Intramedullary Reaming For Treating a Fibular Nonunion

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PURPOSE

In this study we present a successful case of utilizing intramedullary reaming and fixation for the treatment of a symptomatic fibular nonunion.

Level of Evidence: IV, Therapeutic

BACKGROUND

Incidence of symptomatic fibular nonunions has been reported between 0.3 to 5.4%.[1] These are often associated with rotation ankle injury patterns and tibial fractures and often lead to ankle instability if unaddressed.[1] Factors that may lead to a complete or partial nonunion include poor biological or mechanical environment at the fracture site, inadequate blood supply secondary to trauma, or instability at the fracture site.[1] In cases of malrotation of the distal fibula especially in rotational low-energy fractures, the trabecular linearity is altered leading to abnormal stress at the fracture site which may contribute to a nonunion.[1]

Clinically patients with a symptomatic nonunion complain of pain over the fracture site, swelling, paresthesias, an antalgic gait and in some cases instability. Radiographs, computed tomography (CT) and nuclear bone scans are the best modalities in the diagnosis of a nonunion.

Treatment options include electric stimulation, external fixation particularly in presence of infection, drilling of pseudoarthrosis to stimulate osteosynthesis, with the mainstay treatment consisting of open reduction with internal fixation of the fracture site with compression plating after resection of nonviable bone and fibrous soft tissue in the defect.[1,2] However in the presence of significant comorbidities or a poor soft tissue envelope a more minimally invasive approach such as intramedullary nailing may yield better results.

Prior studies have shown an upwards of 94% success rate in healing long bone diaphyseal nonunions following intramedullary reaming especially in the tibia and femur.[2,3] Literature on reaming for fibular nonunions however, is virtually nonexistent. This case report is the first to document the use of intramedullary reaming to successfully treat a fibular nonunion to our knowledge.

CASE STUDY

71 year old male with no significant past medical history presented with persistent moderate pain while ambulating to the lateral aspect of the right fibula. Patient relates he sustained an nondisplaced ankle fracture approximately 5 months prior and was treated with protected weightbearing in a controlled ankle motion (CAM) boot. He relates pain at fracture site never fully resolved. Radiographs and CT obtained (Figures A and B) revealed a partial union at the fracture site.

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CASE STUDY

Figure A: Preoperative Radiographs illustrating fibular nonunion

Figure B: Preoperative CT

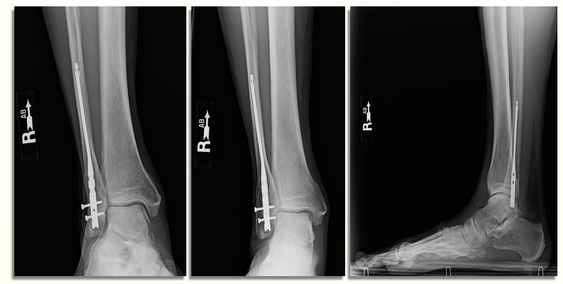

Figure C: Final Postoperative Radiographs illustrating union

Patient consented to surgical intervention in light of continued pain and sclerosis at the fracture site indicating a low healing potential of the nonunion. During this surgical procedure, the intramedullary canal was reamed through the fracture site through an incision at the distal fibula and an intramedullary nail was inserted across the fracture site for stabilization. Intraoperative stress testing revealed no syndesmotic instability.

Postoperative protocol consisted of immediate protective weight bearing in CAM boot for 4 weeks with radiographs taken at 4 week intervals until fracture site was fully healed with no reported symptoms which occured at the 8 week mark. Final radiographs was obtained 8.5 months from surgery (Figure C). Patient healed uneventfully with no infection, wound dehiscence or complications and was able to return to his preinjury activity level by 8 weeks.

DISCUSSION

Research shows that intramedullary reaming increases perfusion to local musculature surrounding a fracture site and enhances bone healing. It also causes release of pluripotent stem cells and growth factors contributing to osteoinduction and osteogenesis.[4] A randomized controlled trial showed that intramedullary reaming significantly reduced time to callus formation, time to weight bearing, and time to full activity in tibial shaft fractures.[5] This case illustrates that intramedullary reaming with nail fixation is a good treatment option for fibular fracture nonunions.

In high risk patients with poor vascular supply, significant comorbidities with high risk of intraoperative cardiac events, cast immobilization may be the best achievable outcome for ankle fracture treatment. In the event a nonunion occurs, which is of higher incidence in this patient population, surgical options are limited. The presented technique allows for a minimally invasive repair that stimulates new bone growth at the fracture site, provides stable fixation which may not be obtainable via traditional plate and screws in osteoporotic bone, and limits complications associated with extensive dissection including wound dehiscence and nerve injury.

More studies are necessary to further investigate this treatment for nonunion compared to conventional treatment with curettage of fracture and stabilization with a plate and screws. Future studies in a larger cohort of higher risk patients than our single healthy patient in this study will shed more light on the effectiveness of this technique for the treatment of fibular nonunions. Further research involves comparing this method to other surgical techniques for treatment of fibular nonunions.

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