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Research Article

Pre-Placed Two -Releasable Suture Trabeculectomy : Assessment of Post Operative Need for Suture Removal

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Abstract

The study evaluated the efficacy of 2-releasable-suture trabeculectomy in lowering intraocular pressure (IOP) among patients with Primary Open-Angle Glaucoma (POAG) and Normal-Tension Glaucoma (NTG). It also aimed to assess the need for postoperative suture removal.

Methods: This was a retrospective study of 36 patients with POAG or NTG who underwent trabeculectomy with preplaced 2 releasable. Males were 19/36(52.78%). with a M:F ratio of 5.3 : 4.7 The mean age of participants was 52.8 years ± 13.2 SD. IOP levels were measured preoperatively and at 3, 6, and 12 months postoperatively. Visual acuity outcomes were assessed, and the statistical significance of IOP reduction was analyzed using repeated measures ANOVA. Need for postoperative suture removal was also assessed.

Results: The mean preoperative IOP was 26.31 mmHg, which significantly decreased to 12.23 mmHg at 3 months, 11.71 mmHg at 6 months, and 10.67 mmHg at 1 year ($p = 0.011$). No patients experienced postoperative hypotony (IOP below 5 mmHg). The 2-releasable sutures-technique demonstrated good IOP reduction with no postoperative suture removals, reducing follow-up visits and patient burden in the eye clinics.No cases of total blindness.

Conclusion: The pre-placed 2-releasable suture trabeculectomy effectively lowers IOP in patients with POAG and NTG, with sustained reductions up to 1 year and minimal complications. The technique offers a balance of efficacy and simplicity. Prospective research with larger numbers of patients is recommended.

Introduction

Glaucoma is the most prevalent condition that causes irreversible sight loss among the populace today. The World Health Organization(WHO) gives a prevalence of 8% among causes of blindness in the world [1], 4% in Sub Saharan Africa [2] or 5.02% in Nigeria [3]. It is particularly more virulent among the negroid race. Various ways or methods used to reduce intraocular pressure include medical, surgical and laser therapy. Surgery could be accompanied by adjuvant therapies such as antimetebolites. Shunt devices could also be used [4]. Whatever method used also depend on the individual surgeon's preferences, the stage, type of glaucoma and the response to the IOP (Intra ocular pressure) management. In order to assess the global burden of the disease, a meta-analysis was performed whereby the authors attempted to determine and project rates of glaucoma in 2013 and the number of individuals who would be affected between the years 2020 and 2040 [5,6]. This analysis was performed using information from the World Population Prospects issued by the United Nations(

a population census and demographic surveys based on, and modified for mortality and fertility parameters among others). The study assessed that the global pooled prevalence of glaucoma was 3.54% with 95% Credible Intervals (CrIs) of between 2.09% and 5.82%. The highest burden of Primary Open Angle Glaucoma (POAG) was noticed in Africa where it was 4.20% (2.08-7.35%) and the highest burden of Primary Angle Closure Glaucoma (PAGC) syndrome was also recorded in Asia at 1.26% (0.34-3.30%). Trabeculectomy is still considered the most effective surgical procedure for treating glaucoma and is often performed to lower the intraocular pressure [5,7]. and for a prolonged period of time thus preventing further damage of the optic nerve due to glaucoma.. It is performed by creating a scleral flap and a filtration pocket, also called a conjunctival bleb, which has undergone various modifications over the years [7]. As it became enhanced with releasable sutures for the control of aqueous outflow, and supplemented with sub conjunctival injections of 5-fluorouracil, mitomycin C etc., the scarring of either conjunctiva or tenon's capsule after surgery was minimized for better postoperative results [5,7,8]. There is evidence of the success of this procedure in various cohort studies with many years of follow up, including studies with 5 to 10 year long follow ups [7,9,10]. Komolafe et al in Nigeria showed a qualified success (post op IOP <18mmHg achieved by adjunct topical IOP lowering drugs) rate of 81.8% in terms of intraocular pressure control in a 72 weeks follow up [11]. There has been no prior study on the suture removal requirement for post- operative IOP control in 2 releasable suture trabeculectomies in Africa to the best of the authors' knowledge. This will be the first study in Africa to assess the post- operative suture removal requirement in two releasable suture trabeculectomy. Therefore, this study was carried out in order to assess the effectiveness of 2-releasable suture trabeculectomy in lowering Intraocular Pressure (IOP) and to assess the necessity for postoperative suture removal in 2-releasable suture trabeculectomy for optimal IOP control.

