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Research Article

Clinical Characteristics of Acute Posterior Circulation Ischemic Stroke: A Hospital-Based Study at Two Stroke Centers of Cairo

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Abstract

Background and Aim: Posterior circulation stroke (PCS) is a potentially life-threatening condition and accounts for about 20–25% of all ischemic strokes. PCS are less represented in scientific literature and are more difficult to diagnose.

Aim: Describe the clinical characteristics and risk factors of posterior ischemic stroke patients presenting to two large Egyptian stroke centers.

Materials and Methods: Patients with PCS were recruited from two Egyptian stroke centers over six months. Patients were classified according to TAOST classification. They were evaluated for vascular risk factors, clinical characteristics, neuroimaging and laboratory workup.

Results: The study involved 83 patients. Fifty-seven (68.7%) were males, with a mean age of 63.59 ± 10.5 years. The median NIHSS at presentation was 6. IQR 3,10. Fifty patients (60.2%) had large arterial atherothrombosis, 20 (24.1%) small vessel disease, 9(10.8%) cardio embolism and 2 (2.4%) other rare causes. Two patients (2.4%) were classified as having a stroke of undetermined cause. The most common risk factors were Hypertension (67.1%), followed by diabetes (53%), smoking (48.14%) and dyslipidemia (3.4%). The common neurological deficits were dysarthria 71(85.5%), hemiparesis 60(74.7%), hemihypothesia 43(51.8%), Ataxia 30(36.1%), and Nystagmus 14(16.9%). Pontine infarction was the most common site in 26 (43.4%) patients followed by 6 (10%) in the medulla, 6 (10%) occipital infarctions, 4(6.7%) thalamic infarctions and 2 (3.4%) cerebellar infarctions.

Conclusions: In this Egyptian hospital-based cohort study, we found that hypertension was the most prevalent vascular risk factor, large artery disease was the most common presumed etiology of posterior circulation ischemic stroke, and middle territory involvement was the most frequent infarction location among our patients

Keywords: Posterior circulation; Ischemic stroke; Risk factors

Introduction

Stroke is globally the third leading cause of both death and disability [1,2]. Posterior circulation stroke (PCS), caused by infarction within the vertebrobasilar arterial system, is a potentially life-threatening condition and accounts for about 20–25% of all ischemic strokes [3]. These strokes are less represented in the scientific literature, are more difficult to diagnose, have a more severe clinical course and have higher mortality compared to anterior circulation strokes [4-6].

PCS is difficult to diagnose owing to the often stuttering, progressive and non-lateralizing nature of the symptoms given the vast area of blood supply and non-specific symptomatology [7], Furthermore, computed tomography (CT), is less reliable in diagnosing of PCS [8] Widely used screening protocols such as the face-arm-speech test (FAST) are less sensitive [9].

The most often used tool for determining the severity of a stroke is the National Institutes of Health Stroke Scale (NIHSS). However, it is inadequate for evaluating PCS as it cannot identify clinical features unique to the posterior circulation, including nystagmus or abnormalities in gait. Because of this limitation, the severity of PCS may be underestimated [10,11].

Current management strategies for PCS include standard medical therapy (SMT) and reperfusion therapy. SMT comprises established treatments, such as antiplatelet therapy, and anticoagulants [12] Reperfusion therapy encompasses IVT, endovascular thrombectomy (EVT), and bridging therapy [13]. In PCS, bridging therapy involves the concurrent or subsequent use of IVT and EVT to optimize treatment outcomes [14]. Although acute reperfusion therapy has become a standard practice in treating anterior circulation strokes, its

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prevalence in PCS remains inadequately elucidated [15], Regarding to new ESO guidelines, IVT for BAO is suggested up to 24 hours. EVT for BAO is suggested up to 24h for NIHSS >10. Reperfusion treatment (IVT, EVT) is suggested by MWG in absence of extensive bilateral and/or brainstem ischemic lesions [16].

It was suggested, earlier, that posterior circulation TIA and stroke were associated with a lower risk of recurrence compared to anterior circulation ischemic infarctions [9]. However, a more recent prospective natural history study have shown that PCS have a higher risk of early recurrence particularly in the first few weeks in patients with atherosclerotic large artery disease [1].

The aim of this study is to describe the demographic characteristics, risk factors, clinical presentation and radiological features of Egyptian PCS patients presenting to two high flow stroke centers in Cairo.

