ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 08 | August - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

"A STUDY OF MRI ANGIOGRAPHY IN EVALUATION OF ACUTE ISCHAEMIC STROKE"

Radio-Diagnosis

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ABSTRACT

Stroke is the third leading cause of death and is the major cause of neurologic disability in adults worldwide [1]. Strokes in young adults are often caused by dissection (spontaneous / traumatic) or drug abuse [2]. Acute ischemic stroke is caused by thrombotic or embolic occlusion of a cerebral artery and is more common than hemorrhagic stroke [3]. Imaging has become the basis for rapid stroke triage since clinical diagnosis is inaccurate in 15-20% of cases [4] MRA is analysed for detecting atherosclerotic lesions since intracranial atherosclerotic (ASVD) strokes are the most common type accounting for almost 30-50 % strokes in Asians [5]. MRA is rapid, noninvasive, does not require use of contrast as in time – of –flight (TOF) MRA and can image arteries as well as veins [7]..Thus, the present study was conducted to evaluate the role of MR angiography in acute ischemic stroke.

KEYWORDS

Acute ischemic stroke, MRI , Imaging , MR angiography.

INTRODUCTION

Stroke is the third leading cause of death and is the major cause of neurologic disability in adults worldwide. Patients of all ages are affected – mostly occurring in middle aged / older adults.

Magnetic resonance angiography (MRA) can be performed in combination with brain MRI in the setting of stroke to help guide therapeutic decision making. It is a useful non-invasive technique to evaluate extracranial as well as intracranial vessels to determine the site of occlusion or dissection.

Lacunar infarcts (< 15 mm in diameter) caused by small artery occlusions involve penetrating arteries in basal ganglia/thalami, internal capsule, pons and deep cerebral white matter which can be embolic, atheromatous or thrombotic[4].

AIMS AND OBJECTIVES

1. To use MRA in evaluation of cerebral microvasculature and macrovasculature in acute ischaemic stroke and transient ischemic attack (TIA) patients.
2. To detect small vessel and large vessel occlusions, thrombus & stenosis in order to guide suitable reperfusion therapies for the same.
3. To evaluate craniocervical vessels for vasculopathies.

MATERIALS AND METHODS

Study Design: Descriptive study

Study Setting:
Data for the study is collected from patients with acute stroke attended to MGM MEDICAL HOSPITAL, KAMOTHE, NAVI MUMBAI.

Institute Ethics Committee approval will be obtained before start of study.
Sample size: 250

Data Collection Method: Probability sampling

Sampling Method: Simple random sampling

Inclusion Criteria:
1. Patients presenting with clinical features of acute stroke & only those cases will be taken with MRI findings of acute ischaemic infarct (stroke).
2. Patients above 18 years of age (male/female) willing to give their consent for the above study40

Exclusion Criteria:
1. Patients less than 18 years of age.
2. Pregnant women

Details of Methodology:
A descriptive study will be conducted on 250 patients with acute ischaemic stroke (infarct). They will be evaluated with MRI angiography (Toshiba 1.5 Tesla MRI) and findings will be correlated with clinical out come and complications.

Also risk factors assessment will be done and statistical significance determined. MR sequences used for acute stroke include T1 weighted, T2 weighted, and spin - echo, FLAIR, T2 weighted gradient echo, DWI. MR Angio sequences used are 3D TOF, 2D TOF.

Parameters To Be Measured:
250 patients with acute ischaemic stroke will be subjected for MRI examination.

Expected Outcome:
Provide an early diagnosis and guide the clinician promptly in decision making regarding suitable interventions for improving outcome of acute ischaemic stroke patients.

OBSERVATIONS & RESULTS

Case : 51 yrs. old male patient

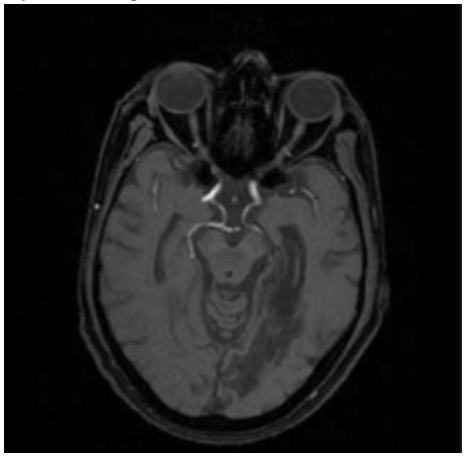

Fig.: MR Angiogram reveals complete loss of flow related signal intensity involving P1, P2 segments of left PCA.

