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(CASE REPORT)

Surgical Management of Recurrent Aneurysmal Bone Cyst of the Scapula: A Case Report

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Abstract

Aneurysmal bone cyst (ABC) is a rare, benign but locally aggressive bone lesion, most commonly affecting the metaphyseal regions of long bones and the spine. Scapular involvement is extremely uncommon, accounting for less than 3% of cases. We describe the case of a massive, aggressive ABC of the scapula in a 23-year-old female presenting with progressive shoulder pain and a large anterior–posterior mass causing significant functional limitation. Radiographic and MRI findings initially suggested a telangiectatic osteosarcoma. Histopathological analysis confirmed the diagnosis of aneurysmal bone cyst. The patient underwent staged surgical curettage through combined anterior and posterior approaches, followed by rehabilitation. Despite initial improvement, MRI at six months revealed local recurrence, necessitating a total scapulectomy with humeral suspension. Postoperative recovery was satisfactory, with preservation of elbow and hand function and no evidence of recurrence at one year. This case highlights the diagnostic difficulties of scapular ABC due to its radiologic overlap with malignant lesions and the therapeutic challenges imposed by its location. Radical excision remains the definitive treatment for recurrent or extensive forms, offering durable local control and acceptable functional outcomes when reconstructive options are limited.

Keywords: Case report; Aneurysmal bone cyst; Scapula; Curettage; Scapulectomy

1. Introduction

Aneurysmal bone cyst (ABC) is a rare benign tumor that predominantly affects children and adolescents, characterized by its multiloculated osteolytic aspect and its locally aggressive behavior. It accounts for only about 1% of all primary bone tumors [1]. They predominantly affect the metaphyseal regions of long bones and the posterior elements of the spine, while involvement of flat bones such as the scapula is extremely rare [2].

The scapular location is of particular interest because of the proximity of critical anatomical structures such as the glenoid cavity, scapular neck, and acromion, making its management both challenging and technically demanding. While curettage with adjuvant therapy remains the mainstay of treatment for accessible lesions, wide or partial scapulectomy may be required in aggressive or recurrent cases. The present report aims to describe a case of a massive, highly aggressive aneurysmal bone cyst of the scapula in a 23-year-old female patient.

2. Patient and Observation

We report the case of a 23-year-old right-handed female, homemaker, with no significant past medical history. The onset of symptoms dated back approximately one year before presentation, with progressive mixed-type pain in the left

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shoulder that was initially responsive to symptomatic treatment. The pain gradually worsened over time, resulting in partial functional limitation and the development of a small, firm, and tender mass on the anterior aspect of the shoulder. The patient initially sought private medical consultation, during which a bone biopsy was performed, revealing normal bone tissue. And symptomatic analgesic treatment was prescribed.

As symptoms persisted and progressively worsened, the mass enlarged, extending to the posterior aspect of the shoulder. The patient was subsequently referred, after a significant delay, to the Department of Traumatology and Orthopedic Surgery at Mohammed VI University Hospital Center in Oujda.

Clinical examination revealed a prominent mass involving both the anterior and posterior aspects of the left shoulder, measuring approximately 8 cm at its greatest dimension and occupying the supra- and infraspinous fossae. The lesion was firm on palpation, adherent to deep structures, and mobile relative to the superficial tissues. Active shoulder movement was completely restricted, whereas passive motion was limited to 90° in abduction and forward flexion. The scar from the initial biopsy appeared clean and well-healed. Neurovascular assessment was normal, regional lymph nodes were not enlarged, and no additional systemic abnormalities were identified.

Standard radiographs revealed expansile osteolytic lesions with sclerotic margins, displaying a multiloculated appearance and involving almost the entire scapula while sparing the inferior tip. Computed tomography demonstrated a large heterogeneous mass centered on the left scapula, with irregular contours, cortical expansion and breakthrough, containing areas of calcification and multiple cystic cavities with fluid–fluid levels, measuring approximately 116 mm at its greatest dimension. Magnetic resonance imaging demonstrated a T2-hyperintense expansile lesion with cortical thinning, multiple fluid–fluid levels, and infiltration of the adjacent musculature (Figure 1). These imaging features were highly suggestive of a telangiectatic osteosarcoma, although an aneurysmal bone cyst could not be definitively excluded.

