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ROLE OF NEUROSONOGRAM IN GERMINAL MATRIX HEMORRHAGE

Radio-Diagnosis

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ABSTRACT

Germinal matrix-intraventricular hemorrhage is one of the most common devastating intracranial complication in preterm infants, especially those born before 32 weeks of gestation and very-low-birth-weight infants (1). The gold standard for diagnosing GMH-IVH has been high-resolution real-time cranial ultrasonography (CUS), which has a 96% sensitivity and 94% specificity for identifying intracranial hemorrhage (1).

KEYWORDS

Neurosonogram, Germinal matrix hemorrhage, Ultrasound, Brain.

INTRODUCTION

Neurosonogram (NSG) is an essential and emerging part of routine neonatal care, particularly in case of preterm neonates. NSG is an easily available non-invasive investigation modality for neonatal cranium showing normal brain development and any congenital or acquired abnormalities of perinatal brain, as well as brain injuries in preterm neonates(2). In days following delivery, preterm neonates are susceptible to brain injuries, commonly intraventricular haemorrhage (IVH), periventricular haemorrhage (PVH) and white mater injury (WMI). The reason for which is not truly understood but attributed to fragile cerebral vasculature(3).

Germinal matrix hemorrhage can be classified based on NSG findings as follows (4):
Grade 1 – Germinal matrix alone
Grade 2 – IVH without ventricular dilation
Grade 3- IVH with ventricular dilation (>50% clot in ventricle)
Grade 4- Intraparenchymal Lesion – Extension periventricular/ intraparenchymal hemorrhage.

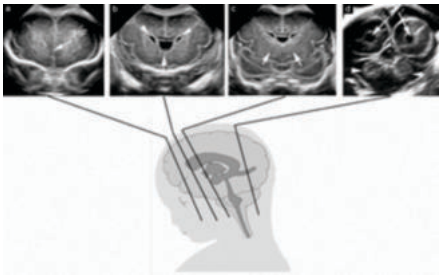

Figure 1. Coronal views of fetal head.

(a) Transfrontal plane- Interhemispheric fissure (IHF) is visible between the two frontal lobes. Sphenoid bone forming roof of orbits as well as orbits themselves are also visible.
(b) Transcaudate plane - The two frontal horns (arrowheads) are displayed, on either side of cavum septi pellucidi. Cross-section of anterior part of body of corpus callosum is also evident as mildly hypoechoic band on top of cavum septi pellucidi and between frontal horns.
(c) Transthalamic plane -Thalami and insulae are indicated.
(d) Transcerebellar plane - Occipital horns of lateral ventricles and cerebellum are indicated.

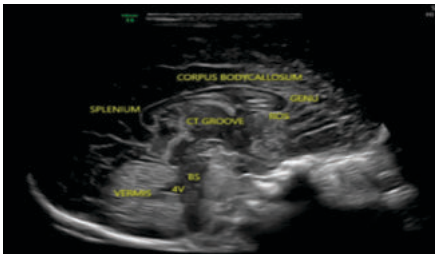

Figure 2. Sagittal section

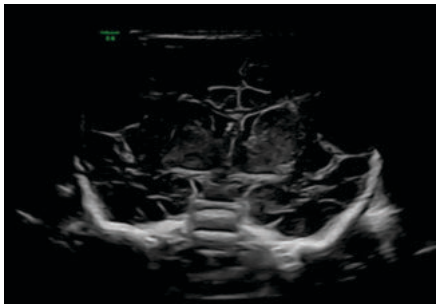

Figure 3. Transcaudate plane.

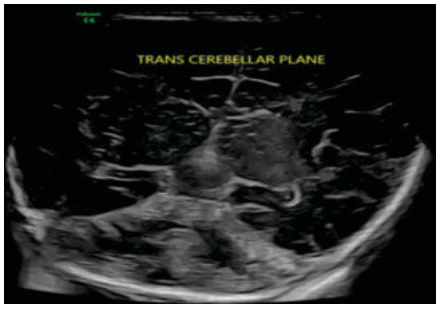

Figure 4. Trans cerebellar plane

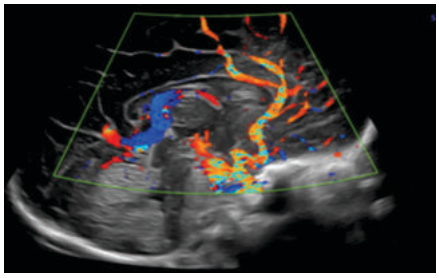

Figure 5. Colour Doppler demonstrating Pericallosal vessels.

