

The Outcomes of Trabeculectomy Surgery among Patients at Makkah Specialist Eye Hospital Bauchi Nigeria

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Abstract

Trabeculectomy remains the world's gold standard and the main therapeutic intervention for controlling moderate to advanced glaucoma in Nigeria due to the expensive anti-glaucoma drugs as well as the unavailability of facilities to carry out minimal invasive glaucoma surgery (MIGS). There is still limited knowledge of the outcomes of trabeculectomy surgery in northeastern, Nigeria. To determine the outcomes of trabeculectomy surgery, regarding lowering post-operative Intra Ocular Pressure (IOP), preserved visual acuity (VA) as well as preserved functional vision among glaucoma patients attending Makkah Specialist Eye Hospital Bauchi (MSEHB). A retrospective trabeculectomy surgery data search of operating theatre records was done to collect the outcomes from January 2021 to January 2023. Patients who have undergone trabeculectomy with a minimum follow-up of 6 months were included in the study. The criteria for a good outcome were post-operative IOP of less than 22mmHG or at least 30% reduction from pre-operative levels, and a preserved aided VA. A visiting consultant from the Ophthalmology Department of Federal Teaching Hospital Gombe performed the trabeculectomy surgeries. A total of fifty-two eyes of 50 patients having a postoperative follow-up of six months were included in the study. The mean age at presentation was 54.10($\pm$ 13.02) years. On the last day before surgery, the mean Snellen VA was 20/60; 0.37($\pm$ 0.36) but became 20/60+3; 0.40($\pm$ 0.36) post-operatively, $p = 0.01$, mean cup-to-disc ratio (CDR) was 0.86($\pm$ 0.12) but changed to 0.87($\pm$ 0.12) $p = 0.79$ at six months after surgery. Complete success, qualified success (with postoperative anti-glaucoma eyedrops), and failure of trabeculectomy (even with postoperative anti-glaucoma eyedrops) were 47(90.40%), 4(7.70%), and 1(1.90%), respectively. Based on the IOP, the complete success rate of trabeculectomy was 90.40%. The mean preoperative Snellen VA was improved by about half a line, six months after surgery and there was a significant reduction of IOP from its baseline. These outcomes revolutionize referral/advice of moderate to advanced glaucoma patients for trabeculectomy surgery in our practice as well as assured post-operative reserved vision.

Keywords: Moderate to advanced glaucoma; Trabeculectomy; Intraocular pressure; Makkah Specialist Eye Hospital Bauchi.

1. Introduction

Trabeculectomy remains the world gold standard and the main therapeutic intervention for controlling moderate to advanced glaucoma in Nigeria and other countries in sub-Saharan Africa is due to the non-adherence of patients to medical treatment as well as the expensive, inadequate anti-glaucoma drugs and

the unavailability of facilities to carry out MIGS, a recent surgical intervention for glaucoma control with minimal trauma to the eye (Lusthaus & Goldberg, 2019; Hasan, Theilig, & Unterlauff, 2019; Dean *et al.*, 2022; Fontana *et al.*, 2006). Trabeculectomy is an outpatient surgery for lowering pressure inside the eye when medical treatments or laser surgery have failed to bring the eye pressure low enough to preserve the optic nerve head or prevent visual field loss (Konstas *et al.*, 2006; Netland *et al.*, 2014; Mani & Brodsky, 2017). In this surgical operation, a small hole is made in the wall of the eye superiorly, to re-route the fluid and allow fluid to escape the eye. This forms a small blister or bleb underneath the upper eyelid.

Trabeculectomy is a very delicate operation that requires an operating room, local anesthesia of the eye, an anesthesiologist, and about an hour of operating time (Rivera, 2014; Baddeley, 2012; Kallio *et al.*, 1999; Khairnar *et al.*, 2016). It is successful about 60-80 percent of the time in controlling eye pressure (Divya, 2015; Roshwalb, 2014; Rhee *et al.*, 2010). After the surgery, patients may stop glaucoma medications that were previously prescribed, and then begin a regimen of antibiotic and steroid eye drops to prevent infection and control inflammation (Vahedian, 2021).

