

Original article:

Evaluation of MRI patterns in hypoxic ischemic encephalopathy

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Abstract:

Background and objectives: Diagnosing hypoxic ischemic encephalopathy remains a clinical challenge even with radiological advances and also the advances in neonatal care. The aim of study was to know the patterns of MRI and its value of importance in diagnosing clinically suspected cases of hypoxic-ischemic encephalopathy (HIE) in term and preterm neonates.

Materials and methods: A study of 30 neonates of diagnosed/suspected with HIE referred to Department of Radiodiagnosis, JJM medical college Davangere. Equipment used was PHILIPS ACHIEVA 1.5T MACHINE.

Results: 30 neonates with suspicion of HIE were evaluated in our study with 21 of them were term and 9 were preterm with term involvement being more common. Most of the babies were normal birth weight and there was no gender predilection was noted. Periventricular leukomalacia is most common MRI pattern in preterm and central pattern in term neonates. In central pattern majority involved corpus callosum.

Conclusion: MRI having the ability of multi-planar imaging, better appreciation of myelination and well grey-white matter resolution makes it the imaging of choice in suspected/known patients of hypoxic ischemic encephalopathy.

Key words: Hypoxic ischemic encephalopathy, corpus callosum, periventricular leukomalacia, and central pattern.

Introduction:

MRI is the chosen imaging modality with very good sensitivity and specificity in infants with suspected hypoxic-ischemic Encephalopathy (1,2). T1 and T2 sequences are best to comment on myelination and other developmental abnormalities of the brain.

When performed after day 4 of life, area of hyperintensity noted describing the injury pattern of HIE. Diffusion-weighted imaging (DWI) findings are pseudo-normalized at the age of 7-10 days, and conventional images are done then as it stands more useful. After a severe asphyxial event, a central pattern of injury (1) is seen with its injury to the deep gray matter (i.e. ventrolateral thalamus, hippocampi, dorsal brainstem or lateral geniculate nucleus)(2) and the periorlandic cortex. These areas contain the highest concentration of the NMDA receptors (N-methyl-D-aspartate) and are actively myelinating.

Methodology and materials:

A Hospital based descriptive study of 30 cases of diagnosed/suspected HIE patients referred from Department of pediatrics, JJM medical college, Davangere during the period from December 2020 to May 2021.

Inclusion criteria:

Patients included were:

- Pre term or term neonates clinically diagnosed with HIE
- Hemodynamically stable neonates

Exclusion criteria:

Patients excluded were:

- Patients with obvious contraindications to MRI examination like metallic implants/foreign bodies.
- Neonates with known congenital abnormalities

Equipment:

MRI was performed on “ PHILIPS ACHIEVA 1.5T” MACHINE. Standard head coil & NV coil was used for imaging.

Observations and results:

HIE was common in term patients in our study showing among 30 patients ,21 were term(70%) and9(30%)were preterm.

Table1: gestational age distribution

GESTATIONALAGE	NO	PERCENTAGE
TERM	21	70
PRETERM	09	30
TOTAL	30	100

Out of a total of 30 patients, 15(50%) were male and 15(50%) were female showing no gender predilection for HIE.

Table 2:gender distribution in neonates

Sex	Frequency	Percentage
M	15	50
F	15	50
Total	30	100

Among 30 patients,63.3% of the patients were normal weight.Only 36.6% patients were low birth weight.

Table3: distribution according to birth weight

BIRTHWEIGHT	NO	PERCENTAGE
NORMAL	19	63.33
LBW	11	36.67
TOTAL	30	100

Among 9 preterm HIE neonates, most common were periventricular leucomalacia changes constituting 55.6% of cases. Rest of the patients with 22.2% cases showing germinal matrix hemorrhage and 11.1% each case of cerebellar hemorrhage and signal abnormality in deep grey matter.

Table4: showing distribution of pattern of HIE in preterm

MRIPATTERN	NO	PERCENTAGE
PVL	5	55.56
GMH	2	22.22
DGM	1	11.11
OTHERS	1	11.11
TOTAL	9	100

Most of the cases almost constituting of 42.8% cases showed central pattern in term neonates. These included thalami, basal ganglia, internal capsules and the corpus callosum. Majority of it involved corpus callosum. The second most common pattern was mixed category (33.3%). Watershed pattern of changes was seen in 19.05% cases. One patient had cerebellar hemorrhage (4.7%).

TABLE5: showing distribution of patterns of HIE in term

MRIPATTERN	NO	PERCENTAGE
CENTRAL	9	42.86
WATERSHED	4	19.05
MIXED	7	33.33
OTHERS	1	4.76
TOTAL	21	100

Table 6: shows distribution of other imaging features in HIE patients

Out of 30 patients, additional SAH was present in 1 patient, cerebellar hemorrhage and hypo-myelination in two patients each and IPH in one patient.

OTHER SIGNIFICANT MRI FINDINGS	NUMBER
SAH	1
CEREBELLAR HEMORRHAGE	2
HYPOMYELINATION	2
IPH	1
TOTAL	6

DISCUSSION

Total population of study group was divided into preterm as well as term neonates who were suspected of HIE underwent MRI to obtain various patterns in them. Our studies showed HIE being found more in term patients. Usually in preterm brain obvious signs might be absent and due to developmental immaturity makes it difficult to diagnose(3). Out of a total of 30 patients 15 each patients of male and female gender showed HIE with no gender predilection in our study. In total population only 36.6% of patients were low birth weight with

majorrrity of it were having normal weight. Ramachandran et al study total of 33 neonates had normal birth weight, 13 had low birth weight.[4]

Periventricular leukomalacia pattern was the most common in preterm neonates about 55.5%. Asphyxia damages white matter in periventricular distribution with gray matter being usally spared.[5] The other pattern found in preterm babies germinal matrix haemorrhage, and deep gray matter injury, Coming to term patients central pattern was distributed most commonly consituiing of 4222.8% of cases with secod most common being 33.3% cases showing mixed pattern.Our study matched with Priyanka et al where again central pattern was the most common one with second being mixed pattern.[6].In central pattern of istribution majority of itinvolved corpus callosum of varying regions like body, splenium, and genu.The reasosn to this is because of huge amont of glutamate receptors noted in corpus callosum and basal hence undergo Glutamate neurotoxicity which is the cause of injury leading tocytotoxic edema. Th stuies have shown Corpus callosum involvement has always shown severe clinical presentations.[7]

CONCLUSION

The study was done to obtain the findings of magnetic resonance imaging of brain hypoxic- ischemic encephalopathy in both term and preterm neonates and to categorize the patterns of HIE in these patients.

MRI has a high sensitivity and specificity in the evaluation of the above condition. It isnon-invasive and has no radiation hazards. It provides well depiction of gray-white matter differentiation and pattern of myelination which could note be obtained from Computed Tomography.

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