

## Hernia mesh prevent dislocation after wide excision and reconstruction of giant cell tumor distal radius

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### Abstract

Giant cell tumor (GCT) remains as major health problem. GCT which located at the lower end of the radius tends to be more aggressive. Wide excision and reconstruction of the wrist in stage 3 of distal radius GCT lesion is an optimal modality to prevent tumor recurrence. However, dislocation often occurs as its complication. We are reporting patient with GCT of distal radius treated with wide excision and reconstruction using nonvascularized fibular graft and the addition of hernia mesh. Circumferential non-absorbable polypropylene hernia mesh was applied, covered radioulnar joint and volar aspect of radius, and served as additional support to prevent dislocation. During five years and two months of follow-up, we found no dislocation in our patient. Furthermore, good functional outcome was obtained. Our finding suggests that the addition of hernia mesh after wide excision and reconstruction with nonvascularized fibular graft may benefit to prevent dislocation and provides an excellent functional outcome.

**Key words:** Giant cell tumor; Wide excision; Fibular graft; Hernia mesh; Dislocation

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**Core tip:** Dislocation after wide excision and reconstruction

with nonvascularized fibular graft on giant cell tumor (GCT) distal radius often occur and becomes a problem for the patient. This case report presented the outcome of a patient with GCT of distal radius and treated with wide excision and nonvascularized fibular graft with the addition of non-absorbable polypropylene hernia mesh. Circumferential non-absorbable polypropylene hernia mesh may prevent the occurrence of dislocation and provides an excellent functional outcome.

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## INTRODUCTION

Giant cell tumor (GCT) is an aggressive lesion with a high rate of recurrence<sup>[1]</sup>. Most GCTs are located in the epiphyseal regions of long bones, however studies reported that GCT in the lower end of the radius more aggressive and possess higher tendency for local recurrence<sup>[2,3]</sup>. Treatments for GCT of distal radius include curettage followed by bone graft or cementing, en-bloc excision and reconstruction either with nonvascular or vascular fibular autograft, ulnar translocation, endoprosthesis, or amputation<sup>[4-6]</sup>.

Wide excision is the optimal surgical treatment modality to prevent tumor recurrence in stage 3 of distal radius GCT lesion. However, reconstruction of wrist after wide excision of distal radius remains a challenging task. Most patients are active young adults who demand cosmetically acceptable and functionally adequate wrist. Nonvascularized proximal fibular graft without arthrodesis still used for reconstruction with excellence function, but dislocation of radiocarpal joint often occur as its complication after surgery<sup>[7]</sup>. Here we try to prevent dislocation of radiocarpal joint by using hernia mesh.

## CASE REPORT

A 28-year-old female presented with lump and pain on the left wrist since one year. The lump was getting bigger, and the pain was felt while flexing the wrist. On examination, the lump was observed on the distal end of the radius with tissue exposure on the dorsal side (Figure 1). The skin was shiny, tense, tenderness with ill-defined margins. The wrist's range of movements was restricted with intact neurovascular status. Left wrist anteroposterior and lateral radiograph revealed extensive local bony destruction along with significant soft-tissue expansion (campanacci grade 3) (Figure 2). She was suspected with GCT of the left distal radius. However, she refused open biopsy and went to bone setter. She came



Figure 1 Clinical photograph of the patient.



Figure 2 Preoperative X-ray of the patient.

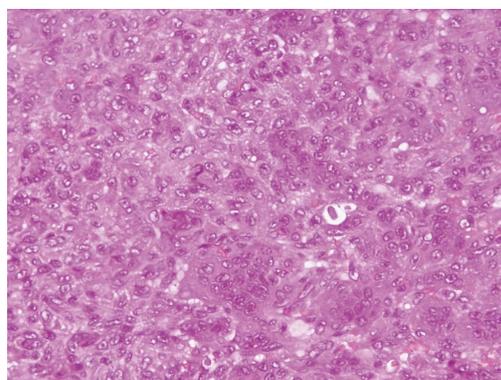


Figure 3 Histopathology examination of the tumor. Multinucleated giant cells were observed from the examination with background of mononuclear cells.

back to the outpatient clinic and then an open biopsy was performed. Histopathology examination revealed GCT of bone (Figure 3).

