Validation of an Ultrasound Dilution Technology for Cardiac Output Measurement and Shunt Detection in Infants and Children. Pediatric Anesthesiology and Intensive Care and Pediatric Heart Surgery, Children’s Hospital, Skane University Hospital, Lund, Sweden

OBJECTIVE
- To validate cardiac output measurements by ultrasound dilution technology (COstatus monitor) against those obtained by a transit-time ultrasound technology with a appropriately sized perivascular COndence Flowprobe®.
- To investigate ultrasound dilution ability to estimate pulmonary to systemic blood flow ratio in children

STUDY
- Prospective observational clinical trial of 21 children (8.1 ± 8.2 months) weighing 6.1 ± 2.6 kg undergoing congenital heart surgery.
- Cardiac Output was measured simultaneously by ultrasound dilution and a COndence Flowprobe® applied to the root of the ascending aorta and when possible, the main pulmonary artery.
- Pulmonary to systemic blood flow ratio estimated from ultrasound dilution curve analysis was compared with that estimated from transit-time ultrasound technology.

RESULTS

<table>
<thead>
<tr>
<th>BLAND-ALTMAN ANALYSIS</th>
<th>TRANSIT-TIME ULTRASOUND</th>
<th>ULTRASOUND DILUTION</th>
<th>PERCENTAGE ERROR</th>
<th>COEFFICIENT OF VARIATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BIAS</strong></td>
<td></td>
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<tr>
<td>Total Cohort (90 measurement pairs)</td>
<td>0.02 L/min</td>
<td>-0.3 to 0.3 L/min</td>
<td>31%</td>
<td>3.5%</td>
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<tr>
<td>Children with no residual shunts</td>
<td>0.04 L/min</td>
<td>-0.28 to 0.2 L/min</td>
<td>19%</td>
<td>2.9%</td>
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</tbody>
</table>

- Ultrasound dilution identified the presence of shunts (pulmonary to systemic blood flow ≠ 1) with a sensitivity of 100% and a specificity of 92%.
- Mean pulmonary to systemic blood flow ratio by transit-time ultrasound was 2.6 ± 1.0 and by ultrasound dilution 2.2 ± 0.7 (not significant).

STUDY’S CONCLUSIONS
- The COstatus® monitor is a reliable technique to measure cardiac output in children with high sensitivity and specificity for detecting the presence of shunts.

COSTATUS® OBSERVATIONS
- Important COstatus® validation in children against gold standard transit-time ultrasound technology.

REFERENCES