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# Clinical and Radioimaging Study in Posterior Circulation Stroke Patients in Central India

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**Abstract**

**Introduction:** *Stroke is one of the major cause of mortality and morbidity in India with its incidence on rise every decade. Stroke syndromes are classified into anterior and posterior circulation strokes based on the area of the brain affected and the corresponding blood supply. This study was carried out to determine the various clinical and radiological patterns of posterior circulation stroke and to analyze the various risk factors of posterior circulation stroke in comparison to anterior circulation stroke.*

**Materials:** *The study was an observational study with a total of 100 patients. Patients who presented with signs and symptoms of stroke were included in the study and were classified into posterior and anterior circulation stroke based on signs and symptoms. All patients with radiological evidence of stroke were also included in the study.*

**Observations:** *The mean age in the subjects with posterior circulation stroke was 61.7 years with a male preponderance of 4:1.Among the risk factors, Hypertension and Diabetes Mellitus were more common in patients with posterior circulation stroke as compared to anterior circulation strokes(p=0.021 and p=0.041 respectively). Dyslipidemia (p=0.043),history of alcohol consumption(p=0.071) and smoking(p=0.083) were found more commonly in patients with anterior circulation stroke as compared to posterior circulation stroke. Heart disease (p=0.111) was found equally in patients with posterior and anterior circulation stroke. Dizziness (52%) and Vomiting(42%) were the most common symptoms and Ataxia(34%) and Visual field defects(30%) were the most common signs of posterior circulation stroke. Cerebellar infarct(30%) was the most common radiological pattern of posterior circulation stroke.*

**Conclusions:** *All patients with brain ischemia whether anterior or posterior circulation need extensive evaluation of risk factors especially modifiable risk factors such as hypertension, diabetes mellitus, dyslipidemia, alcohol consumption, smoking and heart disease.*

**Keywords:** *stroke, ataxia, diplopia,v ertigo, dyslipidemia, infarct, hemorrhage, dysarthria, nystagmus.*

## Introduction

Stroke is defined as loss of brain function due to a disturbance in the blood supply to the brain either due to ischemia or hemorrhage.  Some of the recent studies have elucidated the stroke pattern to considerable extent in our country with a prevalence rate of 471.58/100000 population. Recent study identified that 7% of medical and 45% of neurological admissions were due to stroke with a fatality rate of 9% at hospital discharge and 20% at 28 days. After coronary heart disease (CHD) and cancer of all types, stroke is the third commonest cause of death worldwide. Large vessel intracranial atherosclerosis is the commonest cause of ischemic stroke in India. The common risk factors, that is, hypertension, diabetes, smoking, and dyslipid-

emia, alcohol consumption, elevated homocysteine levels, obesity, cardiac disease are quite prevalent and inadequately controlled; mainly because of poor public awareness and inadequate infrastructure. The non modifiable risk factors are age, gender, race / ethnicity, family history, genetics. Stroke syndromes are classified into anterior circulation strokes and posterior circulation stroke, based on the blood supply. The Internal carotid artery and its branches comprise the anterior circulation and paired vertebral artery, basilar artery and paired posterior cerebral artery constitutes the posterior circulation. Stroke syndromes of the posterior circulation account for approximately 20% of all strokes. Though there have been many studies of stroke around the world, studies pertaining to the subset of posterior circulation stroke are still scarce There are specific signs and symptoms found in posterior circulation stroke patients which help to differentiate them from Non-PCA strokes. These are dizziness, nausea and vomiting, diplopia, dysarthria, dysphagia and headache whereas the signs are ataxia, nystagmus, visual field defects and cranial nerve palsies.

## Objectives
1. To study the various clinical and radiological patterns of posterior circulation stroke
2. To analyze the various risk factors of posterior circulation stroke in comparison to anterior circulation stroke (NON-PCA Stroke)

## Materials and Methods
The study was an observational study. All patients who presented to the medical wards and outpatient department of general medicine and neurology in Hamidia Hospital, Bhopal (M.P) with symptoms and signs of stroke from the period of 1st March 2015 to 31st May 2016 were included in the study. ECG, Chest X-Ray, Echocardiogram, Fasting lipid profile and Blood sugar (Fasting and Postprandial) was performed in all these patients.

