



CLINICAL STUDY OF POSTERIOR CIRCULATION STROKES IN A TERTIARY CARE CENTRE IN SOUTHERN INDIA

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ABSTRACT **Objective:** To Study the Clinical profile of patients diagnosed to have Posterior Circulation strokes and to assess the disability in posterior circulation stroke

Material and Methods: This is a cross sectional study, that included 202 patients, Data of all the patients diagnosed to have posterior circulation stroke by imaging has been documented in predetermined proforma including the clinical presentation, etiology and modified Rankin scale for disability assessment at discharge.

Results: Ischemic strokes constitute 69.8% (141 cases) of posterior circulation strokes and hemorrhagic strokes 30.2% (61 cases). Ischemic stroke is more in males (72.34%) than females (27.66%). Hemorrhagic stroke also more in males (65.57%) compared to females (34.43%). In patients with systemic Hypertension 67.25% had ischemic strokes 32.74% had hemorrhage.

Discussion: Incidence of posterior circulation strokes of 11.32% is comparable to previous studies. Posterior circulation strokes are more common between the ages of 45 to 65. Ischemic strokes constitute majority of PCS, with predominance for males. The incidence of ischemic strokes is higher (69.8%) than hemorrhagic strokes which are in accordance with other studies. Systemic Hypertension was the most common risk factor, causing more Ischemic than hemorrhagic strokes. About 27.72% had favorable MRS of 0-2 at the time of discharge. Another 37.13% had MRS of about 3-4 mainly due to still persisting motor manifestations of unsteadiness. The remaining MRS 5 (30.69%) had severe motor and swallowing disability, bedridden state requiring supportive home care. Mortality of 4.46% was seen in MRS 6 patients.

Conclusion: Hemiplegia was the most common symptom followed by ataxia and visual field defects was the least common symptom, Most of the patients had nonspecific symptoms like headache, vomiting, giddiness and altered sensorium which points that high index of suspicion is needed to diagnose posterior circulation stroke.

KEYWORDS : NCDs, PCAs, Stroke, Posterior circulation Stroke, PCS

INTRODUCTION:

Non communicable diseases (NCDs) account for 2/3rd of global mortality. Among the NCDs stroke is the leading cause of death and disability worldwide. There has been more than 100% increase in stroke incidence in low and middle income countries. And 42% in higher income countries^[1]. The Global burden of stroke is 13.7 million^[2]. Globally the incidence of stroke has doubled in past two decades for both ischemic and hemorrhagic stroke^[3]. The prevalence of stroke globally in 2016 was 80.1 million (74.1-86.3) out of which 4.4% had ischemic stroke. The ratio for women to men is higher, 41.1 million (38.0-44.3) in women and 39.0 million (36.1-42.1) in men^[4].

In India Stroke is one of the leading cause of death and disability and it represents 1.2% of total deaths. During the last decade, the age-adjusted prevalence rate of stroke was between 250 -350/million and annual incidence was 105/ million in urban community and 262/ million in the rural community^[5]. The ratio of cerebral infarct to hemorrhage was 2.21. There has been a dramatic increase in the prevalence rate of stroke in the past two decades from 108 to 133/ million population^[6]. The incidence of stroke was 119/million in 1998-1999 and increased to 141/million in 2003-2010^[7]. The stroke incidence increases with increasing age and was higher in women 178/million as compared with men 117/million but men were at higher risk for death than women^[8].

Posterior circulation stroke (PCS) is classically defined by infarction occurring within the vascular territory supplied by the vertebra-basilar (VB) arterial system. The vertebral arteries (VAs) arise from the right and left subclavian arteries and travel cranially through the transverse foramina of the cervical vertebrae. The topographic classification described by Caplan in the New England Medical Centre-posterior circulation registry (NEMC-PCR)^[11] divides the intracranial vertebro-basilar system into proximal, middle, and distal territories. Posterior circulation strokes represent approximately 20% of all ischemic

strokes^[9,10]. In contrast to the anterior circulation, several differences exists in presenting symptoms, clinical evaluation, diagnostic testing, and management strategy posing a challenge to the treating physician.

