ORIGINAL RESEARCH PAPER
Volume - 10 | Issue - 10 | October - 2021 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

A STUDY ON MAGNETIC RESONANCE IMAGING PROFILE OF CEREBROVASCULAR ISCHAEMIC STROKE IN PAEDIATRIC AGE GROUP

Radiodiagnosis

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ABSTRACT

Cerebrovascular stroke in paediatric population requires specific considerations and constraints for the role and application of diagnostic imaging. It is unique in the vast variety of clinical presentation and suspicions. This article intends to review the concepts of MR imaging in brief manner to commence a paediatric cerebrovascular ischaemic stroke imaging framework eventually to help the imaging in the same.

AIM: To study magnetic resonance imaging profile of cerebrovascular ischaemic stroke in paediatric population.

MATERIALS & METHODS: Consenting patients with clinical suspicion of cerebrovascular ischaemic stroke presenting to department of radiology at MGM Medical College, Aurangabad from July 2019 to April 2021 are included in the study and proper history, clinical details, chief complaints of the patient were taken to classify the staging, age distribution, gender distribution, imaging etiological factors. Patients were scanned using 1.5 Tesla Philips Multiva MRI machine The data were tabulated and observed and conclusions were made.

RESULTS: A total of 20 patients were included, out of which 15 patients presented in acute stage of stroke, 1 presented in hyperacute stage, 2 presented in subacute stage while 1 presented in chronic state. Arterial etiology of stroke was confirmed in 16 patients, while 2 patients each had venous and embolic etiology. Hemorrhagic transformation in infarction was noted in 2 out of 20 patients. Most common presenting clinical symptom was convulsion in 7 patients followed by drowsiness in 5 patients.

KEYWORDS

infarct, cerebrovascular ischaemic stroke, paediatric, MRI

INTRODUCTION

Stroke is public health risk worldwide.

The incidence of ischaemic cerebrovascular diseases that are reported in paediatric age group varies from 2.5-2.7 per 1,00,000 population.

The common mechanisms leading to it are venous & arterial thrombosis, embolic cause etc.

The likely cause can be evaluated in upto 66% patients, the prerequisite of which is a magnetic resonance imaging scan which is main diagnostic tool for it.

The embolic variant usually presents with sudden deterioration of neurological functions.

The arterial variant usually takes longer time to develop with respect to embolic one. Risk factors of this group are familial lipid disorders, homocystinemia, vasculopathies etc.

The venous variant presents with headache, convulsions, altered mental status, focal neurologic deficit.

Differential diagnoses for ischaemic stroke includes convulsion which is followed by focal neurological deficit, intracranial space occupying lesion with compressive manifestations, intraparenchymal hemorrhage due to various causes.

CLASSIFICATION:

INFARCTS CAN BE CLASSIFIED INTO:

On the basis of time at which it is imaged

1) Hyperacute
2) Acute
3) Subacute
4) Chronic

AND ON THE BASIS OF HEMORRHAGIC TRANSFORMATION

1) Without hemorrhagic transformation.
2) With hemorrhagic transformation.

THE SEQUENCES TAKEN IN STROKE PROTOCOL OF MAGNETIC RESONANCE IMAGING INCLUDE

1) Diffuse weighted (DWI) with ADC mapping
2) FLAIR images
3) Gradient images
4) T1 and T2 weighted images (If required)

This is followed by brief evaluation of all the sequences to determine whether likely cause of stroke is embolic, arterial or venous.

If arterial etiology is suspected, it can be followed up with MR angiography of brain vessels.

If venous etiology is suspected, it can be followed up with MR venography of brain vessels.

Hyperacute infarct shows restricted diffusion on diffusion weighted images with corresponding low value on ADC mapping & no altered signal on FLAIR images.

Acute infarct shows restricted diffusion on diffusion weighted images with corresponding low value on ADC mapping & raised intensity on FLAIR images.

Subacute infarct showsrestricted diffusion on diffusion weighted images with characteristic corresponding pseudonormalization on ADC mapping & raised intensity on FLAIR images.

