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To Study Incidence of Neurosonographic Abnormalities in Newborns with Birth Asphyxia

Abhijit Shinde[1], Sunil Natha Mhaske[2], Shreya Bhate[3]

[1]Assistant Professor, [2]Dean, [3]Junior Resident, Depatment of Pediatrics, Dr Vithalrao Vikhe Patil Foundation's Medical College and Hospital, Ahmednagar, Maharashtra 414111, India.

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Abstract

Neonatal sonography of the brain is now an essential part of newborn care, particularly in high risk and unstable premature infants. Cranial ultrasound is the most available and easily repeatable imaging technique for the neonatal brain showing brain development and the most frequently occurring forms of cerebral injury in the preterm and terms. This study aims to assess the importance of cranial ultrasound as an investigatory modality for high-risk neonates and to find out the morphology of various cerebral lesions and correlate clinically.

Materials and Methods: This was a Descriptive Longitudinal Prospective study conducted in Neonatal Intensive Care Unit at Paediatric Department of *Dvvpf Medical College and Hospital*, which is a tertiary care hospital for surrounding districts, during the period of two years. In our period 155 neonates having perinatal asphyxia was studied to evaluate the usefulness of Neurosonogram in diagnosis of various lesions in symptomatic neonates with history of birth asphyxia.

Results: In our study 70 (45.1%) neonates had abnormal NSG findings of total of 155 neonates. In our study abnormal NSG among preterm neonates was maximum with weight in 1-1.5kg (88.5%). In our study abnormal NSG among term neonates was maximum in neonates with weight in 2-3kg (72%) range [2- 2.5kg (25%) and 2.5-3kg (47%) range]. Among 70 abnormal NSG, 25 had mydriasis, 38 had normal anterior fontanelle,58 had negative transillumination test. Abnormal NSG finding were found when done after 72 hours.

Conclusion: This study shows that Neurosonography is a sensitive, easy, simple, non-invasive, value-effective, initial choice of investigation for detection of abnormal changes in brain among neonates. High efficacy of NSG in detecting presence of brain damage and evolution of brain lesions on regular follow up guides clinical decisions and prognosis of the neonate.

Keywords: Neurosonography; Asphyxia; Seizures; Anterior fontanelle; Newborn; Cranial sonography.

Introduction

The advent of cranial ultrasound or neurosonography (NSG) as a routine tool in neonatology has greatly improved our knowledge of the presence and incidence of brain lesions in the newborn infant. Cranial ultrasound has been used routinely for infants at risk of neurological impairment, such as those born prematurely[1–5] or who have suffered from birth asphyxia.[6,7] World Health Organization (WHO) states that about 9 million neonates develop birth asphyxia every year. Of them 1.2 million die

Corresponding Author: Abhijit Shinde, Assistant Professor, Depatment of Pediatrics, Dr Vithalrao Vikhe Patil Foundation's Medical College and Hospital, Ahmednagar, Maharashtra 414111, India.

E-mail: jeetshinde007@gmail.com

and same number develop severe consequences such as cerebral palsy, epilepsy and developmental delay. Cranial ultrasound is the most available and easily repeatable imaging technique for the neonatal brain showing brain development and the most frequently occurring forms of cerebral injury in the preterm and terms.[8]

Ultra sonogram through the anterior fontanelle forms the best acoustic window and is as use full as CT with added advantages as it is easy, value effective, can be repeatable at bedside, free of radiation, minimum discomfort to the baby. And thereby enables visualization of ongoing brain maturation and the evolution of brain lesions. In addition, it can be used to assess the timing of brain damage.[9]

Hence this study is undertaken to evaluate the utility of Neurosonography (NSG) for diagnosis of various assorted brain lesions in symptomatic neonates having history of birth asphyxia.

Methodology

This was a Descriptive Longitudinal Prospective study conducted in Neonatal Intensive Care Unit at Paediatric Department of DVVPF MEDICAL COLLEGE and HOSPITAL, which is a tertiary care hospital for surrounding districts, during the period of two years. In our period 155 neonates having perinatal asphyxia was studied to evaluate the usefulness of Neurosonogram in diagnosis of various lesions in symptomatic neonates with history of birth asphyxia.

