Non-Invasive Haemodynamic Monitoring in Neonates During Respiratory Procedures

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Background: Heart-lung interactions incept in early embryology stages. Vasculogenesis and pulmonary division evolve in parallel thanks to permanent interaction between growth factors of the two systems.

The target parameter is cardiac output ensuring tissue perfusion. It depends on preload, afterload and contractility which are influenced by respiration.

Heart-lung interactions are based on 3 major concepts:

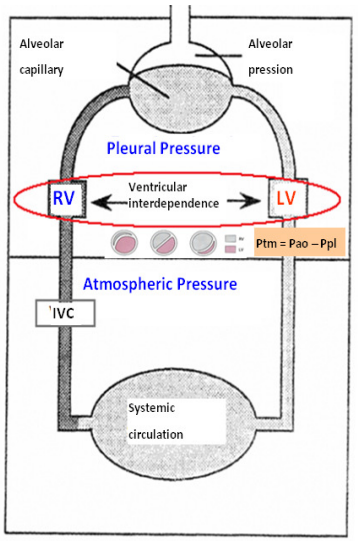
-Left ventricle (LV) transmural pressure = Pao – Ppl

-Compartments intra/extrathoracic: Inspiration increases systemic return

-Ventricular interdependence due to pericardium

Extubation is a key moment, which can induce respiratories complications, but hemodynamic consequences too: it increase catecholamin secretion because of stress and deteriorate LV function.

Chest physiotherapy (CPT) is a current practice in our unit . It aims to decrease congestion and obstruction.



Electrical velocimetry (EV) measurement of stroke volume (SV) presumes that the ejection of blood into the thorax would lower its resistance to current due to vessel volume changes. Models correlate impedance and erythrocytes orientation changes with peak flow velocity in aorta.

Osypka Medical, Berlin, Germany and La Jolla, California.

One of our first study concerning infants with congenital cardiopathy (CC) benefiting of CPT after surgery highlights amelioration in ventilatory conditions and improves contractility and ejection too thanks to CPT.

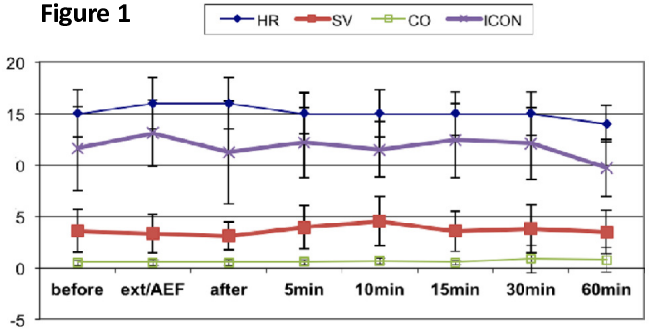
Patients with CC	Before CPT	After
Tidal volume (ml)	33.6	38.9
Inspiratory pressure (cmH2O)	22.5	19
FRC (ml)	33	49
Stroke volume SV	5.6	6.3
Contractility index ICON	49	63.4

Methods : This study aims to assess CPT and extubation impact in a neonatal cohort.
We assessed SV, cardiac output (CO), ICON and HR with EV before CPT or extubation and 5, 10, 15, 30 and 60 minutes after. We used Friedman and Wilcoxon tests.

Results: 24 preterms were included. Fig.1 shows trends of SV, CO, ICON and HR before and after the procedures: no differences were noticed (p=0.98 for SV; p=0.78 for ICON; p= 0.56 for HR, Friedman test). No differences were found analysing separately extubation and physiotherapy groups.

	CPT	EXT
n	11	13
Birth weight	855g	1701g
Gestational age	26+3	31+4

Figure 1



Conclusion: No haemodynamic changes are visible during elective extubation or chest physiotherapy in preterm infants. These preliminary results deserve further evaluation studying cerebral oxygenation with NIRS in order to evaluate cerebral microcirculation.