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Research Article

EVISCERATION AND RECONSTRUCTION POST ORBITAL BLOW OUT FRACTURE

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A B S T R A C T

Evisceration and Enucleation are one of the primary treatment modalities for end stage ocular diseases resulting in total loss of function. Traumatic globe injuries are often associated with orbital trauma. We report the case of a 55 year old male who suffered a left orbital roof and medial wall fracture post fall from a roof. The fall resulted in proptosis and total loss of vision in the left eye ball. Evisceration was done and a HA (Hydroxyapatite) prosthesis was placed in situ to maintain the aesthetic outcome. The fracture was exposed through a supra-orbital incision with a modified nasal bridge extension. It was reduced and fixed with the help of 2mm titanium mesh with 2mm titanium screws. There were no immediate post operative complications. There is always a risk of development of sympathetic ophthalmia due to the nature of uveal antigens being exposed, but in this case, there was no sympathetic ophthalmia that occurred.

INTRODUCTION

Atikul Rahman, 50 year old male reported to the department of Oral & Maxillofacial Surgery at our Institute with a chief complaint of protruding left eye ball and complete loss of vision in the left eye. Fig(1), (2), (3)

Fig 1

Fig 2

Fig 3

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History revealed that the patient had incurred a fall from a ladder from the 4th floor two weeks ago. There was no positive history of bleeding from the external auditory canal or a positive history of an intra oral bleed or any history of epistaxis, although the patient reported with a history of loss of consciousness for 1-2 minutes.

Examination showed complete loss of vision in the left eye. It also revealed the complete loss of extra-ocular muscle movement. Vision and extra ocular muscle movement in the right eye were found to be normal. There were no additional obvious fractures in the Zygomatic-Maxillary complex or the mandibular region. His Mouth Opening was adequate with no TMJ Dysfunction. Left Orbital roof fracture with proptosis was the provisional diagnosis

A CT scan of face with 3D reconstruction of the brain and mid face was taken for a definitive diagnosis. CT scan revealed orbital roof fracture and fracture of the medial wall of the orbit. Fig(4)

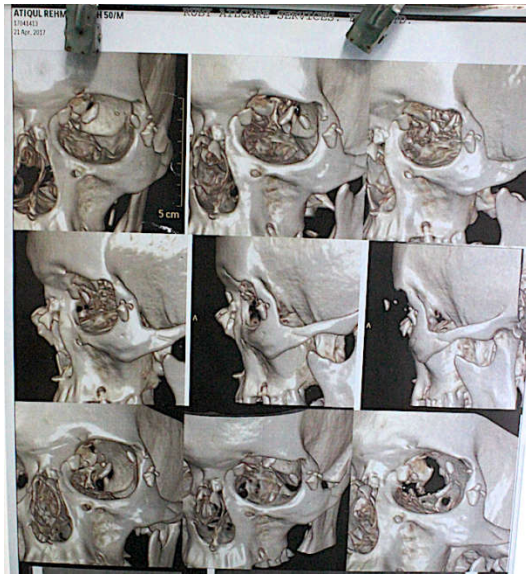

Fig 4

No other inter-cranial abnormalities were noted and the brain parenchyma was normal without any evidence of an intra-cranial bleed.

Evisceration of the intra-ocular contents along with open reduction and internal fixation of the fracture was the definitive treatment plan.

The patient was taken under General Anaesthesia. Following placement of an eye speculum, peritomy was performed.

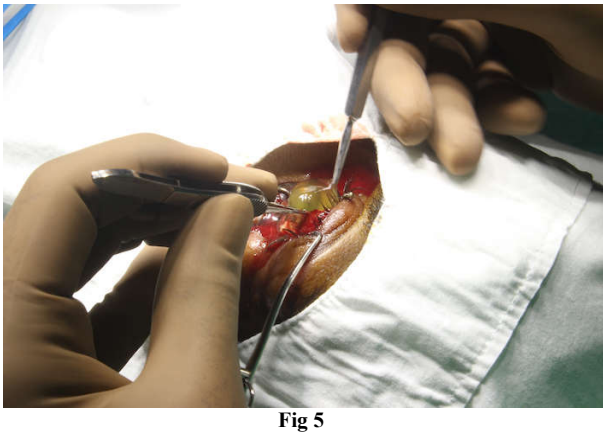

Fig 5

A Limbal incision was given with a #11 blade and the cornea along with the intra-ocular contents were removed with the help of an evisceration spoon. Fig (5)

A Hydroxyapaptite ocular implant was placed in situ (HA was chosen due to its revascularisation potential). Layered closure was done.

