The use of 3D Ultrasonography fetal Lung Volume Measurement in the prediction of Fetal respiratory function outcome

Thesis

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Abstract

Objective: To study the correlation between fetal lung volumes (FLVs), determined by three-dimensional ultrasound and virtual organ computer-aided analysis software (VOCAL), with neonatal respiratory outcomes.

Study Design: prospective observational study.

Setting: Obstetrics and Gynecology casualty department, Kasr El-Aini hospital, Cairo University, Egypt in the period from June 2014 to December 2014.

Methodology: One hundred healthy women with singleton pregnancies presented in the 1st stage of labour were included in the study, divided into two groups; Group A (n: 50 - women pregnant ± 34-37 weeks) & Group B (n: 50 - women pregnant ± 37^{+1}-40 weeks). A 3D volume model of the right fetal lung is generated & lung volume is calculated using VOCAL software. After child birth, neonatal respiratory functions were assessed using APGAR score together with occurrence of RDS and the further need for NICU admission.

Results: In group A, FLV was positively correlated with gestational age, while it was negatively correlated with APGAR score, RDS & NICU admission. In group B, FLV was positively correlated with gestational age, while there was no statistical correlation between FLV & APGAR score, RDS, NICU admission.

Conclusion: 3D FLV using VOCAL technique might be an accurate non- invasive predictor for fetal lung maturity particularly among preterm fetuses.

Keywords:

Fetal lung volumes (FLVs) - Three-dimensional ultrasound - VOCAL - Fetal lung maturity.

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2D	Two-dimensional
3D	Three-dimensional
3DUS	Three-dimensional ultrasound
6 N HCL	N hydrochloric acid
BPD	Bronchopulmonary dysplasia
BPD	Biparietal diameter
CDH	Congenital diaphragmatic hernia
cm H_2O	centimeters of water
CMV	Conventional ventilation
CPAP	Continuous positive airway pressure
CS	Cesarean section
CV	Conventional ventilation
CXR	Chest X-rays
DFE	Distal femoral epipyseal
DM	Diabetes mellitus
FiO2	Fraction of inspired oxygen
fL	Femto liter
FLM	Fetal lung maturity
FLV	Fetal lung volume
FSI	Foam Stability Index
g	Gram
GA	Gestational age
GLHW	Grey-level histogram width
HFOV	High frequency oscillatory ventilation

HFV	High frequency ventilation
iNO	Inhaled nitric oxide
IRDS	Infant respiratory distress syndrome
IUGR	Intrauterine growth restriction
IVH	Intraventricular hemorrhage
kPa	kilopascal
L/S	Lecithin/sphingomyelin ratio
LBC	lamellar body count
LLSIR	Lung-to-liver signal intensity ratio
MAS	Meconium Aspiration Syndrome
MGV	Mean gray value
MHz	Megahertz
min	Minute
mL/kg	Millilitre per kilogram
mm Hg	Millimetres of mercury
MRI	Magnetic resonance imaging
n	Number
NEC	Necrotizing enterocolitis
NICU	Neonatal intensive care unite
NIPPV	Neonatal nasal intermittent positive pressure ventilation
nm	Nanometre
NO-cGMP	Nitric oxide - cyclic guanosilmonophosphate
NS	Not significant
OD650	Optical density at 650 nm
P value	probability value
PaO_2	Arterial oxygen tension

PATET	Pulmonary artery acceleration/ejection time ratio
PCO_2	Partial pressure of carbon dioxide
PDA	Patent duct arteriosus
PEEP	Peak expiratory end pressure
PG	Phosphatidylglycerol
PHE	Proximal humeral epiphysis
PI	Pulsatility index
PIH	pregnancy induced hypertension
PIP	peak inspiratory pressure
PL	Pressure-limited
PPHN	Persistent pulmonary hypertension of the newborn
PTE	Proximal tibial epiphyseal
PVR	Pulmonary vascular resistance
r	Pearson Correlation
RCT	Randomized controlled trial
RDS	Respiratory distress syndrome
RI	Resistance index
ROC	Receiver operating curve
S/A	Surfactant/albumin ratio
SD	Standard deviation
SIMV	Synchronized intermittent mandatory ventilation
TCPL	Time-cycled pressure-limited
TTN	Transient tachypnea of the newborn
VC	Volume-controlled
VG	Volume-guarantee
VOCAL	Virtual organ computer-aided analysis software

wks	Weeks
yrs	Years
µl	Microliter
µm	Micrometre