Volume : 4 | Issue : 3 | March 2015 • ISSN No 2277 - 8179

Research Paper

Satisfactory outcome of autologous fibular grafting following reconstruction in giant cell tumour of first metacarpal

Medical Science

KEYWORDS : giant cell tumour, first metacarpal, fibular graft

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ABSTRACT

Although benign, Giant cell tumour (GCT) of the bone is a locally aggressive lesion, commonly affecting the epiphyseal ends of long bones after skeletal maturation. In the hand bones, GCT runs a further rapid course, often showing whole bone involvement and cortical breach at presentation, along with significant functional deficit. The extent of the tumour at the time of diagnosis and the high recurrence rate reported after simple curettage or limited resection often dictate the need for an en bloc resection through normal tissues. The first metacarpal represents a rare site for GCT occurrence, and also a challenging reconstructive problem after such treatment. Among the various available treatment options aimed at preserving metacarpophalangeal joint mobility include metatarsal substitution, a combined iliac crest and metatarsal head graft and prosthetic replacement. However, in patients with low functional demands, simple substitution with a fibular autograft can provide satisfactory results.

Introduction

Giant cell tumours (GCT) in the bones of the hand comprise only 3% of all Giant cell tumours.1 Although the epi-metaphyseal region of the metacarpals is the site of origin for most of these tumours, the first metacarpal still represents a rare site of occurrence, with only isolated case reports being published in literature.2-6

As the hand has restricted free space, expansion of bone may give rise to pain, loss of function or significant swelling.7 Most tumours exceed 3-6 cm in length and enlarge rapidly, usually bulging beyond the confines of the cortex, and give an expanded contour without periosteal reaction. Analysis of radiographs and interpretation of these features lead to a specific and correct histopathological prediction most of the time. CT scan and MRI has limited role in GCT of hand. MRI may be useful in determining joint involvement, as these tumours often are juxta-articular and break through the cortex at the time of presentation.8 However, biopsy alone can give definitive diagnosis.9

The goals in treating Giant cell tumour of the hand are to obtain local tumour control, restore hand function and maintain good cosmoses.6 However, recurrence has been noted in over 80% of giant cell tumours of hand after simple curettage and bone grafting.3 The extent of the tumour at the time of diagnosis and the high recurrence rate after limited resection often dictate the need for an en bloc resection through normal tissues. Such treatment creates a significant skeletal defect and a challenging reconstruction problem, especially when the digit in question is involved in most gross and fine motor functions of the hand such as the thumb.

We present a case report of an aggressive giant cell tumour of the first metacarpal in a 60 years old male treated by en bloc resection and reconstruction using free fibular autograft.

Case report

A 60 years old male presented with a rapidly enlarging swelling of his left thumb and hand of 6 months' duration. There was no history of antecedent trauma. He complained of difficulty in carrying out hand functions owing to pain as well as restricted thumb mobility and dexterity, and also desired cosmetic betterment of his hand.

On local examination, there was a gross swelling of roughly 6 x 8 cm at the base of the left thumb, involving the radial aspect of its dorsal and palmar surfaces. The overlying skin was taut and shiny with dilated and tortuous veins present. There was local rise of temperature over the affected part. The tumour was soft-to-firm in consistency. The neurovascular status of the thumb seemed unaffected. Thumb movements were somewhat restricted and painful; the patient had difficulty in carrying out grasp and pinch functions of the hand along with thumb opposition.

Radiographs revealed lytic destruction of the first metacarpal. Normal anatomy of the bone was distorted, with irregular expansion and cortical breach at several places. Internal trabeculations were visible. Articular margins however seemed intact. There was increased soft tissue density in the first web space as well as tissue surrounding the first metacarpal. However, other surrounding bones seemed unaffected [Fig 1].



Fig 1: Initial radiograph of the affected hand.

Fine needle aspiration cytology (FNAC) revealed large numbers of osteoclast-like giant cells in a background of epithelioid to spindle shaped mononuclear cells consistent with giant cell tumour. Further evaluation in the form of CT scan or MRI could not be done

Volume : 4 | Issue : 3 | March 2015 • ISSN No 2277 - 8179

as the patient couldn't afford it financially. A decision to go for one-stage en bloc surgical resection with reconstruction was taken.

