

3D METATARSAL PROTRUSION DISTANCE: A POTENTIAL RISK FACTOR FOR BUNION

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BACKGROUND AND PURPOSE: Metatarsal protrusion distance (MPD) has been studied as a contributing factor in the development of bunions. To date, all previous studies to measure MPD used 2D methods. This study is the first to measure MPD in 3D using reconstructed MRI images in subjects with and without bunion.

SUBJECTS: Twenty-nine women (controls N = 10, bunion N = 19) were examined. **MATERIALS AND METHODS:** Weightbearing MRIs were obtained and images were reconstructed into virtual bone models using computer software. A distance measurement tool was then used to measure from the distal end of the first and second metatarsals back to the anterior point of the navicular. Reliability between researcher measurements was assessed. Length of the second metatarsal was then subtracted from the length of the first metatarsal to calculate the MPD.

ANALYSIS: Group differences in demographics (age and BMI) were assessed using an Independent t- test. Interrater reliability of the MPD measurements were evaluated, for each group individually, with an Intraclass Correlation Coefficient [ICC (2, 1)] and a Standard Error of Measurement (SEM). An Independent t-test was used to assess difference in MPD between the control and bunion groups.

RESULTS: There was no difference in demographics between groups ($P \geq 0.46$). The measurements of MPD was highly reliable ($ICC \geq 0.99$; $SEM \leq 0.78$ mm in all cases). Mean values of MPD for the control and bunion groups measured approximately -2.0 mm. There was no statistical difference ($P = 0.89$) in MPD between groups.

CONCLUSION: This study used a novel 3D method to calculate MPD in subjects with and without bunion. No statistical difference was found for MPD between groups indicating that MPD may not in itself be a contributing factor for development of bunion.

IMPLICATIONS: Our 3D measurement results demonstrate the need for more research, and potentially suggest that MPD may not be a significant etiological factor of bunion