"Seven Deadly Sins" in Facial Trauma - Number One, The Eyes. Some Common Causes of Concerns, Complaint and Catastrophe and How to (Hopefully) Avoid Them.

Mike Perry, FRCS, FDS, BSc
Consultant Oral and Maxillofacial Surgeon and clinical lead in Maxillofacial trauma, London

Disclaimer *- This review is not an extensive evidenced based review of the literature. It is based on the past 20 years experience I have gained in assessing and managing facial injuries. Its principles have served me well (so far). Hopefully it will help those readers who see these injuries on an infrequent basis.*

1. The eyes

For the non-ophthalmologist, any patient presenting with a facial injury who may also have a potential eye injury can be quite worrying. The obvious concern is overlooking a potential sight-threatening injury, or missing an injury which later results in complications. Even injuries that are classified as "minor" can cause considerable morbidity to the patient, who may then want to be compensated.

Non sight-threatening problems can still be a source of complaint and litigation if the patient is left with constant irritation, deformity, infection, or tearing (epiphora).To help avoid missing these injuries, there are a few basic principles clinicians can follow.

What to ask

Essential questions include the presence of globe pain and visual disturbances. If pain is present ask about;

1. Its onset and duration
2. Its quality (eg gritty / foreign body sensation / pain within or around the eye / headache)
3. Associated symptoms

These can give an indication of possible injuries.

Visual disturbances should be quantified e.g. from blurring to total loss of vision. “Floaters”, shadows, distortion and diplopia (double vision) should also be noted.

The mechanism of injury is also helpful - was the facial injury from a low energy impact or high energy ? Was it sharp or blunt trauma? The size of any object and whether the patient was wearing eye protection are also useful clues to the likelihood of an underlying globe injury. Even tiny projectiles can result in a superficial foreign body or penetrating eye injury.
Finally its important to ask about any previous ocular history and general medical history.

Examination of the eyes and eyelids - a checklist

Examination must include both the eyes and the eyelids (on both sides).
Corneal abrasions are usually very painful and can often prevent examination. Patients usually have intense spasm of the eyelids. If this is present and there is no contraindication, place a few drops of topical anaesthetic (e.g. oxybuprocaine). Rapid pain relief is almost diagnostic. This can then be followed by a drop of 2% Fluorescein. Most abrasions can then be seen as a green patch on the corneal surface.

1. Check the vision

In all injuries to the eyes or the surrounding bones it is essential to check the vision in each eye separately. Be especially careful in the inebriated, unconscious or otherwise uncooperative / obtunded patient. The absence of a fracture is no guarantee that the visual pathway will be intact. Interestingly, it was Hippocrates who first noticed that a blow to the forehead can render a patient blind, even in the absence of fractures - a good example of how the mechanism of injury is very important when assessing injuries.

Options include a Snellen Chart, Sheridan-Gardner Chart (designed for children, disabled people, those with learning difficulties, or patients who do not speak your language) or a Kay picture chart for children who can’t read. The patient should wear their spectacles or if not available view these through a pinhole.

Vision is recorded as a fraction. The numerator (upper number) is the distance the patient is from the chart, (usually 6m). The denominator (lower number) refers to the line on the chart the patient can read. Test each eye separately. If the patient fails to read the top line, see if they can

count fingers at 1m. Failing that, ascertain if the patient can see movements of your hand in front of the eye. Failing that, test the vision with a light source (light perception or no light perception vision).

Colour vision can be tested using Ishihara colour plates or a bright hatpin. Colour vision defects are common in men and affects 1in 8 males (most commonly confusing reds and greens). However loss of colour perception can be a sign of optic nerve pathology e.g optic nerve compression after trauma, or optic neuritis

2. Assess the Visual fields

These should be tested separately. Test each quadrant (4 quadrants) in turn with your fingers or a hatpin.

