

Relationship of first metatarsal pronation correction with sesamoid bone reduction and intermetatarsal angle following the modified Lapidus procedure: A weight-bearing computed tomography analysis

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Introduction: Hallux valgus (HV) is a complex deformity characterized by multiplanar and complex displacement of the first metatarsal (1M). The modified Lapidus procedure (MLP) is a technique that provides a mechanical advantage through a longer lever arm, allowing for a more powerful and precise correction of the HV deformity's tridimensional components. This study aimed to investigate the relative correlation between 1M pronation correction following the MLP and improvements in 1M varus alignment and sesamoid bone (SB) reduction, as assessed by weight-bearing computed tomography (WBCT). Given that HV is a multiplanar deformity, our hypothesis was that improvement in 1M pronation would be associated with improvements in SB alignment and intermetatarsal angle (IMA) following MLP.

Methods: A prospective cohort study that included 14 patients (14 feet) with HV deformity surgically treated with the MLP. WBCT variables related to the multiplanar and complex realignment of HV deformities were prospectively evaluated, including the Alpha angle to assess 1M pronation, the IMA to assess 1M varus alignment, and both sesamoid position (SP) and sesamoid rotation angle (SRA) to evaluate SB reduction. All variables were assessed and compared between the preoperative and postoperative settings. Additionally, correlation analysis was performed between the Alpha angle and the IMA, SP, and SRA to investigate the relationship between 1M pronation and HV correction parameters.

Results: The mean age of the patients was 58.64 (36-75) years, and the mean postoperative follow-up was 9.42 (6-12) months. All WBCT measurements demonstrated significant postoperative improvement ($p < 0.001$). A positive correlation was observed only between the Δ -Alpha angle and the Δ -SRA ($p = 0.046$).

Conclusion: The observed association between improvement in 1M pronation and SB derotation measurements suggests that rotational realignment alone may be insufficient to achieve complete correction of the varus of the 1M and full sesamoid reduction.

Keywords: Hallux valgus; Pronation; Treatment outcome.

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