Association of Binocular Anomaly with Headache

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ABSTRACT

AIM: To study various binocular attributes associated with headache, in absence of refractive error and other ocular inflammatory diseases.

METHODS: Study comprised of 199 emmetropic patients of headache after all non-ocular causes of headache were ruled out and after getting the ethical clearance and proper consent. Detailed ocular evaluation was done including visual acuity, refraction, binocular assessment like convergence insufficiency and excess, accommodation excess and insufficiency and AC/A ratio, anterior and posterior segment examination. Data was collected and analysed using SPSS software.

OBSERVATIONS: 45.22% patients were young adults of 21-30 years. The female: male ratio was 2:1. Frontal headache was the commonest presentation (34.7%). Precipitating factor for headache was inadequate or irregular sleep in young patients ($p < 0.07$) and smoking in older patients ($p < 0.0001$). An altered AC/A ratio was found in 74.9% patients. Direct proportion was seen between convergence insufficiency and low AC/A ratio and between convergence excess and high AC/A ratio ($p = 0.000$). Accommodation showed inverse relationship with AC/A ratio ($p = 0.0001$). Reduced negative fusional vergence was commonly associated with high AC/A ratio while, reduced positive fusional vergence was more common with low AC/A ratio ($p = 0.03$).

CONCLUSION: Ocular anomalies other than refractive error may coexist with headache complaints. Therefore thorough investigation should be done for refractive and binocular vision abnormalities in all patients suffering from headache.

Key words: Binocular anomalies; Headache; Accommodation insufficiency; Convergence insufficiency

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BINOCULAR ANOMALIES AS A CAUSE OF HEADACHE

Headache is quite prevalent in the general population and is among the most common disorders of the nervous system. Headache disorders are a global problem, affecting people of all ages, races, income levels and geographical areas.

Headache disorders impose a recognizable burden on sufferers including sometimes substantial personal suffering, impaired quality of life and financial cost.

Chronic headache disorders also result in depression which is three times more common in people with migraine or severe headaches than in healthy individuals[3].
Prevalence of primary headache (headache without underlying disorders) varies with age, and is 9–11% in school children. In more than 80% patients, headache starts before the age of 40 with a lower prevalence rate at an advanced age (>50 years).

Even though the evidence in the literature for a strong association between oculo-visual problems and headache is weak, the patients of headache are frequently referred to an ophthalmologist. Ophthalmological studies on headache have reported the role of different ocular diseases like acute glaucoma, uveitis, optic neuritis and visual anomalies like refractive errors and accommodative and vergence deficiencies in causing headache. The most frequently encountered condition after refractive error is binocular accommodative or oculomotor anomaly. The most widely accepted system for classifying binocular vision dysfunctions is Duane’s classification. It is based on both the distance phoria and AC/A (accommodative-convergence by accommodative) ratio. The commonest anomalies are accommodative insufficiency and convergence insufficiency.

Binocular vision anomalies have been a major cause of headache which goes undetected due to neglect towards this aspect as a cause of headache. Therefore this study was conducted with the aim to study various binocular attributes associated with headache, in absence of refractive error and other ocular inflammatory diseases.

**MATERIAL AND METHOD**

It is a prospective cross-sectional study conducted in the department of Ophthalmology, after the approval from Institutional ethics committee and an informed written consent by the patient.

There were 199 patients with complaints of headache who either had come by their own or were referred from other departments to the department of Ophthalmology. Patients were also referred to other departments to rule out non-ocular cause of headache.

Patients who had non-ocular headache and other causes of ocular headache (hysteria, malingerer, neurogenic causes such as intracranial space occupying lesion, benign intracranial hypertension, meningitis, giant cell arteritis; sinusitis, otitis, vascular headaches etc; patients on NSAIDs/anticholinergic drugs – psychiatric disorders) varies with age, and is 9–11% in school children. In more than 80% patients, headache starts before the age of 40 with a lower prevalence rate at an advanced age (>50 years).

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Selected patients were interviewed according to a pre-designed and pre-tested performa. Detailed history of headache pattern, life style pattern and eating habits was taken. Ocular evaluation consisted of detailed refractive check-up, binocular vision assessment and anterior segment and posterior segment examination.

Visual acuity was tested at 6 meters by Snellen’s chart and after refraction only the emmetropic patients were included in the study.

A slit lamp examination of the anterior segment was done and ocular tension was recorded by applanation tonometer. Fundus examination, tonometry and visual fields were done. Ocular refraction only the emmetropic patients were included in the study.

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Table 1

<table>
<thead>
<tr>
<th>Age Group (N)</th>
<th>Sex</th>
<th>Occipital</th>
<th>Frontal</th>
<th>Hemicranial</th>
<th>Generalised</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-20 Yrs (N = 74)</td>
<td>Male</td>
<td>23 (31.10%)</td>
<td>31 (41.90%)</td>
<td>22 (29.60%)</td>
<td>74 (100.00%)</td>
</tr>
<tr>
<td>21-30 Yrs (N = 90)</td>
<td>Female</td>
<td>30 (33.30%)</td>
<td>40 (44.40%)</td>
<td>19 (21.10%)</td>
<td>90 (100.00%)</td>
</tr>
<tr>
<td>31-40 Yrs (N = 27)</td>
<td></td>
<td>8 (29.60%)</td>
<td>9 (33.30%)</td>
<td>19 (70.40%)</td>
<td>27 (100.00%)</td>
</tr>
<tr>
<td>41-50 Yrs (N = 6)</td>
<td></td>
<td>3 (50.00%)</td>
<td>3 (50.00%)</td>
<td>3 (50.00%)</td>
<td>6 (100.00%)</td>
</tr>
<tr>
<td>51-60 Yrs (N = 2)</td>
<td></td>
<td>0 (0.00%)</td>
<td>2 (100.00%)</td>
<td></td>
<td>2 (100.00%)</td>
</tr>
<tr>
<td>TOTAL (N = 199)</td>
<td></td>
<td>64 (32.20%)</td>
<td>81 (40.70%)</td>
<td>54 (27.10%)</td>
<td>199 (100.00%)</td>
</tr>
</tbody>
</table>

