

Vascularized free fibular graft after excision of giant cell tumor of the distal radius

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Abstract:

Giant cell tumor (GCT) is a benign aggressive tumour with large osteoclastic like giant cells. It presents between the age of 20 to 45 years when the epiphyses have closed. Giant cell tumor usually affects the epiphyses of the long bones especially around the knee, proximal numerous and distal radius.

We present case of a 27 years old lady with dominant right hand presented with giant cell tumour of the left distal radius. Wider excision of the giant cell tumour of the distal radius done and left wrist joint reconstructed using ipsilateral vascularized free fibular graft.

Keywords: Giant cell tumor (GCT), osteoplast, epiphyses, vascularized free fibular graft

Introduction:

Giant cell tumor (GCT) of the distal radius poses problems for reconstruction after wide resection. The various modalities for the defect created are vascularized/non-vascularized bone graft, osteo-articular allografts and custom-made prosthesis including ceramic prosthesis and megaprosthesis. We report outcome of wide resection and reconstruction of the wrist with vascularized free fibular grafting in biopsy-proven giant cell tumor.

Case Report:

A 27 years old right-hand dominant lady with no comorbidities was referred for treatment of a giant cell tumor of the left distal radius. She had suffered with gradually worsening wrist pain and swelling for approximately 18 months without previous history of trauma. Symptoms were worse at night and function was poor. She was otherwise fit and well with no other complaints with no history of jaundice, chest problem, anorexia or weight loss.

This patient had history of curettage with iliac bone grafting performed 18 months back elsewhere, after which patient was lost to follow-up from the primary surgeon. Biopsy obtained from the curettage revealed multiple fragments of a

lesion composed of oval to polygonal mononuclear cell population with multinucleated giant cells, features favoring Giant cell tumor. After curettage, wrist pain and swelling temporarily subsided but recur gradually with time.

While presenting to us, on examination, patient had a tender, bony hard and diffuse left wrist swelling with the surgical scar at volar aspect (7 × 4cm). All movements of the left wrist were reduced secondary to pain. Wrist flexion and extension were limited to 15° each while radial deviation was absent and ulnar deviation was reduced to 10°. Pronation and supination were reduced to 10° each from neutral. In comparison to the contralateral side, clinically, grip strength of the affected limb was significantly decreased. No neurovascular deficit was present.

Radiographs of the forearm and wrist demonstrated a large expansile lytic lesion of the distal radius, suggestive of a giant cell tumour of bone (Figure 1). Staging revealed normal chest radiograph and normal CT scan chest. Bone scan showed no other lesion. MRI reported mass at metadiaphyseal area with thin posterior cortex with no infiltration into muscles or carpal bones. (Figure 2).

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Figure 1: X-ray film of left wrist joint showing the giant cell tumor

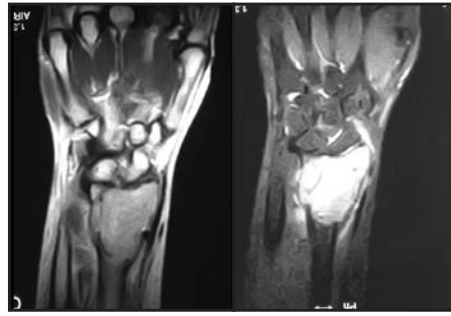


Figure 2: MRI film of left wrist joint showing the giant cell tumor with no infiltration into muscles or carpal bones



Figure 3: Specimen of the excised giant cell tumor



Figure 4: The radiocarpal space after complete excision of the tumour

It was decided that, in view of the stage of the lesion and the patient's age, resection of the tumor and subsequent reconstruction of the defect were to be performed using ipsilateral vascularized free fibular graft which articulated with the carpus.

Informed consent was taken. The tumor was widely excised en bloc with 2 cm safety margin having size of approximately 5 × 3 × 2cm (Figure 3) with preserved tumor free radiocarpal space (Figure 4). On histopathology report the tumor was completely excised with 0.6 cm away from resected bony margin. The defect, thus created in the radius was bridged by ipsilateral proximal vascularised fibular graft. Fibular graft site marking was done and graft of proper size taken (Figure 5 and 6).

