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Original

Higher cerebrospinal fluid (CSF) opening pressure in patients with idiopatic intracranial hypertension (IIH) with permanent visual impairment

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Abstract

Objective

The aim of this study was to identify potential visual prognostic markers in patients with idiopathic intracranial hypertension (IIH).

Methods

Patients with IIH of an outpatient headache clinic in São Paulo, Brazil, were retrospectively evaluated and divided in two groups with and without the presence of permanent visual deficit attributed to IIH. Body mass index (BMI), opening CSF pressure, and the frequency of IIH related MRI abnormalities were compared between these two groups.

Results

Twenty-nine patients, with 35,39±9,93 years, being twenty-eight female (96.55%) were included in the study. Reduced visual acuity attributed to IIH was registered in 16 (55.17%). According to BMI 17.4% had overweight and 82.6% were obese. Brain MRI was normal in 6 (20.69%). BMI, obesity, and the presence of MRI abnormalities were not associated with visual impairment. Initial CSF opening pressure was significantly higher in the group of patients with reduced visual acuity (40.4±13.14 x 30.5±3.41, P=0,015).

Conclusion

Higher CSF opening pressure at onset was significantly associated with a higher percentage of visual impairment in patients with IIH suggesting this measure as a potential prognostic marker for patients with IIH.

Keywords:
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Obesity

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Introduction

Idiopathic intracranial hypertension (IIH) is a syndrome of elevated intracranial pressure of unknown etiology. The most common clinical features are headache, visual abnormalities, and pulsatile tinnitus. Visual abnormalities may include blurred vision, visual field defects, binocular diplopia, and loss of visual acuity. Permanent vision loss can occur in nearly 10% of patients. Most cases are seen among obese female of childbearing age. A definite diagnosis requires the presence of papilledema and elevated opening pressure on lumbar puncture. Magnetic resonance imaging (MRI) abnormalities can be detected, including an empty sella, posterior globe flattening, perioptic subarachnoid space distension, optic nerve sheath thickening, optic nerve tortuosity, Meckel cave enlargement, and transverse sinus stenosis. Although these MRI findings are not specific and are not required for the diagnosis, they increase the probability of diagnosis when three or more of these findings are present. Some of the MRI characteristics in IIH are reversible after treatment.[1-4]

The treatment of IIH includes weight loss, the use of acetazolamide, and surgical management such as including ventriculoperitoneal shunt and optic nerve sheath fenestration when there is a rapid or progressive decline in visual function. The goals of treatment are to prevent permanent visual loss and relieve headache.[2]

The predictive factors of permanent visual loss or deficiency in patients undergoing treatment for IIH are not yet fully understood. In the current study we evaluated a cohort of patients with IIH and evaluated variables associated with permanent visual loss.[5-7]

Methods

Patients with IIH-related headache defined in the Headache Classification of the International Headache Society (ICHD-3)[8] were included. The study was carried out at Headache Outpatient Clinic of the "Irmandade da Santa Casa de Misericórdia de São Paulo". The study was retrospective, and all the data were collected from the institution charts. Patients with intracranial hypertension due to other neurological disorders such as cerebral venous thrombosis, intracranial mass-effect lesions, and meningeal enhancement, patients with systemic conditions potentially associated with secondary intracranial hypertension (anemia, collagen diseases, active malignancy, endocrine syndromes or diseases, severe renal dysfunction, and use of medications such as fluoroquinolones, tetracyclines, vitamin A analogues, and long-term glucocorticoid weaning) were not included. Patients with other potential causes for low visual acuity than IIH were also excluded. The study was approved by the local research ethics committee.

The following data were collected: gender, age, weight, mass body index, IIH treatment, the presence of permanent visual loss attributed to IIH, opening CSF pressure, and IIH related MRI abnormalities. The comparison of categorical variables was performed by the χ-square contingency test or Fisher's exact test when the expected cell frequency was less than 5. Continuous variables without normal distribution in the Shapiro-Wilk test were compared with Mann-Whitney test and the normal distribution ones were compared with unpaired *t* test. The level of statistical significance was set at 5% (p=0.05).

Results

Twenty-nine patients were included in the study. The mean age of the studied population was 35,39±9,93 years. Twenty-eight patients were female (96.55%). According to the BMI classification, 17.4% had overweight and 82.6% were obese. Reduced visual acuity attributed to IIH was registered in 16 (55.17%). Brain MRI was normal in 6 (20.69%). Empty sella was the most common finding found in 18 (62.07%) patients. Optic nerve sheath thickening or tortuosity was found in 12 (41.38%) patients. Posterior globe flattening was found in 10 (34.48%) patients. Unilateral transverse sinus stenosis was found in 10 (34.48%) patients, as shown in Table 1. All patients were under treatment that included therapeutic approaches for weight reduction, pharmacological therapy, or surgical treatments. All patients were using at least one drug for IIH. Eighteen patients were using acetazolamide (62.06%), eight patients were using acetazolamide and topiramate (27.58%), and three were using topiramate (10.34%). Previous surgical treatments were registered in six patients (20.68%), being ventriculoperitoneal shunt in four, optic nerve fenestration in one, and venous sinus stenting in one. At the time of data collection all the patients were clinically considered to have controlled intracranial hypertension (improved headache, absence of papilledema, no recent worsening of vision, and stable visual fields).

