Modified Evisceration Technique: Post- Equatorial Sclerectomy and Autogenous Scleral Patching

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ABSTRACT

Objectives: To describe and evaluate a modified evisceration procedure that is thought to augment the scleral shell volume, allowing the use of a larger-sized orbital implant, and enhancing the strength of the wound.

Methods: A retrospective, descriptive, non-controlled study of evisceration with superior post-equatorial sclerectomy, and patching the wound with autogenous scleral graft was conducted. We reviewed the files and analyzed the data of 52 patients (eyes) who underwent this technique from September 2003 to March 2011.

Results: Out of 52 patients, 26 were female (50%) and 26 were males (50%). Age ranged from five to 90 years with an average of 47.6 years. The type of implant was silicone in 49 patients and hydroxyapatite in three patients. The diameters of the implants ranged between 14 and 20mm; four patients had 14mm, 14 patients had 16mm, 28 patients had 18mm, and six patients had 20mm implants. The commonest indication for evisceration was trauma in 23 (44.2%) patients. None of the patients had implant extrusion, exposure or migration. No scleral patch melting or displacement was encountered. The mean follow up period was 35.9 months (1.25 -104).

Conclusion: Technique of evisceration with post-equatorial sclerectomy and sclera patch graft was described. It was found safe and useful for implantation of larger implants. However, further comparative study is required.

Key words: Autogenous Scleral Graft, Evisceration, Orbital Implant, Sclerectomy

JRMS December 2012; 19(4): 13-18

Introduction

Evisceration is an ablation surgical procedure in which the entire contents of the globe are removed through a corneal, limbal, paralimbal, or scleral incision. The removed contents include all accessible uveal tissues (Iris, ciliary processes and ciliary body, and choroid), retina, vitreous, and lens. The sclera, Tenon's capsule, conjunctiva, extra-ocular muscles, and the optic nerve and its surrounding meninges are not excised.[1]

The evisceration can be done with or without the removal of the cornea (keratectomy).[2]

The removal of the eye (ablation) results in contracture and volume deficit that affects the anatomy and physiology of the orbital tissues and orbital bones and can result in poor cosmetic outcome. Good results from such surgery are not easy to achieve and a poor result can have profound psychological implications for the

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Manuscript received April 27, 2011. Accepted July 14, 2011

patient for the rest of his life. For that reason, orbital implant is placed in the orbital cavity during the procedure to restore the orbital volume and prevent socket contracture that allow the use of appropriate artificial eye that will be comfortable and not apparent to the public at large.[3]

Evisceration is usually performed for functional or cosmetic purposes. The main advantage of evisceration over enucleation, which is the surgical removal of the globe from the orbital socket, in the absence of ocular tumor and phthisis bulbi is that the procedure is simpler, quicker, with less orbital manipulation and hemorrhage, reduced postoperative swelling and pain, and associated trauma. Factors favoring evisceration over enucleation are theoretically better eye movements and less chance of postoperative enophthalmos.[4]

Evisceration is contraindicated in case of intraocular tumors as it does not allow a complete, controlled removal of the tumor and surgical margins are impossible to evaluate. It is also traditionally contraindicated in eyes that are shrunken as a result of phthisis bulbi as the sclera cannot hold an adequate sized implant, which is one of the main determinant factors of good cosmetic results.[2]

The ablation of an eye and the subsequent management of the anophthalmic socket still pose a considerable challenge for the ophthalmic surgeon in spite of the numerous modifications of the standard evisceration technique that allow the use of larger orbital implants and the many recent advances in orbital materials.

We are presenting the outcome of a modified evisceration technique that entails implantation of a ball, splitting the sclera, and patching the wound using the excised scleral strip.

Methods

We reviewed the files of 52 patients (eyes) who underwent the technique from September 2003 to March 2011 at the Royal Medical Services Hospitals in Jordan. Data reviewed included: age, gender, indication for evisceration, other eye examination, implant type and size, postoperative complications and outcome, as well as the follow up period length.

