res., 1995; (311): 157-63.

[23]Lackman RD, Khoury LD, Esmail A, Donthineni-Rao R. The treatment of aneurysmal bone cyst by cryotherapy. J Bone Joint Surg Br., 2002; 84(7): 950-51.

[24]Levy WM, Miller AS, Bonakdarpour A, Aegerter E. Aneurysmal bone cyst secondary to other osseous lesions: report of 57 cases. Am J Clin Pathol., 1975; 63(1): 1-8.

[25]Capanna R, Springfield DS, Biagini R, et al. Juxtaepiphyseal aneurysmal bone cyst. Skeletal Radiol., 1985; 14(1): 20-25.

[26]Kaplanoğlu V, Sözmen Ciliz D, Kaplanoğlu H, Elverici E. Aneurysmal bone cyst of the calcaneus. J Clin Imaging Sci., 2014; 4: 60. doi: 10.4103/2156-7514.143732.