

## Combination of Serial Embolization and Denosumab for Large Pelvic and Sacral Giant Cell Tumor

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### Background

Giant cell tumors (GCT) of bone is an intermediate, locally aggressive but rarely metastasizing tumor. Various methods of treatment have been advocated. Treatment evolved as new techniques become available. The strategy of treatment is determined by a combination of maximizing tumor local control whilst minimizing morbidity and also decision-making needs to be individualized. Serial arterial embolization (SAE) has traditionally been proved to be an effective method and is often used alone or in conjunction with other modalities for sacrum or spine. Recently, denosumab has shown promise, particular for patients with tumors in challenging anatomical locations and those with recurrent disease. It is reasonable to consider combination of SAE and denosumab as neoadjuvant or stand-alone treatment.

### Questions/Purposes

Explore the effectiveness and efficiency of combined treatment of SAE and denosumab.

### Patients and Methods

Two large, inoperable, GCT cases were described. Case 1. A 49-year-old male was referred for a 2-month history of dysuria and constipation. He received sacrectomy below S3 for GCT 2 years before. MRI and CT scan showed a large expansile sacral mass with cortical destruction; a biopsy was performed and local recurrence was confirmed. The patient underwent 6 endovascular embolizations with 2-month interval. He started on denosumab after first session of embolization with induction dosing of 120mg, once per week for 3 weeks, followed by 120mg once per month. He was 15 months into treatment. Case 2. A 22-year-old female presented with severe pain in her left buttock for 8 months, which severely restricted her gait. A large mass was palpated at left buttock. Radiograph revealed a massive pelvic tumor arising in the ilium. A huge soft tissue mass had extended extraosseously. The histological diagnosis was GCT. SAE was performed for 3 sessions and the denosumab was started simultaneously. The patients was on treatment for half year.

### Results

After the first embolization and weekly injection of denosumab, both patients experienced a dramatic decrease in symptoms and concomitant improvement in function. The patient went from being mildly symptomatic after the first month treatment to completely asymptomatic after three months treatment. Consecutive clinical and radiographic evaluation every 2 to 3 months after initial treatment revealed significantly tumor shrinkage in both patients and extensive sclerotic ossification in the pelvic case. Intralesional cystic change was significant on MRI of the sacral GCT case. Both patients were found to be asymptomatic with progressive ossification and decreased feeder vessels in arteriogram. Further biopsy specimens were obtained at 6 months after treatment, and the pathological slides demonstrated significant response with paucity or disappearance of giant cells and the production of bone and fibrous tissue. The SUVmax decreased from 12.1 to 3.6 in case no.2. Tumor removal is being planned with the intent of complete cure at current situation.

### Conclusion

Combination of SAE and denosumab can be effective in treating large GCT at challenging anatomical locations,

for which surgery would carry significant risk. SAE and denosumab can synergically promote sclerosis and result in significant decrease in pain. It is reasonable to consider using SAE combined with denosumab neoadjuvantly to potentially reduce the extensiveness and morbidity of surgery, however further investigation is warranted.

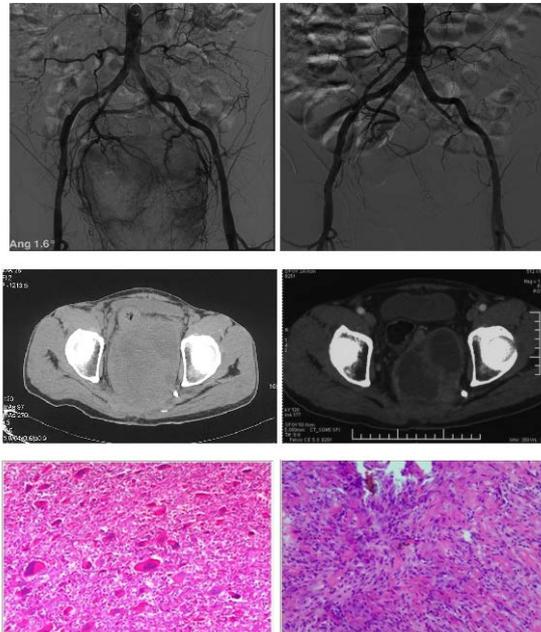


Figure. Angiograph images following first (upper left) and sixth (upper right) embolization in Case 1 demonstrated the vascularity pattern and successful blockage of the feeder vessels. Extensive tumor mass was seen on axial CT scan at diagnosis (middle left). The central lesion showed significant cystic change and overall size was dramatically decreased at 15 months (middle right) since treatment start. Pre- and post-combined treatment pathological appearance, initial biopsy showed typical GCT with numerous multinucleated giant cells surrounded by abundant spindle-shaped tumor stromal cells (lower left). Further biopsy was obtained at 6 months revealed stromal cells, scattered mononuclear spindle cells, no multinucleated giant cells were seen (lower right).