Implant Motility in Two-Scleral Flaps Evisceration

Çift Skleral Flepli Eviserasyonda İmplant Motilitesi

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ABSTRACT Objective: To evaluate the presence of implant motility in each cardinal position associated with two-scleral flaps evisceration. **Material and Methods:** In this interventional case series, the medical records of 38 patients were reviewed retrospectively. Patients that underwent two-scleral flaps evisceration with placement of a spherical acrylic implant were reviewed. The patients instructed to look in 6 extreme gaze directions (superior, inferior, medial, and lateral and superior medial and inferior medial). The horizontal and vertical excursions were measured with a standard millimeter ruler based on any hollow on socket surface and over than four mm excursion was regarded as positive implant motility. Main outcome measure is implant motility. **Results:** Among the 38 patients, 19 (50%) were male and 19 (50%) were female. Mean patient age at the time of surgery was 29.1 years (range: 5-83 years); 6 patients were aged <14 years. Mean duration of postoperative follow-up was 6 months (range: 3-12 months). Medial and lateral excursions over 4 mm were achieved in all patients. Inferior excursion over 4 mm was achieved in 25 (65.9%) patients, superior excursions over 4 mm was achieved 20 (52.6%) patients. Oblique muscle function has been completely disabled in all patients. Mild ptosis was observed in all patients. **Conclusion:** In two-scleral flaps evisceration method some implant motility can obtained. But it does not take into account tenon's capsule-pulley and physiological dynamics of extraocular muscles and check ligaments. Therefore this method is falling in contruction of full implant motility and it can not obviate incomitance between eviscerated eye and fellow eye.

Key Words: Orbital implants; eye evisceration; oculomotor muscles; tenon capsule

ÖZET Amaç: Çift skleral flepli eviserasyonda kardinal bakışlarda implantın motilitesini değerlendirmek. **Gereç ve Yöntemler:** Bu girişimsel olgu serisinde, çift skleral flepli eviserasyon yapılarak akrilik küre yerleştirilen 38 hastanın tıbbi kayıtları geriye dönük olarak incelendi. Hastalar, implantın hareketini incelemek için altı kardinal yöne baktırıldı (yukarı, aşağı, medial, lateral, medial yukarı ve aşağı). Yatay ve dikey yöndeki implant hareketi soket üzerinde bulunan belirgin alanlar dikkate alınarak ölçüldü. Hareket miktarı standart milimetrik bir cetvelle ölçüldü ve 4 mm üzerinde hareket miktarı pozitif olarak kabul edildi. Çalışmadaki temel ölçüm parametresi implant hareketliliğidir. **Bulgular:** On dokuz (%50) erkek, 19 kadın (%50) toplam 38 hastanın ameliyat sırasındaki ortalama yaşı 29,1 (aralık: 5-83) yıl iken, 6 hasta 14 yaşın altında idi. Ameliyat sonrası takip süresi ortalama 6 aydı (aralık: 3-12 ay). Dört mm ve üzerinde medial ve laterale bakış tüm hastalarda gerçekleşti. Dört mm'nin üzerinde aşağı bakış 25 (%65,9) hastada, yukarı bakış 20 (%52,6) hastada elde edildi. Oblik kasların fonksiyonu tüm hastalarda tamamen devre dışı kaldı. Hafif pitozis tüm hastalarda gözlendi. **Sonuç:** Çift skleral flep yönteminde implant hareketliliği bir miktar sağlanabilmektedir. Fakat tenon kapsülün oluşturduğu kasnak yapı ve göz dışı kasları ile kontrol bağların fizyolojik dinamikleri bu teknikte göz önüne alınmamıştır. Bu yüzden her planda tam düzeyde implant hareketini sağlayamamakta ve evissere edilen göz ile diğer göz arasında inkomitansı ortadan kaldıramamaktadır.

