COMPARISON OF A-MODE AND B-MODE ULTRASOUND FOR MEASUREMENT OF SUBCUTANEOUS FAT

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INTRODUCTION

Both amplitude modulation (A-mode) and brightness modulation (B-mode) ultrasound can be used to measure subcutaneous fat thickness.1

B-mode ultrasound is more commonplace for clinical use, but A-mode devices are considerably less expensive and require less technical skill.

The BodyMetrix BX2000 is a low-cost, A-mode ultrasound with software specifically designed to measure subcutaneous fat thickness.

Purpose: Validate subcutaneous fat thickness measurements obtained by the BodyMetrix BX2000 against measurements from a high-resolution B-mode ultrasound.

METHODS

Subjects: 40 subjects (20 males, 21 females, 29.6 ± 11.0 y; BMI 25.3 ± 5.1 kg/m²) estimated from Jackson & Pollock1 7-site A-mode equation.

Measurement sites: Chest, subscapula, mid-axilla, triceps, abdomen, suprailiac, and thigh.

Measurement protocol: Each site was measured with the A-mode device, and then with the B-mode device.

Equipment:
2. B-mode ultrasound: NextGen LOGIQ e7 and 12L-8S linear array transducer at 12MHz; on-screen calipers.

Examiners: Four examiners, two each for A-mode and B-mode; each blinded to the measurements of the others.

Statistical Analyses:
1. means ± SD calculated for each site
2. Repeated-measures ANOVA: mean differences between A-mode and B-mode
3. Pearson correlation coefficients
4. Visual inspection of plots

RESULTS

• Pearson correlation coefficients exceeded 0.80 (P<0.001) between A-mode and B-mode at all sites.

• No significant mean differences between A-mode and B-mode (P>0.05) with the exception of the tricep site (P=0.021); however, the magnitude of difference was small (-0.53mm) and not clinically meaningful (Table 1).

• Variability was greatest at the abdomen, the site with the greatest thickness, however Bland-Altman plots revealed no systematic bias (Figure 1).

• Individual measurements are shown in Figure 1.

SUMMARY and CONCLUSIONS

• Both A-mode and B-mode ultrasound are equally capable of providing measurements of subcutaneous fat thickness with an accuracy of < 1 mm at most sites.

• Limiting factor of the lower resolution A-mode ultrasound is not selecting the correct equation.

• With a strong relationship and insignificant mean differences the lower resolution A-mode ultrasound provides measurements of subcutaneous fat thickness similar to the higher resolution B-mode machine.

REFERENCES


Table 1. Comparison A-mode and B-mode ultrasound subcutaneous fat thickness at seven sites.

<table>
<thead>
<tr>
<th>Site</th>
<th>r</th>
<th>Mean difference (mm)</th>
<th>Pvalue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chest</td>
<td>0.90</td>
<td>-0.24</td>
<td>0.182</td>
</tr>
<tr>
<td>Subscapula</td>
<td>0.91</td>
<td>0.14</td>
<td>0.553</td>
</tr>
<tr>
<td>Midthigh</td>
<td>0.87</td>
<td>0.64</td>
<td>0.073</td>
</tr>
<tr>
<td>Triceps</td>
<td>0.90</td>
<td>-0.53</td>
<td>0.021</td>
</tr>
<tr>
<td>Abdomen</td>
<td>0.95</td>
<td>-0.32</td>
<td>0.563</td>
</tr>
<tr>
<td>Suprailiac</td>
<td>0.85</td>
<td>0.21</td>
<td>0.491</td>
</tr>
<tr>
<td>Thigh</td>
<td>0.91</td>
<td>-0.59</td>
<td>0.151</td>
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