Carotid Stenosis and Recurrence in Patients with First Ever Ischemic Stroke

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ABSTRACT

Background: Stroke is the most leading cause of death and third leading cause of adult disability worldwide. There are many risk factors for stroke, which are also responsible for stroke recurrence. Sometimes Carotid stenosis may be a source of ischemic stroke. If carotid stenosis is found in ischemic stroke patients, recurrence of stroke may be reduced by carotid endarterectomy or endovascular stenting with or without angioplasty. The study was aimed to find out the frequency of carotid lesion among first ever ischemic stroke patients and its association with recurrence of stroke.

Materials and methods: This was a prospective cohort study conducted at inpatient Department of Neurology in Bangabandhu Sheikh Mujib Medical University Hospital for one year (2019-2020). We selected 150 patients with first episode of ischemic stroke. Ischemic stroke was confirmed by brain imaging and duplex study of carotid vessels carried out for all participating patients. After one year recurrence of ischemic stroke was diagnosed by deterioration of modified Rankin scaleand confirmed by imaging.

Results: 150 patients were included. Carotid stenosis was detected in 47.3% (n = 71) patients. At the end of one year 30 (20%) patients had recurrent stroke. Twenty (66.7%) of them had carotid stenosis. There was significant variation in rate of recurrence of stroke among patients with carotid stenosis (28.2%, n = 20) than those without stenosis (12.7%, n =10). Eight patients who had recurrent stroke died. There were also many other modifiable risk factors in ischemic stroke patients. Among them hypertension was the most common risk factors (70.7%) followed by diabetes (50%).

Conclusion: After first episode of ischemic stroke, recurrence events were more in patients with carotid stenosis. Proper therapeutic approach may be taken to reduce the recurrence.

Key words: Stroke; Recurrence; Risk factors.

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INTRODUCTION

The most common cause of carotid artery stenosis is atherosclerosis. When stenosis of carotid arteries >50%, it is associated with significant risk of stroke[1]. Carotid artery atherosclerosis is one of the most important predictors of ischemic stroke[2].

There are many noninvasive and invasive tools to diagnose carotid artery stenosis.

Future ischemic stroke can be reduced by early commencement of treatment and adopting preventive strategies. Doppler ultrasound stands out as a non-invasive, safe and cost-effective modality of evaluation of carotid arteries stenosis[2-4]. It carries 96% sensitivity and 86% specificity. It has positive predictive value of 89% and negative predictive value of 94%. Its accuracy increases with increasing stenosis. It is 91% accurate with any degree of stenosis greater than 50%[5]. Ultrasound grading of carotid artery

stenosis is operator dependent and may vary among laboratories[6-12]. Color doppler ultrasound is also helpful in some cases and may be followed by cerebral Digital Subtraction Angiogram (DSA)[13]. Cerebral DSA is gold standard for carotid stenosis diagnosis. It carries complication rate varying between 0.3 to 5.2%[14]. Fatal events associated with carotid artery stenosis demands for its screening in symptomatic as well as asymptomatic individuals. Mean annual stroke rate was 6% in symptomatic patients and 2% in asymptomatic patients[15]. Doppler ultrasound can be used for screening whereas cerebral DSA is used in high risk patients for diagnosis and endovascular treatment[16].

Regular follow up of risk factors can help to reduce stroke[14]. Ultrasonography is cost effective than cerebral DSA in initial screening of carotid artery atherosclerosis[16]. Current evidence doesnot support routine use of angiography in asymptomatic patients however doppler ultrasonography can be easily performed with good results[16].

Many studies were done for modifiable and non-modifiable risk factors for ischemic stroke. But there was scanty data in home and abroad about recurrence of stroke who had carotid stenosis. The aim of this study was to evaluate the risk of recurrent stroke among patients with first ever event of ischemic stroke who had concomitant carotid stenosis.

MATERIALS AND METHODS

This prospective cohort study was done on patients admitted with the first ever episode of ischemic stroke in the inpatient Neurology Department of Bangabandhu Sheikh Mujib Medical University (BSMMU) Dhaka, Bangladesh, from March 2019 to March 2020. Total 162 patients with first event of ischemic stroke were initially selected purposivelyfor study, but due to cognitive impairment after stroke seven patients were excluded, further five patients were excluded from the study due to noncompliance in annual follow up. So total of 150 patients were studied for recurrence of ischemic stroke. Ischemic stroke was confirmed with brain imaging and duplex study of carotid vessels was used to diagnose carotid stenosis. All patients give follow up for recurrence after one year by measuring Modified Rankin scale (mRS) comparing with the previous status. Deterioration of any index case in mRS scale from previous status was recorded as recurrence.

Statistical analysis was done by using statistical soft ware SPSS 21.0, SPSS Inc, Chicago, USA. Continuous variables was expressed as mean ± SD. Qualitative data was analyzed by chi-square test and quantitative data by unpaired t test. p value < 0.05 was considered as statistically significant.

RESULTS

Total of 150 patients were included in this study. Male were 53.3% (n = 80) and female 46.7% (n = 70). Mean age of the patient's was 60.99 ± 10.95 years (Range 35 to 85 years). Most (34%) of the ischemic stroke patients belonged to the 56 to 65 years age group (Table I).

Hypertension was the most common risk factors (70.7%) followed by diabetes mellitus (50%).

