



## Giant Cell Tumor of the Right Distal Radius Campanacci Iii Treated with Wide Excision and Space Filler Using Prefabricated Polymethyl Methacrylate (Pmma) Bone Cement: A Case Report

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### Abstract

Background: Giant cell tumor of bone (GCT) is the most common benign aggressive primary bone tumor (metastatic rate less than 5% of cases). 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 (epiphysis and metaphysis). Campanacci grade is the classification system for giant cell tumors. Grade I tumors are confined within the cortex, grade II expand to cortex, and grade III perforating cortex with higher incidence of recurrence and transformation into malignancy. Functional outcome of the wrist joint was evaluated using Mayo wrist score (pain intensity, functional status, range of movement, and grip strength). Case Report: A 39 years old male presented lump in his right wrist joint since 6 months ago. The patient complained of decreasing range of motions and palpable mass that increase progressively over time. Slight pain was also felt around the wrist joint. He sought traditional (masseur) therapy for the last 6 months, but the complaint persisted. He then underwent operation (tumor excision and augmented graft) in our institution. The graft was made from PMMA bone cement and designed identically similar to distal part of the patient's radius. Histopathologic analysis was consistent with Giant cell tumor. We evaluated patient's functional outcome using Mayo wrist score, with satisfactory result. Discussion : Most common method of replacing distal part of radius after excision of GCT was grafting using proximal fibula or ceramic prosthesis. There has never been a published clinical trial of using PMMA as a space filler. Nonetheless we used prefabricated PMMA bone cement based graft to mimic the bone in order to prevent the risk of recurrence and to achieve good functional outcome. We took the measurement of the patient's left radius using X-ray as a model, then fabricate the PMMA bone cement in the Anatomy laboratory according to the model's measurement. Although it's not a popular method, but after 6 months of follow up satisfactory functional outcome was achieved (Mayo wrist score) and without sign of recurrence or metastatic. Conclusion: After excision of the GCT, prefabricated PMMA bone cement could be considered as one alternative of space-filling material to achieve good functional outcome.

**Keywords :** *Giant cell tumor, Radius, Excision, Bone Cement, Polymethyl Methacrylate, Graft.*

### Introduction

Giant cell tumor of bone (GCT) is the most common benign aggressive primary bone tumor (metastatic rate less than 5% of cases). It represents approximately 10% of all primary musculoskeletal tumors. It affects slightly more women than men (3:2), typically between the age of 20 and 50 years.

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 (epiphysis and metaphysis). Campanacci grade is the classification system for giant cell tumors. Grade I tumors are confined

within the cortex, grade II expand to cortex, and grade III perforating cortex with higher incidence of recurrence and transformation into malignancy [1,2,3]. Treatment options have included intralesional excision (curettage) with or without adjunctive modalities (eg, high speed burring, cryotherapy, phenol, and hydrogen peroxide), en bloc resection followed by reconstruction (fibular head replacement or ceramic prosthesis), or arthrodesis [4]. Reconstruction of the wrist joint following excision of the distal radius is challenging. Replacement using the vascularised or non-vascularised head of the fibula has been the method of

choice because of the anatomical similarities between the distal articulation of the radius and the proximal aspect of the fibula. Reconstruction with a ceramic prosthesis has several advantages, including preservation of function, restoration of the anatomy, and the ability to repair large defects while avoiding delayed union and donor-site morbidity. Although it is a rare prosthetic and expensive [5]. Curettage and packing with polymethyl methacrylate (PMMA) cement has gained wide acceptance for the treatment of GCTs of bone, which are often large, juxta-articular tumors with a historically high rate of local recurrence.

PMMA alone significantly reduces the likelihood of recurrence. Bone cementing is the most straightforward way to reconstruct a large cavity and simultaneously restore the structural integrity. We reporting a case of giant cell tumor of the right distal radius Campanacci III which treated with excision and space filler using prefabricated polymethyl methacrylate (PMMA) bone cement. Functional outcome of the wrist joint was evaluated using Mayo wrist score (pain intensity, functional status, range of movement, and grip strength) [2,4,5].

## Case Report

A 39 years old male presented lump in his right wrist joint since 6 months ago. The patient complained of decreasing range of motions and palpable mass that increase progressively over time. Slight pain was also felt around the wrist joint. He sought traditional (masseur) therapy for the last 6 months, but the complaint persisted. In the history of past illness, there are no cancer history nor other neoplasms. He is not a smoker. On physical examination the distal radius was tender, with a firm to hard swelling with palpable crepitus.

Radiographic studies showed osteolytic lesion over the distal right radius occupying epiphysis and metaphysis with break in dorsal and volar cortex (Figure 2). The patient then underwent an intralesional resection, with local curettage, as well as filling of the cavity with autologous bone graft. The graft was made from PMMA bone cement and designed identically similar to distal part of the patient's radius. Histopathological analysis was consistent with giant cell tumor. He did not have wound problems post-operatively. We evaluated patient's functional outcome using Mayo wrist score, with satisfactory result.



Figure 1: Prefabricated polymethyl methacrylate (PMMA) bone cement



Figure 2: Radiograph and clinical picture before excision



Figure 3: Radiograph and clinical picture after excision and space filling



Figure 4: Patient's functional outcome after the treatment

## Discussion

Giant-cell tumour is mostly found in the third and fourth decade of life though it has been rarely seen in younger age group also. It is locally aggressive tumour involving. Epiphyseal region of mature bones. Most of the tumours are found around knee joint in distal femur, proximal tibia, and distal radius. GCTs have occurred in the distal radius in approximately 10% of cases (range, 8%-13%).

Local control and reconstruction of GCTs in the distal end of the radius have been challenging owing to the limited amount of surrounding soft tissue, the proximity of this region to adjacent neurovascular structures, and the juxtaarticular location [6]. Various treatment options are used depending on the stage and location of tumour. Intralesional curettage has been the standard method of treatment, but is associated with a relatively high risk of local recurrence. Reconstruction is often performed using PMMA with or without bone grafts and osteosynthesis [3].

PMMA is associated with a lower recurrence risk (12% to 34%), provides immediate mechanical support, and facilitates easy and early detection of local recurrences. PMMA is therefore widely recommended to fill the cavity left after curettage [7,8]. Most common method of replacing distal part of radius after excision of GCT was grafting using proximal fibula or ceramic prosthesis. There has never been a published clinical trial of using prefabricated PMMA as a space filler. We used prefabricated PMMA bone cement based graft to mimic the bone construct in order to prevent the risk of recurrence and to achieve good functional outcome.

Prefabricated PMMA also used due to its biocompatibility, availability, low cost, strength, and ability to be premolded. The use of customized PMMA was associated with excellent patient, family, and surgeon satisfaction at follow-up at a fraction of the cost associated with commercially available implants. We took the measurement of the patient's left radius using X-ray as a model, then fabricate the PMMA bone cement in the

Anatomy laboratory according to the model's measurement. Although it's not a popular method, but after 6 months of follow up satisfactory functional outcome was achieved (Mayo wrist score) and without sign of recurrence or metastatic [2,3,6,9,10].

## References

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## Conclusion

Prefabricated PMMA bone cement could be considered as an alternative of space-filling material after excision of the GCT, to achieve good functional outcome. It also has more cost effective and more applicable than ceramics.

