ECRONICON OPEN ACCESS

EC OPHTHALMOLOGY
Research Article

Comparison of the Hypotensive Effect of Endotrabeculectomy and Deep Scleroectomy Combined with Endotrabeculectomy

Olha Levytska[1]* and Ihor Novytsky[2]

[1]Postgraduate at the Ophthalmology Department FPGE in Danylo Halytsky Lviv National Medical University, Lviv, Ukraine; Ophthalmologist at MMC "Eye Microsurgery" KNP 8th City Clinical Hospital in Lviv

[2]Doctor of Medicine, Professor at the Ophthalmology Department FPGE in Danylo Halytsky Lviv National Medical University, Lviv, Ukraine; Ophthalmic Surgeon; Chief of the Ophthalmological Clinic "Oculus" Lviv

***Corresponding Author:** Olha Levytska, Postgraduate at the Ophthalmology Department FPGE in Danylo Halytsky Lviv National Medical University, Lviv, Ukraine; Ophthalmologist at MMC "Eye Microsurgery" KNP 8th City Clinical Hospital in Lviv.

Received: December 09, 2021; **Published:** January 27, 2022

Abstract

The hypotensive effect of endotrabeculectomy as a stand-alone glaucoma operation and deep sclerectomy in combination with endotrabeculectomy in patients with primary open-angle glaucoma was compared. We observed 35 patients (35 eyes) with primary open-angle glaucoma. In the first group (23 patients, 23 eyes) endotrabeculectomy as stand-alone operation was performed, in the second group (12 patients, 12 eyes) deep sclerectomy in combination with endotrabeculectomy was performed. When comparing the intraocular pressure, it was found that the difference between preoperative and postoperative intraocular pressure was significant lower up to 9 months in both groups ($p < 0.05$), but the hypotensive effect in the second group was slightly more expressed - 6.7 and 7.83 mm Hg in accordance. The number of glaucoma medications in the first group decreased by 0.60, while in the second group - by 2.58 ($p < 0.05$). Thus, hypotensive effect of combined surgery outweighs the effect of stand-alone endotrabeculectomy.

Keywords: *Endotrabeculectomy; Deep Sclerectomy; IOP; Glaucoma Medications*

Abbreviations

ETE: Endotrabeculoectomy; IOP: Intraocular Pressure; POAG: Primary Open-Angle Glaucoma; Sol: Solution; DETE: Dosed Endotrabeculectomy

Introduction

Glaucoma is a group of progressive optic neuropathies, accompanied by typical changes in the optic disc, loss of the layer of retinal ganglion cells and visual field defects. Primary open-angle glaucoma (POAG) treatment aims to slow the progression of glaucoma optic neuropathy and the loss of the optic nerve fiber layer and stabilize the progression of visual field defects [1]. In this purpose, a reduction of intraocular pressure (IOP) is obligatory. The surgical approach is considered after the initial ineffectiveness of medical and / or laser treatment and glaucomatous visual field defects progress [2]. Filter-type operations are well known for their effectiveness, but at the same

time for their complications. This stimulates the development of minimally invasive surgery, combining the high hypotensive efficiency of filter-type operations and the low number of postoperative complications. The comparison of two surgeries - dosed endotrabeculectomy with ab interno access and non-penetrating deep sclerectomy in combination with endotrabeculectomy was assessed to find the optimal solution for surgery in patients with primary open-angle glaucoma.

Purpose

To compare the hypotensive effect of endotrabeculectomy (ETE) and deep scleroectomy in combination with endotrabeculectomy in patients with primary open-angle glaucoma.

Material and Methods

We observed 35 patients (35 eyes) who underwent surgery for open-angle glaucoma. In the first group (23 patients, 23 eyes) a dosed endotrabeculectomy was performed and in the second group (12 patients, 12 eyes), a combined operation a non-penetrating deep scleroectomy and a dosed endotrabeculectomy was performed. Patients in both groups did not differ significantly in age, gender and comorbidities. All patients had moderate or severe trabecular pigmentation. The follow up period was 9 months.

All patients signed an informed consent for surgery.

IOP mesurement was performed before surgery, on the 7th day, 1st, 3rd, 6th and 9th month after surgery. The number of antiglaucoma drugs used by patients at the same time was noted. The combined drugs were counted as two - according to the number of active substances.