Following layered closure, tarsorrnhapy was done with 4-0 vicryl. Fig (6)

Fig 6

After changing of draping and repetition of the painting protocol, a supra orbital incision was given with the help of a #15 blade. Careful dissection of the Orbicularis Occuli muscle was done to expose the supra orbital nerve. The supra orbital nerve was relieved from the supra-orbital notch Fig (7) and dissection continued in a sub periosteal plane to expose the fracture site.

Fig 7

The roof of the orbit was exposed and the medial wall exposed through the extension of the supra orbital incision to the nasal bridge. Fig (8).

Fig 8

The decision to extend the existing incision was taken intra operatively as the extension would provide adequate exposure and access as well as the post operative scar would be concealed in the skin folds. The fractures were reduced and a 2mm titanium mesh was placed in situ. Fig (9)

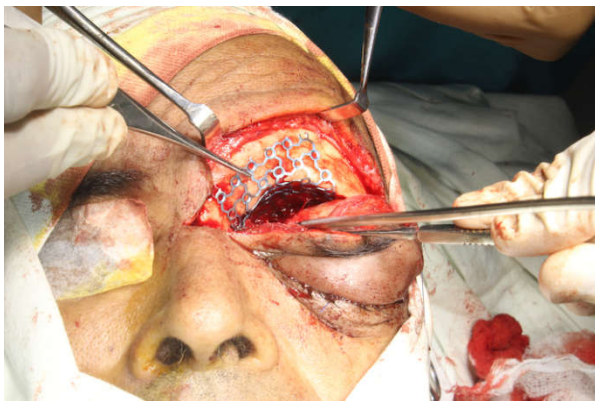

Fig 9

The titanium mesh was fixed using 2mm titanium screws. Fig (10)

Fig 10

Layered closure was done with 3-0 vicryl for muscle. Skin closure was performed with 5-0 PDS using inter Fig (11)

Fig 11

There was no intra-operative complication and post operative healing was un-eventful.

DISCUSSION

Trauma to the roof and the medial wall of the left orbit as a sequel of a fall from a ladder from approximately the fourth floor resulted in Proptosis and total loss of vision in the left eye.

Evisceration of the left eye ball followed by Open Reduction and Internal Fixation of the fractured segments and the placement of a suitable Titanium mesh and Implants was the surgical treatment modality followed.

Evisceration (removal of intraocular contents) and enucleation (removal of the entire eye) are competing techniques, with fluctuating favour since their inception.1

In 1817, Bear introduced evisceration when he removed the remaining intra Occular contents of an eye following an expulsive hemorrhage.2

In 1874, Noyes described evisceration for the management of intraocular infection.3

In 1884, Mules described placing a hollow glass sphere into the eviscerated cavity.4

Because evisceration unlike enucleation disrupts the integrity of the globe, there is a theoretical risk of exposing uveal antigens, which could incite an autoimmune reaction known as sympathetic ophthalmia (SO) in the contralateral eye. The first report of sympathetic ophthalmia occurring in association with evisceration was in 1887.5

Despite this, evisceration gained popularity until 1972 when Green *et al*. reignited the concern of inciting sympathetic ophthalmia with a report of four alleged cases.6

While the risk of sympathetic ophthalmia continues to be a contentious issue, evisceration has gained popularity in the past few decades. This is based largely on the perception that evisceration provides superior functional and cosmetic results compared to enucleation. Several modified evisceration techniques have been described in past decades, each proclaiming improved results.7

Etiological Factors

The medical records of patients who underwent evisceration surgery over the past 9 years, 2005-2013 were retrospectively evaluated.

Detailed data were reviewed, with a focus on the first precipitating factor for evisceration.

Of the 306 patients who underwent evisceration surgery in the studied period, 111 (36.27%) were female (with a mean age of 41.56 ± 21.38 years) and 195 (63.73%) were male (with a mean age of 37.76 ± 21.92 years).

The causes of evisceration between 2005 and 2013 were trauma in 184 patients (60.1%), glaucoma in 39 (12.7%),

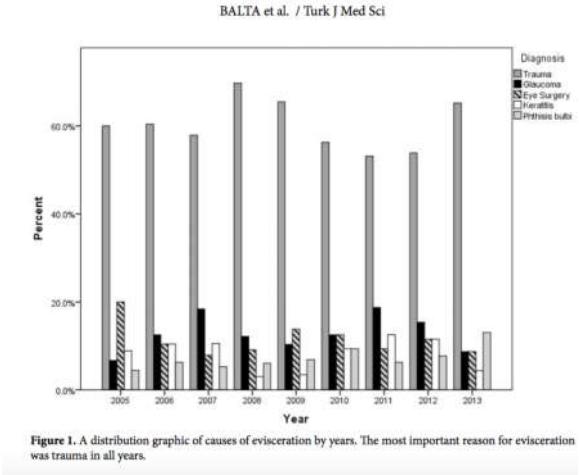

Figure 1. A distribution graphic of causes of evisceration by years. The most important reason for evisceration was trauma in all years.

postoperative endophthalmitis in 36 (11.8%), keratitis in 26 (8.5%), and phthisis bulbi of unknown etiology in 21 patients (6.9%). The distributions by year of these causes are shown in Figure 1.

