Research Article

New Advances in Brain & Critical Care

Assessment of Hypoxic Ischemic Changes in Perinatal Asphyxia of First Ultasonogram of Brain

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Abstract

Background: *In in perinatal asphyxia, hypoxic ischemic brain injury remains most serious condition causing significant mortality and long term morbidity. Early detection of intracranial changes and its consequences will enhance timely intervention and better out come. Cranial sonography can be done to assess the abnormalities of brain in perinatal asphyxia.*

Objectives: *The objective of this study was to evaluate usefulness of assessment of Hypoxic Ischemic Changes in perinatal asphyxia of first Ultasonogram of Brain.*

Methods: *This was an observational study conducted from March 2018 to February 2019 at department of radiology and imaging, Dhaka Shishu Children Hospital, Dhaka, Bangladesh. Total 100 neonates with perinatal asphyxia were included in this study. Cranial USG was done in all cases and sonographic abnormalities were evaluated.*

Result: *This study was 56 term (>37 weeks of gestation) and 44 preterm (<37 weeks of gestation) newborn having birth asphyxia were taken as cases in this study. Common cranial sonographic findings of preterm babies were periventricular leukomalacia 29% (13), germinal matrix hemorrhage 14% (6), Intraventricular hemorrhage 11% (5) cerebral oedema 7% (3) and normal 39% (17). Common cranial USG findings in term babies were cerebral oedema 43% (24), intracerebral hemorrhage 5% (3), Focal cerebral infarct 4% (2), Intraventricular hemorrhage 2% (1) and normal 46% (26).*

Conclusion: *This study found that transcranial sonography is useful to identify the abnormalities in brain of asphyxiated neonate and helps to predict the neurodevelopmental outcome. So proper management plan can be done.*

Keywords: Cranial Sonography, Perinatal, Asphyxia

Introduction

Perinatal asphyxia is a condition characterized by an impairment of exchange of the respiratory gases (oxygen and carbon dioxide) resulting in hypoxemia and hypercapnia, accompanied by metabolic acidosis. Perinatal asphyxia represents the third most common cause of neonatal death. Neonatal mortality contributes a great deal to infant mortality rate [1,2]. Among all the causes, 39% of the neonatal deaths occur due to perinatal asphyxia [3]. Perinatal asphyxia may affect virtually any organ, but hypoxic-ischemic brain injury is the most studied clinical condition and that is burdened with the most severe sequelae. Hypoxic ischemic brain injury is the most important consequences of perinatal asphyxia which

ultimately results in immediate and delayed form of neuronal death [4]. So it is important to assess the severity of asphyxia to give adequate treatments and prevent brain damage. Cerebral sonography in neonatal period can assess the abnormality of brain caused by asphyxia and provide early guide to the neurodevelopmental prognosis. Cranial ultrasound was first introduced in 1979 in neonatal care units to detect intracranial pathology [5,6]. The development of high resolution, real time sector together with increasing expertise in its use and interpretation of finding, has established the role of sonography in the analysis of neonatal brain. Cranial ultrasound has become an essential diagnostic tool in modern neonatology for depicting normal anatomy and pathological changes in neonatal brain. Because in the neonate many sutures and fontanels are still open and these can be used as acoustic window to look into the brain [7]. It is also cost effective, radiation free and its safety is well established in infants [8]. Now a day cranial ultrasound has been used routinely for infants at risk of neurological impairment such as who have suffered from birth asphyxia. This study was conducted to assess the cranial sonographic findings in neonates with perinatal asphyxia.

Objective

The objective of this study was to evaluate usefulness of assessment of Hypoxic Ischemic Changes in perinatal asphyxia of first Ultasonogram of Brain.