3. Look at the Pupils and the Anterior chamber

Assess appearances and pupillary reaction. Normally the pupils of both eyes should identically react briskly to a light stimulus, regardless of which eye is being stimulated. Light entering one eye produces a constriction in both pupils (direct and consensual responses). Failure to do so requires further assessment by a specialist. Irregular or 'teardrop' shaped pupils following trauma to the eye also warrant referral (if not preexisting). Look also for hyphaema (blood in front of the iris), cataract and a collapsed or flat anterior chamber.

4. Assess eye movements

Some orbital fractures may restrict eye movements, but so can some neurological disorders (commonly third or sixth cranial nerve injury). Ask the patient to look straight and then follow a target to the eight positions of gaze. Report if the patient sees double vision at any stage.

5. Look for retained foreign bodies and contact lenses.

These can often tuck themselves away under the upper eyelid, which may require eversion and a close look. If missed, patients can develop corneal abrasions / ulcers or infections.

6. Examine the retina if possible (fundoscopy)

Look for intraocular foreign body (IOFB), vitreous haemorrhage and retinal injury

7. Examination of the eyelids

Look first at:
1. the relative height of the two eyelids and
2. the surface and edge of the eyelids (skin and lashes).
3. their function. Inability to tightly close the eyelids may be seen in facial palsy (? Skull base fractures) Ptosis following trauma may also signify significant injury.

If a wound is present note the position, length and depth. Always consider the possibility of underlying globe damage and retained foreign body. Consider also the possibility of penetrating orbital and brain injuries - the anterior cranial fossa, separating the two is typically quite thin.

If a superficial foreign body is suspected, the upper eyelid may need eversion. Retained contact lenses can irritate the conjunctiva and become infected. These are easily overlooked. Don't rely on a patient to tell you they wear them. However, never evert the upper eye lid if a penetrating injury is suspected.

If a penetrating injury to the globe is suspected (eg there is an eyelid wound), never press on eye. Prevent patient from rubbing the eye. Protect it and refer urgently.

Examination in children

Assessing a child in distress can be difficult. Obtain a detailed history from an adult witness if possible. If this is not available, always suspect an injury being the cause of a red or painful eye.

Assess the visual acuity – fixing and following objects of interest, reaching out for objects of interest, or the Sheridan-Gardner test, depending on the age and verbal ability of the child. Test each eye in turn if possible.

Note the following;
General observation e.g. periorbital redness or bruising
Pupil responses
Red reflexes
If globe injury is suspected, do not try to pry the eyelids open.
If periorbital bruising is present, especially if associated with injuries in other part of the body, consider the possibility of non-accidental injury
A "white blow-out" fracture should be suspected if there are signs of a sunken globe, restricted eye movements and severe pain. The child is often distressed and vomiting. These injuries can be easily over looked as the eye may appear normal.

If in doubt always seek advice.

Some important injuries

These can be broadly divided into
• Perforating / penetrating (sharp) trauma
• Blunt trauma
• Lid trauma

Open globe injury

This refers to a full thickness wound in the wall of the eye, such that the contents can potentially 'leak' out. This may be caused by blunt trauma (globe rupture) or by a sharp object (laceration or penetrating / perforating injury).

Closed globe injury

This is a partial-thickness wound in the eye-wall, where its contents are still retained. It includes contusion of the globe. With small objects (eg squash ball), the force of trauma may not at first appear to be severe, but if the object is small enough to fit within the bony orbital rim it will transmit all of its energy to the globe - a good example of the relevance of the mechanism of injury.

Ruptured globe

This is defined as the loss of the integrity of the eyeball following blunt trauma. Patients present with severe pain and sudden loss of vision. At best this is usually down to perception of light with an afferent pupillary defect. An associated lid laceration and bruising may be seen.

Uveal tissue, retina, and the vitreous gel may be prolapsing out of the eye. The eye is collapsed and a hyphaema is usually present.

Care must be taken not to press on the eye in an attempt to open the lids, as this will further expulse ocular contents. If severe lid oedema prevents examination and a rupture is suspected, then an ultrasound or CT scan can detect globe integrity.

If the eye appears soft or collapsed in the setting of blunt trauma, a globe rupture must be excluded.

