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Wide resection giant cell tumor of distal ulna and stabilization ulnar stump with extensor Carpi ulnaris tendon (2 case reports)

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ABSTRACT

INTRODUCTION: Giant-cell tumor (GCT) of bone occurred in the distal end of the ulna is extremely uncommon. Wide resection is usually indicated in such cases and at times it may be necessary to remove a long segment of the distal ulna. The functional reconstruction of the defect after resection has been a challenge. Wide resection of the distal ulna with or without reconstruction or stabilization of the ulnar stump is the recommended treatment for GCTs in such locations.

PRESENTATION OF CASE: There were 2 cases of giant cells tumor of the distal ulna. They treated with wide resection and stabilization of ulnar stump by extensor carpi ulnaris tendon. We were evaluating outcomes using the Musculoskeletal Tumor Society (MSTS) Score for the upper extremity. The results from the evaluation of the MSTS Score were an average of 24 points.

DISCUSSION: There were 2 patients. All of them present with lumps of their wrist and the pain over the lump. Patients treated with wide resection and stabilization of ulnar stump by extensor carpi ulnaris. The result from the evaluation of the Musculoskeletal Tumor Society (MSTS) score were 24 points.

CONCLUSION: Giant cell tumor of bone is a rare, generally benign, locally invasive tumor. The ulna distal extremity is an unusual site for a primary bone GCT. Any ulnar resection proximal to the insertion of the pronator quadratus can lead to instability in the form of radio-ulnar convergence and dorsal displacement (winging) of the ulnar stump. This can result in a diminution of forearm rotation and weakness with grasp. The main goal of stabilization is the stable, pain-free, and functional outcome of the wrist. In this cases report our patient with giant cell tumor were treated with wide resection and stabilization of ulnar stump by extensor carpi ulnaris. All of the patients satisfied with our treatment.

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1. Introduction

Giant cell tumor (GCT) represents approximately 3%–5% of all primary bone cancers [1,2]. Usually, the tumor site is at the long bone meta-epiphysis, especially the distal radius and femur, proximal humerus, and tibia [2]. The ulna distal extremity is an unusual site (0.45%–3.2%) for a primary bone GCT [1,2]. In the treatment of GCT of the distal ulna, many surgeons try to retain the ulna and perform the only curettage and packing with polymethylmethacrylate. Unfortunately, there is a high recurrence rate of up to 40% when treated in such a manner. The risk of metastasis is thought to increase six-fold with a recurrence. These thoughts have prompted surgeons to be more aggressive in treating distal ulna GCT with

en bloc resection. The functional reconstruction of the defect after resection has been a challenge [3]. Wide resection of the distal ulna with or without reconstruction or stabilization of the ulnar stump is the recommended treatment for GCTs in such locations [2]. We present two patients with GCT of the distal ulna, all of them treated by wide resection of the distal ulna followed by stabilization of the remaining ulna using one half of the extensor carpi ulnaris (ECU) tendon. All of the procedure was performed by a musculoskeletal tumor orthopedic surgeon with 5 years experiences. The MSTS score (total possible score = 30) was used to assess functional outcomes. This case is reported by the SCARE criteria [4].

2. Case presentation

2.1. Case 1

A 43-year-old Indonesian male worked as a labor and right-hand dominance presented to us with a lump on his left wrist that growth

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Fig. 1. a) Clinical appearance lump on left wrist (case 1). b) pre-op AP Radiograph of the left wrist (Case 1). c) MRI examination of Case 1.

recently since 2 years ago. He was also complaining of pain over the lump. One year ago, the pain getting worse and continuous with a moderate intensity that aggravated by movement, there is no weakness or numbness. The patient takes a paracetamol 500 mg 3 times a day for analgetic. There is no history of smoking, injury, surgical, and another lump before. There is no family history with the same condition.

The general physical and systemic examinations were within normal limits. On examination on the left wrist region, there was a solid mass on the ulnar side, clear margin with swelling, fixated, tenderness (Fig. 1a).

