

THE USE OF NONVASCULARIZED PROXIMAL FIBULAR ALLOGRAFTS FOR GIANT CELL TUMOR OF DISTAL RADIUS

(Received 2 March, 1993)

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SUMMARY

Two patients with a recurrent giant cell tumor of the distal radius were treated by "en bloc" resection and replacement of the resected segment with an ipsilateral autogenous fibular graft. The mean follow-up period is 3.5 years. There is no local recurrence, graft failure or distant metastasis. Patients obtained a painless, stable wrist joint, with excellent functional results. This procedure can restore a functionally useful wrist.

Key Words : Giant cell tumor, Autogenous fibular grafts.

INTRODUCTION

Reconstruction of bone defects after primary bone tumor removal is a challenge for the orthopaedic surgeon, particularly when satisfactory functional results are considered. Distal radius is the third most common location for giant cell tumor. About 10 percent of giant cell tumor cases develop at this site. The tumor is clinically benign but often locally aggressive and has a tendency toward local recurrence (1-5).

Curettage and bone grafting is the first step treatment for most lesions. Thus, the integrity of the wrist joint can be maintained. In many reported series, local recurrence of the lesion after curettage and grafting is relatively high and between 40-80 percent. For the recurrent aggressive tumors, marginal and wide resection appears to be the preferred treatment (1-5).

In 1911 Walther was the first who described the

proximal fibular transplant in a distal radius primary bone tumor resection (6,7). Since then, various reports regarding the treatment of defects after removal of the distal radius with giant cell tumor have been appeared in the literature.

These numerous reports include, filling the defect by a free iliac bone graft (1,2,5), using the proximal medial portion of the tibia as a free autogenous graft (8), allograft replacement (9), distal ulnar translocation (10), prosthetic replacement which is proved to be unsatisfactory (11), free vascularized fibular transplant (12) and finally free nonvascularized autogenous proximal fibular graft (6,7,13,14). In all these reports, results in varying success rates are obtained. When these lesions are small they respond to curettage and bone grafting well. However most of giant cell tumors are asymptomatic when in small sizes and come to medical attention only after attaining considerable size and virtually destroying the bony support for the adjacent articular surface. To ensure the lowest rate of recurrence, marginal or wide resection is indicated.

In this report we present two patients who were treated with resection of the distal radius for giant cell tumor followed by reconstruction with an articulating nonvascularized proximal fibular autograft.

CASE REPORTS

CASE 1 A 22-year-old right handed man presented with a painful swelling of the right wrist. He had had curettage and autogenous iliac bone grafting 13 months previously with the diagnosis of a giant cell tumor. On admission his wrist was painful and the

