Reconstructive Dilemma after Blindness

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Abstract Blindness associated with mid-facial fractures is rare. Here we present a case of panfacial fracture associated with loss of vision of right eye. The reconstruction of left orbital region posed a challenge, as post surgical vision loss can be a remote complication. Through this case report we highlight our dilemma and describe the different philosophies adopted by other specialties in management.

Keywords Blindness · Mid-facial fractures · Panfacial fractures

Introduction

Injury to midface can arise from blunt and penetrating trauma. The orbit forms a part of the skeletal elements of the midface and this makes it highly vulnerable to traumatic episodes. Hippocrates was the first person to record the association between facial trauma and blindness [1]. Although ocular injuries occur commonly in association with facial trauma, loss of vision in one or both eyes is one of the most severe and rare consequences of such incidents. Blindness and visual impairment with facial trauma have been reported with an incidence that varies from 0.2–6 % [2], which is significantly less when compared to the incidence of ocular trauma [3]. This may be due to the protection of the globe by orbital rims and eyelids, natural reflexes of

self protection such as blinking, protecting the eye with the hand and averting the head [4]. In addition, resilient structure of the globe allows it to withstand blows of considerable force without rupture [4]. Blindness following facial fracture is complicated and may result from direct or indirect damage to orbital structures. Damage to the optic nerve, short and/or long ciliary arteries, central retinal artery can result in loss of vision. There is a remote possibility of severe ophthalmic complication which may result in blindness after surgical intervention in the orbital region to reduce fractures [5]. In a patient with complete blindness in one eye, should a surgical intervention to reduce fractures be done? In this case report we discuss this dilemma in a young male patient of panfacial trauma with unilateral vision loss and highlight the dearth of literature related to this controversial issue.

Case Report

A young 25 year old male patient was brought to tertiary health care center, 2 weeks after being injured in a road traffic accident (Fig 1). This patient had a tracheostomy tube in place and was on nasogastric tube feeding. He was diagnosed as a severe case of panfacial trauma with complete loss of vision in right eye due to damage to the optic nerve (Fig 2). The mid-face fracture could be broadly classified for treatment purposes as bilateral Le Fort III, Le Fort I along with dento-alveolar fracture and para-median split maxilla. The visual acuity of the left eye was normal with absence of diplopia, however enophthalmos with excessive sclera show was present. Other clinical and radiographic features of naso-orbito ethmoid fractures were also apparent. The occlusion was disturbed with a marked facial deformity. This young patient with a poor economic background was the sole earner for the family and treating

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Fig. 1 Loss of vision in right eye with facial deformity

fractures in vicinity of healthy eye was debatable. The challenge was between risk of losing vision in healthy eye during treatment or letting the facial deformity persist due to non-reduction of left zygomatic complex fracture (ZMC). After deliberation with family, patient and among operating team it was decided to reduce and fix all facial fractures except left ZMC region with titanium miniplates and screws to achieve functionally stable occlusion and facial esthetic. Displaced left ZMC was fixed only in frontozygomatic region and maxillary buttress with minimal manipulation of bony segments (Fig 3). During the follow-up period no ophthalmic complication was encountered on the left side and recovery period was uneventful during the hospitalization period of 3 weeks (Fig 4). The patient was satisfied with the final result of surgery and could start his normal work in a month's time. Subsequently patient was lost to follow-up and did not return for regular checkups.

Discussion

Blindness in any form is a great disability, especially in whose work binocularity is essential. This problem is further compounded when vision is not good in only seeing

Fig. 2 Preoperative 3D CT scan

Fig. 3 Post-operative 3D CT scan

eye. Loss of an eye automatically exposes the patient to a greater risk of blindness than binocular individuals.