Penetrating / perforating globe injuries

With penetrating trauma, the wall of the eyeball is disrupted by a full-thickness entry wound and there may be a foreign body within the eye. This may be associated with prolapse of the ocular contents. In perforating trauma the globe is disrupted by a through and through injury, with both an entrance and exit wound. This is a severe injury. Blood-stained tears may indicate the possibility of an injury.

These injuries are usually caused by sharp objects and can be deceptive. In cases of small high-velocity objects (such as metal and glass chips) the eye may appear intact and a small entry wound overlooked. The history is therefore important.

Care must be taken not to apply pressure to the eye as this can further expulse the ocular contents. The possibility of associated brain injury should also be borne in mind. If intraocular blood or lid oedema prevent examination, refer or consider CT
• A hard plastic shield should be taped over the eye to protect it
• Check tetanus status
• Refer urgently for surgical repair (undertaken as soon as possible)

Corneal abrasion

This is an area where part of the corneal lining is deficient. The patient complains of pain, watering, and has a foreign-body feeling on the surface of the eye. They have difficulty keeping the eye open. Usually there is a history of trauma or contact lens wear. The eyelids may be in spasm and the conjunctiva is inflamed. Following topical anaesthesia, the pain rapidly resolves and the vision is found to be normal. The area of abrasion can be seen using a fluorescein stain. Abrasions usually heal rapidly. Most patients should be a lot more comfortable in a few days.

Medico-legal issues that can arise

- Trauma near to the eye warrants a thorough eye examination. This may be forgotten or overlooked, especially if there are other, more distracting facial injuries present. Patients may be uncooperative for a number of reasons which prevents a detailed assessment. Consequently examination may initially be deferred, but subsequently forgotten and an injury not diagnosed until complications occur. Medial canthal injuries for example, can involve the lacrimal drainage system and delay in treatment results not only in cosmetic disfigurement, but also problems with the tear drainage mechanism.
- Clinicians must keep a high index of suspicion for serious injuries (especially penetrating injuries). Such injuries may be easily overlooked as patients may not necessarily present with blindness. Delays in diagnosis may result in delays in treatments, adversely affecting the prognosis in that eye. Whilst it may not be possible to send every patient to an eye specialist 'just in case', certain mechanisms should ring alarm bells and make one suspicious (such as chipping stone or grinding metal with no eye protection). Similarly, an abnormal shaped or poorly reacting pupil may indicate serious injury. In those patients we send home, they should always be advised to return if symptoms do not settle, or they get worse. Lack of such advice leaves the patient uncertain what to do and can again delay diagnosis.
- Lid lacerations should be correctly sutured, or referred. If poorly repaired, patients can be blighted with chronic irritation or tearing (epiphora), which can be very difficult to treat. Inturned eyelashes (entropion) is a constant irritations they rub on the eye, every time the patient blinks. This can affect daily living and even some careers. Not surprisingly then patients may want compensation.
- Patients should not undergo MRI if there may be a metal foreign body. MRI uses powerful magnets and any iron containing (ferromagnetic) metal will move. Depending where it is (in the eye, brain, chest etc) the ensuing damage can be devastating. Grinding injuries should

raise suspicion.

- Clinicians should always consider the possibility of a retained foreign body (commonly contact lenses). These can also be overlooked in the uncooperative patient or those with distracting or more urgent injuries. If unable to assess it needs to be documented clearly, so that someone can check later when circumstances permit this. If not removed these can result in infection or ulceration and a very unhappy patient.
- When opening a swollen eyelid, clinicians must be careful not to press directly on the eye. If there is serious injury to the eye pressure must be avoided.
- Even though there may be little that can be done to restore vision, if the patient feels they have not been managed well they may look to sue someone.
- As clinicians we must document fully. Litigation may occur months or years later. Thorough documentation is often the best defence. Often the axiom, "If it wasn't documented, it wasn't done" is applied in cases of negligence
- Clinicians must never give false assurances. Make the patient aware of potential complications at the time of the injury
- We should always try to maintain a good rapport. Although not a guarantee, happy patients who feel they have been looked after appropriately are less likely to complain or sue their doctor / specialist, even if they have lost their sight.