Clinical Results of the Anatomic Compression Arthrodesis Technique with Anterior Plate Augmentation for Ankle Arthrodesis

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INTRODUCTION:
Ankle arthrodesis remains the gold standard for treatment of end-stage ankle arthritis, however nonunion rates have historically ranged from 10% to 40%. The anatomic compression arthrodesis technique is proven and reliable, and features multiplanar screw fixation outside the plane of primary motion. Anterior plate augmentation of this same technique provides fixation in the sagittal plane, which was previously shown to increase the construct rigidity in a biomechanical model, and which is hypothesized to decrease the incidence of arthrodesis nonunion. The purpose of this study is to review the clinical results of the anatomic compression arthrodesis technique with anterior plate augmentation for ankle arthrodesis.

METHODS:
We reviewed 275 isolated, primary ankle arthrodeses performed in 273 patients from 2000-2006. The average age was 57.4 years; there were 159 males and 114 females. One-hundred sixty-three patients had undergone a previous ankle procedure, 140 of which were open reduction internal fixation of an ankle or pilon fracture. There were 44 smokers, and 167 patients had other notable co-morbidities, including 24 with diabetes mellitus. All patients underwent an ankle arthrodesis through an anterior approach using the anatomic compression arthrodesis technique. Fixation was achieved with multiplanar cannulated screws, and augmented with an anterior plate and small fragment screws. The post-operative protocol included serial cast immobilization and strict non-weightbearing for 10-12 weeks, followed by boot immobilization and progression of weightbearing. Functional outcomes were assessed prospectively using the SF-36 Physical Component Summary and Mental Component Summary, AOFAS Ankle and Hindfoot, and Maryland Foot scores.

RESULTS:
The average follow-up was 4.15 years, and all patients had a minimum follow-up of 2 years. Two-hundred sixty-four of 275 arthrodeses went on to primary union (96.0% union rate). The average time to clinical union was 3.35 months. Ten nonunions healed with revision arthrodesis; one patient refused further surgery. There was a statistically significant difference (p<0.05) in post-operative SF-36 Physical Component Summary and Mental Component Summary, AOFAS Ankle and Hindfoot, and Maryland Foot scores relative to pre-operatively. Radiographically, 12 had a fracture of one or more of the anterior small fragment screws; 7 had lucency surrounding one or more of the large cannulated screws; and 1 had a fracture of the anterior plate. With the numbers available, there was no correlation between screw fracture or lucency and union rate. Complications included 13 with delayed wound healing; 2 with deep infection; 4 required a subsequent subtalar arthrodesis; 15 had subtalar pain or stiffness but underwent no further surgery. Additionally, 4 developed a stress fracture at the proximal edge of the anterior plate, all of which featured a slight downward trajectory to the proximal-most small fragment screw within the plate, and all of which subsequently healed with immobilization.
CONCLUSION:
The anatomic compression arthrodesis technique with anterior plate augmentation is an effective technique which results in a high union rate, improved functional outcome, and an acceptable complication rate. We believe the anterior plate is a useful complement to standard multiplanar screw fixation, and the increased rigidity provided by the anterior plate effectively counters forces, particularly in the sagittal plane that may otherwise lead to failure of multiplanar screw constructs.