



## Case report

# Wide resection and reconstruction of giant cell tumor of the distal humerus with favorable outcomes in 3 months: A case report

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## ABSTRACT

**Introduction and importance:** A giant cell tumor is a locally aggressive tumor with low-risk progression into malignant and rarely metastasize, but a high risk of recurrence and notable disturbance of bony architecture in peri-articular locations. Wide resection provides a more advantageous therapy option, but the functional outcome is often hampered.

**Case presentation:** A 36-years old woman came with a lump on the left elbow as chief of complaint since a year ago that kept growing bigger with pain, local tenderness, and limited motion. She underwent several examinations and was diagnosed with a giant cell tumor in the distal humerus. Wide excision and reconstruction surgery using megaprosthesis, rotational flap, nerve graft, and skin graft were done. After 3 months follow-up, the patient had favorable functional outcomes.

**Clinical discussion:** The primary aim of treating giant cell tumors is wide resection with good functional than cosmesis outcomes. This manner was common and expected to reduce the potential risk of infection.

**Conclusion:** Reconstruction with megaprosthesis, nerve and skin graft, is a reasonable option after wide resection of the giant cell tumor in the left humerus with favorable functional outcomes within 3 months compared with other treatment modalities.

## 1. Introduction

Primary bone tumors consist of several types of tumors with wide varieties of malignancies, such as giant cell tumors which composed 5% of primary bone tumors. Giant cell tumor of bone mostly located in the epi-metaphyseal end of the long bone in the young adults population ages 20–40 years old and approximately 2–5% located in the hand [1,2]. It accounts for 20% of all benign tumors with surgical removal as the main option of treatment, with phenol, high-speed burr, liquid nitrogen, and methylmethacrylate cement as adjuvant therapies [3].

Giant cell tumor is a locally aggressive tumor with low-risk progression into malignant and rarely metastasize, but a high risk of recurrence [4]. Despite its benign characteristic, 1–4% of giant cell tumors are able to metastasize to the lung [5].

It is also associated with a notable disturbance of bony architecture in peri-articular locations and extend into surrounding soft tissues [1,6].

Several common locations of these tumors are distal femur, proximal tibia, and distal radius, furthermore, proximal humerus is considered

rare with estimated prevalence rate is 4%. Wide resection is indicated in patients with aggressive lesion and cortical breach with involvement of the soft tissue [5]. Wide resection provides the advantage of lower risk of local recurrence by removing the entire tumor, but the functional outcome is hampered [7]. Hereby, we presented a case of a giant cell tumor of the left distal humerus that undergoes wide resection tumor and reconstruction, rotational flap, application of the nerve and skin graft, turns into favorable functional outcomes within 3 months. This case report has been reported in line with the SCARE Criteria [8].

## 2. Case presentation

A 36-years old woman came to Orthopaedics and Traumatology outpatient clinic in the Fatmawati General Hospital with a lump on the left elbow as chief of complaint since a year ago (2020). In addition, she also felt pain and no weight loss. Previous medical history was denied. No history of malignancies in her family history (Fig. 1).

In January 2020, she felt a quail egg-sized lump on the left elbow

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**Fig. 1.** Preoperative condition of the left elbow.

without any pain, redness, and feeling burnt. History of any trauma and limited movement was denied. The patient did not seek any treatment due to no disturbance of activities.

The patient went to the traditional masseuse twice, but the complaints were not improved (Fig. 2).

In the physical examination, her general status was in normal condition. There was a lump in the left elbow without venectasis and redness. Local tenderness with pain score VAS (visual analog scale) 4–5, normal distal vascularization (capillary refill time < 2 s), distal sensory, and motoric status. The circumferential diameter was 42 cm compared to contralateral side 26 cm. Range of movement of left elbow was limited due to pain. The patient had normal results of the complete blood count, liver function test, kidney function test, CRP, alkali phosphatase, and also coagulation test. There was a slight increase in the erythrocyte sedimentation rate (29 mm) and lactate dehydrogenase (322 U/L).

X-ray examination of the left elbow (November 26, 2020) showed primary bone tumor destroys the cortex on the distal of epimetadiaphysis of the left humerus. MRI examination of the left elbow (January 11, 2021) showed a bone tumor with multiple cystic components on the distal epimetadiaphysis of the left humerus extending to the medulla, destroying the cortex in that area, reaches the intraarticular

humeral and radiocapitellar, partially erodes the cortex of the olecranon fossa, suggestive of a giant cell tumor (Figs. 3, 4).

