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Bone Tumor Wide Excision Due to Giant Cell Tumor of Proximal Humerus: A Case Report

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Abstract---*Introduction: Giant Cell Tumors are benign, aggressive tumors typically found in the epiphysis of long bones. It has a potential for aggressive behaviour and the capacity to metastasize. the most common symptom of a giant cell tumor is a pain in the area of the tumor. The patient may also have pain with the movement of the nearby joint. Case: We reported an 18-year-old boy with an extensive giant-cell tumor of proximal humerus. Radiograph show a primary malignant bone tumour proximal humerus dextra with soft tissue swelling. There was a lytic lesion, with wide zone transition on proximal humerus dextra, and a trabeculated bone outside the normal lesion was treated by segmental resection and shoulder reconstruction. A prosthesis was used to reconstruct the shoulder joint, the rotator cuff was reattached to the bone after making a semicircular trough. Discussion: There are several therapy options for the patient, the non-operative and operative therapy. The non-operative way such as radiation therapy, medication therapy, and tumor embolization. The operative way such as extensive, complete resection, and amputation. Conclusion: Wide excision is suitable for this patient, we can save normal tissue and do some shoulder reconstruction.*
Keywords---*bone tumor, giant cell tumor, patient, proximal humerus, wide excision.*

Introduction

Giant Cell Tumors are benign, aggressive tumors typically found in the epiphysis of long bones. It has a potential for aggressive behaviour and the capacity to metastasize. It is characterized by a proliferation of mononuclear stromal cells and the presence of many multi-nucleated giant cells with the homogenous distribution. Most giant cell tumors occur in patients between 20 and 40 years of age (Murphey et al., 2001; Morii et al., 2021). They do not typically occur in children or in adults older than 65 years of age. They occur slightly more often in females. Most often, the tumors occur close to the knee joint either in the lower end of the femur or the upper end of the tibia. Other common locations include the:

a. Wrist (lower end of the lower arm bone)
b. Hip (upper end of the thighbone)
c. Shoulder (upper end of the upper arm bone)
d. Lower back (connection of the spine and pelvis)

The most common symptom of a giant cell tumor is a pain in the area of the tumor. The patient may also have pain with the movement of the nearby joint. The pain is usually mild at first but gets worse over time as the tumor increases in size. Occasionally, the bone weakened by the tumor breaks and causes the sudden onset of severe pain (Unni et al., 2005; Kim et al., 2012). The Giant Cell Tumor has a palpable mass, with some soft tissue swelling. The patient has a tenderness sensation over the mass and decreased range of motion around the

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affected joint. On the X-ray, Giant Cell Tumor appears as a lytic lesion next to a joint (Matev et al., 2012; Gruenwald et al., 2006). MRI or CT-Scan would be better to evaluate the tumor and the area surrounding it. The characteristic of Giant cell tumor is the cells are formed by the fusion of several individual cells into a single and larger cell.

Case

An 18-old-male presented to the hospital complaining the difficulty raising his right arm and the pain sensation in his shoulder. He had a history of breaking his arm when he played volleyball in march 2022. The patient go to the traditional bone setter for 3 times. Ever since he got a difficulty to raise his arm, but could still handle the pain (Gao et al., 2021; Liao et al., 2021). Patient decided to Orthopaedic Surgeon and the doctor said that he had a pathological fracture. The doctor ask the patient to do the biopsy and a several examination. The first one is the bone scan examination, the result is a normal condition of skull bone, the right humerus bone show the complete displaced fracture with callus formation, there was a septation osteolytic lesion with the narrow transitional zone on the proximal third humerus, no periosteal reaction or matrix calcification. The thorax and pulmo shows the normal condition, no infiltrate or nodule. Thoraco lumbal vertebra shows the normal condition (McEnery & Raymond, 1999; Patel et al., 1987).

