

Treatment of a Femoral Nonunion Using a Bone Graft Gel Composite

—AN INITIAL REPORT—

J. Robin deAndrade, M.D., F.R.C.S., F.A.C.S. The Emory Clinic

Despite the development of more effective fracture fixation devices and advances in surgical techniques, nonunion fracture of the femur is not uncommon and can be a challenging clinical problem. It can be estimated that approximately 19,000-23,000 such cases occur annually in the United States alone.(1,2,3) The use of bone grafting is a common and proven approach to the treatment of these cases.(4)

There has been considerable progress in recent years in our understanding of bone formation, and in the development of bone graft materials. Fresh autologous tissue remains the graft of choice for many surgeons, though limitations in autograft tissue availability and some of the drawbacks associated with autograft procedures (e.g., subsection of patient to second surgical procedure and the resulting time under anesthesia, fracturing of the donor site(5), increased surgical morbidity(6), and increased incidence of infection(7)) have prompted surgeons to investigate and utilize alternatives. Research into the selection and processing of allograft bone tissue has been productive, and advances have been achieved recently in the development of allograft tissue with improved biologic potential for graft incorporation and a reduction in the potential for disease transmission. Also, it has become more widely recognized that the safety and effectiveness of allograft tissue can vary significantly according to a number of factors. One new form of allograft bone tissue that appears to hold significant promise is GRAFTON™ Allogeneic Bone Matrix.(8) This unique gel form of demineralized cortical bone provides surgeons with good intraoperative handling characteristics and an osteoconductive and osteoinductive capacity.(9) This allograft tissue can be mixed with autogenous material such as bone marrow obtained from intramedullary reaming or decortication to obtain a workable mixture of osteoconductive/osteoinductive bone combined with viable osteogenic tissue.

The following case history reports our initial use of this new form of allograft tissue in combination with autologous bone in the treatment of a nonunion of the femur.

Patient PC is a 71 year old female who sustained a fall in the early autumn of 1990. The patient also suffers

from diabetes and hypertension. The fall resulted in a comminuted intertrochanteric and subtrochanteric fracture. The fracture was treated via an open reduction and internal fixation utilizing a nail and plate combination. Due to the comminution, she also had cerclage wiring in the region of the lesser trochanter. Fifteen months post-operatively (December, 1991), she presented with severe pain, an inability to sleep, and severe discomfort while walking. Prior to her injury, the patient had been quite active and had pursued normal activities. At presentation, the patient was almost totally immobilized by pain.

The patient was admitted to Emory University Hospital and, on December 23, 1991, underwent removal of the original internal fixation device, reduction of the nonunion, and a new internal fixation with a reconstruction nail utilizing two interlocking screws proximally and two screws distally. Bone grafting was performed utilizing a mixture of autogenous bone and allograft tissue. The autogenous bone was obtained from the intramedullary reaming and thus did not involve a second operative site. The allograft tissue was GRAFTON™ Allogeneic Bone Matrix. These two graft materials were combined prior to graft placement.

The technique utilized in placing and maintaining the graft *in situ* was as follows. A pocket was created using the vastus intermedius and the periosteum. The bone graft was insinuated into this pocket going around the bone and being heaped up laterally. The pocket was closed by continuous suture of the deep fibers of the vastus intermedius. Following this, routine closure was done with one layer for the vastus lateralis, a second layer for the deep fascia, a subcutaneous layer, and then skin closure.

The patient was immobilized post-operatively in a knee immobilizer. She was seen in follow-up at 4, 6, 10 and 16 weeks following surgery. At 10 weeks, there was some consolidation of the graft, though the patient was not able to put full weight on the leg. At 16 weeks, considerably more consolidation of the graft had occurred and the patient was able to put full weight on the leg with minimal pain. Based upon the radiographs and clinical assessment, it was judged that the fracture had healed at 16 weeks.

NOTES

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7. Holmes RE, et al: Mechanical Properties of Synthetic Hydroxyapatite for Cancellous Bone Grafting. Presentation at 29th Orthopaedic Research Society Annual Meeting; Anaheim, CA; March, 1983.
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