

Original Article

Digital subtraction angiography evaluation of extracranial and intracranial atherosclerotic arterial stenosis in patients of ischemic stroke with diabetes mellitus

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Abstract

Stroke is a medical emergency and can cause permanent neurological damage, even death. An ischemic stroke typically results from blockage of an artery that supplies the brain, most commonly a branch of one of the internal carotid arteries. In diabetic people, atheromatous lesions occur earlier in life and are more extensive and severe. This retrospective observational study was conducted among the patients having ischemic stroke with diabetes mellitus who were admitted in DMCH through out patient department during March 2010 to February 2011 to evaluate the extracranial and intracranial atherosclerotic arterial stenosis. A total of 30 patients with ischemic stroke and diabetes mellitus were included in the study. CT scan was done to every patient to confirm the diagnosis. Digital subtraction angiography was performed for complete evaluation. The mean age was 57.9 ± 9.2 years with range from 43 to 80 years and male female ratio was 29:1. Among the 30 diabetic patients with ischemic stroke evaluated by DSA, 70% had extracranial stenosis where as 30 % had intracranial stenosis. Occurrence of extracranial atherosclerotic stenosis is more than intracranial atherosclerotic stenosis in ischemic stroke patients among diabetic population of Bangladesh.

Key words: Angiography, stroke, diabetes mellitus, ischemic, artery, stenosis

Introduction

Stroke is a medical emergency and can cause permanent neurological damage, even death. It is the leading cause of adult disability in the United States & Europe and second leading cause of death worldwide.¹ The incidence and mortality rate due to stroke is higher in Asians than that in Whites. Risk factors for stroke include diabetes mellitus, advanced age, hypertension, previous stroke or transient ischemic attack (TIA), high cholesterol, cigarette smoking and atrial fibrillation.^{2,3} An ischemic stroke typically results from blockage of an artery that supplies the brain, most commonly a branch of one of the internal carotid arteries. Commonly, blockages are blood clots (thrombi) or pieces of fatty deposits (atheromas or plaques) due to atherosclerosis.⁴ The pathological changes associated with atherosclerosis are several-fold more frequent in person with diabetes. In diabetic people, atheromatous lesions occur earlier in life and are more extensive and severe.⁵ It is now well established that atherosclerotic disease (atheroma) is a strong and independent risk factor for ischemic stroke. The thickness of the atheroma and its morphology (protruding, ulcerated, calcified or mobile plaque) are both strongly related to increased risk of ischemic stroke. Plaques >4 mm thick are presumed to be of very high risk. Thus, the burden of atherosclerotic disease has been directly implicated in the increased risk for ischemic stroke. Intracranial carotid lesions are reported to be more common than extracranial carotid lesions among Japanese, Korean, Chinese and African-American as documented by angiographic and autopsy studies in stroke patients, which is in sharp contrast to the pattern of cerebral atherosclerosis in whites.^{6,7,8} This study aimed to evaluate distribution of intracranial and extracranial atherosclerotic arterial stenosis in patients of ischemic stroke with diabetes mellitus by digital subtraction angiography (DSA). Though it is invasive, relatively costly and uses radio contrast dye. This will also evaluate the relationship of diabetes mellitus with intracranial and extracranial atherosclerotic arterial stenosis in ischemic stroke patients. This study will help the patient of ischemic stroke with diabetes mellitus in Bangladesh regarding their etiological evaluation with management.

Methods

This retrospective observational study was carried out with an aim to evaluate the extracranial and intracranial atherosclerotic arterial stenosis by digital subtraction angiography in 30 consecutive patients of ischemic stroke with diabetes mellitus who attended in the out-patient department of Neurology, Dhaka Medical College Hospital (DMCH) during the period of March 2010 to February 2011. Adult patients with age more than 40 years and of both gender who were diabetic and having

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ischemic stroke confirmed by CT scan and ischemic stroke patient whose carotid duplex study shows $\geq 50\%$ stenosis of extracranial carotid artery were included for the study. Hemorrhagic stroke, non-diabetic patients, mixed type stenosis (both extracranial and intracranial stenosis) evaluated by DSA, patients who did not give consent to take part in the study were excluded. Written informed consent was obtained from each patient and study protocol was approved by institutional ethical committee. Statistical analysis was performed using SPSS program. Data was defined as mean (\pm standard deviation), frequency distribution and percentage. P values <0.05 was considered to be statistically significant.

Results

The mean (\pm SD) age was 57.9 ± 9.2 years with range from 43 to 80 years and male female ratio was 29:1 (Table-I).

Table-I: Distribution of the respondents age by group (n=30)

	Number of patients	Percentage
Age (in years)	(n=30)	
41 – 50	8	26.7
51 – 60	11	36.7
61 – 70	10	33.3
71 – 80	1	3.3
Mean \pm SD	57.9 ± 9.2	
Range	43-80	

Among the 30 diabetic patients with ischemic stroke evaluated by DSA, 70% had extracranial stenosis where as 30 % had intracranial stenosis (Table-II).

Table-II: Number of the respondents' according to the type of stenosis (Extracranial / Intracranial)

Total No of respondents	Extracranial Stenosis		Intracranial Stenosis		Z value	P value
	N	%	N	%		
30	21	70	9	30	3.38	0.001 ^s

N= number of observation

Discussion

Risk factors more commonly observed for stroke in this study were IHD, dyslipidaemia, history of TIA, hypertension, obesity and smoking. A study in Hong Kong observed similar risk factors including hypertension (71.0%), smoking (38.7%), previous history of stroke (51.6%) and IHD (19.4%).⁹ Another study reported hypertension and diabetes mellitus as risk factors associated only with intracranial atherosclerosis ($p < 0.001$), whereas ischemic heart disease was associated with atherosclerosis in both the intracranial and extracranial vessels.¹⁰ Smoking was associated with narrowing of the extracranial vessels only ($p = 0.001$).

A study on Korean patients showed diabetes mellitus as only significant factor associated with combined intracranial atherosclerosis and extracranial carotid artery disease.¹¹ These findings are comparable with the present study regarding the risk factors. Most of the patients had uncontrolled diabetes mellitus in this study. Data from the Northern Manhattan

stroke study reported that patients with intracranial atherosclerosis had a higher prevalence of diabetes (67%) when compared to those with extracranial atherosclerosis or non-atherosclerotic (60% and 48% respectively).¹²

Among 30 patients with ischemic stroke, 21 patients showed extracranial stenosis and 9 patients showed intracranial stenosis. So In this series, DSA evaluation showed significantly higher extracranial stenosis (70.0%) than intracranial stenosis (30.0%). In another study it found 92.0% extracranial stenosis.¹³ Study on Korean patient with stroke found that 59.0% patients had extracranial stenosis and 41.0% had intracranial stenosis.¹⁴ Almost similar findings were obtained in two other separate studies.^{15,16} Extracranial stenosis is more common than intracranial stenosis among ischemic stroke patients who suffered from ischemic stroke in Bangladesh.

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