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Vertebrobasilar Occlusive Diseases in a Group of Egyptian Patients with Posterior Circulation Ischemiaat Interventional Neurology Unit Al-Hussein University Hospital

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ABSTRACT

Background: stroke is the third leading cause of long-term disability and a major cause of mortality worldwide. Eighty percent of strokes are ischemic. Twenty percent of ischemic events involve tissue supplied by the posterior (Vertebrobasilar) circulation. **Aim of the Work:** the aim of the study was to assess clinical, risk factors, etiology and vascular lesions of vertebrobasilar occlusive diseases in a sample of Egyptian patients with posterior cerebral circulation ischemia at Al-Hussein Neuro-intervention Unit. **Patients and Methods:** this study was carried out on patients presented with posterior cerebral circulation ischemia undergoing diagnostic cerebral angiography at the Neuro-interventional Unit in Neurology Department of Al -Hussein University Hospital and Bab-Alshaeria University Hospital. We studied risk factors, vascular lesions, symptoms and signs in patients with vertebrobasilar disease. **Results:** in the present study, DM was the most frequent risk factor, present in 20 patients (66.67%), followed by hypertension (19 patients [63.33%]), hyperlipidemia (14 patients [46.67%]), smoking (13 patients [43.33%]) and IHD (12 patients [40%]). **Conclusion:** early detection of stenotic lesions is highly valuable for preventing patients from recurrent TIAs and strokes. Recent improvements in imaging with application the arrival of vertebral artery angioplasty and stenting, however, have opened up new opportunities for intervention in this disease. Digital subtraction angiography is the gold standard method for diagnosis of vertebrobasilar diseases and the most sensitive for detecting intracranial and extracranial stenotic lesions.

Keywords: vertebrobasilar occlusive diseases, posterior circulation ischemiaat interventional neurology

INTRODUCTION

Stroke is the third leading cause of long-term disability and a major cause of mortality worldwide **(1).** Eighty percent of strokes are ischemic. Twenty percent of ischemic events involve tissue supplied by the posterior (vertebrobasilar) circulation.The paralysis of vertebrobasilar stroke can be devastating and some forms have high rates of death. VertebroBasilar ischemia has a variety of different vascular pathologic features at various locations and has multiple clinical courses and outcomes **(2).** Vertebral Artery stenosis may occur either extra- or intra-cranially, but it is often localized at the origin of the vessel as it arises from the subclavian artery. Proximal vertebral (V1 segment) lesions account for approximately 9% of all posterior circulation strokes **(3)**. Vertebral artery is the second most common location of stenosis after internal carotid artery stenosis at the carotid bifurcation **(4, 5)**. The most common lesion of ICVA (Intracranial vertebral artery) occlusive lesions is stenosis and the main cause of bilateral ICVA disease is atherothrombosis. The most common risk factors of vertebrobasilar disease are hypertension, hyperlipidemia, diabetes mellitus, smoking, coronary artery disease, obesity and previous stroke **(2)**. Atherosclerosis most commonly affects the origin and proximal portion of the vertebral artery and is frequently associated with similar disease in the internal carotid artery **(6).**

The most common mechanism of stroke in patients with vertebral artery stenosis is intra-arterial embolism, rather than hemodynamic failure **(7)**. Hemodynamic stroke, however, is less commonly caused by vertebral artery stenosis, because both vertebral arteries feed into one basilar artery **(8)**. Also, in contrast to the internal carotid artery, the vertebral artery gives off numerous branches at the neck region, therefore facilitating a considerable collateral blood supply, which often reconstitutes the distal artery after occlusion at the origin (9). The