Methodology

Study Site

Study was carried out at the Ophthalmology Department of Ladoke Akintola University of Technology Teaching Hospital in Ogbomoso. Ogbomoso is a semi-urban town in South-West Nigeria with an estimated population of 655,517 [12]. The ophthalmology department in the teaching hospital has the eye clinic and eye theatre with 3 consultant ophthalmologists, ophthalmic nurses, optometrist, and attendants giving services. The hospital serves other neighbouring states.

Study Design

This research is a retrospective study carried out between June 2022 and June 2024. A designed proforma, made up of socio demographics (section A), visual acuity and anterior segment examination (section B), posterior segment examination (section C), Investigations - IOP measurements, Surgery Information (section D) - was used to enter the information extracted from health information records of patients who had undergone trabeculectomy for the treatment of Primary Open Angle Glaucoma (POAG) or Normal Tension Glaucoma (NTG).

Sampling Technique

A total sampling of all patients who fulfilled the inclusion criteria and underwent trabeculectomy was done. The primary objective was to assess the effectiveness of 2-releasable suture trabeculectomy in lowering Intraocular Pressure (IOP) and to assess the necessity for postoperative suture removal in 2-releasable suture trabeculectomy for optimal IOP control.

Study Population

This was made up of a total of 36 patients who underwent trabeculectomy between June 2022 to June 2024. Inclusion criteria -Patients diagnosed as having POAG and NTG of age group 18 years and above, both newly diagnosed and old patients. Patients with poor IOP control inspite of maximum tolerable medical therapy. Only those who fall within these categories who complied with post-operative follow up regimen were studied.

Exclusion criteria - Paediatric age group (less than 18 years)with glaucoma, patients with secondary causes of glaucoma, previous intraocular surgeries, or patients with incomplete postoperative data were excluded.

Data Collection

Preoperative and postoperative clinical data were collected from the patients' medical records, including:

- Age and sex
- Visual Acuity at baseline
- Preoperative IOP (measured in mmHg)
- Postoperative IOP at 3 months, 6 months, and 1 year
- Coexisting ocular pathology (e.g., cataract)
- Operated eye (right or left)

IOP measurements were obtained and normal IOP being 10 – 21mmHg. All surgeries were performed by a single glaucoma surgeon.

Postoperative care included visual acuity check using a Snellen's Chart, slit lamp examination for bleb leakage (Siedel's test), wound healing, functioning of the filtering bleb (bleb morphology), corneal clearity, patency of the peripheral iridectomy and IOP measurement. Need for suture removal was based on IOP

measurement. Patients were followed up at 3 months, 6 months, and 1 year postoperatively, with additional visits as needed. The primary outcome measure was the reduction in IOP from the preoperative baseline to postoperative time points at 3 months, 6 months, and 1 year and need for removal of releasable sutures. Secondary outcome measures included:

- Changes in visual acuity at each follow-up time point
- The presence of any postoperative complications (e.g., hypotony, bleb failure, infection)
- The need for additional glaucoma surgeries or interventions

Statistical Analysis

Descriptive statistics were used to summarize the demographic characteristics and clinical features of the patients. Continuous variables, such as IOP, were reported as means ± standard deviations, while categorical variables, such as sex and age group, were presented as frequencies and percentages. Repeated measures Analysis Of Variance (ANOVA) was used to assess changes in IOP over time, with a significance level set at $p < 0.05$. Post-hoc analyses were performed to identify significant differences between specific time points. Statistical power was also calculated to ensure the robustness of the findings.

