

## Outcomes of modified deep scleral trabeculectomy surgery under anterior chamber maintainer

### Ön kamara koruyucu altında modifiye derin skleral trabekülektomi cerrahisi sonuçlarımız

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#### ABSTRACT

**Objective:** To evaluate patients monitored for glaucoma and operated with trabeculectomy combined with deep sclerectomy under an anterior chamber maintainer.

**Methods:** In this retrospective study, fifteen eyes of 15 patients diagnosed with primary open angle glaucoma (POAG) who show up regularly for follow-up examinations between April 2006 and May 2010 were included in this study. Pre-operative/post-operative intraocular pressure (IOP) and the number of antiglaucomatous medications were evaluated.

**Results:** The mean age was  $64.6 \pm 11.4$  (33-80) years and the mean follow-up period was  $22.4 \pm 16.2$  months (6-55). The mean pre-operative IOP was  $24.6 \pm 8.0$  (12-40 mmHg), and the mean cup/disc (c/d) ratio was  $0.71 \pm 0.25$ . According to the Hodapp classification, the mean damage in the visual field was  $2.1 \pm 0.9$ . Mean post-operative IOP at months 1, 12, and 24 was  $13.2 \pm 3.4$ ,  $13.6 \pm 4.6$  and  $13.8 \pm 2.8$  mmHg, respectively. The average number of pre-operative antiglaucomatous medications was 3.1 whereas the average numbers of post-operative antiglaucomatous medications were 1.8, 0.6 and 0.8 respectively.

**Conclusion:** Modified trabeculectomy has low rates of complication and results in a significant decrease in post-operative IOP, as well as the number of antiglaucomatous medications used. *J Clin Exp Invest* 2014; 5 (4): 544-547

**Key words:** Anterior chamber maintainer, deep sclerectomy, trabeculectomy

#### INTRODUCTION

Trabeculectomy was first described in 1967 and is a valid standard surgical technique in glaucoma treatment [1-2]. Although post-operative early period success rates are high, long-term effectiveness in controlling intraocular pressure (IOP) reduces [3-4].

#### ÖZET

**Amaç:** Glokom tanısı ile takip edilen ve ön kamara koruyucu altında derin skleral trabekülektomi operasyonu geçiren hastaların değerlendirilmesi.

**Yöntemler:** Bu çalışmaya Nisan 2006 – Mayıs 2010 tarihleri arasında primer açık açılı glokom (PAAG) tanısı almış, düzenli olarak kontrollere gelen 15 hastanın 15 gözü dahil edildi. Çalışmada preoperatif ve postoperatif göz içi basıncı (GİB), kullanılan ilaç etken madde sayıları değerlendirildi.

**Bulgular:** Yaş ortalaması  $64,6 \pm 11,4$  (33-80) yıl, ortalama takip süresi  $22,4 \pm 16,2$  ay (6-55) idi. Preoperatif ortalama GİB'leri  $24,6 \pm 8,0$  mmHg (12-40), ortalama cup/disk (c/d) oranı  $0,71 \pm 0,25$  saptandı. Hastaların görme alanlarındaki hasar Hodapp sınıflamasına göre ortalama  $2,1 \pm 0,9$  idi. Postoperatif 1. ay, 12. ay ve 24. ay ortalama GİB'leri sırasıyla  $13,2 \pm 3,4$ ,  $13,6 \pm 4,6$  ve  $13,8 \pm 2,8$  mmHg ölçüldü. Preoperatif kullanılan antiglokomatöz etken madde sayısı ortalama 3,1 iken, postoperatif ortalama sırasıyla 1,8, 0,6 ve 0,8 bulundu.

**Sonuçlar:** Çalışmamızda modifiye trabekülektomi cerrahisi düşük komplikasyon oranları ile hastaların postoperatif GİB'inde belirgin bir düşme sağlanmakta ve kullanılan ilaç sayısında belirgin bir azalmaya neden olmaktadır.