According to Le Fort the face resists the force mainly because of the elasticity, its periosteum and its soft tissues [6]. Facial fractures absorb the energy, thereby preventing the further transmission of traumatic forces to the brain. Despite the multitude of papers on trauma, there have been no detailed investigations of incidence and etiology related

Fig. 4 Immediate post-operative appearance of patient

to blindness. The actual incidence is difficult to ascertain, as there are very few reports with large series of patients [7], while others were selective in their cases [8]. Several authors [9] have recorded sporadic cases of blindness in association with facial trauma. It is noteworthy that in some studies blindness was more frequently seen in patients with Le Fort III, Le Fort II and zygomatic complex in descending order [10]. An association between lateral orbital wall fracture and loss of vision has also been noted [11]. The loss of vision in at least one eye was reported to be 6 % among 547 fractures of the facial skeleton [12], whereas Soyris et al. [13], who reported 1,393 cases of malar fractures over a period of 20 years, recorded six cases of blindness and three of enucleation. Al Qurainy et al. [14] studied 363 patients with midfacial fractures and found that 90 % of such patients sustained ocular injuries of various severity; 12 % experienced severe eye injuries. Whitaker and Yaremchuk [15] found 33 % of blindness or significant loss of vision among 78 patients who presented for secondary reconstruction of post-traumatic orbital deformities, presumably a selective group.

Various direct and indirect mechanisms have been suggested for blindness. Direct injury to globe can occur from objects whose diameter is smaller than orbit resulting in

chemosis, hyphema, subconjunctival and vitreous hemorrhage, and luxation of the lens. Other mechanisms include occlusion of retinal vessels, retinal edema or detachment, globe rupture and secondary glaucoma. Indirect effects could arise from injury to the cerebral cortex, intracranial visual pathways, optic chiasma, optic nerve or optic canal. Midface fractures have the potential to cause blindness due to their closeness to orbit and tendency to cause retrobulbar hemorrhage and traumatic optic neuropathy [16]. Intra-conal bleeding from long and short posterior ciliary arteries could cause compression and anterior ischemic neuropathy, which is the most likely mechanism of visual loss. Post-operative ophthalmic complications seem to be primarily mediated by indirect injury to the optic nerve and its surrounding structures. The most frequent cause of post-operative visual loss is an increase in intraorbital pressure in the optic canal. In addition, blindness may be attributable to intraorbital hemorrhage or unspecified mechanisms of increased intraorbital pressure within the restricted confines of the optic canal, mainly because of manipulation of bony segments. In trauma surgery, perfusion of the optic nerve via the nutrient vessels may be further compromised by the patient's blood volume status, multisystem injuries, and hypotension. Ischemic infraction in the optic nerve may occur when the nutrient end-vessels are subject to compression and edema [16]. Even small changes in pressure potentially may cause ischemic optic nerve injury [16]. In borderline cases of orbital trauma only constant monitoring may be required but a diminished papillary response along with progressive reduction in visual acuity are ophthalmic emergency. Treatment with a megadose of corticosteroids and surgical decompression is considered the corner-stone of management in these type of cases [5]. Methylprednisolone in high doses limit post-traumatic and post-operative edema, along with its antioxidant action which protect neural tissue from free radicals generated in ischemic episode. Spontaneous improvement, without any medical or surgical intervention, has also been reported [2]. Though loss of vision after surgery is rare, this could be disastrous in a patient who has already lost an eye.

Road traffic accidents have been established as the most common cause of orbital trauma, others include gunshot injury, falls, fight and assault. Ashar et al. [17] in a review of 49 cases observed that road traffic accidents, especially when seat belts were not worn, are associated with high energy injuries and therefore are more serious eye and general injuries. As majority of serious eye injuries occur with midfacial and frontal fractures an ophthalmologist should examine all the patients who have sustained midfacial fractures. Although some investigators feel there is no correlation with the severity of the injury, others believe that the more severe the fracture, the more likely there is to be an eye injury. Increased numbers of male patients are

involved in severe panfacial fractures with increased chances of loss of vision; this probably reflects the higher number of males involved in motor vehicle accidents and assaultive behavior.

An interesting study was published by Weymuller [5], who sought opinion from various experts from different specialties regarding the treatment of an acute Le Fort III fracture with visual loss in one eye and a fracture involving the orbital apex on the remaining functional side. Majority of ophthalmologists and oral surgeons would not operate, the otolaryngologists were evenly split, and all the plastic and reconstructive surgeons would operate. This implies that different levels of training, expertise and philosophy are important factors in the management of these cases. In our case too we opted with minimal intervention of left orbital region fracture to avoid any possibility of blindness due to surgical manipulation.

Conflict of interest The authors declare that they have no conflicts of interest.

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