Results

Characteristics of Patients

	Freq. (N = 36)	Percent
Sex		
Female	17	47.22
Male	19	52.78
Age at operation		
18-40 years	7	19.44
41-60 years	15	41.67
Above 60 years	14	38.89

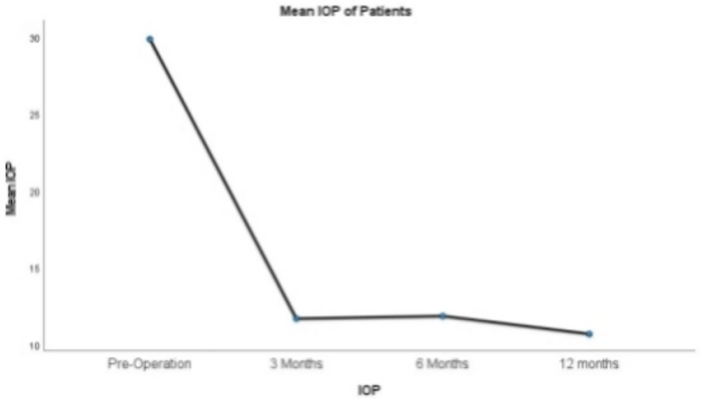
According to the Table 1, A total of 36 patients were included in the study, with male: female being 1.1:1 . The majority of patients were between 41-60 years of age (41.67%).

Table 1: Sex and Age of Respondents.

		N	%
Eye	RIGHT	16	44.4
	LEFT	20	55.6
Type of Glaucoma	NTG	7	19.4
	POAG	29	80.6
Coexisting ocular pathology	CATARACT	8	22.2
	NIL	28	77.8

The ocular pathology of participants primarily involved POAG (80.6%). Majority of the participants (77.8%) did not have any co-existing ocular pathology. See (Table 2-4, Figure1).

Table 2: Ocular Information of Respondents.



The mean preoperative IOP was 26.31mmHg, which was significantly reduced at 3, 6, and 12 months.

Figure 1: Mean Plot showing mean IOP over time.

Measure: IOP						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Observed Power
IOP	1535.667	1.335	1149.986	10.817	0.011*	0.852
Error (IOP)	709.833	6.677	106.312			
a. Computed using alpha = .05						

* Significant at 0.05 level of significance

The reduction in IOP over time was statistically significant, with a power of 0.852, indicating that 2-releasable suture trabeculectomy effectively lowers IOP in POAG and NTG.

Table 3: Tests of Within-Subjects Effects.

	Normal or Near-Normal Vision		Mild Visual Impairment		Moderate Visual Impairment		Severe visual impairment		Blindness	
	(>/=6/12)		(<6/12- 6/18)		(<6/18- 6/60)		(<6/60- 3/60)		(<3/60)	
	N	%	N	%	N	%	N	%	N	%
VA_Preop	12	33.3	6	16.7	4	11.1	14	38.9	0	0
VA_Post_3mths	8	24.2	4	12.1	9	27.3	12	36.4	0	0
VA_Post_6mths	3	17.6	2	11.8	5	29.4	7	41.2	0	0
VA_Post_1yr	1	16.7	1	16.7	2	33.3	2	33.3	0	0
Number of sutures removed postoperatively	0	0	0	0	0	0	0	0	0	0

NB: Definitions of visual impairment(12)

No total blindness was recorded during any of the designated time period and no suture removal was done post- operatively for any patient.

Table 4: Visual Acuity at different time periods and suture(s) removed post operatively.

Discussion

This study appears to be the first of such in literature in Sub Saharan Africa. The importance of releasable suture include the opportunity of further IOP control post operatively by removal of releasable suture(s) as needed. Their age ranged between 23 and 72 years with a mean of 52.8years ± 13.2 SD. There were more men (52.78%). Visual Acuity(VA) showed that there was slow but progressively worsening of vision post operatively which was largely due to development or progression of senile or surgery- related cataract (25% of patients had cataract pre-operatively). There was no wipe- out syndrome in any patient, even those with severe visual impairment preoperatively. The findings indicate that 2-releasable suture trabeculectomy effectively Lowers Intraocular Pressure (IOP) across various time points, which is consistent with its use as a standard procedure for glaucoma management. The findings suggest that age is an independent risk for glaucoma which continues to be a condition primarily affecting middle-aged and older adults, supporting the need for targeted screening and early intervention strategies in these age groups. The number recruited is lower compared to a study conducted by Rong et al [8] where ninety-eight consecutive patients with primary open angle or angle closure glaucoma undergoing primary trabeculectomy were recruited. There is a decrease in IOP after two releasable suture trabeculectomy, which is consistent with the known benefits of this approach namely, the procedure was associated with significant IOP drop from baseline levels to 3 months, 6 months, and 1 year postoperative visits. Emphasis of this decrease is to underline the usefulness of 2-releasable suture trabeculectomy in controlling raised IOP which otherwise is detrimental for glaucomatous optic nerve .This is differed by the result of a study by Rong et al [8] where three level of follow-up rates was used on days 1, 7 and 30 were 100%, 91.8% and 79.4% respectively and the mean IOP in group C was significantly higher than group A at all visits ($p < 0.05$); it was not significantly different from group B.