The success of trabeculectomy is not only on the surgery itself but more importantly on the frequent follow-up visits for post-operative medication and “bleb” management (Olali, Rotchford, & King, 2011; Singh *et al.*, 2007; Elving-Kokke *et al.*, 2019). In addition to the anti-scarring medications, there are other methods that are sometimes used after the surgery for controlling fluid pressure or enhancing aqueous humor filtration into the bleb via the ostium created, such as eye massage (Mead *et al.*, 2003; Wang *et al.*, 2022; Georgoulas *et al.*, 2008; Lama & Fechtner, 2003; Razeghinejad, Fudenberg, & Spaeth, 2012). More so, the surgeon may have to add a suture if the bleb is filtering too much or use a laser to cut a suture if the bleb is filtering too slowly (Jones, Clarke, & Khaw, 2005; Razeghinejad, & Spaeth, 2011; Leung, & Tham, 2013). Unlike most eye laser treatments which guarantee very quick recovery, it can take several weeks for the eye to recover from a trabeculectomy surgery (Soatiana *et al.*, 2013).

Although it is very unusual, serious complications can occur, including infection in the eye, bleeding inside the eye, worsening of cataracts, and eye pressure that is too low. Some of these complications are reversible, such as cataracts, because cataract surgery can be performed at a later date. Findings from the meta-analysis done in Africa regarding the outcomes of trabeculectomy surgery revealed that the success rate varied from 61.8% to 90% (post-operative IOP was between 10-20 mmHg) and that trabeculectomy done with or without application of anti-metabolite like Mitomycin C (MMC) yield good outcome regarding IOP control (Soatiana *et al.*, 2013).

However, there is still limited knowledge of the outcomes of trabeculectomy surgery in northeastern Nigeria. In this retrospective study, an effort was made to assess the outcomes of trabeculectomy surgery carried out on glaucoma patients in MSEHB, Nigeria with emphasis on reduced post-operative IOP as well as the preserved or improved acuity and functional vision.

2. Materials and Methods.

2.1 Study design

All surgery and follow-up examinations were done at MSEHB, Nigeria. A retrospective case note search from operating theatre records was done to collect the outcomes of trabeculectomy surgery done from January 2021 to January 2023. This study was approved by the Research Review Board of MSEHB Nigeria in compliance with the Declaration of Helsinki. The need for patients' informed consent was waived. Visiting consultant from the Ophthalmology Department of Federal Teaching Hospital Gombe performed the

trabeculectomies. Visiting doctors saw patients on post-operative visits. Trabeculectomy with or without intraoperative use of MMC was included. Patients with moderate to advanced glaucoma who underwent trabeculectomy procedures were considered eligible for the study. Patients with a successful outcome but with a follow-up period of fewer than 6 months were excluded.

2.2 Surgical procedures

All surgeries were done under topical amethocaine drops followed by an injection of 4-6 ml of lidocaine, which was administered in the retrobulbar space before the beginning of peritomy for the scleral flap. After exposing the superior part of the globe, a 3 mm by 4 mm scleral flap was constructed with the pre-placement of two 10-0 nylon sutures at the angles. MMC with a 0.1 mg/ml concentration was applied on and under the scleral flap with a stick swab for 1 to 3 min, only in 9 eyes. After a temporal paracentesis and 0.2% intracameral pilocarpine were administered, a 1 mm sclerotomy was done using a Side port knife that was followed by peripheral iridectomy with a vannus micro scissor. The scleral flap was closed using nylon 10-0 preplaced sutures with suture tension that allowed a slow and continuous trickling of fluid flow under the flap. Additional sutures were added in cases where the flow was robust. The conjunctival flap was closed by purse string sutures at the superior limbal area, on the wound and checked for water tightness. Bleb was formed by injecting saline into the anterior chamber through the paracentesis. At the end of each procedure, a subconjunctival combination of steroid and antibiotics injection was given to all patients.

