

Cranial ultrasound screening in preterm infant and correlation with perinatal risk factors

by Soraya Salle Pasulu

Submission date: 05-Oct-2021 04:08PM (UTC+0800)

Submission ID: 1665790721

File name: n_preterm_infant_and_correlation_with_perinatal_risk_factors.pdf (6.93M)

Word count: 3080

Character count: 18198

p-ISSN 0030-9311
e-ISSN 2338-4786

Vol. 56 • No. 5 (Supplement) • September 2016

Paediatrica Indonesiana

(The Indonesian Journal of Pediatrics and Perinatal Medicine)

Abstract of the 8th Annual Scientific Meeting
Indonesian Pediatric Society,
Makassar, Indonesia,
September 17-21, 2016



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Oral Presentations: Nephrology

O-NEF-001	Bacterial pattern of urine culture and antibiotic sensitivity at pediatric ward of Dr. Moewardi Hospital, Surakarta from 2014 to 2015	29
O-NEF-002	Characteristics of anemia in children with chronic kidney disease in Dr. Mohammad Hoesin Hospital, Palembang	29
O-NEF-003	The effect of duration of illness and cumulative prednison dosage on geometry and left ventricular function in nephrotic syndrome	30
O-NEF-004	Risk factors of enuresis in children	30
O-NEF-005	Profiles of acute kidney injury among pediatric inpatients in Cipto Mangunkusumo Hospital from 2013 to 2015	31
O-NEF-006	Neonatal acute kidney injury in Dr. Soetomo Hospital, Surabaya	31
O-NEF-007	Identification of acute post streptococcus glomerulonephritis risk factors in children	32
O-NEF-008	Characteristics of pediatric post-streptococcal acute glomerulonephritis in 2012-2015 in Sanglah Hospital, Denpasar	32
O-NEF-009	Comparison of estimated glomerular filtration rate between cystatin-C and creatinine in children with chronic kidney disease	33
O-NEF-010	Clinical profiles and outcomes of children with Henoch-Schönlein purpura nephritis in Dr. Soetomo Hospital, Surabaya	33
O-NEF-011	Risk factors of relapse in pediatric nephrotic syndrome	34
O-NEF-012	Association between characteristics of patients and frequent relapses in pediatric nephrotic syndrome	34
O-NEF-013	Clinical profiles of end-stage renal disease children underwent hemodialysis in Dr. Cipto Mangunkusumo Hospital, Jakarta	35
O-NEF-014	The association between clinical symptoms with relaps in nephrotic syndrome	35

Oral Presentations: Neonatology

O-NEO-001	Minimally invasive surfactant therapy using gastric tube in preterm infants with respiratory distress syndrome	36
O-NEO-002	Cranial ultrasound screening in preterm infants and its correlation with perinatal risk factors	36
O-NEO-003	Introduction of a neonatal pain and agitation protocol at neonatal intensive care unit Dr. Soetomo Hospital, Surabaya	37
O-NEO-004	A preliminary study: cerebral function evaluation by using aEEG monitoring in newborn infants with severe hyperbilirubinemia	37
O-NEO-005	Hearing loss among NICU babies: how big is the problem?	38
O-NEO-006	Factors influencing the outcomes of neonates treated with continuous positive airway pressure	38

Neonatology

O-NEO-001

Minimally invasive surfactant therapy using gastric tube in preterm infants with respiratory distress syndrome

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Abstract

Background For many years, preterm infants with respiratory distress syndrome (RDS) have been managed with intubation and mechanically ventilated for surfactant therapy. Mechanical ventilation (MV) can lead to lung injury and ultimately to bronchopulmonary dysplasia (BPD). Minimally invasive surfactant therapy (MIST) allows surfactant to be administered to a spontaneously breathing infant who then remains on continuous positive airway pressure (CPAP). The MIST have shown good results reducing the need of MV, BPD and improving oxygenation.

Objective To describe the feasibility of MIST using gastric tube in preterm infants with RDS.

Methods In this prospective cohort study, preterm infants with gestational age ≤ 32 weeks, requiring a fraction of inspired oxygen (FiO_2) ≥ 0.30 during nasal CPAP pressure of ≥ 7 cmH_2O were eligible for MIST. Surfactant (100 mg/kg body weight) was instilled in less than 6 hours after birth, using a sterile gastric tube 5 F. The need for intubation in 72 hours, duration of oxygen supplementation and neonatal outcome were recorded.