Surgical Procedure

The following is an account of how the technique is performed in all patients reviewed at the Royal Medical Services Hospitals. Patient is admitted as a day case. Surgery is performed under local anaesthesia (with IV sedation) or general anaesthesia. After signing the informed consent the correct eye is carefully identified and marked and photographed when possible preoperatively and postoperatively. Topical anaesthesia (tetracaine 0.5%) eye drops is instilled into both eyes if surgery is performed under local anaesthesia. Peribulbar block is achieved with the insertion of the needle parallel to the inferior orbital floor and the second at the level of the supra-orbital notch. A 10 ml of mixed anaesthetic solution of equal quantity of lidocaine 2% with epinephrine (0.25 mg/20 ml) and bupivacaine 0.50% with epinephrine (0.10 mg/20 ml) is injected. The patient is then prepped and draped. A Clarke's lid speculum is placed. Using Westcott scissors, a 360 degree peritomy is performed and undermining in the subconjunctival and sub- Tenon’s fascia planes is carried out to the equator in the inferior half and behind the equator in the superior half. An incision through the limbus is started using a sharp blade followed by extension to each side with corneoscleral scissors. The wound is extended to over 360 degrees and the cornea is removed with Steven’s scissor. A cyclodialysis spatula is used to dissect the uveal tissues from the sclera and the intraocular contents are removed using an evisceration spoon and sent for histopathological examination. To maintain good view and haemostasis suction and bipolar cautery are used (Fig. 1).

The scleral shell is thoroughly cleaned out with cotton- tip applicators soaked with absolute alcohol (100% ethanol) to denature any residue of uveal pigment and then rinsed thoroughly with saline solution. Any source of bleeding is gently cauterized. Horizontal relieving incisions are made in the sclera at five and 11 o’clock to allow the insertion of larger orbital implant.

About (3-5) X (10-17) mm strip of sclera is marked horizontally at the equator behind the insertion of superior rectus muscle and avoiding the superior oblique muscle insertion. A stab

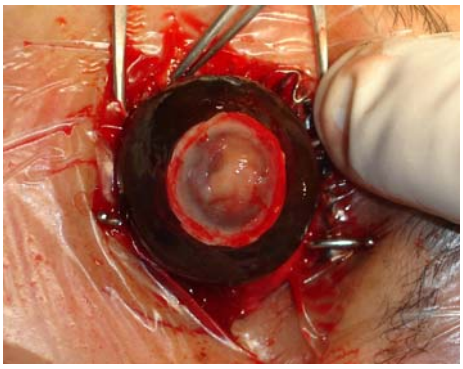

Fig. 1: Removal of intraocular contents

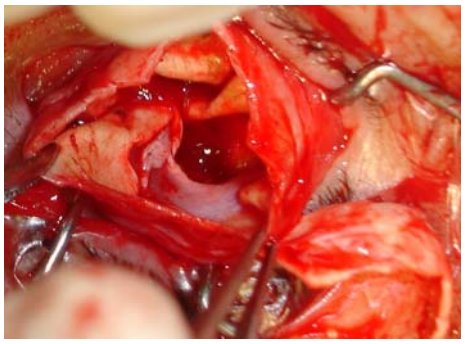

Fig. 2: Excision of a scleral strip superiorly behind the equator

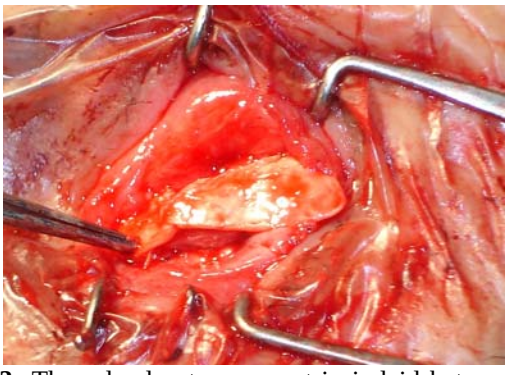

Fig. 3: The scleral autogenous strip is laid between the anterior Tenon's fascia and conjunctiva.

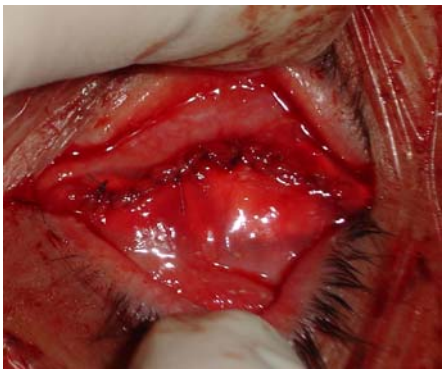

Fig. 4: The scleral autogenous graft is seen through the transparent conjunctiva after closure

incision is made using a sharp blade at the marked site and finished with Westcott scissors. The excised strip is trimmed and cleaned and kept in Gentamicin solution. The horizontal length of the harvested scleral graft is about 2 mm less than diameter of the planned orbital implant to prevent its migration (Fig. 2).