Although comparisons with 3-releasable suture trabeculectomy are not directly presented in this study, both techniques are effective in lowering IOP, with variations in postoperative outcomes possibly influenced by the number of sutures and individual patient factors. The decision of whether to use 2-releaveable or 3-releaveable sutures may influence the need for suture removal, however, the authors did not find literatures comparing need of post-operative suture removal in 2releasable and 3 releasable suture trabeculectomy for optimal IOP control. No patient had Suture(s) removed post- operatively in this study. Our study did not register any postoperative hypotony – IOP did not decrease below 5 mmHg, which is a positive observation. A study by Kolker et al had 21 eyes (14.4%) who developed shallow anterior chamber and 2 eyes (1.4%) with flat anterior chamber after they had the 2 releasable sutures removed [4]. In this regard, 2-releasable suture trabeculectomy (with preplaced releasable sutures), when performed scrupulously, is likely to be associated with a lower rate of hypotony. Nevertheless, a more meaningful comparison can be provided in the future, regarding the rate of hypotony in 2-releasable and 3-releasable suture trabeculectomy, as such rates need further investigations. The considerable reduction in IOP recorded using the 2-releasable suture technique in this study is in agreement with findings by Duman et al. [13] who reported that IOP reduction is the same with different techniques including the use of releasable sutures. Duman et al. stated that the efficacy of all techniques at IOP reduction was the same, however this study proposes that whereas further IOP control is not achievable with permanent sutures, 2-releasable suture trabeculectomy still offers the opportunity to further control the IOP post operatively.

The review and meta-analysis by Zhou et al. [9] concludes that IOP after trabeculectomy with releasable sutures is lower (but not significantly) than that in case of no releasable sutures. According to Zhou et al., the reduction in IOP achieved using techniques with releasable sutures, as compared to the techniques without such sutures, was not significant, but the application of pre-placed releasable sutures reduced the occurrence of post-operative hypotony. This finding is consistent with the results of the present study whereby IOP was continuously decreased using the technique without excessively low figures, especially the 2-releasable suture technique. At the level of suture removal and clinic hour demand, the current study established that there was lower suture removal requirement with the pre- placed 2-releasable suture technique. Patients seeking clinic assistance due to needing suture removal will prolong clinic hours and more repeated visits may be required. This outcome is in agreement with the assertions of de Barros et al [9] who claimed that releasable sutures extend the ability to avoid more complex procedures like laser suture lysis by allowing postoperative adjustment of the suture tension. The fewer clinic visits required for suture removal in the 2-releasable suture group suggests that it may be a more resource-efficient technique for the patients and health care systems in general, especially in places that do not support frequent follow ups. The lower occurrence of hypotony in the pre-placed 2-releasable suture is in line with the evidence from Zhou et al., [9] who demonstrated that trabeculectomies conducted using releasable sutures had lower incidences of hypotony than those performed using non-releasable sutures. In Zhou's metanalysis, relative risks figures of 4.04 and 2.57 stress the critical role of releasable sutures in the control of the intraocular pressure while preventing hypotony. The 2-releasable technique avoids the inconveniences and dangers of more complex suture patterns found in studies like those of Duman et al. [13] or de Barros et al. [10] but produces comparable IOP levels. As the treatments that focus on reducing IOP emerge, visual impairment can be limited and complications reduced [7].

Conclusion

The pre-placed 2-releasable suture trabeculectomy is an effective surgery in Intraocular Pressure (IOP) management in cases of Primary Open Angle Glaucoma (POAG) and Normal Tension Glaucoma (NTG) with proven long-term effects on IOP lowering success rates. The method mostly does not require post-operative suture removal frequently, thereby reducing the overall burden to the patients, health care providers and eye care system. Notwithstanding, there is a need for more research on largers number of patients or eyes using the 2-releasable technique. There is also need for longitudinal studies comparing frequency of need for postoperative suture removal to achieve optimal IOP control in 2-releasable and 3-releasable suture trabeculectomies.

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