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Case Report

Chondroblastoma with Atypical Features

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Abstract

Chondroblastoma (CB) is a rare bone tumour usually occurring in long bones of males in the second decade. Though these are considered benign, rare cases show aggressive behaviour and metastases. However, there are no defined histological criteria to diagnose aggressiveness, except soft tissue (ST) infiltration. With the identification of specific immunohistochemical and genetic signatures, recent research has nurtured the concept of malignant CB and raised concerns that malignant CBs are being frequently misdiagnosed.

Here we report a case of a CB with unusual features, in a 62-year-old woman which includes rare location in the scapula, recurrence following a long period after excision, extensive soft tissue invasion, and predominant small round cell morphology. This case intends to add to the limited literature on aggressive CB as well as to the evolving concept of malignant CB. The case also highlights the importance of follow up of patients with CB preventing mutilating surgery.

Key words: aggressive chondroblastoma, atypical chondroblastoma, Malignant chondroblastoma

Introduction

Chondroblastoma(CB) is a benign cartilaginous tumour comprising less than 1% of bone tumours[1]. It usually occurs in patients with immature skeletons, predominantly in the long bones of males between second to third decade. Flat bones of skull, pelvis, ribs, patella, sternum, clavicle and vertebrae are the other known sites of involvement [1,2]. Though CB is considered a benign tumour, diverse behavior including recurrence, locally-aggressive growth and metastasis have been reported [3,4,5]. The recurrences are usually due to incomplete excision. Rare primary and recurrent CB can show extensive soft tissue involvement simulating malignancy. This aggressive behaviour could occur in recurrences or in the primary tumour. There are no defined factors or morphological features which can be utilized to predict such behaviour.

The concept of malignant transformation of CB/ malignant CB is yet to be accepted. Although these entities confirmed by molecular studies have recently been reported raising concerns of misdiagnosis of these in the past [7].

Case report

A 62-year-old woman presented with a lump over the right scapula which had recurred after 20 years. The initial histological diagnosis had been CB which was managed surgically with no irradiation. The present imaging showed multiple expansile lytic lesions in the scapular blade and few lytic lesions in the humeral head. These lesions showed significant destruction of the scapular blade with soft tissue involvement. The overall radiological appearance was in favour of recurrence of a chondroblastoma (Figure 1). Intraoperative findings also raised the suspicion of soft tissue involvement.

We received a curettage specimen comprising several small brown pieces of tissue, of which the largest measured 32x30x10mm. The histology showed a cellular tumour comprising sheets of small to medium rounded tumour cells with scant cytoplasm and hyperchromatic nuclei. There were areas exhibiting the classical histology of CB displaying oval to polygonal cells

with grooved nuclei, eosinophilic cytoplasm and distinct cell borders. Eosinophilic chondroid matrix and osteoclast-like giant cells were evident focally. Pericellular chicken-wire calcification was identified. The mitotic activity was 3-5/10HPF with no atypical forms. The tumour infiltrated the adjacent soft tissue (Figure 2). There was no necrosis or lymphovascular invasion. DOG1 and S100 immunostains were positive in the tumour cells.

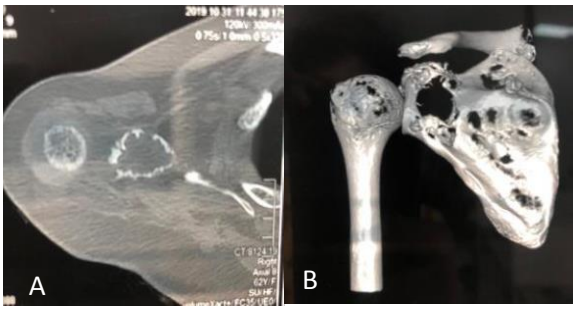

Figure 1: *Axial CT section (A) and reconstructed image(B) of the right shoulder showing multiple expansile lytic lesions in the scapular blade and few lytic lesions in the humeral head. Some of the lytic lesions show significant destruction of the scapular blade.*

