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Original Research Article

Clinical and Radio Imaging Study in Posterior Circulation Stroke at Osmania General Hospital, Hyderabad

Mohd. Akram Pasha[1], Pogidboina Hari Chandana[2], Ramavath Sudheer[3], Thurikepally Lakshmi Sharath Chandran[4], Kandula Sridhan Varma[5], Sriramoju Prem Sagar[6]

[1]Assistant Professor of General Medicine, Osmania Medical College / Hospital, Hyderabad.
[2,3,4,5]MBBS, Interns Osmania Medical College / Osmania General Hospital, Hyderabad.
[6]Professor of General Medicine, Osmania Medical College / General Hospital, Hyderabad

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Corresponding Author: Dr. Thurikepally Lakshmi Sharath Chandran
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Abstract:

To study the various clinical patterns of posterior circulation stroke. All patients who presented to the medical wards and outpatient Department of General Medicine and Neurology in Osmania General Hospital, Hyderabad with symptoms and signs of posterior circulation stroke. The study group included 50 patients. There are 40(80%) male and 10(20%) female patients. The ratio of male to female is 4:1. The age distribution ranged from as low as 18 years to up to 80 years, with the majority being males of elderly age group. Male sex was the predominant population affected by posterior circulation stroke. Most commonly, people above 50 years were affected. Uncontrolled hypertension, smoking, alcoholism and diabetes mellitus were the major risk factors for posterior circulation stroke. Alcoholism was a major risk factor for cerebellar infarcts. Low HDL was the commonest lipid abnormality among posterior circulation stroke patients. Giddiness, vomiting and incoordination were the majorpresenting symptom of posterior circulation stroke. Clinical features suggesting anterior circulation stroke can occur with posterior circulation stroke and careful visual field testing helps in clinicaldifferentiation of both. Aggressive search for treatable risk factors should be made inyounger patients.

Keywords: Posterior Circulation Stroke ; Ischemic Stroke ; Cerebrovascular Accident (CVA)

Introduction

Stroke is defined as abrupt onset of neurological deficit that is attributable to focal vascular cause [1].

Stroke syndromes are classified into 2 categories based on blood supply

1. Anterior circulation stroke.
2. Posterior circulation stroke.

The internal carotid artery and its branches comprise the anterior circulation. Stroke syndromes of the posterior circulation account for approximately 20% of all strokes [2]. The posterior circulation consists of the paired vertebral arteries, the basilar artery, the paired posterior cerebral arteries and their branches.

These arteries, through short penetrating branches and circumferential branches, supply the brainstem (medulla, pons, and midbrain), the thalamus, the hippocampus, the cerebellum, and parts of the occipital and temporal lobes including the visual cortex. There is marked variability in the exact arterial anatomy of the posterior circulation [3]. The posterior circulation is constructed quite differently from the anterior circulation and consists of vessels from each side which unite to form midline arteries that supply the brainstem and spinal cord. Within the posterior circulation, there is a much, higher incidence of asymmetric, hypoplastic arteries, of variability of supply and retention of fetal circulatory patterns. The posterior circulation, unlike the intracranial portions of the anterior circulation, is prone to atherosclerosis much as are other systemic arteries [4]. In the case of one vertebral artery being occluded, collateral flow comes from the opposite vertebral artery, from muscular cervical artery branches, and from posterior communicating artery. [5]

Aims and Objectives

1. To study the various clinical patterns of posterior circulation stroke.
2. To analyze various risk factors for stroke in these patients

Material & Methods

All patients who presented to the medical wards and outpatient department of general medicine and

neurology in Osmania General Hospital, Hyderabad, with symptoms and signs of posterior circulation stroke from the period of November 2019 to April 2021 were included in the study. CT scan of brain, MRI of brain, ECG, CXR, Echocardiogram, 4 Vessel Doppler and Fasting Lipid Profile was performed in all these patients.

Inclusion Criteria

1. Patients who had signs and symptoms of posterior circulation stroke.
2. Patients who had radiological evidence of posterior circulation 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 sub arachnoid hemorrhage, extra dural or subdural
3. Hemorrhage.

Questioned for the symptoms of posterior circulation stroke like dizziness, diplopia, dysphagia, nasal regurgitation, speech disturbances, headache, seizures, altered sensorium, unsteadiness, sensory disturbances, in-coordination, motor weakness

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, peripheral vascular disease, previous anterior circulation stroke, family history was documented.