CT Head was performed for patients suspected of having Non PCA Stroke and MRI Brain was done in patients suspected of having Posterior Circulation Stroke (PCA). Relevant history regarding alcohol consumption and smoking was taken.

## Inclusion Criteria
1. 1. Patients who had signs and symptoms of stroke and were classified into PCA and Non PCA stroke based on signs and symptoms
2. Patients who had radiological evidence of stroke were included in the study.

## Exclusion Criteria
1. Patients with clinical features and neuro – otological features of vestibular disorders and labyrinthine disorders
2. Patients with subarachnoid hemorrhage, extradural or subdural hemorrhage.

## The following data were included for analysis:
All patients were
- Registered in the proforma regarding their name, age, sex, occupation, address and education
- Questioned for the symptoms of posterior circulation stroke like dizziness, vomiting, headache, dysarthria, and limb weakness.
- The patients were examined for signs of posterior circulation stroke such as altered sensorium, ataxia, dysarthria, nystagmus, visual field defects and cranial nerve palsies.
- A detailed history regarding the risk factor profile in the patients including systemic hypertension, smoking, alcoholism, dyslipdemia, diabetes mellitus, coronary artery disease, rheumatic heart disease, previous stroke was documented
- A detailed clinical examination on the neurological status of the patients and comprehensive examination of other systems were recorded in the case sheets.
- All patients were investigated for basic biochemical, hematological investigations.

ECG, Chest X-Ray, Echocardiogram, Fasting lipid profile and Blood sugar (Fasting and Postprandial) was performed in all these patients. CT Head was performed for patients suspected of having Non PCA Stroke and MRI Brain was done in patients suspected of having Posterior Circulation Stroke (PCA).

- Hypertension: Systolic blood pressure > 140 mm Hg and / or diastolic > 90 mm Hg and / or on antihypertensive treatment.
- Diabetes mellitus: Symptoms of diabetes and plasma glucose concentration >200 mg / dl (11.1 mmol/L) or fasting blood sugar > 126 mg /dl (7.0 mmol/L)
- Dyslipidemia was defined as the presence of any of the following : Total cholesterol > 240 mg / dL, triglycerides (TG) > 150 mg / dL, Low density lipoprotein (LDL) > 130 mg / dL and High density lipoprotein (HDL) < 50 mg /dL.
- Addiction:
- Cigarette/ bidi smoking history (patients who were actively consuming cigarette / bidi or had quit within last two months were considered as substance abusers and were considered with positive smoking history in the study and patients who had quit beyond two months were considered in the category of no addiction).
- Alcohol consuming history (patients who were actively consuming alcohol or had quit within last two months were considered as substance abuser and were considered with positive history of alcohol intake in the study and patients who had quit beyond two months were considered in the category of no addiction.
- Heart disease: ECG was done in all patients. ECHO was done in those patients of stroke with signs and symptoms and ECG changes suggestive of heart disease such as coronary artery disease or rheumatic heart disease.

- Statistical analysis and p-value calculation was done by chi square test and z test.
- SPSS software was used for statistical analysis.

## Results

The study group included 50 patients of posterior circulation stroke. There were 39(78%) male and 11(22%) female patients. The ratio of male to female is 4:1. The age distribution ranged from as low as 30 years to upto 93 years, with the majority being males of elderly age group as shown

**Table 1-**Age Distribution and Sex Distribution in Patients with Posterior Circulation Stroke

| S.NO | Age group | SEX | | |
|------|-----------|-----|-----|-----|
| | (Years) | Male (%) | Female (%) | Total (%) |
| 1 | 0-20 | 0 (0%) | 0(0%) | 0 (0%) |
| 2 | 21-40 | 2 (4%) | 0 (0%) | 2 (4%) |
| 3 | 41-60 | 19(38%) | 5 (10%) | 24 (48%) |
| 4 | 61-80 | 16 (32%) | 5 (10%) | 21 (42%) |
| 5 | 81-100 | 2 (4%) | 1 (2%) | 3 (6%) |
| | Total | 39(50) | 11(50) | 50(100%) |

## Risk Factor Profile

The risk factor profile was analyzed in 50 patients of posterior circulation stroke and the observations were compared with the risk factor profile of 50 patients of non pca stroke in this table 3.