During the operation performed in the 1st group, the following main stages can be identified:

- Epibulbar anesthesia Sol. Alcaine 0.5%.
- Paracentesis of the anterior chamber at 3 and 10 o'clock with a 1.2 mm blade
- Intracameral anesthesia of 1% lidocaine
- Filling the anterior chamber with two types of viscoelastics
- Installation of goniolens
- Ablation of the trabeculae through the angle of chamber anterior with forceps in two quadrants, a total of about 120 degrees
- Viscoelastic is washed by aspiration and irrigation system
- Hydroadaptation of paracentesis.

During the operation performed in the 2nd group, the following main stages can be identified:

- Epibulbar anesthesia Sol. Alcaini 0.5%
- Retrobulbar anesthesia Sol. Lidocaine 2% - 2.0
- A suture is applied to the upper rectus muscle
- Incision of the conjunctiva 7 mm from the limbus

- Thermocoagulation of Episcleral vessels
- The sclera within a trapezoid of 5x4 mm is layered at 1/3 of the depth of the base to the limbus
- Subscleral deep scleroectomy on 1/3 of its thickness in the form of a triangle 4x5 mm with the base to the transparent part of the cornea, to the edge of the descemet's membrane
- Using forceps the juxtacanalicular trabecula is removed
- 4 neilon sutures 10/0 are placed on the sclera
- 2 neilon sutures 10/0 on the conjunctiva
- Paracentesis of the anterior chamber at 3 and 10 o'clock with a 1.2 mm blade
- Intracameral anesthesia of 1% lidocaine
- Filling the anterior chamber with two types of viscoelastics
- Installation of goniolens
- Ablation of the trabeculae through the angle of chamber anterior with forceps in two quadrants, a total of about 120 degrees
- Viscoelastic is washed by aspiration and irrigation system
- Hydroadaptation of paracentesis.

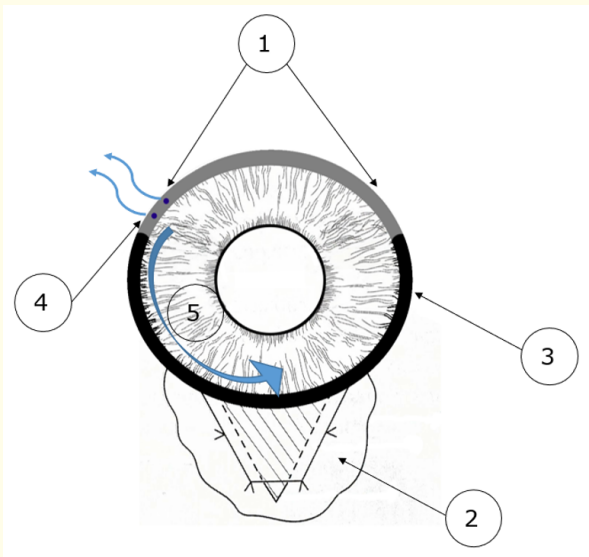

Figure 1: *Scheme of aqueous humor outflow after combined surgery - dosed endotrabeculectomy ab interno and non-penetrating deep sclerectomy.*

1. Area of the ablated trabeculae
2. Area of deep sclerectomy
3. Trabecula
4. Outflow of aqueous humor through collector chnnels in the area of the ablated trabeculae
5. Outflow of aqueous humor through the area of deep sclerectomy.

Non-parametric statistical criteria Wilcoxon's T-test and Mann Whitney's U test were used for statistical data analysis, calculated in the Statistica application.

Results

IOP in the 1st group before surgery was 24.91 ± 4.26 mm Hg. and in the 2nd group - 25.75 ± 1.29 mm Hg. Differences in the level of IOP in two groups was not significant (p = 0.353).

In the 1st group at the follow up visits IOP was 19,39 ± 3,31 mm Hg (7 days), 19.16 ± 3.60 mm Hg (1 month), 18.40 ± 1.64 mm Hg (3 months), 17.33 ± 1.41 mm Hg (6 months) and 18.20 ± 1,30 mm Hg (9 months); in the 2nd group IOP was16.50 ± 1.68 mm Hg (7 days), 17.75 ± 1.48 mm Hg (1 month), 17.42 ± 0.90 mm Hg (3 months), 17.08 ± 0.79 mm Hg (6 months) and 17.92 ± 0.67 mm Hg (9 months).