A detailed clinical examination on the neurological status of the patients and comprehensive examination of other systems including were recorded in the case sheets.

All patients were investigated for basic biochemical, hematological investigations. ECG, ECHO, CHEST X RAY were done in all patients. Patients with stroke in age less than 40 were also evaluated for hypercoagulable states (hyperhomocytienemia, protein C and S deficiencies, Antiphospholipid antibodies). MRI with MRA was done in selected patients.

Patient's previous treatment history was analysed and classification of their premorbid hypertension according to JNC VII was made in those patients whose records were available. Carotid and vertebral artery Doppler was done in all patients and the degree of disease in the vessels were documented. The nature of the study is observational and prospective one.

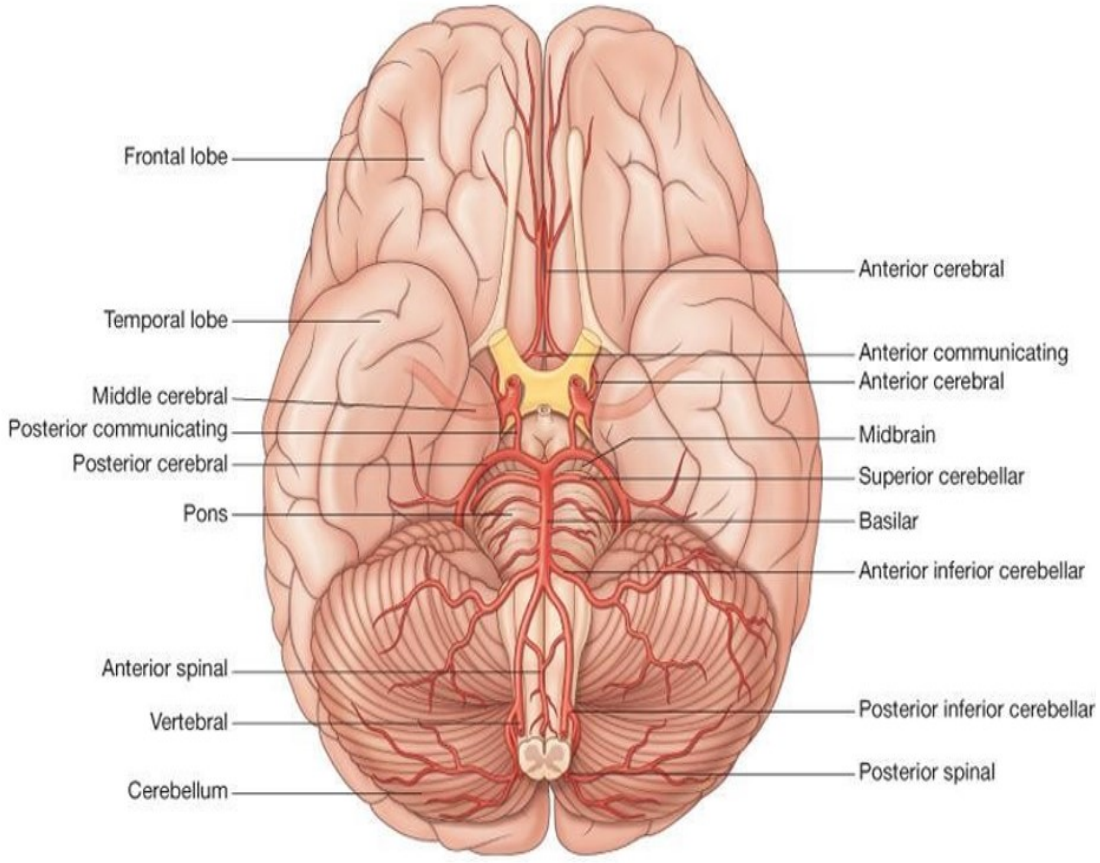


Figure 1: Blood supply of brain

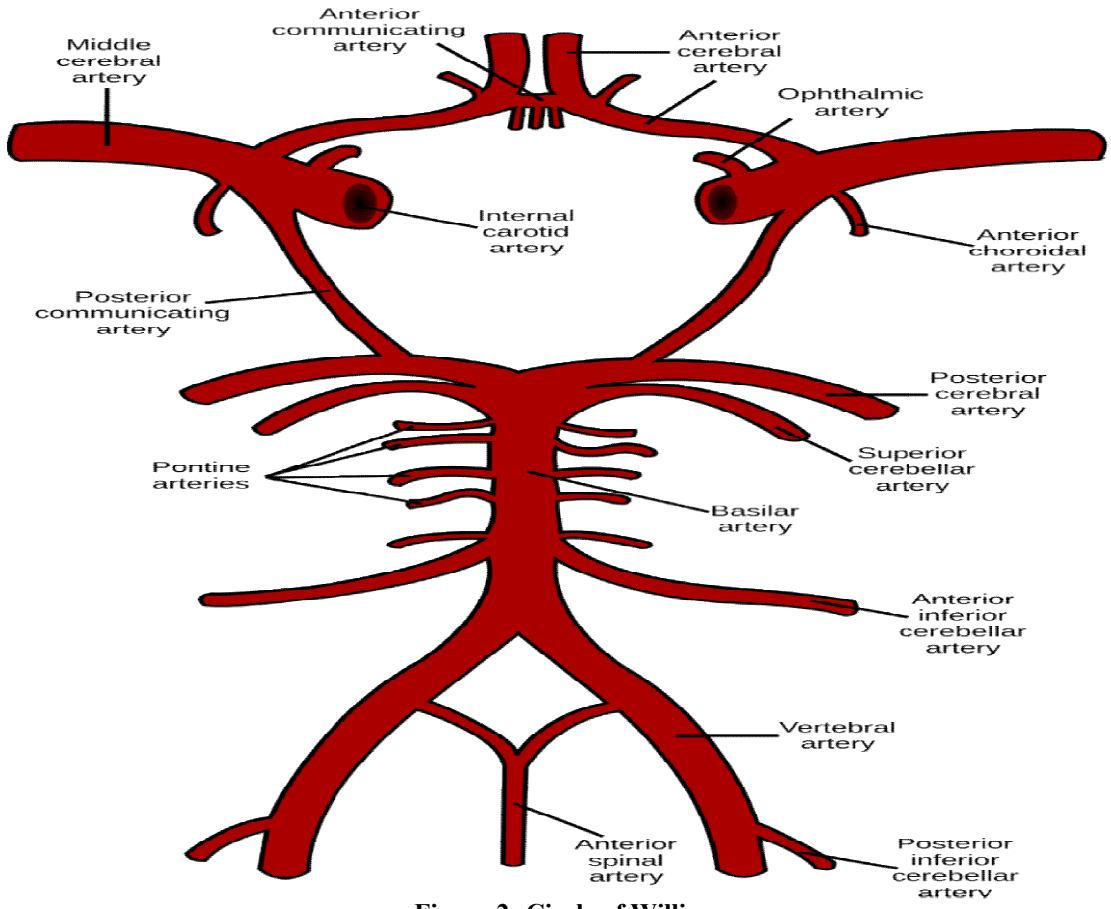


Figure 2: Circle of Willis

Results: The study group included 50 patients. There are 40(80%) male and 10 (20%) female patients. The ratio of male to female is 4:1. The age distribution ranged from as low as 18 years to up to 80 years, with the majority being males of elderly age group.

