CENTRALIZATION OF ULNA IN CAMPANACCI GRADE 3 GIANT CELL TUMOUR OF DISTAL RADIUS

UMARU H, MADUBUEZE CC, ALADA A, OPADELE TO.
Orthopedic Unit, Department of surgery National Hospital Abuja, Federal Capital Territory, Nigeria

Correspondence to: Dr. Habila Umaru, Orthopaedic Unit, Department of Surgery, National Hospital Abuja, Central Business District. P.M.B 425, Garki. FCT. Email: habilaumaru@yahoo.co.uk Phone +234806985470

ABSTRACT

Giant cell tumor (GCT) of the bone has been described as the most challenging benign bone tumors with an unpredictable behavior. Although benign, GCT show tendency for significant bone destruction, local recurrence, rarely malignant transformation and occasionally metastasis. The report presents the management of grade 3 Campanacci GCT of distal radius by wide excision and ulna centralization on the carpus in a dominant hand of young man; and highlights the importance of limb salvage even in late presentation of an aggressive benign tumor

KEY WORDS: Ulcerated, giant cell tumor, radius, wide excision

INTRODUCTION

Giant cell tumor of bone (GCT) is the most common benign aggressive primary bone tumor, accounting for approximately 5% of primary bone tumors in adults from ages 20 to 50 with a slight predominance for females compared to males. GCT may exhibit metastatic disease in less than 5% of cases most often to lungs. Even if metastatic, the course is generally indolent, although fatality has been reported. The typical radiographic appearance of GCT is a lesion which is eccentrically located in the metaphyseal and epiphyseal regions of the long bones. The hallmark appearance of GCT is an expansile lesion which is centrally radiolucent with formation of a thin neocortex at the border of the lesion. Campanacci grade is the classification system of choice for giant cell tumors. Grade 1 tumors are confined within the cortex, grade 2 expand the cortex, and grade 3 perforate the cortex with resultant soft tissue extension.

The mainstay of treatment of GCT is surgery. Options include either en bloc resection and reconstruction, or intralesional curettage with a high speed burr, cryotherapy or phenolation, and cementation or bone grafting.
Giant cell tumor of the distal radius presents unique challenges. Some have suggested that these tumors more frequently recur than GCT in other locations \(^1,6,7,9\) and functional outcomes are often adversely affected due to proximity to the carpus. Should be treated with en bloc or wide excision \(^8,9\) and subsequent reconstruction of resulting defect.

As most giant cell tumors are benign and are located near a joint in young adults, several authors favor an intralesional approach that preserves anatomy of bone in lieu of resection. \(^7,8\) However, most concessions support intralesional excision for grade 1 and 2 GCT with augmentation, while grade 3 should be treated with en bloc or wide excision \(^8,9\) and subsequent reconstruction of resulting defect.

Majority of recurrences were observed to occur within the first two years, although late recurrences are known and long-term surveillance is recommended in these patients. \(^10,11\) Even though the increasing grade from 1 to 3 is not a reflection of the biologic aggressiveness of the tumor, various authors have documented increased recurrence rate in Grade 3 lesions. \(^12,13\) This could be due to the difficulty in achieving complete clearance once the tumor has breached its normal anatomic boundaries and extended into soft tissue. \(^14\)

**CASE REPORT**

Mr. G.A, 24 years old right-hand-dominant final year undergraduate (3 months away from writing his final year examinations) who presented with 9/12 history of progressive pain and swelling of the distal 3rd of the right forearm/wrist. Pain was aggravated by movement of the wrist. He initially visited other health facilities where he was offered below elbow amputation. He refused to consent because of the negative effect that it will have on his final exams and subsequent graduation. He resorted to local treatment with herbal preparations and hot fomentation, till the mass got ulcerated. There was no history of trauma, fever or weight loss.

Examination revealed globular swelling involving the right wrist and distal 3rd of the forearm measuring 12 cm x 8 cm, more over the dorso-lateral aspect of the forearm with area of ulceration measuring 4 cm x 4 cm. All movements at the wrist joint were painful and restricted, distal neurovascular status was normal and chest radiographs were normal. Radiographs of the wrist revealed a lytic/lucent expansile lesion involving the distal 3rd of the radius with breaching of cortex and poorly defined margin, without periosteal reaction or soft tissue calcifications.

MRI similarly showed an expansile mass lesion in the distal aspect of the radius, measuring 10.42 x 7.24 cm, the carpal bones were essentially preserved, the tendons were displaced anteriorly and posteriorly but not destroyed (Figure 1). There was evidence of infiltration of the mass lesion noted in the overlying fascia and subcutaneous layers (Figure 2).