Demographic characteristics of patients and reasons for evisceration are shown in figure 1. Male patients experienced significantly more trauma. 8

The causative agents of eye trauma were as follows: sharp objects in 77 patients (41.8%), fighting in 24 (13.0%), entry of wood in 23 (12.5%), flammable/explosive substances in 23 (12.5%), stones in 19 (10.3%), and road accidents in 18 (9.8%) patients (Figure 2). 9

Table 1. Demographic characteristics of patients and reasons for evisceration.

Reasons for evisceration	Frequency (%)	Sex (%)	P	Mean evisceration age ± SD	P
Trauma	60.1	F = 44.1 M = 69.2	<0.05	F = 31.94 ± 16.14 M = 30.91 ± 18.18	>0.05
Glaucoma	12.7	F = 19.8 M = 8.7	<0.05	F = 52.73 ± 20.05 M = 48.41 ± 23.31	>0.05
Postoperative endophthalmitis	11.8	F = 13.5 M = 10.8	>0.05	F = 55.33 ± 17.12 M = 65.24 ± 15.02	>0.05
Keratitis	8.5	F = 12.6 M = 6.2	>0.05	F = 56.36 ± 15.52 M = 52.83 ± 19.74	>0.05
Phthisis bulbi	6.9	F = 9.9 M = 5.1	>0.05	F = 24.45 ± 23.83 M = 36.30 ± 22.53	>0.05
Total	100	F = 36.3 M = 63.7	<0.001	F = 41.56 ± 21.38 M = 37.76 ± 21.92	>0.05

F: female, M: male, SD: standard deviation.

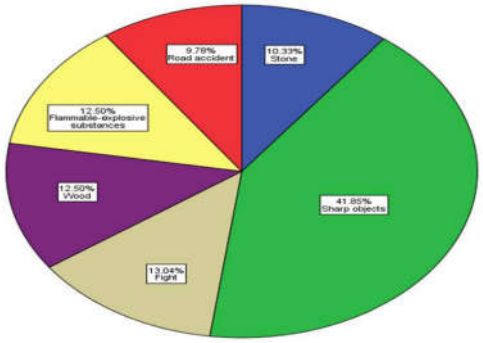

Figure 2. Causative agents of ocular trauma.

Additionally an epidemiological study of 2,340 cases was made in Iran for a period of 5 years.

Of 2,340 patients, 1,904 (81.4%) were men. Mean age was 22.44 +/- 16.65 years (range, 4 months to 90 years).

Table 1 outlines published indications for evisceration and enucleation.11

Table 1

Indication for eviscerations and enucleations

Study	Dates Assessed	Number of Cases	Type of Surgery	Most Common Indications (%)
Erie *et al.*	1956-1988	99	Enuc	Trauma (35)
Spraul *et al.*	1941-1995	513	Enuc	Trauma (41) Neoplasm (24)
Setlur *et al.*	1950-2006	3,264	Enuc	Neoplasm (51)* Trauma (13)* Glaucoma (23)** Trauma (21)**
Davenger *et al.*	1963-1967	207	Enuc	Trauma (51) Corneal disease (18)
Sigurdsson *et al.*	1963-1992	200	Enuc/ evis	Blind, painful eye (46) Neoplasm (25)
Kaimbo *et al.*	1988	143	Enuc	Trauma (37)
Haile *et al.*	1995	282	Enuc	Trauma (33) Neoplasm (21)
Dado *et al.*	1990-1999	146	Evis	Endophthalmitis (79) Trauma (21)
Rasmussen *et al.*	1996-2003	345	Enuc/ evis	Blind, painful eye (36) Neoplasm (34)
Chaudhry *et al.*	2000-2003	187	Evis	Endophthalmitis (46) Phthisis (20)
Eballe *et al.*	2002-2010	48	Enuc/ evis	Endophthalmitis (48) Neoplasm (21)

