

Evaluation of Cosmetic Appearance and Ocular Motility Following Evisceration Surgery

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Abstract

Background: Evisceration is a surgical technique that is used for cosmetic and curative reasons in many ocular diseases such as phthisis bulbi.

Aim of the Study: Evaluation of the cosmetic results and motility of the artificial prosthesis after two techniques of evisceration with insertion of prosthesis.

Patients and Methods: The study was carried out in ophthalmology department in Tanta University Hospital included 20 patients divided randomly into 2 equal groups. We underwent full history taking and acquired ophthalmological examination.

Operation and Follow-up: Evisceration of the eye with scleral quadrisection and insertion of an implant inside sclera in 10 patients (the first group) and addition of relaxing circumferential incision at posterior sclera in another 10 patients (the 2nd group). Follow-up was carried out in 1st day after operation, 1 week, 3 weeks and 6 weeks.

Results: Postoperative superior sulcus deformity difference between 2 groups was statistically significant (p -value=0.031) and it was markedly deformed in 40% of cases in group 1 and 20% in group 2. Palpebral fissure height had also statistically significant difference between 2 groups (p -value=0.030). enophthalmos was significantly reduced in the 2nd group (mean=0.700±0.483) in comparison to the 1st group (mean=1.700±1.059).

Conclusion and Recommendations: Performing relaxing posterior sclerectomies with evisceration surgeries allows insertion of larger implant with no increased risk of extrusion and this technique improves cosmetic appearance and motility of the prosthesis.

Key Words: Evisceration – Sclerectomies – Implants.

Introduction

EVISCKERATION is a surgical technique that is used for certain ocular diseases such as phthisis

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bulbi, this technique involves removal of the intraocular contents, including the cornea, lens, uvea, retina and vitreous, while leaving the sclera and extraocular orbital anatomy intact [1].

Evisceration is preferred over enucleation because in evisceration, the orbital anatomy (including the muscular insertions), volume, and socket motility is preserved leading to better cosmetic result, superior mobility for the prosthesis, and lower risk of intracranial infection or extrusion of orbital implant [2].

Evisceration can be done with or without orbital implants, evisceration with orbital implant necessitates certain techniques to insert the ball like formation of four scleral petals for insertion of adequate size of orbital implants to avoid anophthalmic socket syndrome [3].

Orbital implants can be used in both evisceration and enucleation procedures and they have many types such as polymethyl methacrylate (PMMA), glass, and silicone spheres (nonintegrated implants) which do not allow in-growth of organic tissue into their inorganic substance. Also there are integrated implants (porous) like hydroxyapatite, aluminum oxide, and polyethylene [4].

Evisceration procedures have also many drawbacks like orbital implant extrusion and anophthalmic socket syndrome. These drawbacks mainly results from using of larger or smaller implants than the actually needed [5].

The main cause of implant extrusion is excessive tension on the wound and usage of larger implants. Many evisceration techniques have been described to decrease the tension on the wound like 4 petal scleral technique with posterior sclerectomies [6].

Patients and Methods

This prospective study was conducted in Tanta University Ophthalmology Hospital from 2017 to 2018 and was carried out on 20 patients who underwent evisceration with insertion of implants. These implants are either silicone made or acrylic in nature and no other type was used due to financial issues. Patients were divided into 2 groups equally by 10 patients in each group and they were selected randomly in each group by performing the first surgical technique (scleral quadrisection and insertion of an implant inside sclera) in 1st 10 patients who came to Tanta University hospital and then the 2nd surgical technique (as first group and addition of relaxing circumferential incision at posterior sclera in the other 10 patients).

Patients included in the study are the patients indicated for evisceration. Patients younger than 18 years old, with infectious causes and intraocular tumor are excluded from the study.

Full history taking including previous surgeries, full ophthalmological examination of the diseased eye by slit lamp, external appearance scars, evaluation of ocular motility, evaluation of conjunctival fornices, lid examination for entropion, ectropion & levator function and sclera for staphyloma are done to all patients in the study.

