

The Effect of Arthrodesis of the First-Metatarsophalangeal Joint on the Alignment and Stability of the First-Tarsometatarsal Joint

A Hirpara (M.D., SOM), M Zhu, D Huo, Myerson M, and S Li. Department of Orthopedics, University of Colorado Anschutz Medical Campus, Aurora, CO.

Purpose: The first-metatarsophalangeal (MTP) joint plays an important role in maintaining mobility of the first ray. Fusion of the first-MTP joint is used to treat arthritis, hallux valgus, and hallux varus. Intuitively, fusion of a joint may cause instability of adjacent joints. However, recent studies have shown that first-MTP joint fusion in patients with hallux valgus can improve the stability of the first-tarsometatarsal (TMT) joint. The goal of this study was to investigate the impact of first-MTP fusion on the alignment of the first-TMT joint.

Methods: This was a retrospective study that included one group of patients with hallux valgus (Group 1) and one group without hallux valgus (Group 2). Pre-operative and six-month post-operative weight-bearing radiographs were used to evaluate the alignment of the hallux and the first-TMT joint. The parameters included the hallux valgus angle (HVA), 1-2 intermetatarsal angle (IMA), and medial cuneiform-first metatarsal angle (MC1A). A paired t-test was used to study the impact of first-MTP fusion on HVA, IMA, and MC1A, and an independent t-test was used to compare the difference of the surgical effect on the three parameters between the two groups.

Results: There were 5 patients in Group 1 (age 63.11 +/- 6.85 years) and 18 patients in Group 2 (age 62.7 +/- 12.24 years). HVA was significantly reduced by 16.84 +/- 11.80 degrees in Group 2. MC1A was significantly reduced by 4.53 +/- 2.03 degrees in Group 1 and 4.80 +/- 5.44 degrees in Group 2. Between the two groups, there was significant difference in the surgical impact on HVA.

Conclusion: This pilot study showed that first-MTP fusion may improve the alignment of the first-TMT joint in patients with and without hallux valgus. However, further research with larger sample sizes and a longer follow-up time is needed.

Group	Sample Size	Sex		Age at Operation				BMI			
		Male	Female	Mean	SD	25% Q1	75% Q3	Mean	SD	25% Q1	75% Q3
1	5	4	1	63.11	6.85	59	64.78	24.12	2.61	24.4	25.2
2	18	0	18	62.7	12.24	53.22	70.16	27.7	4.82	23.5	29.2

Table 1: Demographics of Group 1 and Group 2 – including sex, age, and body mass index (BMI).

Group	HVA		IMA		MC1A	
	Pre-op	Post-op	Pre-op	Post-op	Pre-op	Post-op
1	9.73*	8.81*	7.00	6.65	22.23*	17.70*
2	29.12	12.28	15.05	12.94	24.86*	20.06*

Table 2: Pre-operative and post-operative radiographic measurements, including hallux valgus angle (HVA), 1-2 intermetatarsal angle (IMA), and medial cuneiform-first metatarsal angle (MC1A).

*Statistically significant difference between the pre- and post-operative measurements within the same group.



Figure 1: Anteroposterior weightbearing radiographs of a left foot with failed prior hallux valgus surgery before (left) and after (right) first-MTP joint arthrodesis.



Figure 2: Anteroposterior weightbearing radiographs of a right foot with end-stage arthritis but no hallux valgus in the first-MTP joint (left) treated with a first-MTP joint arthrodesis (right).

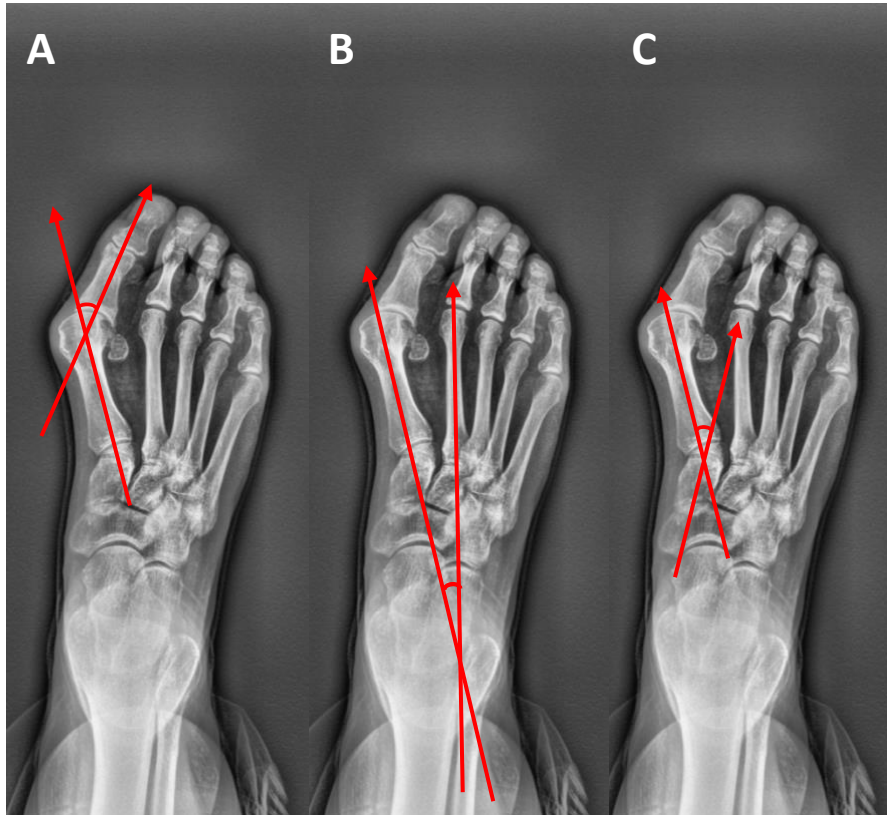


Figure 3: Illustration of the measurements of HVA (hallux valgus angle) (A), IMA (1-2 intermetatarsal angle) (B), MC1A (medial cuneiform – first metatarsal angle) (C).