

Pituitary Tumours and Vision

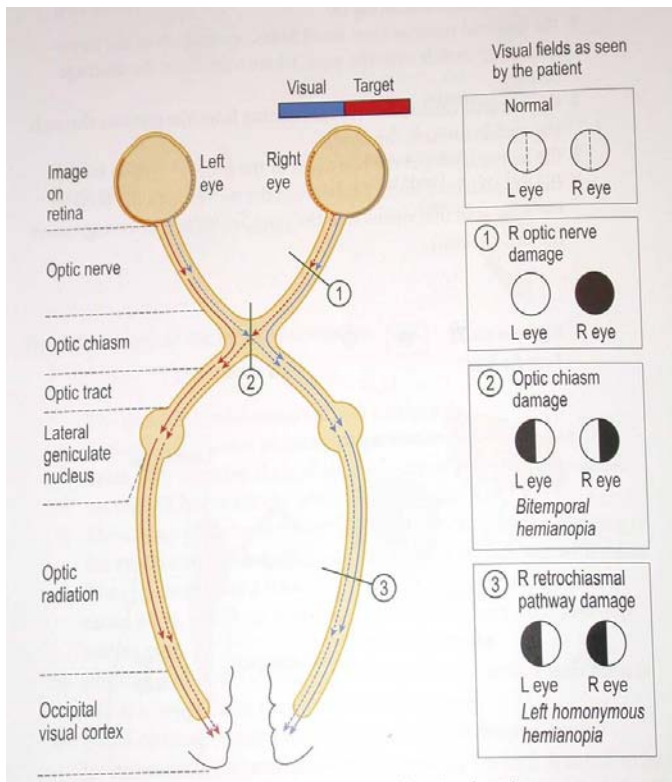
Dr Anthony Pane. Consultant Eye Surgeon and Neuro-Ophthalmologist,
Queensland Eye Institute, Brisbane.

Overview

All information from the eyes travels to the brain through nerves which pass very close to the pituitary gland. Changes in a patient's vision are important to consider in the assessment and continuing care of patients with pituitary tumours for the following reasons:

1. blurred vision or double vision can be the first (or sometimes the only) symptom of a pituitary tumour
2. permanent loss of vision, in one or both eyes, may be the only permanent harm done by some pituitary tumours
3. after a successful operation to remove a tumour, changes in a patient's side vision on special testing may be the first sign that the tumour is recurring

How does the visual system of the brain work?



The visual information from each eye travels back through a complex system of nerve fibres, right back to the back part of the brain for processing. An interruption of this visual pathway at any point can result in blurred vision.

Each eyeball is connected to the visual areas of the brain through an **optic nerve**. Each optic nerve consists of more than a million individual nerve fibres, each of which "sees" a different point in space. The two optic nerves join, and the nerve fibres partially cross, in an X-shaped structure at the base of the brain called the **optic chiasm**. From the chiasm, nerve fibres carrying vision information run back through the brain to the main visual areas of the brain, which lie right at the back of the brain in the occipital lobe.

As pituitary tumours grow they often compress the optic chiasm, although both optic nerves, or sometimes just one optic nerve, can be compressed instead.

The total amount of peripheral (side) vision seen by each eye while looking straight ahead is called the **visual field** of each eye. If the optic chiasm is compressed by a growing tumour, each eye loses the ear-side (temporal) visual field first. If the compression is severe, this causes complete loss of the ear-side half of the visual field of each eye - this is called a **bitemporal hemianopia**. The explanation for this is that the nerve fibres most easily damaged by pressure on the optic chiasm are the crossing fibres, which carry visual information from the temporal visual field of each eye.

If however one or both optic nerves are compressed instead, the patient can lose vision in one or both eyes with any type of visual field defect.

How can pituitary tumours affect vision?

1. By causing blurred vision

If the optic chiasm and/or one or both optic nerves are compressed by upward growth of a pituitary tumour, the patient may notice blurred vision in one or both eyes. This can be quite subtle early on, and the blurring may be all over the vision, or in just part of the side vision.

Some patients also notice that colours do not seem to be as bright as they used to be, for example bright red coloured objects are seen as a washed-out pink colour instead. This is because compression of the optic nerve or chiasm often causes loss of colour vision before it causes loss of visual acuity (reading down the eye chart vision).

If a pituitary tumour does not secrete hormones, and is not causing severe headaches or any other symptoms, often the first and sometimes the only symptom is blurred vision. Patients with pituitary tumours often therefore first go to an optometrist or eye doctor, and further investigations often result in diagnosis of the tumour.

Usually the blurred vision caused by a pituitary tumour is gradual in its onset and only gets worse very slowly, over many months or even years. However sometimes if there is a sudden increase in the size of the tumour, for instance due to sudden bleeding inside the tumour ("pituitary apoplexy"), patients can notice a sudden severe blurring of vision in one or both eyes. This is usually accompanied by a sudden severe headache, and feeling very unwell.

