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ASSESSING CARDIAC OUTPUT AND DERIVED BLOOD VOLUMES IN A NEONATAL LAMB MODEL WITH A LEFT-TO-RIGHT SHUNT

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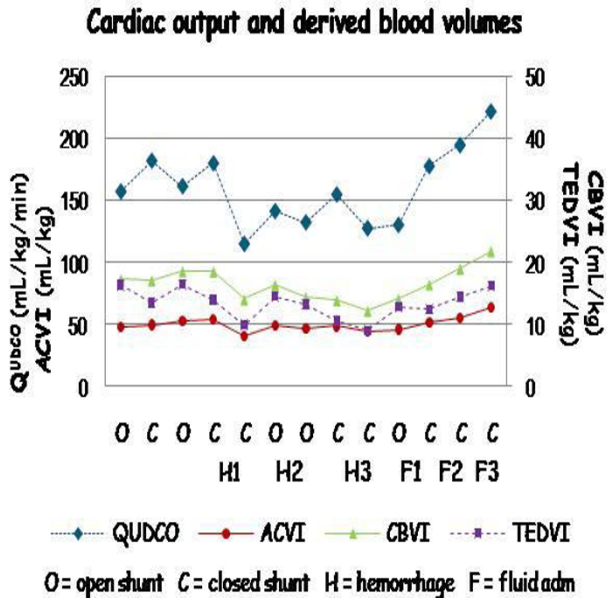
Aims: To assess cardiac output and derived blood volumes in lambs with a left-to-right shunt using the ultrasound dilution technique (UDCO).

Methods: In 8 lambs (mean weight 6.4 kg) arterial and central venous catheters were inserted and connected to the UDCO-monitor (COstatus™). A Gore-Tex® shunt was placed between the left pulmonary artery and the descending aorta. This shunt was intermittently opened and closed while cardiac output was changed by creating hemorrhagic hypotension followed by fluid administration (closed shunt only). Measurements of cardiac output (Q^{UDCO}), central blood volume index (CBVI), active circulating volume index (ACVI) and total enddiastolic volume index (TEDVI) were performed using the UDCO.

Results: 342 measurements were performed. Mean cardiac output was 160 mL/kg/min. Mean Qp/Qs ratio during open shunt was 1.7. Mean total hemorrhage was 17.8 mL/kg and mean total fluid administration 28.5 mL/kg. Figures 1 shows mean values of Q^{UDCO}, CBVI, ACVI and TEDVI during the entire experiment. During shunt opening, only changes in TEDVI were significant (p=0.038). During hemorrhage, CBVI and TEDVI decreased significantly with closed and open shunt (CBVI: p< 0.001 respectively p< 0.001 and TEDVI: p< 0.001 respectively p=0.027), while Q^{UDCO} only decreased significantly with closed shunt (p= 0.03). There were no significant ACVI changes, probably due to redistribution. During fluid administration, Q^{UDCO} and all volumes increased significantly.

Conclusion: The expected changes in cardiac output and derived blood volumes can be detected with UDCO technology, even in the presense of left-to-right shunts.



[cardiac output and derived volumes]

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IMPACT OF BALLOON ATRIAL SEPTOSTOMY ON CEREBRAL OXYGEN SATURATION AND OXYGEN EXTRACTION IN NEONATES WITH TRANSPOSITION OF THE GREAT ARTERIES

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Background: Neonates with transposition of the great arteries (TGA) are at risk of hypoxic-ischemic brain-injury. Balloon atrial septostomy (BAS) improves mixing of oxygen-saturated and -desaturated blood. We determined the impact of BAS on regional cerebral tissue oxygen saturation (r_cSO_2) and fractional cerebral tissue oxygen extraction (FTOE) in neonates with TGA.

Methods: Term neonates with TGA were included. R_cSO_2 was measured with near-infrared spectroscopy 2 hours (hrs) before, 2hrs after, and 24hrs after BAS for a two-hour period. Transcutaneous arterial oxygen saturation ($tcSaO_2$) was measured simultaneously. FTOE was calculated: $FTOE=(tcSaO_2-r_cSO_2)/tcSaO_2$. In neonates who did not need BAS on clinical grounds, according to the attending cardiologist, $tcSaO_2$ and r_cSO_2 were measured twice for a two-hour period: once within 24hrs after admission and once 24hrs