Methods

Study Design and Setting

This is a hospital-based cohort study conducted at two stroke centers in Cairo, Egypt: The Kasr Alainy Cairo University Hospital Stroke Center and Misr International Hospital Stroke Center. The study was conducted over a six-month period, from March to September 2024.

Study Population

We included all patients aged 18 years or older who were admitted to either center with a diagnosis of acute ischemic posterior circulation stroke or TIA. Patients were enrolled in the study if they were admitted within 72 hours of the onset of stroke. Patients with hemorrhagic stroke, and cerebral venous sinus thrombosis were excluded.

Methodology

Upon admission baseline data were collected: demographics, vascular risk factors, NIHSS, clinical characteristics, and acute treatment such as rTPA, and thrombectomy. All subjects had computerized tomography (CT) scan, and/or magnetic resonance imaging (MRI) following standard stroke protocol of both centers. Vascular imaging of the extracranial and intracranial vessels were evaluated with ultrasound followed by other vascular imaging if needed (Magnetic resonance angiography (MRA), and/or Computed Tomography Angiography (CTA)).

The stroke events were classified according to TOAST (Trial of Org 10172 in Acute Stroke Treatment) [18] Classification into five subtypes (1) large vessel atherothromboembolic (LAA), (2) cardioembolic (CE), (3) small vessel disease (SVD), (4) stroke of other determined etiology (OTH), and (5) stroke of undetermined etiology (UND), the location of the stroke was classified into the proximal, the middle, and the distal territories using the NEMC-PCR topographic classification [19].

The study was conducted following the Declaration of Helsinki and approved by the Research Ethics Committee of Cairo University, protocol code: N-176-2024.

Statistical Analysis

Data was analyzed using SPSS version 24 (IBM Corp., Armonk, NY, USA). Descriptive statistics were presented as means, standard deviations range for continuous variables, and frequencies and percentages for categorical variables.

Results

Demographics and Clinical Features

The study included 83 patients; 57 (68.7%) males and 26 (31.3%) females with a mean age of 63.59 ± 10.5 years, eight patients (9.6%) were stroke in young < 50 years old.

According to TOAST classification patients were distributed as follow; large arterial atherothrombosis, small vessel disease, cardio embolism and other rare causes stroke (n=50 (60.2%), n=20 (24.1%), n=9(10.8%), and n=2 (2.4%) respectively). Two patients (2.4%) were classified as having a stroke of undetermined cause. According to OXFORD Classification patients were subdivided into LACS 11(13.3%), POCS 70(84.3%). Two patients presented with TIA (2.4%).

The most common risk factor associated with atherosclerotic disease was Hypertension (n = 55, 66.27%), followed by diabetes (n = 44, 53%), smoking (n = 40, 48.14%) and dyslipidaemia (n = 36, 43.4%). Thirty patients (36.14%) had heart disease, the most common being ischemic heart disease 18 (21.7%), 13 patients of them had a history of stenting followed by atrial fibrillation 9(10.8%) and congestive heart failure 3(3.6%).

Other comorbidities included renal problems in 10 (12.05%) patients, SLE in 1 (1.2%), thyroid disease in 2 (2.4%) patients as shown in Table 1.

Thirty-eight patients had recurrent strokes (45,78%); eight patients had a history of old posterior circulation strokes. 31.58% reported they weren't compliant on treatment.

The median NIHSS at presentation was 6 (IQR 3,10), thirty-one patients had mild NIHSS from (1 to 4), 47 patients had moderate NIHSS range from (5 to 15), 2 patients had moderate to severe NIHSS range from (16 to 20), while 3 patients had severe NIHSS more than 20 (Figure 1).

Table 1: Demographics data and risk factors.

Characteristics	Patients Number (83)
Age in years(mean±SD)	63.59 ± 10.5
Sex (males)	57(68.7%)
Comorbidities	
Hypertension, n (%)	55(67.1%)
Diabetes, n (%)	44(53%)
Dyslipidemia, n (%)	36(43.4%).
Smoking, n (%)	40(48.14%)
Heart disease, n (%)	30(36.14%)
Previous ischemic stroke, n (%)	38(46.8%)
Renal problems, n (%)	10 (12.1%)
Thyroid disease, n (%)	2 (2.4%)

