Cranial Ultrasound in High Risk Neonates

Authors
Dr S.K Valinjkar¹, Dr Shruti Dhale², Dr Yogesh Mokase³, Dr Vikas⁴, Dr Sukena Susnerwala⁵
¹,²Associate Professor, ³Assistant Professor, ⁴,⁵Resident
Dept of Pediatrics, Grant Govt Medical College Mumbai India
Corresponding Author
Dr Sukena Susnerwala
Grant Govt Medical College Mumbai India
Email: ssusnerwala@gmail.com, 9920974140

Abstract
Cranial ultrasonography has become an essential diagnostic tool in modern neonatology for depicting normal anatomy and pathological changes in neonatal brain. In the neonate many sutures and fontanels are open and these can be used as acoustic windows to “look” into the brain. It’s a reliable tool for detecting congenital and acquired abnormalities of the perinatal brain and most frequent patterns of brain injury in preterm and full term neonate. In this observational prospective study total 201 high risk neonates fulfilling inclusion criteria are studied in our NICU, a tertiary care hospital, to find out the role of cranial ultrasound in high risk neonates from October 2014 to September 2016. Cranial ultrasound was done in these patients and results reviewed.

Introduction
CUS is cheap, easy to perform, non-invasive and easily repeatable. Our study evaluates the importance of CUS as an early investigatory modality in NICU protocols. Cranial Ultrasonography CUS was introduced in neonatology the late 1970s and now is an established diagnostic tool in modern neonatology. Both normal and abnormal USG scans have been very useful in predicting neurodevelopment Outcome. It is a reliable tool for detecting most of the hemorrhagic, ischemic and cystic brain lesions as well as calcifications, cerebral infections and major structural abnormalities in preterm and full term newborn. Neonates who have greater than average chance of morbidity & mortality due to fetal, placental, maternal anomalies are termed as high risk neonates. Cranial ultrasound can be done at an early stage even immediately after birth and can be done at the bedside in a critically sick neonate causing minimum distress to the baby.

Aims and Objectives
The study was conducted at a tertiary care centre with the objectives
To assess the importance of cranial ultrasound as an early investigatory modality for high risk neonates and
To find out the morphology of various brain lesions and correlate clinically

Materials and Methods
This was a prospective study conducted over a one year period in the tertiary care Hospital in a metropolitan city in INDIA. A total of 201 high risk babies with suspected neurological injuries were included in this study. Patients were divided on the basis of gestational age into post term, term, late preterm, early preterm, very preterm and extreme preterm. Cranial ultrasound of the high risk neonate fulfilling the inclusion criteria between day 4 to day 7 of life by single senior radiologist using SONOSITE USG machine with 5 Mhz probe.

Results and Discussion
In this study among 201 high risk newborns cases there was 1 post term newborn (0.5%), 50 cases were term newborns (24.9%) and remaining 150 cases were preterm (74.6%).
_ Among 201 cases in this study group, 114 neonates (56.7%) were AGA, 86 neonates (42.8%) were SGA and 1 case was LGA (0.5%).
_ Among 201 cases in this study group, 100 neonates (49.8%) were male and 101 neonates (50.2%) were female.
_ Amongst the 201 sample size which was studied, 41 neonates (20.4%) were multiplets, of which 32 neonates (15.9%) were twins and 9 neonates (4.5%) were triplets, and 160 cases (79.6%) were single.
_ There were 2 neonates (1%) with history of significant birth trauma, 26 neonates (12.9%) had birth asphyxia, 19 neonates (9.5%) had neonatal sepsis and 22 neonates (10.9%) had seizures among which 7 were hypoglycemic seizures.
_ There was hypocalcemic seizure, 12 had meningitis and 2 cases, where cause was not found. In this study group, the incidence of abnormal cranial USG was 14% (28/201).
_ In this study, all hypoglycemic seizure newborns had normal cranial USG. Suggesting poor efficiency of cranial USG to detect hypoglycemic damage/no early visible changes occurs.
_ In this study, no association was found between birth trauma and abnormal USG skull, as no abnormalities were detected in both cases. Many birth trauma cases were not included in this study because of hemodynamic instability.

Table 1: Showing Abnormal Findings in Cranial USG.

<table>
<thead>
<tr>
<th>Abnormality</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrocephalus &amp; small post. Fossa</td>
<td>8 28.6%</td>
</tr>
<tr>
<td>Isolated Hydrocephalus</td>
<td>7 25.0%</td>
</tr>
<tr>
<td>Isolated Ventricular Hemorrhage</td>
<td>4 14.2%</td>
</tr>
<tr>
<td>Periventricular flair/ leukomalacia</td>
<td>4 14.2%</td>
</tr>
<tr>
<td>Other congenital brain anomalies</td>
<td>2 7.1%</td>
</tr>
<tr>
<td>Infarct/ Gliosis</td>
<td>1 3.6%</td>
</tr>
<tr>
<td>Ventricular Hemorrhage with Hydrocephalus</td>
<td>1 3.6%</td>
</tr>
<tr>
<td>Cystic Lesion</td>
<td>1 3.6%</td>
</tr>
<tr>
<td>Calcification</td>
<td>Nil Nil</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
</tr>
</tbody>
</table>

Conclusion
This study highlights the convenience and diagnostic efficiency of cranial ultrasound in high risk neonates in NICU.
In this study, Neonatal sepsis, neonatal seizures and birth asphyxia are important risk factors for abnormal cranial USG.
_ In this study, all hypoglycemic seizure newborns has normal cranial USG. Suggesting poor efficiency of cranial USG to detect hypoglycemic damage/no early visible changes occurs.
_ In this study no association was found between birth trauma and abnormal USG skull, as no abnormalities were detected in both cases. Many birth trauma cases were not included in this study because of hemodynamic instability.

Limitation
Few limitations as observed were only one scan done between day 4-7 of life, good sensitivity (14%) but is lesser on comparison to studies showing sequential scan.
_ Non availability of bedside USG at the center causing loss of cases with risk factors.
References


4. Lara M Liejser& Frances M Cowan , state of the art neonatal cranial ultrasound, Feb 2007 volume 15 no 1

5. Erik Beek and Floris Groenendaal Department of Radiology and Neonatology of the Wilhelmina Children's Hospital and the University Medical Centre of Utrecht, the Netherlands; Radiology assistance manual- Publication date April 1, 2006

6. Dr Neeraj Kumar, Dr Manoj Kumar Singh,Dr A K Gupta, Dr J P K Gill,Dr Shailendra Kumar Singh,Dr V K Gupta. All are affiliated with S. N. Medical College Agra, India & National JALMA Institute for Leprosy and Other Microbial diseases Agra, India,Pediatric Review: International Journal of Pediatric Research Vol 3, No 04 (2016)