



“MRI IN ASSESSMENT OF SINGLE AND MULTIPLE ARTERIAL TERRITORY ACUTE BRAIN INFARCTS”

Radiology

Dr. Tanuj Jain

Resident, Dept of Radio-diagnosis, R.D. Gardi Medical College, Ujjain

Dr. Kapil Kamdar

Resident, Dept of Radio-diagnosis, R.D. Gardi Medical College, Ujjain

ABSTRACT

Background & Method: Aim of this study was to study the role of MRI in assessment of single and multiple arterial territory acute brain infarcts. Patients referred to department of radiology from various in and out-patient departments of our hospital with signs and symptoms of acute stroke were considered for study. These patients were taken for MRI brain using standard imaging protocols. After explaining the details of the research and taking the proper consents, the relevant clinical data was collected. The findings were carefully observed under local expertise and relevant observations were made, followed by careful and detailed statistical analysis and calculations. **Result:** Males suffer from acute arterial infarcts more than females. Among modifiable risk factors hypertension is the most common. In the anterior circulation acute MCA is the most common artery involved. Bilateral acute infarcts are more common in posterior circulation and PCA is the most common artery involved. With addition of DWI the diagnosis of acute infarcts could be made more correctly and chances of errors decreases. **Conclusion:** In my study maximum patients were in age group 51-60 years followed by 61-70 years. The number of male patients was 62% and female patient was 38%. Hypertension was the most common risk factor. Anterior circulation acute infarcts were more as compared to posterior circulation and MCA were most commonly involved. The major territory of involvement in the posterior circulation was the PCA followed by PICA. Bilateral infarcts were more common in the posterior circulation. 16 patients had AMBI (acute multiple brain infarcts). Among these patients bilateral hemispheric involvement was more common. AMBI were more common in the posterior circulation. The sensitivity of DWI was 99% as compared to conventional MRI sequences, the sensitivity of which was around 90%.

KEYWORDS

MRI, acute infarct, AMBI.

INTRODUCTION

Cerebro-vascular infarcts (stroke) is one of the leading causes of death worldwide. Its incidence increases with the increase of age. Developing countries account for major of the global mortality and have a higher prevalence of stroke¹. The age standardized incidence rates from various parts of India ranges from 130-152 per 100000². Acute cerebro-vascular accident is defined as an abrupt onset of neurologic deficit attributable to focal or global disturbances of cerebral function with symptoms lasting for >24 hours³.

Duration of ischemia when more than 30 min, leads to cytotoxic edema featuring focal swelling of parenchyma, sulcal effacement, loss of grey-white matter differentiation (5-10min of complete occlusion causes an infarct). In 3-6 hrs vasogenic edema develops, extending into white matter.

Significance Of Imaging And Imaging Modalities

The most important points to be known in acute infarct are the cause, along which vessel pathology has occurred, the pattern and extent of damage. The importance of imaging in acute infarct is early and correct diagnosis, triage allocation, treatment protocol decision, final outcome, and risk reduction⁴. MRI of brain provides a confirmatory basis for clinical interference that whether the individual patient must be immediately transferred to a stroke unit for primary management or should be treated with thrombolytics.

Diffusion weighted MRI (DWI) in hyper acute and acute phase of arterial infarct can detect and define the whole extent of stroke.

AIMS AND OBJECTIVES

- Categorization of acute infarct as single vascular territory or AMBI.
- Categorization of infarct according to territory of involved blood vessels.
- To assess the risk factors leading to acute stroke.

MATERIALS AND METHODS

This was a single centre retrospective observational study. The study was carried out at R. D. Gardi Medical College, Ujjain with approval by ethical committee, in the department of radiology. MRI Scan machines used - GE 3T MRI Signa Architect.

Inclusion Criteria

Patients with onset of focal or global neurological deficit attributable to vascular cause, referred to department of radiology of our institute from in and outpatient of various departments.

