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Comparison of Patients Undergoing 1st MTP Fusion With and Without Lag Screw Fixation for the Treatment of Hallux Rigidus

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Introduction/Purpose: First metatarso-phalangeal joint arthrodesis is a common procedure for the treatment of end stage hallux rigidus and other conditions like severe hallux valgus deformity, hallux varus and advanced degenerative disease in association to inflammatory arthropathy. Successful fusions provide pain relief, adequate stability for the first ray during gait at the expense of sacrificing motion.
Reported fusion rates range between 90 and 100% (Womack JW 2009). The time to fusion has shown more variability, with reported percentages of fusion ranging between 74 and 92% at 6 weeks (al. 2010).
Hallux rigidus is a common arthritic condition affecting the first Metatarso-phalangeal joint. The progressive degenerative changes and limited motion lead to increasing pain and compromise of daily activities. Treatment includes non-surgical measures like NSAIDS, injections, shoe wear and activity modifications. Surgical options include Cheilectomy and proximal phalanx dorsiflexion osteotomies for initial stages, whereas first metatarsophalangeal arthrodesis is the standard of care for hallux rigidus with end stage arthritis. Different means for fixation include kirschner wires, single and crossed screws, staples or plates.
The main goal of our study is to retrospectively compare two groups of patients who underwent first MTP fusion with and without lag screw performed by the senior attending, between 2011 and 2015 and evaluate for radiological outcomes including differences in the final coronal and sagittal metatarso phalangeal angles and union rates.
Severe hallux valgus and advanced degenerative changes related to inflammatory arthropathy subjected to first metatarsophalangeal arthrodesis using a locking plate construct with or without the use of a lag screw for compression and the main purpose to evaluate differences in postoperative first metatarso phalangeal angles in the sagittal and coronal planes, rate of fusion and postoperative complications. The hypothesis is that there would be no significant differences between groups with and without the compression screw fixation.

Methods: A retrospective review comparing patient that underwent first metatarso-phalangeal fusion by a single surgeon (Senior author) between 2011 and 2015 with conical joint preparation and stabilization with a locking plate placed in compression mode or with a lag screw to provide compression followed by placement of a locking plate.
Inclusion criteria: age between 18 and 80 years old, end stage first metatarsophalangeal joint in relation to Hallux rigidus, se abscense of toe infection
Demographics, Time to fusion, postoperative alignment, and complications were compared between the two groups and subjected to statistical analysis.

Results: 98 patients were subjected to 1st MTP arthrodesis between 2011 and 2015. 84 patients met inclusion criteria and were analyzed in our study. Average age was 59 years (38-84). 67.9% female versus 32.1% male. Average Follow up was 7.6 months (min 1.4 – max 37.9)
Preoperative HV angles did not show a significant difference between patients subjected to screw fixation and neutralization plate or compression plate. Postoperative HV angles Varied between the groups with and without lag screw in patients with hallux rigidus ($p=0.006$) in contrast to patients with hallux valgus that showed no variation ($p=0.3$). Patients with hallux valgus underwent a larger correction of HV angle (mean 20.2 deg) compared to patients with hallux rigidus (mean 5.8 deg) ($P < 0.001$) No difference found in degree of correction between patients that underwent Lag screw and neutralization plate or no lag screw and Compression plate. The Dorsiflexion angle showed a mean of 26 degrees after 1st MTP fusion in patients with hallux valgus and hallux rigidus, no difference was noted. ($P=0.4$) The percentage of fusion was lower in patients with hallux valgus and autoimmune disease compared to hallux rigidus and hallux varus. Patients with hallux valgus without lag screw fixation showed the highest

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non-union rate. Lag screw fixation did not make a difference in the rate of fusion in hallux rigidus (P=0.5). 8.3% of the patients had diabetes and 30% reported tobacco abuse. A 43% nonunion rate was associated to diabetes whereas a 24% nonunion rate was associated to smoking tobacco. Patients with diabetes had a 43% rate of complications. Tobacco was associated with complications in 20%
19% of the patients sustained complications. Highest in patients with autoimmune disease (50%), followed by hallux valgus (25.8%), hallux varus (25%) and hallux rigidus (9.3%) 8 patients had painful hardware, 4 sustained deep infections that required irrigation and debridement with hardware removal, 4 had failure of hardware associated with nonunion and 2 patients sustained superficial wound infections.

Conclusion: Final alignment in the coronal (HV angle) or the Sagittal (Dorsiflexion angle) was not dependent on the method of fixation. The Union rates were highest after MTP fusion in patients with hallux rigidus compared to hallux valgus or autoimmune disease. 1st MTP fusion without lag screw showed higher rates of non union amongst patients with Hallux Valgus. No association was noted between Diabetes, Smoking and complications or rates of nonunion. Success of 1st MTP fusions may be related to the quality of preparation and surgical technique rather than the method of fixation.
The increased number of no unions in hallux valgus patients may be related to the degree of deformity correction and fixation without lag screw compression although this did not show to be significant. Higher numbers of patients with comorbities like Diabetes and Smoking are needed to show statistically significant differences.

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