A bone biopsy performed through the same surgical approach as the initial diagnostic procedure confirmed, upon histopathological examination, the diagnosis of an aneurysmal bone cyst. Given the highly hemorrhagic nature of the lesion, an arterial embolization was initially considered as a therapeutic option. However, the final decision was to proceed with a complete surgical excision, carried out in two stages, one week apart, using two different surgical approaches.

The first operation involved curettage of the anterior portion of the tumor (Figure 2) via a modified deltopectoral approach, reusing the previous biopsy incision. The coracoid process, which was also infiltrated, was resected along with the lesion, and the conjoint tendon was reinserted onto the supraglenoid region. During the second stage, the residual posterior portion of the tumor was excised using a posterior Judet approach (Figure 3). Both the supraspinatus and infraspinatus muscles were found to be markedly atrophic, and the mass filled both the supraspinous and infraspinous fossae, and the postoperative course was uneventful. Rehabilitation was initiated three weeks after surgery. The patient achieved partial recovery of shoulder mobility, with the Constant score improving from 45/100 to 61/100.

At the six-month follow-up, MRI revealed tumor recurrence (Figure 4). In the absence of a scapular prosthesis, total scapulectomy was performed as the definitive therapeutic measure (Figure 5). The procedure included humeral suspension, with reinsertion of the biceps brachii and coracobrachialis tendons through transosseous tunnels in the lateral third of the clavicle.
The postoperative outcome was satisfactory, with preservation of elbow and hand function (Figure 6) and no radiological or clinical evidence of recurrence at the one-year follow-up.

3. Discussion

Aneurysmal bone cyst (ABC) is a rare benign bone tumor with locally aggressive behavior, and its etiology remains uncertain. It may occur as a primary lesion or develop secondarily in association with an underlying bone tumor such as chondroblastoma, giant cell tumor, fibrous dysplasia, osteoblastoma, or osteosarcoma.

ABC most commonly involves the metaphyseal regions of long bones, as well as the spine and pelvis. Scapular involvement is exceptional, accounting for only 2–3% of all reported cases [3]. Cases of scapular ABC described in the literature remain scarce, particularly those managed surgically. Since the initial description of ABC by Jaffe and Lichtenstein in 1942, only eight cases involving the scapula have been reported in the literature [4].

The pathogenesis of ABC remains controversial and poorly understood. Some authors have proposed that it results from an arteriovenous fistula leading to increased venous pressure and the formation of a vascular network within the affected bone. Other hypotheses suggest a post-traumatic origin or consider ABC to be a distinct neoplastic entity.

Diagnosis is based on a combination of clinical, radiological, and histopathological findings. Reported cases of scapular ABC typically present with progressive shoulder pain associated with swelling. The pain is often increasing in intensity and may be accompanied by limitation of shoulder motion compared to the contralateral side. A history of trauma is usually absent. This clinical presentation closely resembled that of our patient, who experienced progressive pain refractory to analgesic therapy and developed a large lesion measuring approximately 80 mm at its greatest dimension, resulting in marked restriction of both active and passive shoulder mobility. Radiologically, an aneurysmal bone cyst typically presents as a lytic, expansile, and trabeculated lesion with the characteristic "soap-bubble" appearance, often demonstrating marked cortical thinning with preservation of the periosteum and no associated fracture.

However, its imaging appearance may occasionally lead to diagnostic confusion with other entities. In our case, MRI findings initially raised suspicion of a telangiectatic osteosarcoma before consideration of an aneurysmal bone cyst [5]. Distinguishing between these two entities remains challenging and requires a multimodal diagnostic approach that integrates clinical presentation and complementary imaging, as MRI findings alone may be inconclusive. ABC usually exhibits thin, smooth septations, absence of solid enhancing soft-tissue components, and preservation of the cortical outline. In contrast, telangiectatic osteosarcoma often presents with irregular, thick septa, solid nodular enhancement, cortical destruction, and soft-tissue extension suggestive of malignancy [6].