Materials and Methods

This study was carried out in the department of radiology and imaging, Dhaka Shishu Children Hospital, Dhaka from March 2018 to February 2019. One hundred asphyxiated neonates were selected for the study and were subjected to cranial sonography. After obtaining the informed consent from the mother or attendant proper maternal, perinatal, antenatal and obstetric history were collected. Detailed clinical examination was done. Age, sex, birth weight, gestational age, other parameters, complications, clinical diagnosis of the baby were recorded. Examination findings were documented on a pre-formed questionnaire. Cranial ultrasound scans were performed with real time B mode gray scale machine with 3.5 MHz and 7.5 MHz transducer in department of Radiology and Imaging in DSCH. Anterior fontanele was used as acoustic window and scanning was done in both coronal and sagittal planes. Sonographic findings of ventricular size, haemorrhage within the ventricles and parenchyma, other parenchymal abnormalities, cerebral oedema were evaluated. Descriptive statistical analysis of all information and data was carried out.

Results

One hundred newborn were enrolled in this study. Among them 44 babies were preterm and 56 babies were term with perinatal asphyxia. Mode of delivery was normal vaginal delivery for 46% neonates and 54% via LUCS for various reasons. There were 52% female and 48% were male neonates (Table 1). Out of one hundred babies highest number 82 (82%) were in age group of 1 to 4 days (Table 2). Among the preterm babies, highest number 26 (59%) were in the age group of 34-36 weeks of gestational age and among the term babies, highest number 38 (68%) were in the age group of 37-39 weeks of gestational age (Table 3 and Figure 1). Table 4 and 5 shows that in preterm babies' birth weight between 1.5-2kg was in 14 (32%) cases and between > 2-2.5 kg was in 30 (68%) cases. In term babies, birth weight between 2.5-3.5 kg was in 40 (71%) cases and between >3.5-4 kg was in 16 (29%) cases. 12% mother had premature rupture membrane, l2% had APH, 8% pre-eclamptic toxemia and hypertension, 6 % had Diabetes mellitus and 4% had oligohydramnios during pregnancy (Figure 2). Out of hundred new born 75% had respiratory distress, 42% had convulsion, 40% had cyanosis, 30% had apnoeic spell and 12% had sepsis (Table 6). Out of 44 preterm asphyxiated newborn, 13 (29%) showed periventricular leukomalacia, 6 (11%) germinal matrix haemorrhage, 5 (11%) IVH, 3 (7%) showed cerebral oedema and 17 (39%) showed normal findings (Table 7). In 56 term asphyxiated newborn, 24 (43%) showed cerebral oedema, 3 (5%) showed intracerebral hemorrhage, 2 (4%) showed Focal cerebral infarct, 1 (2%) showed IVH, and 26 (46%) showed normal findings (Table 8) (Figures 3-6).

Table 1: Distribution of newborns according to gender (n=100)

Gender	No of respondents	Percentage
Male	48	48%
Female	52	52%

Table 2: Distribution of newborns according to age (n=100)

Age	No of respondents	Percentage
< 1 day	6	6%
1-4 days	82	82%
5-8 days	12	12%

Table 3: Distribution of preterm newborn as per gestational age (n =44)

Gestational Age in weeks	No of the respondents	Percentage
31 -33	18	41%
34-36	26	59%

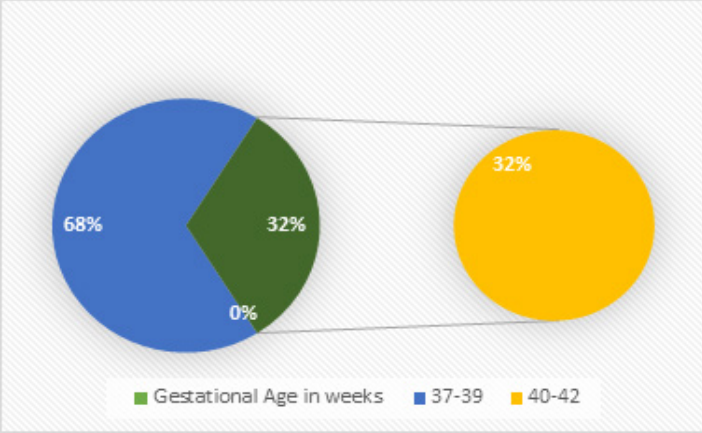

Figure 1: Distribution of term newborn as per gestational age (n =56)

