Original Article

Cranial Ultra-sonographic Findings in Preterm Low Birth Weight and Very Low Birth Weight Infant

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ABSTRACT:

Introduction: *Preterm infants are at high risk of developing brain injury like germinal layer hemorrhage (GLH), intraventricular hemorrhage (IVH), hemorrhagic parenchymal infarction (HPI), cystic periventricular leukomalacia and diffuse non cystic white matter (WM) injury. Cranial ultrasound has been widely used in neonates for early detection of intra-cranial abnormalities which is convenient, non-invasive and safe, without radiation exposure. Early recognition and proper measurement can reduce neonatal mortality and morbidity.* ***Objective:*** *To find out cranial ultra-sonographic features of preterm neonate for proper evaluation and management of CNS complication.* ***Methodology:*** *This prospective study was carried out from May/13 to Feb/14 in Neonatal Care Unit of Pediatrics department of SSMC & Mitford Hospital. Sixty preterm LBW and VLBW newborns were included by purposive sampling method. All newborns were clinically evaluated at 4th day and at two weeks of life; cranial ultrasonography was done by qualified sinologist. Anterior fontanel was used as acoustic window and thorough examination of brain and ventricles were done in coronal, sagittal and parasagittal plane.* ***Result:*** *Among 60 preterm newborns 35(58%) were LBW and 25(42%) were VLBW. Abnormalities in cranial initial Ultrasonography were found in 4(11.4%) cases at day four in LBW neonate and 9(36%) cases among VLBW neonate. Of them, sub ependymal hemorrhage 1(1.6%) case of LBW, intraventricular hemorrhage 3(5%) cases in VLBW, mild ventricular dilatation 7(11.6%) cases in both groups, moderate and marked dilatation occurred in 1(1.6%) cases and 1(4%) in LBW and VLBW group respectively. After 2 weeks 22(36.33%) newborns had abnormal cranial sonography. Majority 12(20%) had mild ventricular dilatation, followed by moderate and marked dilatation 2(3%) and 3(5%) cases respectively. Sub ependymal hemorrhage in 2(3.3%), Intraventricular hemorrhage was found in 3(5%) cases.* ***Conclusion:*** *This study concluded that Ultrasonography might be an important tool in early diagnosis of ICH in LBW infants which would help in optimum management to reduce mortality and subsequent morbidity.*

Key word: *Preterm Low birth weight, Intraventricular hemorrhage, Ventricular dilatation*

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INTRODUCTION:

Neonatal health status is grim in Bangladesh despite recent advances in biophysical and biochemical monitoring of the fetus in labour and delivery. It is found that major causes of neonatal deaths in Bangladesh are birth asphyxia (43%), prematurity and its complication (22%) and neonatal sepsis (5%).[1]

The developing brain is susceptible to injury from a variety of ischemic, infective, inflammatory, and neurotoxic factors. Preterm infants are at high risk of developing germinal layer hemorrhage (GLH), intra-ventricular hemorrhage (IVH), hemorrhagic parenchymal infarction (HPI), cystic periventricular leukomalacia and diffuse noncystic white matter (WM) injury. Infants with these abnormalities are at increased risk of developing motor, cognitive, and other impairment.[2,3] The overall incidence of IVH has decreased over the past decade due to improved perinatal care, antenatal corticosteroid use. However, it is an important cause of morbidity in preterm neonate. Approximately 30% of premature infants <1500 gram have IVH. The risk is inversely related to gestational age and birth weight.[4] IVH in premature infants occurs in the gelatinous sub ependymal germinal matrix. Immature blood vessels in this highly vascular region of the developing brain combined with poor tissue vascular support predispose premature infant to hemorrhage.4

Cranial ultrasound examinations have been performed on preterm infants to provide information about perinatal brain injury for the prediction of long term outcomes.[5] Ultrasound is the imaging procedure of first choice in newborn. The method is non-invasive imaging modality well suited for the study of infant during the perinatal period and during the first years of life whilst the ultrasonic window is patent. Periventricular and other forms of hemorrhage can be identified.[6] Cranial ultrasonographic examination is a safe and effective screening and diagnostic test which provide information about perinatal brain injury for the prediction of long term outcome.[7] This study was done to find out any intracranial abnormality in preterm infant for better management and prevention of mortality and long term morbidity.