2.3 Data collection procedures

Consequently, 114 Trabeculectomy surgeries were performed over a 2-year period (2021-2023), and only a total of 52 eyes of 50 patients' data were reviewed due to the high percentage of lost follow-up at 6 months postoperatively. The data was collected from patients' record charts at a time by a trained optometrist using a standardized Microsoft Excel spreadsheet. All patients' record with trabeculectomy surgery was included in the study. The charts with insufficient data were also excluded. The collected data included: baseline demographic data, preoperative VA, IOP, cup-to-disc ratio (CDR), preoperative glaucoma control duration, types and stages of glaucoma, types of topical and systemic anti-glaucoma medications, intraoperative use of anti-metabolites, and postoperative VA, IOP, CDR as well as the use of anti-glaucomatous medication. Criteria for success were an IOP reduction of less than 22mmHg or more than 30% from pre-operative levels with or without medication and preserved or improved acuity and/or functional vision from pre-operative levels.

2.4 Statistical analysis

The collated data from the charts were carefully coded, processed, and analyzed with Statistical Package for the Social Science (SPSS) version 25. Descriptive statistics such as frequency and cross-tabulation were done to summarize the data. Paired samples t-test was performed to analyze and compare the correspondent preoperative and postoperative IOP, VA, and CDR. P-value <0.05% was considered statistically significant.

3. Results

3.1 Patients' Profile

A total of 52 eyes of 50 patients that had undergone trabeculectomy surgery over two years (2021 –

2023) having a postoperative follow-up of six months were included in the study. The mean age of patients at the presentation was 54.10 ± 13.02 (Range: 18 – 79) years. Eighty-four percent of the subjects were male and less than one-fifth of them were females. Most of them (64%) are from rural areas.

Table 1: The sociodemographic characteristics and clinical status of subjects that have undergone trabeculectomy surgery at MSEHB, Nigeria, 2023. (POAG: primary open-angle glaucoma, NTG: normal tension glaucoma, PACG: primary angle closure glaucoma, NVG: neovascular glaucoma).

On the presentation day, 41 (78.8%) of all eyes were POAG, 4 (7.7%) presented with phacomorphic glaucoma, 2 (3.8%) presented with NTG, 1 (1.9%) presented with PACG, 1 (1.9%) presented with NVG, and 1 (1.9%) presented with glaucoma secondary to advanced diabetic retinopathy. About two-thirds, 32 (61.5%) of all eyes were diagnosed with the advanced stage before surgery and the average preoperative glaucoma duration of all eyes before surgery was about 5 months. All eyes were at least on one antiglaucoma medication until the surgery day as shown in Table 1.

Demographics of the subjects (n=50)		Frequency	Percentage
Mean age (54.10 ± 13.02):	15 - 40	6	12.0
	41 - 60	32	64.0
	61- 79	12	24.0
Sex:	Male	42	84.0
	Female	8	16.0
Address:	Urban	18	36.0
	Rural	32	64.0
Types of glaucoma:	POAG	41	78.8
	Others	11	21.2
Stages of glaucoma:	Moderate	20	38.5
	Advanced	32	61.5
Preoperative duration of glaucoma:	Up to 5 months	37	71.2
	>5 months	15	28.8
Types of medication:	Xolamol	19	36.5
	Xolamol + Brimonidine	10	19.2
	Xolamol + Latanoprost	19	36.5
	Xolamol + Micropost	2	3.8
	Timolol + Pilocarpine	1	1.9
	Betaxolol	1	1.9

Table 2: Comparison of the preoperative and postoperative clinical status of the eyes that underwent trabeculectomy surgery at MSEHB Nigeria, 2023.

On the last day before surgery, Snellen's mean aided VA of all eyes was 20/60; $0.37 (\pm 0.36)$ with a mean spherical equivalence of $-0.15D (\pm 0.93)$. After six months post-operation, it was changed to 20/60+3; $0.40 (\pm 0.36)$ $p = 0.01$ with a mean spherical equivalence of $-0.08D (\pm 0.91)$, $p = 0.23$. In the same vein, the mean IOP on the last day before surgery was 32.21 mmHg (± 9.78) with a mean CDR of $0.86 (\pm 0.12)$, and it was reduced to 10.58 mmHg (± 4.42), $p = 0.00$ with a mean CDR of $0.87 (\pm 0.12)$, $p = 0.79$.

Parameters	Preoperative	Postoperative	P-value
Aided Visual Acuity	0.37 ± 0.36	0.40 ± 0.36	0.01
Spherical Equivalence	-0.15 ± 0.93	-0.08 ± 0.91	0.23
IOP	32.21 ± 9.78	10.58 ± 4.42	0.00
CDR	0.86 ± 0.12	0.87 ± 0.12	0.79

Table 3: The outcome of trabeculectomy surgeries in terms of stages of glaucoma, preoperative glaucoma control duration as well as with or without operative use of antimetabolite called MMC.

All the trabeculectomy surgeries were successful at six months postoperative follow-up, regardless of moderate or advanced stage preoperatively, the preoperative duration as well as with or without MMC, except in one eye as shown in Table 3.

Stages of glaucoma	Success	Failure
Moderate	19 (36.5%)	1 (1.9%)
Advanced	32 (61.5%)	0
Preoperative duration of glaucoma	Success	Failure
Up to 5 months	37 (71.2%)	0
>5 months	14 (26.9%)	1 (1.9%)
MMC	Success	Failure
With MMC	9 (17.3%)	0
Without MMC	42 (80.8%)	1 (1.9%)

Based on the IOP reduction from preoperative baseline to less than 22mmHg and/or 30% reduction, the complete success rate of trabeculectomy was 47 (90.4%). Qualified success was 4 (7.7%) and failure was 1 (1.9%) as shown in Figure 1.

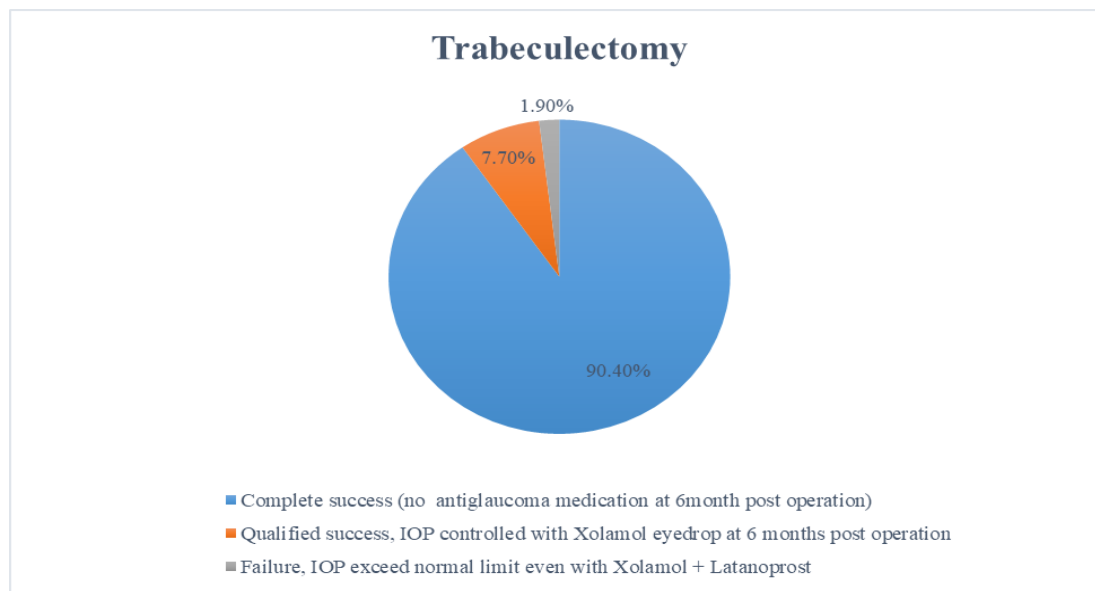


Figure 1. The Outcomes of Trabeculectomy Surgery among Patients at Makkah Specialist Eye Hospital Bauchi Nigeria

4. Discussion

This retrospective study gives an insight into outcomes of trabeculectomy with or without antimetabolite used in northeastern Nigeria. Although the pre and post-operative data collected was just for 52 eyes that have undergone trabeculectomy surgeries and these surgeries recorded were done by one ophthalmic surgeon with expertise in trabeculectomy. Hence, there is no heterogeneity in the techniques regarding the trabeculectomy surgeries done as against what was reported in the previous studies (Lam *et al.*, 2015; Edmunds *et al.*, 2002). Some of the subjects would need eyeball massage to enhance the proper filtration of aqueous humor to the bleb during post-operative follow-up. Otherwise, no manipulation was done to enhance the success rate or desired reduced IOP post-operatively.

Serious complications were not recorded except in one eye with PACG, in that ND-YAG LASER peripheral iridotomy was previously done by an ophthalmologist before trabeculectomy was clinically recommended. Consequently, it resulted in expanded peripheral iridectomy during the trabeculectomy surgery which led to iris prolapse, marked ocular hypotony, and shallow anterior chamber, a day after the surgery, and was managed with topical atropine 1% along with post-operative medications.

In this study, there is about, on average, half a line improvement of Snellen VA post-operatively from the initial pre-operative VA recorded and a complete success rate was recorded in 47 (90.4%) cases as well as qualified success was recorded in 4 (7.7%) at the six months after the surgery, which is quite different or better than the overall success rate from the previous studies done (Anand, Mielke, & Dawda, 2001; Nouri-Mahdavi *et al.*, 1995; AGIS investigators, 2004; Chen, Wilensky, & Viana, 1997; Stavrou, P., & Murray, 1999).

On the contrary, the trabeculectomy failure found in this study was 1 (1.9%), details are in Figure 1.

The reason for the failure was not clear since it was just one eye. But previous studies revealed that doing the procedure on a pseudophakic eye, post-operative encapsulated bleb (Tenon' cyst), the preoperative duration and/or type of pre-operative medication, as well as higher preoperative intraocular pressures were significant risk factors for the failure of Trabeculectomy (Mills, 1981; Borisuth, Phillips & Krupin, 1999).

In the present study, there is no significant difference in the outcome regarding the pre- ($-0.15D \pm 0.93$) and post-operative ($-0.08D \pm 0.91$) spherical equivalence, $p = 0.23$ because the post-operative induced corneal astigmatism was minimal, perhaps due to a moderate superior limbal-top conjunctival closure done on the wound by the surgeon.

More so, the mean IOP was 32.21 ± 9.78 mmHg, and the mean postoperative IOP at six months after surgery was significantly reduced to 10.58 ± 4.42 mmHg, $p=0.00$. Our 6-month post-operative IOP finding is better than the outcome previously reported by different authors at different times with different follow-up periods and populations (Koller, Stürmer, & Gloor, 1998; Baser, Seymenoglu, & Mayali, 2011). At six months after surgery, there was no significant difference in the mean CDR of all eyes (0.87 ± 0.12) when compared to the preoperative mean CDR (0.86 ± 0.12), $p = 0.79$.

In this study, only one eye that was not augmented with MMC during its trabeculectomy surgery failed while others recorded either complete or qualified successful outcomes 6 months post-operative follow-up. Hence, we cannot establish that the trabeculectomy surgery failed because the surgery was done without the MMC as an antimetabolite. We observed that only 9 (17. 3%) trabeculectomies were augmented with MMC because the MMC was not readily available during the period when the surgeries were done. Although, the study conducted among the black West African population, revealed a greater complete (with no medical therapy) postoperatively in the MMC group compared to without MMC group, achieving a significantly higher effect regarding IOP reduction of less than 21 mmHg, $P = 0.02$ (Broadway, & Clark, 2014). The discrepancy between the previous studies compared to this present study may be because this present study is just a short-term 6-month assessment of trabeculectomy outcomes post-operatively while the previous ones were a long-term assessment.

5. Limitations

The limitation of the present study is that it used secondary data from operation theatre records which do not include information about the visual field.

6. Conclusion

Based on the IOP findings, the complete success rate for trabeculectomy was 90.40% which is clinically satisfactory. The mean preoperative VA was improved by about half a line, six months after surgery and there was a significant reduction of IOP from its baseline. These outcomes revolutionize referral/advice of moderate to advanced glaucoma patients for trabeculectomy surgery in our practice as well as assured post-operative reserved vision.

Although, there is a need to explore determinants for trabeculectomy failure and discover more predictors for increased complete success rate, by collecting long-term multicenter data in this regard and follow-up studies on the outcomes of trabeculectomy.

7. Acknowledge

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8. Conflict of Authors

All authors declare that there is no conflict of interest.

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