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The Value of Functional Echocardiography in The Management of Mechanically Ventilated Neonates

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Abstract

Background: Functional echocardiography for the neonates is a targeted bedside cardiovascular ultrasound that aiming to clinical evaluation and management of the current neonatal hemodynamic changes.

Objective: This prospective follow up study aimed at assessment of the hemodynamic changes in mechanically ventilated neonates, and determination of the correlation between ventilation settings and fECHO.

Methods: fifty mechanically ventilated neonates due to non-congenital respiratory problems underwent fECHO after 24 hours of mechanical ventilation. Thirty neonates continued on mechanical ventilation and were available to 48 hours fECHO follow up.

Results: A 24 hours fECHO examination showed; highly significant negative correlation between the RVO and the PIP & MAP (P value <0.01) and significant negative correlation with PEEP (P value <0.05). A significant negative correlation between the LVO and the MAP (P value <0.05). A highly significant negative correlation between SVC flow and PIP & MAP (P value <0.01), while no significant correlations found at 48 hours fECHO examination (P value >0.05). A 24 hours fECHO examination showed 14 patients had significant PDA. There was highly significant increase (P value <0.01) in PDA diameter, LA/AO ratio, LVO/SVC ratio, LPA, significant increase (P value <0.05) in LVO, and highly significant decrease (P value <0.01) in SVC flow of

significant PDA patients more than non-significant PDA or closed patients.

Conclusion: fECHO is an extension of the bedside clinical assessment for neonatal hemodynamic changes, it assisted in many decision taking such as closure of significant PDA, surfactant replacement therapy, increasing total fluid intake, management of pulmonary hypertension.

Keywords: fECHO in neonates, PDA with fECHO, mechanical ventilation.

List of Abbreviations

Abbreviation	Term
AO	Aorta
CO	Cardiac output
CPAP	Continuous positive airway pressure
ECHO	Echocardiography
ECMO	Extracorporeal membrane oxygenation
EF	Ejection fraction
fECHO	Functional Echocardiography
FiO_2	Fraction of Inspired Oxygen
FS	Fractional shortening
HR	Heart rate
IVC	Inferior vena cava
LA	Left atrium
LPA	Left pulmonary artery
LV	Left ventricle
LVO	Left ventricular output
MAP	Mean airway pressure
MAS	Meconium aspiration syndrome
NICU	Neonatal intensive care unit
O_2 Index	Oxygenation Index
PA	pulmonary artery
PDA	Patant ductus arteriosus
PEEP	Positive End-Expiratory Pressure

Abbreviation	Term
PFO	Patent foramen ovale
PIP	Peak Inspiratory Pressure
PPHN	Persistent pulmonary hypertension
PVR	pulmonary vascular resistance
RA	Right atrium
RDS	Respiratory distress syndrome
RR	Respiratory rate
RV	Right ventricle
RVO	Right ventricular output
RVSP	Right ventricular systolic pressure
SVC	Superior vena cava
SVR	Systemic vascular resistance
T_E	Expiratory time
T_I	Inspiratory time
TTN	Transient tachyapnea of the newborn
V_T	Tidal volume

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