

**Title: Correlation of Visual Function and National Eye Institute Visual Function Questionnaire (NEI-VFQ25) in subjects with IIH and normal controls.**

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**Introduction and Purpose**

**Aims of the study:**

1. To assess contrast sensitivity acuity and rapid eye movements (saccades) as a measure of visual function in Idiopathic Intracranial Hypertension (IIH) patients compared to normal patients using the King-Devick Variable Contrast Acuity Chart and the K-D rapid eye movement.
2. To assess subjects quality of visual function using the National Eye Institute Visual Function Questionnaire (NEI-VFQ25) questionnaire and Supplement as a comparison between IIH subjects and normal controls.
3. To study the correlation between visual function and quality of visual function questionnaire in subjects with IIH compared to normal controls.

Contrast sensitivity is a measure of afferent visual system. Contrast sensitivity deficit with preservation of normal Snellen acuity has also been reported in glaucoma, compressive disorders of the anterior visual pathways, retinal diseases, and with cerebral lesions.<sup>1</sup> This test is significantly more sensitive than Snellen acuity.<sup>1</sup> It is also superior for serial testing in patients as there was significant improvement in contrast scores and papilledema grade but no significant change in Snellen acuity.<sup>1</sup>

Visual manifestation of IIH can also include parafoveal deficits. This can lead to deficits in spatial frequency contrast sensitivity.<sup>1</sup> Contrast sensitivity is abnormal initially and improved with regression of papilledema.<sup>2</sup> Since decisions on therapy in IIH are based on the presence and change in visual function, assessing visual acuities is not the most accurate measure of visual status in IIH. Whereas contrast sensitivity would be more sensitive.<sup>3</sup> In this study, we will use the King-Devick Variable Contrast Acuity Chart to assess contrast sensitivity in patients with IIH, allowing us compare between IIH patients and to normal controls from ages 18 to 40. We chose to end at 40 to eliminate presbyopia as a confounding factor.

Additionally, an area much less studied is how IIH affects ocular motility. The abducens nerve in its long path, as it traverses the petrous portion of the middle cranial fossa can be compressed and thus cause a lateral rectus palsy in increased intracranial pressure. Case reports of eye movements abnormalities in IIH have included ophthalmoplegia, Trochlear nerve palsy, and reversible skew deviations.<sup>4,5,6,7,8</sup> There are no studies, to date, in fast ocular motility involvement such as saccades in IIH.

It is postulated that the afferent visual symptoms of IIH patients are caused by obstruction of axoplasmic flow of the optic nerves.<sup>9</sup> It was concluded by Schmidt et al, that IIH is associated with micro-structural changes in the optic nerve as a consequence of increased pressure.<sup>9</sup> The extent to which compression occurs in the brain as a result of increased ICP is unknown. It is thought that increased pressure in the brain may result in interstitial movement of CSF and accumulation in brain parenchyma.<sup>9</sup> This may result in edema, conferring micro-structural alterations much the same way optic nerve microstructure changes occur.<sup>9</sup>

This postulate is of interest, theoretically, and needs further investigation. Our purpose is not to look at how increased intracranial pressure of IIH affects the parenchyma of the brain directly. However, the center for saccades originate in the contralateral frontal lobe, part of the Supranuclear pathway. This pathway extends to ipsilateral abducens nucleus and shares a common pathway in the Pontine Reticular Formation (PPRF). The question we are asking is whether IIH alters saccades. Whether this infers that there are micro-structural changes to the brain is an interesting thought and may need further investigation.

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The King-Devick (K-D) Test is a vision-based test of rapid number naming performance. The test requires eye movements such as saccades, convergence, and accommodation. In addition, it also looks at visual processing, attention, concentration, and language components. The K-D test has been studied and validated as a concussion screening tool in youth to professional level contact sport athletes. Performing the K-D test requires subjects to read numbers aloud and as quickly as possible on an iPad. The times and seconds constitutes the summary score. In athletes, prolonged time scores corresponded to increased saccadic latency post injury compared to pre-season baseline.<sup>10</sup> The K-D rapid eye movement test has also been used to assess other neurologic function in patients with cognitive impairment and Alzheimer's disease (AD), to help diagnostic evaluation.<sup>11</sup> One study revealed significant differences on the K-D total time score and total errors across the diagnostic groups. Both MCI and AD subjects performed worse than controls on the K-D.<sup>11</sup> Other studies assessed patients with Parkinson's disease (PD) essential tremors, and Multiple Sclerosis, demonstrating its ability to be a bedside tool.<sup>12</sup>

## **Concise Summary of Project:**

- Participants with ICD 9 or ICD10 diagnosis of IHH ages 18-40, will be recruited and enrolled during their clinic visit at UTSW outpatient clinics.
- We will also look at the lumbar puncture date and opening pressures to confirm diagnosis by reviewing patient records through their chart.
- Normal controls participants will be recruited and enrolled at UTSW campus. Normal controls are healthy adults ages 18-40 who work, go to school or attend clinic at UTSW.
  - Subjects with Diabetic Eye Disease, Migraine headaches, Parkinson's disease, Multiple Sclerosis, Alzheimer's disease, Traumatic Brain Injury, and Strokes will be excluded.
- Participants will complete the National Eye Institute Visual Function Questionnaire (NEI-VFQ25), and the supplement, and perform assessments on the King-Devick Variable Contrast Acuity Chart and the K-D rapid eye movement assessment on an iPad.
- Results will be collected from the King Devick applications as a measure of their visual function.
- The NEI-VFQ25 and supplement will assess for quality of vision.

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