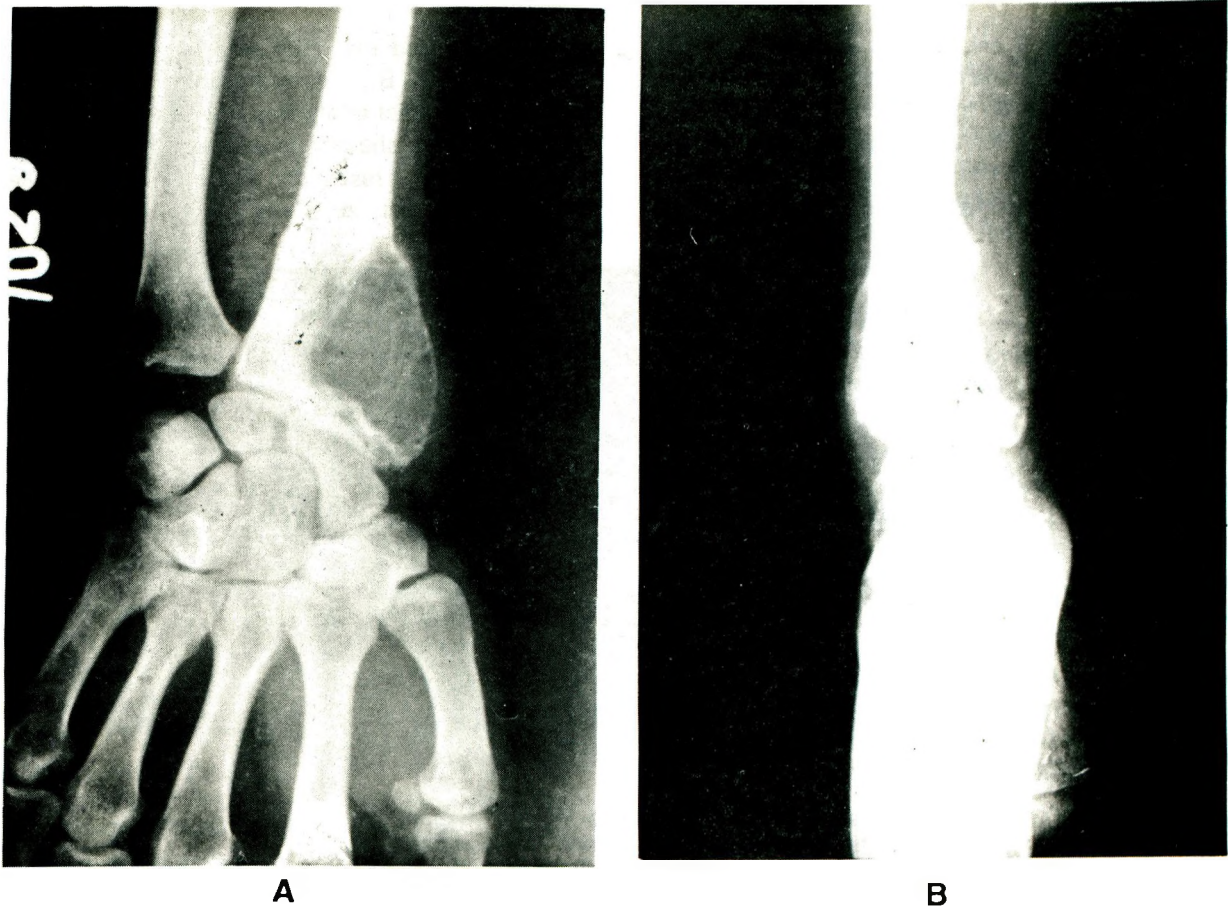


Fig. 1 (Case 1) (A) Anteroposterior roentgenogram of distal radius showing recurrent giant cell tumor. The tumor reaches to the subchondral bone and shows expansion. (B) Lateral view of the same lesion. The tumor shows destruction in the volar aspect of the cortex and extends in to the soft tissues.

motions were limited X-rays revealed an osteolytic, radiolucent lesion located in the distal metaphysis of the radius reaching to the subchondral portion of the bone. The tumor was eccentrically located indicating a destruction in the lateral and volar aspects of the cortex (Figs. 1A and B).

Review of the previous slides confirmed the histologic diagnosis of a giant cell tumor. Total body scan showed no evidence of metastasis or a second focus. Arteriographic examination of the right upper extremity indicated the radial artery was free of tumor.

Surgical approach : Under the pneumatic tourniquet control, a curving dorsal longitudinal incision is used. The incision was planned in order to incorporate the biopsy tract. If the tumor has perforated the cortex and involves the soft tissues they are dissected en bloc with the tumor. The distal radius is then

osteotomized 1 cm. proximal to the proximal extend of the tumor. The distal radiocarpal and radioulnar ligaments are incised and stumps are preserved for lateral attachment to soft tissues. After the removal of the specimen a deep dissection is carried out to identify the reactive tissue plane between the lesion and normal tissues. By use of that reactive plane, lesions that extend outside the bone can also be subjected to marginal resection.

A proximal fibular graft is then harvested from the patient by utilizing the classic Henry approach. The integrity of the articular surface and proximal ligamentous insertions are preserved. For this purpose either fibula may be used, but an ipsilateral graft provides better approximation at the diaphyseal osteosynthesis when styloid placement is correct. There is a reasonable articular congruity between fibula and carpus without alteration and therefore it is better to preserve the cartilage.