Also ultrasound and axial length was done if the condition of the diseased eye allowed that. Examination of the other eye was including also slit lamp and biometry in all patients.

Operative procedure:

Evisceration of the eye was done by limbal incision and removal of the cornea and removal of all intraocular contents. Insertion of an implant either silicone or acrylic implants through scleral quadrisection and insertion of the implant inside the sclera alone in one group or by adding relaxing circumferential incision at posterior sclera and insertion of the implant through in the other group.

Selection of the implant size was done by taking axial length from the other eye and using ball sizers during the operation.

Post-operative follow-up

Postoperative follow-up of the patients was done at the outpatient clinic for edema, ecchymosis, entropion, ectropion and the scar. Artificial prosthesis placement was done 6 weeks post-operative.

Examination and evaluation of the patients in the postoperative visits was done by assessment

of palpebral fissure height, superior sulcus evaluation, degree of movement of both eye ball and evaluation of motility after artificial Prosthesis placement, enophthalmos and lower fornix depth.

Results

This study was conducted on 20 patients (14 male and 6 females). The mean age of these patients was 55.1 years (range from 29 to 70 years).

This study involved different causes of evisceration; 4 cases of atrophial bulbi, 10 cases of blind painful eye, 2 cases of trauma and 4 cases of anterior staphyloma.

In the study we used 2 types of non-porous implants. They are silicone and acrylic in nature. 20 implants are used in the study and they were 14 silicone and 6 acrylic implants and sizes of the used implants were between 16mm and 22mm with a mean of 18.6mm as shown in Table (1).

Axial length was done for all cases in the other eye. The readings ranged from 21.29mm to 27.36 mm. mean value for axial length was 24.17mm with standard deviation of 1.59 as shown in Table (2).

Correlation between axial length and implant size:

This study showed a statistically significant relation between axial length taken from the patients and changes in implant sizes used in the study as shown in *p*-value. There was also a significant positive correlation between them as shown by Pearson correlation coefficient (*r*) as shown also in the following Table (3).

Relation between surgical technique and superior sulcus deformity:

In this study, there was a statistically significant relation between the technique of implantation used in 2 groups and superior sulcus deformity in patients included in the study as shown in Table (4).

Relation between surgical technique and palpebral fissure height:

In this study, there was a statistically significant relation between the technique of implantation used in 2 groups and palpebral fissure height estimated in patients included in the study as shown in Table (5).

Relation between surgical technique and enophthalmos:

In this study, there was a statistically significant relation between the technique of implantation

used in 2 groups and enophthalmos estimated in patients included in the study as in Table (6).

Relation between surgical technique and lower fornix depth:

In this study, there was a statistically significant relation between the technique of implantation used in 2 groups and lower fornix depth in patients included in the study as shown in Table (7).

Relation between surgical technique and prosthesis motility:

In this study, there was a statistically significant relation between the technique of implantation used in 2 groups and degree of motility of prosthesis estimated in patients included in the study as shown in the Table (8).

Relation between size of the implant and superior sulcus deformity in each surgical technique of implantation:

In this study, there was no statistically significant relation between the size of implant used in each technique of implantation and superior sulcus deformity estimated in patients included in the study as shown in the Table (9).

Relation between size of the implant and palpebral fissure height in each surgical technique of implantation:

In this study, there was no statistically significant relation between the size of implant used in each technique of implantation and palpebral fissure height estimated in patients included in the study as shown in the Table (10).

Relation between size of the implant and enophthalmos in each surgical technique of implantation:

In this study, there was a statistically significant relation between the size of implant used and surgical technique used in group one with negative correlation between them and no statistically significant relation between the size of implant used and surgical technique used in group 2 of patients included in the study as shown in the Table (11).