OBJECTIVE

To study the clinical profile of patients diagnosed to have Posterior circulation strokes and to assess the disability in posterior circulation stroke

MATERIALS AND METHODS

This is a cross sectional study done at Madras Medical college for 10 months period from January 2018 to October 2018.

INCLUSION CRITERIA - All posterior circulation strokes admitted at Madras Medical College during the study period and registered in stroke registry were included in study.

EXCLUSION CRITERIA - Anterior circulation strokes and non-vascular lesions excluded from study.

Data from all the patients diagnosed with posterior circulation stroke (PCS), confirmed on imaging were entered on to a predetermined proforma including detailed clinical history, physical examination, investigations complete blood count, random blood sugar, Renal function tests, liver function tests, fasting lipid profile, ECG, CT brain, MRI Brain, 2D ECHO and Neck vessel Doppler reports.

RESULTS

During study period 1784 stroke cases were admitted in Madras Medical College out of which 202 (11.32%) were posterior circulation strokes. Ischemic strokes constitute 69.8% (141 cases) of posterior circulation strokes and hemorrhagic strokes 30.2% (61 cases). Ischemic Posterior circulation stroke is more in males 102 (72.34%) than

females 39 (27.66%). Hemorrhagic Posterior circulation stroke is also more in males 40 (65.57%) compared to females 21 (34.43%). In patients with systemic Hypertension 67.25% had ischemic strokes 32.74% had hemorrhage.

Distribution of stroke cases

Total no of stroke cases	1784
Posterior circulation stroke	202 (11.32%)
Other stroke	1582(88.68)

Type of PCS stroke	No of cases	Percentage
Ischemic	141	69.8%
Hemorrhagic	61	30.2%

Sex distribution of PCS (Ischemic)

Sex	No of cases	Percentage
Male	102	72.34%
Female	39	27.66%

Sex distribution of PCS (Hemorrhagic)

Sex	No of cases	Percentage
Male	40	65.57%
Female	21	34.43%

Age distributions: Mean age was 59

Age range	No of Cases	Percentage
20 to 40	25	12.38
41 to 60	93	46.03
61 to 80	79	39.12
> 80	5	2.48

Clinical features observed in PCS patients

Clinical features	No of cases	Percentage
Hemiplegia	81	40.1%
Gait taxia	70	34.65%
Vomiting	44	21.78%
Headache	38	18.81%
Dysarthria	38	18.81%
Hemi sensory deficits	37	18.32
Giddiness	33	16.34%
facial weakness	34	16.83%
Altered sensorium	30	14.85%
Vertigo	24	11.83%
Dysphagia	16	7.9%
Limb ataxia	8	4%
Seizure	8	4%
Diplopia	5	2.5%
Visual field defect	3	1.5%

Risk factors

Risk factors	No of cases	Percentage
Systemic hypertension	113	55.94%
Alcoholism	65	32.2%
Smoking	58	28.7%
Diabetes mellitus	46	22.77%
Previous stroke/TIA	25	12.38%
Atrial fibrillation	9	4.46%
Dyslipidemia	8	4%
Coronary artery disease	3	1.5%

MRS at discharge:

MRS at discharge	No of cases	Percentage
0-2	56	27.72
3-4	75	37.13
5	62	30.69
6	9	4.46

About 27.72% had favorable MRS of 0-2 at the time of discharge. Another 37.13% had MRS of about 3-4 mainly due to still persisting motor manifestations of unsteadiness. The remaining MRS 5 (30.69%) had severe motor and swallowing disability bed ridden state requiring supportive home care. Mortality of 4.46% was seen in MRS 6 patients

DISCUSSION:

A posterior circulation (PC) stroke is classically defined by infarction occurring within the vascular territory supplied by the vertebral

arteries, basilar artery and posterior cerebral arteries. The vertebral arteries (VAs) arise from the right and left subclavian arteries and travel cranially through the transverse foramina of the cervical vertebrae. And it joins to form the basilar artery at Ponto-medullary junction. Basilar divides into two posterior cerebral arteries PCAs in the interpeduncular fossa. Major arteries give rise to long and short circumferential branches and to smaller deep penetrating branches that supply the cerebellum, medulla, pons, midbrain, sub-thalamus, thalamus, hippocampus, and medial temporal and occipital lobes.

