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Post-trabeculectomy choroidal detachment: Not an adverse prognostic sign for either visual acuity or surgical success

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PURPOSE. *To report the incidence of choroidal detachment (CD) following trabeculectomy and to evaluate its effect on long-term surgical success and best-corrected visual acuity (BCVA).*

METHODS. *A total of 253 eyes of 198 subjects who underwent trabeculectomy between 1993 and 2003 with at least 1 year follow-up were reviewed retrospectively. Twenty-eight eyes of 28 subjects which developed CD postoperatively were classified as Group 1 and the remaining 225 eyes of 170 subjects as Group 2. The risk factors for the development of CD and the influence of CD on BCVA and on the success of trabeculectomy were analyzed and compared between the two groups.*

RESULTS. *In Group 1, preoperative BCVA was significantly lower and cup to disc ratio and the frequency of pseudoexfoliative glaucoma were higher with respect to the control group (p=0.009, p=0.01, p=0.02). The correlations between the development of CD and postoperative findings such as shallowing of the anterior chamber, hypotony, hypotonic maculopathy, hyphema, and fibrin reaction in the anterior chamber were statistically significant. CD was not associated with a significant reduction of BCVA. Intraocular pressures at postoperative first day, sixth month, and first year were lower in Group 1. The success of trabeculectomy and the average number of medications used were not significantly different between the two groups.*

CONCLUSIONS. *CD following trabeculectomy occurred in 11% of our patients. CD was not associated with either a significant drop in BCVA or an adverse influence on long-term IOP control. (Eur J Ophthalmol 2008; 18: 771-7)*

KEY WORDS. *Choroidal detachment, Intraocular pressure control, Trabeculectomy, Visual acuity*

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INTRODUCTION

Choroidal detachment (CD) is one of the most frequent early complications of glaucoma surgery. Its incidence is between 5% and 44% (1, 2). CD is thought to be the result of protein-rich fluid leakage from the choroidal capillaries and its accumulation in the suprachoroidal space (3, 4). Hypotony and uveal inflammation are supposed to be important factors in the etiology of CD (1, 5, 6). As the fluid accumulates in the suprachoroidal space, uveoscleral outflow increases, and aqueous humor secretion decreases, hypotony and shallowing of the anterior chamber ensue (5-7). In most cases the clinical picture resolves with or without treatment. However, complications such as corneal decompensation, cataract, peripheral anterior synechia, and bleb failure have been reported as sequel (1).

The aim of this study is to investigate whether CD is associated with a significant and permanent reduction in BC-

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VA and has any adverse effect on intraocular pressure (IOP) control in the long term. We designed a retrospective controlled study in which all consecutive cases that underwent trabeculectomy within a fixed time period and had sufficient follow-up were included and analyzed in two groups (those with CD and those without). Baseline patient characteristics and possible factors predictive of CD development were also analyzed.

MATERIALS AND METHODS

Patient demographics and baseline characteristics

The study population was planned to include all of the consecutive eyes which underwent primary trabeculectomy between April 1993 and September 2003 in the glaucoma department of Beyoglu Eye Training and Research Hospital. A total of 391 eyes were found to have primary trabeculectomy during that time period. Eyes with primary open angle glaucoma, pseudoexfoliation glaucoma (PXFG), and primary angle closure glaucoma were included. All types of secondary glaucomas, congenital/infantile glaucoma, and neovascular glaucoma were excluded. Eyes with previous Nd:YAG laser and/or cataract surgery (phacoemulsification) were included. Patients' data were evaluated retrospectively and those with less than 1 year follow-up were also excluded. In conclusion, 253 eyes of 198 patients were finally included in the study. Those eyes which had CD were classified as the study group and the remaining eyes were considered as the control group.
Baseline characteristics which were compared within two groups were as follows: age, gender, systemic diseases such as hypertension (HT) and diabetes mellitus (DM), preoperative (LogMAR) best-corrected visual acuity (BCVA), axial length (AL), spherical equivalent refraction (SE), previous history of ocular surgery, glaucoma type, angle width, cup to disc ratio, preoperative IOP without medication (at presentation), mean and maximum IOP with medication during follow-up, the last IOP reading before surgery, and number and total duration of glaucoma medications used preoperatively (Tab. I).

