

Department of Paediatrics

Course on “Point of Care Cranial Ultrasound (POCUS) in neonates

➤ **Introduction:**

Neonatal Care in India is advancing at an impressive phase at the level of the community as well as in tertiary care units. The concept of ‘survival’ of the newborn has predictably given way to the importance of ‘intact survival’ of the high-risk infant, prompting initiation of strategies to identify neurological sub normality at the earliest. Advances in imaging techniques have contributed significantly to early detection of abnormalities of the brain. Ultrasonography, which is now ubiquitously available, is an ideal tool for the primary screening of the neonatal brain. Despite the wide availability of ultrasound machines in the hospitals, the penetration of cranial ultrasonography (CUS) in Indian NICU’s is still very little

➤ **Objectives of the Course:**

By the end of this course learner should understand

1. Principle of Clinical Ultrasound Technique
2. Different ultrasound modalities used in Neonatal Neuro sonography
3. CUS screening protocols in NICU
4. Identification and grading of IVH
5. Detection of PHVD by quantitative measurements
6. Role of POCUS in Asphyxia
7. Role of Doppler in CUS

Target Group: Postgraduates of pediatrics and radiology and pediatricians (including practicing pediatricians)

➤ **Scope:**

1. This training enables pediatrician/neonatologist to diagnose and demonstrate/ exclude cerebral pathology in the neonate at risk and optimize treatment and support.
2. It helps treating pediatrician/neonatologist to determine timing of injury, and assess neurological prognosis, keeping in view long term neuro developmental disability.
3. This training assists pediatrician/neonatologist in making decisions on continuation of neonatal intensive care.

Syllabus

Sl. No	Topic	Hrs
1	Physics and Principle of Ultrasound(theory)	01
2	Knobology (Practical demonstration)	01
3	Cerebral anatomy and two-dimensional imaging of the brain (theory and Practical demonstration)	03
4	Basics and Detection of IVH (theory and Practical demonstration)	02
5	Indications and Screening protocol for Cranial Ultrasound in NICU (theory)	01
6	Post hemorrhagic ventricular dilatation (theory and Practical demonstration)	02
7	Perinatal Asphyxia (theory and Practical demonstration)	03
8	Periventricular Leukomalacia (theory and Practical demonstration)	02
9	Doppler studies in Cranial Ultrasound (theory and Practical demonstration)	03
10	Assessment by written test & Feedback	02
	Total hours	20

➤ **Details of the course;**



Sl. No.	Name of Component	Total Hrs
1	2D Ultrasound finding in <ul style="list-style-type: none"> • Normal neonatal brain • Pathologies like Intraventricular Hemorrhage(IVH), Hypoxic Ischemic Encephalopathy(HIE) Post Hemorrhagic Ventricular Dilatation(PHVD), Periventricular Leukomalacia(PVL), 	15
2	Doppler Studies in cranial ultrasound	03
3	Assessment & Feedback	02
	Total hours	20

- **Course Duration:** Six weeks
- **Course Timing:** 5-6 pm on every Thursday, Friday and Saturday
- **Course Content:** 20 Hours
- **Teaching & Learning Methods:**
 - Interactive Lectures, Small group discussion, assignment,
 - Hands on training
- **Assessment Method:**
 - Formative – written test (20 marks),
 - Practical- 30 marks
- **Name of Co-ordinator – DR. S.V.PATIL**
- **Name of Specific Co-ordinator- DR. M. M. PATIL**
- **Tentative Dates - NOV 15 2019 TO DEC 30 2019**

- **Resource Persons**
 1. Dr. SS Kalyanshettar Professor Pediatrics
 2. Dr. M M Patil Professor Pediatrics
 3. Dr Siddu Charki Neonatal Intensivist
 4. Dr. Naveen Shilavantar Radiologist

- **Feedback -** Feedback about lecture, course content & teaching method will be collected & analyzed.

References

1. ‘Neonatal Neuro sonography Module’, 1st National Basic Neonatal Neuro sonography Workshop for the Neonatologist, organized by National Neonatology Forum, India, December 2012. © Dr Pradeep Suryawanshi, et al
2. Cranial Ultrasonography in the Newborn. In ‘Evidence based Clinical Practice Guidelines’, October 2010, National Neonatology Forum, India
3. Manual of standard operation WHO ACTION I & II trial.
4. NNF Clinical Practice Guidelines 2011

Sample CUS Reporting Form

Name of the baby ID Number Date
 Date of birth Birth weight Gestational age...

Diagnosis and Indication of scanning (screening/follow-up/neurological problem)

Postnatal age..... Post conceptional age

Place of scan (nursery/radiology dept).....Performed by

Machine: Transducer used.....