**Table 2-**Comparison of Risk Factor Profile of Posterior Circulation Stroke and Anterior Circulation Stroke

| RISK FACTOR | PCA Stroke(N=50) | Non PCA(Anterior Circulation) Stroke(N=50) |
|-------------|------------------|---------------------------------------------|
| | No. of patient (%) | No. of Patient (%) |
| HYPERTENSION | 39 (78%) | 34 (68%) |
| DIABETES | 24 (48%) | 18 (36%) |
| DYSLIPIDEMIA | 23 (46%) | 25 (50%) |
| ALCOHOL | 9 (18%) | 14 (28%) |
| SMOKING | 12 (24%) | 19 (38%) |
| HEART DISEASE | 8 (16%) | 9 (18%) |

Hypertension and diabetes were more common in patients with PCA Stroke as compared to NON PCA Stroke with p-values (p=0.021 and p=0.041) respectively which were statistically significant

Dyslipidemia was found more commonly in patients with NON PCA Stroke as compared to PCA Stroke with p value(p=0.043) which was statistically significant. A history of alcohol consumption and cigarette/bidi smoking was found more commonly in patients with NON PCA Stroke as compared to PCA stroke with p values( 0.071 and 0.083) respectively which were statistically insignificant. Heart disease was found to be present almost equally in patients with PCA and NON-PCA stroke with p value (p=0.111) which was statistically insignificant.

In the 50 patients with posterior circulation stroke 41(82%) had ischemic infarct and 9 (18%) patients had haemorrhage as shown in table.

**Table 3-**Pattern of Posterior Circulation Stroke

| Infarct | Bleed(haemorrhage) |
|---------|---------------------|
| 41 (82%) | 9 (18%) |

**Clinical Patterns**

In the 50 patients with posterior circulation stroke the the symptoms and signs analysis revealed the following characterstics:

**Table 4** Symptoms of Posterior Circulation Stroke

| Clinical Pattern | |
|------------------|--|
| Symptoms | No. of patient (%) n=50 |
| Dizziness | 26 (52%) |
| Vomiting | 21 (42%) |
| Headache | 14 (28%) |
| Dysarthria | 16 (32%) |
| Limb weakness | 15 (30%) |

Dizziness and vomiting were the most common symptoms found in patients with posterior circulation stroke and were present in 52% and 42% patients respectively whereas limb weakness and headache were the least common symptoms present in 30% and 28% patients respectively.

The clinical examination revealed the following findings:

**Table 5-**Signs of Posterior Circulation Stroke

| Clinical Pattern | |
|------------------|--|
| SIGNS | No. of patient (%) N=50 |
| Ataxia | 17 (34%) |
| Nystagmus | 5 (10%) |
| Visual field defect | 15 (30%) |
| Cranial nerve palsies | 6 (12%) |
| Altered sensorium | 9 (18%) |

The most common signs of posterior circulation stroke on examination were ataxia and visual field defects found in 34% and 30% patients respectively whereas the least common signs were cranial nerve palsies and nystagmus found in 12% and 10% of patients respectively.

**Radiological Patterns In Posterior Circulation Stroke**

The radiological evaluation revealed the following findings:

**Table 6-**Radiological Patterns in Posterior Circulation Stroke

| RADIOLOGICAL PATTERN IN POSTERIOR CIRCULATION STROKE | |
|------------------------------------------------------|--|
| RADIOLOGICAL FINDING | NO OF PATIENTS(%) N=50 |
| | |
| Cerebellar bleed | 3 (6%) |
| Cerebellar Infract | 15 (30%) |
| Medulla infarct | 5 (10%) |
| pons infarct | 5 (10%) |
| Medulla bleed | 0 (0%) |
| Pons bleed | 1 (2%) |
| Occipital Infarct | 10 (20%) |
| Occipital bleed | 5 (10%) |
| Combination of Above finding | 7 (14%) |

The most common radiological patterns found in the study in patients with posterior circulation stroke were cerebellar infarct and occipital infarct found in 30% and 18% cases respectively whereas the least common radiological patterns found were bleed in the pons found in only 2% of the patients and bleed in the medulla was found in no patient in the study.

