Recurrent Giant Cell Tumor of the Distal Tibia Treated with Trabecular Metal Cones and Tibiotalocalcaneal Arthrodesis Following Intralesional Curettage

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Purpose and Literature Review

Locally aggressive benign tumors of the distal tibia present unique challenges in terms of functional preservation of the affected extremity and local soft tissue coverage. Further complicating matters, these lesions often have a high potential for local recurrence which necessitates more aggressive treatment to maximize local control. The limited literature on this topic describes wide resection of the tumor followed by limb salvage procedures which include free vascularized or non-vascularized centralized fibula autograft and ankle arthrodesis, ilizarov technique, ostearticular allograft and endoprosthesis (1-2). This case study presents our team’s approach to limb-salvage of a recurrent giant cell tumor (GCTB) of the distal tibia using ilizarov and ilizarov's technique in conjunction with tibiotaloalcaneal arthrodesis and porous tantalum trabecular metal cones to address the substantial metaphyseal bone loss. The goal of the procedure was to maximize the long term functionality of the affected limb while constrained by the need to avoid recurrence of the locally.

Case Study and Procedure 1 of 3

In May 2013, a 37-year-old African American male presented to the emergency department complaining of chronic pain in the left ankle persisting from a moped accident that occurred two years prior. A recent fall had aggravated the pain and prompted him to seek treatment. Plain films revealed an expansile osteolytic lesion in the distal tibia without pathological fracture. The patient had no prior history of tumors or cancer. He was referred to an orthopedic oncologist. Subsequent MRI with gadolinium contrast demonstrated a heterogeneously enhancing expansive lesion consistent with a histologically aggressive GCTB. After it was determined that the lesion had been appropriately staged, it was surgically excised. The void in the distal tibial metaphysis was filled with 2 trabecular metal cones. A 10 x 300cm BioMet nail with proximal locking screws was advanced proximally through the reamed calcaneus, talus and the metal cones. The proximal locking holes were secured using the perfect circle technique. The distal screw was placed and the internal compression feature was activated. The distal locking fixture was placed and the trabecular metal cones cemented together with polymethylmethacrylate cement. The proximal locking holes were secured using the perfect circle technique. The distal 5cm of the fibula was removed through a separate 3 cm incision over the distal lateral aspect of the ankle. A talar screw was placed and the internal compression feature was activated. The distal locking fixture was placed and the trabecular metal cones cemented together with polymethylmethacrylate cement, which was also used to pack the remaining voids (Figs 3-4). Hardware placement and fusion position was confirmed by three plane C-arm fluoroscopy. The deep layers and skin were subsequently closed in a typical layered fashion.

Case Study and Procedure 2 of 3

On August 19th, 2014, a repeat curettage of the recurrent GCTB was performed by our multi-specialty team. The thin and friable cement overlying the lesion was removed, along with the previously placed methylmethacrylate. The exterior contents of the lesion was curetted and sent for pathology. A high speed burr was used to smooth the interior surface of the lesion which was subsequently irrigated sequentially with peroxide and pulse lavage. After it was determined that the lesion had been appropriately resected, the team proceeded with ankle salvage by removing the remaining cartilage from the distal tibia and the cartilage of the dome of the talus.

Case Study and Procedure 3 of 3

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Post Operative Course 1 of 2

After non weightbearing in a short leg cast for 2.5 months after the procedure, the patient was placed in a non pneumatic walking boot and allowed to weightbear as tolerated. At 4 months post op, patient began transition to normal tennis shoes and initiated physical therapy.

Post Operative Course 2 of 2

At the 2.5 year follow up, there has been no local recurrence of the patient’s GCTB. At 1 month follow up, functional outcome was measured using the Musculoskeletal Tumor Society Score (MSTS= ‘fair’) and Timed Up and Go Test (TUG=10.2 sec). The patient’s ankle is now fused in a plane graft position with complaints of mild tenderness along the anterior aspect of the distal third of the tibia (Fig 6). Pt can ambulate independently with tolerable pain with the use of a cane and is satisfied with the outcome of his limb salvage procedure in light of the alternative, which was below knee amputation. There have been no surgical site complications to date.

Discussion

Large bone defects, such as those resulting from debridement of locally recurrent benign tumors of the distal tibia in close proximity to the articular surface, can complicate outcomes of salvage arthrodesis by increasing the risk for nonunion, limb shortening and prolonged recovery periods. In these scenarios, a structural graft is required to achieve and maintain desired correction. Allograft is the gold standard for bone grafting but can be complicated by donor site morbidity, limited quantity and risk of graft collapse. Allograft and xenograft carry similar risk as well as lower stability attributable to the preparation process and risk of infectious disease transmission. Porous tantalum is a trabecular metal (TM) that resembles normal bone in it’s microstructure, biocompatibility, compressive strength and elastic modulus. It is considered osteoconductive and it’s osteointegration has been observed in histological canine and micro-CT. TM has been used successfully as a structural graft in cervical fusions, revision total hip/ knee arthroplasties for local control. The limited literature on this topic is infrequently described but has been advocated as a viable alternative to conventional bone graft due to its reduced donor site morbidity and higher friction coefficient, which is theorized to enhance the initial stability of this construct and its potential for implant subsidence. A study by Henricson et al demonstrated promising outcomes associated with the use of TM cones in conjunction with retrograde intramedullar nail for the prosthetic procedures in failed total ankle replacements (3-5). We believe this to be also a viable construct for limb salvage of an ankle with locally aggressive benign tumor of the distal tibia in close proximity to the articular surface.

References