2. By causing double vision

Less commonly, pituitary tumours grow sideways into an area of the brain called the cavernous sinus. The nerves that control the movements of the eyes run through the cavernous sinus, and pressure on these nerves by a growing tumour can therefore sometimes cause double vision (diplopia). In unusual cases, pituitary tumours can therefore first present with double vision (the patient sees two images of everything they look at).

3. By causing a drooping eyelid

Tumours that grow sideways into the cavernous sinus can also cause pressure on the nerve that opens the eyelids. This can cause drooping of one or both eyelids (ptosis). Usually if the patient has ptosis from a pituitary tumour, they have also noticed blurred or double vision.

4. By causing a dilated pupil

Patients with ptosis or double vision from sideways growth of a pituitary tumour sometimes also have a dilated pupil in one or both eyes (that is, the black part in the centre of the coloured part of the eye is larger).

What other symptoms can patients notice?

As well as the vision symptoms discussed above, some (but not all) patients with pituitary tumour is have headaches.

Pituitary tumours that produce hormones (“secreting”) tumours can present with hormonal symptoms - for example loss of periods or impotence in pituitary tumours that secrete the hormone prolactin. Hormone secreting tumours are often discovered while they are fairly small, often before they compress the optic chiasm optic nerves.

Tumours that do not secrete any hormones (“non-secreting” tumours) are more likely to present with visual problems, because they are often larger by the time they are detected.

What tests are used if a pituitary tumour is suspected?

Patients with pituitary tumours are often cared for by a team of four different types of specialist: a neurologist (brain physician), endocrinologist (hormone physician), ophthalmologist (eye doctor) and if necessary a neurosurgeon (brain surgeon).



Tumour (arrow) compressing the optic nerves and chiasm.

If a pituitary tumour is suspected, the first investigation is usually an MRI (Magnetic Resonance Imaging) brain scan. If a tumour is seen on this scan, blood is taken and sent for hormone testing to see whether the tumour is “secreting” or “nonsecreting”. Other tests may also be necessary.

The ophthalmologist will need to perform a range of eye tests. These will include measuring visual acuity (reading down the eye chart), colour acuity (measuring colour vision, usually by reading a book of coloured dots that make up numbers), testing pupil reactions to light, testing eye movements, and looking at the optic nerves at the back of the eyes with a microscope.

The ophthalmologist will also perform computerised **visual field testing** (“perimetry”) - the patient sits in a dark room with their chin on a rest in a large half-bowl machine, and presses a button when they see points

MRI scan of brain showing a pituitary of light shone by the machine inside the bowl out of

the corner of their eye. The machine then produces a computer printout which maps out in great detail the peripheral vision (visual field) of each eye. This test is of great value in determining how much of the vision is impaired initially by the tumour, and any improvements in the visual field with treatment.

What treatment is possible?

Some secreting tumours, particularly those secreting the hormone prolactin (“prolactinomas”), can sometimes be treated with medical treatment (tablets such as bromocriptine or cabergoline). This treatment however can take many months to shrink the tumour, so sometimes in the case of large tumours which are causing severe vision loss or other major problems, surgery is necessary as well as hormone treatment.

For nonsecreting tumours usually the only possible treatment is surgery to remove the tumour. If the tumour is small or medium-size, it can often be removed “endoscopically” (under general anaesthetic, a neurosurgeon passes a telescope up through the patient’s nose and the tumour is removed). If however the tumour is very large or there are other factors, sometimes more major surgery needs to be performed by an incision in the side of the skull (“transcranial” surgery).

What is the outcome?

Most patients who have visual symptoms benefit greatly by treatment of their pituitary tumour, and either have improvement of the vision in one or both eyes, or further deterioration of the vision is prevented. In some patients, the improvement in vision can be quite dramatic, although often there is some persisting damage at least to the peripheral vision.

It should however be remembered that surgical removal of tumours very close to the optic nerves and chiasm has a risk to vision itself, despite the very expert care provided by the neurosurgeon. There is therefore a small risk of the vision being worse after the surgery than it was before.

FOR MORE INFORMATION

Please talk to your treating physician or ophthalmologist.

REFERENCES

Practical Ophthalmology: A Survival Guide for Doctors and Optometrists.

Pane AR, Simcock PR. Elsevier (Churchill Livingstone), Edinburgh, 2005.

A basic eye book for medical students and doctors, which can provide more information regarding the visual pathway and how pituitary tumours can affect vision.

The Neuro-Ophthalmology Survival Guide. Pane AR, Burdon MA, Miller NR. Elsevier (Mosby), Edinburgh, 2007.

A detailed book for eye specialists, which includes information on pituitary tumours their effects on vision.