Ocular signs may be the first indication of serious neurological disease. Alternatively, the eyes may be responsible for "neurological" symptoms such as headache.

Palsies of the third, fourth, and sixth cranial nerves all cause paralytic squints in which the angle of the squint varies with the direction of the gaze. Adult patients may also complain of double vision, so it is important to exclude palsies of these three nerves when examining patients who have either a squint or double vision.

**Third nerve palsy**—A patient with a third nerve palsy may present with a variety of symptoms depending on the cause of the palsy. He may complain of a drooping eyelid, double vision (if the lid does not cover the eye), or headache in the distribution of the ophthalmic division of the trigeminal nerve. On examination there is characteristically a ptosis (paralysed levator muscle of the eyelid) and the eye is turned out because of the action of the unaffected lateral rectus muscle that is supplied by the sixth nerve. The eye is sometimes turned slightly downwards due to the unopposed action of the unaffected superior oblique muscle supplied by the fourth nerve. The pupil is dilated because the parasympathetic fibres of the third nerve supplying the sphincter pupillae are damaged. Important causes of a third nerve palsy include intracranial aneurysms, compressive lesions in the cavernous sinus, and diabetes. The presence of pain and a dilated pupil mean that a compressive lesion must be excluded urgently, as treatment may be life saving and curative for what may be an otherwise fatal lesion such as an aneurysm.

**Fourth nerve palsy**—This is often difficult to diagnose. There may be a compensatory head tilt in that the head will be tilted away from the side of the lesion and the chin will be depressed. The fourth nerve is long and is therefore particularly susceptible to injury. A patient with bilateral fourth nerve palsies due to a head injury may only complain of difficulty in reading. This is due to his being unable to depress and converge the eyes because both superior oblique muscles are paralysed. This diagnosis should be considered in any patient who complains of difficulty in reading after a head injury.
Facial palsy

**Sixth nerve palsy**—This is probably the best known of the palsies of the three nerves of ocular motility. The eye on the affected side cannot be abducted. The patient develops horizontal diplopia that worsens when he looks towards the side of the affected muscle. It is important to recognise a sixth nerve palsy as it may be due to raised intracranial pressure that is causing compression of the sixth nerve.

**Management**—This is initially directed to making an accurate diagnosis. If diplopia is a problem, sticky tape may be placed over the patient’s glasses, or a patch may be put over the eye. Adults will not develop amblyopia. Temporary prisms may be placed over the glasses if the angle of squint is not too large. For long term treatment, permanent prisms (which are clearer than temporary prisms) may be incorporated into a prescription for spectacles. Later, an operation may be performed to straighten the eyes.

### Facial palsy

**Seventh nerve palsy**

Facial weakness due to a seventh nerve palsy is common. In many cases no cause is found and the palsy improves spontaneously. If the eyelids do not close properly corneal exposure, ulceration, and eventual scarring and blindness may result. Ocular assessment should include:

- **Testing of corneal sensation**—If this is impaired the patient should be referred to an ophthalmic surgeon, as there is a high risk of corneal scarring. Patients cannot feel foreign bodies or feel when their corneas are ulcerating. This is in addition to being unable to close the eye and lubricate the cornea.
- **Testing of Bell’s phenomenon** (not to be confused with Bell’s palsy)—Normally when the eyes are closed they move up under the upper lid. This “Bell’s phenomenon” may be tested by asking the patient with a facial palsy to close his eyes while the observer watches the position of the cornea. If the cornea does not move up under the paralysed lid the patient is at high risk of developing corneal exposure.
- **Staining the cornea with fluorescein**—If there is staining of the cornea when fluorescein is used this indicates that the cornea is drying out. If there is only a tiny amount of stain, the eye is white and quiet, and the visual acuity is normal the patient may be managed in the short term with tear drops and ointment. If the staining persists or if the eye becomes red then he should be referred straight away.

### Sympathetic pathway

**Horner’s syndrome**

In a patient with Horner’s syndrome the sympathetic nerve supply to the eye is disturbed. The clinical features are:

- **A small pupil that is reactive to light** (unlike the small pupil due to pilocarpine eye drops) is because the sympathetically innervated dilator muscle of the pupil is paralysed.
- **A drooping eyelid**—The muscles that raise the eyelid are innervated by the third nerve and also by the sympathetic nerve supply. Thus lesions of either the third nerve or the sympathetic nervous system supplying these muscles cause a ptosis, though in the latter case it is only slight.
Lack of sweating on the same side of the face is again because of sympathetic denervation and depends on the position of the lesion. The oculomotor movements are completely normal as the muscles of the globe are not sympathetically innervated. The figure shows the pathway of the sympathetic system and possible causes of Horner's syndrome.