The data are presented in table 1.

Group	**Preop IOP**	**Post-Surgery IOP**				
		7th Day	**1 Month**	**3 Months**	**6 Months**	9 **Months**
I	24,91 ± 4,26	19,39±3,31 p<0,05	19,16±3,60 p<0,05	18,40±1,64 p<0,05	17,33±1,41 p<0,05	18,20 ± 1,30 p<0,05
II	25,75 ± 1,29	16,50±1,68 p<0,05	17,75±1,48 p<0,05	17,42±0,90 p<0,05	17,08±0,79 p<0,05	17,92±0,67 p<0,05

Table 1: *Dynamic of IOP (mm Hg) in the 1st and 2nd groups before and after surgery*

p - significance of IOP difference before and after surgery.

It was found that the difference between preoperative and postoperative pressure is significant up to 9 months in both groups (p < 0.05).

IOP at 6 months after surgery in the 1st group decreased by 7.58 mm Hg, and at 9 months by 6.71 mm Hg. In the 2nd group the IOP at 6 months decreased by 8.67 mm Hg, at 9 months - by 7.83 mm Hg.

The number of antiglaucoma drugs in the 1st group before surgery was 3.00 ± 1.04, in the 2nd group - 3.33 ± 0.49. The difference in the number of antiglaucoma drugs in two groups in the preoperative period was not significant (p = 0.50).

The number of antiglaucoma drugs in the 1st group after surgery was 0.43 ± 0.99 (7 days), 0.83 ± 1.04 (1st month), 0.80 ± 0.91 (3rd month), 1.56 ± 1.33 (6th month), 2,40 ± 0,89 (12th month). In the 2nd group the number of antiglaucoma drugs was 0 (7th day), 0.17 ± 0.39 (1st month), 0.58 ± 0.67 (3rd month), 0.67 ± 0.78 (6- and month), 0.75 ± 0.75 (9th month).

The data are presented in table 2.

Group	**Preop Number of Antiglaucoma Drugs**	**Number of Antiglaucoma Drugs After Surgery**				
		7th Day	**1 Months**	**3 Months**	**6 Months**	**9 Months**
I	3,00±1,04	0,43 ± 0,99 **P** < 0,05	0,83 ± 1,04 **p** < 0,05	0,80 ± 0,91 **P** < 0,05	1,56 ± 1,33 **P** < 0,05	2,40 ± 0,89 P > 0,05
II	3,33±0,49	0 **p<0,05**	0,17 ± 0,39 **p** < 0,05	0,58 ± 0,67 **p** < 0,05	0,67 ± 0,78 **p** < 0,05	0,75 ± 0,75 **P** < 0,05

Table 2: *Number of topical antiglaucoma drugs in the 1st and 2nd groups before and after surgery*

p - significance of antiglaucoma drugs number before and after surgery.

We found that the difference between the number of antiglaucoma drugs used before and after surgery is significant during the follow up period in patients of the 2nd group ($p < 0.05$), while for patients of the 1st group there is a difference only up to 6th month. On the 9th month the difference is not significant ($p = 0.23$).

The number of antiglaucoma drugs in the 1st group at the 6th month after surgery decreased by 1.44 ($p < 0.05$), at the 9th month - by 0.60 ($p > 0.05$). In the 2nd group the number of antiglaucoma drugs at the 6th month after surgery decreased by 2.66, at the 9th month - by 2.58, respectively ($p < b0.05$).

Our results show the effectiveness of trabeculae ablation through the anterior chamber angle (ab interno) as well as the effectiveness of combined surgery for patients with primary open-angle glaucoma. But combined surgery shows a slightly higher hypotensive effect - reduction of IOP by 33.67% (at 6 months) and 30,41% (at 9 months) from baseline compared to 30,4% (at 6 months) and 26,94% (at 9 months) for a standalone ETE.

Both the ETE and the combined ETE with deep non-perforating sclerectomy show a decrease in the number of topical antiglaucoma drugs up to 6 months. There was not significant difference between the number of topical antiglaucoma drugs in both groups up to 6th month. But at 9 months after surgery patients of the 2nd group use less number of antiglaucoma drugs ($p = 0.001$).

