

Comparison of the Effect of Trabeculectomy in Controlling Intraocular Pressure in Pseudo-Exfoliation and Primary Open Angle Glaucoma Patients

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Authors' contributions

This work was carried out in collaboration between both authors. Author SK designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author HHE managed the analyses of the study. Author SK managed the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

Objective: The aim of this study is to compare the efficacy of the trabeculectomy in controlling intraocular pressure in patients with primary open-angle and pseudo-exfoliation glaucoma.

Materials and Methods: The medical data of a sum of 69 eyes of which 36 (52,2%) with primary open angle glaucoma (POAG) and 33 (47,8%) with pseudo-exfoliation (PEG), who have medically uncontrolled glaucoma and had undergone primary trabeculectomy in Göztepe Education and Research Hospital were evaluated in this retrospective study. Postoperatively, data at the first day, at the first month, and at the last examination evaluated in the study. Success of the surgery is defined as measurement of intraocular pressure under 21 mmHg with (incomplete success) or without (complete success) additional medications following the end of the first year follow-up examinations.

Results: POAG group consists of 36 patients of which 16 male, 20 female and PEG group consists

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of 33 patients of which 21 male and 12 female. The mean age was 67.2 ± 9.1 (42-80) years in POAG group and 70.7 ± 6.6 (55-80) years in PEG group. There was no statistically significant difference between POAG and PEG groups in visual acuity, mean intraocular pressure, c/d ratio and the number of antiglaucomatous medications preoperatively and postoperatively ($p > 0.05$). There was a statistically significant difference in groups between post and preoperative values in visual acuity, mean intraocular pressure, c/d ratio and the number of antiglaucomatous medications ($p < 0.05$). Success of the trabeculectomy was 41,7% (complete success), 41,7% (incomplete success) and remaining 16,6% was unsuccessful, in POAG group and success rate in PEG group was 51.5%, 27,3% and 21,2% respectively. There was no statistically significant difference between groups ($p = 0.738$).

Conclusion: Trabeculectomy is an effective surgery in lowering intraocular pressure in both of the study groups equally.

Keywords: Primary open angle glaucoma; pseudo-exfoliation glaucoma; trabeculectomy.

1. INTRODUCTION

Glaucoma is a progressive optic neuropathy in which retinal ganglion cell (RGC) loss and visual loss chronically continues with aging [1]. To lower intraocular pressure is the only approved way to slow down or stop the RGC loss [2]. The clinical management of the glaucoma always starts with medical treatment and if it fails to stop the RGC loss, treatment could be switched to surgical or laser treatment. Though, it is mostly preferred the tube, shunt or non-filtrating surgeries for surgical management of glaucoma throughout the last two decades, trabeculectomy continues to be the gold standard for glaucoma surgeons [3]. The aim of this retrospective study is to evaluate and compare effectiveness of trabeculectomy in lowering intraocular pressure in POAG and PEG patients.

2. MATERIALS AND METHODS

This study includes 69 eyes, of which 36 (%52,2) is POAG and 33 (%47,8) is PEG, all had primary fornix-based trabeculectomy. Data were evaluated for the age, gender, follow-up time before and after the surgery (minimum one year), systemic illnesses, visual acuities and visual field loss before the surgery (grades between 5-7 according to Quigley's classification [4], number of the postoperative antiglaucomatous medications, intraocular pressure, cataracts grade, trabeculectomy related complications, surgical failure. Postoperative data at the first day, at first month, and at the last examination evaluated in this study. Exclusion criteria were as follows previous intraocular surgeries, uveitis, ocular trauma, surgery with antimetabolite, postoperative follow-up time shorter than one year. Cataracts is graded as follows: grade 0, clear lens, grade 1; optic disc visible with blurring, grade 2; fundus is nearly invisible, grade 3;

invisible retina with 90 diopter lens. If the cataract surgery is indicated, never performed before the end of the 3rd month following trabeculectomy. Postoperative "success criteria" was as follows: a) Complete success; mean intraocular pressure under 21 mmHg without any additional antiglaucomatous medication, b) Incomplete success; mean intraocular pressure under 21 mmHg with additional antiglaucomatous medication during the postoperative period. This study is approved by Ethical Committee of Goztepe Education and Research Hospital.

