Giant Cell Tumor Of Distal Radius: A case report and description of surgical technique

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Citation

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Abstract

Giant cell tumour of the distal radius is a relatively common tumour. It is associated with a high rate of recurrence. Thus it is usually treated with wide resection and fibular autograft replacement. The following is a report of such a case with description of the surgical technique.

INTRODUCTION

Giant cell tumor is a benign bone tumor. It is locally aggressive with low metastatic potential. 10 percent of these lesions appear in distal radius. This is the 3rd commonest site for this tumor after proximal tibia and distal femur.

The goal of treatment of this tumour at the distal radius is complete removal of the tumour and reconstruction of the bone defect in order to preserve maximum function of the wrist joint. Patients with a primary giant cell tumor of bone in the distal radius are usually young adults. Therefore it is important that they have as much function as possible in the affected extremity. Treatment consists of either extended curettage followed by packing of the cavity with bone graft or methylmethacrylate cement, or resection of the lesion followed by reconstruction with autograft or allograft.

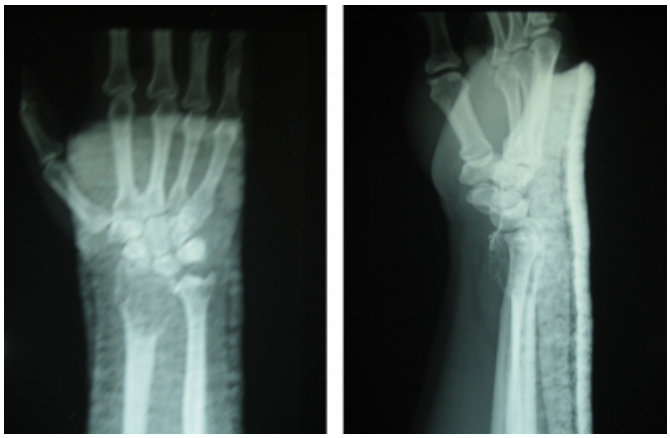
CASE REPORT

This is a 50 years old gentleman who works as a laborer presents with sudden onset of pain and swelling over right wrist. He relates his symptom to a trivial injury to the wrist while working. His symptoms become increasingly worse over the past 2 weeks prior to admission. Examination revealed a tender swelling over right wrist. The overlying skin was normal. Range of movement for the right wrist was limited due to pain.

A plain radiograph of the wrist revealed an expanded osteolytic lesion at the distal right radius. The lesion occupied both the epiphyseal and metaphyseal areas. The bone cortex was thinned and ballooned and there was an area of cortical breakthrough over the volar aspect of the distal radius (figure 1).

Figure 1

Figure 1: Anteroposterior and lateral view of right distal radius showing a balloned out cortex. The lesion extends from the metaphysis extends to epiphysis and joint surface.



A radiological diagnosis of giant cell tumor Campanacci grade 3 was made and a needle biopsy was performed. The biopsy confirmed the diagnosis of Giant cell tumour of the distal radius. He subsequently underwent a wide excision of distal right radius and autologous fibular grafting.

OPERATIVE PROCEDURE

The surgery was performed in 3 stages.

STAGE 1: HARVESTING OF FIBULAR GRAFT (NON VASCULARISED)

Tourniquet applied on the contralateral thigh. A Posterolateral incision is made along the proximal half of the fibula and curved medially toward popliteal fossa. The

common peroneal nerve is identified and protected. The plane between the lateral head of the gastrocnemius and the soleus is entered. The fibula bone is exposed and carefully dissected. The dissection is done very close to periosteum as the anterior tibial vessels and deep peroneal nerve are in very close contact with the bone. Once an adequate length of the fibula is been exposed, it is osteotomised. The distal end of the proximal fibula then is held using bone holder and intraosseous membrane is divided using scissor from distal to proximal to complete the excision.

STAGE 2: EXCISION OF TUMOR

Tourniquet is applied on the right arm. An anterolateral incision is made along the distal third of right radius. The biopsy tract is included in this incision. The radial artery is identified and protected as the radius is expose proximal to the tumour. The dissection of the forearm muscles is carried out subperiosteally along the proximal part of the radius. This is to avoid damage to the blood supply of the flexor muscles. The Pronator Quadratus muscle provides is an effective barrier between tumour and the flexor tendons. This muscle helps to contain the tumour. The tumour in the distal radius is mainly supplied by the anterior interosseous vessels. This vessel is identified and ligated. This is to avoid tumour embolization during manipulation of the tumour. The radius is osteotomised proximally so that the distal radius can be manipulated during the excision. As the dissection is continued distally, the flexor tendons are separated from the distal radius with a good margin of healthy soft tissue including the Pronator Quadratus, which is left attached to the volar aspect of the distal radius. For the dorsal dissection, the distal radius is grasped with Bone holder and lifted volarly and the extensor tendons are separated from the distal radius and only fibrous sheaths enclosing the extensor tendons are divided.