Enuc: Enucleation, Evis: Evisceration, *In the year 2000's, **In the year 1950's

Seventy-five percent of cases were younger than 30 years, with a peak of 5 years. There were 561 patients who had an intraocular foreign body (24.7%). In patients younger than 16 years, a knife was the most prevalent cause (22%); in patients younger than 7 years, knives accounted for 33.6% of trauma etiology; and in patients more than 16 years, a projectile metallic foreign body was the most common cause, accounting for 27% of open-globe injuries.10

Indications and Contraindications

Malignancy is an absolute contraindication to evisceration. An enucleation should be performed whenever managing an eye suspected or known to harbor an intraocular malignancy.12

Diagnosis

Meticulous planning before surgery is essential for a successful outcome. CT scans provide holistic and accurate information about the anatomic extent and areas involved in the fracture. Conventional Multislice Computerised Tomography Scan (CT) is the gold standard of diagnosis. CBCT has also been used as an alternate modality for imaging of orbital fractures. Retro-Orbital haemorrhage was detected only on multi slice CT. The mean radiation dose to the lens of the eye was 42% lower (range 23–53, SD 10) for CBCT than for multislice CT ($p < 0.001$), and the effective dose (a measure of the risk of developing a radiation-induced cancer) was also significantly lower. 13

Multiple protocols of CT exist. The conjugation of axial/MPR (Multi Planar Reconstruction)/ 3D has the highest sensitivity (90.5%). Coronal Sections (86.0%), MPR (84.0%), 3D (78.9%) and axial sections (44.2%) follow suit. 14

Surgical orbital reconstruction is indicated for faults greater than 2 cm2, with a volume greater than 1.62 cm3, an orbital volume greater than 10–15% of the orbital cavity, or when the fracture is located in the innermost region, between the floor and medial wall of the orbit in the so called "key area". 15

With the advent of the technical advancements, virtual planning of surgery can be used for a more efficient and efficacious treatment outcome. Virtual surgical planning in combination with 3D printing has exponentially increased the surgical accuracy due to the availability of 3D models, surgical guides and implants. 16

Surgical Technique

Although minor variations exist, there are core surgical steps, which remain fairly constant

Peritomy

Following placement of an eyelid speculum, a subconjunctival injection of epinephrine containing anesthetic facilitates a 360° peritomy. Care is taken to preserve as much conjunctiva as possible.

Removal of the cornea

A full-thickness limbal incision is made with an #11 blade scalpel. The remainder of the limbus is cut with scissors, allowing for removal of the corneal button.

Removal of the intraocular contents

The intraocular contents are then removed with the aid of an "evisceration spoon," a round relatively flat curette. Careful attention is given to the complete removal of all uveal tissues.

In theory this decreases (possibly eliminates) the risk of sympathetic ophthalmia.

Application of alcohol

The inner surface of the sclera is then bathed in alcohol. The purpose of this step is to denature any residual protein that might otherwise incite inflammation, that is, sympathetic ophthalmia. Cautery should be avoided, due to the flammability of residual alcohol, until the surgical field has been thoroughly irrigated with saline.

Sclerotomy

Performing a sclerotomy, allowing for placement of larger implants, has become popular in recent years and is performed at this stage. Specific techniques are discussed in detail below.

Implant placement

There is much variation in the preferred type of implant. This is one of the greatest areas of disagreement among oculoplastic surgeons and beyond the scope of this text. The authors' preference is a simple silicone sphere. Previously, the largest implant possible was placed. However, with the advent of modern sclerotomies, essentially any sized implant can be used, and implant size is chosen to match prominence of the fellow eye.Due to revascularization potential and minimal acute and chronic immune activity, autologous bone grafts are used for reconstruction.

Closure

The final step is closure. All techniques include the closure of multiple layers, including the sclera, Tenon's membrane and, lastly, conjunctiva. Meticulous closure is felt to be essential in preventing implant extrusion.17-20

Complications

Potential complications, common between enucleation and evisceration, include infection, hemorrhage, and implant extrusion. Long-term complications include sunken/deep superior fornix, lower eyelid laxity and ectropion, upper eyelid ptosis, socket contraction, conjunctival cyst formation, implant migration and late extrusion of the implant

Sympathetic ophthalmia is a potentially devastating autoimmune condition characterized by bilateral panuveitis, where the injured eye incites inflammation in the fellow (sympathizing) eye21

It is believed to be an immunologic response to exposure of previously sequestered tissue.22-23 Proposed antigens include retinal S-antigen, retinoid binding protein, melanin associated antigen, or those from the retinal pigment epithelium.24-27

Signs and symptoms of uveitis have been reported to develop between 5 days. 28-29 and 66 years from the time of injury. Sixty-five percent of the cases occur between 2 weeks and 2 month with roughly 90% present within a year of injury30

Conflict of Interest

We report no conflict of Interest.

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