## Discussion

Epidemiological studies have revealed that the prevalence of stroke is increasing along with rising prevalence of risk factors for stroke in India. .There is not much published data on risk factor profile and clinical patterns of posterior circulation stroke in India  hence it was decided to undertake this study. This study was conducted over a period of 12 months and included  50 patients  with  posterior circulation stroke in whom the clinical patterns and risk factor profile was studied and the risk  factor  profile was compared with 50 patients  of  NON-PCA (anterior  circulation) stroke fulfilling  the inclusion criteria.

### Parameters of Study

**Sex:** In the study group of 50 patients of posterior circulation stroke, there was a male preponderance with a ratio of 4:1 as against in TUFTS posterior circulation registry where there was 1:1 ratio. However another study by Corrado Argentino et al showed a male : female ratio of 4:1

**Age:** Posterior circulation stroke was common among individuals above  50 years  The mean age in the study group was 61.7 years which was similar to Chengdu stroke registry  in which the mean age was 61.4 years

**Pattern of stroke:** The ratio between ischemic stroke and hemorrhagic stroke in the study was 4:1 (41/09). This ratio was similar to anterior circulation stroke (40 infarcts/10 haemorrhages)

**Symptomatology:** As  far  as  the  the symptomatology was concerned , dizziness and vomiting  were the leading complaints during presentation occurring in 52% and 42% patients respectively whereas limb weakness and headache were the least common symptom present in 30% and  28% of the patients respectively. These findings were in accordance to New England Medical Center posterior circulation registry where dizziness was the most common presenting symptom present in 47% of the patients followed by limb weakness in 38% of the patients and vomiting in 27% of the patients.

**Risk Factors:** All of the studied risk factors were found to be associated with stroke with hypertension and diabetes mellitus being more common in patients with posterior circulation stroke and dyslipidemia, alcohol consumption, smoking and heart disease found more commonly in patients with NON-PCA stroke .These  findings were found to be consistent with the previous studies.

## Conclusion

Majority of the patients presenting with stroke are of the elderly age group with predominantly elderly male. All patients with brain ischemia whether anterior or posterior circulation need extensive evaluation of risk factors especially modifiable risk factors such as hypertension, diabetes Mellitus, dyslipidemia, alcohol consumption, cigarette smoking and heart disease. Strict control of hypertension and diabetes mellitus was found to be most beneficial for secondary prevention of stroke. Extensive cardiac work up and evaluation for hypercoagulable states  proves to be useful in identifying correctable causes for stroke and hence secondary prevention for stroke  can be done .

## References

1. Sims NR, Muyderman H. Mitochondria, oxidative metabolism and cell death in stroke. Biochimica et Biophysica Acta. 2009; 1802:80-91.
2. Gupta R, Joshi P, Mohan V, Reddy S, Yusuf S. Epidemiology and causation of coronary heart disease and stroke in India. Heart. 2008; 94:16-26.
3. S. Hartona. Experiences from a multicenter stroke register: a preliminary report. Bull World Health Organ. 1976; 54(5):541-553.
4. P. Bath. Acute stroke. In: D. Machin, S. Day, S. Green, eds. Textbook of Clinical Trials. 2nd ed. Hoboken: Wiley; 2006: 179-180.

5. S. K. Das, T. K. Banerjee, A. Biswas, D. K. Raut, C. S. Mukherjee, A. Chaudhari, et al. A prospective com-munity based study of stroke in Kolkata, India. Stroke. 2007; 38(2):906-910.