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mortality associated with a vertebrobasilar circulation stroke may be as high as 30% [8, 10].Furthermore, patients experiencing vertebrobasilar transient ischemic attacks (TIAs) have a 25% to 35% risk of stroke within 5 years [11]. Patients with unilateral ICVA disease were more likely to have acute-onset strokes without preceding TIAs than patients with bilateral ICVA lesions. The most vulnerable regions for reduced perfusion in patients with ICVA disease are the lateral medulla, which is supplied by arteries that penetrate directly from the ICVA, and the PICA-supplied cerebellum. The main components of vestibulocerebellar system, the vestibular nuclei and their connections with the vestibulocerebellar structures in the cerebellar vermis, lie directly within the core of ICVA supply, explaining the frequency of vertigo and ataxia during TIAs [12]. Diagnostic methods used to identifyIntracranial atherosclerotic stenosis include transcranial Doppler ultrasound, MRA, CT angiography, conventional cerebral angiography, and high-resolution MRI. TCD, MRA, CTA, and high-resolution MRI are non-invasive methods that provide safer and less expensive ways to assess the intracranial arteries than conventional cerebral angiography; however, the accuracy of these methods is less clearly established. Even though many non-invasive diagnostic techniques for the assessment of atherosclerosis of the vertebrobasilar arterial system have been developed during the last few decades, catheter cerebral angiography, though invasive, is considered to be the gold standard for diagnosis of vertebrobasilar stenosis and still remains the major diagnostic tool in evaluating symptomatic patients. It can visualise the location and extent of obstructive lesions and the pattern of major collateral pathways between the carotid and the vertebrobasilar territories [13].

AIM of the WORK

The aim of the study was to assess clinical, risk factors, etiology and vascular lesions of vertebrobasilar occlusive diseases in a sample of Egyptian patients with posterior cerebral circulation ischemia at Al-Hussein Neuro-intervention Unit. This may give an idea about early predictive factors of outcome, which may guide diagnostic evaluation and treatment.

PATIENTS and METHODS

This study was carried out on patients presented with posterior cerebral circulation ischemia undergoing diagnostic cerebral angiography at the Neuro-interventional Unit in Neurology Department of Al -Hussein University Hospital and Bab-Alshaeria University Hospital. We studied risk factors, vascular lesions, symptoms and signs in patients with vertebrobasilar disease. We sought to clarify the distribution of infarction and the clinical courses and to correlate these with the severity and location of vertebrobasilar disease. Because all patients were treated with antiplatelet aggregants and/or anticoagulants, we cannot comment on effect of treatment. A written consent obtained from every patient or his care giver before participate in the study. **The study was approved by the Ethics Board of Al-Azhar University.**

Inclusion criteria:

We studied patients with vertebrobasilar occlusive lesions collected from patients with infarcts in the posterior circulation or definite posterior circulation transient ischemic attack (TIAs). Patients selected upon the confirmation of vertebrobasilar ischemia included detailed clinical information about symptoms and signs, stroke risk factors, results of neurologic examination, results of neuroimaging, cardiac and vascular studies. The diagnosis of posterior circulation ischemic stroke is based on rapidly developing clinical signs of focal (or occasionally global) disturbance of cerebral function, with no apparent cause other than that of vascular origin. Posterior circulation stroke is diagnosed on the basis of history and clinical examination, assisted by imaging. All patients will have brain imaging studies, computed tomography, or magnetic resonance imaging.

Exclusion criteria:

1. Patients suffering from any contraindication of the catheter angiography procedure such as severe renal impairment, inconsistent with the use of contrast material during the procedure, severe hypertension and uncorrectable coagulopathy.
2. Patients with other causes mimicking stroke (trauma, infection or an intracranial malignancy).
3. Patients who refuse to participate in the study.
4. Non Egyptian patients.