Surgical technique

Limbus-based conjunctival flaps were used in all eyes. A rectangular scleral flap was prepared. Intraoperative mitomycin C was used in all pseudophakic eyes. There was no statistically significant difference between the two groups with regard to mitomycin C application (p=0.69); it was used for 1 eye (3.6%) in Group 1 and 12 eyes (5.3%) in Group 2. A 0.2 mg/mL concentration was used; two to three small pieces of sponges were placed under the conjunctiva-Tenon flap for 3 minutes and washed by using 50 cc of BSS. Anterior chamber paracentesis was performed in all cases. Then a 1 × 3 mm internal block was excised and peripheral iridectomy was done. Scleral flap was initially closed with two 10/0 nylon sutures at the corners, and then amount of fluid leakage was checked by irrigation through the paracentesis. Additional sutures were placed if necessary. The knots of nylon sutures were rotated and buried in the sclera in order to avoid suture erosion through the conjunctiva. Conjunctiva-Tenon incision was closed with a running, 8-0 silk suture and subconjunctival gentamicin-dexamethasone injection was given at the inferior quadrant.

Postoperative care and follow-up

All glaucoma medications were discontinued following surgery. Topical antibiotics (usually ciprofloxacin) and steroids (usually prednisolone) were given 5 times daily for the first week, slowly tapered, and stopped 6 weeks after the operation. Cycloplegic eye drops were not given routinely; they only were prescribed in cases of anterior shallowing, profound inflammation, hyphema, and/or CD. Postoperative examinations were scheduled at postoperative first day, first week, first month, third month, sixth month, first year, and second year. Visual acuity testing was performed by using Snellen chart and IOP was measured by Goldmann applanation tonometer in each case.

Outcome parameters and data analysis

The study has a retrospective case-control design. In addition to the comparison of baseline characteristics above, preoperative and postoperative complications were investigated by using patient records and compared within two groups. Shallow anterior chamber, hyphema, hypotony, hypotonic maculopathy, fibrin reaction, a positive Seidel test, and CD were recorded. Hypotony was defined as IOP lower than 5 mmHg. The diagnosis of CD was made by fundus examination using a +90 diopter lens and pictures were taken with a fundus camera. B scan ultrasonography was performed in suspicious cases

or for eyes in which fundus examination was not possible due to opaque media. The onset and duration of the CD were also recorded.

Two outcome parameters were used in the study: the change in BCVA and surgical success. The BCVA, which was assessed by using Snellen charts, was converted into LogMAR equivalents for analysis. The intra- (preoperative and postoperative) and intergroup (between two groups) comparisons were performed throughout the follow-up. The course of IOP and number of glaucoma medications were also compared. Surgical success was defined as complete if IOP was less than 18 mm Hg without medications, partial if the same IOP reduction could be obtained with medications, and failure if IOP was 18 mm Hg or higher despite using medications.

t-Test, chi-square test, Mann-Whitney *U* test, and multiple regression analysis were used for statistical analysis.

RESULTS

Choroidal detachment following trabeculectomy developed in 28 eyes of 28 patients; they were classified as Group 1. A total of 225 eyes of 170 patients without CD were classified as Group 2 (control group). In Group 1, one eye had prior cataract extraction and one eye Nd:YAG laser iridotomy. In Group 2, 12 eyes had prior cataract extraction and 16 eyes Nd:YAG laser iridotomy.

The median time of onset of CD was 5.5 days (range 1–390 days). It developed within the first 2 weeks in 21 cases (75%) and it occurred after 6 months only in 3 eyes. The average duration of CD was 1.7±2.5 months (range 10 days–9 months); 84% of them resolved within 2 months. In 3 eyes, CD lasted for at least 6 months and it recurred in one of them. There was no choroidal hemorrhage in our patients; all of the choroidal detachments were serous. All eyes responded to medical therapy and suprachoroidal drainage was not performed in any of the cases. In one eye with cornea-lenticular touch, anterior chamber was reformed by using saline solution.