The second one is the MRI of right shoulder, the result shows a 7.4x7.3x7.8 cm cystic solid expansion mass, multiloculated with the fluid level inside on the epimetaphysis os humerus dextra with the destroyed half of the lateral aspect cortex area of bone (Azar et al., 2020; Adulkasem & Pruksakorn, 2019). It has firm boundaries with the rotator cuff tendon, long head biceps tendon, and deltoid muscle, no mass expansion to the bursa, nerves, acromioclavicular joint or the glenohumeral joint. The patient agreed to undergo the first core biopsy in march 2022. Five months later, the patient felt the palpable mass on his right shoulder with the tenderness over the mass, the size is around 8x8x9 cm. He also has a tingling sensation on his elbow and wrist. He agreed to undergo the open biopsy in august 2022. After that, the swelling of the right shoulder is getting bigger than before and the pain feels unbearable.

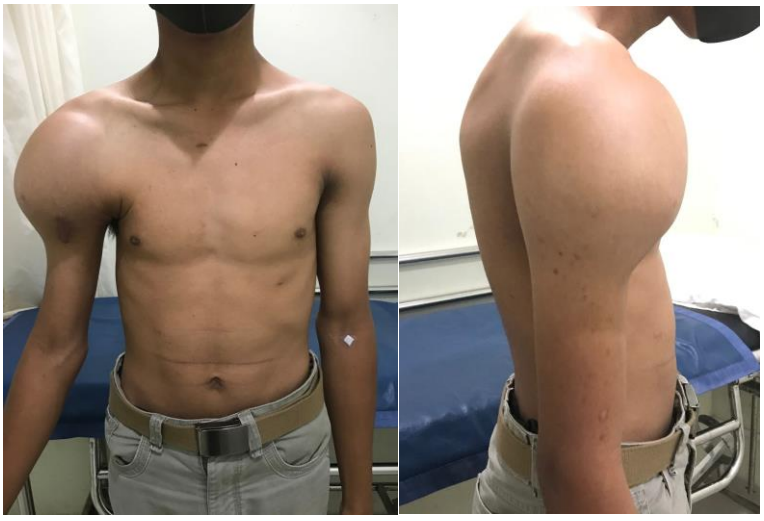

Figure 1 & 2. The clinical picture of right shoulder 1 week preoperative

Radiograph was taken, and the result revealed a primary malignant bone tumour proximal humerus dextra with soft tissue swelling. There was a lytic lesion, with a wide zone transition on the proximal humerus dextra, and there was a trabeculated bone outside the normal lesion (Yadav et al., 2022; Jaiswal & Ambade, 2023; Drumond, 2009).

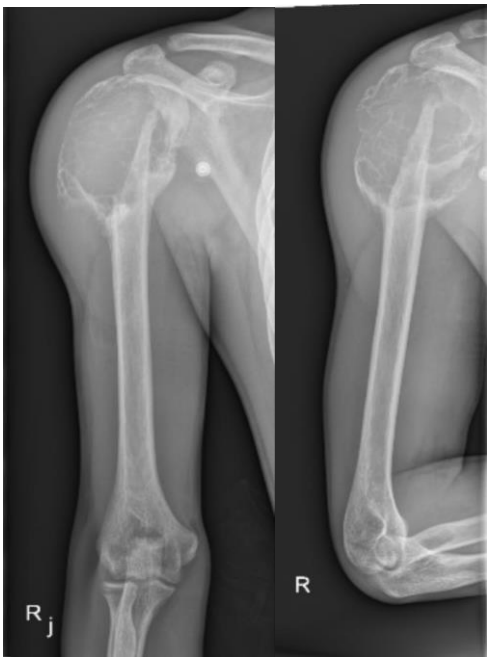

Figure 3 & 4. right humerus radiograph showing a massive bone tumor on the proximal of the humerus

The patient agreed to underwent the surgery in September 2022, we do the surgical wide excision and reconstruction. The reconstructive methods include prosthetic replacement. During surgery, the patient was positioned in a supine position, with an extended delta pectoral approach. The operator did some wide excision of tumour, with a radial and ulnaris nerve intake, intact artery (Reilly et al., 1999; Lau et al., 2005). Then did the osteotomy by cut the humeral head about 12cm length and then cut the humeral mid shaft and replace the humeral head with a 41mm humeral prothesis. Post-operative right shoulder radiograph showing the humeral prosthesis applied to the proximal of humerus, with a normal trabeculated bone outside the lesion. Acromioclavicular joint are normal, there is no soft tissue swelling.