We did wide excision (Figure 4) with a posterior approach along with intracapsular resection (Figure 5) and osteotomy 9 cm proximal from styloid of radius (Figure 6). Flexor, extensor tendon, radial, ulnar artery, median and ulnar nerve were able to preserve. Subsequently, the lateral approach was used for harvesting entire proximal fibula including the head of fibula and bicep tendon with a length of 4 cm. The



Figure 4 Intra-operative photograph of wide excision with posterior approach.



Figure 6 Intra-operative photograph showing large defect due to wide excision.



Figure 5 Excision of tumor.

common peroneal nerve was identified and osteotomy 10 cm from the head of fibula was done (Figure 7).

The harvested fibula was fixed to the radius with 3.5 locking plate. The tip of fibula should lie for the radial styloid and its articular surface articulated with scaphoid. The dorsal radiocarpal capsule was sutured with bicep tendon, and the transplanted fibula stabilized to ulnar with 1.6 K wire. To prevent dislocation of the radioulnar and radiocarpal joint, circumferential non-absorbable polypropylene hernia mesh was applied circularly. At the distal part, the mesh was sutured to the remain of the capsule and the ligament of os carpalia at the volar, while at the proximal part the mesh was sutured to the periosteum and the surrounding soft tissue, attached



Figure 7 Proximal fibula harvested via lateral approach. The asterisk showing the intact of peroneal nerve (A) including head of fibula and bicep tendon (B).

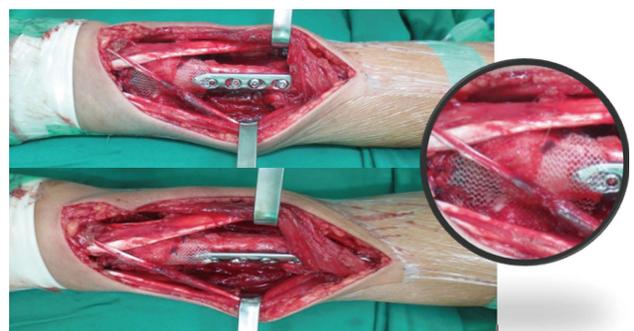


Figure 8 Fibular graft implantation fixed with 3.5 locking plate and covered with hernia mesh on radioulnar joint and volar aspect of radius. The inset showing the hernia mesh.

to fibular graft. The mesh covered the radioulnar joint (Figure 8). This hernia mesh is used to provide additional support to weakened or damaged tissue in this area. Afterward, X-ray examination was performed (Figure 9). A short arm splint in 30° wrist extension was applied. Splint and pins were removed six weeks post



Figure 9 The post operative X-ray after wide excision of giant cell tumor of distal radius (A) and defect in fibula (B).



Figure 10 The follow-up X-ray 5 years after the wide excision of giant cell tumor distal radius and fibular autograft and after removal of plate and screw.



Figure 11 The clinical picture of functional outcome after five years of follow-up. The pictures showing a range of motion of 75%-99% of normal side, and grip strength of 100% compared with normal hand.

operation and gentle range of motion was advised.

Four months post operation we evaluate her functional outcome by using Mayo Wrist Score and obtained a good result. Evaluation with quick dash score also obtained a good result. The total disabilities involving the arm, shoulder and hand (DASH) score was 9.2. During five years and two months of follow-up, no subluxation was observed in our patient (Figure 10). The total Mayo Wrist Score was 90. The patient did not feel any pain, returned to regular employment, range of motion of 75%-99% of normal side, and grip strength of 100% compared with normal hand (Figure 11).

## DISCUSSION

*En bloc* excision method leaving a large defect in excision area, thus reconstruction on this site is necessary. Various techniques have been described for reconstruction, including iliac crest graft, centralization of ulna, distal radial allograft, vascularized or non-vascularized fibular graft, and prosthesis. Non-vascularized fibular autograft is one reconstruction technique to fill the defect caused by the wide excision. It was first used in 1945 for congenital absence of radius. The fibula was chosen since its size and shape are similar with distal radius<sup>[8]</sup>. Later,

fibular transplant was used by various authors for tumors of the lower end of radius.

