Ultrasound assisted arterial cannulation in small children- to see or not to see?

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Background
Arterial cannulation is commonly performed in the operating room and intensive care unit. In small children, it can be challenging in the best of hands via palpation. The catheter may not pass smoothly into the artery despite apparent blood return on initial puncture; resultant hematomas or arterial spasm hinder subsequent attempts. In adults, ultrasound (US) was found to improve successful arterial cannulation at first attempt. Utility in arterial cannulation in small children is unknown, the smaller vessel diameter and relatively bulky probe may make US imaging difficult.

Aims
To investigate:
1) if US facilitates arterial cannulation in children ≤24 months old compared to palpation method
2) potential savings of introducing the method

Methodology
Null Hypothesis
Ultrasound does not facilitate arterial cannulation in small children compared with the palpation method (fewer attempts and faster cannulation).

Study Design: Institutional Ethics Board-approved prospective randomized study

Inclusion criteria:
- Any child ≤24 months scheduled for elective surgery and clinically indicated arterial cannulation as part of standard monitoring

Exclusion criteria:
- Refusal of participation by the parents and/or the attending anaesthesiology staff or fellow
- Children with anticipated circulatory instability after anaesthesia induction

Randomization (blocks of 2):
- Palpation-METHOD (PM) or US-assisted group

Endpoints
Primary: number of attempts; time to successful cannulation
Secondary: rate of success of first attempt; number of attempted sites; learning curve for each of the participating anaesthesiologist

Definitions:
- "attempt": a forward movement of the needle with the intent of hitting the artery
- "time to successful cannulation": the difference between the time when the palpating finger touches the skin (palpation group) or the gel is applied to the skin (US group) at the first intended cannulation site and the time when the arterial cannula is correctly in place

Results

<table>
<thead>
<tr>
<th>Method</th>
<th>n</th>
<th>Success</th>
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</thead>
<tbody>
<tr>
<td>Palpation</td>
<td>10</td>
<td>Yes</td>
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<tr>
<td>US</td>
<td>10</td>
<td>Yes</td>
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</tbody>
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Conclusions
We have a small sample size and not all fellows were recruited.

References