Ipsilateral fibula in 7 cms long is used in this case. The graft is placed in the defect by placing the styloid portion of the fibula on the radiovolar portion of the carpus. The graft fixation was obtained with a compression plate. The remnant fibular collateral ligament is sutured to the radial collateral ligaments,

distal radius and the bone was almost destroyed (Figs. 4A and B). Arteriographic examination revealed the radial artery was free of tumor. A total body bone scan showed no evidence of metastasis. An "en bloc" resection and ipsilateral fibular graft replacement in 8 cm., long was used for

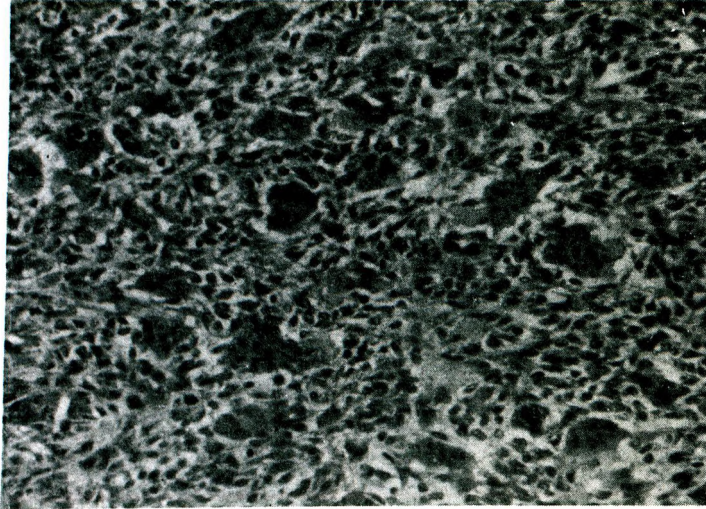


Fig. 2. (Case 1) Histologic sections revealed a giant cell tumor with multinucleated giant cells and mononuclear stromal cells. There is no evidence of malignancy (Hematoxylin-eosin, X 200)

and thus an arthroplasty between the head of the fibula and carpus has been carried out. Histologic sections revealed a giant cell tumor with no evidence of malignancy (Fig. 2). The arm was immobilized in a long arm plaster for 4 weeks and a short arm plaster for 8 weeks. A solid fusion at the proximal end of the graft was obtained in 7 months and splinting was discontinued. Clinically the patient remains free of pain for 4 years after the operation and uses his hand freely. His forearm pronation is 70% and supination 80% of the opposite normal with 30° of wrist dorsiflexion and 25° of palmar flexion (Fig. 3). The grip strength of the involved side was 80 percent of the strength on the uninvolved side.

CASE 2 : A 33 - year - old man presented with a painful large swelling of the right wrist. He had had two operations 37 and 21 months ago respectively. In the first operation an incisional biopsy was reported as consistent with a giant cell tumor of distal radius. The lesion recurred within 16 months after curettage and bone grafting. The second intervention was performed with an "en bloc" resection of the lesion followed by fibular graft reconstruction. The lesion recurred after 21 months. On admission, x-rays revealed a large expanding lytic lesion of the right

reconstruction as described in the surgical technique of case 1. An arthrodesis between the carpus and fibular head was performed with two K-wires because of instability in the wrist joint. Histologic examination revealed a giant cell tumor without evidence of malignancy. The arm was immobilized in a long arm plaster for 6 weeks and a short arm plaster for 10 weeks. A solid fusion at both ends was obtained in 8 months. Clinically the patient is pain free and uses his hand for 3 years. There is no local recurrence. His forearm pronation is 50 % and supination 60 % of the opposite normal. Wrist dorsiflexion is 20° and palmar flexion is 15°. The grip strength of the involved side is 60 percent when compared with the normal side (Fig. 5).

DISCUSSION

The treatment of giant cell tumor in the distal end of radius is controversial. The major problem after removal of the primary lesion is recurrence. In the Mayo Clinic series there are 29 giant cell tumors located at this site. The factor that influences the recurrence rate of the tumor is the completeness of surgical removal. Patients who had curettage of the lesion had a recurrence rate of 34 per cent, where

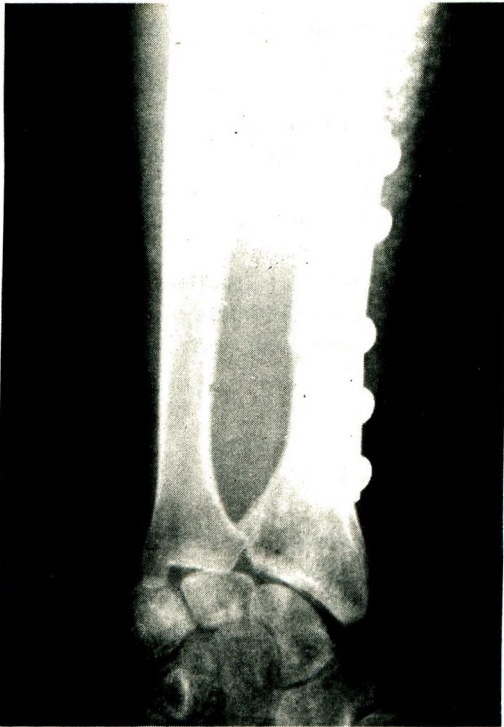


Fig. 3. (Case 1) Roentgenograms obtained two years after reconstruction. There is solid bony union at the proximal junction. Joint space is well preserved and patient is asymptomatic.