Ceftazidime antibiotic solution is used to rinse the scleral shell, and then a spherical implant is inserted. The superior and inferior scleral flaps are closed with interrupted 5/0 Vicryl (Polyglactin 910) or 5/0 Ethibond (multifilament braided polyester) sutures creating an overlap of 2-3 mm of the sclera without tension. The anterior Tenon's fascia is closed with interrupted 7/0 Vicryl (Polyglactin 910) sutures. The autogenous scleral graft is then placed over the suture line to reduce the risk of implant exposure (Fig. 3). Next, the conjunctiva is closed with interrupted or continuous 6/0 or 7/0 Vicryl (Polyglactin 910) (Fig. 4). A sterile surgical conformer of appropriate size is inserted into the conjunctival sac, ensuring that the eyelids will close passively over the conformer without creating tension on the conjunctival suture line. A temporary suture tarsorrhaphy is undertaken using a central 4/0 nylon suture passed through tarsorrhaphy tubing. If the patient is under general anaesthesia, a retro-bulbar injection of 5 ml of 0.5% bupivacaine and 1:200,000 adrenaline is given to aid postoperative analgesia and haemostasis. An intravenous injection of a broad-spectrum antibiotic is given along with an anti-inflammatory agent and non-opiate analgesic. Topical antibiotic ointment is instilled into the conjunctival sac and a pressure dressing and bandage are applied. These are kept for a minimum of five days.

Results

Out of 52 patients 26 were females (50%) and 26 were males (50%). Age ranged from 5 to 90 years (mean 47.6 years). The right eye was involved in 31 patients (59.6%) and left in 21 (40.4%). Silicone ball was implanted in 49 patients (94.2%) and hydroxyapatite ball in 3 (5.8%). Implant diameters ranged from 14 to 20 diameters (Table I). The indications for evisceration are shown in (Tables II, III). The evisceration surgery was done under general

Table I: Orbital implant types and diameters

Type/ diameter	14 mm	16 mm	18 mm	20 mm	Total
Silicone	4	12	28	5	49
Hyroxyapatite	0	2	0	1	3

Table II: Indications for evisceration in relation to gender

Reason	Males	Females	Total	%
Trauma	12	11	23	44.2
Melted cornea	2	3	5	9.6
Glaucoma	3	5	8	15.4
Infection	4	5	9	17.3
Phthisis bulbi/ microphthalmos	5	2	7	13.5
Total	26	26	52	100

Table III: Indications for evisceration in relation to age group

Age group	Trauma	Melted cornea	Glaucoma	Infection	Phthisis bulbi/ microphthalmos	Total
0-10	1	0	1	0	2	4
11- 20	4	0	0	0	O	4
21- 30	8	0	1	0	1	10
31- 40	3	0	0	0	1	4
41- 50	2	0	0	0	0	2
51- 60	1	0	0	2	0	3
61- 70	2	2	3	3	2	12
> 71	2	3	3	4	1	13
Total	23	5	8	9	7	52

Table IV: Follow up periods

Interval (month)	Number	%
1-2	6	11.5
3-6	6	11.5
7-12	2	3.8
13- 24	5	9.6
25- 36	7	13.5
> 36	26	50
Total	**52**	**100**

anaesthesia in 43 patients (82.7%) and under local anaesthesia with sedation in nine patients (17.3%).

The commonest indication for evisceration was trauma, 23 (44.2%) patients. None of the patients had implant extrusion, exposure or migration. No scleral patch necrosis, melting, or displacement was encountered. Orbital infection was not encountered in the study group. None of the patients had sympathetic ophthalmia in the fellow eye. The mean follow up period was 35.9 months (1.25 -104). Table IV shows follow up periods.

Discussion

Many surgical modifications have been described to provide better cosmetic effect and prosthesis motility after evisceration since it was first reported by James Bear 1817.[5-7]

The first review of routine evisceration was published by Noyes in 1874.[5-7] Ten years later Mules inserted an implant into the scleral shell to restore the orbital volume and prevent socket contracture that allow the use of appropriate artificial eye that will be comfortable and not apparent to the public at large.[5-7]

In spite of the numerous modifications of the standard evisceration techniques that allow the use of larger orbital implants and the many recent advances in orbital materials implant extrusion and exposure is still a major challenge for the ophthalmic plastic surgeon.