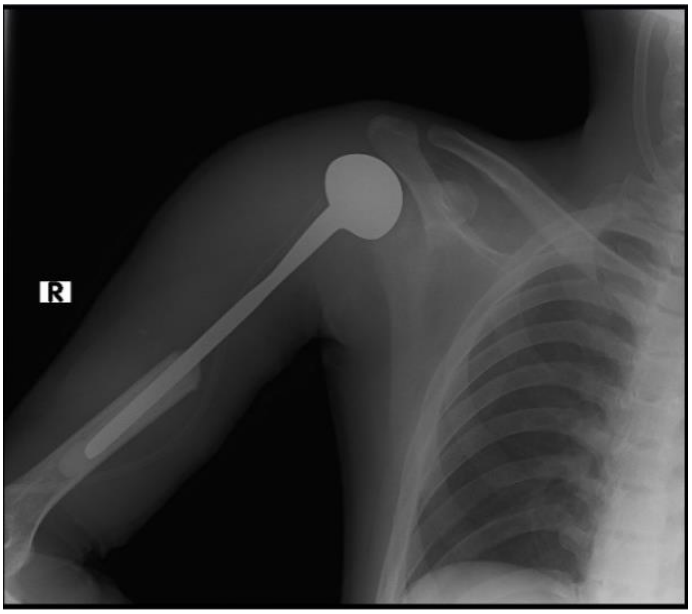

Figure 5. Post-operative right shoulder radiograph

After surgery, patient routinely came to the outpatient clinic. We performed evaluation by clinical and radiological examinations. Twelve months after surgery, there was no local recurrence and distant metastasis. Patient had good functional outcome, he could go to college and do the normal activity.