All patients were subjected to:

***1*- Full general and neurological evaluation.**

- **Personal history:** age, sex, occupation, address, marital status and special habits.
- **Present history:**
  - Onset, course and duration of presenting symptoms.
  - Other neurological manifestations: motor, sensory, cranial nerves, cranial manifestations and sphincters.
  - Other medical condition diabetes mellitus, hypertension, renal or liver disease.
- Past history: stroke or TIA.
- Family history: stroke
- General examination: pulse, BP, temperature and respiratory rate
- Neurological examination: motor, sensory, cranial nerves, cranial manifestations and sphincters

***2*- Radiological investigations for all patients:**

- Non contrast computed tomography (CT).
- Electrocardiography (ECG); transthoracic or esophageal in some cases.
- Duplex, CT angiography or MRA in some cases.
- **Diagnostic cerebralcatheter Angiography.**

***3*- Laboratory investigations for all patients:**

- RBS (Random blood sugar).
- CBC (Complete blood count).
- Lipid profile (cholesterol, triglyceride)
- Renal function (urea and creatinine).
- Liver function (SGPT and SGOTand serum Albumin).
- Serum uric acid
- ESR
- PT, PTT, INR.

***4*- Ethical considerations*:*-**

- All steps of the study explained clearly to the patient and /or care giver before participations.
- A written consent was obtained from all the participants.

***5*- All data were collected, tabulated and statistically analyzed,** classified according to site as distal, middle and proximal [14] and according to degree of stenosis as mild > 50 %, moderate 50 – 70 % and severe > 70 % [15]**.**Data were collected, revised, coded and entered to the Statistical Package for Social Science (IBM SPSS) version 23. The quantitative data were presented as mean, standard deviations and ranges when their distribution found parametric. Also qualitative variables were presented as number and percentages. So, the p-value was considered significant as the following: P > 0.05: non significant, P < 0.05: significant, P < 0.01: highly significant.

RESULTS

Table 1: degree of stenosis in relation to age

Stenosis	Age						T-Test	
	Range			Mean	±	SD	t	P-value
Moderate	30	-	63	53.333	±	10.646	-4.009	<0.001*
Severe	51	-	87	69.444	±	10.869		

There was highly statistical significant difference between degree of stenosis and age;severe stenosis was being more in old age.

Table 2: site of stenosis in relation to age

Site of stenosis	Age						T-Test	
	Range			Mean	±	SD	t	P-value
VA	30	-	87	66.238	±	13.371	2.164	0.039*
BA	33	-	70	55.444	±	10.088		

There was a statistical significant difference between site of stenosis and age, VA stenosis was being more in older age than BA.

Table 3: comparison between degree of stenosis and risk factors

		Stenosis						Chi-Square	
		Moderate		Severe		Total			
		N	%	N	%	N	%	X^2	P-value
HTN	**Yes**	5	41.67	14	77.78	19	63.33	4.043	0.044*
	No	7	58.33	4	22.22	11	36.67		
AF	**Yes**	0	0.00	2	11.11	2	6.67	1.429	0.232
	No	12	100.00	16	88.89	28	93.33		
DM	**Yes**	8	66.67	12	66.67	20	66.67	0.000	1.000
	No	4	33.33	6	33.33	10	33.33		
IHD	**Yes**	1	8.33	11	61.11	12	40.00	8.356	0.004*
	No	11	91.67	7	38.89	18	60.00		
Hyperlipidemia	**Yes**	5	41.67	9	50.00	14	46.67	0.201	0.654
	No	7	58.33	9	50.00	16	53.33		
Smoking	**Yes**	7	58.33	6	33.33	13	43.33	1.833	0.176
	No	5	41.67	12	66.67	17	56.67		
HF	**Yes**	0	0.00	2	11.11	2	6.67	1.429	0.232
	No	12	100.00	16	88.89	28	93.33		

There was a highly statistical significant difference between degree of stenosis and risk factors as regard stenosis was being more in HTN and IHD. There was no statistical significant difference of other risk factors.