Many surgeons recommend different techniques to prevent implant extrusion like

posterior sclerotomies, patching the wound with temporalis fascia,[8] or wrapping the implant with autogenous sclera like enucleation with reverse replacement of sclera as an alternative to conventional evisceration.[9]

In the standard technique of evisceration, the size of the implant is usually between 14 to 16 mm, thus it cannot guarantee a tight implantation, as scleral shrinkage may occur during the healing periods.[10] Modified evisceration techniques have therefore been developed, mostly involving additional scleral incisions posteriorly that allow the placement of larger implants while reducing exposure rates.[11-16]

Our technique is as effective as Kim *et al*[11] procedure, who described a primary evisceration with four anterior relaxing incisions and posterior sclerotomies made circumferentially behind the equator at approximately 330º, combined with porous polyethylene orbital implant placement, and found to be a useful technique for treating a variety of end-stage eye diseases with no exposure or extrusion of implant over 8 years. Kim et al performed computed tomography to confirm orbital implant migration; none of the patients in this series had orbital computed tomography.

Huang *et al*,[12] described another modified evisceration technique with scleral quadrisection and porous polyethylene implantation. In their study there was no case of conjunctival dehiscence, implant extrusion, implant exposure, significant enophthalmos, superior sulcus deformity, or orbital cellulitis. This series shows comparable results, apart from the cosmetic appearance and implant mobility which were not reported. Another technique described by Sales-Sanz and Sanz-Lopez consisted of a 4-petal scleral sectioning from the limbus to the optic nerve, with release of the sclera from the optic nerve.[13] Adenis *et al.*,[14] described a new technique of evisceration after resection of the corneal epithelium and limbus, with preservation of the posterior layer of the cornea and anterior sclera, after a 360° dissection of the sclera behind the insertion of the extra ocular muscles, and preservation of the insertions of the rectus muscles. The technique was designated "Parachute" when the posterior sclera was excised, and "Russian doll" when the posterior sclera was preserved and is behind the orbital implant. The implant was inserted at the end of the procedure with a "birdcage" forceps. Massary and Holds,[15] performed two full-thickness sclerotomies from the anterior limbus incision to the optic nerve in the inferonasal and superotemporal quadrants to create two scleral flaps with release of the sclera from them. The most recent modification was described by Georgescu *et al.*,[16] who described an evisceration with equatorial sclerotomy for phthisis bulbi and microphthalmos concluding that this procedure could be a useful adjuvant for placement of a larger orbital implant at the time of evisceration in patients with phthisis bulbi and microphthalmos. Long *et al.*[17] described a modified evisceration technique with trans-scleral hydroxyapatite spherical implant placement. Their procedure is based on cutting the sclera antero-posterior to the optic nerve, which is divided, inserting a 16-20mm hydroxyapatite spherical implant and everting the posterior scleral layers in front of the implant. The anterior half of the implant is covered by double layers of sclera while the posterior sclera is opened to the orbital tissues, facilitating the integration of porous implant tissue. Their procedure is suitable for hydroxyapatite orbital implant only while our procedure suites all types of orbital implants as it covers the implants from posterior and anterior surfaces and provides a superior window for direct integration of porous implant.

The technique described in the present study involves two steps: first, excising a strip of the sclera behind the equator to augments the ocular volume and permits insertion of a larger implant. This minimizes the risk of developing post enucleation socket syndrome, and decreases the tension on the wound. It also increases surface contact between porous implants and the orbital tissue, which may facilitate more vascular integration. Second is patching the scleral wound with the excised scleral strip which gives the implant an additional layer of protection against exposure.

The scleral graft was laid between the anterior Tenon's and the conjunctiva to reduce the risk of scleral graft melting.

During follow up, none of our patients had implant extrusion or exposure, scleral patch

melting or displacement, or orbital infection. All fellow eyes showed no signs of sympathetic ophthalmia.

Conclusion

The modified evisceration technique described is as effective as other modifications reported in the literature. It probably provides a wider scleral shell to accommodate a bigger implant, and adds to the strength of the wound to decrease the incidence of extrusion attributed to wound dehiscence. A controlled comparative study is needed to further solidify these results.

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