Chronic infarctshowsvariable signal on diffusion weighted images with corresponding high value on ADC mapping & low signal intensity on FLAIR images.

The gradient imaging is used for determination of hemorrhagic transformation, which shows blooming in the setting of hemorrhagic transformation.

MATERIALS AND METHODS:

It is a time bound retrospective observational study.

The study was done over a period of 20 months from July 2019 to April 2021 and total 20 patients were included in the study.

Patients included in the study were patients who were referred to the department of radiology, MGM medical college and hospital Aurangabad for MRI scan and were diagnosed to have brain infarction on imaging study.

Proper history, clinical details,chief complaints of the patient were taken. The data were tabulated and observed and conclusions were made.

INCLUSION CRITERIA:

1) Age from 1 day to 18 years
2) Clinical suspicion for cerebrovascular ischaemic stroke
3) Those giving consent

EXCLUSION CRITERIA:

1) Age more than 18 years
2) MRI non-compatible stents, implants.
3) Not giving consent

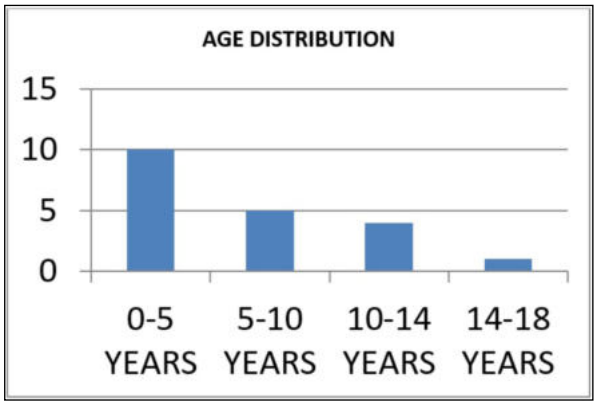
RESULTS :

1) Gender distribution

Out of total 20 patient in the study, 9 patients (45%) were male and 11 were female(55%).

2) Age distribution

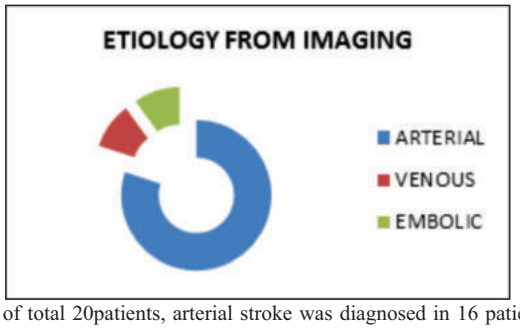
Table Number 1



most common age group involved is 0-5 years age group (10 out of total 20 patients).

3) ETIOLOGICAL IMAGING FEATURES

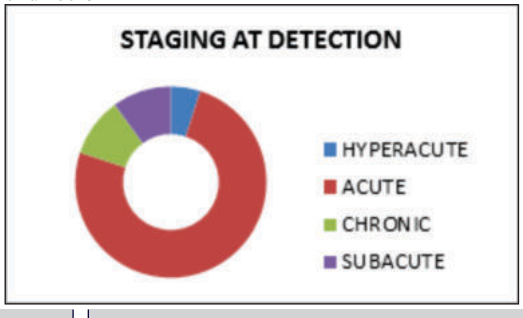
Table number 2:



Out of total 20patients, arterial stroke was diagnosed in 16 patients (80%) of the patients as compared to 2 patients with embolic and venous etiology (10% each).

4) Staging at detection:

Table number 3



Out of total 20 patients, 15 patients (75%) were classified in acute category, while the hyperacute, subacute and chronic category included 1 (5%), 2 (10%) and 2 (10%) patients respectively.

5) NUMBER OF PATIENT SHOWING HEMORRHAGIC TRANSFORMATION

Out of total 20 patients only 2 patients showed hemorrhagic transformation in infarction.

6) CLINICAL FEATURES IN PATIENTS:

Table Number 4

	No. of patient	% of patients
Convulsions	7	35%
Drowsiness	5	25%
Unresponsive	2	10%
Hemiparesis	3	15%
Headache	2	10%
Vomiting	1	5%

The most common clinical manifestation for stroke was found to be convulsion followed by drowsiness.

