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Tension pneumo-orbit treated by endoscopic, endonasal decompression: case report and literature review

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Abstract

Objective: We present a 38-year-old man with a tension pneumo-orbit following medial orbital wall fracture, managed with endoscopic decompression.

Method: A case report and a review of the world literature concerning the aetiology, clinical features and management of medial orbital wall fractures are presented.

Results: Our patient presented with a post-traumatic tension pneumo-orbit exacerbated by air travel and nose-blowing. Computed tomography revealed a fracture of the ethmoid bone, and intra-orbital emphysema causing proptosis. Management with endoscopic, endonasal surgery produced excellent results, with decompression achieved and immediate and sustained improvement in visual acuity.

Conclusion: A search of the world literature revealed no documented cases of tension pneumo-orbit as a complication of medial orbital wall fracture. Endoscopic sinus surgery is currently used in the management of nasal and sinus diseases and their orbital complications. We discuss this extended indication of endoscopic surgery, and its advantages over other surgical approaches.

Key words: Orbital Fractures; Decompression; Endoscopes; Otorhinolaryngologic Surgical Procedures

Introduction

Endoscopic sinus surgery is a well established technique in the management of nasal and sinus pathology, including chronic and recurrent sinusitis, nasal polyposis, and excision of tumours. Its use extends to ophthalmological procedures, including drainage of subperiosteal abscesses, dacryocystorhinostomy, optic nerve decompression, orbital decompression in Graves' disease and reconstruction of medial orbital wall fractures.[1] We present and discuss its use in relieving intra-ocular pressure in a case of traumatic tension pneumo-orbit.

Fractures of the orbit may be orbito-zygomatic, naso-orbital or intra-orbital ('blow-out'). Blow-out fractures occur when the diameter of the object applying force exceeds that of the orbital rim. They are most commonly seen following road traffic accidents and typically involve the inferior orbital floor, which can result in trapping of the inferior rectus muscle and subsequent diplopia on upward gaze.

Case report

A 38-year-old man was admitted under the care of the ophthalmologists with decreased visual acuity, proptosis and retro-orbital pain of the left eye, following an assault five days previously whilst abroad in Germany. The mechanism of injury had involved a significant blow to the left side of the head. Immediate management had involved repair of an avulsed left lower eyelid and insertion of a lacrimal duct stent. The patient's symptoms of retro-orbital pain and impaired vision had commenced shortly after his return to the UK and were exacerbated by nose-blowing. He denied any symptoms of clear, watery rhinorrhoea, suggestive of a cerebrospinal fluid (CSF) leak. His medical history included severe visual loss in the right eye secondary to herpetic corneal scarring and a septoplasty a few years previously.

On examination, visual acuity in the right eye was reduced to counting fingers only, and was 2/60 in the left eye. Pupillary reflexes and fundoscopy were normal, and there were no signs of medial rectus entrapment, retinal tears or retinal detachment.

Computed tomography (CT) scanning of the head revealed a fracture of the medial wall of the left orbit involving the anterior ethmoid cells, with an insignificant amount of fluid in the left maxillary antrum (Figure 1). Intra- and extra-conal emphysema, causing proptosis of the globe (measuring 1.4 cm), was

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FIG. 1
Coronal computed tomography image.

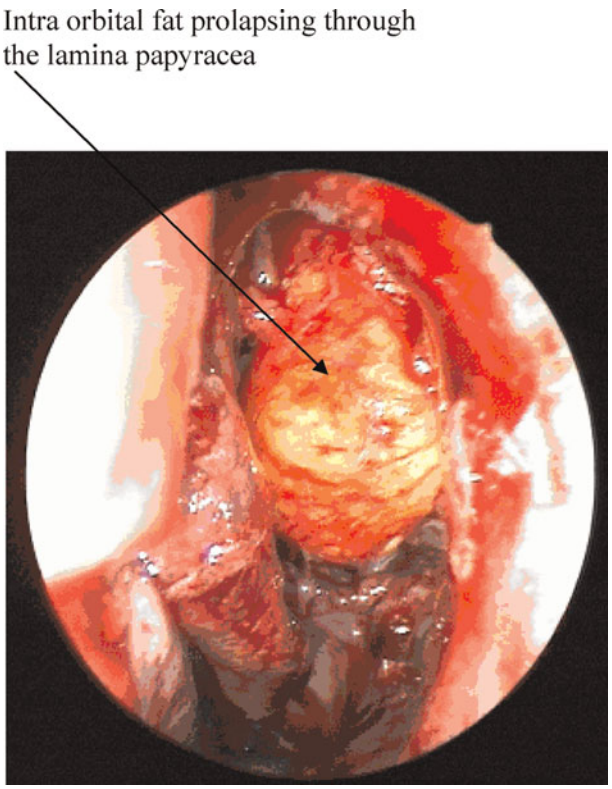

FIG. 2
Intra-operative image.

also noted. A small amount of intra-orbital soft tissue or fluid was observed which may have been a haematoma, although this was not felt to be large enough to account for the degree of proptosis.

Following CT scanning, aspiration of the orbit was performed by the ophthalmologists, with the release of approximately 5 mls of air. However, the proptosis recurred within 12 hours of the procedure.

