Prevalence of Middle Cerebral Artery Stenosis in Bihar Population (A Trans-cranial Doppler Study)

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Abstract

Background: The prevalence and causes of intra cranial arterial stenosis in adults' stroke patients is largely unknown. Hence it has become a great clinical challenge for Neuro-physician, neurosurgeon and radiologist to find out the aetiologies of intra cranial arterial stenosis.

Method: 100 patients of aged between 25 to 60 years were selected for study. Their past history and clinical manifestations were noted TCD examination was performed with portable machine (multi-drop (R) + DWL), which is a 2MHz power motion single channel TCD, MCA was approached through temporal windows by use of standard protocol. stenosis of arteries were defined by the peak systolic flow velocity more than 140 cm/sec for MCA.

Results: The highest clinical manifestation was HTN 75%, followed by DM 58%, obesity 52% and hyper cholestremia 48%, smoker 38%, CAD 32% and least was PVD 2%. In odds ratio study HTN was highest 8.5, followed by CAD ratio was 6 and least ratio was alcoholics 1.6.

Conclusion: The present study revealed the aggravating factor like HTN, DM, and CAD. Atherosclerosis causes stenosis of MCA and peak systolic velocity more than 140 mc/sec for MCA. Hence the patients having such clinical manifestations will be more prone for stenosis of MCA.

Keywords: Temporal Acoustic window, TCD, Peak systolic Flow, Multi-drop B+ DWL, Stenosis

Introduction

Prevalence of cerebral artery stenosis varies by their locations. Risk of intracranial arteries stenosis is much higher than that in extra cranial arteries in Indian population[1]. It has been estimated that intra cranial arteries stenosis may contribute to 30 to 50% if ischemia strokes and middle cerebral artery (MCA) is the most commonly affected[2]. Moreover symptomatic intracranial artery stenosis seems to be relatively unstable because of high frequency of progression[3]. The prevalence and causes of intracranial artery stenosis in adult stroke patients are also largely unknown[4]. Relationship between intracranial artery stenosis and clinical manifestations in different age group of patients are still uncertain.

Hence attempt was made to correlate the various manifestation related MCA stenosis in different age groups and both sexes so that aetiologies of the intracranial arterial stenosis can be evaluated and present study will be valuable guidance for

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treating the stenosis of intracranial arterial stenosis especially MCA.

Material and Method

100 (one hundred) adult patients admitted in Department of Neurosurgery Sri Krishna Medical College hospital Muzaffarpur – 842003, Bihar were studied.

Inclusive Criteria: Patients aged between 25 to 60 years having high risk but asymptomatic for stroke were selected for study.

Exclusion Criteria: Previous history of stroke or transient stroke attack (TIA) poor or incomplete echo window for Trans cranial Doppler were excluded from studies.

Method: Past Medical history of HTN, Diabetes Mellitus (DM), Hypercholesterolemia coronary artery disease (CAD) and smoking BMI BP, Fasting serum lipids, fasting blood glucose were noted.

High risk asymptomatic for stroke population was defined as per the modified Framingham clinical assessment criteria. According to this HTN DM, history of smoking excessive consumption of alcohol CAD, peripheral vascular disease (PVD), high cholesterol and obesity were taken as vascular risk factors and recorded cardiovascular disease included history of myocardial infarction or angina, Fasting Cholesterol > 200 mg/dl was considered as hypercholesterolemia and obesity was BMI > 30 kg/mz

TCD examination was performed with portable Medline (Multi-drop (R) B + DWL) which is a 2 MHz power motion single channel TCH. Bilateral middle cerebral arteries were studied through the temporal windows by use if a standardized protocol. Insonation depth, peak systolic velocity, ends diastolic velocity, Mean flow velocity for all vessels were recorded, cerebral arteries that could not be insonated because of poor acoustic windows were excluded from the study. Presence of intra cranial arterial stenosis was diagnosed according to peak flow velocity based on published criteria which was validated against MR angiography and clinical outcomes. The criteria for stenosis of arteries were defined by the peak systolic flow velocity more than 140 cm/sec for middle cerebral artery (MCA).

The duration of study was June 2019 to July 2021.

Statistical analysis: Various findings in MCA stenosis were recorded. The statistical analysis was carried out SPSS software. Ratio of male and female was 2:1

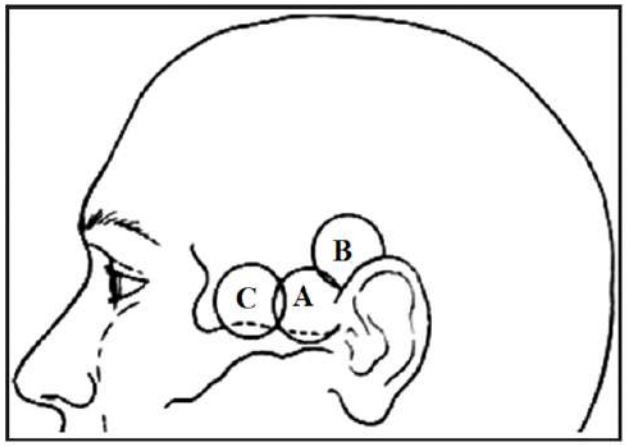

Figure 1: Temporal acoustic windows to identify MCA: A, pre auricular position; B, posterior window; C, anterior window. The probe should be placed in pre auricular region to identify MCA. If not successful, position B should be tried before position C