A plain radiograph of the left wrist showed a geographic lytic lesion in the distal ulna (Fig. 1b). Magnetic Resonance Imaging (MRI) showed a solid mass with center necrotic, margin relatively clear, size: 6 × 6 × 8 cm full fill intramedullary epimetaphysis os ulna distal that induce ballooning and diluting cortex, pressing surrounding and edema soft tissue (Fig. 1c).

A clinical diagnosis of GCT was made, which was confirmed postoperatively by histopathological examination. A wide resection planned after obtaining informed and written consent from the patient. The resection margins calculated keeping in view the radiological extent of the lesion. The decision was made to stabilize the ulnar stump, because of the age, the functional demands of the patient, and the high level of the resection. We stabilize the

Table 1
Musculoskeletal Tumour Society Score in 2 case.

	Case 1	Case 2
Pain	5	4
Function	4	4
Emotional	4	4
Hand positioning	4	4
Manual dexterity	4	4
Lifting	4	4
Total	25	24

ulnar stump using the extensor carpi ulnaris tenodesis technique described by Kayias & Drosos [2].

The tumor resected with a 3 cm margin of the normal bone proximal to the tumor (Fig. 2a). This included approximately half (twelve centimeters) of the distal end of ulna, the triangular fibrocartilage complex, the ulnar border of the pronator quadratus, and a part of the distal radio-ulnar joint capsule. This case is reported by the SCARE criteria [4].

The tendon of ECU was passed through a 3-mm drill hole, 5 mm above the end of the ulnar stump in a dorsal to volar direction with the forearm held in supination. The tendon was then directed to the ulnar side and sutured back on itself. This created a cuff of the tendon over the end of the ulnar stump, which stabilized the remaining ECU and tethered it toward the radial side of the ulna (Fig. 2b).

Patient postoperatively immobilized in a splint with the forearm in supination for four weeks, following which physiotherapy 2 times a week until 3 months post-operative (Fig. 2c). The patients compliance was good. After 10 months follow-up there was no evidence of recurrence or lung metastatic of the tumor. The patient felt comfortable and satisfied with the result of treatment. The functional result evaluated using the Musculoskeletal Tumor Society Scoring System (MSTS) based on pain, function, emotional, hand positioning, manual dexterity, and lifting ability. The patients achieved scoring 25 out of 30 points (Table 1).

2.2. Case 2

A 31 years old Indonesian female, the occupation was a housewife and right-hand dominance. She presented with a lump and pain on her right wrist. The lump has grown recently since 1 year ago. There's no weakness or numbness. The patient takes a meloxicam 15 mg 2 times a day for analgetic. There's no history of smoking, injury, surgical, and another lump before. There's no family history with the same condition.

The general physical and systemic examinations were within normal limits. Examination on the right wrist region, there was a solid mass on the ulnar side, clear margin, fixated, tenderness (+) (Fig. 3a). The distal neurovascular status was normal. A plain radiograph of the right wrist showed a geographic lytic lesion with a soap bubble appearance in the distal ulna (Fig. 3b). MRI showed the primary bone tumor (GCT) (Fig. 3c). The pathology anatomy examination found osteoclast-type giant cells and not found malignant cells.

For this patient, we also planned a wide resection and stabilization of the ulnar stump using the extensor carpi ulnaris tendon. We performed a wide resection of the ulna that included 3 cm of the normal bone (Fig. 4a). ECU stabilization was done in the same technique as described in Case 1.

The postoperative protocol was similar as described for Case 1 (Fig. 4b). The compliance of these patients was good. After 10 months post-operative there was no evidence of recurrence or lung metastatic of the tumor. We evaluated the functional with MSTS