Table 4: Distribution of preterm neonates as per birth weight (n=44)

Birth weight	No. of the respondents	Percentage
1.5-2 kg	14	32%
> 2 - < 2.5kg	30	68%

Table 5: Distribution of term neonates as per birth weight (n=56)

Birth weight	No. of the respondents	Percentage
2.5 – 3.5 kg	40	71%
>3.5 – 4 kg	16	29%

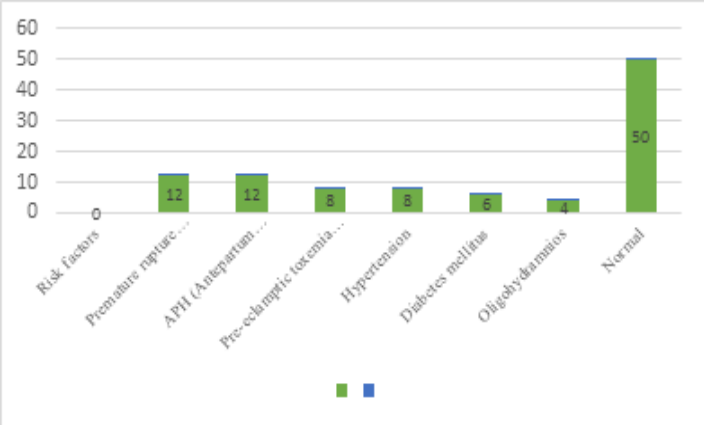

Figure 2: Perinatal risk factors for asphyxia of newborns (n = 100)

Table 6: Distribution of clinical presentation of the asphyxiated newborns

Clinical features	No. of patient	Percentage
Respiratory distress	75	75%
Convulsion	42	42%
Cyanosis	40	40%
Apnoeic spell	30	30%
Sepsis	12	12%

Table 7: USG findings in Preterm (n=44)

Cranial USG finding	No of patient	Percentage
Periventricular leukomalacia	13	29%
Germinal matrix hemorrhage	6	14%
IVH(intraventricular hemor rhage)	5	11%
Cerebral oedema	3	7%
Normal finding	17	39%

Table 8: USG findings in Term babies (n=56)

Cranial USG finding	No. of patient	Percentage
Cerebral oedema	24	43%
Intracerebral hemorrhage	3	5%
Focal cerebral infarct	2	4%
IVH(intraventricular hemorrhage)	1	2%
Normal finding	26	46%

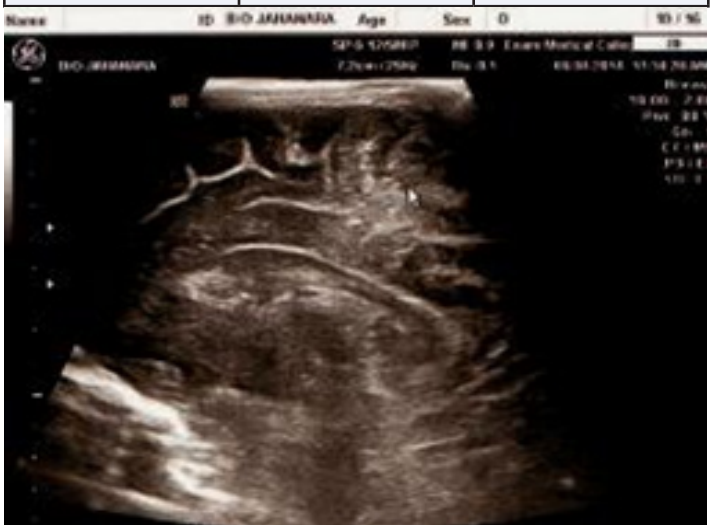

Figure 3: Periventricular leukomalacia (PVL)

