# 98 The relationship between intracranial pressure (ICP) and visual field loss (VFL) in paediatric patients presenting with idiopathic intracranial hypertension (IIH) at a tertiary referral centre.

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## INTRODUCTION

Paediatric idiopathic intracranial hypertension (IIH) commonly presents with headache, nausea and vomiting, transient visual obscurations, papilloedema and visual field changes, caused by raised intracranial pressure (ICP). Prompt diagnosis and management are important to prevent irreversible visual loss.

## AIMS

- To assess the relationship between quantifiable proxy measures of ICP and visual field loss in paediatric IIH.
- To characterise the extent of visual field loss at presentation and its change over an IIH treatment course.

## METHODS

A retrospective review of case notes of 37 paediatric patients presenting with IIH at a UK tertiary centre with reliable Humphrey Field Tests (HFTs) was conducted. Reliable HFTs were defined as those with fixation loss <20%, false positives <33% and false negatives <33%, which are the cut-offs recommended by Humphrey Instruments, Inc.

Analysis included: visual field index (VFI), MD (mean deviation) and PSD (pattern standard deviation) values; cerebrospinal fluid (CSF) infusion study or tap opening pressure, Optical Coherence Tomography (OCT) retinal nerve fibre layer (RNFL) thickness and papilloedema Frisén grading at presentation. MS Excel was used for statistical analysis.

## DEMOGRAPHICS

| Patients with reliable HFT for at least one eye at initial presentation | |
|---|---|
| **37 patients, 60 eyes**<br><br>23 patients x both eyes = 46 eyes<br>5 patients x right eye only = 5 eyes<br>9 patients x left eye only = 9 eyes | |
| M:F | 11:26 |
| Mean age at presentation | 13.3 ± 2.2 |
| Percentage White British ethnicity | 73.0 |
| Mean BMI | 26.9 |
| Symptoms at presentation | Headache: 100%<br>Migraine: 5%<br>Vomiting: 27%<br>Transient visual obscuration: 19%<br>Pulsatile tinnitus: 20% |
| Modal visual acuity at presentation | 6/6; range 6/4 – 6/48 (RE), 6/4 – 6/60 (LE) |
| Percentage with reduced colour vision at presentation | 22% |

Of these patients, a subset of 26 had more than one reliable HFT over their treatment course, offering the opportunity for comparison over time.

## RESULTS: PROXY ICP MEASURES vs HFT PARAMETERS

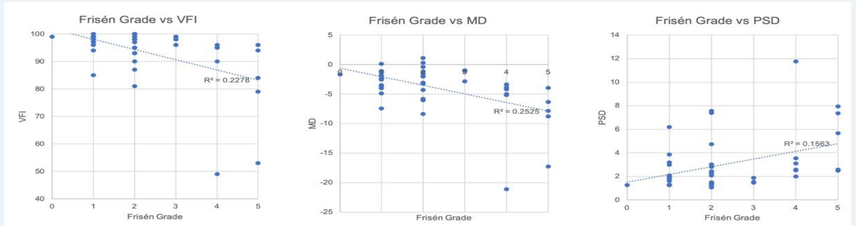



*Figure 1. Frisén grade vs VFI, MD and PSD. Frisén grading was available for 42 eyes; mean grade 2.4*

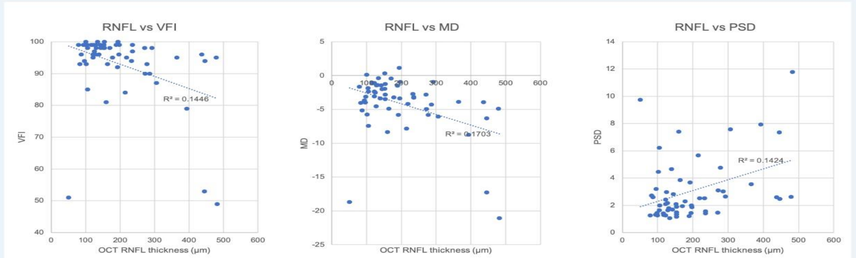



*Figure 2. OCT mean RNFL thickness vs VFI, MD and PSD. OCT mean RNFL thickness was available for 57 eyes; mean 194.3µm.*

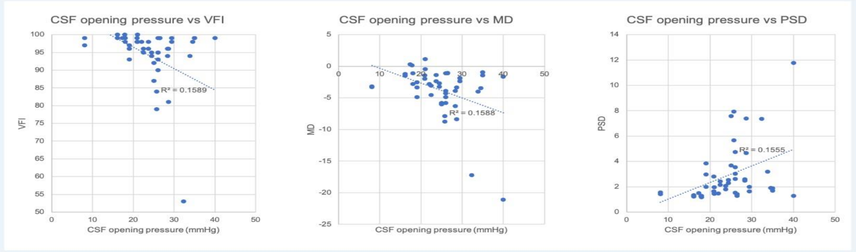



*Figure 3. Opening pressure for CSF infusion study or tap vs VFI, MD and PSD. Opening pressure was available for 46 eyes of 28 patients; mean opening pressure 25mmHg.*