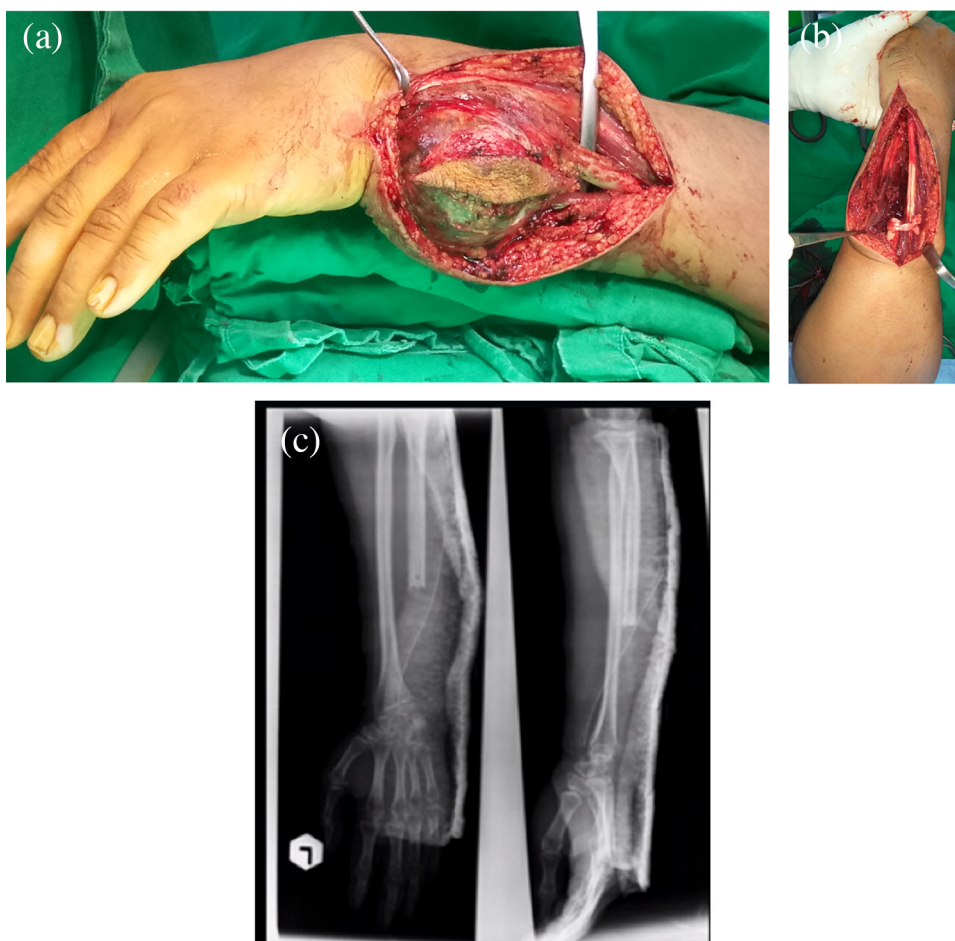


Fig. 2. a) Operative photographs showing a large tumor originating from the left ulna (case 1). b) Stabilization ulnar stump using ECU tenodesis technique (case 1). c) AP & lateral radiograph of left lower arm postoperative (case 1).

score and the score was 24 (Table 1). The patient also felt comfortable and satisfied with the result of treatment.

3. Discussion

Giant cell tumors seem to act more aggressively than those tumors of the distal radius. Surgeons must keep in mind that, although touted as a benign tumor, GCT has the capability of killing. Even when lung metastases were resected, 17% of patients died due to tumor-related complications [5].

GCT was a locally aggressive tumor with a high potential of recurrence, so the treatment should focus on minimizing the recurrences. The recurrence rates correlate better with the inadequacy of tumor tissue removal rather than the type of specific adjuvant treatment used [1].

High rates of local recurrence and the high morbidity associated with metastasis has led surgeons to search for more treatment options. Aggressive resections have been limited in the past due to the avoid of reconstructive options that provided a stable, pain-free, functional outcome [5].

Most of the studies on GCT ulna have focused on wide resection of the distal ulna without reconstruction [6]. High risk of failures after wide resection due to the ulnar stump was displaced to dorsal (winging) and converge towards the radius. This inevitably leads

to handgrip weakness, persistent pain, and limitation of forearm rotation [1,7].

Stabilization using the Extensor Carpi Ulnaris (ECU) tendon after ulnar resection was originally described by Goldner & Hayes in 1979 [1,2]. However, the application of this technique for GCT of the ulna was first described by Kayias et al. This technique used one half of the ECU tendon because there was a possibility that the tumor had extended anteriorly to the flexor compartment.