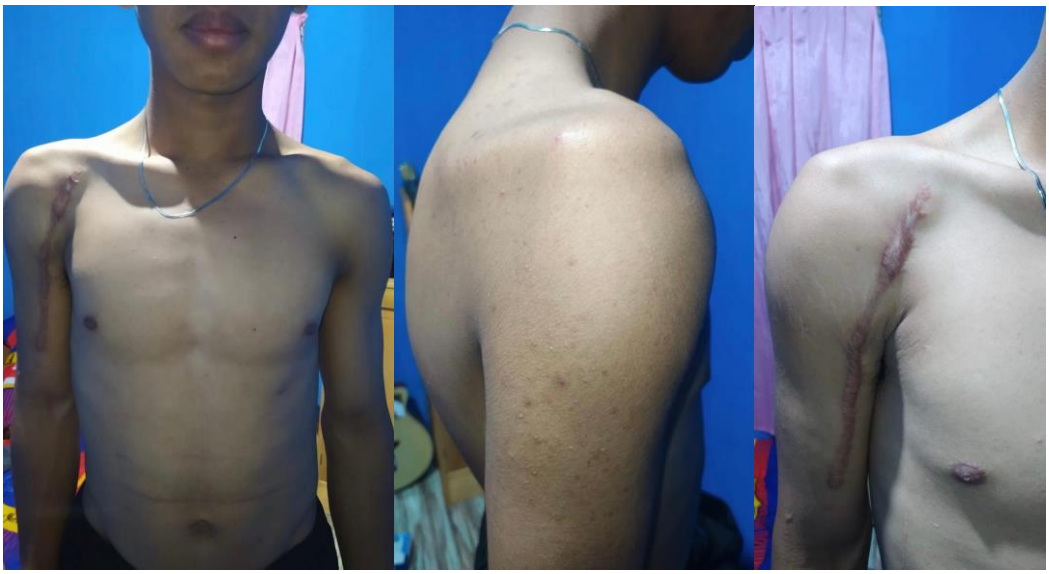

Figure 6. Twelve months after surgery

Discussion

GCT of the bone is a benign, locally aggressive neoplasm that is composed of sheets of neoplastic ovoid mononuclear cells interspersed with uniformly distributed large, osteoclast like giant cell. It represents around 4-5% of all bone tumors, and approximately 20% of all benign primary bone tumors. GCT is described as a predominantly osteoclastogenic stromal cell tumor of mesenchymal origin. It is composed of three cell types, mainly neoplastic giant cells (tumor stromal cell), mononuclear monocytic cell, and multinucleated giant cell. The radiological finding of GCT Includes well-defined lytic lesion, eccentrically located in the metaepiphyseal region of long bones, but in the hand, it tends to be more often central. The cortex is usually thinned without any periosteal reaction. Campanacci et al. classified GCT of bones into three grades: Grade 1 has minimal cortical involvement; Grade 2 presents with thinned and bulged cortex; and Grade 3 has cortical breach with soft tissue involvement (Mazzaferro et al., 2007; Eriksson et al., 1997).

Clinical presentation includes pain with or without signs of inflammation. Since the natural history of this tumour is quite benign, most cases will have insidious and progressive localised pain. Range of motion can be limited if the lesion lies adjacent to a joint. Various treatment modalities of GCT of bone in the hand have been described such as curettage alone, curettage with or without different adjuvants, followed by packing the cavity with bone graft or methylmethacrylate bone cement; wide margin resection and reconstructionamputation, and disarticulation. According to the National Comprehensive Cancer Network Clinical Practice Guidelines in Oncology for bone cancer recommendations, for localized GCT of bone, if the tumor is resectable, excision of tumor is the primary option. The GCT is aggressive despite not being a sarcoma and has a high risk of recurrence even after limited resection (Roux et al., 2012; Krappinger et al., 2011).

There are several therapy options for the patient, the non-operative and operative therapy. The non-operative way such as radiation therapy for the inoperable or multiply recurrent lesions, sacral, or large vertebral body lesions that are not amendable to surgery. Tumor Embolization Therapy will block the specific arteries that supply blood to the tumor, and the tumor cells begin to die. Medical management like denosumab or biphosphonates to stabilize lesions and replace surgical management. Operative therapy such as extensive curettage, adjuvant treatment, and reconstruction are indicated for the amenable lesions, a majority for the lower extremity lesions. Complete resection and reconstruction for the lesions that are not possible due to structural compromise. After we do some curettage, the cavity is filled with a bone graft to stabilize the bone. The amputation for the hand lesions with cortical breakthrough who are not amendable to intercalary resection. Conventionally, the technique is a wide excision. The head of

humerus of the patient is destroyed by the tumor. There is no way to keep the humeral head (Buchanan et al., 1998; Burke et al., 1995).

So, the operator had to replace it with a humeral prothesis. First we do some ellipse incision to the deltoid region, do a wide excision and cut the humeral mid shaft. We replace the proximal humerus and the head humeral with a 41mm humeral prothease. In principle, total amputation has the lowest incidence of recurrence, but the lesion of this patient are amenable to curettage. This treatment had 20-40% recurrence, but if we do some adjuvant treatment such as phenol, hydrogen peroxide, cryo, argon beam, or high speed burr, the recurrence lower to 3-10%.

Conclusion

Wide excision are suitable for this patient, we can save a normal tissue and do some shoulder reconstruction. with the surgical intervention and postoperative vigorous physiotherapy can lead to regaining of normal anatomic and physiological functions of the affected joint.

Conflict of interest

The author has no conflict of interest related to this article.

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