Anahtar Kelimeler: Orbita implantları; göz eviserasyonu; okülomotor kaslar; tenon kapsülü

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To overcome the problems associated with conventional evisceration, the classical procedure has been modified over time. Such techniques include sclerotomy and releasing techniques that facilitate insertion of larger implants such as 18 and 20 mm sphere party into the intraconal space. Sclerotomy that made for expansion of scleral shell and anterior transposition of scleral flaps minimizing the risk of enophthalmos and decreasing tension on wound. Therefore transection of optic nerve was used as a releasing techniques.[1-8] Stephenson, Jordan, Yang, Kostick, Sales-Sanz & Sanz-Lopez and Massry & Holds are some of authors that tried various sclerotomy techniques with/without transection of optic nerve. With advancement in evisceration surgery, all reported modern techniques can handy for placement of a larger implant, can overcome implant exposure, and give a good cosmetic result. Now, the biggest concern of patients and the biggest aim of surgeons is implant motility.

According to the reports, an improved implant motility can be obtained by all modified evisceration techniques comparable to classic evisceration technique. But implant motility was assessed in only horizontal and vertical excursions.[9,10] Whereas, an excellent result can only be achieved by excursion in all directions. In the present interventional retrospective case series two scleral flaps evisceration technique was used and acrylic spheres were implanted. We want to evaluate the motility results in each cardinal position including oblique excursions and the probably causes of presence or absence of motility.

MATERIAL AND METHODS

The medical records of patients that underwent two-scleral flaps evisceration and placement of a spherical acrylic implant were retrospectively reviewed; all other patients were excluded. The Batman State Hospital Ethics Committee approved the study protocol, and the tenets of the Declaration of Helsinki were adhered to. Patient consent was obtained for use of figures accompanying this paper.

We used two-scleral flaps evisceration method, which is similar to the method described by Massry and Holds. The technique has previously been described in detail.[1] Briefly following standard evisceration, full-thickness sclerotomy from the limbal incision to the optic nerve in the inferonasal and superotemporal quadrants between the rectus muscle insertions to create 2 scleral flaps were performed (Figure 1). The scleral flaps were released from optic nerve attachments, allowing them to be mobilized and easily brought forward. Then, an appropriate acrylic sphere was placed into the muscle cone and within the scleral flaps. Scleral flaps were placed over the implant and closed

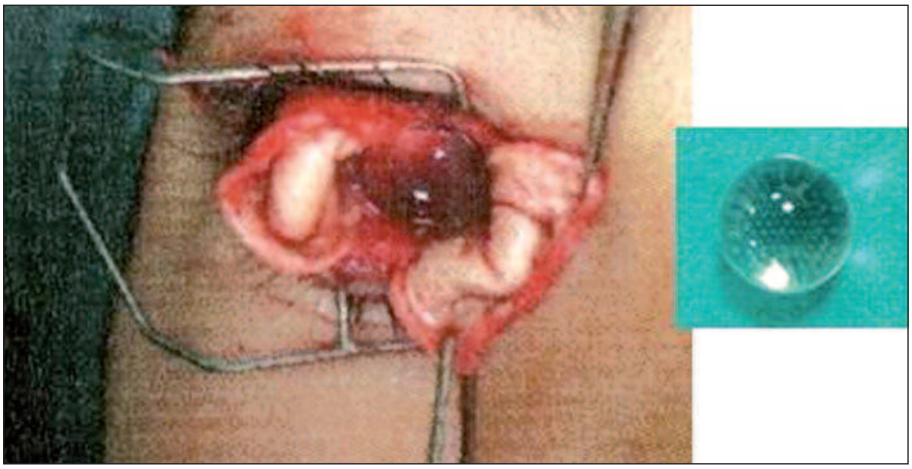

FIGURE 1: Intraoperative photograph of Case 7. (Right) two scleral flaps; (left) a 20-mm acrylic sphere.
(See color figure at http://www.turkiyeklinikleri.com/journal/oftalmoloji-dergisi/1300-0365/)

with interrupted 6-0 vicryl sutures. One of the scleral flaps overlapped the other (2-3 mm of overlap), and if necessary the scleral flaps were trimmed. Tenon's capsule and the conjunctiva were closed over the implant in layers using 6-0 vicryl sutures.