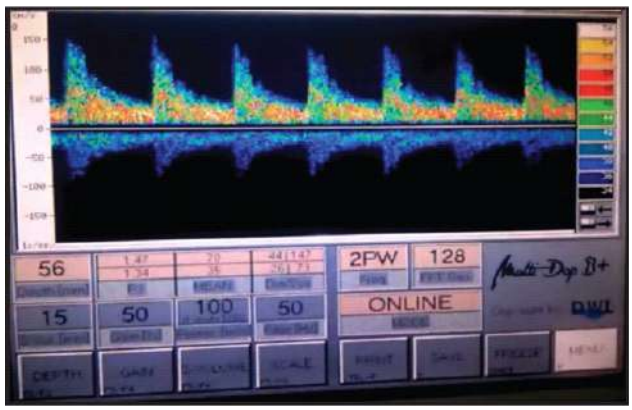

Figure 2: TCD of right MCA on a patient showing peak systolic flow velocity

Observation and Results

Table-1: Study of clinical Manifestations in MCA stenosis patients 75 (75%) HIM, 58 (58%) DM, 38 (38%) Smoking, 26 (26%) alcoholise, 32 (32%) CAD, 48 (48%) Hyper-cholestremia, 52 (52%) obesity, 2 (2%) PVD

Table-2: Study of adds ratio of various risk factors

Table 1: Study of clinical manifestation MCA stenosis patients

(No of patients: 100)

Sl No	Manifestations	No of patients	Percentage (%)
1	HTN	75	75
2	DM	58	58
3	Smokers	38	38
4	Alcoholics	26	26
5	CASD	32	32
6	Hyper cholestremia	48	48
7	Obesity	52	52
8	PVD	2	2

HTN = Hyper tension, DM = Diabetes Mellitus, PVD = Peripheral Vascular Disease

Table 2: Study of odds ratio of various risk factors in MCA stenotic patients

Variables	Odds ratio	95% CI
HTN	8.5	1.1-63
DM	2.0	0.7-5
Smokers	2.2	1-5.3
Alcoholic	1.6	0.6-3.8
Hypercholesterolemia	2.2	1-4
CAD	6	2.7-16.2
PVD	2.6	0.1-16.4
Obesity	2.1	0.8-5.1

CAD = Coronary Artery Disease

PVD= Peripheral Vascular disease

DM = Diabetes Mellitus

HTN = Hyper tension

- 8.5 odds ratio and CI 1.1-5 in HTN
- 2.0 odds ratio and CI 0.7-5 in DM
- 2.2 odds ratio and CI 1-5.3 in Smokers
- 1.6 odds ratio and CI 0.6-38 in Alcoholic
- 2.2 odds ratio and CI 1-4 in hyper-cholestremia
- 6 odds ratio and CI 2.7-16.2 in CAD
- 2.6 odds ratio and CI 0.1-16.4 in PVD
- 2.1 odds ratio and CI 0.8-5.1 in obesity

Discussion

Trans Cranial Doppler (TCD) study in stenosis of MCA in Bihar Population. The clinical manifestations were 75% of HTN, 58% DM, 38% smokers, 26% alcoholics, 32% CAD, 48% hypercholestremia, 52% obesity, 2% PVD (Table-1). In the study of odds ratio also HTN had 8.5, CAD had 6, DM 2.0, smokers 2.2, PVD 2.6, obesity 2.1, odd ratios (Table-2). TCD technique was approached temporal acoustic window to identity MCA (Fig-1) and TCD of right MCA patient showing peak systolic velocity (Fig-2). These findings are more or less in agreement with previous studies [5][6][7].

Identification of underlying causal aetiology during the treatment and prevention in adult / young stroke patients, The most common aetiologies are Large Artery atherosclerosis (LAA) and small vessel diseases (SVD). The causes of LAA and SVD are hypercholestremia could be due to obesity, DM, smoking, alcoholism and rarely PVD. These factors aggravate the stenosis in MAC and results into stroke [8]. It is also reported that moyamoya, disease plays vital role in sterosis of intracranial arteries. This disease is more prevalent in Asian countries including India [9].

Identification of exact mechanism of intracranial stenosis especially MCA is challenging. High resolution magnetic resonance imaging (CH-MRI) may be helpful in distinguishing characters if stenosis by offering arterial wall imaging. It is also reported during TCSS (Trans cranial colour code duplex sonography) study that stenosis of intracranial arteries patients were quite variable, i.e. from 83 to 94% and 67 to 72% suggesting that patients with ischemic cerebro – vascular disease were prone to intra-cranial artery stenosis and ischemic stroke [10]. Hence SVD aetiologies are not clearly understand

Summary and Conclusion

The trans cranial Doppler study of intra cranial stenosis in different age groups and both sexes and its clinical manifestations are universally accepted and secondary treatment is to avoid lipid or fatty diet, smoking, alcohol which enables obesity DM and HTN. But this study demands further genetic, cardio vascular, nutritional, patho-physiological,

pharmacological study because exact pathogenesis of stenosis, IHD and stroke is still unclear.

Limitation of study: Owing to tertiary location of research centre, small number of patients and lack of latest technologies, we have limited findings and results.

This research paper was approved by Ethical committee of Sri Krishna Medical College and hospital Muzaffarpur-842003, Bihar.

Conflict of Interest: No

Funding: Self

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