Chondroblastoma of the distal femur - management with excision and allograft reconstruction

SUJAY SUSIKAR
Department of Surgical Oncology,
KILPAUK MEDICAL COLLEGE AND HOSPITAL

Abstract:
Chondroblastoma is a rare primary benign tumor of bone commonly affecting older children around the knee, hip and shoulder. The tumor usually involves the epiphysis before closure of the physis. Chondroblastoma can be treated with simple curettage, bone grafting, and possible cementation using similar techniques as for giant cell tumour surgery. These techniques are however plagued by problems such as recurrence, growth disturbances with limb length discrepancy and resultant deformity. We report a 16 years old teenage girl who presented to us with chondroblastoma of the distal femur which was managed with wide excision of the bone lesion and allograft bone grafting using cadaveric femoral head fixed in place with a plate and screws. This resulted in good integration and good function and range of motion.

Keyword: chondroblastoma, distal femur, wide excision, cadaveric allograft,

Introduction:
Chondroblastoma is a rare primary benign tumor of bone with a relatively high incidence in older children (1). The knee, hip and shoulder are most common affected areas (2). The tumour usually involves the epiphysis before closure of the physis (3). Ninety percent of patients are between the ages of 5 to 25 years. Males predominate with a ratio of 3 to 2. There can be functional impairment and growth disturbances as the tumor is usually localised near a joint or growth plate. There is also a high rate of recurrences. Metastasis of a histologically benign chondroblastoma is rare (4). The suggested treatment for aggressive chondroblastoma ranges from simple curettage to wide resection with structural reconstruction (1).
Case Report:
We report a 16 years old teenage girl who presented with 6 months history of right knee pain and swelling. She had severe pain over the right knee radiating up the thigh. It was associated with night pain and rest pain. It had progressively increased in intensity. Now she found it difficult to squat and stand for long periods of time. There were no constitutional symptoms such as loss of weight or appetite. There was no history of exposure to Tuberculosis. Examination revealed a swelling involving the posterior and medial aspects of her right knee. It was firm, fixed, warm and tender on deep palpation. Active range of motion of the knee was 10 to 50 degrees.

Radiographs done showed an osteolytic lesion in the distal epiphysis the femur extending into the physis. Magnetic resonance scanning done showed a heterogenous lesion within the medial condyle of the femur, extending up to the physis and a break in the medial cortex of the femur.

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An open incision biopsy had been done prior to referral to us and the histopathological report confirmed the clinical diagnosis of chondroblastoma. We proceeded with a wide excision of the bone lesion and allograft bone grafting using cadaveric femoral head bone grafts fixed in place with a plate and screws. Post operative specimen radiographs were used to assess the completeness.
Operative picture Tumor excision

Operative picture Tumor excision

Cadaveric allograft
Postoperatively, patient was put on full length plaster of Paris cast with knee kept in extension. Isometric quadriceps muscle and straight leg raising exercises were initiated on the second postoperative day. The cast was removed two weeks after the surgery. Active and active assisted range of motion exercises were initiated at that time. Three months after the surgery, patient is ambulating with full weight bearing without pain and a good range of flexion from 0 to 100 degrees and radiographs show good integration of the allograft.
Discussion:
Chondroblastoma constitutes a very rare bone tumour entity (1,5). It is the most common primary epiphyseal tumor in children. Most commonly arises between ages 10 to 30. These lesions are distributed widely in the skeleton, but mostly involving the epiphyses or apophyses regions. Most lesions occur in the proximal part of the tibia (17%) and the proximal part of the humerus (15%). Other regions that are commonly affected are the distal femur and pelvis. It may also occur in the apophysis of the greater trochanter. It commonly affects males more than females. In the literature, there are only three types of tumours that involve the physis. They are chondroblastoma, Giant cell tumour of the bone, and clear cell chondrosarcoma. Other possible differential diagnosis would be epiphyseal osteomyelitis. Chondroblastomas are generally well circumscribed lesions limited within the epiphysis. The radiographic appearance is usually suggestive of the diagnosis. The lesion is usually seen as an oval intramedullary tumour with distinct margins. A key diagnostic feature is its almost invariable location within an epiphysis or an apophysis. Other common features are expansion, sclerotic rim, and matrix calcification. Penetration through the cortex into the soft tissues is seen only in a small percentage of cases (6). The adjacent cortex is normal in only 15% of tumors (advanced and stage III lesions) (6). Three fourths of the tumors result in erosion and thinning of the involved cortical bone. Cortical destruction is unusual, occurring in 10% of cases (7). The subchondral articular cortex is thinned to less than 5 mm in slightly more than half of the cases. The cortex is normal in 41% and completely destroyed in at least one region in up to 5% of cases (1,6,7). Regional epiphyseal plate expansion has also been observed. Thinning of subchondral bone, and close proximity to the articular cartilage may cause excessive fluid collection in the knee. Chondroblastoma in soft tissues tends to be well circumscribed and usually has a shell of ossification (1). Hence complete resection of the lesion is not difficult. Predominant secondary aneurysmal bone cyst like changes has been noted in up to 15% of chondroblastoma cases (6). Some authors have suggested that recurrences are more common when aneurysmal bone cyst changes are present (1). Treatment for chondroblastoma consists of simple curettage, bone grafting, and possible cementation using similar techniques as for giant cell tumour surgery (1,6). After intrallesional resection, reconstruction can be accomplished with autograft or allograft or both. When treated with curettage these tumours seem to have a higher rate of recurrence (6). Dahlin recommends that aggressive lesions (lesions with cortical erosion or cortical breakthrough) should be treated with wide cortical saucerisation and curettage. Cryotherapy or phenol can be used as adjuvants (1). Vascularised or cancellous autogenous grafts would give maximum bone incorporation but donor site morbidity limits their use. Limb length discrepancy and deformity have been reported after curettage of physeal chondroblastomas in children (3,6). Secondary aneurysmal bone cyst-like changes were seen indeed in more than one-third of all lesions reported. The term chondroblastoma suggests a benign cartilage-forming tumour, but in fact this epiphyseal lesion of childhood has a histological appearance that is more typical of the benign metaphyseal-epiphyseal giant cell tumour seen in young adults (1). Even though chondroblastoma is
considered benign, on rare occasions it can metastasize to the lung (4). Local recurrences after curettage range from 10% to 38%.

**Conclusion:**
Chondroblastoma is a relatively rare benign tumor of the physis affecting older children and wide excision with reconstruction using a cadaveric allograft is an attractive option achieving good integration and alleviating problems of growth and gait disturbances.

**References:**