Postoperative follow-up visits were scheduled at 1, 2, 4, 6, and 12 weeks post procedure. Implant motility was analysed in 6 cardinal gaze directions, in a masked fashion as follows: the patient was asked to look in the primary gaze direction at a fixation object, and was then instructed to look in 6 extreme gaze directions (superior, inferior, medial, lateral and superior medial and inferior medial). Over than four mm on horizontal and vertical excursions were regarded as positive implant motility. If there was any oblique excursion was accepted as positive implant motility in oblique direction. Any hollow on socket surface was used as a reference point and the excursions were measured with a standard millimeter ruler in patients. If the implant did not act in all gaze directions the motility score was 0. If the implant acted in 1 gaze direction the motility score was 1, in 2 gaze directions the score was 2, in 3 gaze directions the score was 3, and in 4 gaze directions the score was 4 and etc.

RESULTS

In total, 38 patients underwent the procedure between January 2008 and October 2009. Among the 38 patients, 19 (50%) were male and 19 (50%) were female. Mean patient age at the time of surgery was 29.1 years (range: 5-83 years); 6 patients were aged <14 years. Mean duration of postoperative follow-up was 6 months (range: 3-12 months). Indications for surgery (in order of descending frequency) were traumatic phthisical eye in 13 (34.2%), absolute eyes caused by endophthalmitis in 13 (34.2%), spontaneous laceration in 5 (13.1%), microcytic eye in 3 (7.8%), absolute glaucoma in 2 (5.2%), anophthalmic socket syndrome in 1 (2.6%), and implant exposure in 1 (2.6%) patients. All of the patients had phthisis bulbi. A spherical acrylic implant was placed in each eye. Among the patients, 29 (76.3%) received a 20-mm sphere and 9 (23.7%) received an 18-mm sphere. Implant exposure did not occurred in any patients. By wearing ocular prosthesis we could eliminate enophthalmos (Figure 2).

Medial and lateral excursions over 4 mm were achieved in all patients. Inferior excursion over 4 mm was achieved in 25 (65.9%) patients, superior excursions over 4 mm was achieved 20 (52.6%) patients. Oblique muscle function has been completely disabled in all patients (Figure 3). So, implant motility in 4 cardinal gaze directions (the score was 4) was achieved in 17 (44.7%) patients, in 3 cardinal gaze directions (the score was 3) in 11 (28.9%) patients, and in 2 cardinal gaze directions (the score was 2) in 10 (26.3%) patients. The main implant motility was gained in horizontal direction. That is all of patients had horizontal duction. In 21 patients (55,2%) upward and/or downward gaze was recorded under 4 mm and was accepted limited. Besides implant motility, we find an unexpected result that mild ptosis was observed in all patients even with ocular prosthesis (Figure 2).

FIGURE 2: Clinical photograph of Case 25 (right) and Case 10 (middle and left) after two scleral flap evisceration technique. In the two patients a 20 mm implant inserted. In case 25 white arrow shows compensatory brow elevation, black arrow shows ptosis and arrowhead shows reverse ptosis. In Case 10, in the middle figure arrow shows ptosis in despite wearing of prosthesis. Also when we compare the socket in case 10 after (middle figure) and before (left figure) wearing prosthesis, enophthalmos was eliminated by wearing ocular prosthesis.

(See color figure at http://www.turkiyeklinikleri.com/journal/oftalmoloji-dergisi/1300-0365/)