In our study we did not observe any complications that follows trabeculectomy (ciliochorioid detachment, uveitis, circulatory disorders in the retinal vessels and optic nerve).

Discussion

Comparative studies of the effectiveness of removing trabeculae ab interno and the combination of endotrabeculectomy with the removal of the inner wall of the shlemm's channel ab externo are currently quite few.

Rick E. Bendel and Michael T. Patterson in 2018 conducted a study that aimed to examine the long-term effectiveness of trabeculectomy with access ab interno [3]. According to their results, there was a statistically significant decrease in IOP by almost 23% ($p < 0.01$) during the final observation (mean = 18.35 months). According to the results of our study, there was a decrease in IOP by 26.94% from baseline after the DETE.

In 2019. Vassilios Kozobolis, Eleni Kalogianni, and Haris Sideroudi [4] conducted a study to evaluate the effectiveness of deep sclerectomy and trabeculectomy with ab externo access. The study was performed in the ophthalmology department of the University of Alexandroupolis Hospital, Greece, on 29 eyes of 29 patients. According to their results, the average decrease in intraocular pressure at the end of the 3-year follow-up period was 11.24 (57.88%) - whereas in our study 7.83 mm Hg. (30.41%), respectively. After surgery, the average number of drugs decreased from 3.75 ± 0.89 to 0.89 ± 0.98 (in our study from 3.33 ± 0.49 to 0.75 ± 0.75). A low level of postoperative complications was recorded. The difference in the level of IOP can be explained by the fact that the final measurement of IOP in our study was performed at 9 months after surgery, while in the study of these authors - at 36 months. There also may be a difference in the level of preoperative IOP and the number of topical antiglaucoma drugs used among the patients of the studies. The number of antiglaucoma drugs used in the postoperative period is almost the same for both studies.

It may be concluded that ETE with ab interno access in combination with non-perforating deep sclerectomy has a slightly higher hypotensive effect than stand-alone ETE, and slightly less hypotensive effect than filtration surgery (deep sclerotomy ab externo according to Vassilios Kozobolis., *et al* [4]). The number of drugs used after both interventions (combined and filtering type) are almost the same.

There is a need for further studies comparing the effectiveness of both stand-alone ETE and ETE in combination with non-penetrating deep sclerectomy with filter-type surgery (trabeculectomy) to clearly understand the benefit/risk factor for the choice of surgiery. Longer follow-up is also required for patients in the above two groups.

Conclusions

1. Dosed endotrabeculectomy as stand-alone surgery and endotrabeculectomy in combination with non-perforating deep sclerectomy shows a significant hypotensive effect for patients with primary open-angle glaucoma within 9 months of follow-up.

2. The hypotensive effect of ETE and non-penetrating deep sclerectomy is slightly better than the hypotensive effect of istand-alone ETE (30.41% and 26.94%, respectively) - $p = 0.41$.

3. The number of drugs after the combined operation decreased by 2.58, and after a stand-alone ETE - by 0.60 (the difference between the groups at the 9^{th} month is significant - $p < 0.05$).

4. More pronounced hypotensive effect of ETE in combination with non-penetrating deep sclerectomy than stand-alone ETE makes it a choice of surgery for patients with high IOP when using 3 or more local antiglaucoma drugs.

Bibliography

1. Trivli A., *et al.* "Primary open angle glaucoma genetics: The common variants and their clinical associations (Review)". *Molecular Medicine Reports* 22.2 (2020): 1103-1110.

2. Bertaud S., *et al*. "[Primary open-angle glaucoma]". *La Revue de Medecine Interne* 40.7 (2019): 445-452.

3. Rick EB and Michael TP. "Long-term Effectiveness of Trabectome (Ab-interno Trabeculectomy) Surgery". *Journal of Current Glaucoma Practice* 12.3 (2018): 119.

4. Kozobolis V., *et al.* "Penetrating deep sclerectomy in primary open-angle and pseudoexfoliative glaucoma". *European Journal of Ophthalmology* 30.2 (2020): 264-268.

Volume 13 Issue 2 February 2022