The procedure was carried out under general anaesthesia. Tourniquet was raised but the affected limb was not exsanguinated. Incision was made over the radial edge of the lesion. The tumour was excised en bloc along with surrounding involved tissue from the dorsal and palmar aspect as well as from the first web space. However the neurovascular bundles were found to be intact and were preserved. 5 cm of ipsilateral fibula was harvested from the midshaft and introduced into the defect created by the metacarpal resection. The articular margins of the trapezium and the proximal phalanx were freshened to receive the ends of the fibular autograft, and a single intramedullary Kirschner wire was used to hold the graft in place [Fig 2].



Fig 2: Immediate post-operative radiograph. The graft is well secured with an intramedullary Kirschner wire and the thumb protected in a Plaster-of-Paris spica cast.

Post-operatively the patient was kept in a thumb spica for a total duration of six weeks. The Plaster-of-Paris cast had to be changed on two occasions, once at two weeks to allow wound inspection and suture removal, and thereafter at four weeks to allow the Kirschner wire to be withdrawn. At six weeks when the cast was finally removed, the surgical wound had completely healed. Radiographs showed the fibular autograft maintained in proper position with early signs of incorporation with local bone. Clinically, the graft seemed stable on attempting passive thumb movements and manipulation. Sensation over the thumb seemed intact with two-point discrimination present and good capillary filling in the nail bed. The patient was encouraged to start active and passive thumb movements, and was kept on regular follow-up.

At six months' follow up, the patient had good hand and thumb function. Although he had lost some thumb opposition, he could grasp and pinch well [Fig 3], and had already resumed manual work including the use of a tube well. His movements were, for the most part, painless. Moreover, he was also satisfied with the cosmetic outcome of the surgery.



Fig 3: At 6 months' follow up, graft seems stable and well incorporated with local bone. Patient has satisfactory hand function, including good grasp strength and pinch.

Discussion

Giant cell tumour of the bone is a benign, but locally aggressive lesion. It is a relatively rare tumour composed of connective tissue stromal cells having the capacity to recruit and interact with multinucleated giant cells that exhibit the phenotypic features of osteoclasts.10 The precise histogenesis of the tumour is not known.

GCT commonly occurs at the distal aspect of the femur, proximal part of the tibia and the distal end of the radius.11,12 Involvement of the bones of the hands is uncommon (about 0.9 to 3.3%).13 GCT of the hand seems to represent a different lesion than conventional GCT in the rest of the skeleton. Overall they appear in a younger age group and recur more rapidly in the hand than they do in other locations. They also have a shorter duration of symptoms averaging six months or less before a diagnosis is made. Further, there is an 18% incidence of multicentric foci.14

The typical radiologic findings of giant cell tumour include; a well-defined, lytic lesion located in the epiphysis with some degree of trabeculation. The cortex is usually thinned and may show areas of destruction. Periosteal reaction is usually not observed.3,13,15

The macroscopic appearance is usually soft fleshy tan to light brown. On histologic examination, giant cells are seen uniformly distributed within a bland mononuclear round to oval stromal cell background. The presence of giant cells is not specific for the diagnosis of Giant cell tumour.15

Among the various treatment modalities described in literature include curettage with or without bone grafting, cryosurgery or cementation, irradiation, resection with reconstruction, and amputation.10,14 In hand GCT, surgical choices are also limited due to late presentation of cases and aggressiveness of the tumour. It is preferable to opt for local resection of the involved metacarpal with reconstruction using autograft or allograft for several reasons. First, no correlation has been found between the grade of giant cell tumour and the rate of recurrence. Therefore all giant tumours of the hand should be considered locally aggressive. In addition curettage with or without bone grafts has resulted in recurrence rates of more than 80%.3 Thus, curettage is an unacceptable form of treatment. Second, although ray amputation may prevent recurrence, it severely hampers hand function and is also cosmetically deforming.14 Finally, it is feared that multiple surgical procedures may increase the chances of converting a benign tumour into a more malignant one, and hence a definite procedure should always be the plan of treatment.16

In addition to tricortical iliac crest graft, use of free non-vascularised fibular autograft for metacarpal reconstruction has been documented and proven to give satisfactory results.17,18 For patients with low functional demands as in our case, it provides a viable treatment option. Further, in cases where metacarpophalangeal joint reconstruction is desired, the same can be achieved by metatarsal substitution, a combined iliac crest and metatarsal head graft5 and prosthetic replacement.19

Acknowledgements

The authors reported no conflict of interest and no funding was received on this work.

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