

27 PHYSIOLOGICAL ASSESSMENT OF COMMON CAROTID ARTERY END DIASTOLIC VELOCITY, A HEMODYNAMIC PARAMETER, WITH FUTURE RISK FOR THE DEVELOPMENT OF CEREBROVASCULAR STROKE ,authors MANISHA B. MAKWANA* ANAND MISTRI VILAS J. PATEL*******MANISHA B. MAKWANA* ANAND MISTRI** VILAS J. PATEL*****

*TUTOR , **ASSOCIATE PROFESSOR, *** PROFESSOR , DEPARTMENT OF PHYSIOLOGY, GCS MEDICAL COLLEGE,AHMEDABAD-380025

Background : Low End diastolic velocity of common carotid artery is potential hemodynamic marker of intracranial resistance and associated with ischemic stroke.

Abstracts: Aim: Assessment of Common carotid artery end diastolic velocity , a hemodynamic parameter, with the future risk for development of Cerebrovascular stroke . In order to assess common carotid artery end diastolic velocity , we have evaluated age, BMI, W/H , blood pressure , lipid profile and HbA1c in CV Stroke and control subjects. **Material method:** *The present study was conducted on 30 CV Stroke patients(Group A) and 30 non stroke hypertensive and diabetic patients (Group B) . CCA End diastolic velocity was assessed in each group by Doppler ultrasound machine. BMI and W/H was measured according to WHO protocol. Blood pressure was measured by sphygmomanometer. Lipid profile and HbA1c was done by autoanalyser machine .* **Result :** *CCA End diastolic velocity in Group A and group B was found to be 10.49 ± 6.02 & 17.70 ± 4.18 and 12.59 ± 3.47 & 21.47 ± 5.21 in right and left side respectively. The data was highly significant ($p<0.0001$). Age in Group A and B was found to be 62.8 ± 9.11 and 53.87 ± 10.06 respectively ($p=0.0007$). BMI in Group A and Group B was found to be 27.93 ± 3.24 and 28.52 ± 3.87 respectively ($p=0.5245$). W/H in Group A and Group B was 0.88 ± 0.042 and 0.89 ± 0.04 respectively ($p=0.3489$). Systolic and diastolic blood pressure in both the groups was found to be 148.02 ± 14.77 & 138.93 ± 7.04 and 88.33 ± 5.97 & 84.53 ± 5.75 which was statistically significant with p value 0.003 and 0.014 respectively. The difference between mean of two groups for HbA1c ,HDL , LDL , triglyceride and total cholesterol in both the groups were 8.61 ± 0.84 & 7.47 ± 0.56 , 38.7 ± 5.42 & 49.91 ± 8.333 , 143.37 ± 6.25 & 113.63 ± 17.42 , 136.63 ± 12.11 & 201.9 ± 55.26 , 226.37 ± 8.006 & 202.4 ± 22.08 respectively which was statistically very significant($p<0.0001$). **Conclusion:** Carotid hemodynamic alterations expressed in Common Carotid Artery End diastolic velocity should be screened for future risk for development of CV stroke in hypertensive and diabetic patients with advance age. These findings need to be confirmed by a prospective study.*

Key Words: CCA EDV ,CV stroke,HbA1c, HDL, LDL, Total cholesterol , triglyceride

Author for correspondence : Anand Mistri, Department of Physiology , GCS Medical College , Ahmedabad-380025.E-mail:dranand.4.10@gmail.com

INTRODUCTION

Stroke is global health problem. ^[1,2] It is the second commonest cause of death and fourth leading cause of disability worldwide ^[3]. Four out of 5 of the ischemic events are

caused by atherosclerotic diseases, with most changes affecting the carotid bifurcation ^[4] It is one of the leading causes of death and disability in India.

End diastolic velocity meaning the capacity to provide blood in to the intracranial circulation at diastolic phase , is a more sensitive index to predict ischemic stroke.

