

## Statement of Purpose

The purpose was to evaluate the relationship between fixation method used to achieve arthrodesis for the first metatarsal phalangeal joint and patient satisfaction using a validated measure, the revised foot function index short form (FFI-R).

## Literature Review

Arthrodesis of the 1<sup>st</sup> MTPJ is a commonly performed procedure used to treat deformity of the 1<sup>st</sup> MTPJ. It is frequently used for patients with hallux rigidus or hallux valgus deformity, in patients with rheumatoid arthritis with severe deformity or as a salvage procedure. Fusion of the joint provides long-term pain relief while maintaining the length and stability of the first ray (1). Prior research has evaluated long-term prognosis as well as factors which influence overall success of the procedure, Desandis et al. looked at functional outcomes following 1<sup>st</sup> MTPJ arthrodesis using plate and screw or independent screw constructs. They found high overall satisfaction rates and low functional limitations in their patients regardless of the construct used (5). In addition this study indicated that higher rates of non-union occurs with the use of crossed screw construct, however this did not effect overall functional outcome of the patient. To our knowledge, no study has specifically evaluated the efficacy of utilizing only a dorsal locked plate as a fixation construct and comparing that to the standard fixation methods.

## Methodology & Hypothesis

A prospective review of 19 patients undergoing elective arthrodesis of the first MTPJ within Loyola University Health System between 2015 and 2019 have been evaluated using the FFI-R short form pre- and post-operatively. We compared three groups based on fixation method, including two crossed screws, locking plate only, and locking plate with compression screw to determine any difference in patient satisfaction.

The criteria of inclusion in our study were: patients at least 18 years of age undergoing elective 1<sup>st</sup> MTPJ fusion; the criteria that excluded patients were: prior fusion of the 1<sup>st</sup> MTPJ or HIPJ on the planned operative side or other pedal fusion on the operative side.

Patients undergoing elective 1<sup>st</sup> MTPJ fusion at our facility were enrolled, and 19 patients met our inclusion criteria. Patients completed the FFI-R short form pre- and post-operatively. These were completed between 5 and 15 months post-operatively with an average response at 10 months. The FFI-R short form is a self-reporting measure that assess multiple dimensions of foot function on the basis of patient-centered values and is a validated measure.

Our null hypothesis is that there is a difference in patient satisfaction following first MTPJ arthrodesis based on the fixation used, specifically that those patients with a dorsal locking plate only may experience higher rate of non-union and decreased FFI-R scores. Additionally, patients with a dorsal plate construct may experience lower FFI-R scores due to the potential for shoe-gear irritation from the plate.

## Procedures

Informed consent was obtained for patients meeting inclusion criteria for study. Prior to elective first MTP fusion, patients completed the FFI-R short form and then again after at least 5 months post-operatively. The fixation method used was based upon surgeon preference. The patients were followed clinically and radiographically post-operatively to evaluate for hardware failure as well as non-union.

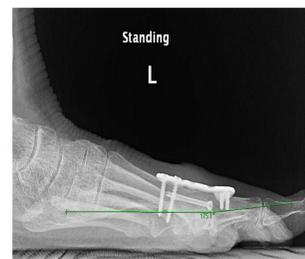


Figure 1 shows a radiograph of the dorsal plate + lag screw that was used as one method of fixation.

## Results

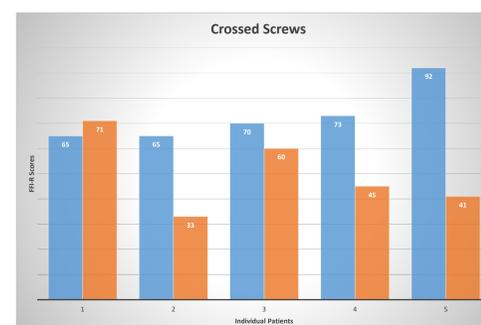
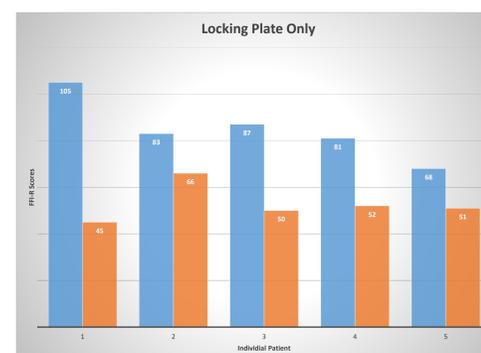
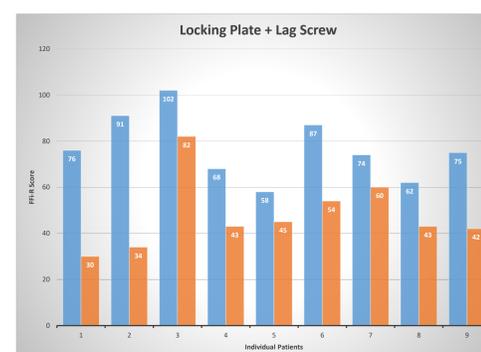
Of the 19 patients in the study, 9 patients had a locking plate and lag screw, 5 had a dorsal locking plate only, and 5 had crossed screws to achieve arthrodesis of the first metatarsal phalangeal joint. Of these patients, all but one achieved arthrodesis. One patient went on to a fibrous union that was diagnosed radiographically and clinically, and this patient had crossed screws. All but this one patient had improvement in FFI-R scores.

ANOVA single factor was used to compare the differences in improvement in FFI-R score between the three groups. In regards to overall improvement, we found no statistically significant difference in between the three groups.

ANOVA single factor was used to analyze the differences in improvement in the individual categories of the FFI-R including pain, stiffness, difficulty, activity limitation, and social issues. There was no statistically significant difference in any of these individual categories between the groups either.

There was the strongest positive correlation coefficient between FFI-R improvement between the plate + lag screw and the crossed screw group ( $r=0.673$ ) followed by the locking plate and crossed screws groups ( $r=0.502$ ). There was the weakest correlation in FFI-R improvement between the lag screw + dorsal plate and the locking plate groups ( $r=0.199$ )

Figures 3,4,5 (Right) show comparisons between pre and post operative FFI-R scores for each type of fixation used



## Results Continued



Figure 4(Left), depicts relative improvement comparisons between the three different fixation types used.

## Analysis/Discussion

The FFI-R questionnaire evaluates pain, stiffness, difficulty, activity limitation and social issues related to a patients' foot condition. Overall we found a statistically significant decrease, or improvement in patients postoperative scores despite which fixation method was used. This confirms previous research that functionally improves after first MTPJ fusions.

When looking at the relationship between type of fixation and FFI-R score improvement, we did not see a statistically significant difference between the groups. All but one patient improved pre to post-operatively. The patient that did not improve was in the crossed screw group and was found to have a fibrous union. Despite this, there was no overall difference in the cohort as a whole in terms of a more favorable outcome based on hardware construct used.

Prior studies have examined patient satisfaction rates among patients undergoing 1<sup>st</sup> MTPJ arthrodesis and have found similar outcomes with interfragmentary screw and plate vs crossed screws. Our research confirms these prior studies. However, there has not been a study to our knowledge that has examined the use of dorsal plating alone. This study, although it has a small sample size, suggests that similar patient satisfaction may be achieved using only the dorsal locking plate for fixation. Our study is limited most significantly the sample size. We hope that these results can continue to be expanded upon by further investigations.

## References

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