Can Ultrasound Dilution (UD) Identify and Qualify the Type of Shunt in Neonates with Patent Ductus Arteriosus (PDA)?

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OBJECTIVE
Pilot study to determine if ultrasound dilution technology can identify and qualify patent ductus arteriosus (PDA) shunts in neonatal ICU (NICU) patients.

STUDY
- Two NICU patients were studied.
- ULTRASOUND FLOW/DILUTION MEASUREMENTS: A primed AV loop was connected between in situ umbilical arterial and dual-lumen umbilical venous catheters. To perform measurements, 2-4 ml of body temperature isotonic saline was injected into the venous side of the loop as a roller pump circulated blood at 8-10 ml/min from the artery to vein through the loop for up to 5 minutes. Two UD sensors placed on the loop sensed the change in velocity of the blood. After measurements were performed, the AV loop was flushed with heparinized saline and blood was returned to the patient.
- The hypoxic neonate had COstatus® measurements taken before and after infusion with 70 ml albumin.

RESULTS
- Preterm (0.9 kg) neonate: the shape of the dilution curve indicated a functioning PDA with possible Left-to-Right shunting (L-to-R) (Fig. 1).
- Hypoxic (3.5 kg) Neonate:
  - 1st measurement set: functioning PDA, possible Right-to-Left (R-L) shunt (Fig. 2).
  - 2nd measurement set after albumin infusion: possible (L-to-R) shunt.

STUDY’S CONCLUSIONS
- First experience using ultrasound dilution technology to identify and possibly predict the type of shunts in neonates.
- More studies required to validate findings with echocardiography.

COSTATUS® OBSERVATIONS
- PDA is a common defect in preterm neonates.
- Early diagnosis of PDA and shunts is important.
- The new ultrasound dilution (UD) (COstatus®, Transonic Systems Inc., Ithaca, NY) works off in-situ catheters and uses isotonic saline to measure cardiac output and blood volumes in ICU patients.
- The method can also identify the presence of shunts from the shape of the generated dilution curve.

REFERENCES
Marr B. "Can Ultrasound Dilution (UD) Identify and Qualify the Type of Shunt in Neonates with Patent Ductus Arteriosus (PDA):" Pediatric Critical Care Colloquium Pittsburgh, PA, May 15-17, 2010. (Transonic Reference # CO8026A)