Table 1: Age distribution

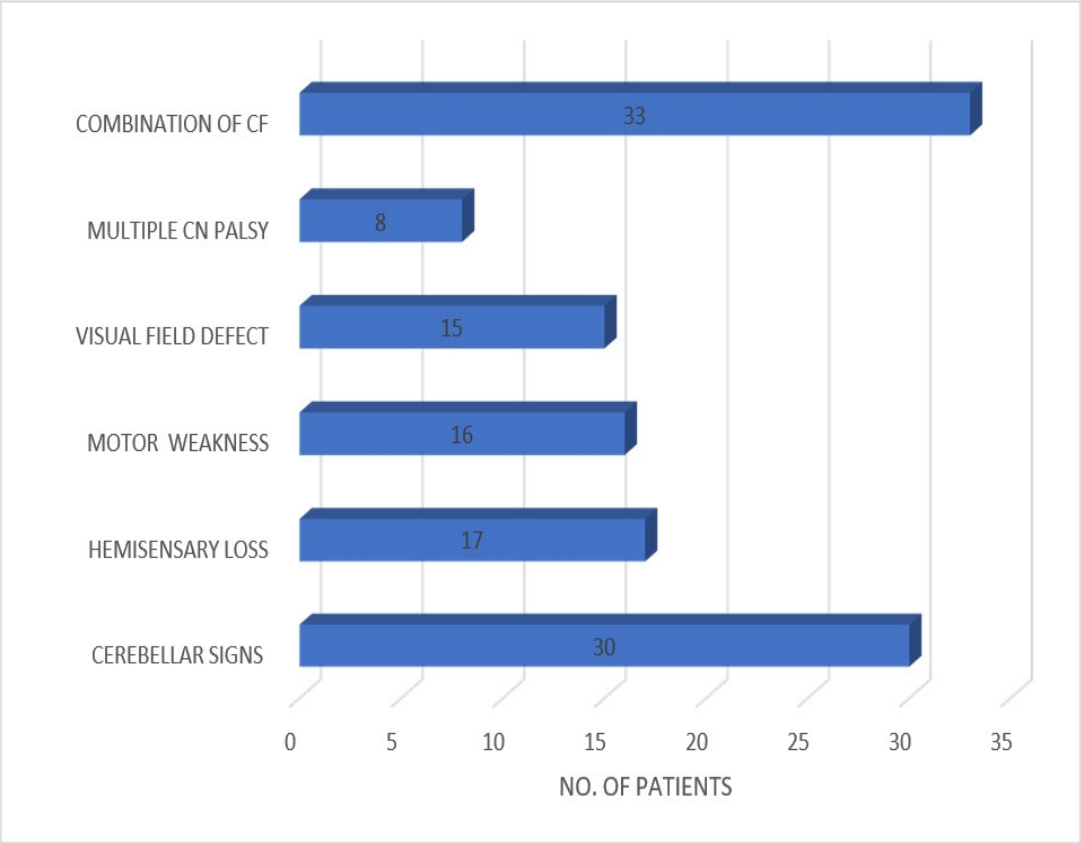
Age group in years	Males(n=40)	Females(n=10)
11-20	01	0
21-30	02	0
31-40	03	01
41-50	08	01
51-60	16	05
≥61	10	03

Table 2: Risk Factor Profile

Risk Factor	Number of patients (%) n=50
Hypertension	30(60)
Smoking	23(46)
Alcoholism	20(40)
Diabetes mellitus	20(40)
Hyperlipidemia	15 (30)
Embolism from heart	10(20)
Coronary artery disease	10(20)
Atrial fibrillation	08(16)
Oral anticoagulants use	07(14)
Hyper homocystinemia	03(06)
Anti-phospholipid antibody	01(02)
Takayasu arteritis	01(02)

