Ultrasound dilution and thermodilution versus color Doppler ultrasound for arteriovenous fistula assessment in children on hemodialysis.

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OBJECTIVE
For the first time, to compare ultrasound dilution (UD) and thermodilution (TD) from the Fresenius 5008 HD machine with color Doppler ultrasound (CDU) for arteriovenous fistula (AVF) assessment in children on hemodialysis (HD).

MATERIALS AND METHODS
- Sixteen measurements in 16 patients (median weight of 39 kg) were dialysed with the Fresenius 5008 HD machine.
- UD was performed using the Transonic device.
- The two methods US were compared with CDU performed on a non-HD day.
- AVF flow rate was expressed as ml/min/1.73 m².

RESULTS:
- Sixteen measurements of AVF flow rate and recirculation with UD and TD were compared with CDU.
- Both UD and TD overestimated AVF flow rate when compared with CDU:
  - UD: +437 (95% CI +200, +674) ml/min/1.73 m².
  - TD: +476 (95% CI +80, +871) ml/min/1.73 m².
- CDU flow rate significantly correlated to UD flow rate (r² = 0.761, p < 0.001), but not to TD flow rate (r² = 0.164, p = 0.120).
- Although recirculation in all AVF was estimated to be 0% (UD) and <15% (TD), 7 significant stenoses were diagnosed by CDU.
- AVF with stenosis had lower flow rates when measured by CDU, UD or TD, but only CDU measurements reached statistical significance (p = 0.008, p = 0.142 and p = 0.174, respectively).

CONCLUSION
- UD and TD overestimate AVF flow rate when compared with CDU.
- CDU is the most reliable non-invasive method for screening vascular access for stenosis.
- UD seems more accurate than TD for AVF flow rate assessment.
- Recirculation via UD or TD should not be used for early screening of AVF stenosis in children on HD.

TRANSONIC OBSERVATION
- Given the small sample size (16), future larger studies are needed to confirm the findings.
- The lengthy and interesting discussion in this paper poses that color Doppler may be replacing fistulography as the gold standard for diagnosis of vascular access dysfunction. It is safe, non-invasive, reproducible, but costly.

REFERENCE