Results There were 12 infants included. Reduction of FiO_2 was observed in all cases after surfactant administration. Intubation in 72 hours was conducted in 1 infant. Average duration of oxygen supplementation was 6.1 (SD 4.8) days. Incidence of BPD found in 2 patients, who also had necrotizing enterocolitis and septicemia. There were no other outcomes found such as intraventricular hemorrhage, periventricular leucomalacia, and ROP requiring treatment.

Conclusion The MIST using gastric tube in spontaneously breathing infants on nasal CPAP is feasible and deserves further studies.

Keywords: surfactant, RDS, MIST, gastric tube

O-NEO-002

Cranial ultrasound screening in preterm infants and its correlation with perinatal risk factors

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Abstract

Background Preterm birth is associated with variable degree of brain injury and medical complication. Cranial ultrasonography (cUS) is most widely used and routine procedure in NICU.

Objective To perform cranial ultrasound screening in preterm infant and determine risk factors of abnormal cUS.

Methods A cross-sectional study, in March to May 2016 of preterm infant in NICU Dr. Soetomo Hospital, using am3 ultrasound transportable machine with curved and linier transducers, frequency of 5-10 MHz. Statistical analysis used Chi-square and logistic regression multivariate analysis for risk factor of cUS abnormality. **Results** One-hundred-twelve infants were enrolled, 57 (50.9%) were males, mean age was 3.1 (SD 3.03) days. Mean gestational age of abnormal cUS were 30.1 (SD 2.75) weeks whereas in normal cUS were 32.1 (SD 1.93) weeks. Twenty three infant (20.5%) were abnormal cUS, consist of intraventricular hemorrhage (IVH) 16 (14.3%), three infants (2.7%) were periventricular leucomalacia, and four infants (3.6%) were ventricular dilatation. The univariate analysis of birth weight (OR 8.72, 95%CI 2.93 to 25.97), gestational age (OR 3.21, 95%CI 1.09 to 9.42), asphyxia (OR 10.96, 95%CI 3.87 to 31.02), duration of oxygenation (OR 6.07, 95%CI 2.11 to 17.44), and resuscitation (OR 5.35; 95%CI 1.95 to 14.67; $P < 0.05$) predicted abnormal cUS. Multivariate analysis of birth weight and asphyxia was predicting abnormal cUS with AUC 84.5% (95%CI 75.1 to 93.8%).

Conclusion The most common cUS abnormality is IVH. Birth weight under 1500g and asphyxia are important risk factors of cUS abnormality in preterm infant.

Keywords: preterm, screening, cranial ultrasound

3 Cranial ultrasound screening in preterm infant and correlation with perinatal risk factors

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17 ABSTRACT

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Conclusion: The most common cUS abnormality was IVH. Birth weight under 1500g and asphyxia are important risk factor of cUS abnormality in preterm infant.

Keywords: Preterm, screening, cranial ultrasound.

BACKGROUND

Preterm infants defined as babies born less than 36 weeks of gestation. Being born prematurely is not a normal event despite its routine nature. The fetal or preterm infant brain is vulnerable to both hemorrhagic and ischemic injury during the late second and early third trimester. This is due to vascular, cellular and anatomical features of the developing brain, and the tendency for preterm infants to experience periods of physiological instability at a time when they have limited cerebral circulatory autoregulation. Even premature infants who have relatively uncomplicated neonatal causes are at substantial risk for developmental delays in cognition and motor skills. Although advances in neonatal care have greatly improved the survival and outcome of these vulnerable patients, brain injury still remains a major concern. Early diagnosis is important for prognostication, optimal treatment, and neurological outcome.^{1,2}

Cranial ultrasonography (cUS) is the most widely used as a routine procedure technique for evaluating brain morphology and cerebral lesions in neonates in neonatal intensive care, and in particular in all the infants who are at risk for brain lesions. Serial ultrasound scans can identify not only the presence of lesions but also their type and extent. The major advantages of cUS are: it is relatively inexpensive and safe compared to other neuroimaging techniques, can be performed bedside with little manipulation of the infant. It can be repeated as often as necessary and thereby enables visualizations of ongoing brain maturation and the evaluation of brain lesion in addition to assessing the timing of brain damage. When cUS is used repeatedly, its sensitivity and specificity can be very high. Many studies have been performed in preterm infants and these have provided important information on the incidence and evolution of cerebral lesions and their relation with gestational age.^{1,2,3}

Intraventricular hemorrhage (IVH), periventricular leukomalacia (PVL), and ventriculomegaly (VM) are major neuropathological complications occurring commonly in premature infants and can be evaluated using cranial ultrasonography, and are associated with high mortality and adverse neurodevelopmental outcome.^{4,5}

We therefore decided to perform a hospital-based cranial ultrasonography screening program aiming to describe the pattern of cUS abnormalities in preterm infants and to define the potential need for cUS according to perinatal risk factors.

