



Cerebrovascular reactivity in patients with migraine using transcranial doppler

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INTRODUCTION

- Migraine is an episodic disorder commonly encountered in daily practice.
- Multiple hypothesis have been proposed for the pathophysiology of migraine. It is a state of altered excitability capable of activating trigeminovascular system.
- It is a neurovascular coupling disorder where the cerebrovascular reactivity is malfunctioning.
- The neuronal hypersensitivity to different external and internal stimuli is the primary pathophysiological changes in patients
- The migraineurs show maladaptation to environmental stimuli owing to loss of adaptability compared to normal people.
- Several transcranial doppler studies have reflected the altered reactivity with varying outcomes in migraineurs

AIMS & OBJECTIVE

- To study the cerebral blood flow velocities in migraine
- To assess cerebrovascular reactivity in interictal phase of migraine patients

STUDY DESIGN

This study was conducted over three months in institute of neurology, madras medical college. 30 patients who satisfied the criteria for migraine as per IHS criteria were selected from headache outpatient clinic of our institute. 30 controls were selected who were age and sex matched with patients. Inclusion criteria: 1) age 20-70 years 2) Migraine as per IHS criteria 3) Willing to participate Exclusion Criteria:

- Arterial hypertension and brain disease
- Pregnancy
- Metabolic and pulmonary disease
- Alcohol abuse
- Migraine preventive drugs beta blockers, calcium channel blockers
- Patients with daily chronic headache

METHODOLOGY

- All patients complete history, clinical examination, routine investigations, imaging was done.
- Transcranial doppler using 2Hz probe was done was done in all patients in supine position.
- The baseline Peak systolic velocity (PSV), Pulsatility index (PI) was measured in Middle cerebral artery (MCA) and posterior Cerebral artery (PCA) in all patients.
- Photic stimulation using a flickering light was done for 100 seconds from a distance 1m
- After photic stimulation, PSV in MCA and PCA was measured, the highest PSV value was averaged.
- Statistical analysis was done using SPSS software Independent t test was used to compare between two means

RESULTS

Demographic data: We included 30 patients, 25 female and 5 male patients. The average duration of headache was 2.3 years in patients. Of 30 patients 12 had history of aura and all were visual aura and 18 were without any aura. 30 controls were also included which were age and sex matched. No significant difference in demographic data was noted.

Transcranial doppler results:

Table 1. The Peak systolic velocities in MCA, in patient and control group was compared. There was no significant difference between PSV MCA between patient and the control group at baseline. After photic stimulation there was increase in peak velocities, however it was not statistically significant with p value (0.08).

| Pair 1 | | Controls | Patients | N | Std. Deviation | Sig. (2-tailed) |
|--------|-------------------------------------|----------|----------|----|----------------|-----------------|
| | MCA PSV - Before Photic stimulation | 75.48 | 78.80 | 30 | 13.745 | 0.12 |
| | MCA PSV - After Photic stimulation | 77.55 | 80.40 | 30 | 12.719 | 0.08 |

Table 2: The peak systolic velocities in PCA were compared between the patient and the control group. The baseline velocities in patients was comparatively higher in patient group. After photic stimulation the increase in PSV in patient group was higher and statistically significant (p=0.001) but the PSV changes in control group was not significant

| Pair 2 | | Controls | Patients | N | Std. Deviation | Sig. (2-tailed) |
|--------|-------------------------------------|----------|----------|----|----------------|-----------------|
| | PCA PSV - Before Photic stimulation | 54.67 | 59.47 | 30 | 10.345 | 0.34 |
| | PCA PSV - After photic stimulation | 56.21 | 63.13 | 30 | 11.013 | 0.001 |

Table 3: The Peak velocities were also compared between two subgroups that is aura and without aura, the baseline PCA PSV in patients with aura was higher compared to those without aura. After photic stimulation the velocities in patient with aura was higher and statistically significant. The PSV in MCA however was not significant.

| | AURA | N | Mean | Std. Deviation | Std. Error Mean | Sig. (2-tailed) |
|-------------------------------------|------|----|-------|----------------|-----------------|-----------------|
| PSV PCA - Before Photic stimulation | Yes | 12 | 66.50 | 10.059 | 2.904 | .002 |
| | No | 18 | 54.78 | 7.674 | 1.809 | 0.21 |
| PSV PCA - After photic stimulation | Yes | 12 | 70.67 | 10.316 | 2.978 | .001 |
| | No | 18 | 56.11 | 8.443 | 1.990 | 0.09 |

DISCUSSION

- The change in PSV PCA was significantly higher in migraineurs after photic stimulation and also higher in patients with aura
- Similar results were obtained in study by segdhi et al and wolf et al.
- They concluded that visually evoked flow rate in PCA was higher in patients of migraine with aura.
- In summary stimulation of visual pathway showed altered vasoreactivity in migraine patients more so detected in PCA
- We assessed the cerebrovascular reactivity in migraineurs using photic stimulation by measuring PSV in MCA and PCA.
- However no significant changes were noted before and after photic stimulation in the MCA
- Also no significant differences noted among two patient subgroups
- Similar finding were noted in study by Backer et al and Thie et al
- Cerebrovascular reactivity in MCA may be difficult to detect by photic stimulation

CONCLUSION

- There was increased cerebrovascular reactivity in patients with migraine
- There was further increase in Cerebrovascular reactivity in patients with aura.
- There was maladaptation of cerebrovascular reactivity in migraineurs, more so in patients with aura causing activation of the trigeminovascular system causing change in neurovascular homeostasis thereby inducing migraine attacks.
- Transcranial doppler can be useful tool to assess the cerebrovascular reactivity in migraineurs. This study demonstrates increased cerebrovascular reactivity in patients of migraine with aura using photic PSV.
- Photic PSV along with other indices can be valuable tool to assess CVR in patients with migraine

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