**Anahtar kelimeler:** Ön kamara koruyucu, derin sklerektomi, trabekülektomi

Presence of many early or late complications such as hyphema, anterior chamber reactions, hypotonia, hypotonia induced maculopathy, cataract development, choroid detachment, endophthalmitis led clinicians to search various techniques [1,5-7]. The most important stage in trabeculectomy surgery is to maintain IOP within normal limits during

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post-operative period based on filtration rate. To this aim, various suture techniques were described [8-10]. Non-penetrating methods such as collagen implant deep sclerotomy and viscocanalostomy were developed in order to reduce complication rates when maintaining effectivity of trabeculectomy [8-11]. Despite lower complication rates of these techniques, many studies reported lower IOP-lowering efficacy [12-15]. In this study, our aim was to report short and long term results of operations performed by modified scleral trabeculectomy technique under anterior chamber maintainer which enables scleral flap suture tension during operation.

## METHODS

In this retrospective study, 15 eyes of 15 patients who had modified glaucoma surgery due to primary open-angle glaucoma between April 2006 and May 2010 were evaluated. All the study patients were operated by the same surgeon (Ö.K). Due to follow up problems, 9 patients were evaluated for the first year and 6 patients were evaluated for the second year.

Preoperative and postoperative IOP, the number of drug active substances were assessed. Fundamental eye examination was performed to all patients before surgery. Best-corrected visual acuity, IOP measurements by Goldmann applanation tonometer, glaucoma gonioscopy, fundus examination, biomicroscopic examination were done. All these examinations were repeated postoperative on day 1, 7, at month 1 and then by 3 month intervals until 24 month. Antimetabolite was not used in any of the operations.

**Surgical technique:** All operations were performed by the same surgeon under retrobulbar anesthesia. Periorbital skin area and eyelids were cleaned by 10% povidone-iodone before surgery. Eyelids and lashes were covered by a sterile eye covering. One drop of 5% povidone-iodone was instilled onto conjunctiva and washed by balanced saline solution (BSS). All operations were made from upper temporal or upper nasal quadrant and fornix-based conjunctival flap was made. Scleral vessels were cauterized following conjunctiva and Tenon dissections. Then, a 4x4 mm, limbus-based, square, superficial scleral flap was formed. The second deep scleral, 3x3 mm flap was formed by tracing black reflection of choroid. The roof of Schlemm's canal was peeled during deep scleral flap excision from limbal region. Deep scleral flap was excised after reaching the Descemet membrane. At

this stage, paracentesis was made from lower temporal quadrant by using a 20 gauge microvitrectomy (MVR) knife to put the anterior chamber maintainer. Anterior chamber maintainer was closed. After removal of trabeculum tissue, peripheral iridectomy was made.

After putting the superficial scleral flap into its bed, it was sutured by a 10/0 monofilament (Alcon Surgical, Houston, TX, USA) material. Anterior chamber maintainer was opened and BSS drainage under scleral flap was observed. Bottle height was adjusted to 30 cm above the eye level in order to maintain IOP around 20 mmHg. Depending on the surgeon's choice, additional sutures were placed or suture tension was reduced according to the amount of filtration. The number of sutures varied between 2 to 5. Conjunctiva was closed by 8/0 vicryl. At the end of each operation, diffuse bleb development was observed by the action of anterior chamber maintainer in each patient.

In the statistical analysis, differences of means in paired groups were tested by Wilcoxon signed ranks. A p value  $\leq 0.05$  was accepted as significant.

## RESULTS

The mean age of patients was  $64.6 \pm 11.4$  year (range, 33-80 year), and the mean follow up period was  $22.4 \pm 16.2$  (6-55 month) month. In the preoperative period, the mean cup/disc (c/d) ratio was  $0.71 \pm 0.25$  and the mean damage of visual field based on Hodapp classification was  $2.1 \pm 0.9$ . The mean preoperative IOP of patients under antiglaucomatous medication was  $24.6 \pm 8.0$  mmHg (12-40 mmHg). Total 3 patients did not come to 6th month visit. Of these, one was taking medication starting from the end of the first month, whereas the remaining two were medication-free. Another 3 patients did not come to the 12<sup>th</sup> month visit. Of these, one started 1 medication whereas the remaining two started 2 medications at the 9 month. Nine patients completed 12 month visits. Among the final 9, six patients completed 24 month visits whereas 3 patients failed to attend the visits.