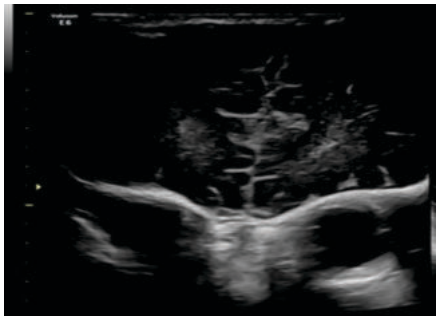

Figure 6. Trans frontal plane.

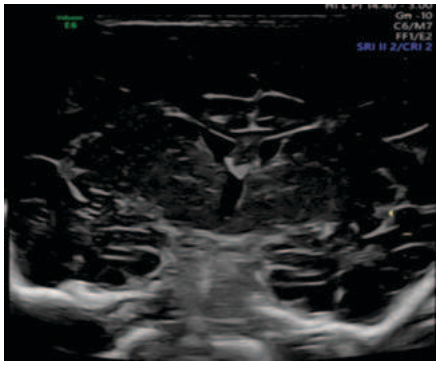

Figure 7. Trans caudate plane.

METHODS:
Study type: Observational study

Study design: Cross sectional descriptive study.

Study setting: Justice K.S. Hegde Charitable Hospital attached to K S Hegde Medical Academy, a unit of NITTE (deemed to be University), Mangaluru – 575018.

Study duration: Study will be conducted from 01/10/2022 to 30/10/2023.

Study population: Neonates who are admitted in the NICU of Justice K.S. Hedge Charitable Hospital, Mangaluru.

Sample size: 30.

Inclusion criteria:
Neonates admitted in NICU who are referred to the radiology department for routine NSG study and are diagnosed with germinal matrix hemorrhage.

Neurosonogram will be performed using SonoSite Fujifilm M-Turbo with 5-1 MHz phased array probe in the NICU.

OBSERVATIONS AND RESULTS:

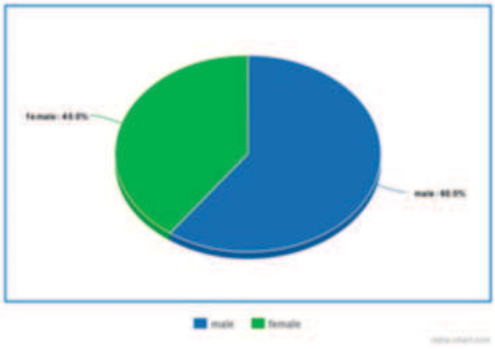

Figure 8. Among the study subjects, 18 were males and 12 were females.

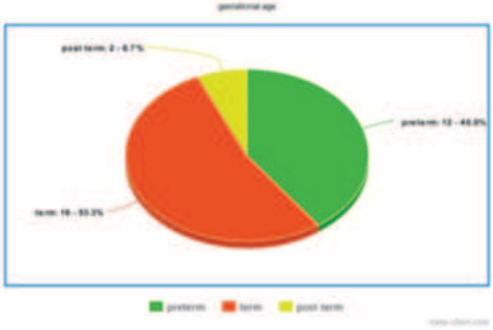

Figure 9. Out of 30 cases with germinal matrix hemorrhage, 12 cases (40%) were preterm, 16 (53%) were term and 2 (6%) were post term.

Figure 10. Out of 30 cases, we classified the neonates based on the birth weight. 1 case was <1000gms, 10 cases were 1000-2000gms, 18 cases were 2000-3000gms and 1 case was >3000gms.

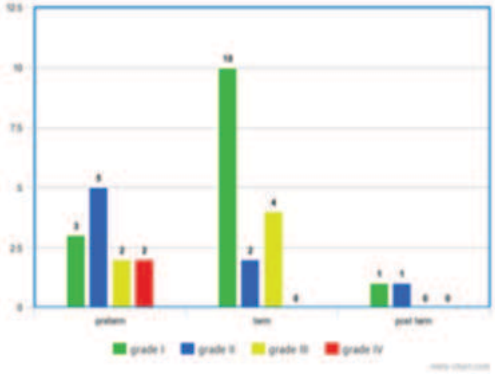

Figure 9.
Out of 12 **preterm neonates,** 3 had grade I hemorrhage, 5 had grade II hemorrhage, 2 had grade III hemorrhage and 2 had grade IV hemorrhage.

Out of 16 **term neonates,** 10 had grade I hemorrhage, 2 had grade II hemorrhage, 4 had grade III hemorrhage.

Out of 2 **post term neonates,** first neonate had grade I hemorrhage, and the second neonate had grade II hemorrhage.