2.1 Surgical Technique

Following periorbital anesthesia, and a fornix-based conjunctival flap was created. A 2/3 thickness lamellar triangular shaped scleral flap with dimensions approximately 4x4 mm was created. Afterthen, a paracentesis was performed, and an anterior ostium was performed with a Descemet's membrane punch, followed by peripheral iridectomy. Interrupted 10-0 nylon sutures were used if required to approximate the edges of the sclera flap. Then, IOP titration technique was used to maintain a stable anterior chamber with adequate aqueous outflow and desired IOP. The conjunctiva and Tenon's capsule were closed with 8.0 vicryl suture at either end of the peritomy augmented with central mattress sutures as needed to ensure watertight closure. Subconjunctival antibiotics and steroids were given at the end of the procedure. Patient had antibiotics, corticosteroids and cycloplegics for six weeks postoperatively.

2.2 Statistical Analysis

Data computerized with SPSS (Statistical Package for Social Sciences) for Windows 22.0 (SPSS Inc, Chicago, IL)". Descriptive statistics

presented as mean ±SD (minimum-maximum), frequency and percentage. Uni-variate comparisons between treatment groups were performed using the 2-sided Student t test for continuous variables and Fisher exact test, or test ki-square test for categorical variables (p<0,05). Treatment success comparisons were assessed with the stratified Kaplan-Meier survival analysis log-rank test.

3. RESULTS

POAG group consists of 36 patients of which are 16 male, 20 female and PEG group consists of 33 patients of which are 21 male and 12 female. The mean age was 67.2±9.1 (42-80) years in POAG group and 70.7±6.6 (55-80) in PEG group. There was no statistically significant difference between POAG and PEG groups in visual acuity, mean intraocular pressure, cup-to-disc ratio and anti-glaucomatous medications pre

and postoperatively (p>0.05). There was a statistically significant difference in groups between post and preoperative values in visual acuity, mean intraocular pressure, c/d ratio and antiglaucomatous medications (p<0.05) Success of the trabeculectomy surgery was 41,7% (complete success), 41,7% (incomplete success) and remaining 16,6% was unsuccessful, in POAG group and success rate in PEG group was 51.5%, 27,3% and 21,2, respectively. There was no statistically significant difference between groups (p=0.738). There was a statistically significant increase grading in cataracts with the strongest effect in PEG group (p≤0,001).

There was no statistically significant difference between groups in terms of surgical success (p=0.738) The success rate of the trabeculectomy is calculated by Kaplan Meier Survival Analysis. According to this test; success rate for 5 and 3 years, respectively were 19,3%

Table 1. Shows descriptive statistics of study groups

	POAG (n=36)	PEG (n=33)	p
Age (year), mean±SD (min-max)	67.2±9.1 (42-80)	70.7±6.6 (55-80)	0.117 [†]
Gender, n (%)			
Male	16 (44.4)	21 (63.6)	0.110 ^{**}
Female	20 (55.6)	12 (36.4)	
Age at the operation (year), mean±SD (min-max)	62.0±9.2 (39-78)	65.4±6.5 (49-74)	0.098 [†]
Diabetes mellitus, n (%)	5 (13.9)	2 (6.1)	0.431 ^{***}
Hypertension, n (%)	7 (19.4)	10 (30.3)	0.296 ^{**}
Follow-up time (months), mean±SD (min-max)	14.6±14.4 (2-50)	7.8±9.7 (1-36)	0.015 [†]
Postoperative follow-up time (month), mean±SD (min-max)	37.8±18.9 (14-89)	45.1±17.6 (15-72)	0.052 [†]

n: Number; %: Percent; SD: Standard deviation,; POAG: Primary open angle glaucoma; PEG: Pseudo-exfoliation glaucoma. [†]Mann-Whitney U Test; ^{**}Ki-square test; ^{***}Fisher's exact test Follow-up time until the operation was significantly longer in POAG group (p=0.015), but follow-up time postoperatively was equal in both (p=0.051) Distribution of age, gender, DM, HT, age at the operation was statistically equal in both of the groups (p>0.05)

Table 2. Distribution of complications in study groups

Complication percent	POAG (n=36)	PEG (n=33)	p
	n (%)	n (%)	
Total number of complications (n=15)			
Retrabeculectomy	0	1	
Vascularized bleb	1	1	
Abscence of bleb	1 [^]	0	
Hypotonia	2	2	
Choroid detachment	3	3	
Macula edema	0	1	

n: number of eyes ^{*}Ki-square test, [^]; bleb reformed with massage Distribution of complication occurrence was statistically equal in both groups (p=0.629). There were complications in seven eyes (19,4%) of POAG group, and eight eyes (24,2%) of PEG group