Table 4: comparison between degree of stenosis and clinical presentation in the studied patients

Main presentation	Stenosis						Chi-Square	
	Moderate		Severe		Total			
	N	%	N	%	N	%	X^2	P-value
Vertigo	10	83.33	17	94.44	27	90.00	0.988	0.320
Ataxia	10	83.33	17	94.44	27	90.00	0.988	0.320
Motor weakness	9	75.00	17	94.44	26	86.67	2.356	0.125
Vomiting	7	58.33	6	33.33	13	43.33	1.833	0.176
Headache	4	33.33	5	27.78	9	30.00	0.106	0.745
Cranial Neuropathy	10	83.33	18	100.00	28	93.33	3.214	0.073
Dysphagia	7	58.33	14	77.78	21	70.00	1.296	0.255
Visual symptoms	6	50.00	15	83.33	21	70.00	3.810	0.051*

There was a statistical significant difference between degree of stenosis and main presentation as regard visual symptom is being more in severe stenosis than moderate stenosis. There was no statistical significant difference of other main presentations.

Table 5: comparison between degree of stenosis and TIAs in the studied patients

TIA	Stenosis						Chi-Square	
	Moderate		Severe		Total			
	N	%	N	%	N	%	X^2	P-value
No	8	66.67	3	16.67	11	36.67	8.302	0.016*
One	2	16.67	4	22.22	6	20.00		
Two (recurrent)	2	16.67	11	61.11	13	43.33		
Total	12	100.00	18	100.00	30	100.00		

There was highly statistical significant difference between degree of stenosis and TIAs as regard TIAs was being more in severe stenosis than moderate stenosis.

Table 6: comparison between degree of stenosis and stroke alone or stroke and TIAs in the studied patients

Stroke and TIA	Stenosis						Chi-Square	
	Moderate		Severe		Total			
	N	%	N	%	N	%	X^2	P-value
Stroke	8	66.67	3	16.67	11	36.67	7.751	0.005*
Stroke and TIA	4	33.33	15	83.33	19	63.33		
Total	12	100.00	18	100.00	30	100.00		

There was highly statistical significant difference between degree of stenosis and stroke alone or stroke and TIAs as regard stroke and TIAs is being more in severe stenosis than moderate stenosis.

Table 7: comparison between site of stenosis and TIAs in the studied patients

TIA	Site of stenosis						Chi-Square	
	VA		BA		Total			
	N	%	N	%	N	%	X^2	P-value
No	3	14.29	8	88.89	11	36.67	15.642	<0.001*
One	5	23.81	1	11.11	6	20.00		
Two (recurrent)	13	61.90	0	0.00	13	43.33		
Total	21	100.00	9	100.00	30	100.00		

There was a highly statistical significant difference between site of stenosis and TIAs as regard TIAs was being more in VA stenosis than BA stenosis and also recurrence of TIAs more in VA stenosis.

Table 8: comparison between site of stenosis and stroke alone, stroke and TIAs in the studied patients

Stroke and TIA	Site of stenosis						Chi-Square	
	VA		BA		Total			
	N	%	N	%	N	%	X^2	P-value
Stroke	3	14.29	8	88.89	11	36.67	15.099	<0.001*
Stroke and TIA	18	85.71	1	11.11	19	63.33		
Total	21	100.00	9	100.00	30	100.00		

There was highly statistical significant difference between site of stenosis and stroke alone, stroke and TIAs as regard stroke was being more in BA stenosis than VA stenosis, but stroke and TIAs were being more in VA stenosis than BA stenosis.

Table 9: comparison between site of stenosis and distribution of stenosis in the studied patients

Distribution of stenosis	Site of stenosis						Chi-Square	
	VA		BA		Total			
	N	%	N	%	N	%	X^2	P-value
Ostium	13	61.90	0	0.00	13	43.33	30.000	<0.001*
V1	3	14.29	0	0.00	3	10.00		
V2	1	4.76	0	0.00	1	3.33		
V4	4	19.05	0	0.00	4	13.33		
Proximal segment	0	0.00	6	66.67	6	20.00		
Middle segment	0	0.00	3	33.33	3	10.00		
Total	21	100.00	9	100.00	30	100.00		

There was a highly statistical significant difference between site of stenosis and distribution of stenosis as regard ostium stenosis is being more in VA stenosis than V1, V2 and V4 while, proximal segment stenosis was being more in BA stenosis than middle segment.