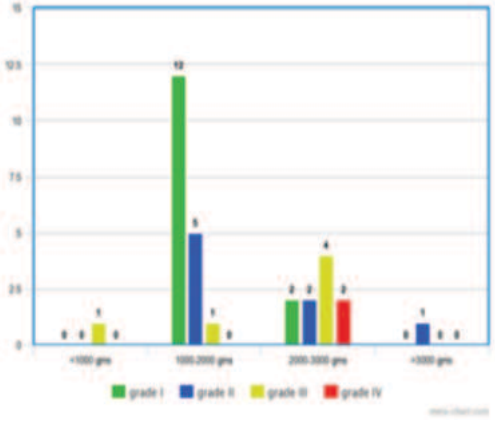

Figure 11.
The neonates with birthweight below **1000gms** had grade III germinal matrix hemorrhage.

Among neonates with birth weight **1000 – 2000gms,** 12 cases had grade I hemorrhage, 5 cases had grade II hemorrhage and 1 case had grade III hemorrhage.

Among neonates with birth weight **2000 -3000gms,** 2 cases had grade I hemorrhage, 2 cases had grade II hemorrhage, 4 case had grade III hemorrhage and 2 cases of grade IV hemorrhage.

The neonate with birthweight **>3000gms** showed grade II hemorrhage.

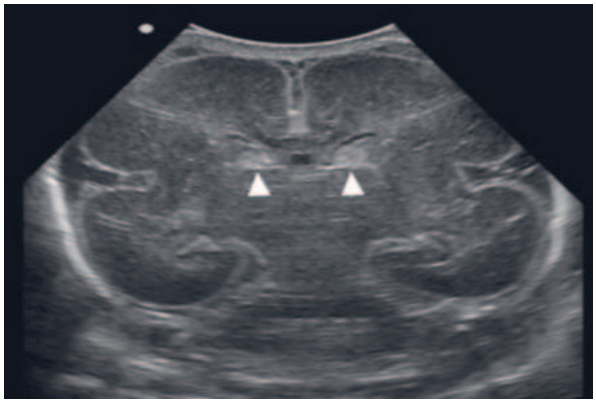

Figure 12. Hyperechoic stripe in the bilateral caudothalamic groove- Suggestive of grade I germinal matrix hemorrhage. (5)

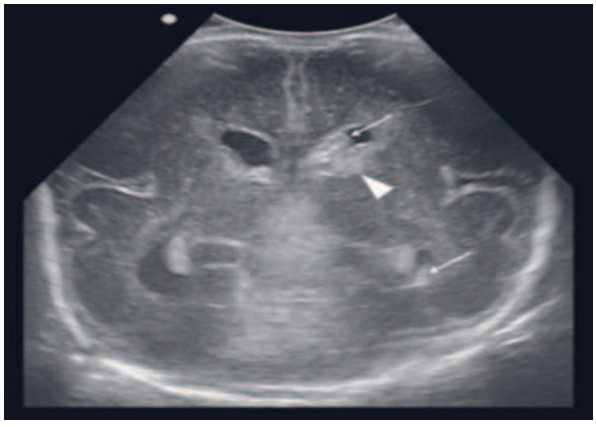

Figure 13. Hyperechoic changes in the left caudothalamic groove with ipsilateral bulky choroid plexus- Suggestive of Grade II germinal matrix hemorrhage. (5)

Figure 14. Hyperechoic changes in right caudothalamic groove with extension into the 3rd ventricles with mild dilatation of bilateral lateral ventricles - Suggestive of Grade III germinal matrix hemorrhage. (6)

Figure 15. Large echogenic mass (arrow) extending well beyond the expected superior extent of the right frontal horn - Suggestive of Grade IV hemorrhage. (6).

DISCUSSION:

30 cases of germinal matrix hemorrhage were enrolled in the study. Out of these 12 (40%) cases were preterm neonates, 16 (53%) were term and 2 (6%) were post term neonates. Of the 30 participants, 18 (60%) were males, and 12 (40%) were females. Birthweight were recorded for all patients.

Among 30 patients, 14 had grade I germinal matrix hemorrhage, 8 had grade II hemorrhage, 6 had grade III hemorrhage and 2 showed grade IV hemorrhage.

Further on comparing the grade of hemorrhage with birth weight; <1000gms neonate showed grade III hemorrhage, 1000-2000gms showed 18 cases of hemorrhage, among 2000-3000 gms weight category showed 10 cases of hemorrhage and lastly in >3000 gms 1 case of grade II hemorrhage noted.

CONCLUSION:

Nowadays use of Neurosonogram screening for preterm neonates plays crucial role in assessing their neurodevelopmental outcome.

Neurosonogram in identifying brain damage and its evolution is highly efficacious on regular follow up which provides information that guides clinical decisions and prognosis.

Thus, Neurosonogram plays potential role in preventive, protective, and rehabilitative strategies in the management of critically ill neonates. This study concludes Neurosonogram as choice of investigation modality in NICU which effectively documents neuroabnormalities.

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