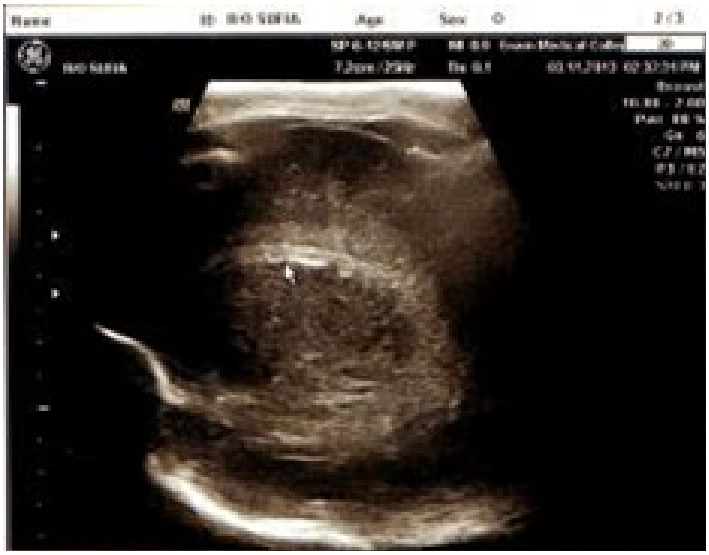

Figure 4: Periventricular leukomalacia (PVL)

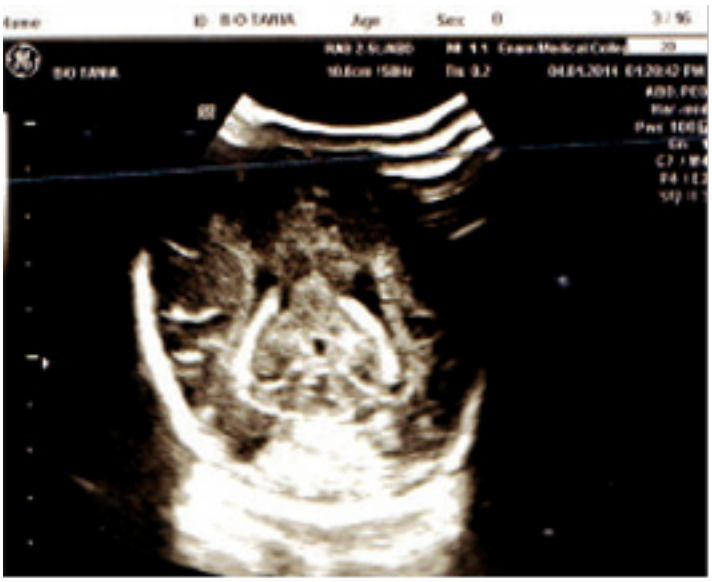

Figure 5: Intraventricular hemorrhage (IVH)