The histopathological examination of the bone biopsy represents a crucial step in establishing the diagnosis of an aneurysmal bone cyst. However, interpretation by an experienced musculoskeletal pathologist is essential to avoid a misleadingly reassuring diagnosis that may delay appropriate management, as occurred in our patient. Aneurysmal bone cyst remains an enigmatic entity, both in terms of its etiopathogenesis and its therapeutic management. The main challenge in treating ABC lies in selecting the least invasive yet most effective approach, particularly in atypical locations such as the scapula. The choice of surgical technique is guided by the anatomical location, extent of the lesion, involvement of surrounding structures, and the degree of aggressiveness of the cyst. The standard surgical approach for primary aneurysmal bone cysts remains intralesional curettage with or without bone-graft depending on the resultant void. Nevertheless, this technique carries a notable risk of local recurrence, which often necessitates the use of adjuvant therapies to achieve better local control [7]. Various adjuvants such as bone cement, high-speed burring, argon beam coagulation, phenol application, and cryotherapy have been employed as complementary measures to eradicate residual tumor cells and reduce recurrence rates, particularly in anatomically challenging sites where complete resection is difficult to achieve. En bloc resection is generally reserved for recurrent aneurysmal bone cysts or for lesions located in expendable bones, where functional loss can be tolerated. Although this approach provides the most reliable local control, with reported success ranging from 95% to 100% in the literature [8], it is associated with substantial surgical morbidity. Complete resection often necessitates complex reconstruction and may result in postoperative pain, muscle weakness, limb-length discrepancy, or restricted joint mobility [9]. Because of these potential complications, en bloc excision is currently recommended only for refractory or aggressive recurrences, and for lesions located in areas where the resulting functional impairment would be minimal compared with the benefit of definitive local control. Selective arterial embolization constitutes a valuable therapeutic modality, effectively reducing the vascularity of the lesion prior to surgery. It may be employed as an adjunct to surgical excision or, in selected cases, as a standalone treatment. This approach is particularly indicated for large or surgically challenging lesions, where the risk of intraoperative bleeding and vascular injury is significant [10]. In our case, given the considerable size of the aneurysmal bone cyst, preoperative arterial embolization was performed prior to surgical resection, thereby minimizing intraoperative bleeding risk and facilitating safer excision.

In the end, conservative treatment proved insufficient in the face of this highly aggressive lesion, and recurrence was inevitable. In such cases, some authors have suggested scapular allograft reconstruction [11] or the use of a scapular prosthesis [12] as potential alternatives. However, due to the unavailability of these two therapeutic options, we were compelled to perform a total scapulectomy with humeral suspension to the distal clavicle. Although this radical procedure sacrifices scapulohumeral mobility, it allowed our patient to achieve complete pain relief, improved upper limb balance, and preservation of elbow and hand function, with an overall acceptable aesthetic and functional outcome.

Figure 1 MRI of the shoulder, axial T2 sequence: Expansile lesion with fluid–fluid levels within the tumor

Figure 2 Intraoperative images showing curettage of the anterior component of the tumor