The tendon was passed through a 3-mm drill hole, 5 mm above the end of the ulnar stump in a dorsal to volar direction with the forearm held in supination. The tendon was then directed to the ulnar side and sutured back on itself. This created a cuff of the tendon over the end of the ulnar stump, which stabilized the remaining ECU and tethered it toward the radial side of the ulna (Fig. 5).

GCT of distal ulna is a rare entity with no standard modality of treatment [7]. In this study, we as the orthopedic surgeons chose to stabilize the ulna stump after considering the length of ulna resection and removal of the entire pronator quadratus, which in our opinion could affect ulnar stability and therefore functional outcomes in this young patient.

All of our patients satisfied with our treatment. The average MSTs score was 24. We would like to suggest that this treatment can be an option for the GCT of the distal ulna. This study registered with the researchregistry5554 unique number.

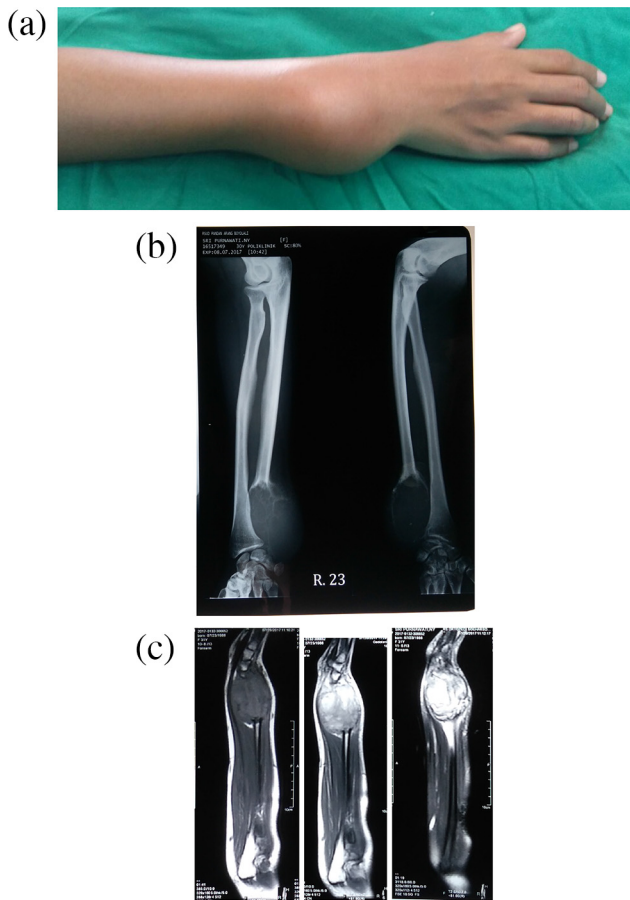


Fig. 3. a) Clinical appearance lump on left wrist (case 2). b) pre-op AP Radiograph of the left wrist (Case 2). c) MRI examination of Case 2.