Relation between size of the implant and lower fornix depth in each surgical technique of implantation:

In this study, there was no statistically significant relation between the size of implant used in each technique of implantation and lower fornix examination in patients included in the study as shown in the Table (12).

Relation between size of the implant and degree of motility of prosthesis in each surgical technique of implantation:

In this study, there was no statistically significant relation between the size of implant used in each technique of implantation and degree of prosthesis motility in patients included in the study as shown in Table (13).

Table (1): This table shows different sizes of implants used in the study.

	Descriptive Statistics	
	Range	Mean ± SD
Size	16–22	18.600±1.603

Table (2): This table shows axial length reading range and mean in the study.

	Range	Mean ± SD
Biometry	21.29–27.36	24.1765±1.592

Table (3): This table shows details of correlation between axial length and implant size.

	Correlations	
	Axial length	
	r	p-value
Size	0.941	<0.001*

Table (4): This table shows the relation between technique of implantation and superior sulcus deformity in patients.

Superior sulcus deformity	Surgery						Chi-Square	
	Group I		Group II		Total		X ²	p-value
	N	%	N	%	N	%		
No	1	10	3	30	4	20	6.927	0.031*
Mild	5	50	7	70	12	60		
Marked	4	40	0	0	4	20		
Total	10	100	10	100	20	100		

Table (5): This table shows the relation between technique of implantation and palpebral fissure height in patients.

Palpebral fissure height	Surgery						Chi-Square	
	Group I		Group II		Total		X ²	p-value
	N	%	N	%	N	%		
No	2	20	5	50	7	35	6.985	0.030*
Mild	4	40	5	50	9	45		
Moderate	4	40	0	0	4	20		
Total	10	100	10	100	20	100		

Table (6): This table shows the relation between technique of implantation and enophthalmos in patients.

Enophthalmos	Surgery		<i>t</i> -test	
	Group I	Group II	<i>t</i>	<i>p</i> -value
Range	0-3mm	0-1mm		
Mean ±SD	1.700±1.059	0.700±0.483	2.716	0.014*

Table (7): This table shows the relation between technique of implantation and lower fornix depth in patients.

Lower fornix depth	Surgery						Chi-Square	
	Group I		Group II		Total		X2	<i>p</i> -value
	N	%	N	%	N	%		
Very shallow	5	50	0	0	5	25	6.818	0.033*
Shallow	4	40	7	70	11	55		
Enough depth	1	10	3	30	4	20		
Total	10	100	10	100	20	100		

Table (8): This table shows the relation between technique of implantation and degree of mobility of prosthesis in patients.

Degree of mobility of prosthesis	Surgery						Chi-Square	
	Group I		Group II		Total		X2	<i>p</i> -value
	N	%	N	%	N	%		
Poor	6	60	0	0	6	30	9.818	0.007*
Fair	4	40	7	70	11	55		
Good	0	0	3	30	3	15		
Total	10	100	10	100	20	100		

Table (9): This table shows the relation between size of implants and superior sulcus deformity used in each surgical technique of implantation.

Surgery	Superior sulcus deformity	Size		ANOVA or <i>t</i> -test	
		N	Mean ± SD	F or <i>t</i>	<i>p</i> -value
Group I	No	1	20.000±0.000	1.462	0.295
	Mild	5	18.800±1.095		
	Marked	4	17.500±1.915		
Group II	No	3	18.000±2.000	-0.980	0.356
	Mild	7	19.143±1.574		

Table (10): This table shows the relation between size of implants and superior sulcus deformity used in each surgical technique of implantation.

Surgery	Palpebral fissure height	Size		ANOVA or <i>t</i> -test	
		N	Mean ± SD	F or <i>t</i>	<i>p</i> -value
Group I	No	2	19.000±1.414	1.112	0.381
	Mild	4	19.000±1.155		
	Moderate	4	17.500±1.915		
Group II	No	5	18.400±1.673	-0.730	0.486
	Mild	5	19.200±1.789		

Table (11): This table shows the relation between size of implants and enophthalmos in each implantation technique used in both groups of patients.

