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The Effect of Supplemental Bone Grafting in Giant Cell Tumor of the Extremity

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Introduction: Giant cell tumors (GCT) are epiphyseal (periarticular) benign aggressive bone tumors. Periarticular bone and cartilage can usually be preserved and treatment is resection-curettage, with adjuvants, followed by stabilization. Stabilization may or may not include bone grafting. Complications include recurrence, fracture, and joint degeneration. Studies have shown that adjuvant treatment may affect recurrence rates. Joint degeneration and fracture may be related to the extent of disease and the method of reconstruction. Bone grafting is more biologic than bone cement alone.

Purpose: We hypothesized that supplemental subchondral bone grafting would result in fewer periarticular complications, including fractures and osteoarthritis, without affecting tumor recurrence rates.

Methods: Forty-six patients with a giant cell tumor were treated primarily with resection-curettage and adjuvant therapy from 1996 to 2013. There were two groups. The first group consisted of 25 patients (27 reconstructions) treated with polymethyl methacrylate (PMMA) alone. The second group consisted of 21 patients treated with bone grafting with or without the addition of PMMA. Internal fixation using Steinmann pins, cortical screws, or a locking plate was performed in 19/27 reconstructions from the first group, and in 18/21 reconstructions from the second group. Reconstruction included the distal femur in 20 cases, the proximal tibia in 16, the distal tibia in 9, and the distal humerus, distal radius, and posterior ilium in 1 case each. Complications were studied in both groups and included reoperation, recurrence, fracture and osteoarthritis.

Results: The difference in the overall complication rate between PMMA alone and supplemental bone graft (with or without PMMA) was statistically significant (52% vs. 24%, $p=0.036$). The difference in the rate of non-oncologic complications (fracture and osteoarthritis) between the two methods was also significant (41% vs. 10%, $p=0.006$). We did not observe a significant difference between the two groups in regards to the rate of local recurrence (26% vs. 19%, $p=0.56$) or mean MSTS score (89.4% vs. 92.6%, $p=0.25$).

Conclusion: Compared to PMMA alone, the use of bone graft constructs with or without PMMA following giant cell tumor resection significantly reduces the rate of post-operative complications, specifically fracture and osteoarthritis, without increasing tumor recurrence rates. Therefore, the addition of periarticular bone graft may provide a biologic solution without increased risk.