Table 3: Symptom Analysis

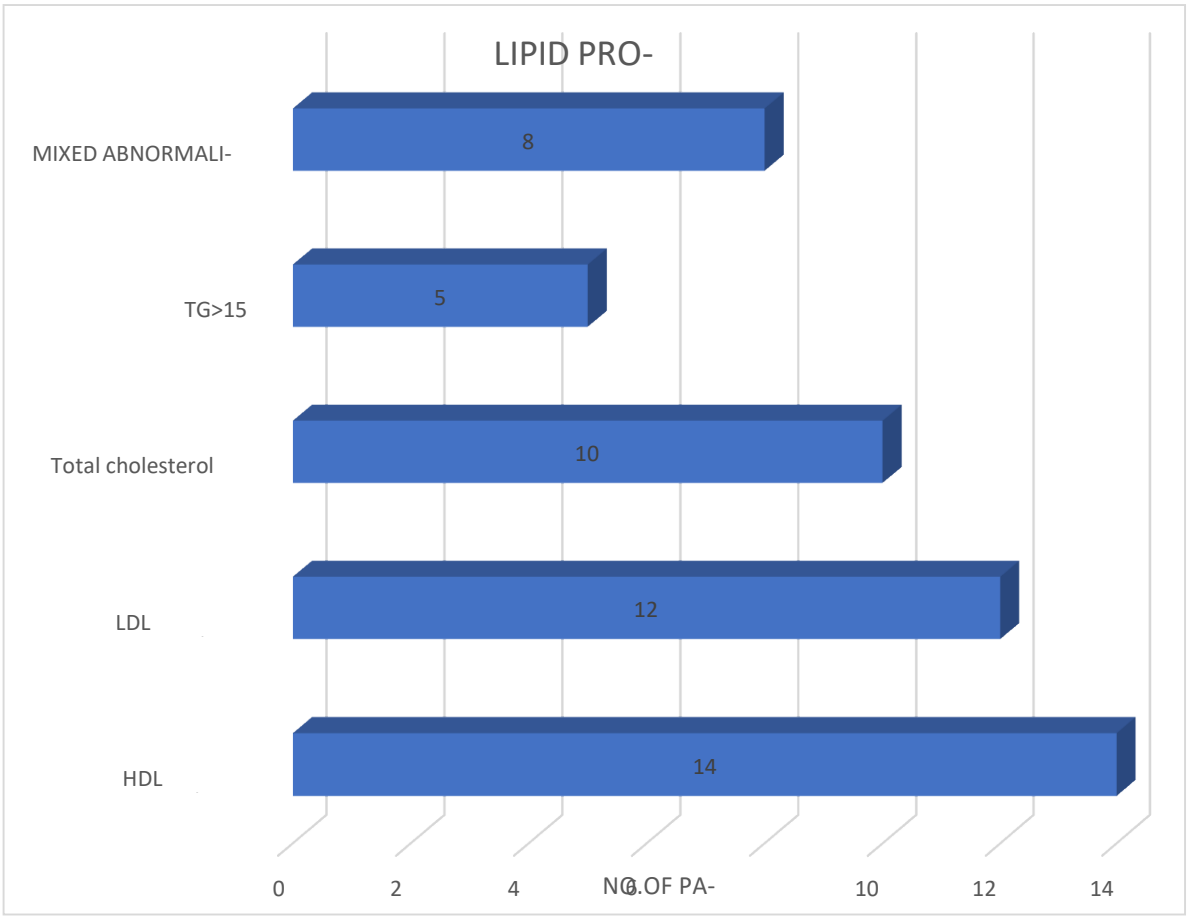
Symptoms	Number of Patients (%)
Giddiness and vomiting	27 (54%)
Incoordination	20 (40%)
Headache	16 (32%)
Seizures	13 (26%)
Motor weakness	09 (18%)
Sensory disturbance	09 (18%)
Altered sensorium	10 (20%)



Graph 1: Clinical Findings

Table 4: Radiological findings

Radiological Finding	Number Of Patients (%)
Cerebellar infarct	20 (40)
Medullary infarct	13 (26)
Cerebellar hemorrhage	07 (14)
Occipital hemorrhage	04 (08)
Pontine infarct	03 (06)
Pontine hemorrhage	03 (06)
Combination of above	20 (40)



Graph 2: Lipid profile abnormalities

Table 5: Staging of Hypertension

JNC VII Stage	Number Of Patients (%)
STAGE 1	06 (12)
STAGE 2	24 (48)

Discussion

In the study group of 50 patients, there was a male preponderance with a ratio of 4:1 as against in TUFTS posterior circulation registry [6] where there was 1:1 ratio. However another study by Corrado Argentino, et al [7] showed a male: female ratio of 4:1

Posterior circulation stroke was common among individuals above 50 years. The mean age in the study group was 55 years. The ratio between ischemic stroke and hemorrhagic stroke was 2.6:1.

In females, out of the 10 patients, 7 had ischemic stroke (70%), in males where 29 out of 40 had ischemic infarcts (72%).

As far as the symptomatology was concerned, giddiness and vomiting, incoordination are the leading complaints during presentation occurring in almost half of the patients. Headache and seizures are present in 32 and 26 percent of patients and unilateral headache was striking feature in patients with cerebellar hemorrhage. In a study by R.B. Libman, et al [8] it was found that headache was more common among posterior circulation stroke patients, present in 15% of patients. In 18% of patients presented with motor weakness, it mimicked anterior circulation stroke clinically. This finding went hand in hand with the results of study by Corrado Argentino, et al which showed that shortly after onset the clinical discrimination between Anterior and atypical Posterior circulation infarcts is not reliable, which explains the frequent occurrence of this misdiagnosis. In such cases, emergency CT scan helps in the differential diagnosis only when it demonstrates an early focal hypodensity within the carotid territory.

In the study by Huan et al [9], more than half of the patients had hemiparesis (58%).Altered sensorium was present in 10% percent of patients.

