Grant Information Summary:

Radiographic Validation and Reliability of Selected Clinical Measures of Pronation

Practical Significance:

This study determined the validity and reliability for two tests of tarsal pronation. The navicular drop test showed good validity and reliability evidence, while the Feiss' line measurement had poor validity and moderate reliability evidence.

Background

The navicular drop test (NDT) and Feiss' line measurement (FL) are two static clinical tests used to estimate the amount of pronation via transcutaneous measurement of inferior displacement of the tarsal navicular during weight bearing. Although used in clinical practice for decades, there is no published record of validation for these special tests. The results of inter-rater reliability studies of the NDT have been mixed (ICC = 0.57 – 0.96). Sommer et al. concluded that FL had good inter-rater reliability (ICC = 0.69), but their testing technique was different from the one utilized in this study.

Objective

The purposes of this study were: (a) to employ radiographic imaging techniques to determine the validity of the NDT and FL measurements in normal and injured limbs, and (b) to establish the intra-examiner and inter-examiner reliability and standard error of measurement (SEM) for these clinical tests.

Design and Setting

Initially the subjects were pre-screened and 3 adhesive radiopaque encapsulated lead markers were applied to the center of the medial malleolus, the prominence of the navicular tubercle and the center of the first

metatarsal head. Measurements of the NDT and FL were obtained after the foot was placed in a subtalar neutral position using the closed kinetic chain talar congruency method. The first radiograph was taken while the subject's foot was in this position. The subject was then asked to place full weight on the foot and the second measurements of the NDT and FL were obtained prior to the second radiograph.

Within two weeks of the initial session, the subjects came to the Sports Medicine Research Laboratory at Oregon State University for the second testing session. The principal investigator and a second clinician, both certified athletic trainers, performed bilateral measures of the NDT and FL tests.

All x-rays were scanned with a digital scanner in which the positions of three lead markers were plotted on a x-y coordinate system. These displacement values were compared with the NDT and FL values obtained in session one.

Subjects

32 (female and male, x = 42.7 years (± 7.3) who sought medical treatment for lower extremity pathologies were recruited to participate in the study. Radiopaque markers were placed on the medial malleolus, navicular tubercle, and head of the first metatarsal to facilitate the calculation of the NDT and FL.

Measurements

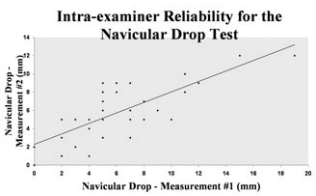
Displacement of the navicular, as calculated from the radiographs, served as the criterion measure for validation of the clinical tests, and was compared with the NDT and FL test results using interclass correlation statistical analyses (Pearson r, a = .05). Repeated measurements of NDT and FL on different days by the same certified athletic trainer, and same day comparisons between two certified athletic trainers were used to calculate intraclass correlation coefficients [ICC (2,1)] and the SEM.

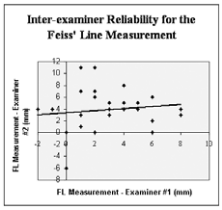
Results

The NDT was moderately to well-correlated (r = 0.61 - 0.89) with the x-rays, indicating that this test does reflect tarsal position and, therefore, pronation. Conversely, the FL measurement of change in navicular position was not accurate (r = -.09). Both tests had excellent intra-rater reliability (ICC = 0.82 - 0.93) while measurements of inter-rater reliability showed the NDT to be reproducible more than the FL (ICC = 0.69 - 0.89 and ICC = 0.43 - 0.74, respectively).

Conclusions

These findings suggest that the NDT may be a valid measure of pronation while the FL test did not appear to be valid. Both tests are reliable within the same examiner, and the NDT was moderately reliable between examiners. The reliability of the FL between examiners was poor. These findings support the continued use of the NDT as a clinical test of pronation, but indicate that FL test results should be used with caution.





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