Assessment of accuracy and repeatability on wound models of a new hand-held, electronic wound measurement device (SilhouetteStar™)

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Aim

To assess the accuracy and repeatability of a new hand-held, electronic wound measurement device (SilhouetteStar™, ARANZ Medical Limited, Christchurch, New Zealand) on wound models of known dimensions.

Method

Three different rats made five repeated measurements on four different wound models.

The wound models included:
1. A 2 cm on a flat sheet, the simplest case.
2. A 2 cm on a cylinder, representing a superficial wound on a limb.
3. A 2 cm on a convex hemispheres, representing a prolate spheroid (convex).
4. A 2 cm on a concave hemispheres, representing a spherical wound on a head (convex).

For the purpose of this study, all the wound models were chosen to have a circular outline with a diameter of 2 cm, to allow for the easy of data entry. A photograph of the wound model is shown in Figure 1.

The flat and cylindrical models were constructed by printing circles on paper sheets and mounting them on a flat block of medium density fibreboard (MDF) and an 8 cm in diameter cylinder respectively. The concave and convex models were filled from a block of acetal, a dimensionally stable plastic, hemispherical tolerances for all models, verified with digital calipers, were ± 0.04 mm (+ 0.1%) leading to area and volumetric tolerances of ± 0.2% and ± 0.3% respectively.

Results

The three rats made five repeated measurements on each of the four wound models, resulting in 60 area and perimeter measurements (3 rats by 5 repeats by 4 wounds). All wounds were one only model with a concavity, there were only 15 volume and depth measurements (3 rats by 5 repeats by 1 wound).

Table 1 summarizes the accuracy and repeatability indicators for area, perimeter, depth (average and maximum) and volume (please refer to the Definitions of Terms information page for definitions).

Table 1: Wound models - dimensions and percent error.

<table>
<thead>
<tr>
<th>Wound Model</th>
<th>Area (cm²)</th>
<th>Perimeter (cm)</th>
<th>Depth (mm)</th>
<th>Volume (cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flat</td>
<td>12.57</td>
<td>12.57</td>
<td>0.94</td>
<td>0.94</td>
</tr>
<tr>
<td>Cylinder</td>
<td>32.57</td>
<td>32.57</td>
<td>2.94</td>
<td>2.94</td>
</tr>
<tr>
<td>Concave</td>
<td>52.57</td>
<td>52.57</td>
<td>4.94</td>
<td>4.94</td>
</tr>
<tr>
<td>Convex</td>
<td>72.57</td>
<td>72.57</td>
<td>6.94</td>
<td>6.94</td>
</tr>
</tbody>
</table>

The authors would like to thank statisticians Dr Chris Hampton, Associate Professor of Biostatistics, University of Otago, Christchurch, New Zealand, for his help in the preparation of the statistics.

Future Work

Future work will present results using a wider range of wound model shapes and sizes, and temporal changes on actual wounds in the clinical setting.

References


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The authors would like to thank statisticians Dr Chris Hampton, Associate Professor of Biostatistics, University of Otago, Christchurch, New Zealand, for his help in the preparation of the statistics.

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