

Functional Cure Beyond Palliative Care by Ablation-Osteoplasty-Reinforcement-Internal Fixation Percutaneous Skeletal Oncology Procedure for Massive Periacetabular Osteolytic Metastases in a Prospective Cohort of 60 Patients with Up to 4 years of Follow-Up Outcomes

Francis Young-In Lee¹, Christopher M. Dussik, Izuchukwu Kenneth Ibe, Dieter Lindskog², Gary E Friedlaender³

¹Yale Univ School of Med/Dept Ortho Surg, ²Yale Univ Sch of Med, ³Yale Univ School of Med

INTRODUCTION:

Periacetabular osteolytic metastases with impending or established pathological fractures have been treated with heavy emphasis on metal implants that are used for trauma, arthroplasty, or sarcoma surgeries. Minimally invasive percutaneous ambulatory AORIF (RF Ablation - Balloon Osteoplasty - Reinforcement with zoledronate -loaded PMMA bone cement - Internal Fixation) procedure is a first-line minimally invasive percutaneous ambulatory procedure addressing 4 major dimensions of local cancer control, bone biology, biomechanical stability, and time-factors. The main advantage of AORIF is to avoid extensive open surgical approaches for mega-implants for periacetabular bone defects in patients with often-unpredictable remaining life. The goals of this study were twofold: 1) to analyze pain reduction and improvement of ambulatory function following minimally invasive percutaneous AORIF at 2 weeks and for the duration of survival up to 4 years; and 2) to characterize short- and long-term complications within the postoperative period.

METHODS:

This study details a single center prospective cohort investigation of 59 patients with osteolytic peri-acetabular skeletal metastases with mean follow up of 17 months up to 4 years or until death. The primary outcome of hybrid pain and functional ambulatory scores [Ranges: 1-2 (Bed-ridden with mild or severe pain); 3-4 (wheelchair with mild or severe pain); 5-7 (walker-cane ambulation with mild or severe pain); 8-10 (8-9: Unsupported ambulation with mild to moderate pain, 10: recreational activities)] were assessed pre- and postoperatively. Secondary outcomes included infection, transfusion requirement, length of stay, 30-day readmission, mortality, subsequent acetabular fracture, and requirement for conversion into total hip arthroplasty. Visual Analogue Scale (VAS), Eastern Cooperative Oncology Group score (ECOG), and Combined Pain and Ambulatory Function Scores were compared to assess outcome.

RESULTS:

Detailed pre-/intra-/post-AORIF photographs and videos will be presented at the meeting. Our cohort displayed universal outcome improvement by their first postoperative appointment within the first 2-4 weeks following AORIF. Combined Pain and Ambulatory Function Score improved from 4.3 ± 2.4 to 7.7 ± 2.2 ($p < 0.001$) without significant deterioration in patients without cachexia during the survival time. VAS pain scores improved from 8.2 ± 2.0 to 2.3 ± 2.3 ($p < 0.001$), and ECOG scores from 3.0 ± 1.0 to 1.5 ± 1.2 ($p < 0.001$). No disintegration of the AORIF construct was observed in all patients. There were no surgical site infections, readmissions, or delays in oncologic care observed following AORIF. Forty-seven patients did not show collapse of acetabular roofs or femoral heads. Among 12 patients who presented with near complete periacetabular subchondral bone loss, comminuted acetabular fractures or protrusio acetabuli, 6 patients died without requiring conversion arthroplasty, 4 patients who survived beyond 1 year did not want to have conversion arthroplasty. Two patients underwent simple hemiarthroplasty due to an ipsilateral femoral neck fracture at 5 months and due to mild pain secondary to flattened head at 22 months respectively. One additional patient with newly diagnosed Stage IV breast cancer, ipsilateral femoral neck fracture, and virtually no bone stock in the pelvis underwent hemiarthroplasty at 16 months after dramatic pelvic bone reconstitution and life-saving chemotherapy. All these 3 patients underwent simple hemiarthroplasty instead of complex reconstructive surgeries using acetabular megaprotheses. Two patients required additional AORIF and optional screw exchange due to progression of cancers and osteolysis in the adjacent bone. Increased bone formation in the periacetabular defects were observed in most patients who showed responses to oncologic drug therapies and survived beyond 1 year.

DISCUSSION AND CONCLUSION:

AORIF is an effective, minimally invasive endoskeletal reconstruction method that represents a first-line alternative for the reconstruction of periacetabular metastatic bone defects with emphasis on local cancer control, improving local bone homeostasis, biomechanical stability, and time-related bone mass improvement in patients who survived less than one year and beyond one year. Furthermore, AORIF does not necessitate extensive open total hip arthroplasties with megaprotheses and replacement of intact femoral head.