Predictors of CD

Three baseline characteristics were found to be different among two groups in the binary logistic regression analysis (Tab. I). Preoperative BCVA was statistically lower (p=0.009), cup to disc ratio was higher (p=0.010), and PXFG was more common (p=0.020) in the first group

TABLE I - BASELINE CHARACTERISTICS

	Group 1 (n=28)	Group 2 (n=225)	p value
Gender, M/F	17/11	117/108	0.42
Age, yrs	68.1±7.3	65.3±11.7	0.22
Hypertension	9 (32)	68 (30)	1.0
Diabetes mellitus	3 (10.7)	35 (15.5)	0.58
BCVA (Snellen)	0.35±0.34	0.50±0.37	0.009*
BCVA (logMAR)	1.11±1.18	0.62±0.81	
Axial length (mm)	23.1±0.9	23.3±1.4	0.60
Spherical equivalent	–0.8±2.4	–0.6±3.3	0.73
Cup to disc ratio	0.8±0.1	0.7±0.2	0.01*
Angle width (grade)	2.8±1.0	2.7±1.0	0.76
Primary open angle glaucoma	7 (25)	97 (43)	0.07
Pseudoexfoliation glaucoma	17 (61)	84 (37.5)	0.02*
Angle closure glaucoma	4 (14)	44 (19.5)	0.61
IOP without medication (mmHg)	35.9±11.3	32.5±12.8	0.28
Mean IOP with medication (mmHg)	19.80±6.4	20.3±7.1	0.73
Maximum IOP with medication (mmHg)	24.2±7.7	24.5±8.9	0.83
Final IOP (mmHg)	21.2±7.0	20.7±7.6	0.73
No. of preoperative medications	2.1±0.6	2.0±0.9	0.76
Duration of the medication (mo)	27.0±28.7	25.0±25.5	0.84

Values are mean ± SD or n (%).
*Statistically significant.
IOP = Intraocular pressure

(those group of eyes which had CD). Patient age, gender, systemic diseases such as HT and DM, AL, SE, any previous ocular surgery, angle width, preoperative IOP without medication (at presentation), mean and maximum IOP with medication during follow-up, the last IOP reading before surgery, and number and total duration of glaucoma medications were not found to be associated with increased risk of CD in binary logistic regression (Tab. I).

Relationship with other postoperative complications

Anterior chamber shallowing was observed in 21 eyes (75%) in Group 1 and in 54 eyes (24%) in Group 2 ($p<0.001$). Hyphema was present in 11 eyes (39.3%) in Group 1 and in 38 eyes (16.9%) in Group 2 ($p=0.009$). Hypotony was observed in 23 eyes (82.1%) in Group 1 and in 90 eyes (40%) in Group 2 ($p<0.001$) and hypotonic maculopathy was observed in 5 eyes (17.8%) in Group 1 and in 3 eyes (1.3%) in Group 2 ($p=0.001$). In Group 1, 2 eyes had positive Seidel test (leakage from the incision line) which required additional suture placement. In Group 2, 6 eyes had positive Seidel test but only one of them needed additional sutures ($p=0.21$). Ten eyes (35.7%) in Group 1 and 34 eyes (15.1%) in Group 2 had fibrin exudation in the anterior chamber ($p=0.01$). There was no significant difference between the amount of IOP decrease on the first postoperative day and the development of CD ($p=0.12$). Early cataract formation was found in three eyes; only one of them belonged to Group 1, while two cases were in Group 2.

Change in BCVA

As mentioned above, BCVA in Group 2 was statistically better than that in Group 1 and intergroup differences remained statistically significant during the entire follow-up; i.e., BCVA was better at all time points (including preoperative visits) in eyes that did not develop post-trabeculectomy CD.
Intragroup analysis revealed that a statistically significant drop in BCVA occurred at the first postoperative week visit in both groups ($p<0.01$). When compared with the baseline, a statistically significant improvement was found in Group 2 at first year and second year visits ($p<0.05$, Fig. 1), while there was no similar change found in Group 1. Eight eyes (28.5%) in Group 1 and 46 eyes (20.4%) in Group 2 underwent cataract extraction throughout the follow-up period ($p=0.25$).

TABLE II - SURGICAL SUCCESS IN TWO GROUPS

Time	Success	Group 1 (%)	Group 2 (%)	p value
6th month	Complete	77. 3	87.5	0.30
	Partial	13.6	9.2	
	Failure	9.1	3.3	
1st year	Complete	72	74	0.98
	Partial	20	18.9	
	Failure	8	7.1	
2nd year	Complete	38.9	50.4	0.65
	Partial	44.4	37.2	
	Failure	16.7	12.4	

TABLE III - AVERAGE NUMBER OF GLAUCOMA MEDICATIONS

Average no. of medications	Group 1	Group 2	p value
6th month	0.33±0.76	0.16±0.53	0.17
1st year	0.42±0.80	0.37±0.77	0.75
2nd year	1.16±1.3	0.68±0.82	0.03*