Table 10: comparison between site of stenosis and distribution of stenosis as ECVA, ICVA and BA

Distribution of stenosis	Site of stenosis						Chi-Square	
	VA		BA		Total			
	N	%	N	%	N	%	X^2	P-value
ECVA	17	80.95	0	0.00	17	56.67	30.000	<0.001*
ICVA	4	19.05	0	0.00	4	13.33		
BA	0	0.00	9	100.00	9	30.00		
Total	21	100.00	9	100.00	30	100.00		

There was highly statistical significant difference between site of stenosis and distribution of stenosis as regard ECVA was being more in VA stenosis than ICVA and ECVA stenosis is being more than BA stenosis.

Table 11: comparison between distribution of stenosis as (ECVA, ICVA and BA) and TIA in the studied patients

TIA	Distribution of stenosis								Chi-Square	
	ECVA		ICVA		BA		Total			
	N	%	N	%	N	%	N	%	X^2	P-value
No	1	5.88	2	50.00	8	88.89	11	36.67	18.918	0.001*
One	4	23.53	1	25.00	1	11.11	6	20.00		
Two (recurren)	12	70.59	1	25.00	0	0.00	13	43.33		
Total	17	100.00	4	100.00	9	100.00	30	100.00		

There was a highly statistical significant difference between distribution of stenosis as (ECVA, ICVA and BA) and TIA as regard TIA was being more in ECVA.

DISCUSSION

We described 30 patients with Vertebrobasilar occlusive with respect to risk factors, etiology, clinical course, symptoms and signs, localization and distribution of vertebrobasilar lesions. Vertebrobasilar insufficiency (VBI) is probably an under diagnosed clinical condition because patients often have nonspecific symptoms. With new noninvasive techniques (Duplex scan, MRI, MRA, CT scan, CTA), the diagnosis has become easier and a stenosis of the VA was more and more suspected, leading to DSA, which remains the main technique to confirm the presence of a lesion in the VA territory. Imaging of the posterior circulation requires evaluation of the vertebral artery and basilar artery and its major branches. Ideally, assessment of the vertebral arteries includes views of the subclavian arteries and vertebral origins, the cervical segments, and the intracranial segments to their junction with the basilar artery. In our study, Age ranged from 30 to 87 years (mean, 63 years), 18 men (60%) and 12 women (40%), this is in agreement with results of **Prabowo *et al.*** [16] who showed that the mean age of 62 years was 60.4% I male and 39.6% in female. Also, this is near to results of **Bash *et al.*** [17] who showed that age range was 24-79 years, with a mean age of 58 years and the female-to-male ratio was 12:16 (43:57%).However, in the study of **Yan *et al.*** [18] in their studies means of ages were 56, 68.2, 68, 65.9, 68, 67.2 and 72.1 years respectively. The presence of patients with different age may be explained by the difference in vascular risk factors between them and current study, for example the presence of patients with younger age in the **Cloud *et al.*** [19] study may be explained by the difference in vascular risk factors between the current study and it, the frequency of hyperlipidemia, hypertension and smoking is more in it than the current study, the frequency of diabetes mellitus is equal or slightly higher than the current study. There was highly statistical significant difference between degree of stenosis and age; severe stenosis was being more in old age and statistical significant difference between site of stenosis and age, VA stenosis is being more in older age than BA, this is in agreement with results of **Voetsch *et al.*** [15] included older patients as part of widespread posterior circulation atherosclerosis.In the study of **Rawat *et al.*** [20] who showed Stroke occurs in relatively younger people in developing countries. In this study, only 3 patients (3.75%) were older than 75 years, while in **NEMC-PCR** 27.7% of patients were in age group ranging more than 75 years. Lower life expectancy in Indian population compared to the Western world (66.46 vs 78.24 years) could be the explanation for this difference.In the present study, 16 (53.33%) patients were obese and 14 (46.67%) were non-obese. We found no statistical significant difference between degree of stenosis and BMI as obese and non-obese in agreement with results **Li *et al.*** [25] **and Zhang *et al.*** [26]**.**In the present study, DM was the most frequent risk factor, present in 20 patients (66.67%), followed by hypertension (19 patients [63.33%]), hyperlipidemia (14 patients [46.67%]), smoking (13 patients [43.33%]) and IHD (12 patients [40%]). DM as most risk factor in our study may be explained by Steady increase in the incidence of type 2 diabetes mellitus (T2DM) related to adverse eating habits, obesity and inadequate physical activity resulted in an exponential rise in diabetes-related cardiovascular morbidity worldwide in recent years that is in agreement with results of **Tun *et al.*** [27]**.**Vasculopathy induced by chronic hyperglycaemia related endothelial damage