Table 2

<table>
<thead>
<tr>
<th>Working Hours</th>
<th>Total</th>
<th>Occipital</th>
<th>Frontal</th>
<th>Hemicranial</th>
<th>Generalised</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPTO 4HRS (N = 76)</td>
<td>4 (5.30%)</td>
<td>41 (53.90%)</td>
<td>24 (31.60%)</td>
<td>7 (9.20%)</td>
<td></td>
</tr>
<tr>
<td>5-8HRS (N = 61)</td>
<td>(··)</td>
<td>30 (49.10%)</td>
<td>19 (31.20%)</td>
<td>12 (19.70%)</td>
<td></td>
</tr>
<tr>
<td>9-12HRS (N = 18)</td>
<td>(··)</td>
<td>11 (61.10%)</td>
<td>5 (27.80%)</td>
<td>2 (11.10%)</td>
<td></td>
</tr>
<tr>
<td>13-16HRS (N = 44)</td>
<td>4 (9.10%)</td>
<td>8 (18.20%)</td>
<td>21 (47.70%)</td>
<td>11 (25.00%)</td>
<td></td>
</tr>
<tr>
<td>TOTAL (N = 199)</td>
<td>8 (4.00%)</td>
<td>80 (40.50%)</td>
<td>69 (34.70%)</td>
<td>52 (16.10%)</td>
<td></td>
</tr>
</tbody>
</table>
DISCUSSION

Headache is experienced by majority of population and has a major impact on public health. The condition has been ranked among the ten most disabling conditions by the world health organisation. Headache is common during childhood and it becomes even more common and more frequent during adolescence.

In our study, the commonest binocular anomaly was accommodative insufficiency (46.7%), followed by convergence insufficiency (39.1%), while according to Mocci F et al(12) convergence insufficiency is the most frequent cause of musclar aesthenopia. This prevalence of convergence insufficiency is less than that of Gupta et al(13) (49%), Romanian(14) (60.4%) and Patwardhan and Sharma(15) (71.4%), while it is more than that of Sanjay et al(16) (16.2%). These discrepancies might be because of the different working environment of the patients.

In our study, accommodative insufficiency is associated with low AC/A ratio, which is normally overcome by positive fusional reserve but when this fusional reserve is also insufficient the patient develops the symptom of aesthenopia and then actual headache. This fusional reserve become insufficient due to functional causes such as overwork or deficient physiology though there may be other non-functional causes. And this may be the reason for headache in younger age group as they stress their eyes by staying awake at night and watching television or computers and also skipping meals.

In this study, headache was more common in females (p<0.001) similar to the observations of Hendricks et al(17) and Sanjay et al(18), with females having more than two fold prevalence over males especially in young adults in the age group of 21-30 years. Headache prevalence in this particular age group might be because of the psychological stress caused by educational pressures for career development and emotional factors. Female preponderance could be because of the culturally set factors and the effects of male dominated society which may lead to psychological stress(19). In our study, patients in the school age comprised of 37%. Headache in this age group could be because of peer pressure for better performance in the studies and extracurricular activities.

Regarding the site of headache, our study revealed that the frontal (45.2%) followed by unilateral location (34.7%) were the commonest sites. According to Unp et al (2005)(21) most of the patients who suffered from headache defined more than one location. More than half of the studied sample (70.35%) had throbbing type of headache followed by piercing type in 16.08%. Throbbing headache was commonly associated with low AC/A ratio (40%) while piercing type was commonly associated with high AC/A ratio (43.8%). These findings were similar to the studies of Unp et al. 2005 (22) and Ayatollahi & khosravi (2006)(24).

Various studies have stated different precipitating factors for headache such as skipping meals, and inadequate or irregular sleep, and stress to be majorly responsible for headache. Isik et al (2006)(19) and El tallawy et al (2006)(20) reported them to be the most common precipitating factors for headache in 69%, 83.6% and 72.6% cases respectively. Hunger or missed meal is shown to be a precipitating factor in 60.06% of children by Blau et al (2004)(21).

Other precipitating factors were staying for long in front of TV or computer, ingestion of cold drink or ice cream and eating chocolate or cheese in a study carried out by Stovner et al (2007)(22). These environmental triggers, light, sound and smell are transmitted directly to the central nervous system (CNS) by the special senses and thus cause direct excitation of the neural pathways which then causes headache attack. We could not include them in our study due to limited resources.

CONCLUSION

Emmetropic females above the age of 21 years without any systemic association suffer from headache more than males.

Younger age group (10-20 years) patients suffer more from convergence insufficiency, accommodation insufficiency and poor fusional vergence.

Inappropriate lifestyle pattern could be the major precipitating factor triggering headache in them. Thus we found that ocular anomalies other than refractive error may co-exist with headache complaints for which thorough investigation should be done as proper treatment of refractive anomalies and binocular vision usually results in improvement of headache.

REFERENCES

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