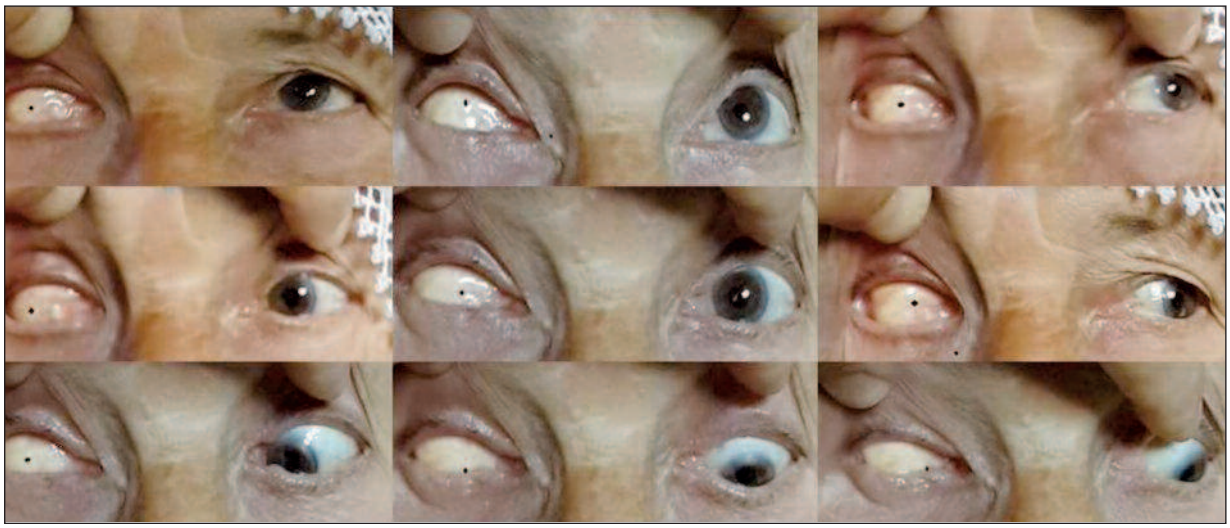

FIGURE 3: Clinical photograph of the socket in Case 25 after two scleral flap evisceration technique shows excursions of implant in all direction. Excursions were determined based on a hollow on socket surface. Horizontal and vertical excursions are over 4 mm, but oblique muscle function has been completely disabled. In this patient implant motility was achieved in 4 cardinal gaze directions. The score is 4.

(See color figure at http://www.turkiyeklinikleri.com/journal/oftalmoloji-dergisi/1300-0365/)

DISCUSSION

In an evisceration surgery, as large an implant as possible must be inserted.[11-13] On the other hand, wound tension must be minimized in order to reduce implant exposure.[1-3,14,15] In the present study, two-scleral flaps evisceration method was used. This technique is easy to perform, is suitable for non- bio integratable implants and large sized implants, and is effective for minimizing wound tension. Also we accomplished to overcome implant exposure in all cases and to insert a 18 or 20 mm sized implant, too. It is effective in volume replacement and implant exposure.[1,10,16,17] But there are some limitations of two-scleral flaps evisceration method. Forward displacement of both flaps for overlapping distends horizontal and vertical muscles so antagonist muscles counteract against the other. Oblique muscles relax and muscle functions are disabled. Also forward displacement of check ligaments will result in ptosis and even reverse ptosis. However, to achieve the best result, it is imperative reconstructing the orbital volume in true position and maintaining physiological dynamics of extraocular muscles and check ligaments. This is closely associated with the nearest physiological three-dimensional tenon's capsule-pulley re-construction. Only in this way, extraocular muscles gain the ability to move on an implant as a pulley.[18] Our study results display limited implant motility and mild ptosis in all patients and suggest this pathogenesis. That is to say, overlapping two scleral flaps is logical for preventing implant exposure but affects implant motility conversely.

In our method, we generally overlaid inferior flap on superior flap. This is an explanation why upward excursions are limited in our cases. But any limitation in vertical excursions and completely losing oblique excursions are seems reasonable in any modified evisceration surgery, if there is forward displacement of any flaps. Already Custer mentioned this limitation also that vertical measurements averaged 20% less than the horizontal excursions.[13]

Our primary goal was to evaluate the presence of implant motility in each cardinal position; therefore, although the follow-up time in the present study was limited, we think it is sufficient for assessing implant motility. Based on our knowledge excursion rate of implant motility was reported previously but the presence of motility in each cardinal position especially in oblique position was not published previously.[9,10,13] In this respect this article is first report. Furthermore, our results

point out implant motility based on association between three-dimensional tenon's capsule-pulley and physiological dynamics of extraocular muscles and check ligaments.

Implant exposure did not occurred in any patients, this finding confirm the results of some modified evisceration techniques.[1-8,19] These techniques mainly focused on preventing implant exposure and then improving implant motility. But now, it is conspicuous that implant motility has a key role for patients' and surgeons' satisfaction. It is obvious that these satisfactions only will be without any incomitance between eviscerated eye and fellow eye. Therefore further modifications are needed.