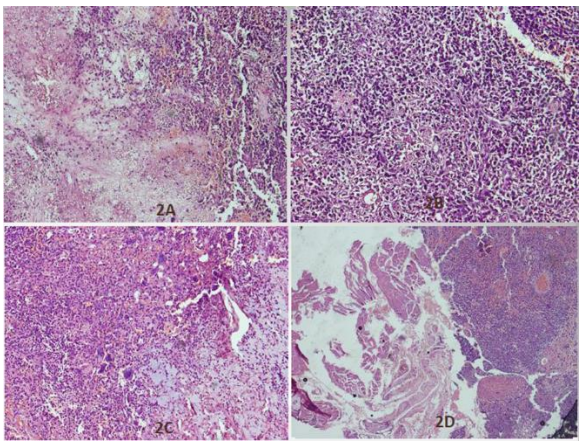

Figure 2: *Microscopy of the tumour*
A: Cellular tumour comprising sheets of small-medium sized rounded tumour cells (H and E x10), B: Chicken wire type calcification around tumour cells (H and E x40), C: Areas with well-formed chondroid matrix and osteoclast like giant cells (H and E x20), D: The tumour infiltrates the soft tissue (H and E x10).

Considering the soft tissue involvement seen on imaging and intraoperative findings confirmed by histology, the tumour was regarded as a CB with aggressive behavior.

Discussion

CBs are typically benign tumours. The essential diagnostic criteria of this lesion as defined in the latest edition of the 'WHO classification of soft tissue tumours' are the epiphyseal/apophyseal location, arrangement of chondroblastic cells in sheets, the presence of an eosinophilic chondroid matrix and osteoclast-like giant cells [1]. However, the cells in this case had a predominance of small cells challenging the histological diagnosis by the mimicry of other bone tumours with small cell morphology. The differentiation of CB from these other differentials is mainly based on the identification of the above described classic histological features and the other desirable features such as presence of pericellular chicken wire calcification without apparent cytological atypia.

In an elderly patient with a cartilaginous tumour, chondrosarcoma is an important differential to be considered. Atypical chondrocytes lying in lacunae, multinucleation, and the presence of hyaline cartilage in a chondrosarcoma are helpful in differentiation.

Giant cell tumour of bone and chondromyxoid fibroma are two other lesions that come into the differential diagnosis of CBs. S100, DOG1, SOX9 immunostains are known to be expressed in CBs and can be helpful but their utility in confirming the diagnosis of CB is limited due to the low specificity of these stains[2].

However, the recent advancement in molecular studies have identified K36M mutation in either the H3F3A (a gene that encode histone 3 family 3A protein on chromosome 1) or H3F3B (a gene on chromosome 17 encoding histone 3 family on 3B Protein) genes[6]. These alterations are found in 95% of CBs, with most cases harbouring the mutation in the H3F3B gene. The use of genetic testing or demonstration of this mutation using the monoclonal antibody (H3K36M) which appears to be highly specific for CB could be revolutionary in a challenging scenario [2,7].

The curative treatment for majority of these cases is surgical curettage with or without adjuvant treatment of the surgical bed [3]. As in our case, rare CBs can behave aggressively.

10-15% of CB are known to recur [2,8]. Some studies have found the recurrence rate to be as high as 35% [3]. The rate of recurrences have shown to vary from site to site with the highest being in the flat bones. Incomplete excision could be the most likely reason for local recurrence. However, whether there is a difference in the aggressiveness of CB depending on the site is yet unanswered. The primary and recurrent CB can show extensive extra-cortical ST involvement simulating malignancy on radiology [5,9]. Aggressiveness could occur in recurrences or as an inherent property of the tumour. However, there are no defined histological criteria to predict aggressive behaviour, except soft tissue infiltration.

Some CBs may even metastasize and majority of such have led to indolent lung metastases[4,10]. Although there are some reports on malignant transformation of CBs and/or malignant CB, this concept is not yet accepted and has not been included in the latest edition of WHO classification of bone tumours [1]. However a group of soft tissue pathologists from the United States have recently published a study on clinicopathological characterization of malignant CB including 7 malignant CB's[7]. The study clearly raises concerns that malignant CBs are being frequently misdiagnosed as chondroblastoma-like osteosarcoma, benign CB or chondrosarcoma considering the overlap of features among these entities [7]. The same study highlights that a case of malignant CB gave rise to widespread metastases leading to the death of the patient. In their view H3K36M IHC appears to resolve the common dilemma of differentiating between malignant CB and chondroblastoma-like osteosarcoma.

Conclusion: As the histological features of aggressiveness are not defined in CB, it is important to perform staging chest radiology at the initial presentation and to follow up the patients diagnosed with CBs to prevent mutilating surgery.

The authors also suggest that histopathologists should be cautious in reporting CBs with atypical features in this era where the concept of 'malignant chondroblastoma' is evolving.

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