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Radiographic Investigation of the Absolute and Relative First Metatarsal Lengths in the Asymptomatic Foot.

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Abstract

BACKGROUND: We investigated distortion of measured lengths of the first and second metatarsals between two radiographic views and ultrasound-guided measurements.

METHODS: In a case series performed between June 29, 2012, and February 6, 2013, two standard anteroposterior and lateral radiographs of each foot were obtained from 27 asymptomatic participants. Three raters performed blinded radiographic measurements of the first and second metatarsal lengths on each view and compared results. Actual first and second metatarsal lengths were measured using diagnostic ultrasound and were compared with the radiographic measurements. The relative distances between the first and second metatarsals were obtained on the anteroposterior and lateral views and were compared.

RESULTS: Absolute first metatarsal length measurements were significantly affected by view (mean difference, 5.3 mm; 95% confidence interval [CI], 4.88-5.78 mm; $P < .001$), with no significant difference between raters ($P = .039$). Absolute second metatarsal length measurements were significantly affected by view (mean difference, 2.84 mm; 95% CI, 2.8-3.6 mm) and by rater ($P = .024$). First and second metatarsal anteroposterior values were 13.9% and 15.3% longer, respectively, than the actual length as measured by ultrasound ($P < .001$). Relative first metatarsal length was significantly shorter on lateral views (mean difference, 3.85 mm; 95% CI, 2.7-5 mm; $P < .001$). First metatarsal length was best approximated by the lateral view.

CONCLUSIONS: This study demonstrates the effect of radiographic distortion on the measurement of metatarsal length. The lateral view is more accurate than the anteroposterior view for measuring the first metatarsal. Owing to variance of relative metatarsal length on the two views, conclusions regarding a relatively short or long first metatarsal compared with the second metatarsal cannot be drawn.

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