

Comparison of Screws to Plate-and-Screw Constructs for Midfoot Arthrodesis

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Introduction/Purpose: Arthritis of the midfoot's 1st, 2nd, and/or 3rd tarsometatarsal joints (TMTJ) are routinely treated with arthrodesis when nonsurgical treatments fail. This surgery is traditionally performed with trans-articular screws, but newer plate-and-screw constructs placed across the TMTJs may confer greater rigidity to the midfoot fusion. While in vitro biomechanical studies show advantages to using plate-and-screws over screws to achieve a solid midfoot arthrodesis, there have yet to be clinical comparative investigations about this subject. The purpose of this study is to prospectively evaluate and compare clinical and radiographic outcomes of trans-articular screws versus plate-and-screw constructs for arthrodesis of the midfoot's 1st, 2nd, and/or 3rd TMTJs in a single surgeon's practice.

Methods: Between April 2010 and December 2015, 68 patients presented with arthritis of the 1st, 2nd, and/or 3rd TMTJs that failed nonsurgical management. Of these persons, 50 enrolled in this study to receive a midfoot arthrodesis with either trans-articular screws or plate-and-screw constructs. On the day of surgery, 25 patients were randomized to receive 4.0 mm partially-threaded cannulated cancellous screws (Synthes, Paoli, PA) while the remaining 25 were randomized to receive plate-and-screws (ALPS, Biomet, Warsaw, IN) at their involved TMTJs. Preoperative and postoperative function and pain was graded using the Foot and Ankle Ability Measures (FAAM) Scoring System and a Visual Analog Scale (VAS) of pain respectively. Radiographs were assessed for bony healing and hardware stability at the arthrodesis. Postoperative data regarding complications and revision surgeries were also recorded. Patients were routinely followed for 12 months from arthrodesis and then invited for updated longer-term follow-up to collect further data.

Results: Of 25 patients with screws for arthrodesis, 21 (84%) achieved fusion within 6 months. Mean FAAM and pain scores changed from 46.4/100 and 8.3/10 preoperatively to 82.7/100 and 2.1/10 respectively at final follow-up. Three (12%) patients developed wound complications. Four patients (16%) experienced delayed union or nonunion of their arthrodesis. Of 25 patients with plate-and-screws for arthrodesis, 23 (92%) achieved fusion within 6 months. Mean FAAM and pain scores changed from 48.2/100 and 8.0/10 preoperatively to 86.3/100 and 1.8/10 respectively at final follow-up, which were not significantly different from patients with screws. Six (24%) patients developed wound complications, which is significantly higher than patients with screws. Two (8%) patients experienced delayed union or nonunion of their arthrodesis, which is less than patients with screws.

Conclusion: A comparison of outcomes from performing midfoot arthrodesis with screws or plate-and-screw constructs has not been previously reported in the orthopaedic literature. This study demonstrates that using either screws or plate-and-screw to achieve TMTJ fusion results in a high rate of improving midfoot function and pain. While using just screws generate significantly less wound complications ($P<0.05$), employing plate-and-screws produce less problems with delayed union or nonunion of the fusion ($P=0.30$). Studies with a larger patient population may be needed to further confirm these results when using different types of implants for midfoot arthrodesis.

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