6. D. Nagaraja, G. Gururaj, N. Girish, Samhita Panda, A. K. Roy, G. R. K. Sarma, et al. Feasibility study of stroke surveillance: data from Bangalore, India. Indian J Med Res. 2009 Oct; 130 :396-403.

7. Tapas Kumar BANERJEE, Shyamal Kumar DAS. Epidemiology of stroke in India. Neurology Asia 2006; 11 : 1 – 4.

8. Joao Gomes and Ari Marc Wachsman. Types of Strokes. Chapter 2M.L. Corrigan et al. (eds.), Handbook of Clinical Nutrition and Stroke, 15 Nutrition and Health, DOI 10.1007/978-1-62703-380-0_2, © Springer Science+Business Media New York 2013.

9. Tapas Kumar Banerjee, Shyamal Kumar Das1 Fifty years of stroke researches in India. Ann Indian Acad Neurol 2016;19: 1-8.

10. Abraham J, Rao PS, Inbaraj SG, Shetty G, Jose CJ. An epidemiological study of hemiplegia due to stroke in South India. Stroke 1970;1: 477-481.

11. Bansal BC, Parkash C, Jain AL, Brahmanandan KR. Cerebrovascular disease in young individuals below the age of 40 years. Neurol India 1973;21:11-8.

12. Banerjee TK, Mukherjee CS, Sarkhel A. Stroke in the urban population of Calcutta: An epidemiological study. Neuroepidemiology 2001 ;20: 201-207.

13. Das SK, Banerjee TK, Biswas A, Roy T, Raut DK, Mukherjee CS, et al. A prospective community-based study of stroke in Kolkata, India. Stroke 2007;38: 906-910.

14. Jiang B, Wang WZ, Chen H, Hong Z, Yang QD, Wu SP, et al. Incidence and trends of stroke and its subtypes in China: Results from three large cities. Stroke 2006;37:63-8.

15. Kumar, Amit; Kumar, Pradeep; Kathuria, Prachi; Misra, Shubham; Pandit, Awadh Kishor; Chakravarty, Kamalesh; Prasad, Manya. Genetics of ischemic stroke: An Indian scenario. Neurology India . Jan/Feb2016, Vol. 64 Issue 1, p29-37. 9p.

16. Prabal Deba,∗, Suash Sharma b, K.M. Hassan. Pathophysiologic mechanisms of acute ischemic stroke: An overview with emphasis on therapeutic significance beyond thrombolysis. Pathophysiology 17 (2010) 197–21

17. Harrison's text book of Internal Medicine . 16th Edition. Cerebrovascular disease.2384-2386

18. Lie .T. congenital malformation of carotid and vertebral Arterial system,including the persistent anastamoses. Hand book of clinical neurology 1972 289-339.

19. Caplan L R . cerebrovascular disease. Large vessel occlusive disease . Current neurology 1998.179-226

20. STROKE .Text book chapter 20. Posterior cerebral artery disease.481-502

21. STROKE. Text book . chapter 22 .Vertebrobasilar occlusive disease. 513-597

22. Posterior Circulation Ischemia: Then, Now, and Tomorrow. The Thomas Willis Lecture—2000 by Louis caplan MD Stroke 2000;31;2011-2020

23. John parker frizzel. Acute stroke. Pathophysiology , diagnosis and management. AACN clinical issues,volume16 , number 421-440

24. Victor M Rae , Cerebroavascular disease .Adam and victor's principles of neurology.

25. American Heart Association 2000. Heart and stroke, statistical update.

26. Mohr JP .Lacunes,Strokes 1982

27. Toole JF. Cerebrovascular disease Newyork Raven Press 1990

28. Publication Committee for the Trial of Org 10172 in Acute Stroke Treatment (TOAST) Investigators. Low molecular weight heparinoid, ORG 10172 (danaparoid), and outcome after acute ischaemic stroke. JAMA 1998;279:1265-1272.
29. Student BMJ Journal .2006;14:309-352 September ISSN 0966-64
30. Timothy C . Hain – Braistem strokes associated with vertigo or hearing symptoms 2005.