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Diminished Remaining Subchondral Bone Predicts Risk for Fracture or Arthritis Following Treatment of Giant Cell Tumor of Bone at the Knee

Significance & Hypothesis/Techniques:

Giant cell tumors (GCTs) are benign, locally aggressive bone tumors that are treated with curettage and adjuvant therapy when possible to salvage the articular surface. We asked if remaining subchondral bone, tumor size, and use of bone graft influenced development of osteoarthritis or fracture at the knee.

Innovation:

Studying the relationship between subchondral bone thickness may help to better counsel patients prior to initial surgeries.

Approach:

Thirty-eight patients were included, 18 treated with PMMA cement alone, 20 treated with bone grafting with or without PMMA. Subchondral bone thickness was measured using pre-operative CT or MRI and post-operative x-rays. In patients with < 3mm of subchondral bone remaining, a percentage of condylar involvement was performed based on AP and Lateral imaging. Patients classified as having osteoarthritis were symptomatic and with a Kellgren-Lawrence score of 3 or 4. Patients with less than 1 year follow-up were excluded.

Results:

Mean age was 33.5 years, with mean follow-up of 80 months (range: 12-271). Fourteen (36%) patients experienced a mechanical complication of fracture or osteoarthritis. Seven (19%) developed local recurrence. Patients with mechanical complication had a mean of 75% condylar involvement with < 3mm of remaining subchondral bone, versus 35% in the group without mechanical complication ($p < 0.0001$). Overall, the rate of mechanical complications between bone grafting (25%) and PMMA alone (39%) groups was comparable ($p = 0.351$). However, when greater than 50% of the remaining articular surface had < 3mm of subchondral bone, bone grafting appeared to have a protective effect versus PMMA alone [5/13 (38%) vs 7/8 (88%); $p = 0.027$]. Patients with a fracture extension to the articular surface on CT/MRI had increased risk for mechanical complications versus those without [10/20 (50%) versus 1/18 (5%); $p < 0.01$].

Discussion & Impact:

Patients with fracture extension to the articular surface are at increased risk for later mechanical complication joint preserving treatment of GCT at the knee. In patients with greater than 50% of the articular surface involved as defined by < 3mm of remaining subchondral bone, subchondral bone grafting provided a protective effect against fracture or arthritis development.

