INTRODUCTION

The wide availability of MRI in recent times has led to increased detection of white matter hyperintensity and have become a very common finding on MRI Brain. It is an independent and one of the important risk factor than can foresee future stroke. It remains one of the most accessible markers to access the effect of vascular hemodynamics on the brain. Carotid Doppler indices have a strong correlation with WMH mainly due to atherosclerotic plaques. Thus these indices can predict the white matter Hyperintensity burden.

OBJECTIVES

• Study cerebral white matter hyperintensities association with structural and hemodynamic parameters of the carotid artery.
• Score the white matter Hyperintensity into low and high burden plaques.
• To determine carotid artery composite intima-media thickness and various other parameters.

MATERIALS AND METHODS

Study design: Cross-sectional study
All patients referred to our Radio diagnosis department for MRI Brain showing white matter hyperintensities over 2 years. After written informed consent from the patients who come for MRI Brain which reveals white matter hyperintensities suggestive of small vessel ischemic changes are included.

**Exclusion criteria**
1. Patients with a previous history of stroke and intracerebral bleed.
2. Patients with known causes of white matter Hyperintensity like acute demyelinating encephalomyelitis, multiple sclerosis, vasculitis, connective tissue diseases, migraine, major psychiatric disorder, normal pressure hydrocephalus.\(^9\)
3. Post radiotherapy patients.
4. Patients who did not give consent for participating in the study.
5. Uncooperative patients in whom MRI brain or carotid artery Doppler cannot be performed.

**MRI Brain**
Modified Scheltens scoring system is used to score White matter. Carotid artery composite intima-media thickness, Degree of stenosis and internal carotid artery Pulsatility index will is accessed. Modified Scheltens scoring system includes:

Deep white matter score
- Parietal
- Frontal
- Occipital
- Temporal

Each region has a minimum score of 0 and a maximum scoring of 6.

Periventricular white matter score
- Frontal
- Occipital
- Lateral Vertical bands

Each region has a minimum score of 0 and a maximum scoring of 2.

So total Scoring can range from 0 to 30, which will further be divided into high and low burden scores.

Carotid artery variables:
1. Composite Intima media thickness
   - It is the average of the measurement of IMT of both left and right side’s segment of the carotid artery. It includes Common and internal carotid, carotid bulb segment.\(^10\)
2. Plaque
   - Any focal or diffuse thickening noted within the artery.
3. Carotid stenosis
   - Using an appropriate acoustic angle, It is calculated in terms of the degree of stenosis which percentage the lumen that is occluded due to IMT or Plaque. It is divided into hemodynamically significant and insignificant stenosis.\(^11\)
4. Pulsatility index
   - PI of the internal carotid artery will be used. It is calculated automatically by the scanner.

**Study size**: total sample size is calculated to be 76 patients with white matter hyperintensities by using Chi-Square formula.

\[
X^2 = \text{Chi square value is 3.84 at 5\% level of significance}
\]

\[
P = 50\%
\]

\[
\text{Proportion} = 0.50
\]

\[
C: \text{confidence interval of the one choice (95\%CI)} = 0.05
\]

The prevalence rate for WMH: 94

\[
N = \frac{3.84 \times 94 \times 0.5 \times 0.5}{0.05^2 \times 93 + 3.84 \times 0.5 \times 0.5}
\]

\[
= 76
\]

**Bias**: Inter-observer variations will be minimized by taking an average of the 3 reading. The images will be zoomed in at required magnification to minimize error\(^12\).

**EXPECTED OUTCOMES/RESULTS**

In this cross-sectional observational study, white matter score should be more in men and increases as the age advances. Composite IMT will have better indicator than Common carotid IMT and is expected to behave better sensitivity and specificity than other parameters. As the burden of white matter score increases, the Composite IMT increases. Hemodynamically significant stenosis when present, high burden score is expected. Hypertension, diabetes, dyslipidemia are most commonly associated risk factors. Among them, Hypertension could be the commonest. We should be able to calculate the diagnostic cut-off value for periventricular, deep and total WMH by using receiver operating characteristic.

**DISCUSSION**

Cerebrovascular events are the commonest cause of mortality and morbidity in population especially the elder ones.\(^13\)

With the use of this study, we will determine the burden of white matter in brain which is itself a known risk factor for stroke.\(^14,15\) In this, we will divide WMH into a low and high burden. Further, they are correlated and statistically analysed. Single centric study leading to bias, since verte-
bral artery is not evaluated\textsuperscript{16} and only Carotid artery is being evaluated, the lesion and hemodynamically status of them will be skipped which causes many cerebrovascular events especially the posterior circulation.\textsuperscript{17}

CONCLUSION

By use of carotid artery Doppler, we can predict the burden of T2/FLAIR white matter ischemic changes in the brain and thus can be used as a predictor of stroke.

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