DISCUSSION:

From the above study we were able to know the different findings seen in stroke imaging of paediatric age group population. As the classification states, the imaging findings does not only stage the entity and rule out hemorrhagic transformation, but also briefs the radiologist about possible etiology.

Imaging findings can involve the arterial territories in its subtype, cortical and subcortical locations in venous etiological setting and non-specific regions in embolic variant.

In this study we saw that out of total 20 patients, 16 patients (80%)had imaging findings in arterialterritories and 2 each had findings in venous and non-specific territories. This is comparable to study done by Sébire G, Fullerton Hin which majority etiological territory was seen as arterial in 76% of the cases.(5).

In the study the two patients had hemorrhagic transformation in infarct, comparable to less likely incidence of hemorrhagic transformation in another study(3).

The patients suffering from stroke in paediatric age group included 11 females out of total 20 (55%) (1).

Most common presenting clinical symptoms was convulsion (35%) followed by drowsiness (25%) comparable to study bySacco. (3)

The more common age group involved amongst paediatric population was 0 to 5 years age.

Majority of the cerebrovascular strokes were detected at acute stage numbering 15 out of 20 (75%).

CONCLUSION:

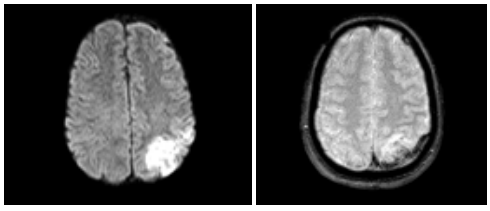
Ischemic stroke in paediatric population presents with classical imaging manifestations on diffusion weighted, ADC map, FLAIR and GRE images.

The likelihood of etiological factors from magnetic resonance imaging can help early detection and treatment.

The radiologists should be aware of the atypical clinical features such as convulsions, raised intracranial tension, headache so that diagnosis could be made and early treatment could be initiated.

CASES

Figure Number 1

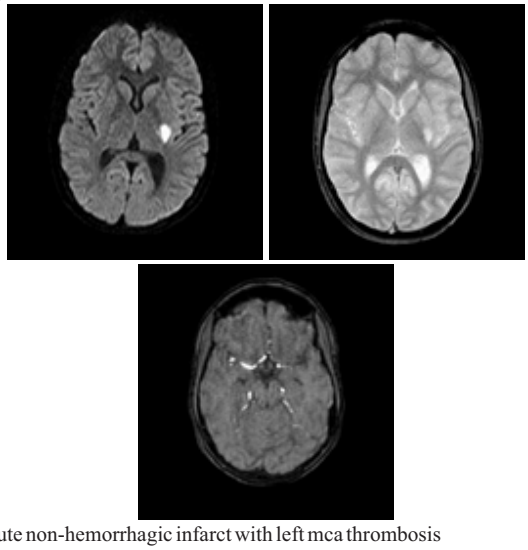


Acute venous ehmorrhagic infarct with superior sagittal venous thrombosis.

A 17 year old female was brought with the complain of intense headachewith known case of coagulopathy. MRI finding suggest restricted diffusion on DW images with corresponding low values on ADC in cortical and subcortical region of left parietal lobe with areas of blooming on GRE images, s/o acute infarct with hemorrhagic transformation.

On radiological suspicion of venous etiology of stroke, MR venography was performed which depicts loss of flow related enhancement in superior sagittal sinus, s/o thrombosis.

Figure Number 2



Acute non-hemorrhagic infarct with left mca thrombosis

A 13 years old female was brought for MRI with chief complaints of 3 episodes of convulsions since 8 hours followed by right sided upper and lower limb weakness. She was not a known case of any past illness. MRI showed areas of restricted diffusion with corresponding low ADC values in left ganglio-capsular region. Suspecting the pathology in left MCA territory, MR angiography was performed to reveal thrombosis of M2, M3 segments and opercular branches of left MCA.

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