Table 3. Shows groups compared in terms of intraocular pressure, cup-to-disc ratio, the number of antiglaucomatous medication, for both pre and postoperative period

		Preoperative mean±SD (min- max)	Postoperative mean±SD (min- max)	p**
Visual acuity LogMAR)	POAG (n=36)	0.33±0.65 (0-3.0)	0.79±1.08 (0-3.0)	<0.001
	PEG (n=33)	0.26±0.52 (0-3.0)	0.49±0.75 (0-3.0)	0.036
	p*	0.801	0.384	
Intraocular pressure (mmHg)	POAG (n=36)	29.1±8.7 (16-55)	15.3±4.3 (8-28)	<0.001
	PEG (n=33)	30.4±10.0 (14-60)	15.2±5.6 (6-28)	<0.001
	p*	0.652	0.604	
Cup-to-disc ratio	POAG (n=36)	0.76±0.21 (0.2-1.0)	0.82±0.21 (0.2-1.0)	0.001
	PEG (n=33)	0.71±0.27 (0.1-1.0)	0.76±0.27 (0.2-1.0)	0.001
	p*	0.491	0.360	
Number of medications	POAG (n=36)	2.61±0.49 (2-3)	1.06±1.09 (0-3)	<0.001
	PEG (n=33)	2.64±0.49 (2-3)	0.85±1.00 (0-3)	<0.001
	p*	0.830	0.423	

When compared to preoperative measurements, the visual acuity, cup-to-disc ratio increased but, intraocular pressure and the number of antiglaucoma medication decreased statistically significant in the postoperative period, for both of POAG and PEG groups (p<0.05)

and 57,5%, in POAG group. The success rate for 5 and 3 years, respectively were 31,7% and 69,1%, in PEG group. There was statistically significant difference between groups (p=0.286; Log-Rank test).

4. DISCUSSION

The glaucoma is a heterogenic group of disease which presents cupping of the optic disc head and progressive visual field loss and is also the most frequent cause of irreversible blindness in the world [5]. Randomized clinical studies show that decreasing the intraocular pressure to 18% of the starting point will slow 40% down the progression of the disease in 5 year follow-up period [2]. In the last 25 years, it is developed new antiglaucoma medications, surgical

procedures and laser treatment options to decrease intraocular pressure into an optimal level [6]. There are different filtration mechanisms in which the glaucoma surgeries work that aqueous is drained under the conjunctiva in trabeculectomy, directly to the trabecular system in viscocanalostomy and to the suprachoroidal space in the choroid related glaucoma surgeries. From the first day of the presentation of these surgeries that aim to increase trabecular filtration were taken attention by glaucoma surgeons [6]. Trabeculectomy continues still to become the first and most effective type of surgery, though it has associated serious complications such as bleb-related endophthalmitis, unpredictable wound healing exist throughout the lifespan of the patients [7,8].

Table 4. Shows comparison of POAG and PEG groups in terms of intraocular pressure, cup-to-disc ratio, the number of antiglaucoma medication

Pre and postoperative difference	POAG (n=36) mean±SD (min-max)	PEG (n=33) mean±SD (min-max)	p*
Visual acuity (LogMAR)	0.46±0.86 (-0.18;3.00)	0.23±0.61 (-0.40;3.00)	0.167
Intraocular pressure (mmHg)	13.8±9.8 (-1;42)	15.2±11.4 (-10;40)	0.493
Cup-to-disc ratio	0.05±0.09 (0-0.5)	0.04±0.07 (0-0.2)	0.915
Number medication	1.6±1.0 (-1;3)	1.8±1.0 (0-3)	0.399

As POAG and PEG groups compared in terms of intraocular pressure, cup-to-disc ratio, the number of antiglaucoma medication, there was no statistically significant difference between groups for both pre and postoperative period (p>0.05)

Table 5. Shows distribution of complete and incomplete success rate in groups

	PAAG (n=36) n (%)	PEG (n=33) n (%)	p*
Complete success	15 (41.7)	17 (51.5)	0.455
Incomplete success	15 (41.7)	9 (27.3)	
Unsuccessful	6 (16.6)	7 (21.2)	