USG findings:

		1 st Scan	Serial scans with dates		
		Postnatal/ Gest. age	Postnatal/ Gest. age	Postnatal/ Gest. age	Postnatal / Gest. age
1	Anatomical structures distinguishable? Normal?				
2	Cortical folding (maturation of the brain) appropriate for gestational age.	Y/N			
3	Cortical grey matter echogenicity (IPE)?	Y/N			
4	Sub cortical white matter appears normal.	Y/N			
5	Thalami and basal ganglia echogenicity normal?	Y/N			
6	a. Ventricular system? a. Size (width) dilated /slit like(ventricular index) b. asymmetry c. lining d. Intraventricular hemorrhage (give grade and laterality) e. Mention if having PHVD	Y/N			

7	PVL ; If yes, grade and laterality	Y/N			
8	Evidence of calcifications? If yes, whether a)Periventricular or b) intracerebral	Y/N			
9	Corpus callosum present?	Y/N			
10	A midline shift present?	Y/N			
11	Any suggestion of cortical atrophy?	Y/N			
12	Do posterior fossa structures appear normal?	Y/N			
13	Subarachnoid space normal or increased?	Y/N			
14	Any extracerebral collection; If Y, area of collection.	Y/N			
15	Any gross structural malformation.	Y/N			
16	Any other finding.	Y/N			
	Date of Procedure				
	Signature & Name & Designation of Sonographer				
	Special Comments				

Standard Operating Procedure for Transcranial Ultrasound in Neonates

Requirements:

- GE HD5 scanner with a sector probe
- Warmed Ultrasound gel

Position of neonate:

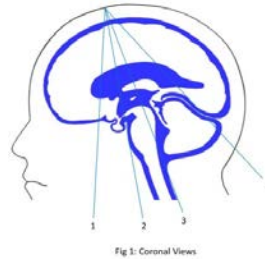
- Supine or lateral position

Technique:

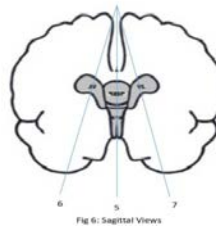
- During patient registration in the scanner, use the Participant Number in the place of patient name and enter the postnatal age of the neonate.
- The probe should be cleaned with the vendor recommended antiseptic agent
- Apply sufficient USG gel
- Probe placed over the anterior fontanel
- Optimise the depth and B-mode brightness
- Adjust the focus point to the area of interest (level of lateral ventricles)

- The entire cranial structures should be scanned in coronal and sagittal plane by doing a sweep in anteroposterior and right-left direction respectively
- Care should be taken to maintain the plane of scanning to get a symmetrical view of brain
- Any asymmetry or abnormality should be evaluated and documented in both views
- The following views are to be obtained and documented with proper labelling as mentioned below

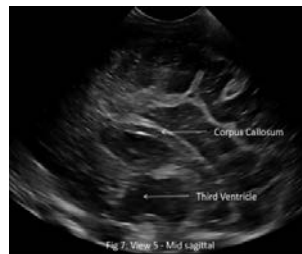
- Coronal Views (Fig 1)



- Sagittal views



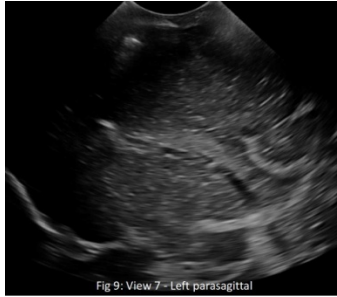
1. Mid sagittal plane showing the corpus callosum and septum (labelled as 5) (Fig 7)



2. Right parasagittal plane to show the entire anteroposterior extent of lateral ventricle upto the occipital horn, caudothalamic groove and choroid plexus (labelled as 6) (Fig 8)



3. Left parasagittal plane to show the entire anteroposterior extent of lateral ventricle upto the occipital horn, caudothalamic groove and choroid plexus (labelled as 7) (Fig 9)



- All the above stored images (showing the abnormality and routine coronal and sagittal views) should be archived (CD/Flash drive)

Interpretation:

The presence of IVH and its grading should be evaluated as mentioned below:

- Any echogenicity at the level of caudothalamic groove (extending anterior to Foramen of Munro) is suggestive of IVH
- IVH should be graded according to the grading proposed by Papile as given below
 - Grade 1 – Subependymal haemorrhage without ventricular extension
 - Grade 2 – Intraventricular Haemorrhage without ventricular dilatation
 - Grade 3 - Intraventricular Haemorrhage with ventricular dilatation
 - Grade 4 – Intraventricular haemorrhage with associated parenchymal involvement

Reporting Format:

Participant Number:

Age:

Date of scan:

- IVH present / Not present

If present

- Grade of IVH – 1 / 2 / 3 / 4
- Any associated findings -
- Follow-up / Recommendations –