Occlusion of each vessel produces its own distinctive syndromes and clinical symptoms and signs. 75% of cases PCAs arise from bifurcation of the basilar artery, in 20% one has its origin from the ipsilateral internal carotid artery via posterior communicating artery, in 5% both originate from the respective ipsilateral internal carotid arteries. The topographic classification described by Caplan in the New England Medical Centre-posterior circulation registry (NEMC-PCR)[3] divides the intracranial vertebro-basilar system into proximal, middle, and distal territories.

Syndrome observed with occlusion of PCA : (1) **P1 syndrome:** midbrain, sub-thalamic and thalamic signs which are due to disease of the proximal P1 segment of the PCA or its penetrating branches (thalamogeniculate, Percheron, and posterior choroidal arteries. **P2 syndrome:** cortical temporal and occipital lobe sign due to occlusion of P2 segment distal to junction of PCA with posterior communicating artery. Large vessel atherosclerotic disease within the PC can result in thromboembolism, or less commonly, hemodynamic failure leading to ischemia [12]. A study of combined registries found large vessel atherosclerotic disease to be responsible for 35% of PC strokes and small vessel disease accounting for 13% [10]. Steno-occlusive atherosclerotic disease as an embolic source most commonly affects the PICA territory, distal BA, superior cerebellar artery (SCA), and PCA branches [13]. Ischemia due to intracranial disease may result from tissue hypo perfusion, in situ thrombosis, or artery-to-artery thromboembolism. Mild intracranial disease may have minimal effect on cerebral hemodynamic. As the stenosis increases, reflex vasodilation due to inadequate or failing collateral circulation occurs to increase cerebral blood volume (CBV) and preserve normal cerebral blood flow (CBF), and oxygen extraction fraction will increase as CBF further deteriorates. Failure of these compensatory mechanisms is known as "misery perfusion" [14]. "Tandem lesions" are commonly found in patients with VA atherosclerosis and PC stroke [13].

Approximately 40% of cerebral blood flow goes to each ICA and only 20% goes to the PC. Therefore by chance, a fifth of cardiac emboli may end up within the PC [11]. Cardiac diseases with risk for embolism include mechanical prosthetic valves, atrial fibrillation, left atrial or ventricular thrombus, myocardial infarction within 4 weeks of stroke, dilated cardiomyopathy, and infective endocarditis, mitral stenosis without atrial fibrillation, bio-prosthetic cardiac valves, and congestive heart failure. In 407 patients in the NEMC-PCR, embolism (cardiac, artery-to-artery, or both) was the most common etiology (40%) and a cardiac source of embolism was reported in 24%. Distal PC territory infarctions were most common followed by the middle territory. Vertebro-basilar dolichoectasia (VBD) refers to dilatation, elongation, and tortuosity of the BA. The anatomy is highly variable. Asymptomatic patients may be found to have VBD incidentally on neuroimaging while other patients present with vertebro-basilar territory ischemia [15]. Risk factors for VBD include male gender, increasing age, hypertension, smoking, and history of a myocardial infarction. VBD has been associated with aortic dilations, ectatic coronary arteries, Marfan syndrome, late-onset Pompe disease, autosomal dominant polycystic kidney disease, and Fabry disease [16]. The estimated 5-year complications in VBD is 17.6% for ischemic stroke, 10.3% for brainstem compression, 10.1% for TIAs, 4.7% for hemorrhagic stroke, 3.3% for hydrocephalus, and 2.6% for subarachnoid hemorrhage (SAH) [16]. Long-term prognosis may be related to VBD severity and evolutionary characteristics such as vertical elongation, lateral displacement, and diametric changes over time [15].

Cervical artery dissections (CADs) may occur spontaneously or result from major or minor cervical trauma [17]. VA dissections more frequently present with ischemia (>90%) and PICA territory strokes (lateral medullary and/or cerebellar) are common [18].