Surgery	Correlations	
	Size	
	<i>r</i>	<i>p</i> -value
Group I	-0.718	0.019*
Group II	0.327	0.356

Table (12): This table shows the relation between size of implants and lower fornix examination used in each surgical technique of implantation.

Surgery	Lower fornix examination	Size		ANOVA or <i>t</i> -test	
		N	Mean ± SD	F or <i>t</i>	<i>p</i> -value
Group I	Very shallow	5	17.600±1.673	1.658	0.257
	Shallow	4	19.000±1.155		
	Enough depth	1	20.000±0.000		
Group II	Shallow	7	19.143±1.574	0.980	0.356
	Enough depth	3	18.000±2.000		

Table (13): This table shows the relation between size of implants and degree of mobility of the prosthesis used in each surgical technique of implantation.

Surgery	Degree of prosthesis mobility	Size		<i>t</i> -test	
		N	Mean ± SD	<i>t</i>	<i>p</i> -value
Group I	Poor	6	18.000±1.789	-0.980	0.356
	Fair	4	19.000±1.155		
Group II	Fair	7	19.143±1.574	0.980	0.356
	Good	3	18.000±2.000		

Discussion

Evisceration is a common surgical procedure by which intraocular contents are removed with preservation of sclera, extraocular muscles and orbital adnexa. In comparison with enucleation, evisceration is better due to relative preservation of tissues and this leads to better cosmetic result. It also can be combined with insertion of an implant into the eviscerated cavity for orbital volume replacement. Common causes of evisceration include endophthalmitis, expulsive hemorrhage and blind painful eye. In our study, the most common cause of evisceration was due to blind painful eye and they were 10 cases (50% of patients). Other causes included 4 cases anterior staphyloma (20% of patients), 4 cases of atrophial bulbi (20% of patients) and 2 cases of trauma (10% of cases). [1,2].

Most surgeons prefer immediate placement of the implants in a single surgery due to simplicity and cost-effectiveness but some surgeons choose to place the implant in a secondary staged procedure

days to weeks after the initial evisceration, particularly in the setting of acute infection, believing that the rates of implant extrusion may be higher with primary implantation at the time of evisceration. In our study, we performed evisceration with immediate placement of the implant in the same session [3].

In our study non-porous non-integrated implants were used. We used silicone implants in 14 cases (70% of patients) and the other 6 cases acrylic implants were used (30% of patients).

In the past, standard evisceration techniques typically only allow placement of a 13-16-mm spherical implant [7,8]. To achieve optimum volume replacement with insertion of suitable large implant and reducing the tension on scleral flaps, the evisceration technique has undergone several modifications. Yang et al., [9] described scleral quadrisection after evisceration, without releasing it from the optic nerve. Massry and Holds [10] performed 2 full thickness sclerectomies from the anterior limbus incision to the optic nerve in inferonasal and superotemporal quadrants. Kim et al., [4] used evisceration with four anterior full thickness scleral relaxing incisions between the recti muscles insertion to the equator, and circumferential posterior sclerotomy surrounding the optic nerve for 330°. Sales-Sanz and Sanz-Lopez [2] described the four petals evisceration. They performed four sclerectomies from the limbus, between the recti muscles to the optic nerve with releasing the scleral flaps from the optic nerve. Huang et al., [1] described a similar technique involving scleral quadrisection and suturing the implant with each rectus muscle through the scleral petal.

In this study, we used evisceration with scleral quadrisection and insertion of an implant inside the sclera in 10 cases (50% of patients) and in the other technique, we added relaxing posterior sclerectomies in other 10 cases (50% of patients) to compare statistically between results of both techniques.