METHODS AND MATERIALS:

This prospective study was carried out at the Neonatal Care Unit (NCU) of Sir Salimullah Medical College & Mitford Hospital, Dhaka from May 2013 to February 2014. Sixty preterm (<37 weeks gestation) Low birth weight (1.5-2.5 kg) and Very Low birth weight (<1.5kg) newborn were included in this study by purposive sampling. Infant with severe respiratory distress with respiratory support, multiple

congenital anomalies, and multiple organ failure was excluded from this study. Informed consent was taken from parents. After enrollment history and clinical examination was done in every case. Gestational age was assessed by date of last menstrual period (LMP) and clinical assessment using New Ballard scoring method. Cranial USG study of all the babies was done at 4 days of birth or later, after the baby become clinically stable and at the age of two weeks. USG was done by a qualified sinologist of the department of Radiology and Imaging of SSMC&MH. Anterior fontanel was used as the acoustic window and through examination of the brain and ventricles was done in coronal, sagittal and parasagittal planes. Ultrasonography of brain was done with real time sector using 3.5 MHz/5MHz which was available. The clinical and sonographic finding was recorded. Data was analyzed by SPSS version 20. Quantitative data was expressed as mean and SD. Qualitative data was expressed as frequency and percentage. Chi square test was done to find significance. P value of<0.05 was considered as significant.

RESULTS:

Of the 60 enrolled newborns, 36 were male and 24 were female (M:F-3:2). Mean gestational age was 31 ± 3.6 weeks, among them 35(58%) was low birth weight (between 1.50-2.50kgs) and 25(42%) was very low birth weight (<1.50kgs). Mean occipitofrontal circumference (OFC) was 28 ± 3.45cms.

Table I: Ultra sonographic findings among the study cases n=60

USG finding	Mean ± SD (cm)
Hemispheric width	35 ± 3.5
Lateral ventricular width	0.7± 0.11
Lateral ventricular/hemispheric width ratio	22.8

Table II: Cranial Ultra sonographic findings among the study cases on 4th day n=60

USG findings	LBW (35)	VLBW (25)	P value
Normal	**31(88.57 %)**	**16(64 %)**	
Mild ventricular enlargement	**2(5.5%)**	**5(20%)**	0.04
Moderate ventricular enlargement	**1(2.8%)**	**0(0%)**	
Marked ventricular enlargement	**0(%)0**	**1(4%)**	
Subependymal	**1(2.8%)**		

haemorrhage	
IVH	**3(12%)**

Table III: Cranial Ultra sonographic findings among the study cases on 14th day n=60

USG findings	LBW (35)	VLBW (25)	P value
Normal	25(71.8%)	13(52%)	
Mild ventricular enlargement	6(17%)	6(24%)	
Moderate ventricular enlargement	1(2.8%)	1(4%)	0.032
Marked ventricular enlargement	1(2.8%)	2(8%)	
Subependymalhaemorrhage	2(5.6%)		
IVH		3(12%)	

DISCUSSION:

The development of high resolution, real time sector scanner together with increasing expertise in its use and interpretation of finding, has established the role of sonography in analysis of the neonatal brain. It can provide better information regarding the brain parenchyma and ventricular system. Use of real time ultrasound provides a safe, rapid convenient method to measure the size of lateral ventricles.[8]

The mean hemispheric width in both groups were 35±3.5cm, lateral ventricular width 0.7± 0.11cm and Lateral ventricular/hemispheric width ratio was 22.8. These findings are consistent with the findings of Chowdhury et. al.8 In the present study 3 (5%) babies developed sub-ependymal hemorrhage. But one study report found that 25% of preterm less than 1500gm suffer from GMH-IVH.[9] Among 60 newborn of preterm LBW and VLBW, abnormal sonography were found in thirteen cases. After 2 weeks it was found that in preterm LBW, VLBW sonography abnormality developed more. It can be described that cranial ultrasonography perform near two weeks of age provide most reliable and complete diagnosis of hemorrhagic lesion.[10]

The frequency of IVH depends on gestational age. It increases progressively with decreasing age of presentation. One study found IVH (80%) in age less than 35 weeks of gestation.[11]Another study showed

the incidence of IVH among LBW babies was 37% and in VLBW babies was 41%.[12] There exists a significant relationship between birth weight and occurrence of IVH. In a study on newborn by Kadri H (including 282 preterm), showed that incidence of IVH increases with decreased birth weight.[12]

Cranial ultrasound alone is diagnostic tool of choice for detection of IVH. In one study[11] 14 cases of IVH were detected by cranial ultrasound and only one case required CT scan for confirmation. Similarly, Debillion et al. found in their study that cranial ultrasound is quiet effective in detecting CNS lesions in preterm neonates.[i] Their study design was prospective cohort and included 79 preterm neonates.

CONCLUSION:

This study concluded that Ultrasonography might be an important tool in early diagnosis of ICH in LBW infants which would help in optimum management of ICH and prevention of long term morbidity. USG at two weeks might be a better option for diagnosis ventricular parenchymal change.

Present study highlights and establishes the role of real time sonography in the evaluation of neonatal brain. It is felt that neurosonography should be routinely performed in all preterm LBW to find out any intracranial hemorrhage to which these groups are more susceptible and to detect any other intracranial pathology. For more clear diagnosis, USG at two weeks of birth is more useful.

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