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Original Research Article

Carotid intima media thickness in type 2 diabetes mellitus with ischemic cerebrovascular stroke and its utility as a marker for predicting cerebrovascular disease

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ABSTRACT

Background: In India, the national prevalence of diabetes mellitus (DM) is estimated at 18.2%. More than half of all diabetic deaths are accounted for by atherosclerotic disease leading to cardiovascular or cerebral complications. Intima media thickness (IMT), a measure of atherosclerotic vascular disease. It can easily be measured especially at the carotids by B mode ultrasonography, a relatively simple way representing a safe, precise, and reproducible measure. It has therefore been proposed as a non-invasive measure of predicting chances of cerebrovascular disease burden in adults.
Methods: A total of 60 subjects in the age group of 30-75 years (M:F=37:23) were selected and divided into three groups, group C: Patients of either sex in the age group of 30-75 years with type 2 DM (T2DM) with or without hypertension with ischemic stroke demonstrated on CT scan. Group B: Age-matched T2DM patients of either sex without any prior history of transient ischemic attack or stroke. Group A: Age-matched normal individuals of either sex. The following groups of diabetic patients with stroke were excluded from our study: cardioembolic stroke, patients with hemorrhagic stroke, and patients with stroke due to secondary causes like trauma, impaired coagulation or tumor.
Results: Average mean common carotid artery IMT (CCA-IMT) ranged from 0.72 to 0.97 mm across cohorts in people with diabetes. Patients with T2DM with ischemic stroke were found to have significantly higher prevalence of increased CIMT and a value greater than 0.8 mm was found to be associated with the occurrence of stroke. The mean CIMT was significantly higher in diabetic subjects compared to healthy subjects.
Conclusions: A high CIMT is a surrogate and reliable marker of higher risk of cerebrovascular accidents amongst type 2 diabetic patients. Our study demonstrates the utility of carotid IMT as a simple non-invasive screening test for the assessment of atherosclerosis risk/prognosis in T2DM.

Keywords: Carotid IMT, Diabetes mellites, Atherosclerosis

INTRODUCTION

Diabetes mellitus (DM) currently affects 6% of the world's adults, a figure expected to double in the western world. In India, the national prevalence is estimated at 18.2%. More than half of all diabetic deaths are accounted for by atherosclerotic disease leading to cardiovascular or cerebral complications. Intima media thickness (IMT), a measure of atherosclerotic vascular disease, is considered as a comprehensive picture of all alterations caused by multiple risk factors over time on the arterial walls. It can therefore be described as a robust indicator of vascular risk. It can easily be measured especially at the carotids by B mode ultrasonography, a relatively simple way representing a safe, precise, and reproducible measure. In resource-limited settings like ours, cost of equipment and dearth of skilled personnel restrict the use of this investigative tool in clinical

practice. Whatever the method or site of measurement including the distal common carotid far wall IMT, increased IMT has been shown to be a powerful predictor of coronary and cerebrovascular complication. It has therefore been proposed as a non-invasive measure of predicting chances of cerebrovascular disease burden in adults. Although CIMT is not yet routinely measured in clinical practice, its predictive value regarding cardiovascular complications has been established, giving it a potential role in future for cerebrovascular disease risk stratification and primary prevention. The increase in CIMT as an index of cerebrovascular disease occurs in conjunction with other cardiovascular risk factors.

METHODS

The type of current study was of cross-sectional observational study. The study conducted at SMIMER hospital, Surat, Gujarat India. The study was conducted from March 2020 to November 2021.

Procedure

A total of sixty subjects in the age group of 30-75 years (Male: Female=37:23) were selected and divided into three groups, i.e., diabetes with ischemic stroke, diabetes and healthy subjects. All the participants were subjected to B-mode ultrasonography of both common carotid arteries to determine CIMT, along with history taking, physical examination and routine laboratory investigations including included fasting and two hours postprandial blood sugar, blood urea, serum creatinine, lipid profile, also, the glycated haemoglobin as well as the microalbuminuria. Trained sonographers performed the B-mode ultrasound examination with a linear array transducer of 7.5-12 MHz on the selected subjects in supine position with the head slightly extended and turned to the opposite direction of the CCA being studied. Both sides were imaged at three places, i.e., at the proximal part, mid part and the bulb. The means of the three maximum right and three maximum lefts far wall measurements were calculated for each CCA. In our study, all the six right and left wall values were measured and the average values noted. Ethical approval was not required for the study along with a signed patient consent form in local language, for performing CIMT and blood reports.

Statistical tool

Test of significance using ANOVA test and Chi-square test. Confidence interval was set as 95%. Thus, $p<0.05$ was considered as statistically significant.

Selection criteria

Selection criteria for the study as following-Group C: Patients of either sex in the age group of 30-75 years with T2DM with or without hypertension with ischemic stroke demonstrated on CT scan. Group B: Age-matched T2DM patients of either sex without any prior history of transient ischemic attack or stroke and group A: Age-matched normal individuals of either sex.