In conclusion, in two-scleral flaps evisceration method some implant motility can be obtained. But this method can not obviate incomitance between eviscerated eye and fellow eye and are falling in contruction of full implant motility. Because it does not take into account tenon's capsule-pulley and physiological dynamics of extraocular muscles and check ligaments. Future modified evisceration technique should provide a few advantages such as to be suitable for insertion of large implant and should not change the anatomical true position of extraocular and oblique muscles and check ligaments. On the other hand it should have a strong resistance against to implant exposure.

REFERENCES

1. Massry GG, Holds JB. Evisceration with scleral modification. Ophthal Plast Reconstr Surg 2001;17(1):42-7.
2. Sales-Sanz M, Sanz-Lopez A. Four-petal evisceration: a new technique. Ophthal Plast Reconstr Surg 2007;23(5):389-92.
3. Huang D, Yu Y, Lu R, Yang H, Cai J. A modified evisceration technique with scleral quadrisection and porous polyethylene implantation. Am J Ophthalmol 2009;147(5):924-8.
4. Stephenson CM. Evisceration of the eye with expansion sclerotomies. Ophthal Plast Reconstr Surg 1987;3(4):249-51.
5. Jordan DR, Anderson RL. The universal implant for evisceration surgery. Ophthal Plast Reconstr Surg 1997;13(1):1-7.
6. Yang JG, Khwarg SI, Wee WR, Kim DM, Lee JH. Hydroxyapatite implantation with scleral quadrisection after evisceration. Ophthal Surg Lasers 1997;28(11):915-9.
7. Kostick DA, Linberg JV. Evisceration with hydroxyapatite implant: surgical technique and review of 31 case reports. Ophthalmology 1995;102(10):1542-8.
8. Ozgur OR, Akçay L, Doğan OK. Evisceration via superior temporal sclerotomy. Am J Ophthalmol 2005;139(1):78-86.
9. Guillinta P, Vasani SN, Granet DB, Kikkawa DO. Prosthetic motility in pegged versus unpegged integrated porous orbital implants. Ophthal Plast Reconstr Surg 2003;19(2):119-22.
10. Masdottir S, Sahlin S. Patient satisfaction and results after evisceration with a split-sclera technique. Orbit 2007;26(4):241-7.
11. Park WC, Han SK, Kim NJ, Chung TY, Khwarg SI. Effect of basic fibroblast growth factor on fibrovascular ingrowth into porous polyethylene anophthalmic socket implants. Korean J Ophthalmol 2005;19(1):1-8.
12. Tari AS, Malihi M, Kasaee A, Tabatabaie SZ, Hamzedust K, Musavi MF, et al. Enucleation with hydroxyapatite implantation versus evisceration plus scleral quadrisection and alloplastic implantation. Ophthal Plast Reconstr Surg 2009;25(2):130-3.
13. Custer PL, Trinkaus KM, Fornoff J. Comparative motility of hydroxyapatite and alloplastic enucleation implants. Ophthalmology 1999;106(3):513-6.
14. Moshfeghi DM, Moshfeghi AA, Finger PT. Enucleation. Surv Ophthalmol 2000;44(4):277-301.
15. Zolli CL. Implant extrusion in eviscerations. Ann Ophthalmol 1988;20(4):127-32, 135.
16. Georgescu D, Vagefi MR, Yang CC, McCann J, Anderson RL. Evisceration with equatorial sclerotomy for phthisis bulbi and microphthalmos. Ophthal Plast Reconstr Surg 2010;26(3):165-7.
17. Smith RJ, Prazeres S, Fauquier S, Malet T. Complications of two scleral flaps evisceration technique: analysis of 201 procedures. Ophthal Plast Reconstr Surg 2011;27(4):227-31.
18. Roth A. Appareil suspenseur du globe oculaire (Chapitre 1.2.). In: Espinasse-Berrod MA, ed. Strabologie: approches diagnostique et thêrapeutique. 2nded. Issy-les-Moulineaux Cedex: Elsevier Masson SAS; 2008. p.9-11.
19. Özay S, Önder F. [Posterior sclerotomy procedures in evicseration]. Turk J Ophthalmol 2008;38(5):364-70.