Exclusion Criteria

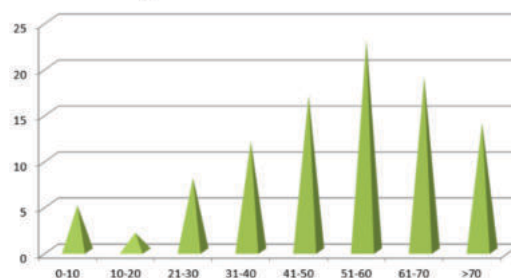
1. Patients not giving consent for the study will be excluded.
2. Patients having the following diseases/ history were excluded from the study –trauma, infection, white matter diseases, tumors, patients with general contraindication to MRI such as those with pace makers, cochlear implants and other electromagnetic implants in body.

OBSERVATIONS and RESULTS

Table 1: Age distribution of the cases

Age in years	Number of cases	% of cases
0-10	3	5
11-20	1	2
21-30	4	8
31-40	6	12
41-50	9	17
51-60	13	23
61-70	10	19
>70	8	14
Total	54	100

Age distribution of the cases



Maximum incidence is seen in the age group 51-60 years (23%), followed by 61-70 years (19%)

Table 2: Sex distribution the cases

Sex	No. of cases	Percentage
Male	33	62
Female	21	38
Total	54	100

Table 3: Risk Factors

Risk factors	% of cases
Hypertension	68

Hypercholesteremia	42
Diabetes mellitus	40
Cardiac disease	21
P/H/O CV Stroke	13
Migraine	4
Bleeding /coagulation disorders	4
Smoking/tobacco	48
Alcohol	9

Hypertension was the most common risk factor. In modifiable risk factor smoking and tobacco were the most important.

No. of cases

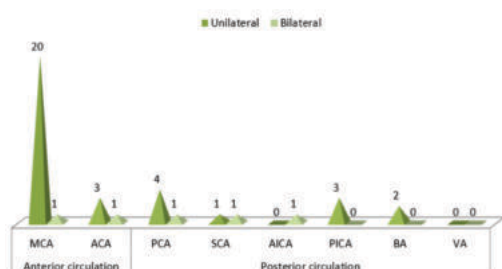


In my study there were 62% males & 38% females

Table 4: Single territory involvement

	Unilateral	Bilateral	Total	% cases
Anterior circulation				
MCA	20	1	21	55
ACA	3	1	4	11
Posterior circulation				
PCA	4	1	5	13
SCA	1	1	2	5
AICA	0	1	1	3
PICA	3	0	3	8
BA	2	0	2	5
VA	0	0	0	0
TOTAL	33	5	38	100

Chart Title

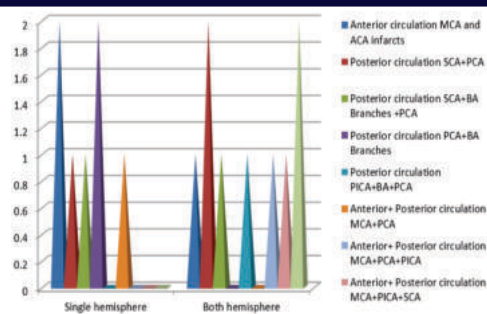


In my study 38 (33 U/L + 5 B/L) patients revealed infarcts in single territory. Most commonly territory was MCA.

Commonest territorial involvement in posterior circulation was PCA (13%) followed by PICA (8%).

Table 5: Incidence of acute multiple brain infarction (AMBI)

	Single hemisphere	Both hemisphere	Total	% of cases
Anterior circulation				
MCA and ACA infarcts	2	1	3	19
Posterior circulation				
SCA+PCA	1	2	3	19
SCA+BA Branches +PCA	1	1	2	13
PCA+BA Branches	2	0	2	13
PICA+BA+PCA	0	1	1	6
Anterior+ Posterior circulation				
MCA+PCA	1	0	1	6
MCA+PCA+PICA	0	1	1	6
MCA+PICA+SCA	0	1	1	6
Multiple lacunar	0	2	2	13
TOTAL	7	9	16	100



AMBI were more common in the posterior circulation and bilateral hemispheric involvement was more common than single hemisphere involvement.

