Study of detection of incidence of cranial USG abnormalities in neonates with asphyxia.
Jayshree Jadhav, Bhushan Deo, Shashank

Abstract

Introduction: World Health Organization (WHO) states that about 9 million neonates develop birth asphyxia every year. Of them 1.2 million die and same number develop severe consequences such as cerebral palsy, epilepsy and developmental delay.

Methodology: This was a Descriptive Longitudinal Prospective study conducted in Neonatal Intensive Care Unit at Paediatric Department of Pravara Rural Hospital, Loni, which is a tertiary care hospital for surrounding districts, during the period of two years. In our period 162 neonates having perinatal asphyxia was studied to evaluate the usefulness of Cranial Ultrasonogram in diagnosis of various lesions in symptomatic neonates with history of birth asphyxia.

Results: In our study 72 (44.4%) neonates had abnormal CUS findings of total of 162 neonates. In our study abnormal CUS among preterm neonates was maximum in neonates with weight in 1-1.5kg (87.5%) range which is consistent with Dubowitz et al although we had higher percentage (87.5%) in that rage as compared to Dubowitz et al (41%). In our study abnormal CUS among term neonates was maximum in neonates with weight in 2-3kg (71.4%) range[ 2-2.5kg (25%) and 2.5-3kg (46.4%) range] this is also consistent with Dobowitz et al151 which had 51% preterm with abnormal CUS in this range.

Conclusion: Cranial ultrasonogram is a sensitive, non-invasive, cost-effective, initial investigation of choice for detection of abnormal changes in brain among neonates. High efficacy of CUS in detecting presence of brain damage and its evolution on regular follow up guides clinical decisions and prognosis.

Introduction

World Health Organization (WHO) states that about 9 million neonates develop birth asphyxia every year. Of them 1.2 million die 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. Ultra sonogram through the fontanelle forms the best acoustic window and is as use full as CT with added advantages as it is simple, cost 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.

Hence this study is undertaken to evaluate the usefulness of Cranial Ultra sonogram in diagnosis of various lesions in symptomatic neonates with history of birth asphyxia.

Methodology

This was a Descriptive Longitudinal Prospective study conducted in Neonatal Intensive Care Unit at Paediatric Department of Pravara Rural Hospital, Loni, which is a tertiary care hospital for surrounding districts, during the period of two years. In our period 162 neonates having perinatal asphyxia was studied to evaluate the usefulness of Cranial Ultrasonogram 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 at Pravara Rural Hospital, Loni.

All cases of Birth asphyxia fulfilling inclusion criteria were included in the study.

Inclusion Criteria

A. All Inborn term and preterm neonates with features suggestive of perinatal asphyxia.
B. Criteria for asphyxia includes
1. Apgar score of d” 3 at 1min.
2. Positive pressure ventilation for more than 1 min at resuscitation.
3. Fetal heart rate abnormalities (Fetal bradycardia <100beats/ minute or fetal tachycardia>160beats/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 resuscitation.

**Exclusion Criteria:**

- Outborn neonates.
- Neonates with major congenital malformations e.g.- anencephaly, open neural tube defects, diaphragmatic hernia etc.
- Neonates who are extremely low birth weight (<1000gms)
- Neonates of extreme prematurity (less than 28 weeks of gestation)
- Neonates which failed 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 proforma.

Gestational age in completed weeks was assessed on basis of mother’s last menstrual period and confirmed where necessary 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 New Ballard’s score.

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

## Results

### Table 1: Distribution of various clinical findings V/s Neurosonography

<table>
<thead>
<tr>
<th>Presentation</th>
<th>Pupil reflex (n=162)</th>
<th>Ant. Fontanelle(n=162)</th>
<th>Transillumination (n=162)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL (n=162)</td>
<td>N 84</td>
<td>Mi 34</td>
<td>My 16</td>
</tr>
<tr>
<td>CUS Normal (n=90)</td>
<td>78</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Abnormal (n=72)</td>
<td>6</td>
<td>24</td>
<td>14</td>
</tr>
</tbody>
</table>

### Table 2: Relation of central cyanosis and Neurosonography findings.

<table>
<thead>
<tr>
<th>CUS</th>
<th>CENTRAL CYANOSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Present</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
</tr>
<tr>
<td>Normal (n=90)</td>
<td>0</td>
</tr>
<tr>
<td>Abnormal (n=72)</td>
<td>20</td>
</tr>
</tbody>
</table>

### Table 3: Distribution of birth asphyxia neonates based timing of cranial ultrasound

<table>
<thead>
<tr>
<th>Time</th>
<th>CUS Normal</th>
<th>CUS Abnormal</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 24 hours</td>
<td>106</td>
<td>56</td>
</tr>
<tr>
<td>4-72 hours</td>
<td>96</td>
<td>66</td>
</tr>
<tr>
<td>&gt;72 hours</td>
<td>90</td>
<td>72</td>
</tr>
</tbody>
</table>