METHODS

A cUS screening of preterm infants was carried out between March to May 2016 in a single neonatal tertiary care center (Neonatal Intensive Care Unit, NICU, Rumah Sakit Dr. Soetomo, Surabaya, Indonesia). All preterm infants (less than 36 weeks gestational age) were considered eligible. Cranial ultrasonography were performed after 24 hours of life. Babies were excluded for parental refusal or when they had multiple congenital anomaly.

The following obstetrics and neonatal characteristics were collected: mode of delivery (vaginal delivery, vacuum extractor, elective or emergency caesarean section), gender, gestational age (GA), birth weight (BW), Apgar score at 1 and 5 min of life). Comorbidities were classified as: transient tachypnea (TT, defined as tachypnea > 60 breaths/min shortly after delivery that usually resolves within 72 h and doesn't require any assisted ventilation), respiratory distress syndrome (RDS, requiring either nasal continuous positive pressure, nCPAP, or invasive mechanical ventilation, congenital anomalies, necrotizing enterocolitis (NEC, requiring surgical treatment), sepsis (defined as increase in serum inflammatory markers and positive blood culture associated with clinical signs of infection). Morbidity at NICU admission was recorded and considered in the analysis. CUS scans were performed by radiology resident according to the clinical protocol of the unit and under the supervision. The radiologic resident were previously trained in performing cUS for at least 6 months.

Babies were scanned at bedside in supine position. Scans were performed with an IM3 machine using a convex transducer with frequency of 7.5 MHz. CUS report included the description of: ventricular system, midline structures, parenchymal echogenicity, posterior fossa structures. Ventricular dilatation was estimated according to the measurement of anterior horn width and of the thalamo-occipital distance. The parenchymal echogenicity in the periventricular areas was defined as periventricular hyperechogenicity (PHE) when isoechogenic/hyperechogenic to the choroid plexus.

Cranial ultrasonography findings were classified as: 1. normal; 2. mild abnormalities: asymmetric lateral ventricles, mild dilatation of the occipital horns (thalamo-occipital distance <95 percentiles), cysts of the choroid plexus, frontal, temporal and caudothalamic pseudocysts, lenticulostriate vasculopathy; 3. PHE; 4. severe abnormalities: GHMIVH, defined according to the Papile's criteria, cPVL, venous/arterial stroke and malformations.

6 Ethics, consent and permissions

All procedures performed in the study were in accordance with the ethical standards of the institutional research committee in RumahSakit Dr. Soetomo. Informed consent was obtained from the parents of participants included in the study.

Statistical analysis

Agreement between cUS scans over time was examined using Cohen's kappa statistics. We fitted univariate and multiple logistic regression models to calculate the odds ratio (OR) and 95 % confidence interval (CI). To evaluate the usefulness of cUS when added to other selected clinical variables, after the logistic models we estimated the receiver operating characteristic (ROC) curves and their area under the curve (AUC). Statistical analyses were performed with SPSS statistics 17.0

Results

8 there were 112 preterm infants were eligible. The characteristics of the study population are shown in Table 1.

Table 1 Characteristics of the study population

n	112
Gender	57 (50.9%)
Male	55 (49.1%)
Female	
Age (mean, SD) days	3.1 (SD 3.03)
Gestational Age (weeks)	
< 32	65 (58%)
> 32	47 (42%)
Birth Weight (gram)	
≤ 1500	44 (39.3%)
> 1500	68 (60.7%)
Apgar score in 5'	
< 5	28 (25%)
≥ 5	84 (75%)
Resuscitation	
Yes	24 (21.4%)
No	88 (78.6%)
Duration of oxygenation (days)	
≤ 3	92 (82.1%)
> 3	20 (17.9%)
Cranial ultrasound finding	
abnormal	23 (20.5%)
normal	89 (79.5%)

57 (50.9%) were males, mean age was 3.1 (SD 3.03) days. Mean gestational age of abnormal cUS were 30.1 (SD 2.75) weeks whereas in normal cUS were 32.1 (SD 1.93) weeks. Twenty three infant (20.5%) were abnormal cUS, consist of intraventricular hemorrhage (IVH) 16 (14.3%), three infants (2.7%) were periventricular leucomalacia, and four infants (3.6%) were ventricular dilatation were shown by Table 2.