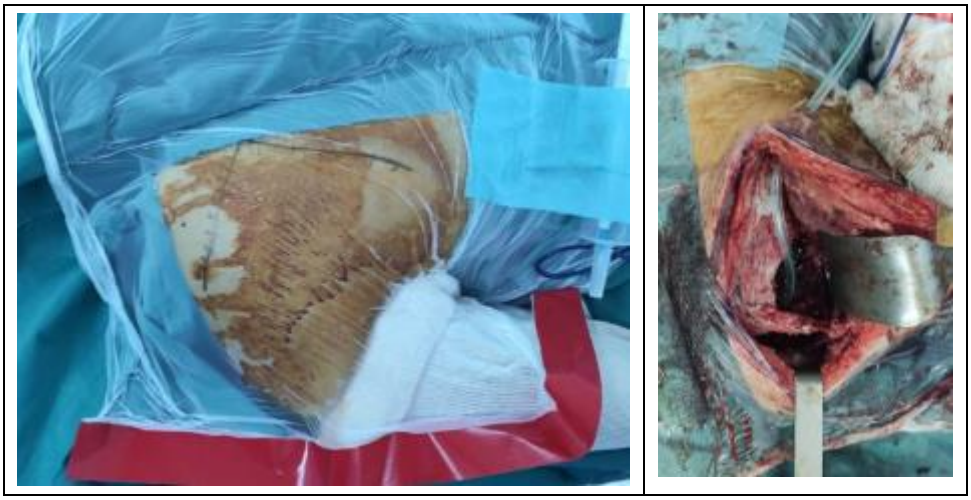

Figure 3 Intraoperative images showing curettage of the posterior component of the tumor

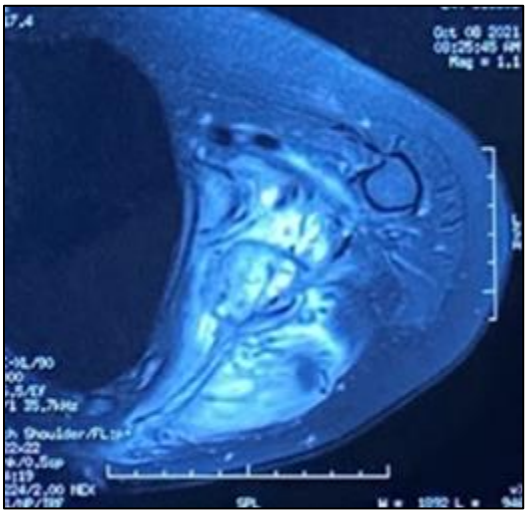

Figure 4 Follow-up MRI demonstrating recurrence of the tumor.

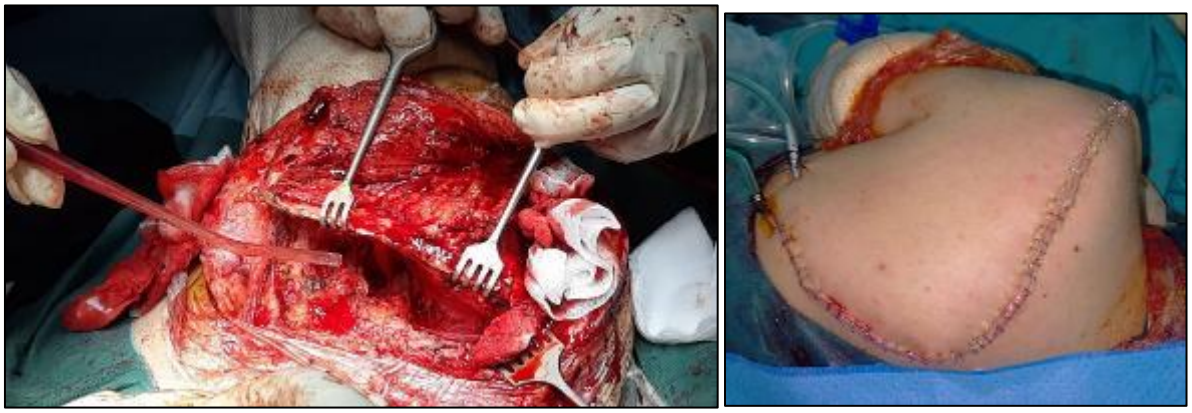

Figure 5 Intraoperative images demonstrating total scapulectomy with humeral suspension

Figure 6 Functional outcomes at 6 months after total scapulectomy

4. Conclusion

Aneurysmal bone cyst of the scapula remains an exceptionally rare entity, posing both diagnostic and therapeutic challenges. Intralesional curettage is the most commonly employed treatment approach and generally provides satisfactory outcomes. However, given the risk of recurrence, regular postoperative follow-up with magnetic resonance imaging (MRI) is strongly recommended to allow early detection of any residual or recurrent lesion.

Compliance with ethical standards

Disclosure of conflict of interest

We declare that no author has any conflict of interest in relation to this manuscript.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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