Values are mean ± SD.
*Statistically significant

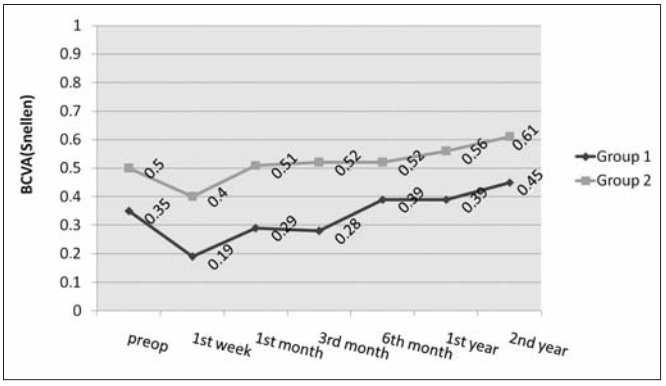

Fig. 1 - *Course of best-corrected visual acuity throughout the follow-up.*

IOP and surgical success

In both groups, IOP remained statistically lower than preoperative level during the entire follow-up ($p<0.05$, Fig. 2). There were some intergroup differences; mean IOP in Group 1 was statistically lower than that in Group 2 at the first postoperative day, sixth month, and first year visits ($p=0.015$, $p=0.026$, and $p=0.005$, respectively).

There was no difference with regard to the surgical success rates between the two groups (Tab. II).

There was no significant difference in the average number of glaucoma medications between the two groups at postoperative sixth month and first year visits, but a higher proportion of eyes were using glaucoma medications at the postoperative second year visit in Group 1 (Tab. III). The average time interval between trabeculectomy and initiation of glaucoma medications were 13.1±11.5 months in Group 1 and 18.1±12.25 months in Group 2 ($p=0.18$).

Repeat trabeculectomy was performed in 1 eye (3.6%) in Group 1 and 8 eyes (3.5%) in Group 2 throughout the follow-up ($p<0.05$).

DISCUSSION

Choroidal detachment is a frequently reported early complication of trabeculectomy. Its incidence has been reported as 5 to 44% (1, 2). In those earlier works, post-trabeculectomy CD has been shown to be associated with some other complications such as anterior chamber shallowing, blood in anterior chamber, marked inflammation, very low IOP, early cataract formation, and closure of the filter (1, 8, 9). On the other hand, CD usually resolves with steroid/cycloplegic therapy. In this retrospective case-control study, we planned to investigate whether development of post-trabeculectomy CD has indeed any long-term adverse effect on either visual acuity or bleb function.

The relationship between patient-related factors and development of post-trabeculectomy CD has been investigated in some studies: Berke et al reported that chronic and recurrent CD had significant correlations with age, HT, atherosclerotic heart disease, hyperopia, aqueous suppressant therapy, ocular inflammation, and full-thickness glaucoma surgery (3). In the Collaborative Initial Glaucoma Treatment Study (CIGTS), age was found to be

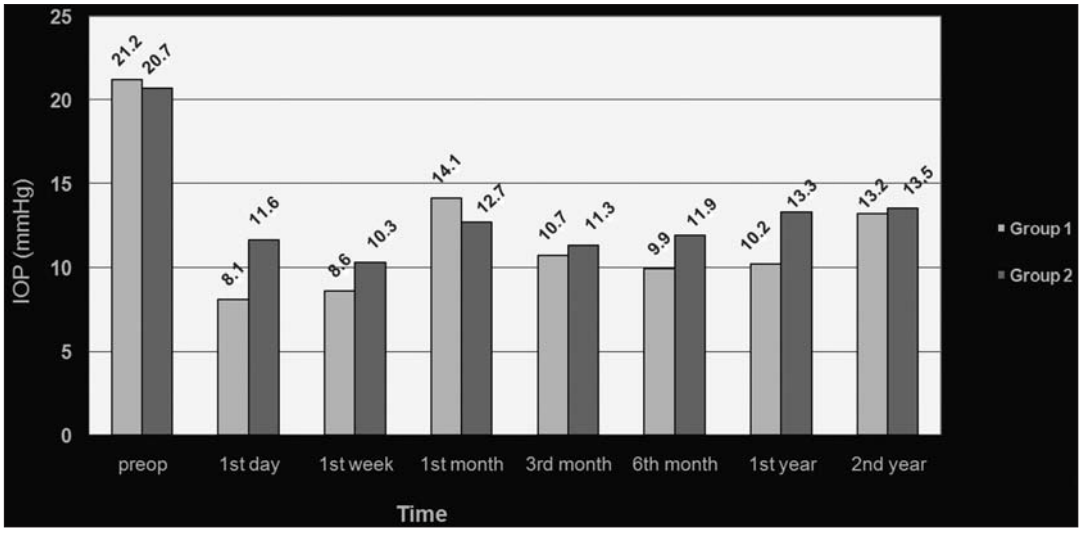

Fig. 2 - *Course of intraocular pressure.*

a related factor in the development of CD (10).

