A Randomized, Prospective Comparison of Bioabsorbable and Steel Screw Fixation of Lisfranc Injuries

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Purpose: The purpose of this study is to prospectively evaluate and compare the long-term clinical and radiographic outcomes of bioabsorbable (Smart Screw, Linvatec) and traditional steel screw fixation of the Lisfranc ligament complex in unstable Lisfranc injuries in a single surgeon's practice.

Methods: Between September 2008 and December 2013, 40 patients presented with acute, closed, unstable Lisfranc injuries. Patients that required a midfoot arthrodesis, such as those with chronic injuries or severe joint comminution, were excluded. On the day of surgery, 20 patients were randomized to receive 4.5-mm bioabsorbable screws while the remaining 20 were randomized to receive 4.0-mm steel screw fixation. All 20 patients that received steel screw fixation received additional surgery to remove this hardware by 9 months from their original surgery. Preoperative and postoperative function and pain was graded using the Foot and Ankle Ability Measure (FAAM) scoring system and a visual analog scale (VAS) of pain respectively. Radiographs were assessed for joint congruency, stability, and degenerative changes. Data regarding postoperative complications and revision surgeries were also recorded.

Results: All 40 patients (100%) with acute, closed, unstable, ligamentous Lisfranc injuries that randomly received either steel or bioabsorbable screw fixation returned for the final evaluation. All twenty patients who received bioabsorbable screws for Lisfranc fixation were evaluated with a mean follow-up time of 36.3 months. The mean FAAM score increased from 32.5 of 100 preoperatively to 91.2 of 100 at the time of final follow-up. The mean VAS pain score decreased from 4.7 of 10 preoperatively to 1.3 of 10 at final follow-up. One patient (5%) who received a single absorbable screw for Lisfranc fixation developed an inflammatory reaction at the head of the screw at 2 years after her original surgery. This portion of the screw had not completely absorbed by that time and was treated with removal of the screw head remnant. At the time of final follow-up, no patients that received absorbable screws developed posttraumatic instability but 2 of these 20 (10%) patients have developed posttraumatic midfoot arthritis. All twenty patients who received steel screws were evaluated with a mean follow-up time of 40.5 months. The mean FAAM score increased from 24.9 of 100 preoperatively to 89.6 of 100 at the time of final follow-up. This postoperative score is lower than that of the absorbable screw group, but not to a statistically significant degree ($P = 0.4$). The mean VAS pain score decreased from 6.5 of 10 preoperatively to 1.9 of 10 at final follow-up. This postoperative score is higher than that of the steel screw group, but not to a statistically significant degree ($P = 0.25$). Aside from hardware removal that was performed in all of these 20 patients by 9 months from their original surgery, none of these patients required subsequent procedures on their injured foot. None of these patients developed midfoot instability after hardware removal. At the time of final follow-up, 4 of these 20 (20%) patients have developed posttraumatic midfoot arthritis.

Conclusion: A comparison of outcomes from treating unstable ligamentous Lisfranc injuries with bioabsorbable and steel screws has not been previously reported in the orthopaedic literature. This study demonstrates that using either bioabsorbable or steel screws to treat these conditions results in a high rate of regaining normal midfoot function and stability. This study shows that using absorbable screws provides results that are equivocal to, if not better than, the traditional use of steel screws for treating unstable ligamentous Lisfranc injuries. In addition, the use of absorbable screws eliminates the need for an additional surgery to remove hardware. Studies with a larger patient population may be needed to further confirm these reported advantages when using absorbable screws to manage these injuries.

See pages 47 - 108 for financial disclosure information.