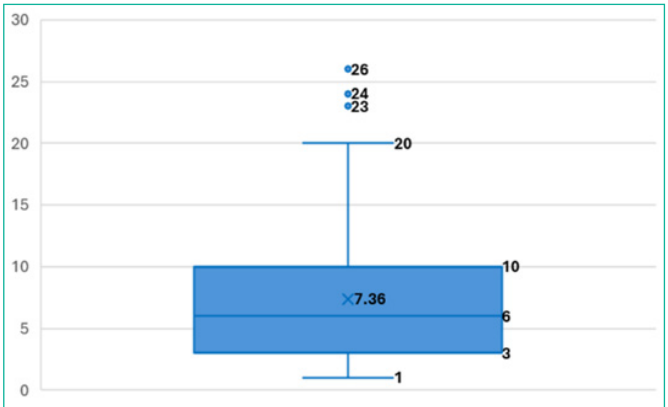

Figure 1: BOX PLOT of initial NIHSS at admission.

Table 2: Clincal Features.

Clinical Symptoms	
Dysarthria, n (%)	71(85.5%)
Hemiparesis, n (%)	60(74.7%),
Hemihypothesia, n (%)	43(51.8%),
Ataxia, n (%)	30(36.1%),
Nystagmus, n (%)	14(16.9%)
Ophthalmoplegia, n (%)	9(10.8%)
Other Cranial nerve palsy ,n(%)	60 (72.29%)
locked in n (%)	2(2.4%)
Respiratory (Brain stem origin)	3(3.6%)
Glasgow Coma Scale score (median)‡	13.988±2.16
NIHSS	
Mild NIHSS (1-4)	31
Moderate NIHSS (5-15)	47
Moderate to severe NIHSS (16-20)	2
Sever NIHSS <20	3

Initial GCS was 13.988±2.16. Only 17 patients needed admission to ICU, the most common neurological deficit at presentation was dysarthria 71(85.5%) followed by hemiparesis 60(72.2%), hemihypothesia 43(51.8%), Ataxia 30(36.1%), Nystagmus 14(16.9%) while 2 patients were locked in as shown in Table 2.

Brain Imaging and Vascular Imaging

Brain stem infarction was the most common in distribution of PCS n=41 (49.4%), Isolated pontine infarctions was the most commonly involved sites in 33 (40%) patients followed by medulla in 8 (10%). Isolated Supratentorial infarctions n=30 (36.14%) was distributed as follow occipital infarction in 11 patients (13%), thalamus 13 (16%). Only 3(4%) patients had cerebellar infarctions. Eleven patients (13.25%) presented with two or more intracerebral locations: brain stem and occipital& cerebellar or thalamic). According to NEMC-PCR majority of the infractions were in n the middle territory, followed by multiple posterior territories.

The most common stroke etiology of PCS was large vessel intracranial disease of the posterior cerebral, basilar, or vertebral arteries in 50 (60.2%) patients followed by small vessel occlusion in 20(24.1%). Basilar stenosis /occlusion was found in 18(21.9%), and mid basilar stenosis was present in 10 patients of them. The prevalence of any atherosclerosis of the vertebral artery, causing stenosis or occlusion, was 18 (21.9%) while stenosis of PICA was in 5 (6%) and only one patient had AICA occlusion as shown in Table 3.

Table 3: Vascular Imaging.

Vascular Imaging (%)	
small vessel occlusion	20(24.1%)
Basilar artery	18(21.9%)
Total BA	6
Mid/proximal BA	10
Distal BA	2
Vertebral	18(21.9%)
PICA	5(6.1%)
AICA	1(1.2%)
PCA	8(9.8%)
Carotid system	3(3.6%)
Carotid and vertebral system	3(3.6%)

Acute Management

Nineteen patients (22.89%) received thrombolytic therapy. The median door to needle time was 45 ± 34.81 minutes. The initial NIHSS before injection was 6±5 and the follow-up NIHSS after 24 hours was 5.5±4.9. Only two patients had hemorrhagic transformation post-thrombolytic.

Three patients received Thrombectomy with successful revascularization, medians of initial NIHSS and post-intervention NIHSS are 6, 2 respectively, with average door to puncture time of approximately 327 minutes.

Discussion

There is a scarcity of reliable studies on posterior ischemic stroke among Egyptian patients [20]. This is a prospective, hospital-based study involving patients admitted to either acute stroke units with posterior circulation ischemic stroke or TIA, they were consecutively enrolled over the period of six months, to evaluate the clinical characteristics of PCS in the Egyptian population.