Inborn Term and Preterm neonates with perinatal asphyxia admitted to Neonatal Intensive Care Unit during the study period. The probe used for neurosonogram (Sonosite machine) was Linear high frequency probe and was done in NICU. Findings on neurosonogram were periventricular leukomalacia grading 1, 2 and 3, Haemorrhage, Infarct, Ventricular and white matter haemorrhage. No follow up is available.(Fig. 1&2)

All cases of Birth asphyxia fulfilling inclusion criteria were included in the study. No baby amongst these were on anticonvulsants having abnormal or absent pupillary reflexes.

Inclusion Criteria

A. All In-born term and preterm neonates with features indicative of perinatal asphyxia.

B. Criteria for asphyxia includes

1. Apgar score of 3 at 1min.
2. Requirement of Positive pressure ventilation for more than 1 min at resuscitation.
3. Fetal heart rate abnormalities (Fetal bradycardia 160 beats/minute) and/or presence of meconium stained amniotic fluid.
4. Abnormal neurological findings including altered muscle tone, altered sensorium and seizures.
5. Need for chest compression during neonatal resuscitation.

Exclusion Criteria

1. Outborn neonates.
2. Neonates with major congenital malformations e.g.- anencephaly, open neural tube defects, diaphragmatic hernia etc.
3. Neonates with extremely low birth weight (< 1 kg)
4. Neonates of extreme prematurity (less than 28 weeks of gestation)
5. Neonates who did not respond to resuscitation

Informed consent was obtained from the parents/guardian regarding inclusion of the neonate in the study. All babies received standard care during and after resuscitation. The relevant maternal and neonatal data was recorded in the standard proforma.

Gestational age in completed weeks was obtained on basis of mother's last menstrual cycle and confirmed where neccessary by routine early antenatal USG examination. In some cases where LMP was not available and antenatal USG was not done, then gestational age was assessed by Modified New Ballard's scoring system

The images were obtained through the anterior fontanelle. Image quality was maximized by fine adjusting the preset already available for transcranial scans.

All the data was arranged in a tabulated form and was analysed using Epi info software version 7.1.2. Chi square test and student t test was used for comparison. Probability value of less than 0.05 was considered significant.

Results

Table 1A: Distribution of Various Clinical Findings V/S Neurosonography (According To Pupil Reflex)

Presentation	Pupil Reflex (N= 155)			
	Normal	Mydriasis	Miosis	Absent
Total (n=155)	80	30	15	30
NSG - Normal (n= 85)	75	07	03	00
NSG - Abnormal (n= 70)	05	25	15	25

X2= 103.85, p < 0.001, Significant

Significant association was seen between the NSG normal-abnormal and pupillary reflexes (p < 0.001). Out of 85 normal NSGs, 75 cases had normal pupillary reflex, while out of 70 abnormal NSGs, only 5 were normal.(Table 1A)

Table 1B: According to Anterior Fontanelle.

Presentation	Anterior Fontanelle (N= 155)		
	Bulged	Depressed	Normal
Total (N= 155)	30	14	111
NSG- Normal (n= 85)	00	10	75
NSG-Abnormal(n=70)	30	02	38

X2 = 46.43, p < 0.001, Significant

Significant association was seen between the NSG normal-abnormal and anterior fontanelle (p < 0.001). Out of 85 normal NSGs, 75 cases had normal anterior fontanelle, while out of 70 abnormal NSGs, only 38 were normal.(Table 1B)

Table 1C: According to Translumination.

Presentation	Translumination (n= 155)	
	Positive	Negative
Total (n= 155)	10	145
NSG- Normal (n= 85)	00	85
NSG-Abnormal(n=70)	12	58

X2 = 15.79, p < 0.001, Significant

Significant association was seen between the NSG normal-abnormal and anterior fontanelle translumination (p < 0.001). Out of 85 normal NSGs, 85 cases had negative translumination, while out of 70 abnormal NSGs, only 12 were positive. (Table 1C)

Table 2: Relation of Central Cyanosis and Neurosonography Findings.

