Role of Trans-Cranial Ultrasonography in the Evaluation of Brain Insults in Preterm and High-Risk Term Neonates

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Abstract:

Background: Brain insults remain a major cause of morbidity and mortality in preterm and high-risk term neonates. Early detection is crucial for timely intervention. Transcranial ultrasonography (TCUS) is a safe, bedside, and cost-effective imaging modality for evaluating neonatal brain injuries.

Aim: To assess the role of transcranial ultrasonography in detecting brain insults in preterm and high-risk term neonates and to correlate findings with clinical outcomes.

Materials and Methods: This prospective observational study was conducted in the Department of Radiodiagnosis at Shyam Shah Medical College and associated Sanjay Gandhi Memorial Hospital and Gandhi Memorial Hospital, Rewa, over 18 months. A total of 150 neonates were included and categorized into three groups based on gestational age: ≤32 weeks (Group 1), 32–37 weeks (Group 2), and ≥37 weeks high-risk term neonates (Group 3). All subjects underwent TCUS, and findings were correlated with birth weight, APGAR score, mode of delivery, and clinical outcomes.

Results: Male predominance was observed (64%). Overall, 58% of neonates had abnormal TCUS findings, with the highest incidence in very preterm infants (94%). Periventricular leukomalacia (22%) was the most common abnormality, followed by intraventricular hemorrhage (16.6%) and germinal matrix hemorrhage (9.3%). Hypoxic-ischemic encephalopathy (8%) was predominantly seen in term neonates. Brain abnormalities showed significant association with gestational age ($p<0.0001$), birth weight ($p=0.0023$), APGAR score ($p=0.0015$), and mode of delivery ($p=0.0068$). Adverse outcomes were observed in 26.7% of cases, with highest rates in very preterm neonates (41.2%). PVL severity strongly correlated with poor prognosis ($p<0.0001$).

Conclusion: Transcranial ultrasonography is an invaluable tool for early detection and characterization of neonatal brain insults. Prematurity and low birth weight are major risk factors, while the type and severity of insult significantly influence outcomes. Routine TCUS screening in high-risk neonates is recommended for early diagnosis, prognostication, and management.