Nonvascularized fibular autograft possesses more advantages compared with other procedures. It has low morbidity of the donor site, satisfactory functional result, and free of major complications although some minor complications exist<sup>[7,9,10]</sup>. A study by Saini *et al*<sup>[11]</sup> in twelve patients with GCT of distal radius treated with wide excision of tumor and ipsilateral nonvascularized fibular autograft obtained the average of grip strength was 70% (24%-86%) compared with normal contralateral side and well preserved of forearm supination and pronation movement. However, a complication in term of subluxation occurs in 3 cases.

Subluxation is a commonly-occurring complication in defect reconstruction with nonvascularized fibular autograft method. With the addition of hernia mesh, the patient in our case did not develop any dislocation or subluxation, but the incidences reported in the literature are quite high. A study by Saikia *et al*<sup>[7]</sup> (2010) obtained 10 cases of subluxation from the total of 24 GCT of distal radius cases treated with en bloc resection and arthroplasty reconstruction of autogenous non-vascularized ipsilateral fibular graft. Seven of them occur 3-12 mo after surgery. A study by Dhammi *et al*<sup>[12]</sup> in 16 patient with GCT of lower end radius treated with similar method reported 10 cases suffered from wrist subluxation out of 16 patients, with follow-up duration ranges from two to five years. Saraf *et al*<sup>[13]</sup> reported subluxation on 2 patients from 15 patients which caused significant pain, deformity, and loss of function.

Fibular graft with appropriate length is a method to prevent subluxation of wrist joint after the reconstruction was performed. Saikia *et al*<sup>[7]</sup> ensure the appropriate length obtained with the addition of 2-3 mm longer than the required length, which is the resection tumor and safe margin, so that the compression at the host-graft junction during fixation with DCP was achieved and subluxation could be prevented. K-wire fixation used to stabilized wrist joint. However, this method did not ensure the prevention of subluxation.

We perform modification with a different approach than previous technique that is the addition of hernia mesh to prevent subluxation or dislocation. Circumferential hernia mesh which covered radioulnar joint and volar aspect of the radius was applied to stabilize the graft. Furthermore, the tensile strength of the mesh may withstand the local pressure forces, hence prevent the occurrence of dislocation or subluxation. During five years and two months of follow-up, no subluxation was observed in our patient. The total Mayo Wrist Score was 90. The patient did not feel any pain, returned to regular employment, the range of motion of 75%-99% of normal side, and grip strength of 100% compared with normal hand.

In conclusion, the complication in the form of subluxation did not occur in our case. Reconstruction method with the addition of hernia mesh to prevent subluxation provides an excellent functional outcome.

## COMMENTS

### Case characteristics

A 28-year-old female with lump which getting bigger in the last one year and pain on left wrist, aggravated by flexion of the wrist.

### Clinical diagnosis

Swelling on the distal end of radius, the skin condition was shiny, tense, tenderness with ill-defined margins, and tissue exposure on the dorsal side.

### Differential diagnosis

Aneurysmal bone cyst and tuberculosis of bone.

### Laboratory diagnosis

All labs were within normal limits.

### Imaging diagnosis

Anteroposterior and lateral radiograph of the left wrist showed extensive local bony destruction along with significant soft-tissue expansion (campanacci grade 3).

### Pathological diagnosis

Multinucleated giant cells with a background of mononuclear cells, appropriate for giant cell tumor (GCT).

### Treatment

Wide excision and reconstruction using non vascularized fibular graft with the addition of hernia mesh.

### Related reports

GCT located in the lower end of the radius tend to be more aggressive and has a higher tendency for local recurrence. The optimal surgical treatment to prevent tumor recurrence in stage 3 of GCT distal radius is wide excision along with non-vascularized fibular autograft to repair the large defect in excision area. Subluxation is a commonly-occurring complication in defect reconstruction with nonvascularized fibular autograft method. The addition of hernia mesh may advantageous to prevent the subluxation, affecting the functional outcome of the patient.

### Term explanation

GCTs are benign tumors which have a tendency for aggressive characteristics and ability to metastasize. The disabilities of the arm, shoulder and hand (DASH) score is an outcome instrument for measuring upper-extremity disability and symptoms.

### Experiences and lessons

The addition of hernia mesh after wide excision and reconstruction using nonvascularized fibular graft of GCT of distal radius prevent the complication in term of subluxation and offer excellent functional outcome.

### Peer-review

The authors present a very interesting paper on the reconstruction of the wrist after radius bone excision for a GCT.

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