

Novel, vacuum-assisted method for harvesting autogenous cancellous bone graft and bone marrow from the proximal tibial metaphysis

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Introduction/Purpose: Autogenous cancellous bone graft and bone marrow aspirate are commonly used in lower extremity fusion procedures. Autologous graft is considered the gold standard as it is osteogenic, osteoinductive, and osteoconductive, and is without the potential risks of graft-associated infection and immunologic reaction. Disadvantages include graft harvest time and donor site morbidity due to the surgical incision, approach and bone corticotomy. This study evaluated the safety and efficacy of a novel vacuum-assisted bone graft harvesting device which was able to obtain both cancellous bone and bone marrow for insertion into the arthrodesis sites of patients undergoing complex primary and revision lower extremity fusion procedures.

Methods: Between March and November 2017, 9 patients had a foot and/or ankle complex primary or revision arthrodesis performed, with autogenous cancellous graft and bone marrow harvested from the ipsilateral proximal tibia. All patients were 18 years or older with no prior history of knee pain, injury, or surgery at the proximal tibia. Following a circular corticotomy, cancellous bone was harvested using a novel suction-powered, hand-driven bone curettage system (Avitus Orthopaedics, Farmington, CT). The donor site was backfilled with bone graft substitute. Incision length was recorded as well as surgical time from donor site incision to completion of graft acquisition. The volume of cancellous graft and bone marrow were separately recorded. All patients were non-weight bearing on the involved extremity for a minimum of 6 weeks post-operatively and all were evaluated at 2 and 6 weeks post-operatively for donor site pain and associated complications.

Results: There were five male and four female patients with an average age of 51 years and 8 months. Procedures included six complex primary fusions and three revision subtalar or tibio-talar-calcaneal fusions for nonunion. Mean incision length was 2 cm (range 1.80-2.75 cm). Mean volume of obtained graft material included 25 cm³ of cancellous bone (range 9-30 cm³) and 21 cm³ bone marrow aspirate (range 10-40 cm³). Mean procedure time was 5 mins (range 4-8 mins), and average blood loss was less than 1 mL. Two patients had mild pain at 2 week follow-up; however, no patients reported donor site pain at 6 week follow-up. There were no major or minor complications including fracture, infection, hematoma formation, sensory changes, or wound healing issues.

Conclusion: The use of an innovative, vacuum-assisted bone harvesting device allows large volumes of autogenous cancellous bone graft and marrow to be rapidly and readily obtained from the ipsilateral proximal tibia with minimal donor site morbidity.

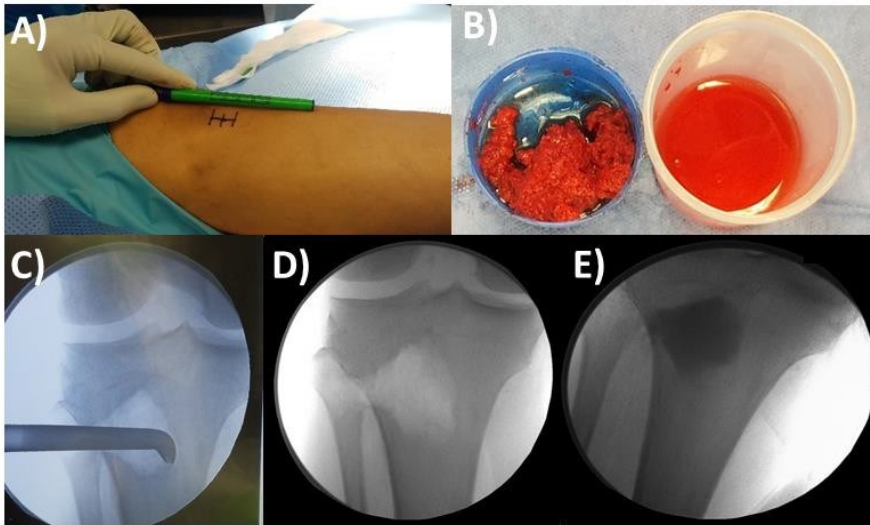


Figure. A) 2 cm incision site over anterior proximal tibia. B) Collected autologous bone graft (left) and bone marrow aspirate (right). C) Radiograph with curved, beveled tip of aspirator in the proximal tibia. D) Radiograph of proximal tibia post-harvest. E) Radiograph of bone substitute backfilled proximal tibia harvest site.