Other less common causes of ischemia with predilection for the PC circulation include subclavian steal syndrome, giant-cell arteritis, and

Fabry disease. Mitochondrial encephalopathy, lactic acidosis, and stroke like episodes (MELAS), migraines, and posterior reversible encephalopathy syndrome (PRES) also have a predilection for the PC^[12]. Reversible cerebral vasoconstriction syndrome (RCVS) should be considered in the differential diagnosis of sudden onset headache and focal neurological deficits as this may mimic PCA embolus presentation. Common presenting symptoms of PC stroke include vertigo, imbalance, unilateral limb weakness, slurred speech, double vision, headache, nausea, and vomiting. Exam findings include unilateral limb weakness, gait ataxia, limb ataxia, dysarthria, and nystagmus. Infarcts involving the proximal PC territory may cause dysphagia due to pharyngeal weakness, nausea, vomiting, and Horner's syndrome. Infarcts involving the middle territory are often associated with limb weakness and nuclear facial palsy. Distal territory infarctions are commonly associated with decreased appendicular sensory loss, lethargy, and visual field defects^[20]. Patients typically present with more than one finding and rarely have an isolated symptom or sign of PC ischemia^[21].

Kora S.A et al had stated the incidence of posterior circulation stroke is 12.3%. Incidence is more common in males. The incidence of visual disturbance was high in present study (47%). This was due to presence of more number of occipital infarcts in the present study.

Incidence of posterior circulation strokes is 11.32% which is comparable to studies conducted by Kora S.A^[22] (12.3%). Incidence is more common in males (74.25%) compared to females and this is in accordance with other studies, Kora S.A^[22]. In this study incidence of ischemic strokes is higher (69.8%) than hemorrhagic strokes and is in accordance with other studies like Uma Sunder et al^[23] and Kora S.A^[22]. Incidence of infra tentorial strokes in our study 61.38% is comparable with study by Kora S.A (63%)^[22]. Incidence of hemorrhagic strokes (30.2%) are higher than Uma et al^[23] (22%) and Kora S.A^[22] (24%) but less than that of Kavita J Rawat (36.85%)^[24]. Ischemic strokes were 69.8% which is higher than Kavita J Rawat^[24] (63.15%) but lower than Uma et al^[15] (77.6%) and Kora S.A^[22] (76%). Basilar artery thrombosis was detected only in one case.

The most common symptom in the study had been motor manifestations weakness hemiplegia along with cerebellar manifestations followed by vomiting headache, sensory disturbances, altered sensorium, and vertigo in various combinations followed by swallowing difficulties. These observations are also similar to observations in the studies Uma et al^[15], Kora S.A^[22], Kavita J Rawat^[24]

Systemic Hypertension was the most common risk factor (55.95%) which was lesser than Kavita J Rawat^[24] (60.5%) and Manmohan Mehendiratta^[25] (63.75%) but higher than all other studies Uma et al^[23] (35.5%), and Kora S.A^[22] (37%). The next common factors were diabetes mellitus, smoking, alcohol and dyslipidemia which were similar to the observation in the above compared studies Uma et al^[15], Kora S.A^[22], Kavita J Rawat^[24].

Most of the patients had nonspecific symptoms like headache, vomiting, giddiness and altered sensorium which points that high index of suspicion is needed to diagnose posterior circulation stroke.

A better outcome of MRS 0-2 in one third was due to smaller infarct size and fewer regions of involvement. A relatively worse outcome in the remaining two thirds of cases was due to larger area of infarcts and more regions of involvement in posterior circulation leading to more disability and mortality

CONCLUSION

Ischemic strokes were more common along with Infra-tentorial lesions being commoner than the supra-tentorial lesions. Although more common manifestations were of motor weakness and ataxia, symptoms like headache, vomiting, giddiness and altered sensorium, any vague dizziness, hemi-sensory loss should be viewed with suspicion to diagnose or rather not to miss a posterior circulation stroke.

LIMITATION OF STUDY

This study was conducted at a Government Tertiary care centre hence majority of patients are in poor socioeconomic status hence may not project the population data.

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