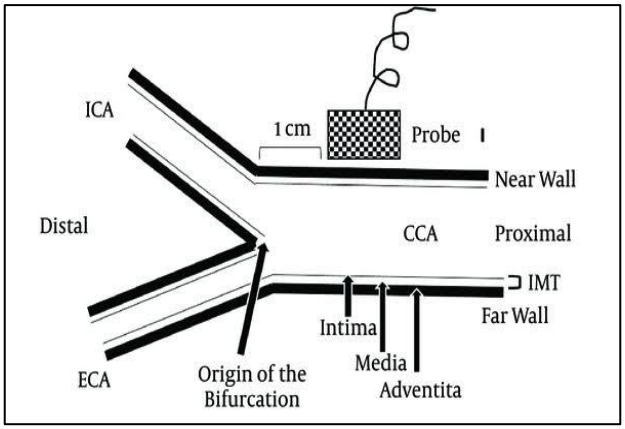

Figure 1: Diagram representation of ICMT.

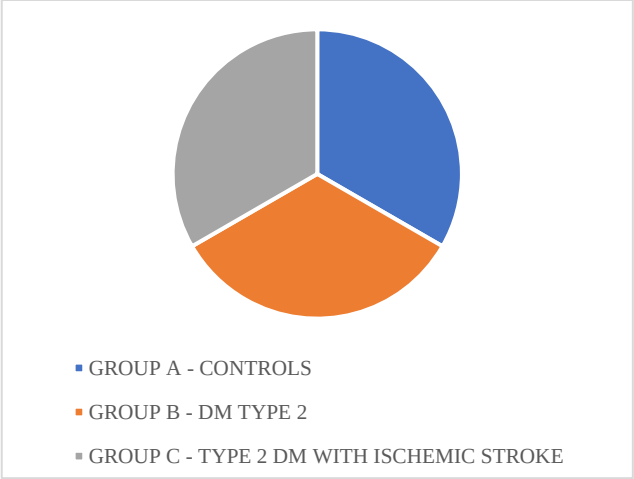

Figure 2: Selection criteria.

The following groups of diabetic patients with stroke were excluded from our study: Cardioembolic stroke, patients with hemorrhagic stroke and patients with stroke due to secondary causes like trauma, impaired coagulation or tumor.

RESULTS

Average mean CCA-IMT ranged from 0.72 to 0.97 mm across cohorts in people with diabetes.

Patients with T2DM with ischemic stroke were found to have significantly higher prevalence of increased CIMT and a value greater than 0.8 mm greater than allowed limits from control group was found to be associated with increased risk of stroke. The mean CIMT was significantly higher in diabetic subjects compared to healthy subjects.

Other parameters like higher age, smoking, hypertension, hyperlipidemia, low HDL cholesterol, the glycemic parameters and the duration of diabetes were not considered.

Table 1: Carotid IMT at CCA and ICA in study groups.

Carotid IMT (mm)	Group A (Mean of 20)	Group B (Mean of 20)	Group C (Mean of 20)
Right CCA	0.748±0.875	0.858±0.180	0.922±0.172
Left CCA	0.722±0.155	0.832±0.765	0.889±0.675
Mean CCA	0.734±0.540	0.845±0.550	0.906±0.375
Right ICA	0.425±0.780	0.515±0.420	0.585±0.175
Left ICA	0.430±0.210	0.503±0.210	0.576±0.450
Mean ICA	0.427±0.525	0.509±0.660	0.579±0.380

*CCA=Common carotid artery, ICT=Internal carotid artery, IMT=Intima media thickness.

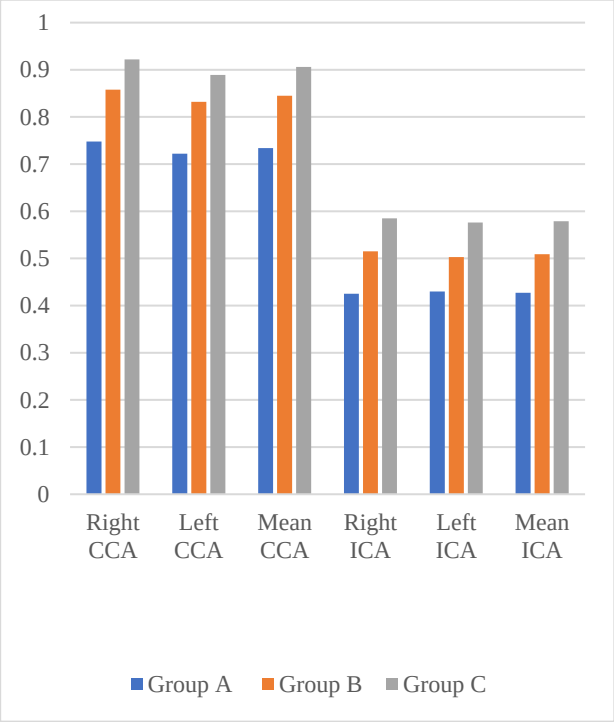

Figure 3: Carotid IMT in study groups.