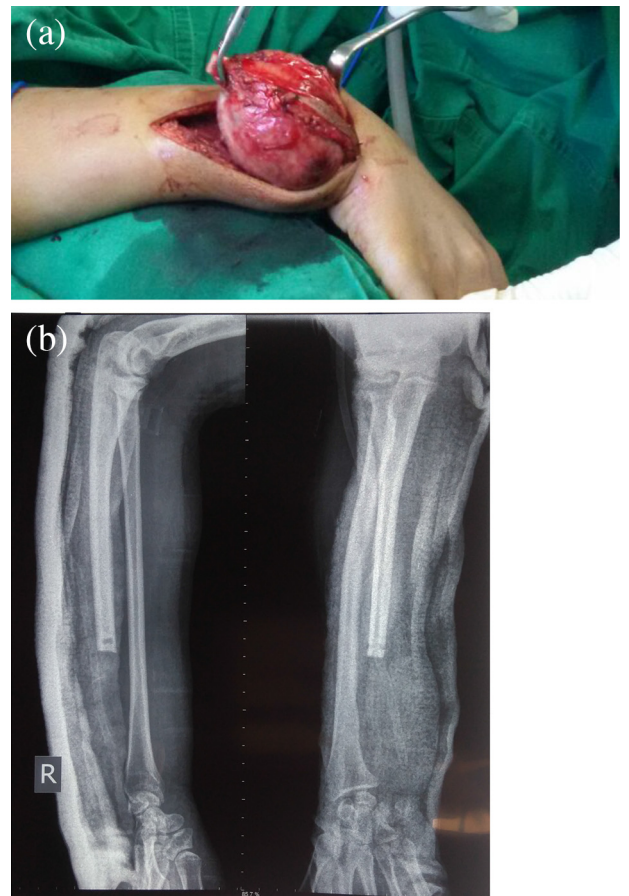


Fig. 4. a) Operative photograph showing a large tumor originating from the right ulna (case 2). b) AP & lateral radiograph of right lower arm postoperative (case 2).

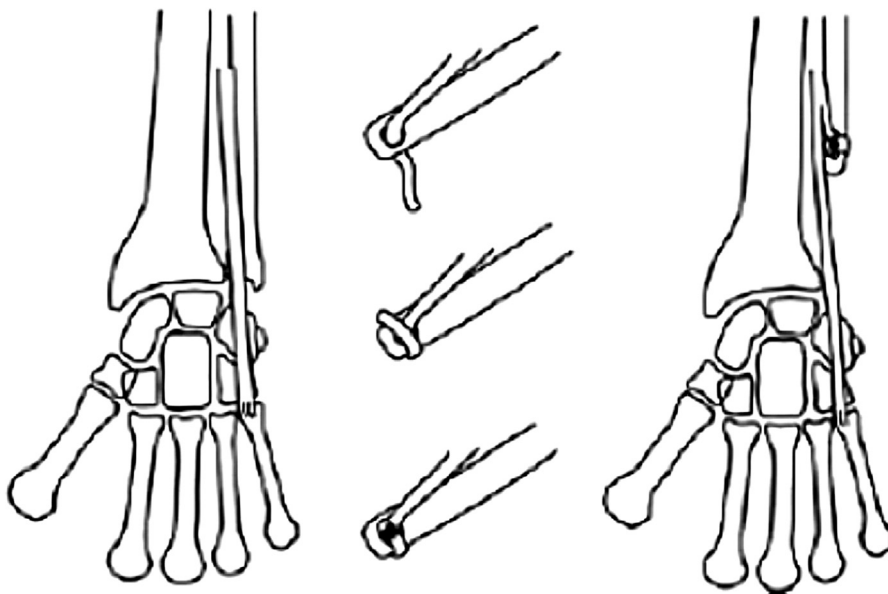


Fig. 5. The tenodesis technique, first described by Goldner and Hayes in 1979, using one half of the ECU tendon.

4. Conclusion

Patients with GCT of the Distal Ulna can be treated with wide resection and stabilization of ulnar stump by extensor carpi ulnaris tendon.

Declaration of Competing Interest

None.

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There is no sponsor for this research. All expenses are covered up by the author.

Ethical approval

Ethical approval has been issued by Orthopaedic Hospital Prof. Dr. R. Soeharso Surakarta Ethics Committee which our patient provided informed written consent.

Consent

Written informed consent obtained from the patient for publication of this case report. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Study concepts and study design: Mujaddid Idulhaq, Pamudji Utomo, Handry Tri Hanjoyo, Brian Wasita.

Data acquisition: Mujaddid Idulhaq.

Data analysis and interpretation: Mujaddid Idulhaq, Savero Iman Hari Suko.

Manuscript preparation: Mujaddid Idulhaq.

Manuscript editing: Mujaddid Idulhaq, Savero Iman Hari Suko.

Manuscript review: Savero Iman Hari Suko.

Registration of research studies

1. Name of the registry: Wide Resection Giant Cell Tumor of Distal Ulna and Stabilization Ulnar stump with Extensor Carpi Ulnaris Tendon (2 Case reports)

2. Unique identifying number or registration ID: researchregistry5554
3. Hyperlink to your specific registration (must be publicly accessible and will be checked): <https://www.researchregistry.com/register-now#userresearchregistry/registerresearchdetails/5eaa973d6310c300155bc996/>

Guarantor

The Guarantor is Mujaddid Idulhaq MD.

Provenance and peer review

Not commissioned, externally peer-reviewed.

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