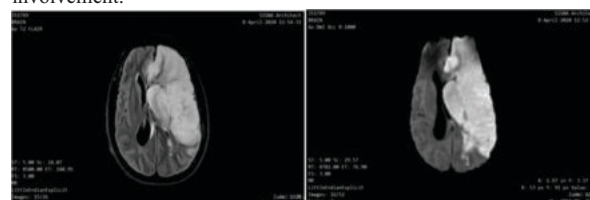


Figure 1 MRI of 40 year female with restriction seen on DWI and hyperintensity on FLAIR in left MCA territory with mid line shift s/o acute infarct.



Figure 2 DWI and FLAIR in 47 year male show multiple hyperintensities in right thalamic and parietal region s/o multiple acute infarcts involving different territories.

DISCUSSION

In my study, the most common age was 51-60 years. The numbers of male patients having acute infarct were 62% & female patients were 38%.

Hypertension was the most common risk factor. The next most common risk factor was hypercholesteremia (42%).

38 (33 uni-hemispheric and 5 bi-hemispheric) patients had single territorial involvement. Overall anterior circulation was more commonly involved than posterior circulation. 66% patients had anterior territory infarct & 34% patients had posterior territory infarct.

Single territory involvement

In patients with single territory involvement MCA was the most common territory affected (55%) followed by PCA (13%) & PICA (8%).

In my study, PCA was most commonly involved in posterior circulation followed by PICA. In my study with arterial infarcts 16 patients had AMBI.

In my study AMBI were more common in the posterior circulation (55%) as compared to anterior circulation (20%).

18% of patients had involvement of both anterior and posterior circulation.

CONCLUSION

Maximum number of patients was seen in the age group 51-60 years (25%) followed by 61-70 years. The numbers of male patient having acute infarct were 62% and female patient were 38%.

Hypertension was the most common risk factor followed by hypercholesteremia (42%) and diabetes mellitus (40%). Anterior circulation infarcts were common as compared to posterior circulation. 66% of the patients revealed infarcts in anterior circulation out of which middle cerebral artery (55%) were most commonly involved.

The major territory of involvement in the posterior circulation was posterior cerebral artery (13%) followed by posterior inferior cerebellar artery (8%). Bilateral infarcts were more common in the posterior circulation.

16 patients had AMBI (26%). Bi-hemispheric involvement was more common. AMBI were more common in the posterior circulation.

The sensitivity of DWI was 99% as compared to conventional MRI, the sensitivity of which was 90%.

SUMMARY

Males suffer from arterial infarcts more than females. Hypertension is the most common risk factor. In acute infarcts MCA is the most common artery to be involved.

Bilateral acute infarcts are more common in Posterior circulation and PCA is the most common artery involved.

With addition of DWI diagnosis of ischemic stroke could be made more correctly with less error.

REFERENCES

1. Turgut Tatlisumak, MD, PhD, Department of Neurology, Helsinki University Central Hospital; Is CT or MRI the Method of Choice for Imaging Patients With Acute Stroke? Why Should Men Divide if Fate Has United? Turgut Tatlisumak, MD, PhD
2. Turgut Tatlisumak, MD, PhD, Department of Neurology, Helsinki University Central Hospital; Is CT or MRI the Method of Choice for Imaging Patients With Acute Stroke? Why Should Men Divide if Fate Has United? Turgut Tatlisumak, MD, PhD
3. Wade S. Smith; Joey D. English; S. Claiborne Johnston; Harrison's Principles of Internal Medicine, 18e; Chapter 370. Cerebrovascular Diseases
4. Elizabeth Tong, M.D.,¹ Qinghua Hou, M.D., Ph.D.,^{1,2} Jochen B. Fiebach, M.D.,³ and Max Wintermark, M.D., M.A.S.1, The role of imaging in acute ischemic stroke.