

## **Talar Head Coverage Correction in the Absence of Lateral Column Lengthening: A Prospective Study with Calcaneal Osteotomy and First Ray Procedures**

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### **INTRODUCTION:**

Peritalar subluxation (PTS) is a crucial feature of progressive collapsing foot deformity (PCFD). Surrounding structures assume distinct behaviors, contributing to different disease deformities (classes). One of its most traditional aspects is the midfoot abduction (class B), usually noted by a lateral deviation of distal structures at the talonavicular joint. This finding commonly leads surgeons to perform a lateral column lengthening osteotomy for abduction correction, a complex surgery with potential complications. The first ray's ability to reestablish the tripod and restore the hindfoot by derotating structures under the talus was previously theorized. This study aimed to test the capability of the Lapidus and the Cotton procedures in conjunction with a calcaneus displacement osteotomy (MDCO) to improve midfoot abduction in the setting of a collapsed foot.

### **METHODS:**

In this IRB-approved, prospective cohort study, we analyzed patients undergoing medial column instability surgery and evaluated preoperatively with a weight-bearing CT (WBCT). We included individuals receiving a Lapidus bone block procedure or a Cotton for PCFD or Hallux Valgus (HV). Patients having a lateral column lengthening procedure of any type were excluded. Talonavicular coverage angle (TNCA) was measured as a marker of midfoot abduction. Medial arch collapse and forefoot varus were evaluated by the sagittal talus-first metatarsal angle (TFMA), and the forefoot arch angle (FFA) was measured. Associated procedures and the correction amount (displacement or wedge size) were recorded. Normality was estimated by the Shapiro-Wilk test and comparison among timelines by the one-way ANOVA. A multivariate regression analysis was executed to evaluate which of the measurements influenced abduction improvement. Statistical significance was considered for p-values of less than 0.05.

### **RESULTS:**

A total of 20 patients (age: 43.85 [19-72], BMI 30.98 [SD: 5.95]) were included, 11 PCFD (55%) and 9 HV (45%) with a mean follow up of 7.5 months (3-12). Bone block Lapidus was performed in most subjects (90%), and the median wedge used was 9mm (5-12mm). MDCO occurred in 55% of patients. All measured variables had improvement with surgery (TNCA: 23.74 to 10.66,  $p < 0.0001$ ; FFA: 6.27 to 12.67,  $p < 0.0001$ ; TFMA: 11.73 to 4.22,  $p = 0.0003$ ). A correlation was found between TNCA improvement and FFA improvement ( $r_s = 0.46$ ,  $p = 0.0407$ ), but not among TNCA improvement and TFMA improvement ( $r_s = 0.43$ ,  $p = 0.06$ ). The size of the wedge did not strongly influence the TNCA correction ( $R^2 = 0.016$ ,  $p = 0.0036$ ), an improvement moderately explained by the MDCO amount ( $R^2 = 0.186$ ,  $p < 0.0001$ ).

### **DISCUSSION AND CONCLUSION:**

This study demonstrated correction of midfoot abduction, translated by the TNCA, in the absence of lateral column lengthening procedures. When evaluating patients submitted to first ray procedures (bone block Lapidus and Cotton) in conjunction with MDCO, an enhancement on the talar head coverage was noted. Variables associated with arch height and forefoot varus (FFA and TFMA) were correlated with the TNCA improvement. Nevertheless, only the MDCO displacement amount and not the size of the used allograft wedge could explain changes in TNCA. The provided data might support surgeons when planning treatment in the PCFD scenario.

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