results in acceleration of atherosclerosis inherent to diabetes. Therefore, higher prevalence and incidence of cardiovascular disease including stroke are common in the diabetic population. Being a disease mainly associated with lifestyle, patients with T2DM usually have additional risk factors for stroke such as obesity, hypertension and dyslipidaemia that multiplies the vascular risk in these patients that is in agreement with results of **Dutton *et al.*** [28]**.**In study of **Shin *et al.*** [2] patients usually have multiple stroke risk factors, hypertension and hyperlipidemia were more frequent in patients.In our study, the percent of DM as most risk factor than HTN as second risk factors was near whereas DM present in 20 patients and hypertension in 19 patients and in study of **Ichikawa *et al.*** [21] who showed DM patients had significantly less frequent atrial fibrillation and more frequent hypertension, vertebrobasilar lesions were found in 73 of the 275 DM patients (26.5%) and in 76 of the 751 non-DM patients (10.1%) which indicated a 2.6 fold higher prevalence in DM patients. Risk factors as HTN, DM and hyperlipidemia were more in BA stenosis while IHD, smoking and HF were more in ICVA stenosis and AF was more in ECVA this was in agreement with results of **Harrigan and Deveikis** [22] who showed hypertension was present in up to 75% of patients with intracranial stenosis. Diabetes, coronary artery disease, cigarette smoking and hypercholesterolemia were also strongly associated.

In our study, the most common symptoms and clinical signs were cranial neuropathy (28 patients [93%]), vertigo (27 patients [90%]), ataxia (27 patients [90%]) and weakness (26 patients [86.67%]), this is in agreement with results of **Voetsch *et al.*** [15] who showed bulbar and pseudobalbar signs, cerebellar signs and vertigo were most common. Bulbar / pseudobalbar signs were 64 patients [73.6%], vertigo/dizziness 47 patients [54%], cerebellar signs 43 patients [49, 4%] and nausea 30 patients [34.5%].However, in study of **Rawat *et al.*** [20] who showed most common presenting feature of posterior circulation was ataxia (77.3%) followed by vertigo (62.6%), headache (58.33%), vomiting (54.16%), speech disturbance (54.16%), motor disturbance (29.16%), visual disturbance (20.83%), sensory disturbance (16.6%). **Nouh *et al.*** [23] **and Caplan *et al.*** [24] showed dizziness or vertigo was47%, limb weakness was 38%, dysarthria was 31%, ataxia was 31% and nausea or vomiting was 27%. **Savitz *et al.*** [29] showed that the most common signs were limb weakness, gait and limb ataxia, oculomotor palsies and oropharyngeal dysfunction. **Savitz *et al.*** [29]***;*** **Caplan** [24]**and Caplan** [9] showed that only 7 percent of the 407 patients in this series described light headache, vertigo was the most common clinical presentation in study of **Mehndiratta e*t al.*** [30] and study of **Shi *et al.*** [31] who demonstrated a relatively higher percentage of patients with motor weakness (81.9%).Among 21 stenotic lesions of VA we had 15 lesions (71.43%) in left VA, 5 lesions (23.81%) in right VA and 1 patient (4.76%) had bilateral lesions in both right and left VA. Severe stenosis was more in left side than right side this is in agreement with results of **Harrigan and Deveikis** [22]; **Cloud and Markus** [32] and **Hass *et al.*** [5] who showed in an angiographic series of 4728 patients with ischemic stroke, some degree of extracranial stenosis was seen in 18% of cases on the right and 22.3% on the left. The left vertebral was dominant approximately 50% and the right in 25% and only in the remaining quarter of cases were the two vertebral arteries of similar caliber. In our study, there is highly statistical significant difference between degree of stenosis and TIAs as regard TIAs is being more in severe stenosis than moderate stenosis, highly statistical significant difference between degree of stenosis and stroke alone or stroke and TIAs as regard stroke and TIAs was being more in severe stenosis than moderate stenosis. In study of **Shin *et al.*** [2], transient ischemic attacks were noted by 81% of patients; 38% had only TIAs, whereas the others had TIAs before and after strokes. There was a highly statistical significant difference between distribution of stenosis as (ECVA, ICVA and BA) and stroke alone, stroke and TIAs as regard stroke alone is being more in BA stenosis while stroke and TIA are being more in ECVA stenosis. In our study, stenosis was more in ECVA than other sites and also severe stenosis is more in ECVA.The basilar artery was the major vessel of concern in vertebrobasilar ischemia, this disagrees with our study and another study of **Voetsch *et al.*** [15] who showed that the ICVAs were most often involved in association with the BA, followed by the ECVAs.Among 21 stenotic lesions of VA; we had 13 lesions (43.33%) in ostium, 3