Low end diastolic velocity of common carotid artery is potential hemodynamic marker of intracranial resistance and associated with ischemic stroke⁵.

Aim:

Assessment of Common carotid artery end diastolic velocity , a hemodynamic parameter, with the future risk for development of Cerebrovascular Stroke .

Objective:

In order to assess common carotid artery end diastolic velocity, we have evaluated age, BMI, W/H , blood pressure, HbA1c and lipid profile in CV stroke and control subjects.

Material method

Present study was case control study. It was conducted in General population at GCS Medical College , Hospital and Research Centre, Ahmedabad. Subjects were selected randomly. Study subjects were hypertensive, type 2 diabetic and CV stroke patients. . The study was initiated after obtaining approval from Institutional Ethical committee. Informed consent was taken from each subjects. During the study period data were collected as per predesigned questionnaire.

We made two groups .

Group A : 30 CV stroke Patients

Group B : 30 Hypertensive and type 2 diabetic Patients.

Carotid sonography is a Noninvasive, accurate, and cost-effective unique imaging method for the investigation of carotid abnormalities.

Common carotid artery end diastolic velocity was assessed in each groups by Doppler ultrasound machine (Logiq P5 , GE Wipro) in Radiology department of GCS Medical College , Hospital and Research Centre, Ahmedabad.

The patient lie down in the supine or semi-supine position with the head slightly hyperextended and rotated 45° away from the side being examined. End diastolic velocity of both the side was examined .

Blood pressure was measured by Sphygmomanometer. Lipid profile was estimated by autoanalyzer machine (XL – 640) .

Inclusion criteria :

Age : 45 to 75 yrs

Sex : Male and female

Patients with CV stroke , hypertension and type 2 diabetes mellitus

Exclusion criteria :

Patients with Atrial Fibrillation

Valvular heart Disease

Results:

Statistical Software Med Calc Version 11.5.1.0 was used for data analysis. The Student t – test was applied to compare mean between two groups. P value < 0.05 were considered significant.

Table 1. comparison of age, BMI,W/H and blood pressure in both the groups:

Parameter	Group A	Group B	P value
Age (Yrs)	62.8 ±9.12	53.87±10.06	0.0007
BMI(kg/m ²)	27.93±3.24	28.52±3.87	0.5245
W/H	0.88±0.042	0.89±0.04	0.3489

Systolic BP (mm of Hg)	148.02±14.77	138.93±7.04	0.003
Diastolic BP (mm of Hg)	88.33±5.97	84.53±5.75	0.014

Table No. 2 comparison of lipid profile and End diastolic velocity in both the groups:

Parameter	Group A	Group B	P value
HbA1C (%)	8.61±0.84	7.47±0.56	P<0.0001
HDL (mg/dl)	38.7±5.42	49.91±8.33	P<0.0001
LDL (mg/dl)	143.37±6.25	113.63±17.42	P<0.0001
Total Cholesterol (mg/dl)	226.37±8.006	202.4±22.08	P<0.0001
Triglyceride (mg/dl)	136±12.11	201.9±55.26	P<0.0001
Right CCA End diastolic velocity (cm/sec)	10.49±6.02	17.70±4.18	P<0.0001
Left CCA End diastolic velocity (cm/sec)	12.59±3.47	21.47±5.21	P<0.0001

Discussion:

It is reported that lower blood flow velocity of extracranial carotid arteries associated with the ischemic stroke independently of carotid atherosclerosis.^[5] In our study we found the difference of right and left CCA End diastolic velocity of both the groups was statistically very significant with $p < 0.0001$.

As hypertension, diabetes, hyperlipidemia and age are most prevalent risk factors for CV stroke, we found positive correlation of these risk factors in case group.