Surgery was performed by the orthopaedic surgeon. First, we identified the size of the mass with the impression of the dominant mass on the medial side of the arm, elbow, to the left proximal forearm. Incision was made then we performed mass excision. Identification of the neurovascular bundle revealed that the brachial artery was on the outer edge of the tumor and only a few small branches entered the tumor. Similar conditions were found to median and radial nerve. The ulnar nerve was found to have entered the tumor, it was decided to perform a sacrificial procedure with defect was found to be about 10 cm.

The mass was released by performing osteotomy of the proximal humerus bone from the tumor, arthrotomy was performed to the distal part of the humerus bone. Mass has already infiltrated the capsule of the elbow joint and partially destroyed the olecranon, so we removed the remaining tumor mass at the joint and performed intramedullary curettage of the ulnar head.

We performed megaprosthesis insertion to the forearm and humerus bone with slight shortened the olecranon part and adjusted the hinge size, followed by shoulder stem insertion, size 7 × 105 mm and shoulder spacer for stem insertion, size 30 mm-wide, and elbow prosthesis insertion with diameter 2/4. Evaluation of component and elbow joint



Fig. 2. Preoperative radiograph lateral view of the left humerus showing giant cell tumor.

range of motion was carried out. It is found that full flexion and extension can be done with the stable position of the implant.

Furthermore, we harvested the sural nerve for 20 cm-long and divided it into two. The sural nerve connected to the patient's left arm ulnar nerve defect using a 9.0 non-absorbable monofilament thread, then bioglue was applied to the suture. Muscle defect was found on the medial side of the left arm involving the brachialis and part of the biceps muscle. We decided to take the brachioradialis muscle with a rotational flap technique to close the defect. We performed a split-thickness skin graft taken from the left thigh applied to the left lateral humerus defect. The wound is washed and drained, closed layer by layer, then a backslab was installed (Fig. 5).

After 3-months follow-up, range of movement of the elbow joint for flexion-extension 90–95°, wrist joint for flexion 0–15° and extension 0–5°, and no limited range of movement of the finger joints. Hypoesthesia was only found in the location of ulnar nerve at the medial side of the forearm until the fifth finger of the left hand. Patient reported feeling satisfied after the procedure.

### 3. Discussion

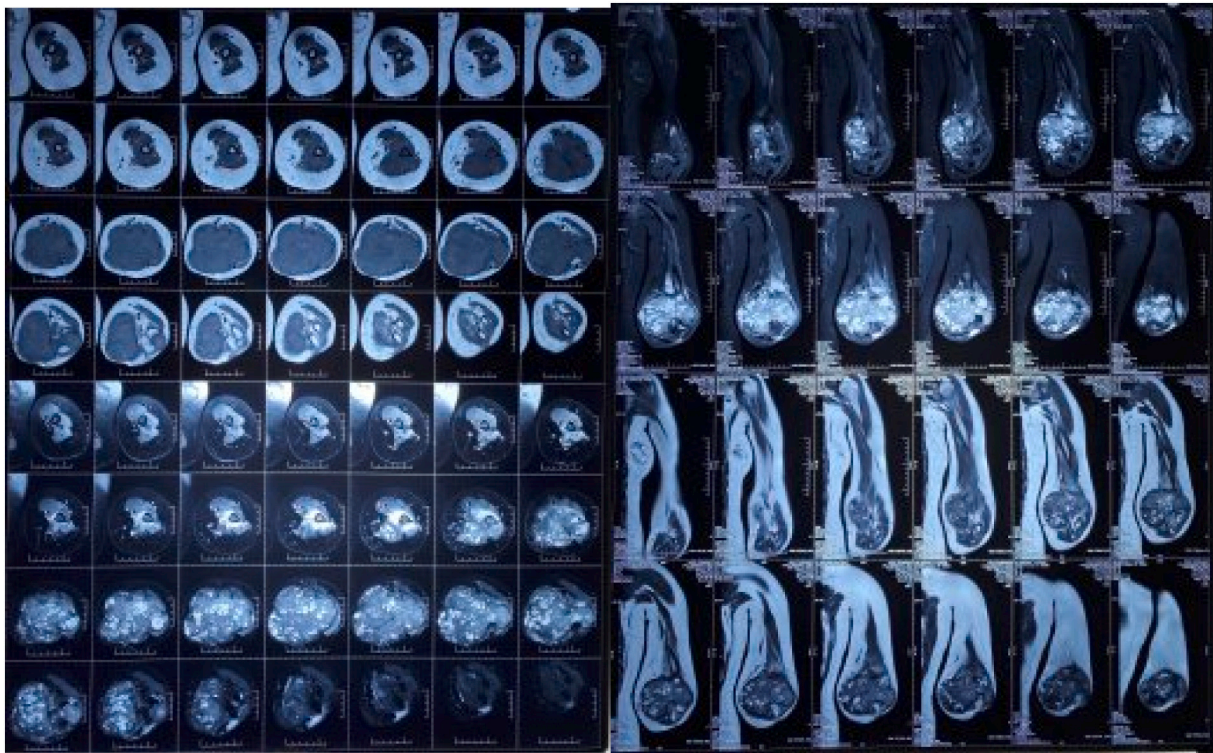
A giant cell tumor is a locally aggressive tumor with low-risk

