

New research published reports eye scans can help in Idiopathic Intracranial Hypertension

A recent article was published in an American medical journal called JAMA Ophthalmology. It was called “**Using Optical Coherence Tomography Measures as Surrogates for Raised Intracranial Pressure in Idiopathic Intracranial Hypertension**”. The research was done through Professor Alex Sinclair and the IIH research network in the United Kingdom.

Full text can be found at : <https://jamanetwork.com/journals/jamaophthalmology/article-abstract/2772034>

What is Idiopathic Intracranial Hypertension?

Idiopathic Intracranial Hypertension (IIH) is a condition where there is raised brain pressure.

Raised brain pressure can cause problems in people with IIH like headaches and problems with their vision. Raised brain in a lot of people can cause papilloedema. Papilloedema is swelling of the eye nerves and can be measured using eye scans. The high brain pressure causes the eye nerve or “optic nerve” to change shape and become thicker and taller than it is meant to be. This can cause permanent vision problems in one in ten people.

How is Idiopathic Intracranial Hypertension usually diagnosed and monitored?

Papilloedema can be picked up by opticians and eye doctors. The doctors then do tests such as brain scans (MRIs) and a lumbar puncture to diagnose IIH. A lumbar puncture (also known as LP or spinal tap) is a medical procedure used to measure the brain pressure and to remove a small sample of the cerebrospinal fluid for testing in a lab. A lumbar puncture involves putting a needle with an attachment into the lower back (with local anaesthetic to help numb the pain) to measure the brain pressure. It is an ‘invasive procedure’, as it can be uncomfortable and hurt. A lumbar puncture is safe, with few people having serious problems after it.

What was this research paper about?

The research looked at the measurement of papilledema and with eye scans (called OCT) to predict the brain pressure. OCT stands for Optical Coherence Tomography. OCT uses light to take high-quality pictures of the eye nerves (optic nerves). A scan is quick, does not touch the eye, and is entirely painless.

By doing this research, the researchers hoped they would be able to use OCT eye scans instead of a lumbar puncture to measure brain pressure.

What did this research involve?

This research took place between 2014 and 2019 at five NHS hospitals across the UK. There were 104 women who took part in this research. They were all between 18 and 45 years old. These women all been diagnosed with IIH. IIH is more common in women.

Every time the women had their brain pressure measured, an OCT eye scan was taken. Brain pressure was measured in two different ways:

1. A small number of women (15 in total) had a brain device placed by surgery as part of another study. This was called a telemetric intracranial pressure monitor. These are very accurate at reporting the brain pressure.
2. The rest had their brain pressure measured in the normal way using a lumbar puncture.

The researchers used a mathematical method to compare the brain pressure measurements to the changes from the OCT eye scans over 2 years.

What were the results?

The results of this study were very promising. The researchers found that the eye scan 'numbers' were significantly representative of changes in brain pressure. These include the following names:

- The optic nerve head volume total number
- The central thickness number
- The central volume number
- The maximum height of the optic nerve

So the researchers decided to take forward one number called the central thickness, to understand more about it and its relationship to brain pressure.

Using a mathematical method (called surrogacy) they were able to see that the central thickness changes could help predict changes in the brain pressure over 2 years.

They also found that one of the eye scans on the central part of the retina, called the macula ganglion cell volume, was able to predict the problems seen in the visual field test.

Why is this different from other studies?

Women in this study were highly monitored, as they were all part of randomised controlled trials. This is important when looking at the information scientifically.

The researchers used the number read outs from the OCT machines, rather than manipulating the images in the lab with software they have built. This means the results could be used in other NHS hospitals and in other countries around the world that have this type of OCT machine and scanner.

Are there any problems with this research?

With any type of research there can be issues. OCT eye scan machines find it hard to draw lines that are really accurate if the eye swelling is too bad, this means the eye doctors have to draw the lines. This might change the results in a small way.

The mathematical method used should really use data from many hundreds of patients in randomized controlled trails. The problem is IHH is too rare for the researchers to have this

kind of data. They therefore used the best way to predict the brain pressure over 1 and 2 years.

What does this mean for people with IIH?

This research is exciting for people with IIH and other conditions that have high brain pressure. These OCT eye scans may in the future be used instead of a lumbar puncture.

What happens next?

This study was the first of its kind, and more work is needed to be done. The researchers need more 'real world' data, as IIH and papilloedema is a rare condition. At the moment OCT eye scans cannot replace a lumbar puncture. But this research gives us hope that in the future OCT eye scans could be used instead of a lumbar puncture.