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CORR Insights®: What are the Functional Results, Complications, and Outcomes of Using a Custom Unipolar Wrist Hemiarthroplasty for Treatment of Grade III Giant Cell Tumors of the Distal Radius?

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Where Are We Now?

Giant cell tumors (GCTs) of bone comprise approximately 5% of all primary bone tumors [1] and 20% of benign

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bone tumors, with higher rates reported in China [8]. The distal radius is a common location for this uncommon tumor, and given its predilection to arise in young adults, Campanacci Grade III (cortical breakthrough with soft-tissue mass) GCTs may cause considerable long-term local morbidity. A wide variety of methods to reconstruct the distal radius after en bloc resection of a GCT have been described, including arthrodesis of the wrist, osteoarticular allograft, nonarthrodesed nonvascularized or vascularized fibula graft, vascularized iliac crest bone graft, centralization of

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the ulna, and prosthetic arthroplasty, suggesting that a predictably successful solution to this problem does not yet exist [2, 4, 5].

To address this challenging problem, Wang and colleagues reviewed a small group of patients with Grade III GCT of the distal radius treated with en bloc resection and a custom unipolar wrist hemiarthroplasty. Although the authors demonstrated effective short- to mid-term prevention of local and distant recurrence, after comparing their procedure and results to other techniques and reported results, they concluded that unipolar wrist hemiarthroplasty is best used as an alternative to the other more-established methods of addressing GCT treated with en bloc distal radius resection. The authors concluded that prosthetic wrist hemiarthroplasty is best indicated when an osteoarticular allograft is not available or when the patient does not accept the donor site morbidity of a proximal fibula

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autograft. The authors should be commended for the critical appraisal of their proposed treatment.

Where Do We Need To Go?

Ideally, treatment of Grade III GCTs of the distal radius would be guided by Level I or II evidence with long-term followup. However, for rare conditions such as GCT, we remain reliant upon Level III and IV studies such as this case series by Wang and colleagues. We ideally need long-term results for whichever reconstructive technique is chosen. Compounding the importance of longer-term followup of a durable reconstruction is the fact that GCTs typically arise in patients in their 20s and 30s. Future studies involving en bloc resection and reconstruction would ideally last a minimum of several decades and include a greater number of patients. While this degree of followup is not currently a realistic scenario for something as uncommon as GCTs of a particular grade arising in a particular bone, it may be in the future as we develop more robust national databases such as the American Joint Replacement Registry.

Wang and colleagues treated their patients with a prosthesis that was customized based upon the planned level of resection and radiographic measurements of the contralateral

wrist and forearm. The prosthesis was manufactured in Beijing, China but no cost data was included in the study. With the advent of alternative payment models and merit-based incentive systems, the era of “cost is no object” medical care is certainly over in the United States [3]. Though the costs of implants to treat musculoskeletal tumors may be more resistant to the economies of scale that are driving down the costs of implants for total joints, in the future we will all be under increasing pressure to know the costs of our therapies and to control these costs. Resection of the distal radius is an infrequently performed, but high-financial-impact procedure when performed with bulk allograft, vascularized autograft, or a custom implant. Further research into the relative costs of the various treatments is imperative.

When focusing on technically complex surgical procedures, it is easy to lose sight of the dramatic advances being made with targeted molecular therapies and other modern medical tumor treatments. If one were to envision the ideal treatment for Grade III GCT of the distal radius, it would certainly be a noninvasive therapy. Denosumab is a monoclonal antibody which obstructs the receptor activator of nuclear factor kappa-B ligand (RANKL) and is used to treat osteoporosis and skeletal metastases. This

antibody is also an FDA-approved therapy for GCT of bone. Early results using Denosumab to treat GCT of bone demonstrate favorable clinical, pathologic, and radiographic responses with efficacy in preserving the joint and articular surface [6, 9].

How Do We Get There?

Several approaches might lead to a better understanding of the costs, durability, and functional outcomes of the various techniques used to reconstruct the distal radius for Grade III GCT. First would be to leverage multi-institutional studies to enroll more meaningful numbers of patients if not in randomized trials, then at least in prospective cohort studies. It is unlikely that there are more than few centers that treat enough Grade III GCTs of the distal radius to have fostered differing specific preferences amongst multiple treating surgeons. However, it is likely that centers with multiple orthopaedic oncologists have evolved to prefer a single one of the various techniques used to reconstruct the distal radius and these preferences could form the basis for a multi-institutional study.

It should be relatively straightforward to understand the important issue of the perioperative costs of the different surgical techniques. The largest

difference in short-term costs would almost certainly be the difference in cost between a fresh-frozen osteoarticular allograft, an intercalary allograft for arthrodesis, and a custom-made implant. A proximal fibula allograft would entail a different set of costs associated with operative time and perhaps more intensive postoperative care.

Finally, thoroughly assessing the ultimate costs to society of these various reconstructive techniques would require assessments (such as quality- and disability-adjusted life years) that would incorporate long-term measures of disease burden normalized to the cost of treating the disease [7]. The road to obtaining meaningful and detailed long-term data on functional outcome, cost, and cost-effectiveness will be difficult, but is the only rational way to advance the surgical treatment of this rare but potentially devastating condition. However, if targeted therapies such as Denosumab continue to evolve, it's also possible that GCT of bone either ceases to be a surgical

disease or will only rarely require en bloc resection.

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