NSG	Central Cyanosis	
	Present	Absent
Total (n= 155)	15	150
NSG- Normal (n= 85)	00	85
NSG-Abnormal(n=70)	17	53

X2 = 23.19, p < 0.001, Significant

Significant association was seen between the NSG normal-abnormal and central cyanosis (p < 0.001). Out of 85 normal NSGs, 0 cases had cyanosis, while out of 70 abnormal NSGs, only 17 had cyanosis. (Table 2)

Table 3: Distribution of Birth Asphyxia Neonates Based on Timing of Nsg

Timing of NSG	Normal	Abnormal	Total
< 24 Hrs	98	57	155(100%)
24-72 Hrs	90	65	155(100 %)
>72 Hrs	85	70	155(100%)

X2 = 2.29, p = 0.32, Not Significant

No significant association was seen between the NSG normal-abnormal and timing of NSG (p < 0.001).(Table 3)

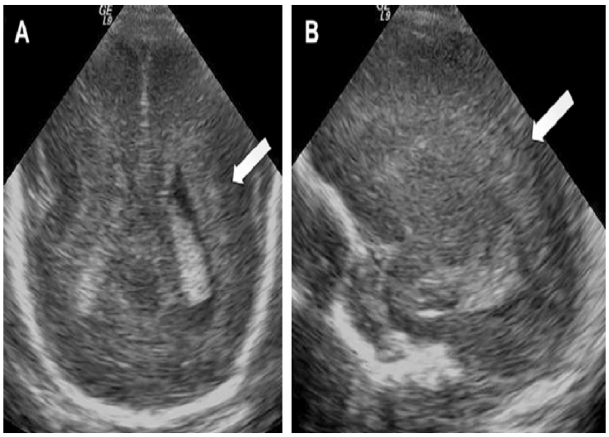

Fig. 1 A: Neurosonogram showing periventricular leukomalacia.
Fig. 1 B: Neurosonogram in which ventricles are visualized.

Discussion

In our study 70 (45.1%) neonates had abnormal NSG findings of total of 155 neonates.

In our study abnormal NSG among preterm neonates was maximum with weight in 1-1.5kg (88.5%) range which is consistent with Eastman NJ et. al. although we had higher percentage (88.5%) in that rage as compared to Eastman NJ et. al. (41%).

In our study abnormal NSG among term neonates was maximum in neonates with weight in 2-3kg (72%) range [2- 2.5kg (25%) and 2.5-3kg (47%) range] this is also consistent with Eastman NJ et. al. which had 51% preterm with abnormal NSG in this range.[10,11,12]

Primhak RA et. al. in their study found out that up to 50% Of neonates weighing less than 1500 g

exhibited some abnormality on the initial NSG.[13]

In our study we have found that out of 155 neonates, 80 had meconium of which 36 (45%) had abnormal scan. 70 mothers had anemia of all these deliveries 30 (42.8%) had abnormal NSG. PROM as risk factor was present in 36 pt. of these deliveries 22 (61.1%) had abnormal NSG. Out of 25 deliveries with PIH as risk factor, 8 (32%) neonates had abnormal scan. In only 5 deliveries cord around neck was present, 3 (60%) of these neonates had abnormal scan. Prolonged 2nd stage of labour was present in 22 deliveries, 15 (68%) of these asphyxiated neonates had abnormal neurosonography.

Reddy et. al. reported that PROM and preeclampsia influenced the presence of NSG abnormalities and risk of developing periventricular intraventricular hemorrhage(PVH).[14]

Conclusion

Neurosonography is a sensitive, easy, simple, non-invasive, value-effective, initial choice of investigation for detection of abnormal changes in brain among neonates. High efficacy of NSG in detecting presence of brain damage and evolution of brain lesions on regular follow up guides clinical decisions and prognosis of the neonate.

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