High Variability of Observed Weight Bearing During Standing Foot and Ankle Radiographs

CHRISTOPHER P. MILLER MD
MOHAMMAD GHORBANHOSEINI MD
LAUREN K. EHRlichMAN, MD,
KEMPLAND C. WALLEY
JOHN Y. KWON, MD
Disclosure

No Conflict to Disclose

High Variability of Observed Weight Bearing During Standing Foot and Ankle Radiographs

Christopher P. Miller MD
Mohammad Ghorbanhoseini MD
Lauren K. Ehrlichman, MD
Kemland C. Walley
John Y. Kwon MD

Our Disclosures are in the final mobile app.

We have no potential conflicts with this presentation.
Weight bearing radiographs are a critical component of evaluating foot and ankle pathology. An underlying assumption is that patients are placing 50% of their body weight on the affected foot during image acquisition. The accuracy of weight bearing during radiographs is unknown and, presumably, variable, which may result in uncertain ability of the resultant radiographs to accurately portray the pathology of interest.

The purpose of this study is to assess how much weight patients actually apply when standing radiographs are obtained for common conditions of the foot and ankle.
Material and methods

- 50 patients without acute trauma who could safely bear weight were included regardless of diagnosis.

- A digital scale was placed under the image receiver cassette. The contralateral foot was placed on a raised platform at the same height as the foot being imaged.
Material and methods

- The amount of weight applied was blinded to the patient and recorded at the time of the initial radiograph (trial 1).
- The patient was then specifically instructed to place “half [their] weight” on the affected limb.
- The weight was again recorded in blinded fashion for the second radiograph (trial 2)
- “Ideal” weight bearing defined as 45-55% of body weight on affected extremity
- “Appropriate” weight bearing defined as >45% body weight on affected extremity
Scatter plot demonstrating the percent body weight (y-axis) of each subject (x-axis).

- Trial 1 is in blue and trial 2 is in red.
- The dashed yellow lines indicate the “ideal” weight bearing range between 45% (lower line) and 55% (top line).
- Number of subjects weight bearing within the “idea” range (45-55% body weight) on the left column.
- Number of subjects weight bearing at the “appropriate” level (>45% body weight) on the right.
Results

- The mean improvement towards ideal 50% weight bearing was 3.6% ± 2.4% between trial 1 and 2.

- 34/50 subjects improved their weight bearing closer to 50%, whereas 16 subjects actually were further from 50% on the second trial.

- The range of difference between trial 1 and 2 was from 26% improvement, closer to ideal 50% weight bearing, to a 21% divergence from 50% weight bearing.
Results

- The scatter plot demonstrates a substantial variability of weight bearing in both trial 1 (blue point) and trial 2 (red point).
- Without specific instruction only 18 of 50 subjects placed an ideal amount of weight (within 5% of ½ body weight).
- Following an additional instruction by the research staff, there was a significant (p=0.005) increase in the number of subjects who were able to weight bear in the “ideal” range from 18 to 32 out of the 50 subjects.
Results

- There was also a significant improvement in the proportion of patients bearing “appropriate” weight between trial 1 (24/50 subjects) and trial 2 (39/50 subjects), $p=0.002$.
- These findings demonstrate that appropriate amounts of weight bearing when obtaining the radiograph can be positively influenced with simple verbal instructions from the physician or radiology technician.
Conclusion

- There is significant variability in weight bearing during radiograph acquisition.
- Weight bearing affects radiographic parameters and measurements.
- If patients are not placing an appropriate amount of weight on the foot, the resultant radiographs are of uncertain value.
- We recommend clear instructions to the patient to bear 50% (or more) weight on the foot as we have shown that a simple instruction to this affect will improve the likelihood of appropriate weight bearing.
References:


