Al-Azhar International Medical Journal

Volume 4 | Issue 10 Article 27

2023
Section: Ophthalmology

Comparison of Ab Externo 360-degree Suture Trabeculotomy and Deep Sclerectomy in Management of Primary Open-angle Glaucoma in Adults

Mohamed Yousri El-Sayed
Ophthalmology department, Faculty of Medicine, Al-Azhar University, Cairo, Egypt,
doctoryousri@gmail.com

Hosny Hassan Mohammad
Ophthalmology department, Faculty of Medicine, Al-Azhar University, Cairo, Egypt

Mahmoud Hamed Abd-Rabbuh
Ophthalmology department, Faculty of Medicine, Al-Azhar University, Cairo, Egypt

How to Cite This Article

El-Sayed, Mohamed Yousri; Mohammad, Hosny Hassan; and Abd-Rabbuh, Mahmoud Hamed (2023) "Comparison of Ab Externo 360-degree Suture Trabeculotomy and Deep Sclerectomy in Management of Primary Open-angle Glaucoma in Adults," *Al-Azhar International Medical Journal*: Vol. 4: Iss. 10, Article 27.
DOI: https://doi.org/10.58675/2682-339X.1987

ORIGINAL ARTICLE

Comparison of Ab Externo 360-Degree Suture Trabeculotomy and Deep Sclerectomy in Management of Primary Open-angle Glaucoma in Adults

Mohamed Yousri El-Sayed*, Hosny Hassan Mohammad, Mahmoud Hamed Abd-Rabbuh

Ophthalmology Department, Faculty of Medicine, Al-Azhar University, Cairo, Egypt

Abstract

Objective: **To evaluate the effectiveness of ab externo 360-degree suture trabeculectomy (ST) and deep sclerectomy (DS) in adults with primary open-angle glaucoma (POAG) in lowering intraocular pressure (IOP), lowering the number of antiglaucoma medicines needed, and reducing surgery and postsurgical problems.**

Patients and methods: **This research involved 20 eyes out of 20 cases with POAG classified into two equal groups according to surgical treatment modality. Group (1) performed an ab externo 360-degree suture trabeculotomy, and group (2) performed a deep sclerotomy. Visual acuities, gonioscopy, fundus examination, and fundus optical coherence tomography (OCT) were done.**

Results: **Complete success was observed in 100%, 100%, 80%, and 70% in the ST group (1) in the first week, first month, third month, and sixth month, respectively, while it was 100%, 90%, 70%, and 60% in the DS group (2) in the first week, first month, third month, and sixth month, respectively. It was observed that failure occurred in only one instance (10%) in group (1) and in three instances (30%) in group (2) at the conclusion of the 6-month follow-up duration.**

Conclusion: **The rate of success and IOP lowering was slightly better in the ab externo 360o suture trabeculotomy technique than the deep sclerectomy technique. Both techniques showed fewer complications; however, the complications were less in deep sclerectomy.**

Keywords: Glaucoma, Suture trabeculotomy, Deep sclerectomy

1. Introduction

Trabeculotomy decreases IOP by lowering aqueous outflow resistance through a roughly 120-degree incision in the trabecular meshwork and the inner layer of Schlemm's canal (without bleb formation). Despite the fact that IOP is further decreased when trabeculotomy is done in combination with cataract surgery, IOP is generally not capable of being maintained below 15 mm Hg following surgery when done alone.[1]

Procedures for circumferential trabeculotomies have developed throughout time. In 1960, an ST over one-third of the drainage angle in cadaveric eyes had been described. Later, the method was improved to achieve 360° catheterization and trabeculotomy by utilizing suture material.[2]

Ab externo circumferential trabeculotomy has grown more common in the therapy of pediatric glaucoma and OAG during the last two decades. Yet there are several disadvantages to an ab externo trabeculotomy, which demands the formation of a scleral flap.[3]

A cut is made with 5-0 nylon suture along the whole circumference of the trabecular meshwork and inner layer of Schlemm's canal during a modified 360-degree suture trabeculotomy (360S-LOT). In comparison to a standard trabeculotomy, this

Accepted 11 June 2023.
Available online 30 November 2023

* Corresponding author.
E-mail address: doctoryousri@gmail.com (M.Y. El-Sayed).

https://doi.org/10.58675/2682-339X.1987

technique has the potential to reduce IOP significantly.[4] The postsurgical IOP ought to theoretically be near the episcleral venous pressure because the resistance of the inner layer of Schlemm's canal vanishes upon circumferential incision, which was observed to be about 12 mm Hg in both POAG and normal tension glaucoma (NTG).[1]

Kozlov and Fyodorov described deep sclerectomy (DS) in 1990 as one of the more efficient and safe nonpenetrating procedures. Targeting the area of greatest outflow resistance, a scleral gap is formed with the removal of a flap of deep sclera, the deroofing of Schlemm's canal, and the removal of the underlying juxtacanalicular trabecular meshwork. This procedure increases aqueous humor outflow and lowers IOP. The key difference between the two procedures previously discussed is that they are intended to drain aqueous humor in two different ways. In ab externo trabeculotomy, the aqueous humor drainage essentially takes place via the posterior pigmented trabeculum, while for deep sclerectomy, the major aqueous humor outflow takes place at the anterior trabeculum level.[5]

This study compares the effectiveness of 360-degree ab externo ST and DS in reducing IOP, lowering the amount of antiglaucoma drugs required, and reducing postoperative, as well as intraoperative complications in adults with POAG.

2. Patients and methods

This prospective, comparative, nonrandomized, interventional research involved twenty eyes from twenty patients who had POAG at the time of enrollment. The research has been conducted over the duration of one year, from August 2021 to August 2022, at the Al-Azhar University Hospitals' Ophthalmology Department, Faculty of Medicine.

The study included twenty eyes of twenty POAG patients, all of whom were above the age of 18 (both sexes were included), had IOPs greater than 21 mm Hg, and were receiving maximum-tolerated medicinal treatment while experiencing progressive visual field degeneration. Other forms of glaucoma, cataract, ocular trauma, and eyes with previous surgery were excluded.

Patients who provided informed consent and agreed to participate in the trial had 20 eyes of 20 patients randomized according to surgical type into two equal groups of 10 eyes each. Eyes were treated using ab externo 360-degree suture trabeculotomy in group (1) and deep sclerectomy in group 2.

The patient's medical history, particularly their ocular history, the length and kind of therapy they received before their first visit, the existence of systemic disorders, the assessment of their corrected distance visual acuity, refraction, slit lamp biomicroscopy, gonioscopy, visual field, and their IOP were all covered at the initial examination. A fundus examination by ophthalmoscopy and spectral-domain OCT was also performed.

2.1. Group (1): Ab externo 360-degree ST

Before starting the treatment, a cautery device had been employed to generate a matchstick-like end on the 5/0 nylon suture to make sure the end was appropriately blunt. A needle holder was used to mark the 5/0 nylon suture 40 mm (about the same length as the Schlemm canal's circumference) from the end. A fornix-based conjunctival flap was dissected following a corneal traction suture that was placed at the inferotemporal cornea, and a superficial scleral flap (4 × 4 mm) was then performed. A deep scleral flap (3–4 mm) had been constructed in order to permit Schlemm canal identification and stop after-surgery aqueous humor infiltration (formation of an unintended bleb). The Schlemm canal was then cannulated using the 5/0 nylon suture that had a matchstick-like end. The suture was inserted until it reached the canal's whole circumference. In order to cannulate the canal in the opposite direction when resistance prohibited additional cannulation, the 5-0 nylon suture had been first withdrawn and subsequently reinserted from the opposite side of the scleral flap. There was a good possibility that the suture had been misdirected if it did not pass completely around the circumference, even after the suture's 40-mm marker point had entered the Schlemm canal. Through a corneal side port, viscoelastic material had been administered into the anterior chamber when the suture tip delivered the other side of the scleral flap. Traction was applied in opposite directions on both ends of the suture to complete the 360-degree trabeculotomy (Fig. 1).

Lastly, 10/0 nylon sutures were used to close the scleral flap. After that, aspiration and irrigation handpieces were used to remove the anterior chamber's viscoelastic material. Further scleral sutures had been placed until the leakage of aqueous fluid from the scleral wound ceased. 9/0 virgin silk sutures were used to close the conjunctiva.

2.2. Group (2): Deep sclerectomy

A superior fornix-based conjunctival flap was made, a 7/0 Vicryl corneal traction suture was inserted, and then cautery was used to establish hemostasis. A superficial limbus-based scleral flap

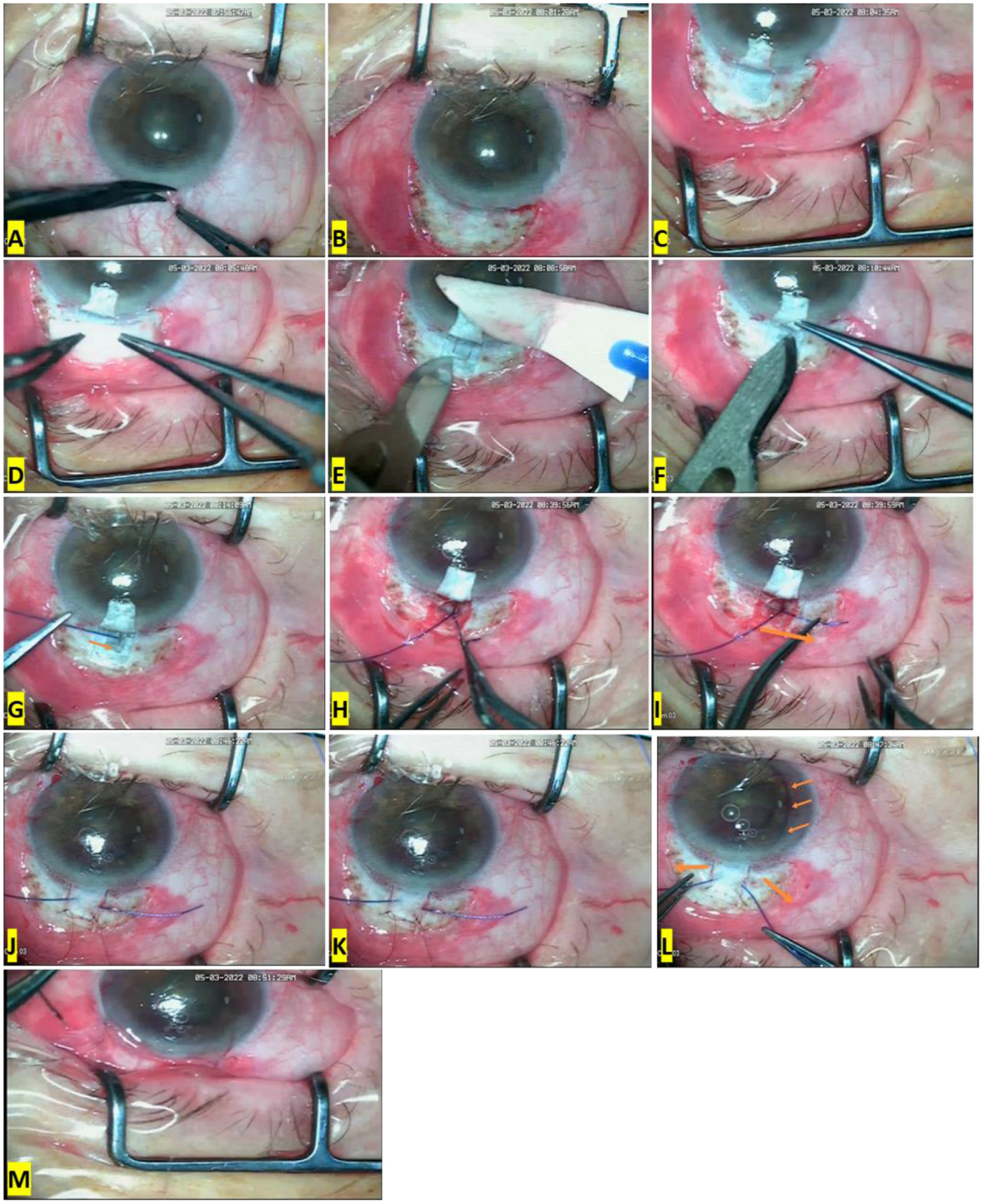

Fig. 1. Steps of Ab externo 360-degree Suture Trabeculotomy (A, B opening conjunctiva; C superficial scleral flap; D MMC was applied; E deep scleral flap; F identification of Schlemm's canal; G The 5/0 nylon suture was applied to Schlemm's canal; H, I the 5/0 nylon insertion throughout the entire canal circumference; J, K closure of scleral flap; L traction of suture on opposite sides to do 360-degree trabeculotomy; M closure of conjunctiva).

of two-thirds thickness measuring 5 × 5 mm was created, and it was progressed 1 mm into the clear cornea. For 3 min, posteriorly beneath the conjunctiva and superficial scleral flaps, cellulose sponges soaked in MMC (0.3 mg/ml) were placed. This was followed by copious irrigation using a balanced salt solution. The Schlemm's canal has been reached by creating a 4 × 4 mm-deep scleral flap that was then de-roofed by removing the juxtacanalicular fibers from the trabeculo-descemet's window (TDW). The deep flap has been removed in close proximity to the TDW after being injected with

a viscoelastic material into the scleral bed. With 10-0 Vicryl sutures, the conjunctiva and superficial scleral flap have been tightly closed. At the conclusion of the procedure, atropine, topical antibiotics, and subconjunctival steroids were administered (Fig. 2).

Postoperative follow-up: Data collection from five follow-up visits within 6 months of the surgery occurred on days 1, 7, and after 1, 3, and 6 months. Evaluation includes IOP measurements, slit lamp biomicroscopy to assess scleral flap healing and search for any new signs or complications, and visual acuity, visual field testing, and examining the fundus.

2.3. Statistical data analysis

Data were analyzed using the statistical package SPSS version 24.0 (SPSS Inc., Chicago, IL, USA). A normal distribution of variables was assessed using the Kolmogorov–Smirnov test. Two study groups were established based on the value of the mean ± SE group #1 = Ab externo 360-degree suture trabeculotomy (ST) and group #2 = deep sclerotomy (DS).

The differences between the two treatment groups were analyzed using multiple analysis of variance (ANOVA) with the Bonferroni correction (post hoc comparisons). Linear regression was used to analyze the correlation between central pachymetry with the SE, and visual acuities were represented in decimal values. The correlation coefficient (r) was determined. The Pearson correlation coefficient was also calculated to determine the relationship among the study variables.

2.3.1. Descriptive statistics

(1) Arithmetic mean: as an average describing the central tendency of observations.

$$\text{Mean } (\overline{X}) = \frac{\sum X}{n}$$

where: ΣX = sum of individual data, n = number of ipersonaldata.

(1) Standard deviation: as a measure of the dispersion of the results around the mean.

$$\text{Standard deviation } (SD) = \sqrt{\frac{\sum (\overline{X} - X)^2}{n-1}}$$

2.3.2. Analytical analysis

(1) Chi-square (χ^2 test):

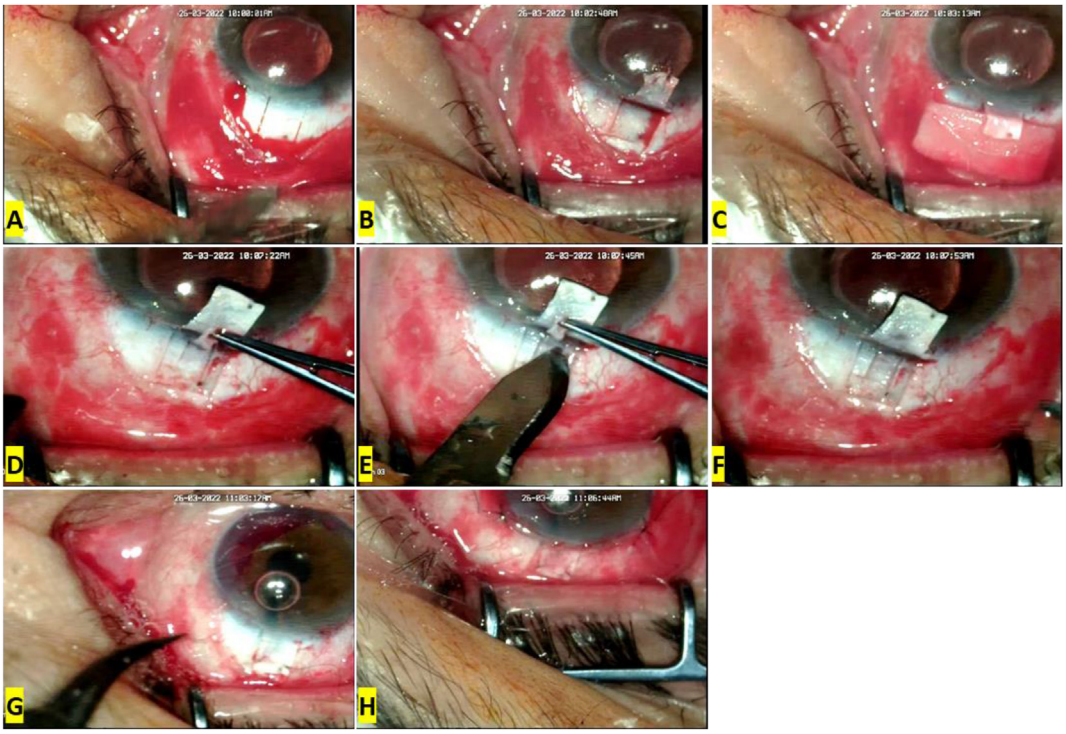

Fig. 2. Steps of Deep Sclerectomy (A opening conjunctiva, B superficial scleral flap, C MMC was applied, D deep scleral flap, E, F excision of deep scleral flap at the level of Schlemm's canal, G, H closure conjunctiva).

It is a test for significance for the difference between more than two proportions i.e., to assess whether the observed frequency (O) of an event departs significantly from that expected (E) on the basis of the null hypothesis. It can be calculated from the following equation:

$$X^2 = \frac{\sum (O - E)^2}{E}$$

where: O = observed value, E = expected value.

Expected value was calculated as follows:

$$E = \frac{(\text{row total})(\text{co lumn today})}{\text{Grand total}}$$

2.3.3. Level of significance

For all above mentioned tests done, the threshold of significance was fixed as 5% level student t-test (t) and the probability (*P* value):

(1) *P* value of >0.05 indicates nonsignificant results.
(2) *P* value of <0.05 indicates significant results.
(3) *P* value of <0.01 indicates highly significant results.
(4) *P* value of <0.001 indicates very highly significant results.

Final results were collected and tabulated and then comparison with correlation with each other was performed.

Administrative design and ethical considerations: The study was conducted after approval of the protocol by the Local Research Committee and the Studies Committee, as well as the Research Ethics Committee. An informed consent was obtained from all patients that contain the following:

(1) The aim, procedures, and duration of the study explained in a simple way.
(2) The patients have the right to refuse participation without affecting the medical care expected to be offered to the patient.
(3) The patients have the right to withdraw from the study at any time without any penalty and without giving reasons.
(4) Confidentiality of data and results of all study population was preserved by ensuring anonymity of data and minimal access to data by the research team only.

The procedure was performed by a qualified, experienced ophthalmologist.

3. Results

The age range for group 1 was 49–77 years, with a mean ± SD of 61.8 ± 5.36 years, and the age range for group 2 was 51–79 years, with a mean ± SD of 62.3 ± 6.42 years. All parameters in both groups, such as age, sex, IOP, visual acuity, and C/D ratio were matched as they were statistically insignificant (Table 1).

The reduction of IOP does not reach significant levels during the follow-up in comparison between the two groups. The intergroup study showed a highly significant decrease of IOP in both groups from preoperative to postoperative values, while group (1) showed a more significant reduction than group 2 ($P = 0.001$ and $P = 0.008$, respectively) (Table 2).

The comparison of BCDVA showed a nonsignificant difference between groups (1) and (2) preoperatively and during follow-up ($P > 0.05$). The intergroup study exhibited a nonsignificant improvement ($P > 0.05$) in BCDVA from preoperative to postoperative values in both groups (Table 3).

Table 4 showed that the C/D ratio was similar in both groups pre- and post-surgery through the follow-up duration ($P > 0.05$). The intergroup study showed a nonsignificant difference preoperatively and postoperatively in both groups ($P > 0.05$).

Table 1. Preoperative patients' criteria of the study population.

	Group (1) Number (%)	Group (2) Number (%)	Significance	
			χ^2	*P*
Males	4 (40.0)	3 (30.0)	0.102	0.749
Females	6 (60.0)	7 (70.0)	0.164	0.870
Total	10 (100)	10 (100)		
	Mean ± SD	Mean ± SD	t	*P*
Age (years)	61.8 ± 5.36	62.3 ± 6.42	0.158	0.824
IOP (mm Hg)	33.6 ± 4.85	32.9 ± 3.94	0.001	0.986
Visual acuity (decimal)	0.25 ± 0.04	0.25 ± 0.03	0.000	0.999
C/D ratio	0.7 ± 0.4	0.7 ± 0.3	0.000	0.999

C/D, cup/disc; IOP, intra-ocular pressure; SD, standard deviation; t, paired *t*-test, $P > 0.05$: nonsignificant; χ^2, Chi square.

Table 2. Comparison of the two studied groups' pre- and postoperative IOP.

IOP (mm Hg)	Group (1) ST	Group (2) DS	Significance	
			t	*P*
Preoperative (mean ± SD)	33.6 ± 4.85	32.9 ± 3.94	0.001	0.986
7 days postoperative	12.56 ± 2.67	15.62 ± 2.95	0.167	0.411
1 month postoperative	15.24 ± 2.18	17.31 ± 2.58	0.157	0.428
3 months postoperative	16.82 ± 1.89	18.25 ± 1.98	0.214	0.316
6 months postoperative	17.34 ± 1.88	19.15 ± 1.96	0.218	0.319
t-test[a]	0.976	0.927		
P value[a]	0.001*	0.008*		

*$P < 0.05$ = significant.
DS, deep sclerectomy; IOP, Intraocular pressure; ST, Ab Externo 360° Suture Trabeculotomy.
[a] Intergroup analysis between preoperative and last follow up.

Table 3. Comparison of the two study groups' best corrected distant visual acuities pre- and postoperative.

BCDVA (Decimal values)	Group (1) ST	Group (2) DS	Significance	
			t	*P*
Preoperative (mean ± SD)	0.25 ± 0.03	0.25 ± 0.04	0.000	1.000
7 days postoperative	0.27 ± 0.12	0.26 ± 0.15	0.009	0.715
1 month postoperative	0.27 ± 0.16	0.26 ± 0.18	0.000	0.715
3 months postoperative	0.26 ± 0.11	0.27 ± 0.19	0.000	0.715
6 months postoperative	0.26 ± 0.12	0.26 ± 0.21	0.000	1.000
t-test[a]	0.023	0.023		
P value[a]	0.672	0.672		

*$P > 0.05$ = insignificant.
BCDVA, best corrected distant visual acuity; DS, deep sclerectomy; ST, Ab Externo 360° Suture Trabeculotomy.
[a] Intergroup analysis between preoperative and last follow up.

Table 4. Comparison of pre and postoperative C/D of the two studied groups.

C/D ratio	Group (1) ST	Group (2) DS	Significance	
			t	*P*
Preoperative (mean ± SD)	0.71 ± 0.38	0.69 ± 0.37	0.009	0.956
1 month postoperative	0.70 ± 0.36	0.69 ± 0.38	0.007	0.915
3 months postoperative	0.70 ± 0.31	0.68 ± 0.29	0.008	0.934
6 months postoperative	0.71 ± 0.28	0.69 ± 0.26	0.009	0.956
t-test[a]	0.000	0.000		
P value[a]	0.999	0.999		

*$P < 0.05$ = significant.
C/D, Cup/disc; DS, deep sclerectomy; ST, Ab Externo 360° Suture Trabeculotomy.
[a] Intergroup analysis between preoperative and last follow up.

Complete success was observed in 100, 100, 80, and 70% in the ST group (1) in the first week, first month, third month, and sixth month, respectively, while it was 100, 90, 70, and 60% in the DS group (2) in the first week, first month, third month, and sixth month, respectively. Failure was reported in only one instance (10%) in group (1) and 3 instances (30%) in group (2) at the conclusion of the 6-month follow-up duration (Table 5).

Mild postoperative complications occurred in both groups; however, DS showed less complications than ST group because it is a nonpenetrating

Table 5. Rates of success and failure for the two studied groups.

Postop. Follow-up	Group 1 (ST), Number (%)			Group 2 (DS), Number (%)		
	Complete success	Qualified Success	Failure	Complete success	Qualified Success	Failure
1 week	10 (100)	0 (0)	0 (0)	10 (100)	0 (0)	0 (0)
1 month	10 (100)	0 (0)	0 (0)	9 (90)	1 (10)	0 (0)
3 months	8 (80)	1 (10)	1 (10)	7 (70)	2 (20)	1 (10)
6 months	7 (70)	2 (20)	1 (10)	6 (60)	3 (30)	3 (30)

Table 6. Postoperative complications of the two studied groups.

Complications	Group 1 (ST) Number (%)	Group 2 (DS) Number (%)
Hyphemia	3 (30)	0 (0)
Vitreous loss	0 (0)	0 (0)
Elevated IOP	1 (10)	3 (30)
Eccentric pupil	1 (10)	0 (0)
Shallow AC	3 (30)	2 (20)
Endophthalmitis	0 (0)	0 (0)
Choroidal detachment	0 (0)	0 (0)
Hypotony	2 (30)	3 (50)
Maculopathy	0 (0)	0 (0)

procedure. Most of the complications were treated conservatively; hyphemia was treated by topical steroids and mydriatics followed by complete resolution, shallow anterior chamber was managed by mydriatics, IOP increasing was treated using Dorzolamide or timolol. On the other hand, minor intervention is used in some cases such as needling, anterior chamber reformation and tight re-suturing may be used (Table 6).

4. Discussion

Deep sclerectomy (DS) and trabeculotomy (TLO) have been discovered to have the same surgical results.[6] In 2012, Chin et al. treated patients with open-angle glaucoma using a modified method and saw greater results than they would have with standard TLO, with the IOP dropping to 13.1 mm Hg at 12 months following surgery. But there has not been any research on the use of this approach in combination with surgery for cataracts and DS to lower IOP published in the literature.[7]

An incision is made with 5-0 nylon suture along the whole circumference of the trabecular meshwork and inner layer of Schlemm's canal during a modified 360-degree suture trabeculotomy (360S-LOT). This surgery has the potential to significantly decrease IOP compared to standard trabeculotomy. Because the resistance of the inner layer of the Schlemm's canal vanishes with circumferential incision, the postsurgical IOP ought to theoretically be close to the episcleral venous pressure that has been found to be about 12 mm Hg in both POAG and NTG.[4]

As far as we are aware, this is the first research to compare Ab Externo 360-degree Suture Trabeculotomy and deep sclerectomy in the treatment of POAG. There is insignificant difference ($P > 0.05$) of preoperative parameters in comparison between the two studied groups. Comparison of OCT parameters of the retina and optic disc before operations were insignificant. There is decrease of IOP but does not reach significance during the postoperative follow-up in comparison between the two groups. Intergroup study showed highly significant decrease of IOP from preoperative to postoperative values in both groups, however, group 1 showed more significant ($P = 0.001$) than group 2 ($P = 0.008$).

Similar data obtained by several previous literatures who used Ab Externo 360-degree Suture Trabeculotomy in treatment of POAG. They found a highly significant decrease in IOP postoperatively.[1,4,7–9]

In earlier investigations, the mean postoperative IOPs with ab externo TLO were found to range from 12.3 to 18.4 mm Hg.[10–13] Our current postoperative IOPs, which were higher in both procedures when compared to these studies after a 6-month follow-up, were 17.34 ± 1.88 and 19.15 ± 1.96 mm Hg. This was similar to Mori et al. who had ab externo TLO IOP lowering at 1 year postoperatively of 18.3 ± 7.4 mm Hg. They concluded that the lower efficacy in their trial was due to the inclusion of numerous patients who had used numerous glaucoma medications for a prolonged duration that was comparable to our study.[7]

When compared to trabeculectomy surgery, ab externo TLO with DS tends to show a higher IOP decrease following 3 years after surgery, although the difference wasn't statistically significant, according to Kinoshita-Nakano et al.[13]

In the present research, there have been no significant differences in BCDVA among groups (1) and (2) before surgery, as well as during follow-up ($P > 0.05$). The comparison of intergroup values exhibited nonsignificant improvements in BCDVA from preoperative to postoperative values in both groups ($P > 0.05$).

This was in agreement with most of the previous studies who did not find improvement of visual acuity after both techniques.[4,7–9] Mori et al. compared between Ab externo (65 eyes) and Ab interno (69 eyes) suture techniques and find that Ab externo had worse visual acuity than Ab interno (LogMar VA was 0.25 ± 0.35 and 0.05 ± 0.23, respectively), however both techniques had no significant difference regarding the change from preoperative to postoperative values ($P = 0.43$).[7]

Surgical success (with or without medication use) was defined as an IOP between 6 and 15 mm Hg with a postoperative IOP reduction of at least 20% (criterion A) or an IOP between 6 and 12 mm Hg with a postoperative IOP reduction of at least 30% (criterion B). A surgical failure was defined as not meeting success criteria at two consecutive follow-up visits at least 1 month after surgery or the need for additional glaucoma surgery. The IOP levels later

than 1 month were used as determinants of surgical success so that short-term IOP fluctuations would not influence long-term surgical success rates.[1]

In the current investigation, the rates of success of the two studied groups were 100, 100, 80, and 70% in the ST group (1) in the first week, first month, third month, and sixth month, respectively, while they were 100, 90, 70, and 60% in the DS group (2) in the first week, first month, third month, and sixth month, respectively. It was observed that failure occurred in only one patient (10%) in group (1) and in three patients (30%) in group (2) at the conclusion of the 6-month follow-up period.

Our rate of success was higher than that of Sato et al., who found that their 360-degree suture trabeculotomy group had a surgical rate of success of 64.2% within 6 months, depending on an IOP of <15 mm Hg, which had been set as the postsurgical aim with or without medication usage. Two years postoperatively, the surgical rate of success dropped to 49.2%. They did not find any differences in the success rate between the two groups, nonetheless. That difference in success rate may because of the larger number of patients in Sato et al. study.[1]

Over the course of the 5 years after surgery, the rate of success of the ab externo operation, which entails incising the trabecular meshwork and inner layer of the Schlemm's canal at 360° or 120°, dropped.[10]

Trabecular meshwork and the closing of the incision in the inner layer of Schlemm's canal during the healing process are likely to blame for the efficacy reduction that occurred over time. It's likely that the opening created by the 360-degree incision closes more slowly than the opening created by the 120-degree incision due to the bigger trabecular meshwork and inner layer of Schlemm's canal opening.[1]

Manabe et al., on the other hand, reported that a Schlemm's canal incision of 150° or more during S-LOT ab externo showed no impact on decreased IOP at one year following surgery.[14] Because it was possible that a 360-degree Schlemm's canal incision was too invasive, Sato et al. prospectively studied the connection between Schlemm's canal incision width and the after-surgery IOP decrease.[1] Ab externo 360-degree ST and ab interno 360-degree ST both had success rates that were similar with regard to effectiveness and safety for POAG patients.[9] According to Mori et al., ab interno TLO procedures had a success rate of 74%, whereas ab externo TLO had a success rate of 78%.[7]

It was observed from the current study that mild postoperative complications occurred in both groups, however, DS showed less complications than ST group. Most of the complications were treated conservatively: hyphemia has been managed with topical steroids and mydriatics, accompanied by total resolution; shallow anterior chamber managed by mydriatics; IOP drop using Dorzolamide or timolol. On the other hand, minor intervention is used in some cases such as needling, anterior chamber reformation and tight re-suturing may be used.

Higher rates of complications were recorded in previous studies. Fukuchi et al. reported hyphema in their ab externo TLO in 90.1% of patients which was much higher than our findings in 30% of patients. Sato et al. reported hyphema in all eyes that resolves spontaneously, Nevertheless, neither anterior chamber flattening nor Descemet's detachment were present in any of the patients.[4] We counted a small number of eyes with hyphema as we used pre-incision cautery. Because of this, after surgery, hyphema occurred significantly less frequently than in earlier publications, while our cohort may have included more instances of milder hyphema.

According to Inatani et al., prolonged major anterior chamber bleeding is one that persists for a minimum of 7 days after surgery and involves bleeding that extends to the meniscus of the anterior chamber surrounding the pupil. They discovered that conducting anterior chamber lavage could reduce an increased IOP of >30 mm Hg.[15]

None of our patients had vitreous loss or hemorrhage in our ab externo ST group. In three instances, vitreous hemorrhage was discovered by Mori et al. Those individuals experienced exfoliation glaucoma, and because of zonular dehiscence, blood in hyphema most likely fell into the vitreous cavity in those cases.[7]

The study had some Limitations such as: the small number of our sample that interferes with the accuracy of statistical analysis and inaccurate calculation of the outcomes and complications. The short (6-month) follow-up duration for those who do not fulfill the criteria for the outcomes and late complications reported in the two surgical techniques.

4.1. Conclusion

It was concluded from this study that the success rate and IOP lowering was slightly better in ab externo 360° suture trabeculotomy technique than deep sclerectomy technique. Both techniques showed less complications, however, the complications were less in deep scelerectomy.

Conflicts of interest

None declared.

References

1. Sato T, Kawaji T, Hirata A, Mizoguchi T. 360-degree suture trabeculotomy ab interno to treat open-angle glaucoma: 2-year outcomes. *Clin Ophthalmol*. 2018;12:915–923.
2. Chin S, Nitta T, Shinmei Y, et al. Reduction of intraocular pressure using a modified 360-degree suture trabeculotomy technique in primary and secondary open-angle glaucoma: a pilot study. *J Glaucoma*. 2012;21:401–407.
3. Zhang W, Wang Y, Xin C, et al. Ab interno vs. ab externo microcatheter-assisted circumferential trabeculotomy in treating patients with primary open-angle glaucoma. *Front Med*. 2021;8:795172.
4. Sato T, Hirata A, Mizoguchi T. Outcomes of 360 degrees suture trabeculotomy with deep sclerectomy combined with cataract surgery for primary open angle glaucoma and coexisting cataract. *Clin Ophthalmol*. 2014;8:1301–1310.
5. Roy S, Mermoud A. Deep sclerectomy. *Dev Ophthalmol*. 2017; 59:36–42.
6. Luke C, Dietlein TS, Luke M, Konen W, Krieglstein GK. A prospective trial of phaco-trabeculotomy combined with deep sclerectomy versus phaco-trabeculectomy. *Graefes Arch Clin Exp Ophthalmol*. 2008;246:1163–1168.
7. Mori S, Murai Y, Ueda K, et al. A comparison of the 1-year surgical outcomes of ab externo trabeculotomy and microhook ab interno trabeculotomy using propensity score analysis. *BMJ Open Ophth*. 2020;5:1.
8. Dao JB, Sarkisian SRJr, Freedman SF. Illuminated microcatheter-facilitated 360-degree trabeculotomy for refractory aphakic and juvenile open-angle glaucoma. *J Glaucoma*. 2014; 23:449–454.
9. Yalinbas D, Dilekmen N, Hepsen IF. Comparison of ab externo and ab interno 360-degree suture Trabeculotomy in adult open-angle glaucoma. *J Glaucoma*. 2020;29:1088–1094.
10. Tanihara H, Negi A, Akimoto M, et al. Surgical effects of trabeculotomy ab externo on adult eyes with primary open angle glaucoma and pseudo-exfoliation syndrome. *Arch Ophthalmol*. 1993;111:1653–1661.
11. Fukuchi T, Ueda J, Nakatsue T, et al. Trabeculotomy combined with phacoemulsification, intraocular lens implantation and sinusotomy for exfoliation glaucoma. *Jpn J Ophthalmol*. 2011;55:205–212.
12. Iwao K, Inatani M, Tanihara H. Success rates of trabeculotomy for steroid-induced glaucoma: a comparative, multicenter, retrospective cohort study. *Am J Ophthalmol*. 2011;151: 1047–1056.
13. Kinoshita-Nakano E, Nakanishi H, Ohashi-Ikeda H, et al. Comparative outcomes of trabeculotomy ab externo versus trabecular ablation ab interno for open angle glaucoma. *Jpn J Ophthalmol*. 2018;62:201–208.
14. Manabe SI, Sawaguchi S, Hayashi K. The effect of the extent of the incision in the Schlemm canal on the surgical outcomes of suture trabeculotomy for open-angle glaucoma. *Jpn J Ophthalmol*. 2017;61:99–104.
15. Inatani M, Tanihara H, Muto T, et al. Transient intraocular pressure elevation after trabeculotomy and its occurrence with phacoemulsification and intraocular lens implantation. *Jpn J Ophthalmol*. 2001;45:288–292.