Seventy one (47.3%) of the first time ischemic stroke patients had carotid stenosis and 79 (52.7%) did not. After one year 30 (20%) patients had recurrent stroke. Twenty of them (66.7%) had prior carotid stenosis. Among those who had some degree of carotid stenosis, 20 patients (28.2%) had recurrent stroke after one year follow up. Whereas among those patients who had no carotid stenosis 10 (12.7%) had recurrent stroke (Table II). The difference was statistically significant (p = 0.01).

Patients who had carotid stenosis, bilateral involvement was most common (n = 65, 91.5%). This pattern was also frequent among both male (n = 37, 88.1%) and female (n= 28, 96.6%) (Table III).

There was no statistically significant difference (p = 0.77) in rate of recurrence of stroke with right, left or both sided carotid stenosis (Table IV). Similarly, degree of stenosis of carotid artery did not result in significant variation (p = 0.99) in recurrence of stroke (Table V).

Eight patients who had recurrent stroke died. Thus case fatality rate was 26.7% in recurrent stroke.

Table I : Distribution of the patients according to age (n = 150).

Age (Years)	n	%
45	15	10.0
46 -55	35	23.3
56 -65	51	34.0
66 -75	40	26.7
> 75	9	6.0

Table II: Relation of carotid stenosis with recurrent ischemic stroke.

Carotid stenosis		Recurrence		p
	n	Yes	No	
Present	71	20 (28.2)	51 (71.8)	
Absent	79	10 (12.7)	69 (87.3)	0.018
		30 (20.0)	120 (80.0)	

Figure within brackets indicates percentages.

Table III: Carotid artery involvement pattern (n = 71).

Involvement pattern	Gender			
	Male		Female	
	n	%	n	%
Right carotid artery (n = 2)	2	4.8	-	-
Left carotid artery (n = 4)	3	7.1	1	3.4
Both carotid artery (n = 65)	37	88.1	28	96.6

Table IV: Comparison of recurrence of stroke by carotid artery involvement pattern.

Involvement pattern of carotid arteries	n	Recurrence		p
		n	%	
Right carotid artery	2	1	50.0	
Left carotid artery	4	1	25.0	0.77
Both carotid artery	65	18	27.7	

Table V: Comparison of recurrence of stroke by severity of carotid stenosis (n = 65).

Degree of stenosis	n	Recurrence		p
		n	%	
Mild (< 50%)	59	16	27.1	
Moderate (50 - 70%)	9	3	33.3	0.90
Severe (> 70%)	3	1	33.3	

DISCUSSION

This study showed the higher recurrence of ischemic stroke event in patients who had carotid stenosis within one year after first ever stroke. Within one year follow up 28.2 % patients who had carotid stenosis suffered from an ischemic stroke recurrence. This was statistically significant (p = 0.01). Among 150 patients of ischemic stroke 71(47.3%) patients had some degree of carotid stenosis. Seventy one patients who had carotid stenosis 65 (91.5%) had bilateral involvement. In the first several years after a stroke, the most common vascular event is another stroke[17]. The risk of further stroke may be as high as 5% within the first week and 20% within the first month[18].

During the last several decades, numerous studies identified the relationship between carotid atherosclerosis and recurrent cerebral infarction[19-22]. Touboul et al found, using systematic screening, that 45% of stroke patients had carotid atherosclerosis[20]. This is correlated with this study. Nagai et al showed that, in addition to advanced stenosis, earlier stages of carotid atherosclerosis are associated with the increased risk for stroke[21]. Clinical usefulness of carotid ultrasound could also improve stroke risk assessment[22]. This study also showed among 71 patients who had carotid stenosis 59 patients had < 50% stenosis.

During one year follow up of first ever ischemic stroke patients, 8 patients (5.3%) died with recurrent stroke. Case fatality rate in our cohorts was 26.7%. One study showed case fatality rate was 31.8%[23].

The mean age of stroke onset was 60.99 ± 10.95 years. Though most of the ischemic stroke patients were 56-65 years group, among them 21.6% patients developed recurrence. Maximum patients who developed recurrence of stroke were from > 75 years age group which was 44.4%. Recurrence rate of stroke did not differ significantly by gender (Male 21.2% Vs female 18.6%) . This male predominant recurrence of stroke was similar with the Framingham study[24].

There were also many modifiable risk factors other than carotid stenosis. In this study hypertension was the most common risk factor (70.7%) followed by diabetes (50%) among ischemic stroke patients. Several prior studies have showed hypertension was associated with a higher risk of stroke recurrence[25,26]. DM was the second most common risk factors in this study. About 50% stroke patients has been suffering from DM. Similarly, patients with diabetes had an increased risk of stroke recurrence in several stroke cohorts studied by Hier et al, Alter et al, and Olsson et al but not by Viitanen et al [26-29].

CONCLUSION

Overall, our study demonstrated that the incidence of carotid atherosclerosis in patients with recurrent cerebral infarction was higher than that in first-ever cases, suggesting the need to focus on the role of carotid atherosclerosis in the development of acute stroke.

Ischemic stroke patients with carotid stenosis have a higher chance of stroke recurrence. So appropriate measures should be taken to reduce the recurrence.

DISCLOSURE

All the authors declared no competing interest.

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