Implant size has traditionally been determined on an empiric basis. Insertion of an implant of an inappropriate size results in a variety of complications. Placement of an abnormal small implant causes volume deficit in the orbit leading to deep superior sulcus while excessively large implants increase the risk of implant extrusion and compromise the fitting and retention of the prosthesis. For accurate determination of the implant size, Kaltreider and Lucarelli [5] described a simple formula which allowed good volume replacement. They

used implant diameter equals axial length of the contralateral eye-3mm that results from the evisceration procedure.

In our study, axial length was taken from other eye in all patients and the size and type of implant is chosen by operator preference. Ball sizer is used in patients intraoperative to assess the size of the opening in the sclera to allow insertion of the predetermined implant.

A common complication associated with orbital implants is implant extrusion. The actual incidences of implant extrusion were variable in different reports using different surgical techniques. Viswanathan et al., [11] in a national survey recorded 3% rate of extrusion of the implant after evisceration (4 of 128 cases). Detailed analysis of this complication was limited in this survey due to questionnaire design as specific clinical and surgical details were not requested. The main risk factors for exposure and extrusion of the implant are inadequate surgical technique, covering the implant with high tension, and persistent conjunctival inflammation [2].

Despite placement of a large implant, patients may still develop a "sunken-in" appearance. Several mechanisms have been proposed for deep superior sulcus and subsequent ptosis.

In this study, there is a statistically significant relation between the technique of surgery used in 2 groups and superior sulcus deformity in patients included in the study (p -value: 0.03) and this difference is supposed to be due to adequate volume replacement. Also in this study, there is a statistically significant relation between the technique of surgery used in 2 groups and other outcomes like palpebral fissure height, enophthalmos, superior lower fornix and degree of mobility of the prosthesis in patients included in the study.

In conclusion, performing relaxing posterior sclerectomies increases the space and allows larger sizes of implants to be used. This technique facilitates the insertion of such large implant without tension on scleral flaps avoiding implant exposure and improving surgical cosmetic outcome.

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تقييم المظهر الجمالي للعين وحركتها ما بعد عملية التفريغ

أجريت الدراسة على ٢٠ مريضاً متوسط أعمارهم ١-٥٥ سنة وكانت عوامل الأنتقاء كالآتي:

البالغين أكثر من ١٨ سنة. التفريغ بسبب الحوادث والتفريغ بسبب العيون المؤلمة والغير مبصرة للضوء والتفريغ بسبب ضمور العين والتفريغ بسبب العناية الأمامية.

وكانت عوامل الأستبعاد كالآتي:

المرضى الذين تقل أعمارهم عن ١٨ سنة والتفريغ لوجود عدوى والتفريغ لوجود ورم بالعين هؤلاء المرضى المشمولين بالدراسة عانوا من مشكلات مختلفة حيث عانى ٤ مرضى من ضمور العين وعانى ١٠ مرضى من جلوكوما مطلقة وعانى ٤ منهم من عناية أمامية فى العين الغير مبصرة للضوء وعانى ٢ من إصابة بالعين.

تم إستخدام ٢٠ كدة بواقع ١٤ كدة مصنوعة من السليكون و ٦ كرات مصنوعة من مادة الأكريليك وكانت أحجامهم تتراوح من ١٦ مم إلى ٢٢ مم بمتوسط ١٨.٦ مم.

وقد بينت النتائج وجود علاقة إحصائية ذات أهمية بين نوع العملية التى تم إجراؤها مع كل من تشوه الأخدود العلوى وطول الشق بين الجفون وخص العين وحركة العين الأصطناعية. وكذلك بينت النتائج عدم وجود علاقة إحصائية ذات أهمية بين خروج الكرة ونوع العملية التى تم إجراؤها.

أما بالنسبة لحجم الكرة التى تم زرعها فلم توجد علاقة إحصائية ذات أهمية بينها وبين كل ما سبق من تشوه ولأخدود العلوى وطول الشق بين الجفون وخص العين.