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**Primary arthroplasty in healed osteoarticular allografts in patients with history of primary femoral bone tumors.**

**Authors:** N.R. Cools Paulino Pereira, MD<sup>1</sup>; B. Verbeek, MD<sup>1</sup>; J.H. Schwab, MD, MS<sup>1</sup>; S.A. Lozano Calderon, MD, PhD<sup>1</sup>

1. Orthopedic Surgery, Massachusetts General Hospital, Boston, MA, United States.

**Background:** Limb-sparing surgery has replaced amputation as standard treatment in patients with primary bone tumors of the lower limb. Allograft reconstruction is advantageous in the younger and physically more active patients who place high demands on the reconstructions. Drawbacks of allograft use include fractures, non-union, infection and most patients develop articular degeneration. Once this point is reached, traditional treatments involve revision to an endoprosthesis or a new allograft. A modality of treatment that we sometimes use in this clinical scenario is to leave the healed allograft in place and proceed with a primary knee or hip replacement in the standard fashion. To our knowledge, this technique has not been reported in the literature.

**Questions/Purposes:** The primary aim of this study is (1) identify failure rates and their etiology and (2) to compare the functional outcome and quality of life of these patients when compared to patients that received primary arthroplasties for primary osteoarthritis.

**Patients and methods:** We identified 22 patients who had primary arthroplasty between 1990 and 2013 over healed osteoarticular allografts for the treatment of allograft articular degeneration at two tertiary referral institutions. We are currently enrolling patients to fill out the PROMIS Physical Function questionnaire, PROMIS Pain Intensity, Harris Hip Score, Knee Society Score, the MusculoSkeletal Tumor Society score and the EQ-5D-5L after at least 1-year follow-up. Multivariable cox regression analysis was used to determine clinical and laboratory factors associated with failure rates.

**Results:** Sixteen patients were initially diagnosed with osteosarcoma (73%), four with giant cell tumor (18%) and two with chondrosarcoma (9%). Median time between allograft reconstruction and arthroplasty was 73 months. After a median follow-up time of 120 months seventeen patients were alive (77%). Thirteen patients (59%) eventually developed a failure of their femur construct after a median time of 13 months (IQR 9 – 49), either because of a periprosthetic fracture (n = 11), infection (n = 5), prosthesis loosening (n = 6), joint dislocation (n = 2) and/or non-union (n = 2). After multivariate analysis, no independent factors could be associated with failure of the femur construct.

**Discussion and conclusion:** To our knowledge this is the first study describing failure rates and functional outcomes after primary arthroplasty in healed osteoarticular allografts in patients with history of primary femoral bone tumors. Due to a failure rate greater than 50%, we consider that revision to an endoprosthesis or a new allograft may offer a more durable construct.