lesions (10%) in V1, 1 lesion (3.33%) in V2, 4 lesions (13.33%) in V4 and among 9 stenotic lesions of BA; we had 6 lesions (20%) in the proximal segment and 3 lesions (10%) in the middle segment.The VA lesion was most often located in ostium (13) lesions (43.33%) followed by V4 (4) lesions (13.33%) and the BA lesion was most often located in proximal segment (6) lesions (20%) followed by middle segment (3) lesions (10%). In the current study, the lesions distribution in the vertebral artery, were located at the ostium of the artery in 43.33% and this is consistent with study of **Henry *et al.*** [(11)] who reported 92 % of patients at the ostium and this can be explained by that in case of vertebrobasilar ischemia are due to distal embolization of plaques or lesions of the subclavian, and the ostium part of VA is a small segment that originates from significant large artery lead to encroaching of subclavian plaque on the orifice of the VA.

There was highly statistical significant difference between distribution of stenosis as (ECVA, ICVA and BA) and different sites of stenosis as regard stenosis was being more in ostium in ECVA stenosis and stenosis is being more in proximal segment in BA stenosis.

Atherosclerosis can also occur in the distal vertebral and basilar artery. **Nouh *et al.*** [(23)] **and Caplan *et al.*** [(24)] showed that the most common locations of VA atherostenosis were the V1 and V4 segment, the most common intracranial a site of atherostenosis in the BA, arteriosclerotic changes at the origin of the vertebral artery were the most frequent finding in patient with a clinical diagnosis in the vertebrobasilar [(32).] **Cloud and Markus** [(32)] showed that stenotic, particularly at the origin of the vertebral artery, were not uncommon. This was the second most common site of stenosis after internal carotid artery stenosis at the carotid bifurcation. The Cleveland clinic, this was a prospective collection of 96 cases of angiographically-proven vertebral artery stenosis of ≥50%, of which 89 had stenosis at the origin, and eight had intracranial vertebral or basilar artery disease.

CONCLUSION

From the present study we concluded that:

- Early detection of stenotic lesions is highly valuable for preventing patients from recurrent TIAs and strokes.
- Recent improvements in imaging with application the arrival of vertebral artery angioplasty and stenting, however, have opened up new opportunities for intervention in this disease.
- Digital subtraction angiography is the gold standard method for diagnosis of Vertebrobasilar diseases and the most sensitive for detecting intracranial and extracranial stenotic lesions.
- Catheter cerebral angiography provides high resolution images of extracranial and intracranial vessels that help in planning endovascular procedures and could potentially reduce the procedural time.

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