Table 1. Data comparison between patients with and without reduced visual acuity attributed to IIH

	With reduced visual acuity (n=16)	Without reduced visual acuity (n=13)	p value
BMI	34.11±3.86	37.17±5.13	0.077
Obesity	4 (80%)	19 (82.6%)	1
MRI abnormalities	12 (75%)	9 (69.2%)	1
CSF opening pressure at the time of diagnosis	40.4±13.14	30.5±3.41	0.015

Note: IIH – idiopathic intracranial hypertension; BMI -body mass index; MRI – magnetic resonance imaging; CSF – cerebrospinal fluid.

Discussion

We found that CSF opening pressure at the time of diagnosis was higher in patients with permanent visual symptoms attributed to IIH. Our finding is in line with previous studies that also found a relationship between raised opening pressure and the visual prognosis of IIH. Effective treatment of this condition with acetazolamide is associated with a reduction in opening pressure and an improved visual prognosis.[9-12] Another study found that patients with severe visual loss had significantly higher initial CSF opening pressure at the onset than patients with mild to moderate visual loss.[7] This association is not surprising since there is a relationship between intracranial pressure and optic nerve integrity. The precise mechanisms of optic nerve involvement in IIH are not completely understood but it is possible that raised intracranial pressure results in ischemic and compressive effects on the optic nerve.[12-14] Another possibility is that structural abnormalities, such as degenerative changes, take place in the optic nerve due to raised intracranial pressure. Optic nerve sheath diameter and sonoelastography optic nerve studies reinforce this possibility.[6]

We did not find higher BMI indexes and higher percentage of obesity within the group of patients with visual impairment. A previous large study with 414 IIH patients found an association between class III obesity with BMI of 40 or higher with increased risk of severe visual loss in IIH.[15] Lower degrees of obesity did not show the same correlation.[15] Other studies did not find an association between BMI and visual outcome.[16,17] In our study the number of patients with grade III obesity was too small to draw any specific conclusion regarding this specific subgroup of obese patients. The lack of higher BMI indexes and the higher CSF opening pressures among patients with visual impairment found in the present study suggests that BMI and CSF opening pressure do not increase at the same rate. This is consistent with the lack of correlation between BMI and CSF opening pressure that was recently showed.[18] Some studies found an association between recent weight gain, but not degree of obesity, with visual impairment.19 In our study it was not possible to assess how many of the patients had recent weight gain. The obesity percentage was high in both groups regardless of whether there is a direct relationship between the degree of BMI with visual prognosis. Weight reduction aiming to achieving a BMI within normal limits in IIH is certainly an important strategy to improve the outcome of these patients.[8]

The presence of MRI abnormalities was not more frequent among patients with visual abnormalities. A previous study found and association of bilateral transverse sinus stenosis with visual outcome at 6 months.[5] A more recent study did not reproduce this finding.20 We had only 10 (34.48%) patients with unilateral transverse sinus stenosis but there were not cases of bilateral transverse sinus stenosis not allowing to evaluate this association in our population. Other study found that three or more MRI abnormalities were associated with impaired visual prognosis.[21] Another study suggested a prognostic and monitoring role of MRI since MRI characteristics in IIH may be partially reverted after treatment.[22] In our study it was not possible to assess the monitoring role of MRI since we did not perform serial MRI scans. The frequency of MRI abnormalities of nearly 80% of the cases in our study is close to what has been shown in previous studies.[23,24] MRI is a very useful method to aid in the diagnosis of this entity, however, its role in the prognostic assessment of IIH remains undefined.

Our study has limitations. First, it was a retrospective study, precluding the establishment of any causal relationship. Other variables with a potential impact on visual prognosis, such as the time elapsed between the onset of symptoms and the onset of the treatment were not evaluated, due to the lack of precision of this information in the medical records of the patients of the study. The number of patients was small, although it is a relevant series in view of the rarity of this condition.

In conclusion, CSF opening pressure was the only variable significantly different between patients with or without visual abnormalities. While this reinforces the potential of this measure as a prognostic marker for this entity, future studies are still needed to establish whether and how CSF opening pressure can aid to define the therapeutic strategy for patients with IIH.

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