Calcaneal Osteosarcoma

R.A. Flavin¹(✉), AFRSCI, R. Landers², M.B.B.C.h.MRCPath, I.M.G. Kelly³, FRRRC.SI.FRCR, I.P. Kelly¹, M.C.h. FRSCI.

¹ Dept. of Trauma & Orthopaedics,  
² Dept. of Pathology  
³ Dept. of Radiology  
Waterford Regional Hospital, Waterford, Ireland.

Correspondence:  
Tel: +353 87 7990406  
e-mail address: flavin.r@O2.ie

Case report

A 20-year-old lady presented with a ten month history of right heel pain and swelling. On clinical examination there was localized tenderness over the sinus tarsi and the calcaneocuboid joint. Plain radiographs and calcaneal CT scan showed a large osteolytic lesion within the calcaneus, extending to the calcaneo-cuboid joint. Appearances were suggestive of a benign lesion. Biopsy showed two predominant cell types, namely
multinucleated giant cells and uniform oval mononuclear cells on a background of fibrovascular stroma. The differential diagnosis included a benign Giant cell tumour or a Brown tumour of bone. Serum calcium was normal. Excision and curettage of the cyst and packing with allograft bone was performed. Intraoperatively, the gross appearance demonstrated a necrotic type tissue arising from the anterior process of the calcaneus through to the articular surface of the calcaneo-cuboid and the subtalar joints. Histology demonstrated a primary bone tumour showing areas of Giant cell tumour with numerous mitoses consistent with a malignant Giant cell tumour or a giant cell rich osteosarcoma. The histology was referred to a specialist pathology unit and the specimen was reviewed and a diagnosis of a malignant giant cell tumour was made. Staging studies were negative for metastasizes. Six weeks later, a right Below Knee Amputation was performed and the final histology of the specimen demonstrated evidence of transformation from a malignant giant cell tumour to an osteosarcoma.

**Discussion**

Giant cell tumours are primary tumours of bone, accounting for 5% of all bone tumours and 22% of benign bone tumours [4]. They have a slight predominance for males and have a peak incidence between the third and fifth decade. They occur predominantly in the metaphysis and epiphysis of long bones, with approximately 50% of all Giant cell tumours occurring around the knee [12]. Other less common locations are the radius and the small bones of the hand and foot. Despite being a benign lesion, Giant cell tumours have the capacity to metastasize, primarily to the lungs, however this is rare occurring in less than 1% of cases. A small proportion of these tumours can undergo malignant change, which occurs in 1.5-13% of cases [2,6,10,14], and further malignant transformation to osteosarcoma has been reported in
approximately 1% of cases\(^5\). Only four calcaneal osteosarcomas have been reported in literature to date [1,3,7,13].

Gee and Pugh described the classic radiographic features of a Giant cell tumour as an expanding zone of radiolucency situated eccentrically, usually in the end of a long bone of an adult. It usually extends to the articular cartilage and can destroy the bone cortex and extend into the surrounding soft tissues. Our patient’s radiographs shows classic features of a Giant cell tumour (fig 1).

![Fig.1: Lateral radiograph of Calcaneus](image)

The biopsy suggested a benign Giant Cell tumour, showing characteristic multinucleated osteoclastic-type Giant cells, with round to oval/spindle shaped nuclei. Mitotic activity is seen in most Giant cell tumours and has little prognostic significance [5].

On gross pathology, post excision, the lesion was typically Giant cell in origin, as it was soft friable dark tissue, with associated cystic and necrotic like tissue. However the pathology post excision showed malignant change, which occurs in 1.5-13% of cases of Giant Cell tumours [2,6,10,14], with further conversion to osteosarcoma as seen in approximately 1% of benign
Giant cell tumours [11]. The question of whether an osseous lesion is benign or malignant and the interpretation of non-neoplastic conditions simulating a malignant tumour has been a difficult for histopathologists. Dahlin et al, recommends that these tumours should be reviewed in specialist centers were these tumours prevail [4].

The prognosis of these tumours still remains poor, with the overall survival rate depending on the specific type of osteosarcoma. The two-year survival rate varies between 15-20% for all osteosarcomas [4,9]. However with the advent of neoadjuvant and adjuvant chemotherapy survival rates have increased to 60-70%, depending on the response of tumor to neoadjuvant chemotherapy. If the response is greater than 90% tumour necrosis, the chance of survival is 90% [8].

With regards to this case, the question of whether a true transformation from a benign Giant cell tumour to an osteosarcoma must be raised. The initial biopsy may have been misinterpreted due to the size of the sample or due to the difficulty in determining the difference between benign and malignant Giant cell tumours. This supports Dahlin in the principle that these lesions should be managed in specialist centers.

References