In a study by Timothy et al [10], vertigo without hearing loss was the commonest symptom in brain stem stroke syndromes. In this study also dizziness associated with vomiting was the commonest symptom. A previous history of posterior circula-

tion TIA was present in 15 percent and there were three patients who had previous anterior circulation stroke within a period of four years. This was in contrast to the study by Huan et al which reported an incidence of TIA as 50% the cerebellar syndrome is the most common clinical presentation present in 60 percent (30 patients) of individuals. Hemisensory loss is present in 34 percent (17 patients) in whom 16 had clinical features of lateral medullary syndrome. Visual field defects including, hemianopia with sparing of macula, quadrantanopia, sectoranopia were present in 30 percent (15 patients) of patients.

Multiple cranial nerve involvement was the presenting feature in 16 percent (8 patients) of patients. The common cranial nerves affected include III,IV,V, VII, IX,X. Two patients presented with complex oculomotor involvement as the sole presentation and MRI revealed brain stem infarcts in those patients. In the NEMC posterior circulation registry less than one percent of the 407 patients had only one complaint as presenting symptom. One patient had simultaneous involvement of anterior and posterior circulations. Hypertension topped the risk factor with 60 percent followed by smoking, alcoholism and diabetes mellitus in 46, 40 and 40 percent of patients respectively.

Hyperlipidemia was present in 30 percent of patients. Embolism from heart and coronary artery disease were present in about 20 and 18 percent respectively. This was comparable to NEMC Posterior circulation registry data where embolism from heart was demonstrated in 24%.

In the study of the 10 patients who had embolism from the heart, eight had preexisting rheumatic heart disease and two had systemic hypertension and atrial fibrillation

In the study, among eight patients who had coronary artery disease as risk factor, three had extensive anterior wall myocardial infarction and five had inferior wall myocardial infarction pattern ECG wise which was confirmed by regional wall motion abnormalities in ECHO.

Table 6: Comparison of risk factors in present study with study by Huan et al

Risk Factors	Present Study (N=50)	Huan et al(n=31)
Hypertension	60%	71%
Smoking	46%	39%
Diabetes mellitus	40%	23%
CAD	19%	19%
Atrial fibrillation	16%	10%

Patient who had posterior circulation infarcts before the 20 years of age, presented with diabetic ketoacidosis and he had bilateral posterior cerebral artery infarcts. One male patient presented with multiple infarcts in brainstem and cerebellum had no routine risk factors had elevated fasting homocystiene levels. Bilaterality of involvement was seen among patients who had hematological and metabolic disorders.

Among 15 (30%) patients who had dyslipidemia, low HDL (28%) was the most common abnormality followed by elevated LDL (24%), elevated total cholesterol (20%), elevated triglycerides (10%).a mixed pattern of the above abnormalities were found in 16% patients. Alcoholism was strikingly prevalent among male patients who had cerebellar infarcts (fourteen of those sixteen had a strong history of alcoholism). Patients who had massive cerebellar infarcts and hemorrhages reported headache and had signs suggesting increased intracranial pressure. One patients with cerebellar bleed was successfully operated and other three conservatively managed. Among 30 patients who had systemic hypertension before the stroke, analysis of the treatment records showed that 6 patients were in JNC stage I and 24 patients were in JNC stage II. In the study population 27 patients had clinical features suggesting cerebellar involvement and the radiological investigations demonstrated isolated cerebellar involvement in twenty four patients (18 had infarcts and 6 had hemorrhage).

Of the 16 patients suspected to have lateral medullary syndrome clinically, 13 had medullary infarcts and the other 3 had medullary and pontine infarcts. Four patients suspected to have brainstem involvement had brainstem infarcts in two and hemorrhage in two patients. One patients who had takayasu's arteritis had both MCA and PCA territory involvement. In this study the observed one month mortality rate was 6% (3/50). In general The rate of death immediately after posterior- circulation stroke is approximately 3 to 4 percent [11,12]. In the NEMC-PCR, 3.6 percent of patients died, and 18 percent of patients had a major disability. It was obvious that an intensive search for factors other than routine risk factors for stroke should be carried out, especially in individuals less than forty years.

Conclusion

1. All patients with brain ischemia whether anterior or posterior circulation need extensive evaluation of risk factors especially modifiable.
2. With the advent of newer investigations like MRI with diffusion weighted Imaging, MRA, CT Angio, extra cranial and intra cranial

3. Ultrasound, the stroke mechanism could be precisely diagnosed.
4. Extensive cardiac work up and evaluation for hypercoagulable states proves to be useful in identifying correctable causes for stroke and hence secondary prevention

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