**Discussion**

In our study 72 (44.4%) neonates had abnormal CUS findings of total of 162 neonates. In our study abnormal CUS among preterm neonates was maximum in neonates with weight in 1-1.5kg (87.5%) range which is consistent with Dubowitz et al although we had higher percentage (87.5%) in that rage as compared to Dubowitz et al (41%). In our study abnormal CUS among term neonates was maximum in neonates with weight in 2-3kg (71.4%) range[2-2.5kg (25%) and 2.5-3kg (46.4%) range] this is also consistent with Dubowitz et al which had 51% preterm with abnormal CUS in this range. 4,5,6

Jeffrey M. Perlman, Nancy Rollins et al in their study found out that up to 50%

Of neonates weighing less than 1500 g exhibited some abnormality on the initial CUS. 7

In our study we have found that out of 162 neonates, 86 had meconium of which 40 (46.5%) had abnormal scan. 76 mothers had anemia of all these deliveries 36 (47.3%) had abnormal CUS. PROM as risk factor was present in 36 pt. of these deliveries 22 (61.1%) had abnormal CUS.

Out of 30 deliveries with PIH as risk factor, 10 (33.3%) neonates had abnormal scan.

In only 6 deliveries cord around neck was present, 4 (66.6%) of these neonates had abnormal scan.

Prolonged 2nd stage of labour was present in 26 deliveries, 18 (69.2%) of these asphyxiated neonates had abnormal neurosonography. 8
By applying chi-square test it was observed only prolonged 2nd stage of labour has statistically significant association with abnormal CUS. p value=0.0326

Badrawy N et al reported that PROM and preeclampsia influenced the presence of CUS abnormalities and risk of developing periventricular intraventricular hemorrhage PIVH.9

**Conclusion:**

Cranial ultrasonogram is a sensitive, non-invasive, cost-effective, initial investigation of choice for detection of abnormal changes in brain among neonates. High efficacy of CUS in detecting presence of brain damage and its evolution on regular follow up guides clinical decisions and prognosis.

**References**


Objective: To study the cranial ultrasonographic finding in HIE Infants and its clinical correlation and prediction of outcome. Method: it is a prospective clinical study of 120 baby suffering from hypoxic ischemic encephalopathy. Ultimate outcome of 104 neonates with initial USG abnormality showed recovery in 53% of cases mortality of cases and sequel in 17% of cases. Newborn infants with grade I USG abnormality had mortality in 15.4% and the remaining 84.6% had completely recovery. Neurosonographic abnormalities in neonates with hypoxic ischemic encephalopathy. Indian Pediatr. 1994 Jul;31(7):767-74. There are many outstanding controversial issues in neonatal resuscitation that need to be addressed. This article provides a comprehensive and critical literature review on the most relevant and current research pertaining to evolving new strategies in neonatal resuscitation. The key elements to a successful neonatal resuscitation include ventilation of the lungs while minimizing injury, the judicious use of oxygen to improve pulmonary blood flow, circulatory support with chest compressions, and vasopressors and volume that would hasten return of spontaneous circulation. Several exciting new a Objective The study aimed to utilize the neurosonographic findings in neonates in early diagnosis, prediction of their long-term outcome, parental counseling, and early intervention. Methods The study was carried out in neonatal intensive care unit (NICU) of Shri BM Patil Medical College and Hospital. High Incidence of Cranial Ultrasound Abnormalities in Full-Term Infants with Congenital Heart Disease. Article. Jan 1996. Neonatal seizures evolve over time. The peak incidence occurs between 12 and 24 hours of age but the time of onset is dependent on aetiology and treatment. Often the seizures cease by 72 hours of age. The typical time of presentation is identified in Table 4. Presentation, but the day of onset may be variable. Table 4. Presentation Typical onset. Data regarding adverse effects in neonates is limited to case reports and abstracts. Does not induce cell death in the developing brain (apoptosis). Refer to an Australian pharmacopoeia for complete drug information. There is a clear cause (e.g. birth asphyxia). Seizures are usually multifocal and clonic at onset and progress rapidly to. Comment. Five abnormalities were recognized as arterial infarction; 6, as borderzone infarction; and 3 lesions, as punctate white matter lesions. Rutherford et al studied 63 term neonates who presented with early seizures, of whom 49 with HIE had undergone repetitive MR imaging. Reduced ADC in the centrum semiovale, anterior and posterior white matter at the level of the basal ganglia, central sulcus, lentiform nucleus, medial and lateral thalamus, PLIC, brain stem, and cerebellum allowed early detection of infarction. Early detection of cerebral infarction and hypoxic ischemic encephalopathy in neonates using diffusion-weighted magnetic resonance imaging. Neuropediatrics 1994;25:172-75. PubMed.