PERFORMANCE EVALUATION OF THE ACHILLES INSIGHT: PRECISION, ACCURACY, AND COMPARISON TO CENTRAL DXA

E. Hosszu¹, S. Meszaros², V. Ferencz³, C. Horvath³
¹Department of Pediatrics, Semmelweis University, Budapest, Hungary, ²Department of Internal Medicine, Semmelweis University, Budapest, Hungary.

INTRODUCTION

Quantitative ultrasound (QUS) of the calcaneus is accepted as an effective low-cost method to assess osteoporotic fracture risk. Ultrasound measurements have been shown to predict fractures in several prospective studies [1-2]. However, not all heel ultrasonometers have equivalent clinical utility. Differences in technology, coupling, imaging capabilities, measurement time, precision, and relationship to central spine and hip DXA measurements exist between systems. Gil-Lara Achilles, Achilles + and Achilles Express ultrasonometers are widely used with over 6,000 systems installed worldwide. In this in vivo study, we evaluated a new imaging ultrasonometer, the Achilles InSight (Figure 1), in terms of its precision, accuracy and comparability to central DXA measurements. An additional objective of this study was to identify the T-score cutpoint on the Achilles InSight which identifies 90% of individuals with osteoporosis, i.e. a T-score of -2.5 at the spine or hip.

RESULTS

Fourteen of the 52 subjects measured on both the Prodigy and the InSight were found to have osteoporosis, i.e. a T-score of -2.5 at the spine or hip. The ROC analysis of the ultrasound results showed the 90% sensitivity cutpoint at a T-score of -0.6 for the alcohol (Figure 2A and 2B) and at -0.5 for the gel (Figure 2A and 2B). At these cutpoints, the specificity of the InSight was 92% and 95%, respectively. Average T-score for the InSight was -1.4 ± 1.1 using alcohol and -1.2 ± 1.3 using gel coupling. This difference was statistically significant (p < 0.01), though considered of little clinical importance.

The results of the precision study (Table 1) showed that the InSight was equally precise using either isopropyl alcohol or conventional coupling gel. The repeat measurement precision (% CV) was 1.8% for alcohol and 1.7% for gel. There was no significant difference in precision error between alcohol and gel (p = 0.39) based on an F-test comparing the two results. The InSight was equally precise using alcohol and gel coupling agents.

Table 1: Repeat measurement precision (%CV) for Stiffness Index (SI) using alcohol and gel coupling agents.

<table>
<thead>
<tr>
<th>Coupling Agent</th>
<th>Mean</th>
<th>SD</th>
<th>CV %</th>
<th>var</th>
<th>df</th>
<th>Mean</th>
<th>SD</th>
<th>CV %</th>
<th>var</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>84.6</td>
<td>1.40</td>
<td>1.67</td>
<td>2.00</td>
<td>113</td>
<td>81.8</td>
<td>1.45</td>
<td>1.78</td>
<td>2.11</td>
<td>114</td>
</tr>
<tr>
<td>Gel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CONCLUSION

We conclude that the Achilles InSight is an accurate and precise imaging ultrasonometer, with precision errors for Stiffness Index of 1.8% and 1.7% for alcohol or gel, respectively. Based on ISCD recommendations, the Achilles InSight can be used as an effective screening tool with a T-score of -0.6 for referring patients for spine and femur DXA assessment, providing better than 90% sensitivity for detecting patients with osteoporosis at the spine or hip. In situations where central DXA systems are not readily available, Achilles InSight can be used as an effective screening tool with a T-score cutpoint of -0.6 for referring patients for spine and hip density measurements.

REFERENCES

3. Miller PD, et al., What are the standards by which bone mass measurement at peripheral sites should be used in the diagnosis of osteoporosis? J Clin Densitometry; vol. 5 (Suppl), S39-S45, 2002.