Effects of inter-arm differences of brachial systolic blood pressure on the derivation of aortic systolic pressure

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Introduction

- Inter-arm differences in brachial systolic blood pressure (SBP) should not theoretically translate to differences in calculated aortic SBP, there being only one value of aortic blood pressure at any time.
- No reported study has yet compared aortic blood pressure derived from both the left and right arm simultaneously.

Methods

- This study assessed seated brachial and derived aortic SBP in 79 subjects (36±16 years, 40 male) using oscillometric brachial blood pressure measurement and cuff volumetric displacement waveform recording.
- Measurements were taken simultaneously in the left and right arm using two identical SphygmoCor XCEL units (AtCor Medical, Sydney).
- Measurements were taken four times in each subject, swapping blood pressure devices between arms each measurement.

Results

- Brachial SBP was significantly higher in one arm compared to the other in 11 subjects (average difference across those 11 subjects: 5.4±0.7 mmHg).
- Aortic SBP was higher when calculated from one arm than when calculated from the other in 18 subjects (average difference across those 18 subjects: 3.1±0.6 mmHg).

Results (cont.)

- Arm dominance accounted for 1.1±0.5 mmHg of the inter-arm brachial SBP difference (p=0.032) but did not account for any of the inter-arm aortic SBP difference (p=0.163).
- Average left arm SBP was not different to average right arm SBP for the whole cohort for brachial (p=0.083) or aortic (p=0.789) measurement.

Conclusions

- The inter-arm absolute difference in brachial SBP translates to a significant but small (2 mmHg) difference in derived aortic SBP.
- Further studies are required to establish if this artefactual difference in derived aortic SBP is predominantly due to arm dominance or other factors associated with left/right difference in vascular properties.

<table>
<thead>
<tr>
<th>anatomical site</th>
<th>absolute aortic inter-arm difference (mmHg)</th>
<th>absolute brachial inter-arm difference (mmHg)</th>
<th>aortic/brachial mean inter-arm difference (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>right − left systolic pressure (mmHg)</td>
<td>10.0</td>
<td>0</td>
<td>5.0</td>
</tr>
<tr>
<td>right − left systolic pressure (mmHg)</td>
<td>5.0</td>
<td>0</td>
<td>2.5</td>
</tr>
<tr>
<td>right − left systolic pressure (mmHg)</td>
<td>−5.0</td>
<td>0</td>
<td>−2.5</td>
</tr>
</tbody>
</table>

Figure 1: Right – left, dominant – non-dominant, and absolute inter-arm difference for measured brachial systolic pressure and calculated aortic systolic pressure. (Open circles indicate outlier values.)

Figure 2: The inter-arm SBP difference for brachial and aortic sites was correlated (R²=0.74, p<0.001). Dotted line shows unity. Dashed lines show mean and mean±2× the standard deviation of the difference between inter-arm difference of brachial and calculated aortic systolic pressure.

Figure 3: Absolute inter-arm difference in brachial and calculated aortic systolic pressure was not dependent on age. Brachial inter-arm pressure difference:
  slope = -0.03 mmHg/year, R²=0.04, p=0.066.
  Aortic inter-arm pressure difference:
  slope = -0.02 mmHg/year, R²=0.01, p=0.30.