progression into malignant and rarely metastasize, but a high risk of recurrence and a notable disturbance of bony architecture in peri-articular locations [1,6]. Tumor is composed of sheets of mononuclear cells, large osteoclast-like giant cells, particularly in the metaphysis of the long bone. The incidence was 1.7 per million inhabitants per year with a higher ratio of female than male (1.38:1) and the median age of 35 years old. Most common location of giant cell tumor was the femur and tibia [9]. In our case, the tumor was located in the distal humerus which is the rare location of bone tumor. High incidence of tumor recurrences is the main reason to develop more effective therapies for this tumor.

The primary aim of treating giant cell tumors is sound resection with favorable functional than cosmesis outcomes. Reconstructive surgery can be very challenging due to the local breakdown of the lesion [10]. Wide resection is indicated to the destruction of the endosteal surface of the cortex and surrounding soft tissue [5,8].

Hereby we present a case of a young adult with GCT in the left distal humerus that underwent wide excision and reconstructive surgery with mega-prosthesis. A retrospective study showed that megaprosthesis survival rate after surgery was 82% and 64% 2-years and 5-years after surgery and good functional outcomes with mealy risk of loosening stem and periprosthetic infection [11]. No evidence of recurrence within





**Fig. 3.** Preoperative MRI result of the left humerus.

6, 12, 18, and 24 weeks followed by 6 months after surgery [12]. Wide excision leads to more improved reduction of tumor cell burden than other methods, such as intralesional curettage [13].

We connected sural nerve graft to the patient's left arm ulnar nerve defect using a 9.0 non-absorbable monofilament thread. Ulnar nerve neuropraxia usually recovered within 10 weeks spontaneously [12]. Sural nerve graft had many advantages than other nerves, for example, it has consistent anatomy, adequate structure (30–40 cm length for long defect), ease of dissection, and low morbidity of the donor site [14].

Muscle defect was found on the medial side of the left arm involving the brachialis and part of the biceps muscle. This defect was closed by brachioradialis muscle with rotational flap technique. This manner was common and expected to reduce the potential risk of infection [5]. Local muscle flaps for elbow defect are anconeus, brachioradialis, extensor carpi radialis longus, and flexor carpi ulnaris muscles. In other side, this flap plays a role as soft tissue coverage [14,15]. In summary, this case report provided evidence that wide resection of giant cell tumor doesn't necessarily hamper functional outcome when combined with adequate reconstruction and furthermore associated with lower recurrence rate.

#### 4. Conclusion

Reconstruction with megaprosthesis, nerve and skin graft, is one of the reasonable options after wide resection of the giant cell tumor in the left humerus with good functional outcomes within 3 months compared to other modalities.

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#### Ethical approval

This study has been approved by the Ethics and Medical Research Committee, Faculty of Medicine, University of Indonesia, Jakarta.

Ethical clearance reference: KET-924/UN2.F1/ETIK/PPM.00.02/2019.