'Fair'[1] but statistically significant correlation was found between Frisén Grade and each of VFI, MD and PSD (r=-0.4773, -0.5025 and 0.3953, p<0.01; Fig. 1), between RNFL thickness and each of VFI, MD and PSD (r=-0.3803, -0.4126 and 0.3774, p<0.01; Fig. 2) and between CSF opening pressure and each of VFI, MD and PSD (r=-0.3986, -0.3985 and 0.3943, p<0.01; Fig. 3).

*[1]Chan, Y. H. "Biostatistics 104: correlational analysis." Singapore Med J 44, no. 12 (2003): 614-619*

## RESULTS: CHANGES OVER TREATMENT COURSE

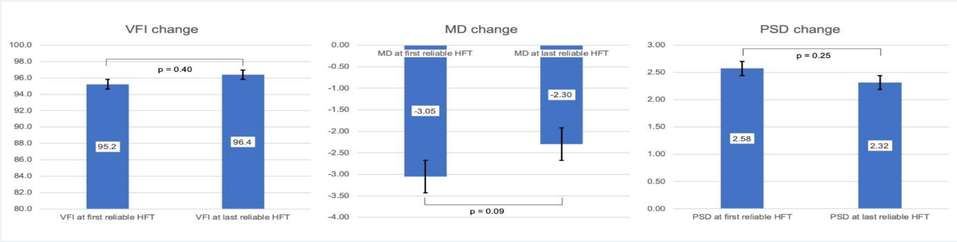



*Figure 4. Change in VFI, MD and PSD over treatment course. N = 26 patients, 52 eyes.*

Mean VFI, MD and PSD at presentation were 95.2±7.29, -3.05±2.74 and 2.58±1.76 respectively (Fig. 4), and a positive trend to improvement but no significant change in HFT parameters between the first and last reliable tests during treatment lasting 31 months on average (p = 0.40, 0.09 and 0.25 respectively, p < 0.05; Fig. 4).

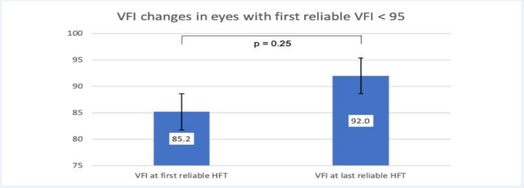



*Figure 5a. Change in VFI over treatment course for patients starting with first reliable VFI < 95. N = 5 patients, 10 eyes.*

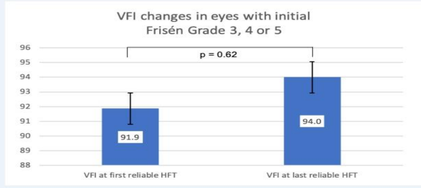



*Figure 5b. Change in VFI over treatment course for patients with initial Frisén grade 3, 4 or 5. N = 10 patients, 15 eyes.*

Mean VFI for two subgroups of patients with initial severe presentations was 85.2±12.0 for patients with first reliable VFI < 95 (low VFI; Fig. 5a) and 91.9±11.8 for patients with Frisén grade of 3, 4 or 5 (severe papilloedema; Fig. 5b). Neither the low VFI nor the severe papilloedema group showed a significant change in HFT parameters between the first and last reliable tests during treatment lasting on average 32 and 24 months respectively (p = 0.25 and 0.62 respectively, p < 0.05; Fig. 5a and Fig. 5b).

## CONCLUSIONS

- There is fair correlation between Frisén grade, RNFL thickness or CSF opening pressure and reliably-measured VFI, MD and PSD in children with IIH. This suggests the extent of ICP as measured by degree of papilloedema on slit lamp examination, OCT or CSF manometry is predictive of the extent of VFL, and vice versa: the extent of VFL is predictive of ICP.
- The overwhelming majority of patients in the study were medically treated according to national guidelines with a combination of acetazolamide and topiramate.This medical treatment failed to bring about a statistically significant improvement in visual fields, though baseline VFI, MD, and PSD were generally found to be high at the time of first HFT.
- When considering a subgroup of patients with severe IIH, a similar lack of statistically significant improvement with conventional medical therapy is more concerning as the potential for recovery to adequate visual fields is reduced.
- Therefore, these data suggest early intervention with aggressive medical therapy should be considered for children with IIH presenting with concerning OCT, CSF opening pressure and papilloedema parameters that correlate with poor visual fields.
- An important limitation is imposed by the relatively small sample size associated with a paucity of reliable HFT results from paediatric patients, and further work is required to determine whether these findings can be replicated in other centres.

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