In our study, the incidence of CD was found to be 11%. We did not find any significant correlation between CD development and baseline factors such as age, gender, HT, DM, preoperative IOP, angle width, AL, SE, the duration of preoperative medication, the number of medications, and use of intraoperative mitomycin C.

However, we did find that three baseline factors were associated with a statistically higher incidence of post-trabeculectomy CD. Baseline C/D ratio was greater and BCVA was lower in those eyes which developed CD. We also found that CD was more common in eyes with PXFG. Those three factors pointed out a possible association between the development of post-trabeculectomy CD and the advanced stage of glaucomatous damage. Additional work is necessary on the subject. It has been demonstrated that extensive blood–aqueous barrier breakdown in eyes with PXFG following trabeculectomy is an important risk factor for complications (11, 12). As inflammation is one of the key factors in the pathogenesis of CD, it is not surprising to encounter this complication more frequently in eyes with PXFG.

We found significant correlations between the development of CD and shallow anterior chamber, hypotony, hypotonic maculopathy, hyphema, and fibrin reaction in the anterior chamber. Hypotony has been commonly associated with post-trabeculectomy CD in the literature (13). According to Brubaker and Pederson, the surgical trauma of trabeculectomy and intraoperative hypotony induce the uveal inflammation and the fluid content of the choroidal stroma increases which results in CD and decreased aqueous formation (8). Despite this, Popovic observed hypotony in 50% of the eyes within a week after the operation and CD developed in 23% of these eyes (14).

It is well known that trabeculectomy usually leads to a transient reduction of BCVA in most cases (1, 15). A similar trend was observed in our patients; BCVA decreased significantly in the first postoperative week in both groups but recovered within 1 or 2 months (Fig. 1). We found that the amount of BCVA reduction was somewhat greater and visual recovery was slower in eyes with CD as compared with the controls. In eyes with CD it took almost 6 months for the full recovery of BCVA while it was completed within 1 month in the control group. It is apparent that development of post-trabeculectomy CD does not lead to a permanent influence on BCVA. In Group 2, BCVA improved significantly in the postoperative first and second years' visits, which may be due to cataract extraction.

There is no consensus on the influence of CD on long-term IOP control. Migdal and Hitchings reported that eyes that developed hypotony and CD would have higher final IOP than uncomplicated eyes (9). Several studies reported that CD may cause subsequent bleb dysfunction (13, 16). However, Stewart and Crinkely did not find any correlation between CD and the control of IOP in the first postoperative year (17). Popovic found no difference between the eyes with and without CD according to final IOP control, whereas he detected an increase in the number of the antiglaucoma medications and a shorter interval between trabeculectomy and reinstitution of medical therapy in eyes with CD (1). Fourman obtained adequate final IOP control in 7 of 8 eyes with CD, whereas Berke et al obtained adequate control in 13 of 14 eyes with CD (3, 18). Martinez and coworkers did not observe any drop in BCVA and no additional antiglaucomatous medications use in eyes with CD (2).

According to our study, IOP in the sixth month and first year was significantly lower in Group 1 whereas there was no difference between the groups in the second year. When the success was defined as IOP equal to or lower than 18 mmHg, there was no statistically significant difference between the two groups regarding the success rate in the sixth month, first year, and second year. When the number of antiglaucoma medications was compared, there was no intergroup difference in the sixth month and first year, whereas a higher amount of medications was used in eyes with CD in the second year. Also, it was found that antiglaucoma medications were initiated sooner in Group 1. We believe it is mostly due to the selection of a lower target IOP for those eyes as they had already experienced advanced glaucomatous damage.

In summary, we found that post-trabeculectomy CD was a relatively benign complication with proper treatment. In our series, it had no adverse effect on the long-term BCVA and it did not appear to decrease long-term success of trabeculectomy. Prospective studies will be helpful to confirm our observations and conclusions.

None of the authors has a financial or proprietary interest in any material or method mentioned.

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