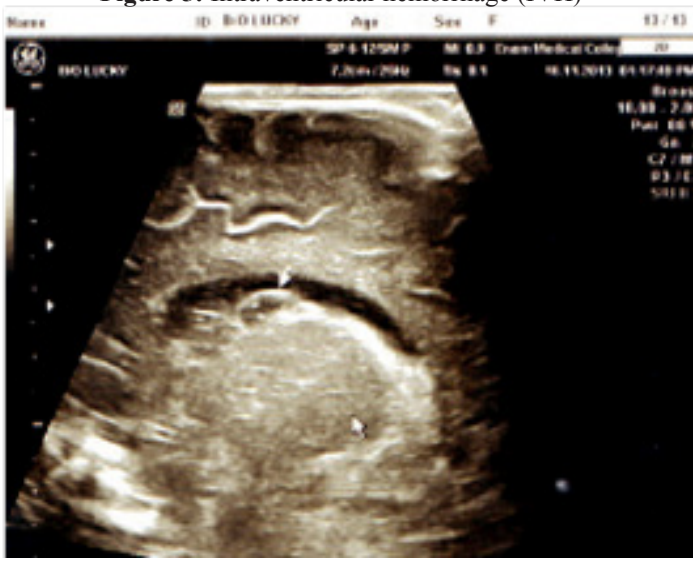

Figure 6: Germinal matrix hemorrhage

Discussion

Although there is great improvement in perinatal practice, the mortality and incidence of cerebral palsy caused by asphyxia have remained unchanged partly because of the absence of early diagnosis and identification methods. Due to wide availability of ultrasound machines and other advantages like, it is cheap, easy to perform, non-invasive and can be initiated at a very early stage, even immediately after birth, ultrasound has been used extensively in neonates to evaluate neonatal brain in perinatal asphyxia. This study explores early diagnostic value of cranial sonogram to identify abnormalities in perinatal asphyxia. In our study there were 52% female and 48% male out of one hundred newborn of which 44 were preterm and 56 were term. Most of the studies also showed that birth asphyxia is more common in full term rather than preterm babies [9,10]. This study shows that majority (68%) of the preterm babies were more than 2kg to less than 2.5 kg weight group and majority (71%) of the term babies were of 2.5 to 3.5 kg weight group. This figures correlate well with the studies of Barr and Dipietro et al [11,12]. In our study common clinical presentations were 75% respiratory distress, 42% convulsion, 40% cyanosis, 30(30%) apnoeic spell and 12% sepsis which were near consistent with other studies [11,13-15]. Respiratory distress was the most common findings (75%) in this study. Martin et al found respiratory distress in 48.4% cases in his study [14]. Convulsion is also an important presentation in this study, about 42%. Result of Finer, et al. and Goldberg, et al. are near consistent with this study [10,16]. Cyanosis in this study was found in 40% cases which is also consistent with other study [13,14]. Perinatal risk factors were 12% premature rupture membrane, l2% APH, 8% pre-eclamptic toxemia and hypertension, 6% Diabetes mellitus and 4% oligohydramnios. Other studies were also consistent with the present study [14,17]. In preterm asphyxiated baby common sonographic finding is periventricular leukomalacia (PVL) which appear on ultrasound as increased echogenicity in perventricular region. In preterm neonate perventricular region is watershed zone and relatively hypovascular that's play a role in development of PVL. But with maturity of infant watershed zone shifts from periventricular region to a more peripheral location and PVL is less common and cranial ultrasound most commonly shows pattern of diffuse cerebral oedema in term neonate seen as diffuse increased echogenicity of brain with obliterated CSF spaces. In preterm neonate highly vascular germinal matrix is the site of hemorrhage, intraventricular hemorrhage (IVH) may also occur either from rupture of germinal matrix hemorrhage (GMH) or from choroid plexus bleeding. In term neonate germinal matrix is involutes so hemorrhage is uncommon here but intraventricular hemorrhage has been reported from choroid plexus. In our study common cranial ultrasound findings in preterm asphyxiated neonates were periventricular leukomalacia in 29% (13) cases, germinal matrix haemorrhage in 14% (6) cases, IVH in 11% (5) cases. Other studies also showed that in the preterm, the major lesions are germinal matrix hemorrhage (GMH) or intraventricular hemorrhage (IVH) and periventricular leucomalacia (PVL) [18,19]. USG fared well in the diagnosis of GMH/IVH and PVL [20,21]. In this study common cranial ultrasound findings of term asphyxiated neonates were cerebral oedema in 43% (24), intracerebral hemorrhage in 5% (3) cases. This result also correlate well with other study [22,23].

Conclusion

This study found that cranial USG is a reliable technique for demonstrating the most frequently occurring forms of cerebral injury in perinatal asphyxia, assessing the evolution of the lesion, and following brain development. Our study reveals that PVL, germinal matrix hemorrhage and IVH are common sonogrphic findings in preterm neonates and that of term neonates is cerebral oedema. As cranial sonography is a noninvasive diagnostic technique, simultaneously efficient, effective and safe modality, it can be used as a valuable diagnostic tool and predictor of outcome of hypoxic ischemic brain injury.

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