At host graft junction, step cuts were made and fixed with a dynamic compression plate (DCP). Wrist ligament reconstruction and fixation of the head of fibula with lower end of ulna was performed using K-wire. (Figure 7 and 8) No tumor invaded the wrist joint so as to excise any

carpal bone. Postoperatively, an above elbow back slab immobilization was given.

Post-operative period was uneventful and K wire was removed 6 weeks after this surgery. Stability of the graft-ulnar joint was assessed under image intensifier and found to be satisfactory.

Discussion:

The primary aim of treatment of a giant cell tumor is to completely remove the tumor, avoid recurrence, and retain maximum possible function of the affected limb.^{1,2} En bloc resection offers the lowest recurrence rate of less than 10%.³

The use of autograft from various sites, with or without wrist arthrodesis, for the reconstruction

of the resulting distal radial defect has been reported with varying success. Vascularised and non-vascularised iliac crest, proximal tibia, proximal fibula, and distal ulna grafts have been utilized to fuse the wrist joint following tumor resection.^{4,5} Alternatively, successful arthroplasty of the wrist joint allows preservation of wrist



Figure 5: Marking of the fibular graft



Figure 6: Fibular graft of proper size taken



Figure 7: Dynamic compression plate used to reconstruct the wrist joint

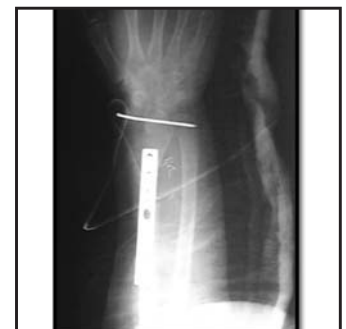


Figure 8: Fixation of the head of the fibula with lower end of ulna using K-wire

movement and this has been performed with proximal fibular autografts,⁶ cadaveric allografts, and prosthetic replacements.⁷

Distal radius reconstruction and radiocarpal fusion with autograft aims for secure union of the radius-graft and graft-carpus junctions, restricting movement at the wrist and elbow but yet maintaining satisfactory function.⁸ The use of a vascularized fibula flap offers an effective treatment after ablative resection of locally aggressive benign or low-grade malignant bone tumors. It allows a more radical resection of the pathology without concern for the reconstruction of the resulting massive defect.⁹

Nevertheless, such operations can be prolonged, particularly with vascularised grafts, and complications including nonunion, graft or junctional fractures, and donor-site morbidity are well reported. In addition, disruption of the extensor mechanism may occur.¹

Knee instability is a potential complication of harvesting the fibular head for such procedures. In the majority of cases involving fibular free flaps, the proximal head of the fibula is left intact at knee level to maintain stability and the distal fibula is retained to avoid problems with ankle instability.¹⁰ However, the inclusion of the fibular head in the autograft for carpal reconstruction created instability in the knee that was corrected with anchoring the remnant of the femoral collateral ligament and biceps femoris tendon to the lateral tibia. Potential donor site complications include chronic leg pain, lateral ligament laxity, leg dysesthesia, and foot.

Vascularised proximal fibular graft is reasonably congruous with distal radius as well as its incorporation as an autograft is more rapid and predictable. The limb function restores to an average 80% of normal function and bone union is achieved within six months in most of the patients with vascularised fibular graft.¹¹

Some of the risks and disadvantages involved in GCT resection with arthroplasty using a vascularized fibula free flap include a difficult and lengthy dissection, potential damage to vessels and nerves, donor and recipient site pain and scarring, ischemia to graft and distal structures, weakness, infection, instability of joint, tumor recurrence, and potential for additional surgeries in the event of complications.¹²

Conclusion:

Vascularised proximal fibular graft is reasonably congruous with distal radius as well as its incorporation as an autograft is more rapid and predictable graft for reconstruction of the hand.

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