Therefore, the patient underwent definitive treatment with an urgent endoscopic decompression of the orbit, six days after the initial trauma. Operative findings included dehiscence and comminution of the lamina papyracea and anterior ethmoid air cells, together with localised breaching of the orbital periosteum. On removal of the residual lamina papyracea and horizontal incision of orbital periosteum, the globe returned back into the orbit (Figure 2). A large antrostomy was created to prevent obstruction of the natural maxillary antrum. There were no intra- or post-operative complications, and on the second post-operative day the visual acuity in the left eye had improved to 6/36. The patient was discharged with a one-week course of antibiotics and steroids.

One week later, on review in the ophthalmology out-patient clinic, the patient's vision in his left eye had improved even further, to 6/18.

Discussion

Orbital emphysema is almost always preceded by trauma, although cases have been described following sneezing[2] and air travel.[3] The condition occurs when there is inadequate drainage of air from the ethmoid cells to the nasal cavity, e.g. following a fracture of the naso-ethmoid-frontal area. The problem is exacerbated by pre-existing nasal obstruction and increases in endonasal pressure, e.g. during nose-blowing. Visual loss can occur secondary to optic nerve damage (whether due to compression, stretching, contusion or ischaemia) or central retinal artery occlusion, but is largely reversible if treatment is instituted promptly.

The diagnosis of orbital wall fractures requires an understanding of the different fracture types. In those patients with concomitant nasal fractures, the diagnosis is apparent; CSF rhinorrhoea, epistaxis and restriction of ocular motility may be part of the clinical picture. Internal orbital (blow-out) fractures are postulated to result from a sudden increase in intra-orbital pressure,[4] or from transmission of the force of trauma from the orbital rim.[5] It is widely accepted that isolated medial orbital fractures are infrequent[6] (despite one report suggesting otherwise);[7] they are certainly less common than those of the orbital floor. This is despite the relative thinness of the medial orbital bone (0.25 mm *vs* 0.5 mm at the floor), and is perhaps attributable to the buttressing of the lamina papyracea by the bony septa of the ethmoid sinuses.

Features suggestive of isolated medial orbital fractures following trauma include diplopia and progressive enophthalmos (due to prolapsed tissues or enlargement of the cavity), periorbital swelling, local haemorrhage and subcutaneous emphysema[8] (which has been reported to extend to the mediastinum.)[9] Medial blow-outs are more commonly associated with medial rectus incarceration (presenting with diplopia and painful, limited abduction and adduction) than are naso-orbital fractures. The forced duction test can be used to further assess these cases. Late enophthalmos is a complication of medial blow-out fracture[8] (e.g. due to contraction

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of necrotic muscle or fat atrophy). In children, 'trapdoor' fractures are more common owing to the greater flexibility of the bone; hence, children with such fractures are more prone to entrapment of muscle and other soft tissue.[10] Nausea and vomiting should raise suspicion of the diagnosis in paediatric cases, even in the absence of ecchymoses and oedema.[11]

Computed tomography is the investigation modality of choice, as diagnostic signs are seen in only 79 per cent of plain radiographs.[8] Blood or bone fragments may be seen in the ethmoid sinus, and muscle entrapment can be detected.

Management of a medial orbital wall fracture may be conservative if there is no diplopia, minimal enophthalmos and no herniation into the ethmoid sinus. Healing can be expected within three weeks. However, displacement of bone fragments towards the globe or optic nerve, orbital emphysema, or large haemorrhage with visual loss, requires immediate exploration and decompression. In all other cases, repair may safely be delayed for 7–10 days to allow the oedema to subside.[12] The presence of a ruptured globe is an absolute contraindication for repair. Repair is usually very successful, with persistent enophthalmos or diplopia uncommon.

Surgical repair may utilise the endoscopic[13] or trans-orbital route (via a Lynch incision through the superomedial orbital rim, or via the transcaruncular approach). Endoscopic sinus surgery confers many advantages, including clearer and magnified visualisation of the operating field, especially the more superior aspects. This enables easier distinction between inflamed mucosa and herniated orbital contents. Endoscopic sinus surgery obviates the need for an incision, and has less scarring and greater patient acceptability.[14] Furthermore, it avoids infraorbital nerve hyperaesthesia – a recognised complication of the traditional approach.[15] Bleeding and hospitalisation times are both reduced.

A retrospective study of 16 patients who underwent primary endoscopic reduction of their medial orbital wall fractures 7–14 days post-injury found no complications and complete resolution of symptoms in 94 per cent, over a 12–27 month follow-up period, confirmed by CT and repeat endoscopy.[1] One patient had persistent diplopia which was adequately managed with prisms. Work by other groups has produced similar results,[16,17] confirming the safety and efficacy of this approach. The present case represents the first report of a tension pneumo-orbit managed by endoscopic sinus surgery.

Conclusion

Tension pneumo-orbit is uncommon, and is an indication for urgent surgical intervention in order to prevent visual loss. We report the first case of endoscopic medial orbital wall decompression to reduce a tension pneumo-orbit, which resulted in an excellent patient outcome. We recommend that this technique be considered in the management of medial orbital wall fractures.

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The original version of the article has been changed to correct the corresponding address.

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