He was offered wide excision through dorso-lateral approach to include the ulcerated area with the tumour. Approximately 9 cm of distal radius along with parts of the radio-scaphoid, radiolunate capsules and distal radio-ulna joint capsules was resected; distal ulna was freed of cartilage, and the lunate was freshened (Figure 3). Tumour bed was treated with 3% hydrogen peroxide to take care of the likely spillage. The wrist translocated to place the lunate in line with the distal ulna and fixed (wrist placed in neutral - hand shake...
position) with cross K-wires (Figure 4). The construct was supported with bulky dressing using gamjee and a broad arm sling. Patient had uneventful recovery, except for necrosis of wound edge noticed about the 10th post operative day which was managed by debridement and subsequent secondary wound closure. Radiologic union of the ulno-carpal interface was achieved at 3 months post-operatively and patient successfully wrote his final year examination with the same hand to graduate with his mates. At two years of follow-up, the patient had no clinical or radiological evidence of recurrence. 

(Figures 5 and 6)

He was pain free and satisfied with the cosmetic and functional outcome of the hand with comparative grip power of 80%.

DISCUSSION

Giant cell tumor of the distal radius presents unique challenges. Some have suggested that these tumors more frequently recur than GCT in other locations and functional outcomes are often adversely affected due to proximity to the carpus. The index patient was a final under graduate student who had GCT of the distal radius of dominant hand; the fear of losing his dominant hand influenced his decision to seek opinion from one health facility to the other and even alternative treatment from traditional bone setters to avert amputation as advised in one of facilities he visited, this a common scenario in our setting because of poor referral system.

The optimal treatment for GCT of the distal radius remains controversial due to its complex anatomic structure. Intralesional curettage, along with adjuvants is reserved for Stage 1 and 2 lesions as high rates of recurrences have been noted in Stage 3 lesions. In conformity with the mainstay of treatment of high grade GCT, Wide excision of the tumour (9cm of distal radius along with parts of the radio-scaphoid, radiolunate capsules and distal radio-ulnar joint capsules was resected and distal ulna was freed of cartilage) was undertaken for our patient who had Campanacci grade 3 tumour that had breach the bone cortices. This is in agreement with O’Donnell et al, who pointed out that Curettage and bone grafting is justified only in well-contained tumours within an intact cortex; whereas for aggressive GCT of bone, en bloc resection is preferred to minimize the risk of recurrence. En-bloc resection was not feasible in this case because of tumour extension beyond bone cortices, involving the soft tissue with skin ulceration.

The choice of reconstruction method after resection of the distal radius varies among surgeons, but pertinent consideration when evaluating a technique of reconstruction includes the ease of the procedure, its morbidity, the complications and functional outcome and the durability of the reconstructed segment as opined by Jali et al. Fibular autograft, allograft or ulna centralization is among the common options, each with its advantages and drawbacks. Ulna centralization was our reconstruct of choice in this case being a relatively shorter procedure, simple for an orthopaedic surgeon to perform, without the need of a microvascular and oncological team, has low morbidity and act as a local vascular graft which reduce chances of infection and improved union compared to donated (fibular autograft or allograft) graft as observed by others.
The disadvantages of reconstruction with fibular autograft or allograft as highlighted by some authors include donor site morbidity, delayed union or non-union\textsuperscript{17}. Also, allografts may not be available in all orthopaedic setups and there is at least a theoretical risk of transmission of viral diseases as observed by others\textsuperscript{17, 19}. Furthermore Meena et al in a similar study reported that, wrist fusion through centralization of the ulna to the carpus achieved a satisfactory outcome. They also observed that procedure has low morbidity, a good union rate, and provides a stable joint for heavy work;\textsuperscript{20} these advantages were buttressed in this report, our patient had stable wrist joint with comparative grip power of more than 80\% within 12 weeks after surgery. Kirschner's wire fixation of the ulna to the carpus supported with bulky dressing and the limb supported in broad arm sling was the stabilization technique adopted in our study with good bone union in 12 weeks. Meena et al in a similar study opined that, the use of Kirschner's wires (rather than a locking plate) is cost-effective. This technique could mitigate the complications associated with massive prosthetic implants such as aseptic loosening and deep infection, often necessitating revision, and sometimes even amputation\textsuperscript{6, 9, 20}.

The common complications cited\textsuperscript{17, 18, 20} with this procedure includes ankylosis of the wrist, damage to neural structures, vascular insufficiency of the hand, wound infection, necrosis of wound margins, fracture of the ulna, and hardware failure. Necrosis of wound margin was the only complication observed in this report on the 10\textsuperscript{th} post operative day which was managed by wound debridement and subsequent secondary closure. Similar to experience of others\textsuperscript{18, 19, 20} at subsequent follow up, wrist fusion resulted in a loss of pronation and supination in the forearm and flexion and extension at the wrist, a sizeable scar (Figures 5 & 6) decreased distal forearm circumference, extensor tendon lagging of the extensor pollicis brevis and abductor. We conclude that limb salvage is a viable option in management of high Grade GCTs of distal radius by wide resection and reconstruction by ulna centralization which can potentially overcome the disadvantages of fibular graft and provide a stable, pain free wrist despite some loss of motion.

REFERENCES


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Figure 1

Figure 2