DISCUSSION

The use of carotid IMT has been increasingly used in trials investigating patients with T2D. The existing knowledge about reproducibility of this method is based on very heterogeneously populations including either no or relatively few patients with T2D. With regard to future clinical diabetes research further knowledge about reproducibility of this method is required. In this methodological study we have explicitly evaluated the reproducibility of the method in patients with T2D and persons without T2D and T2D with ischemic CV stroke.

The study shows that carotid IMT can be determined with good and comparable reproducibility in both patients with T2D and healthy persons. The patients with T2D participating in this study had a mean diabetes duration of 16±8 years, 50% had microalbuminuria.

In addition, we found a significant increase in carotid IMT independent of age and duration of diabetes in the T2D patients with microalbuminuria compared to the patients with normoalbuminuria. Accordingly, earlier study Ito H they have found a significant association between carotid IMT and diabetic nephropathy measured as either microalbuminuria (elevated ACR) and/or decreased estimated glomerular filtration rate (eGFR).[4]

In the study Brohall et al T2DM was associated with an 0.13 mm increase in IMT compared with control subjects. In patients with IGT, the increase in IMT was about one-third of that observed in diabetes. The observed difference in IMT can be interpreted as if the diabetes patients were more than 10 years older than the control groups, and that the relative risks of myocardial infarction and stroke were increased by almost 40%, respectively.

Our findings are consistent with the experiences of Adaikkappan et al and Dikanovic et al where CIMT of hypertensives and diabetics, respectively, were significantly greater than normal controls.[2,3]

Limitations

A large study sample size is ideally required for statistical significance of the results, their implications and the validity to extrapolate results and to suggest recommendations on the basis of the same. It was a point study and so the results could not be used to prognosticate as it would require long term prospective trial.

There is also a possibility of inter observer variability of CIMT by different radiologists and different equipment. This study also does not take into account calcified plaque or thrombus in artery into consideration of mean thickness.

CONCLUSION

A high CIMT is a surrogate and reliable marker of higher risk of cerebrovascular accidents amongst type 2 diabetic patients. Our study demonstrates the utility of carotid IMT as a simple non-invasive screening test for the assessment of atherosclerosis risk/prognosis in T2DM.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Brohall G, Odén A, Fagerberg B. Carotid artery intima-media thickness in patients with Type 2 diabetes mellitus and impaired glucose tolerance: a systematic review. Diabet Med. 2006;23(6):609-16.
2. Adaikkappan M, Sampath R, Felix AJW, Sethupathy S. Evaluation of carotid atherosclerosis by B'mode ultrasonographic study in hypertensive patients compared with normotensive patients. Indian J Radiol Imaging. 2002;12(3):365-8.
3. Dikanovic M, Hozo I, Kokia S, Tithic M. Transcranial Doppler ultrasound assessment of intracranial haemodynamics in patients with typ 2 diabetes mellitus. Ann Saudi Med. 2005;25:486-8.
4. Ito H, Komatsu Y, Mifune M, Antoku S, Ishida H, Takeuchi Y et al. The estimated GFR, but not the stage of diabetic nephropathy graded by the urinary albumin excretion, is associated with the carotid intima-media thickness in patients with type 2 diabetes mellitus: a cross-sectional study. Cardiovasc Diabetol. 2010;9:18-10.
5. Kota SK, Mahapatra GB, Kota SK, Naveed S, Tripathy PR, Jammula S et al. Carotid intima media thickness in type 2 diabetes mellitus with ischemic stroke. Indian J Endocrinol Metab. 2013;17(4):716-22.
6. Lorenz MW, Price JF, Robertson C, Bots ML, Polak JF, Poppert H et al. Carotid intima-media thickness progression and risk of vascular events in people with diabetes: results from the PROG-IMT collaboration. Diabetes Care. 2015;38(10):1921-9.
7. Bartman W, Pierzchała K. Clinical determinants of carotid intima-media thickness in patients with diabetes mellitus type 2. Neurol Neurochir Pol. 2012;46(6):519-28.
8. Barghouti N, Elkeles R, Nicolaides A, Geroulakos G, Dhanjil S, Diamond J. The ultrasonic evaluation of the carotid intima-media thickness and its relation to risk factors of atherosclerosis in normal and diabetic population. Int Angiol. 1997;16(1):50-4.
9. Poredos P. Intima-media thickness: indicator of cardiovascular risk and measure of the extent of atherosclerosis. Vasc Med. 2004;9(1):46-54.
10. Aminbakhsh A, Mancini GB. Carotid intima-media thickness measurements: what defines an abnormality? A systematic review. Clin Invest Med. 1999;22(4):149-57.

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