

# Effect of First Metatarsophalangeal Joint Arthrodesis on PROMIS Functional Outcomes and Radiographic Alignment for Hallux Rigidus

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**Introduction/Purpose:** Improvement in first ray alignment after arthrodesis of the arthritic first metatarsophalangeal (MTP) joint has been shown, yet few studies have attempted to correlate radiographic alignment with functional outcomes. The purpose of this study was to determine if 1st MTP joint deformity due to hallux rigidus correlates with patient reported pain and function, and whether there is a correlation between outcomes and radiographic measurements made before and after surgery. We also sought to determine how 1st MTP joint arthrodesis affects patient reported pain and function in a series of patients with hallux rigidus using a validated outcome measure.

**Methods:** We conducted a retrospective study on patients treated with 1st MTP joint arthrodesis for diagnosis of hallux rigidus from 2012 to 2014 using a single surgical technique. The hallux-valgus angle (HVA), intermetatarsal angle (1-2 IMA) and lateral talar first metatarsal angle (LT1MTA) were measured independently by the senior author and an Orthopaedic Surgery fellow on pre- and post-operative radiographs. Inter-observer and intra-observer coefficients of repeatability were calculated. Pre- and post-operative physical function and pain scores were generated using the Patient Reported Outcome Measurement Information System (PROMIS). Paired t-test was used to detect differences. Bivariate analysis was used to assess radiographic measurement and PROMIS score correlation.

**Results:** 30 subjects met inclusion criteria for radiographic analysis. Mean pre- and post-operative IMA, HVA and LT1MTA are shown in Table I. 23 subjects had pre-operative PROMIS data. Mean pre-operative pain and function were 72.7 and 32.0. Only pre-operative HVA significantly correlated with pre-operative physical function scores, with Pearson correlation value of 0.507 ( $p = 0.014$ ). 7 subjects had pre- and post-fusion PROMIS data with average follow up 173 days post-fusion (minimum 130, maximum 196). Mean change in pain and function were -9.14 ( $p = 0.094$ ) and 6.57 ( $p = 0.31$ ), respectively. Only change in patient reported pain significantly correlated with change in HVA, with a Pearson correlation value of -0.76 ( $p = 0.05$ ). Interclass correlation coefficients for interoperator reliability ranged from 0.835 to 0.998.

**Conclusion:** 1st MTP joint arthrodesis significantly improved radiographic IMA, HVA and LT1MTA for patients with hallux rigidus. In a small series of patients, arthrodesis improved patient reported pain and function, but this was not significant. Only pre-operative HVA correlated with pre-operative physical function, while only change in HVA correlated with change in patient reported pain after arthrodesis. Special attention should be paid to the HVA for the patient undergoing 1st MTP arthrodesis for hallux rigidus.

**Table I.** Difference in Pre- and Post-Operative Radiographic Measurements

	Mean	Std. Dev.	95% CI		p-value
			Lower	Upper	
Δ IMA	-3.76667	3.03637	-4.90047	-2.63287	0.0001
Δ HVA	-11.44	16.26847	-17.51475	-5.36525	0.001
Δ LT1MT	3.29333	6.22664	0.96827	5.6184	0.007

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