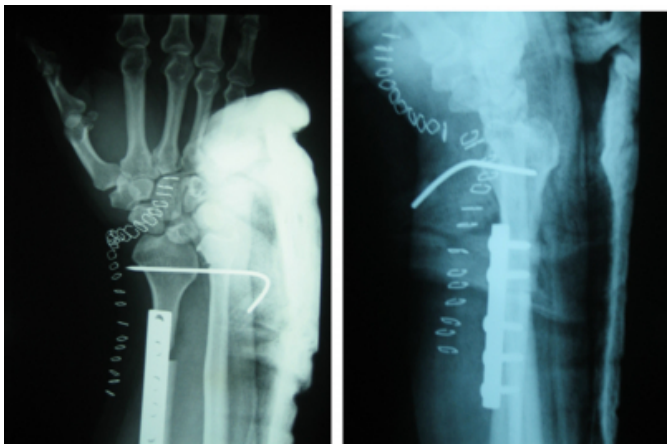
STAGE 3: FIXATION OF THE FIBULAR GRAFT TO THE WRIST JOINT

The fibular graft is adjusted into the correct length in the wrist. This is important because if the graft to long it will cause ulna minus and predispose to subluxation of the wrist joint. The fibula graft is placed in way that the carpal bones are well supported by the fibular head. The fibular head should be in direct contact with the scaphoid and there should be no volar or dorsal subluxation. Plating was done to secure the fibular graft to the remaining radius. A transverse K wire through the fibula and ulna is used for additional fixation and to help maintain the fibula and ulna in close approximation (Figure 2).

Wound is closed without tension and a below elbow slab is applied.

Figure 2

Figure 2: Anteroposterior and lateral view of right wrist after operation.



Thermoplastic splint is applied to the right wrist. Physiotherapy is commenced immediately after the surgery, starting with hand therapy. Wrist physiotherapy is commenced at 6 weeks post surgery.

DISCUSSION

Giant cell tumor of bone may present with pain over the joint, effusion and swelling. About 10-15 % patient will present with pathological fracture. This tumour is locally aggressive and has a high incidence of recurrence. It can also metastasize to the lung (less than 2 %).

Ten percent of the giant cell tumor of bone involved the distal radius. The goal of treatment in this type of patient is not only to completely resect the tumor but also have to maintain the function of the upper limb.

In this patient, it's a Campanacci grade 3 tumour. A variety of treatment have been advocated for giant-cell tumor of bone, including curettage, curettage and bone grafting, cryotherapy of the cavity after curettage, application of phenol after curettage, insertion of methylmethacrylate cement in the cavity after curettage and resection followed by allograft, autograft or prosthetic reconstruction. Historically, simple curettage of giant-cell tumor is associated with a 40 to 50% rate of local recurrence. Adjuvant treatment of bone bed with liquid nitrogen or phenol after removal of the tumor has been advocated to decrease the risk of local recurrence. Liquid nitrogen results in effective osteonecrosis to a depth of 1 to 2 centimeters. The extend of the osteonecrosis induced by liquid nitrogen is

difficult to control, thus it may weaken the bone and lead to a fracture. Phenol has been advocated as a safer agent than liquid nitrogen for adjuvant therapy. Phenol causes protein coagulation, damages DNA, and causes necrosis. Preventing leakage of Phenol in the extensive cortical disruption while at the same time allowing adequate saturation of the bone with the chemical is difficult and the leakage can potentially be harmful. Phenol is toxic to the nervous system, the heart, kidney, and the liver. It is readily absorbed through skin, mucosa and open wounds.

The technique of intralesional curettage followed by packing of the defect with methylmethacrylate has become popular. The free radicals and the thermal effects of the polymerization reaction can cause necrosis as much as 2 or 3 mms in the cancellous bone. Additional advantages of the use of cement include low cost, ease to use, lack of donor-site morbidity, and elimination of the risk of transmission of disease associated with the use of allograft bone, immediate structural stability and potential for earlier detection of local recurrence.

After the resection of a lesion that is not amenable to curettage, techniques of athroplasty have been employed in an attempt to preserve motion at the wrist joint. A lower rate of recurrence has been noted after resection of the distal part of the radius compared with curettage, especially when the tumor has broken the cortex or when there has been rapid enlargement of the lesion or a local recurrence. After resection, the defect has been reconstructed as an arthroplasty or an arthrodesis involving use of either vascularised or non vascularised bone bone grafts from the tibia, the proximal part of the fibula, the iliac crest, or the distal part of ulna. Other procedures that have been used to fill the defect have included use of an osteoarticular allograft, custom made prosthesis and transposition of the carpus onto the distal part of the ulna to create a one bone forearm.

Although there are advantages to the use of vascularised bone grafts, non vascularised bone graft were successfully employed in the few series. The advantages of vascularised graft may be less important in the distal radius, due to its relatively short length of resection and graft.

Resection with wrist reconstruction using autogenous fibular grafting enables the patient to achieve some function at the wrist as compared to fusion. Most patients can return to useful employment despite their functional limitations. Wide resection with fibular grafting also caries the risk of complications related to the graft such as non union, graft fracture, residual subluxation of the carpus, degenerative oeteoathrosis, limited wrist movement and pain. There can also be donor site complicatins such as chronic leg pain, lateral ligament laxity, leg dysesthesia and foot drop.

References

1. Vander Griend RA, Funderburk CH. The treatment of giant-cell tumors of the distal part of the radius. J Bone Joint Surg Am. 1993; 75:899-908.
2. Schajowicz F. Giant-cell tumors of bone (Osteoclastoma): A pathological and histochemical study. J Bone Joint Surg Am. 1961; 43: 1-29.
3. Murray JA, Schlafly B. Giant-cell tumors in the distal end of the radius. Treatment by resection and fibular autograft interpositional arthrodesis. J Bone Joint Surg Am.1986; 68:687-694.
4. Pho RW. Malignant giant-cell tumor of the distal end of the radius treated by a free vascularized fibular transplant. J Bone Joint Surg Am. 1981; 63:877-884.
5. O'Donnell RJ, Springfield DS, Motwani HK, Ready JE, Gebhart MC, Mankin HJ. Recurrence of giant-cell tumors in the long bones after curettage and packing with cement. J Bone Joint Surg Am. 1994; 76:1827-1833.

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