Non-invasive continuous blood pressure monitoring based on radial artery tonometry (T-Line TL-200pro device) in the intensive care unit

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Background

Based on radial artery tonometry, the T-Line TL-200pro (TL-200pro) device (Tensys Medical Inc., San Diego, CA, USA) provides an arterial blood pressure (BP) waveform and beat-to-beat values of systolic arterial pressure (SAP), mean arterial pressure (MAP), and diastolic arterial pressure (DAP). The aim of the study was to evaluate this non-invasive technique for continuous BP monitoring in intensive care unit (ICU) patients.

Methods

In this method comparison study, BP measurements obtained using the TL-200pro technology were compared with invasively assessed BP values using a femoral arterial catheter in 34 ICU patients in a German university hospital.

BP was measured for a total of 15 minutes resulting in a "beat-to-beat" report providing SAP, MAP, and DAP for every heart beat recorded during the measurement procedure.

BP values were analyzed and compared in 4,502 averaged 10-beat epochs.

We computed Bland-Altman plots accounting for repeated measurements and calculated the mean difference (bias), standard deviation, and 95% limits of agreement.
## Results

<table>
<thead>
<tr>
<th>Blood pressure, n=4,502 averaged 10-beats epochs</th>
<th>Femoral arterial catheter</th>
<th>TL-200pro device</th>
<th>Bias (mean ± standard deviation of the difference)</th>
<th>95% limits of agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean arterial pressure, mmHg</td>
<td>82.3 ± 11.3</td>
<td>83.0 ± 11.4</td>
<td>+0.72 ± 5.15</td>
<td>-9.37 to +10.82</td>
</tr>
<tr>
<td>Systolic blood pressure, mmHg</td>
<td>123.6 ± 17.8</td>
<td>122.2 ± 16.6</td>
<td>-1.39 ± 8.85</td>
<td>-18.74 to +15.96</td>
</tr>
<tr>
<td>Diastolic blood pressure, mmHg</td>
<td>60.1 ± 8.8</td>
<td>64.5 ± 9.6</td>
<td>+4.36 ± 6.64</td>
<td>-8.66 to +17.38</td>
</tr>
</tbody>
</table>

Mean ± standard deviation of blood pressure variables is presented. Bias (mean ± standard deviation of the difference) and 95% limits of agreement calculated using Bland and Altman analysis accounting for repeated measurements are shown for blood pressure values simultaneously assessed using the TL-200pro device and the femoral arterial catheter.
Bland-Altman plot for mean arterial pressure
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Bland-Altman plot for systolic arterial pressure
Bland-Altman plot for diastolic arterial pressure
Conclusion

BP measurement based on radial artery tonometry using the TL-200pro technology is feasible in ICU patients. The TL-200pro system is able to provide MAP values with high accuracy (low mean difference) and precision (narrow limits of agreement) compared to invasively assessed MAP values using a femoral arterial catheter. In addition, the device allows determination of SAP and DAP with clinically acceptable agreement.

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