



# Tennis ball injury

## Eye series - 13



**Chris Hodge**, BAppSc (Orth), is Research Director, The Eye Institute, Chatswood New South Wales.

**Jeff Friedrich**, MBBS, FRANZCO, FRACS, is an ophthalmic surgeon, The Eye Institute, Chatswood, New South Wales.

### Case history

A 27 year old man was playing competition tennis 2 days ago and was struck in the left eye by a quickly returned volley. The eye has been swollen since, and is difficult to open. The patient describes pain in the left eye on ocular movement and says his cheek and upper gum on this side feel slightly numb. On examination you carefully open the eye – as you are doing this, the patient notes he is seeing two images.

### Question 1

Describe the anatomy of the orbit.

### Question 2

What symptoms would indicate a fracture of the orbit?

### Question 3

Can these symptoms help localise the fracture?

### Question 4

What important signs should the examiner look for?

### Question 5

What are the main causes of fractures to the orbital floor?

### Question 6

What tests will help confirm diagnosis?

### Question 7

When is surgery indicated?

### Question 8

Are there any possible long term complications to this condition?

## FEEDBACK

### Answer 1

The orbit is formed by seven bones: frontal, zygomatic, sphenoid, ethmoid, maxilla, lacrimal and palatine. The medial wall separates the ethmoid sinuses from the orbit. Fractures are particularly common in the medial wall and orbital floor as these are the thinnest parts of the orbit. Most commonly, blunt trauma will lead to a fracture in an area between the orbital floor (and over the infraorbital nerve) and the medial wall. Entrapment of the extraocular muscles (ie. inferior rectus) is common in such fractures. The lateral and superior walls are relatively sturdy by comparison and are rarely fractured. The orbital rim – which represents the anterior border of the orbit – is very strong and similarly is only fractured by significant force.

### Answer 2

An orbital fracture can lead to:

- entrapment of the extraocular muscles – this can cause pain on ocular movement and diplopia. Diplopia may exist in the patient's primary gaze or may manifest when the eye moves into the area controlled by the entrapped muscle
- damage to the infraorbital nerve – this will result in a numbing of the cheek and upper gum on the affected side. This is often temporary but can last several months
- blurred vision – this may reflect damage to the anterior chamber (eg. hyphaema or corneal damage) or posterior segment (eg. optic nerve injury). Decreased vision may be temporary, although severe damage can cause long term visual loss.

### Answer 3

Vertical diplopia (ie. double vision with the two images directly on top of each other) indicates an orbital floor is fractured with entrapment or restriction of the inferior rectus. If the images are not directly above each other, it is probable that the fracture extends to the medial wall (and therefore entrapment of the medial rectus). If hypoaesthesia of the cheek and gum is present, it is likely the infraorbital nerve has been compromised. This is commonly due to an orbital floor fracture, the floor lying directly above the nerve.



Figure 1. Lid swelling due to trauma



Figure 2. CT scan of orbital floor blowout. Note the herniation of tissue into maxillary sinus

### Answer 4

Due to the swelling in the traumatised eye, examination may be difficult in the immediate period following injury – diplopia will not be apparent if the patient's eye is swollen closed or injured. Therefore it is particularly important to note the signs that may represent an ocular emergency (Figure 1).

Signs that require immediate specialist referral include:

- pupillary defect – this may result from the direct trauma or as a result of optic nerve damage. Patients with optic nerve damage will also have decreased vision
- poor vision – due to possible optic nerve trauma or anterior segment damage
- hyphaema – or blood in the anterior chamber – represents significant trauma to the vascular or intraocular tissues and can lead to secondary glaucoma and further vision complications
- subluxated lens – due to trauma, the natural lens of the eye may move forward into the anterior chamber or posteriorly into the vitreous. The patient may complain of decreased vision or multiple images in the injured eye. The lens may be seen on close examination of the eye
- oedema – in severe cases the eye will be proptosed due to the local oedema. After several weeks the eye may become enophthalmic due to herniation of the eye into the surrounding sinuses and as swelling settles.

### Answer 5

A direct blow from an object about the same size as the eye will cause a build up of pressure within the orbit, causing fracture, often at the thinnest point (Figure 2). The orbital rim may or may not also be fractured due to the blow. Common causes include fists, large balls such as tennis or baseballs, and dashboards in the case of vehicle accidents. An indirect blow from an object the same size or larger than the orbit itself will often lead to an orbital fracture involving the entire zygomatic complex.

### Answer 6

Ocular movements can be tested to discover possible muscle restriction or palsies, however, due to swelling, this may be difficult in the immediate post-trauma period and may provide uncertain findings. To differentiate between a muscle palsy and entrapment of the extraocular muscle, a forced duction test (performed by a specialist) may be required. If restriction is present, the patient will commonly describe moderate to severe pain when the eye is moved. In an orbital floor blowout, the discomfort will be greatest when forcing the eye in an upward direction. Pre-existing haemorrhage and oedema may lead to a false positive test, therefore examination should wait until this has resolved. Computerised tomography (CT) scans can help to differentiate between orbital fractures and soft tissue damage and are often vital in the decision for surgery.

### Answer 7

Surgery is generally indicated when the patient continues to exhibit diplopia, as a result of muscle entrapment. The presence of a large fracture, enophthalmos (due to the eye and orbital contents prolapsing into the sinus) or cosmetic deformity, may also lead to surgical intervention. Unless the possibility exists for ischaemic muscle damage, surgery is generally delayed until the swelling has subsided (usually 7–10 days). The aim of surgery is to remove the muscle restrictions and restore the integrity of the orbit. The surgical approach required is dependant on the fracture. Small fractures may not require the use of an implant, however, larger fractures may require either an autogenous (bone or cartilage) or alloplastic (synthetic) implant. The implant is fixed over the fracture site by a combination of glue, screws, sutures or wires.

### Answer 8

Complications include:

- damage to the optic nerve during surgery
- temporary palsy due to the manipulation of the intraocular muscles. This should subside over time although it may take several months
- movement or migration of the implant over time leading to a recurrence of the symptoms (ie. diplopia or discomfort on ocular movement). Although this is particularly rare the patient must be warned to avoid strenuous activity during the initial 2–3 months following surgery
- orbital emphysema – the patient should be told to avoid blowing their nose for 2–3 months after surgery.

Conflict of interest: none declared.

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### Correspondence

Email: chodge@theeyeinstitute.com.au