#### Consent

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

#### Authors' contributions

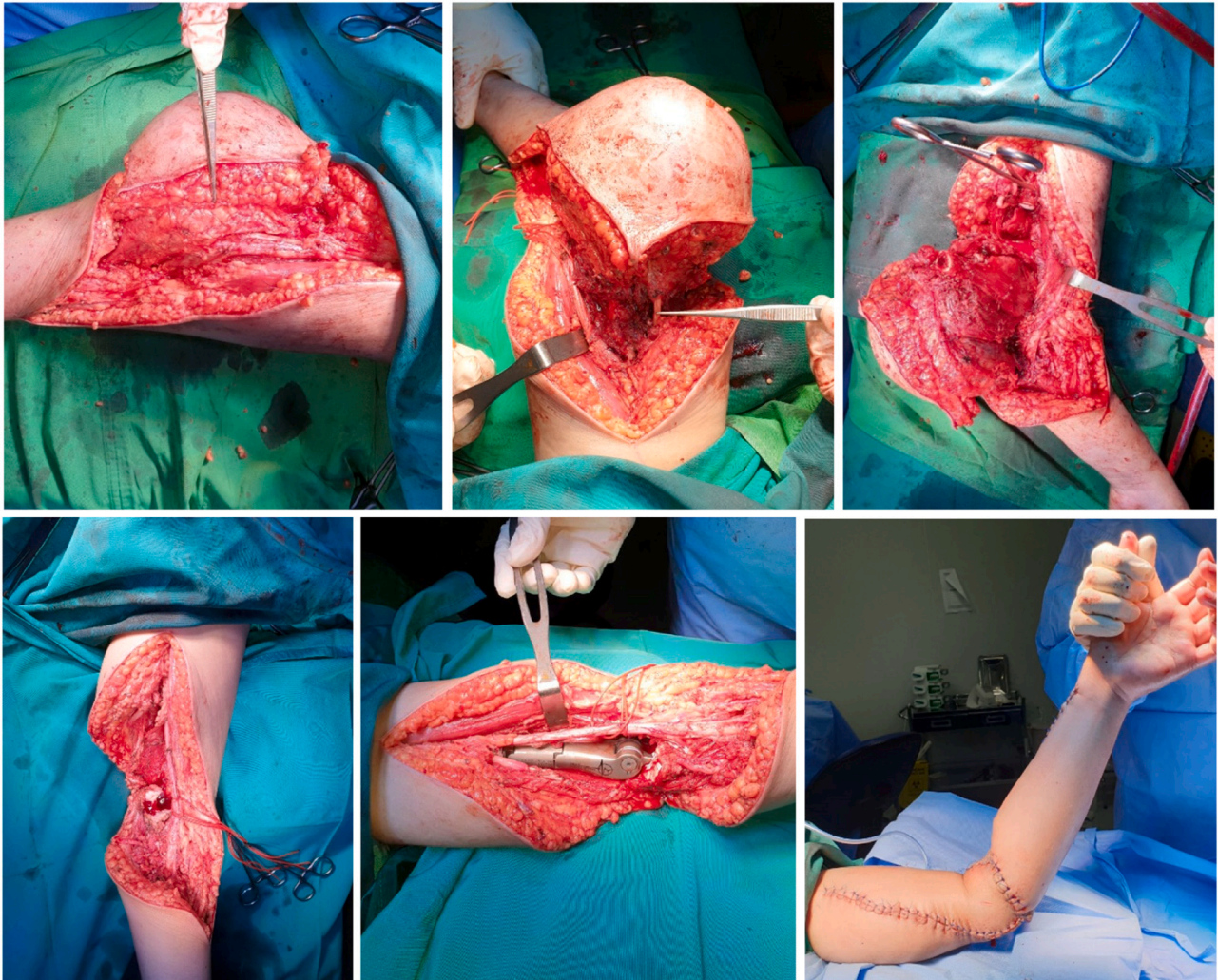
Guntur Utama Putera MD: writing the paper, data collection, analysis, interpretation

Oryza Satria, MD: writing the paper, analysis, interpretation

M. Wahyudi, MD: reviewing, supervising, analysis

#### Registration of research studies

Not applicable.



**Fig. 4.** Intraoperative view of wide resection of giant cell tumor in the left humerus, followed by reconstruction with the application of megaprosthesis, nerve and skin graft.





Fig. 5. Postoperative (left) and 3-months (right) follow up radiograph view of the left humerus.

#### Guarantor

M. Wahyudi MD.

#### Provenance and peer review

Not commissioned, externally peer-reviewed.

#### Declaration of competing interest

None declared.

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