*Ki-square test

Caprioli et al. [9], reported that trabeculectomy has a visual function protecting effect resulting from reversal of the RGC functions in long-term, which is supported by electrophysiological studies. The success criteria following trabeculectomy are in a wide range in studies such as progression in visual field, loss in visual acuity or combination or both [10]. Parish et al. [11], reported recovering effect of the RGC functions of the trabeculectomy in a study which is designed to compare the effect of medical and surgical treatment on the progression of the cup to disc ratio. There was no progression of the cup-to-disc ratio in 87% of the patients intrabeculectomy group in aforementioned study [11]. However in our study, comparison of the cup-to this ratio showed that there was a statistically significant progress in both groups though trabeculectomy surgery performed, which supports continuing loss of RGC in early postoperative period though a successful surgery

Popovic et al. [12] reported that PEG patients were older and has clinically a more aggressive progress as compared to those with POAG before trabeculectomy surgery. In our study data also showed that PEG patients had been trabeculectomy performed earlier than POAG patients had.

Akyol et al. [13], reported in their study that overall success of the trabeculectomy, with or without additional medication in POAG patients, was 97% at the end of the postoperative third month. The overall success rate of the trabeculectomy in our study groups were 83,4% and 78,8%, in POAG and PEG groups, respectively with no statistically significant difference. However, in our study, follow-up time of the patients after the surgery was at least one year but, there was a wide time range between cases in aspect of total postoperative follow-up time.

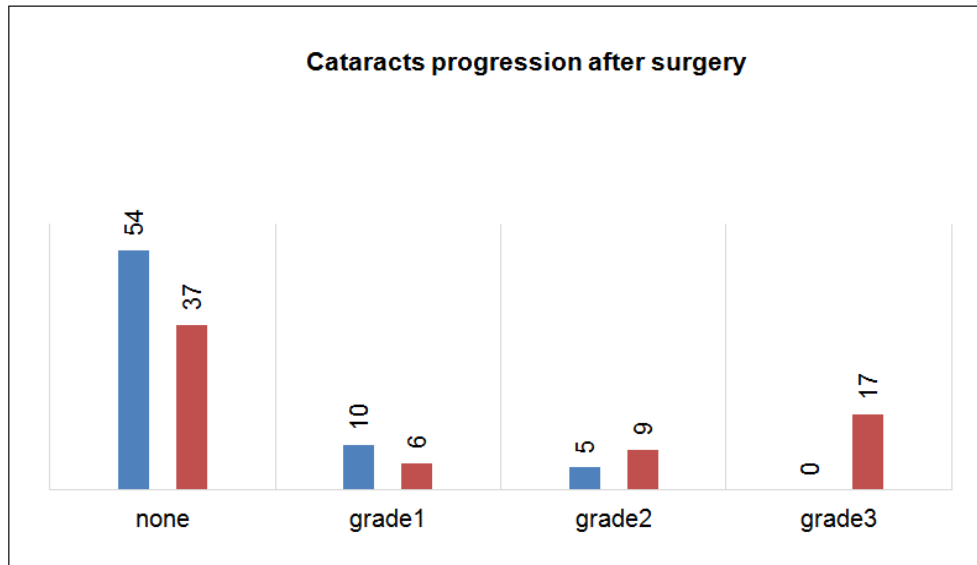


Fig. 1. Shows cataracts progression after trabeculectomy at the last examination in postoperative period
Cataracts grading increased statistically significantly in PEG group in the postoperative period ((p<0,001)

Gedde et al. compared success rate of trabeculectomy with Mitomycin C and Baerveldt tube in a study. At the first year results of this study, success rate was equal in both types of the surgery, but trabeculectomized patients need less topical antiglaucomatous medication. However, at the end of the fifth year, tube implantation was more successful compared to trabeculectomy group in aforementioned study [14,15]. These studies showed that long term complications of the trabeculectomy increase by the postoperative third year. Though mean follow-up time of our study is almost three years, not for all cases. Cataracts progression is one of the trabeculectomy related complications. In daily practice, combined cataracts and glaucoma surgeries are given up by the most of surgeons because of the increase of the bleb fibrosis effect of this combination [8,16].

Limitations of our study are as follows; firstly, there is a wide range between follow-up times of the patients. Secondly, the most of the patients in the study groups have medically uncontrollable intraocular pressure, progressive visual loss or unable to use topical medications to lower intraocular pressure so referred to our clinic. These should be taken into account when comparing our results to the data of the general population.

5. CONCLUSION

As a conclusion, the overall success rate of the trabeculectomy to control intraocular pressure and surgery related complications in both POAG and PEG groups were statistically equal.

CONSENT

It is not approval.

ETHICAL APPROVAL

This study is approved by Ethical Committee of Goztepe Education and Research Hospital.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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