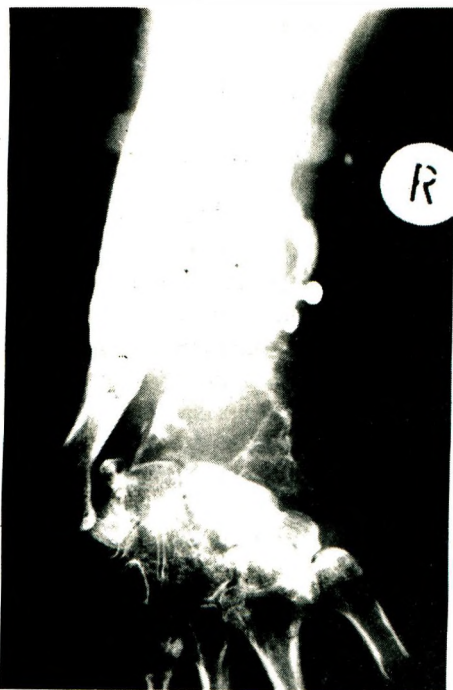
those treated with a wide resection had a rate of 7 per cent in the entire series. For small and primary lesions curettage and bone grafting to preserve the wrist joint is generally preferred. For large, expansile lesions with cortical destruction and for recurrent lesions, "en bloc" resection of the distal radius is the treatment of choice (1,4,13).

There are many techniques to restore the wrist joint after wide resection of the distal radius with giant cell tumor.

In 1982 Seradge used distal ulnar translocation for reconstruction of the distal radius in two cases. He used a segment of distal ulna without detaching its soft tissue attachments and the bone was fused to proximal radius and carpal bones. He obtained relatively good results with this method of treatment (10).

In 1975, Campbell and Akbarnia treated six patients with corticocancellous tibial autografts. He mentioned good functional results without recurrence or metastasis.

The first literature published in the treatment of a giant cell tumor of the distal radius with a fibular transplant belongs to Lawson in 1952 (13).



A



B

Fig. 4. (Case 2) (A) Anteroposterior roentgenogram showing recurrent giant cell tumor. The lesion is extensive and previous fibular graft is destroyed. (B) Lateral view of the same tumor. The tumor extends in to the soft tissues. The limits of the cortex are indistinguishable.



Fig. 5 - (Case 2) Roentgenograms after 19 months. There is good union at the proximal end of the graft and between the graft and carpus.

Mac, Lichtman and Mac Donald reported 3 cases with good results in 1979. Noellert and Louis published long-term follow-up of 3 new cases in whom they obtained excellent functional results (6,7).

Pho reported a case of malignant giant cell tumor of the distal radius treated with free vascularized fibular autograft. His result in this case is excellent but follow-up period is too short and number of patients is insufficient to make a final evaluation (12).

Murray and Schlafly from M.D. Anderson described eighteen giant cell tumors in the distal end of the radius, treated by en bloc resection and arthrodesis of the wrist utilizing a fibular autograft. Local recurrence occurred in five patients and a patient died of pulmonary metastasis. In five patients non-union developed and three sustained a graft fracture (14).

Lackman, Mc Donald, Beckenbaugh and Sim from Mayo Clinic reported 12 cases of giant cell tumor of the distal radius treated with fibular autografts. In two patients failure in the union of graft have occurred. One patient developed local recurrence and this was treated with resection of lunate and scaphoid. The duration of the follow-up period ranged from 3 to 14 years (average 8 years). They obtained excellent results in 3 patients, good in four and fair in two (13).

Our results in two cases are compatible with the literature. The mean length of follow-up is 3.5 years. There is no local recurrence or graft failure. The range of motion in the first case is excellent and good in the second. The grip strength is over 50 per cent in both cases. Over all functional results are rated excellent in two patients.

Finally this type of treatment for recurrent or aggressive giant cell tumors of the distal radius is a dependable way with low recurrence rate and complications.

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