Age is an important nonmodifiable risk factor for stroke. The mean age of stroke onset in India (i. e., 63 years) is lower than that in Western countries (68 years in the USA and 71 in Italy).^[6] There were several studies in India determining risk factors of stroke. CCA End diastolic velocity is related with age, systolic-diastolic blood pressure and LVMI (left ventricular mass index) in hypertensive patient. This evaluation could predict the presence of early cardiovascular damage and provide an accurate estimation of overall risk in this population. In our study we found that in comparison of both the groups by t-test for systolic and diastolic blood pressure was statistically significant with p value 0.0003 and 0.014 respectively. In Statistical comparison of different parameters of lipid profile between two groups we found the difference between values of HDL, LDL, Triglyceride and Total cholesterol in both the groups statistically very significance by t-test with $p < 0.0001$ respectively. The mean concentration of total cholesterol, LDL & triglyceride is higher and lower HDL in case group than control group. Difference of HbA1c Values between two groups was statistically very significant by $p < 0.0001$ in t-test.

Conclusion:

Carotid hemodynamic alterations expressed in Common Carotid Artery End diastolic velocity should be screened for future risk for development of CV stroke in hypertensive and diabetic patients with advance age. These

findings need to be confirmed by a prospective study.

Carotid hemodynamic alterations expressed in Common Carotid End diastolic velocity should be screened for future risk for development of CV stroke in hypertensive patients with advance age. These findings need to be c.

References :

1. S. E. Sridharan, J. P. Unnikrisnan, S. Sukumaran, P. N. Sylyja, S. D. Nayak, P. S. Sarma, et al., "Incidence, Types, Risk Factors, and Outcome of Stroke in a Developing Country: The Trivandrum Stroke Registry," *Stroke*, Vol. 40, No. 4, 2009, pp. 1212-1218. doi:10.1161/STROKEAHA.108.531293
2. G. A. Donnan, M. Fisher, M. Macleod and S. M. Davis, "Stroke," *Lancet*, Vol. 371, 2008, pp. 1612-1623. doi:10.1016/S0140.
3. Strong K, Mathers C, Bonita R. Preventing stroke: saves lives around the world. *Lancet Neurol* 2007; 6: 182-7.
4. Steinwachs DM, Collins-Nakai RL, Cohn LH, Garson A Jr, Wolk MJ.J The future of cardiology: utilization 24 and costs of care. *Am Coll Cardiol*. 2000 Apr; 35(5 Suppl B):91B-98B.
5. Bai CH, Chen JR, Chiu HC, Pan WH : Lower blood flow velocity, higher resistance index, and larger diameter of extracranial carotid arteries are associated with ischemic stroke independently of caroti atherosclerosis and cardiovascular risk factors. *J Clin Ultrasound*. 2007;35:322–330.
6. Wasay M, Khatri IA, Kaul S.: Stroke in South Asian countries. *Nat Rev Neurol*. 2014;10:135–43. [\[PubMed\]](#)
7. Sridharan R. Risk factors for ischemic stroke: A case-control analysis. *Neuroepidemiology*. 1992;11:24–30. [\[PubMed\]](#)
8. Frauchiger B, Nussbaumer P, Hugentobler M, Staub D. Duplex sonographic registration of age and diabetes-related loss of renal vasodilatory response to nitroglycerine. *Nephrol Dial Transplant*. 2000;15:827– 832.
9. Bude, RO; Rubin, JM (May 1999). "Relationship between the resistive index and vascular compliance and resistance.". *Radiology*. **211** (2): 411–7. [PMID 10228522](#). doi:10.1148/radiology.211.2.r99ma48411.

10. Boas FE, Desser TS, Kamaya A (2011). "Does separating the resistive index into pre- and post-glomerular resistance and vascular compliance improve the diagnostic accuracy of renal transplant doppler ultrasound?". *American Journal of Roentgenology*. **196** (5): A87. [doi:10.2214/ajr.196.5_supplement.0a84](https://doi.org/10.2214/ajr.196.5_supplement.0a84).