A total of 83 patients were included in this study, median of 64 years, IQR 64, 70? how, aligning with the NEMC-PCR study that showed similar cohort age and a recent Middle Eastern large national database [19,21]. Eight patients (9.6%) were stroke in young (< 50 years) which is consistent with the prevalence of all strokes in young adults internationally [22]. As in most previous studies [19,21,23,24], this study shows male predominance (68.7%).

The most common vascular risk factor observed was hypertension 67.1%, which has been reported consistently across the posterior circulation ischemic infarction studies despite the difference in their prevalent underlying mechanism. [19,21,23-25], followed by diabetes, dyslipidemia and smoking. Only 5% of women were smokers in a total of the forty patients, which may be due to the fact that smoking is not socially accepted in Egypt for women [26,27]. A total of 38 patients (45.8%) had a prior history of cerebral ischemic events. This high percentage could be explained by the fact that most of the patients had large atherothrombosis (60.2%) which is generally associated with a higher risk of recurrent stroke [28,29]. Also, the treatment non-compliance of around third of the patients can have a role and may be explained by possible socio-economic issues (cost of the medication and awareness).

The most common stroke etiology according to TOAST criteria was Large arterial atherothrombosis (60.2%). Earlier studies reported inconsistent results; some aligned with our findings, reporting

large artery atherothrombosis as the most common stroke subtype [23,25,30], while two large cohort studies found different results. In the NEMC-PCR study, embolic stroke was the most common cause, whereas in Imam et al. (year)? study small vessel disease was the most frequent posterior circulation stroke subtype [19,21].

At presentation, the majority of patients had mild to moderate stroke severity. The median NIHSS was 6 (IQR 3,10). This comes with most studies which show a low stroke severity in PCS [21,23,31,32]. Yet, the low NIHSS scores in posterior circulation ischemic strokes might be reflecting the scale's limitations in assessing the heterogeneous posterior circulation clinical deficits [33].

Eighty-five percent (85%) of our patients had dysarthria. Kumral et al [34] found that among the subset of infratentorial lesion in patients who developed dysarthria, pontine infarction was the most common infraction site. Pontine infarction was the most prevalent location in our cohort.

The middle territory was the most prevalent location 85%, followed by multiple territories, and the least in our cohort were cerebellar infarcts, one study showed similar results Lee et al [23]. Otherwise, previous studies showed distal infarcts were the most common territory [19,21,25]. This could be attributed to racial differences, different risk factors and lifestyle. Another possible explanation is that basilar artery was the most frequent large artery involved in our cases. in Voetsch et al. (year?) basilar artery study, the most frequent location was also middle territory, Basilar artery stenosis /occlusion the most frequent affected artery, especially proximal and midpart [35].

Of the total cohort, 22 (26.5%) patients received acute stroke treatment, with 19 receiving intravenous rTPA and 3 had thrombectomy without bridging. In a previous Qatari registry only about 7% received intravenous thrombolysis [21], while other studies reported that 5-19 % of PCS receives intravenous thrombolysis [36], the two-decade-long GWTG-Stroke [37] Data have shown a progressive rise in thrombolysis, Thrombolysis rates among over a million patients presenting within 4.5 hours increased from 10%–15% to 43%–46% over the past two decades from 2003 to 2021, which may be due increased awareness with IVT, and better identification acute posterior circulation.

Limitation

Our study had limitations such as a small sample size, the study was conducted in two-stroke centers at Cairo which doesn't reflect all Egyptian population, and accompanying symptoms, that are not part of the NIHSS, weren't properly reported such as vertigo, headache, dizziness.

Declarations

Ethical Approval

The conduct of the study adhered to the Helsinki Declaration. The Research Ethical Committee at Cairo University gave their approval for this study's ethical conduct.

Patient Consent

All of the participants signed written informed consent forms.

Availability of Data and Materials

The corresponding author is reportedly willing to provide the datasets used and/or analysed during the current study upon justifiable request.

Authors' Contribution

DA &SA participated in the study design and collection of data. SA&MM contributed to the study design, data analysis, and interpretation, as well as drafting the manuscript. ED &NM contributed to the data interpretation and text drafting. HS&AA helped to draft the manuscript. AF contributed to the data interpretation and manuscript drafting. All authors reviewed and approved the final manuscript.

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