Optic disc

**The swollen optic disc**

There are many causes of a swollen optic disc, the best known of which is raised intracranial pressure resulting in the development of papilloedema. The absence of papilloedema, however, does not exclude raised intracranial pressure. It is the history and examination of the patient that should lead to the suspicion of raised intracranial pressure, and a swollen optic disc is merely a helpful sign. The vision of patients with papilloedema is usually not affected until late in the course of the disease. Most causes of a swollen disc are serious from either the ocular or the systemic point of view, and patients should be referred promptly. If a patient has a swollen optic disc the following features suggest a diagnosis other than raised intracranial pressure.

- **Impaired vision**—Vision is usually only impaired late in the course of papilloedema. It is crucial to consider giant cell arteritis in the presence of impaired vision and the patient may or may not have, in addition, aching muscles, malaise, headaches, tenderness over the temporal arteries, and Claudication of the jaw muscles when eating. The disc is characteristically swollen and pale because the small vessels that supply the head of the optic nerve are inflamed and occluded. By this time the vision will be severely affected. It is important to exclude giant cell arteritis in any patient over 60 with visual disturbance or a swollen optic disc as urgent treatment with steroids should be instituted to prevent blindness in the other eye.

- **Disturbance of the visual fields**—The visual field of a patient with raised intracranial pressure is usually normal. The presence of a field defect should lead one to suspect some other diagnosis such as compression of the optic nerve.

- **A pale disc**—The disc of a patient with raised intracranial pressure is often hyperaemic. It is only in longstanding papilloedema that the discs become atrophic and pale. The disc is also pale if the swelling is due to ischaemia of the optic nerve as in giant cell arteritis.

- **Retinal exudates and haemorrhages**—These do occur in the presence of papilloedema but they are usually around the disc and relatively limited. If there are many exudates or haemorrhages in the retina diagnoses such as retinal vein occlusion, malignant hypertension, diabetes, and vasculitis should be considered. In all patients the blood pressure should be measured and the urine tested for the presence of sugar, blood, and protein.

Conditions that may mimic swelling of the head of the optic nerve include:

- **Long sightedness** (hypermetropia), in which the margin of the optic disc does not look clear. A clue lies in the patient’s glasses, which make the eyes look larger.

- **Drusen of the head of the optic nerve**—These colloid bodies of the head of the nerve make the margin of the disc look blurred.
Headaches and the eye

Important features

- Nature of pain
- Associated visual disturbance
- Red eye
- Defective ocular movements
- Abnormal pupils
- Abnormal optic disc

Most patients who present with a history of "headache" around the eye do not have serious disease. Points in the history and examination that should raise suspicion of serious disease include:

The nature of the headache—Headaches that cause sleep disturbance, or that are worse on waking or with coughing, suggest raised intracranial pressure. Temporal tenderness in patients over the age of 60 with symptoms of aching muscles and malaise suggest giant cell arteritis.

Visual disturbance—If there is a change in visual acuity that cannot be corrected by a pin hole test, serious disease should be suspected. A history of haloes around lights (due to transient oedema of the cornea when the intraocular pressure rises with the headache) suggests attacks of angle closure glaucoma.

A red eye—In acute glaucoma the eye is usually red, infected, and tender, and the acuity is diminished. The pain is deep seated and may be associated with vomiting. Inflammation of the iris and ciliary body also cause a red eye and pain. Chronic open angle glaucoma does not present with severe pain.

Defective ocular movements—If there are restricted ocular movements on the same side as the pain serious disease must be suspected. This may include orbital cellulitis (from infected sinuses), inflammatory lesions in the orbit, and compressive lesions causing nerve palsies—for example, a posterior communicating aneurysm causing a third nerve palsy and pain around the eye.

Abnormal pupils—An abnormal pupil on the side of the headache should suggest a compressive lesion—for example, a painful Horner's syndrome due to an internal carotid aneurysm.

In so called "cluster headaches" and "ophthalmoplegic migraine" pupillary abnormalities and ocular motility problems may be present in these relatively benign conditions. Patients with headache around the eye, however, together with ocular motility or pupillary abnormalities, should be investigated to exclude serious lesions.

Swelling, atrophy, or cupping of the optic disc—If a patient with headaches around the eye has any of these findings referral is required. The swelling and atrophy may be due to a compressive lesion and pathological cupping suggests a chronic form of glaucoma.

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