Regarding Age Distribution : Maximum number of cases of ischemic stroke were in age group of 50-59 yrs. (124 cases , 49.6 %) followed by age group of 40-49 yrs. (79 cases , 31.6 %) , age group of 60-69 yrs. (29 cases , 11.6 %) , age group of > 70 yrs. (12 cases ,4.8 %) and minimum cases were in the age group of < 40 yrs. (6 cases , 2.4 %).

Table 1: Age Distribution Of Study Population

Age Group (in yrs.)	Frequency	Percentage
<40	6	2.4%
40-49	79	31.6%
50-59	124	49.6%
60-69	29	11.6%
>70	12	4.8%
Total	250	100.0%

Table 3: Arterial Loss/paucity Of Flow Related Signal Intensity - MCA Segments

Age Group	Female	Male	Female Percentage	Male Percentage	Z-Value	P-Value
<40		1	0.0%	0.4%	-	-
40-49	20	33	8.0%	13.2%	1.8886	0.05876
50-59	33	48	13.2%	19.2%	1.8207	0.06876
60-69	1	13	0.4%	5.2%	3.253	0.00116
70 <	3	5	1.2%	2.0%	0.7128	0.4777
Grand Total	57	100	22.8%	40.0%	4.1434	0.00001

Table 4: Arterial Loss/paucity Of Flow Related Signal Intensity - PCA Segments

Age Group	Female	Male	Female Percentage	Male Percentage	Z-Value	P-Value
<40			0.0%	0.0%	-	-
40-49	6	9	2.4%	3.6%	0.7865	0.42952
50-59	3	9	1.2%	3.6%	1.7532	0.08012
60-69		7	0.0%	2.8%	-	-
70 <		2	0.0%	0.8%	-	-
Grand Total	9	27	3.6%	10.8%	3.1142	0.00188

DISCUSSION

A descriptive study was conducted over a period of two years (March 2021 to December 2022) on 250 patients with acute ischaemic stroke (infarct) and evaluated with MRI brain angiography.

There were total of 157 cases (62.8%) of patients showing loss/paucity of flow related signal intensity involving MCA segments detected on MR Angiography out of which 22.8 % were females and 40 % were males. This was in accordance with study conducted by **A.J. Degnan[6], G. Gallagher[6] Et al**. who reviewed that MCA atherosclerosis is increasingly recognized as an important contributor to the risk of stroke worldwide [6]

In our study maximum number of cases of ischemic stroke were in age group of 50-59 yrs. (124 cases , 49.6 %) followed by age group of 40-49 yrs. (79 cases , 31.6 %) , age group of 60-69 yrs. (29 cases , 11.6 %) , age group of > 70 yrs. (12 cases ,4.8 %) and minimum cases were in the age group of < 40 yrs. (6 cases , 2.4 %) with 158 cases (63%) amongst males and 92 cases (37%) amongst females. In a study conducted by **Jennifer L. McCarty[9] ,Lester Y. Leung[9]** it was demonstrated that the vast majority of infarcts (87%) are ischemic, only 10%–14% of which occur in young adults which is in accordance with our study findings.

There were total of 137 cases showing restriction on DWI images involving basal ganglia region, total of 19 cases showing restriction on DWI images involving brainstem total of 90 cases showing restriction on DWI images involving thalami , 20 cases showing restriction on DWI images involving cerebellum, total of 45 cases showing restriction on DWI images involving periventricular white matter. Hence, in our study MRA demonstrated basal ganglia region has having the maximum predilection for acute ischaemic infarct as compared to other regions. There were total of 3 cases showing loss/paucity of flow related signal intensity involving superior sagittal sinus indicating thrombosis of superior sagittal sinus mainly in young population (age group of <40 yrs).This is in accordance with the study conducted by **Gustavo Saposnik[1101], Fernando Barinagarrementeria[10] Et al.** in which it was stated that thrombosis of the dural sinus and/or cerebral veins (CVT) is an uncommon form of stroke, usually affecting young individuals.

CONCLUSION

In this study comprising of total 250 cases of acute ischemic non haemorrhagic stroke, we conclude that MR Brain Angiography 3D TOF helps in the identification of partial or complete thrombosis by detection of loss or paucity of flow related signal intensity involving arteries of anterior circulation, posterior circulation & Circle of Willis. Timely detection within the window period thereby assisted the clinician in making informed decisions regarding suitable therapeutic interventions.

MRI Brain stroke protocol sequences helped to identify the arterial / venous territories involved by detection of restriction on DWI images, corresponding loss of signal intensity on ADC and detection of hyper intense signal intensity on FLAIR & T2W weighted images.

Aneurysms & arteriovenous malformations were accurately detected by the scanning protocol sequences as abnormal dilatation & nidus of vessels with feeding artery or a draining vein respectively.

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