Table 2. Cranial ultrasound finding

Cranial ultrasound finding	N (%)
Normal	89 (79.5%)
Abnormal	23 (20.5%)
IVH	16(69.5%)
PVL	3 (13.1%)
Ventricular dilatation	4 (17.4%)

Table 3. Perinatal risk factor associated with abnormal cranial ultrasound

Risk factors	OR	95%CI
Birth weight \leq 1500g	8.72	2.93-25.97
Gestational age \leq 32 weeks	3.21	1.09-9.42
Asphyxia	10.96	3.87-31.02
>3 days of oxygenation	6.07	2.11-17.44
Resuscitation	5.35	1.95-14.67

P<0.05 ; univariate analysis

The univariate regression (Table 3) was used to investigate the association between perinatal risk factors and abnormal cUS at 5 weeks. Birth weight \leq 1500g (OR 8.72; 95%CI 2.93-25.97), gestational age \leq 32 weeks (OR 3.21; 95%CI 1.09-9.42), Asphyxia (OR 10.96; 95%CI 3.87-31.02), more than 3 days of oxygenation (OR 6.07; 95%CI 2.11-17.44), need resuscitation (OR 5.35; 95%CI 1.95-14.67).

At the multivariate analysis (Table 4) the accuracy in predicting unfavorable cUS, estimated by combined birth weight and asphyxia ROC curve, was AUC 84.5% (95%CI 75.1 to 93.8%)(Fig. 1).

Table 4. Perinatal risk factor associated with abnormal cranial ultrasound

Risk factors	OR	95%CI	p
Birth weight \leq 1500g	12.09	2.87-50.93	0.01*
Gestational age \leq 32 weeks	0.29	0.03-2.52	0.26
Asphyxia	5.90	1.69-20.55	0.005*
>3 days of oxygenation	3.65	0.98-13.60	0.053
Resuscitation	0.62	0.12-3.26	0.58

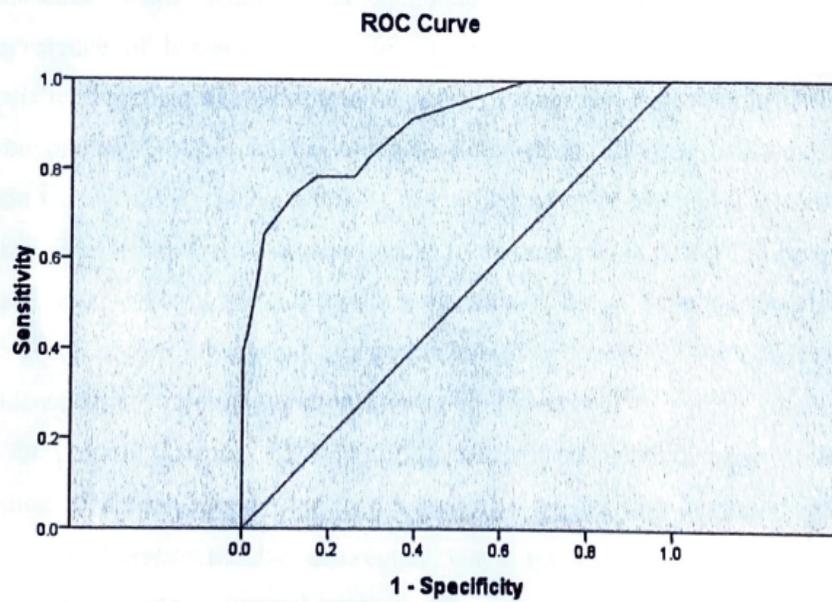


Figure 1. ROC curves for variables. The thin continuous line represents the reference model; the dashed line represents the model with birth weight and asphyxia

Discussion

Our data support the hypothesis that birth weight and the occurrence of neonatal comorbidities are the most important risk factors for detecting brain lesions in the preterm population. The combination of birth weight less than 1500g and the occurrence of asphyxia represents the strongest indication to perform a cUS scan.^{1,3,6}