The mean postoperative IOP values at months 1, 12 and 24 was  $13.2 \pm 3.4$  mmHg,  $13.6 \pm 4.6$  mmHg, and  $13.8 \pm 2.8$  mmHg, respectively. The mean number of preoperative antiglaucomatous active substance was 3.1 whereas postoperative values were 1.8, 0.6 and 0.8 respectively (Table 1). There were significant reductions in postoperative IOP values and number of active substance ( $p < 0.05$ ).

During control visits of the patients, choroid detachment in one patient, and 10-0 suture irritation in another patient were observed. None of the patients revealed any sign of severe inflammation in anterior chamber.

**Table 1.** Preoperative and postoperative mean intraocular pressure (IOP) values and number of used active substances

	IOP (mmHg)	Number of Drug Active Substance
Preoperative	24.6± 8.03 (n = 15)	3.1
Postoperative 1 <sup>st</sup> month	13.2 ±3.4 (n = 15)	1.8
Postoperative 12 <sup>th</sup> month	14± 4.3 (n = 9)	0.6
Postoperative 24 <sup>th</sup> month	13.8± 2.8 (n = 6)	0.8

## DISCUSSION

Many modifications were described to reduce complication rate and enhance filtration rate since the first introduction of trabeculectomy. However, fundamentals of trabeculectomy were not changed during the years and it is still the gold-standard of glaucoma surgery. Non-penetrating glaucoma surgery, which was described by Krasnov in 1968, is the most popular alternative surgical method to trabeculectomy [16]. When compared to trabeculectomy, the most important advantage of non-penetrating surgery is lower complication rate [1, 5-8].

On the other hand, the most important complications include trabeculodescemet membrane rupture which may develop at high rates during deep sclerectomy and ineffective surgery.

Filtration failure problem of deep sclerectomy is solved by trabecular membrane rupture made by yttrium aluminium garnet (YAG) laser. Thus, non-penetrating surgery turns into penetrating surgery. After deep sclerotomy, 30 to 81% of the patients require YAG goniotomy [17-20].

Shiota et al reported high incomplete success rates of 94% to 88% at the end of 5th and 10th years after trabeculectomy surgery in POAG patients [21]. Cillino et al found complete and incomplete success rates 55% and 88.9%, respectively, in open-angle glaucoma patients with a 12-month follow up period [22].

Combined trabeculectomy and deep sclerectomy were first described by Feusier et al [23]. The study included juvenile, congenital and secondary glaucoma patients. Complete (IOP<21 mmHg, without medication) and incomplete (IOP<21 mmHg, with medication) full success rates in this heterogeneous group after nine years were 52.3% and 70.6%.

In our study group, complete and incomplete success rates of nine patients who completed 12 month follow up visits, were 77.7% and 100%, respectively, whereas these figure were 66.6% and 100% at month 24. The major weakness of our study is ineffective follow up visits which led to loss of 6 patients. It may be considered that patients with problems remained to attend follow up visits or some patients lost their belief for healing. The reason for success rate alterations at month 24 was drop of 3 patients who were not on medication.

Determining the filtration resistance by adjusting suture tension and number under a anterior chamber maintainer might increase our surgical success rates. The aim of this technique is to create a potential space by deep sclerectomy and to obtain perioperative control of filtration rate and suture tension by anterior chamber maintainer. In addition, use of maintainer increases surgical success via removing inflammatory mediators and hemorrhage at the last stage of surgery. In order to prevent corneal endothelial cell damage due to turbulence, anterior chamber protector was used at the last stage of surgery and none of the patients developed postoperative corneal edema.

Bayoumi reported 20% disc edema due to hypotonia with surgery in which deep sclerectomy, mitomycin C + trabeculectomy were combined in pediatric glaucoma patients [24]. Munteanu et al. reported decompression retinopathy as a complication in a patient who underwent deep sclerectomy combined with trabeculectomy [25]. In our study, no complication was observed in any of the patients during surgery, but during postoperative period, one patient had choroid detachment and another patient had suture irritation.

In conclusion, adjusting scleral flap suture tension during surgery under the anterior chamber maintainer is a new and rarely used concept. This may be an alternative for adjusting postoperative filtration rate. One limitation of this study was weak follow up monitorization. Therefore, only available data were evaluated and presented. For a detailed comparison, prospective randomized studies with

larger patient groups and equal follow up periods should be performed.

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