Clinical Outcomes Following Crossed Screw Fixation vs Dorsal Plate With Compression Screw For 1st MPJ Arthrodesis

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Statement of Purpose

What are the union rates and clinical outcomes for first metatarsophalangeal joint (MTPJ) arthrodesis using crossed screw fixation or dorsal plate and compression screw? It is not feasible to perform an equivalency or non-inferiority study, due to an inadequate sample size, therefore we conducted a retrospective comparative study.

Methodology

This study was performed within Kaiser Permanente Northern California. We performed a retrospective review on 305 patients who underwent arthrodesis of the first MTPJ with two crossed screws or dorsal plate with interfragmentary screw during a 3 year period from 2008-2010. Demographic information gathered included age, gender, laterality, and body mass index. Patient comorbidities were also identified. Statistical analysis was performed for each cohort.

Procedure

305 patient charts were retrospectively reviewed. All patient underwent fusion of the 1st MPJ with either two crossed screws or dorsal plate with one interfragmentary screw. The procedure was not standardized and was performed by many surgeons throughout the Kaiser Permanente Northern California region.

Literature Review

Arthrodesis is considered the gold standard for end-stage arthritis of the first metatarsophalangeal joint. A successful fusion is achieved by stable fixation that maintains the desired position in order to optimize rate of bony union and reduce pain during toe-off in the gait cycle (1). The ideal fixation method is one that is reproducible, yields high fusion rates, and is associated with a low incidence of complications. Numerous fixation techniques have been described in the literature and include utilization of wires, staples, external fixation, plates and screws (1). Of these, plate fixation has been shown to be the most stable construct (2,3). It has been suggested that plate fixation therefore leads to higher fusion rates, allows for early post-operative weight-bearing, and maintain better joint alignment (4). However, plating increases operative expenditure when compared to a crossed screw construct (5). The clinical significance of increased stability with dorsal plating has not been correlated clinically with decreased non-union rates when compared to crossed screws.

Literature Review Continued

Politi et al studied five different fixation techniques in synthetic bone models and found the most stable technique to be a combination of conical reaming and oblique interfragmentary lag screw with a dorsal plate. A single compression screw was the next strongest technique (6). In a cadaveric study, Buranosky et al found the six-hole plate with interfragmentary screw fixation to be statistically stiffer only in the first 0-1mm of displacement than with the crossed screw fixation technique (7).

Successful first metatarsophalangeal fusion rates have been reported between 80-100% (2,3,4,5,8,9). Berlet et al retrospectively reviewed the two fixation constructs after immediate post-operative weight-bearing and showed an overall fusion rate of 91.1%, thus suggesting that immediate weight-bearing may be appropriate if rigid fixation is achieved, regardless of technique (4). This study did not compare fusion rate between the two construct groups.

In a cost analysis study, lower costs of the crossed screws technique was found to be statistically significant in comparison to the dorsal plating method. Interestingly, there was no statistical difference in the time to fusion between the two fixation constructs (5).

The most common complication in first MPJ fusions is bony non-union, which is reported up to 14% with plate fixation. The most common complication in first MPJ fusions is bony non-union, which is reported up to 14% with plate fixation. Plate removal rates have been reported between 80-100% (2,3,4,5,8,9). Berlet et al found the six-hole plate compression screw technique (7).

Results

There were 212 females and 93 males. Of those with crossed screws, 92.3% showed clinical union at 6 weeks in comparison to 93.8% of the dorsal plate subjects. At 12 weeks, 99.4% of subjects with a crossed screw construct had clinical union in comparison to 97.9% of subjects with dorsal plates. Radiographic union at 6 and 12 weeks in the crossed screw construct group was 89.0% and 95.3% respectively, whereas radiographic union at 6 and 12 weeks in the dorsal plate group was 64.7% and 93.5%.

Discussion

The data collected and interpreted in this study suggests that no difference was detected between those with crossed screw construct and dorsal plate with interfragmentary screw for first MTPJ arthrodesis.

References