GMH-IVH mostly occurs during the first 72 h of age and a very early 1st scan (within the defined interval time 1st–7th day of life) may have missed it. The problem of undetected GMH-IVH may be further compounded by recent evidence showing that cUS sensitivity in detecting grade 1–2 GMH-IVH is surprisingly low, compared to MRI. GMH-IVH is a rare although unusual event in late prematurity. In addition, also minor form occurring in VLBW babies are associated with impaired neurological outcome as very recent and robust studies demonstrated. Thus, we included also grade I-II GMH-IVH in the unfavorable cUS. These negative effects are consistent with germinal matrix destruction and loss of astrocytic precursor cells or with periventricular white matter inflammation due to astrocytes activation triggered by the long persistence of haemosiderin along the ependymal.^{7,8} Difficulties in performing an early diagnosis tend to occur also with arterial stroke, a brain lesion developing within the first week, rarely beyond day 3 of life, but becoming more obvious at cUS over the following few days. It is a common finding in very preterm infants in the first week of life and it is more pronounced with declining GA. It can be either pathological (pre-cystic phase of cPVL) or transient (related to increased water content) and not resulting in a definite lesion. Scan is supported by the evidence that cPVL still occurs among early preterm infants (28–35 weeks) despite the dramatic decrease in its incidence at the youngest gestational ages (24–27 weeks).^{1,8,9}

In preterm infants, RDS requiring mechanical ventilation has been associated with fluctuation of cerebral blood flow in the first days of life and increased risk of brain injury, mainly IVH. Cerebrovascular autoregulation and reactivity play a role in brain injury in premature babies and mechanical ventilation may interfere with these physiological mechanisms by affecting systemic haemodynamics and modulating arterial carbon dioxide tension. The causative association between comorbidities and severe cUS abnormalities deserves further analysis as they seem to act as a second “hit” triggering or aggravating pathological processes in the developing brain of premature babies and affecting both the white matter and the involuting structures, such as the germinal matrix.^{7,8,10}

The univariate analysis did not support the possible role of twin birth as risk factor for brain lesions. Twin pregnancies carry a higher risk of neonatal death, cerebral palsy and intrauterine death. However, increased neonatal morbidity appears to be related to prematurity rather than to twin birth itself although monochorionicity seems to play a detrimental role, in particular when complicated by twin-to-twin transfusion syndrome.^{2,8}

Conclusions

At the low birth weight, the intrinsic vulnerability of the developing brain increases the risk of developing brain lesions in particular when extrinsic factors, such as comorbidities, coexist. The indication to perform a cranial ultrasound scan in a preterm infant should be modulated according to birth weight and the comorbidities, in particular the occurrence of respiratory distress syndrome or asphyxia

References

1. Hankaran S, Bauer CR, Bain R. Prenatal and perinatal risk and protective factors for neonatal intracranial hemorrhage. *Arc Pediatr Adolesc Med.* 1996;150:49–96.
2. Fumagalli M, Ramenghi LA, Carli A. Cranial ultrasound findings in late preterm infants and correlation with perinatal risk factors. *Italian J Pediatrics.* 2015;41:65.
3. Islam M, Atiqul I, Hossain M. Cranial Ultrasound in Preterm Neonates: Screening of at Risk Infants for Long Term Neurodevelopmental Impairments. *Journal of Enam Medical College.* 2016;6:28-32.
4. Pape KE, Blackwell RJ, Cusick G. Ultrasound detection of brain damage in preterm infants. *Am J Neuroradiol.* 1997;24:1261–4.
5. Pape KE, Blackwell RJ, Cusick G, et al. Ultrasound detection of brain damage in preterm infants. *Lancet.* 1979;1261-74.
6. Sannia A, Natalizia AR, Parodi A, et al. Different gestational ages and changing vulnerability of the premature brain. *J Matern Fetal Neonatal Med.* 2009;10:92-6.
7. Ferriero DM. Neonatal brain injury. *N Eng J Med.* 2004;35:1985–95.
8. van Wezel-Meijler G, Steggerda SJ, Leijser LM. Cranial ultrasonography in neonates: role and limitation. *Acta Paediatr Scand.* 2009;78:142–53.
9. Van de Bor M, Ouden LD, Guit Gerard L. Value of cranial ultrasound & MRI in predicting outcome in preterm infants. *Pediatrics.* 1992;90:196.
10. Volpe J. Brain injury in the premature infant, neuropathology, clinical aspects, pathogenesis and prevention. *Clin Perinatal.* 1997;24:567–87.

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PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9

PAGE 10

PAGE 11
