Original Article

Retinal nerve fiber layer (RNFL) thickness before and after trabeculectomy in primary open angle glaucoma

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ABSTRACT

Background

Primary open-angle glaucoma (POAG) is a leading cause of irreversible blindness, characterized by progressive optic neuropathy and retinal nerve fiber layer (RNFL) thinning. Trabeculectomy, a common surgical intervention to lower intraocular pressure (IOP), aims to slow disease progression. Evaluating RNFL thickness before and after trabeculectomy using OCT is crucial to understanding the surgery's impact on optic nerve health.

Aim

This study aims to assess the RNFL thickness in primary open-angle glaucoma (POAG) before and one month after trabeculectomy surgery using optical coherence tomography (SD-OCT).

Method

A group of patients aged 40-60 years who attended the Department of Ophthalmology at Bangladesh Medical University and were diagnosed with POAG comprised this prospective observational pre–post study's patients. 20 eyes of 20 patients were selected for the study group. The study duration was one year. A complete clinical evaluation was conducted, including intraocular pressure (IOP) measurement before and one month after surgery. Optical coherence tomography (OCT) RNFL was performed preoperatively and postoperatively in the ophthalmology department. Statistical analysis of the results was conducted using computer-based software, SPSS 22. A probability 'P' value of 0.05 or less was considered significant.

Results

It was observed that most of the patients (90%) belonged to the age group of 51–60 years, mean age was 57.1±4.12 years. More than half of the study patients were male (55.0%), while 45.0% were female. In terms of glaucoma severity, 60.0% had severe glaucoma, remaining had mild and moderate glaucoma. The mean preoperative intraocular pressure (IOP) was 18.9±3.73 mmHg, while the mean postoperative IOP was 14.2±2.1 mmHg. A significant ($p<0.05$) reduction in IOP was observed postoperatively compared to the preoperative period. Regarding retinal nerve fiber layer (RNFL) thickness, the superior RNFL thickness was 75.2±23.7 preoperatively and 81.6±25.29 postoperatively. The mean overall RNFL thickness was 60.65±10.34 preoperatively and 63.85±12.74 postoperatively. A significant (<0.05) increase was observed in superior and mean RNFL thickness postoperatively compared to the preoperative period. But in other quadrants, there were changes in RNFL thickness, but the changes weren't statistically significant (>0.05).

Conclusion

This study assessed RNFL thickness changes before and after trabeculectomy in primary open-angle glaucoma. A significant reduction in IOP was observed postoperatively. Superior and mean RNFL thickness increased notably, while inferior, nasal, and temporal regions showed mild changes.

Keywords

Retinal nerve fiber layer thickness (RNFL), trabeculectomy, primary open-angle glaucoma (POAG), intraocular pressure, optic nerve, optical coherence tomography

INTRODUCTION

Glaucoma is a progressive optic neuropathy characterized by irreversible damage to the optic nerve, leading to visual loss and potential blindness. [1] The optic nerve head is the primary site of glaucomatous damage and is characterized by clinically detectable tissue loss in RNFL.[2,3] It primarily includes primary open-angle glaucoma and angle-closure glaucoma.[4]

The global prevalence of glaucoma is estimated at 3.5% among individuals aged 40 to 80 years, with projections indicating that the number of affected individuals will increase from 76.0 million in 2020 to 111.8 million by 2040.[5]

Primary Open-angle glaucoma (POAG) is a chronic and progressive optic neuropathy that is distinguished by an open anterior chamber angle, characteristic alterations in the optic nerve head, thinning of the retinal nerve fiber layer, and a gradual decline in peripheral vision.[6,7] It is primarily associated with elevated intraocular pressure (IOP), although some cases occur with normal IOP, highlighting the involvement of

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vascular and neurodegenerative mechanisms.[8]

The worldwide prevalence of POAG accounts for 8% of all blindness.[9] Among those diagnosed, primary open-angle glaucoma (POAG) accounts for 74% of cases, with nearly 80% of glaucoma cases in the United States classified as POAG. The global prevalence of all forms of glaucoma is expected to increase.[7] In Bangladesh, POAG is also a growing concern. A population-based study found that the prevalence of glaucoma in individuals aged 35 and above is 3.2%, with POAG accounting for approximately 78% of all glaucoma cases.[8] Another study in a tertiary hospital in Bangladesh reported that POAG constitutes around 32% of all glaucoma cases diagnosed.[10] Early diagnosis and management are crucial in preventing vision loss and reducing the socioeconomic burden associated with POAG.

The pathogenesis of POAG includes mechanosensitive ion channel dysfunction, oxidative stress, retinal ganglionic cell degeneration, and impaired axonal transport at the optic nerve head leading to irreversible vision loss.[11,12] Genetic susceptibility plays a crucial role, with mutations in genes such as MYOC and OPTN being linked to familial cases.[13] Elevated intraocular pressure (IOP) remains the most significant risk factor, contributing to mechanical stress and vascular dysfunction within the optic nerve head.[14] Recent studies suggest that decreased choroidal blood flow and neurotrophic factor deficiency contribute to disease progression, emphasizing the need for early diagnosis and effective management strategies.[8]

POAG is considered a heritable and polygenic disease.[12] It has multiple contributing factors including elevated intraocular pressure (IOP), genetic predisposition, age, ethnicity, and vascular dysfunction.[15,16] Increased IOP remains a significant risk factor as it contributes to optic nerve damage, leading to progressive vision loss.[13] Vascular risk factors, mainly HTN and blood pressure dipping, play an important role in the pathogenesis and progression of glaucoma.[17]

Retinal nerve fiber layer (RNFL) thickness is a critical biomarker for evaluating glaucoma progression, as it reflects the structural integrity of retinal ganglion cell axons.[18] Retinal nerve fiber layer (RNFL) thickness measurement using optical coherence tomography (OCT) is a critical tool in glaucoma diagnosis and monitoring.[19] It is the common non-invasive tool used in the diagnosis of glaucoma.[20] OCT enables high-resolution, cross-sectional imaging of the retina, allowing early detection of structural damage before significant visual field loss occurs.[15] The precision of OCT in segmenting and quantifying RNFL thickness provides valuable insights into disease progression and treatment efficacy.[21]

Trabeculectomy is a gold-standard surgical procedure for reducing intraocular pressure (IOP) in glaucoma patients by creating a drainage channel to allow aqueous humor outflow thereby preventing optic nerve damage.[22] By lowering IOP it causes slowing down apoptosis of retinal ganglionic cells and halt glaucoma progression.[23] It's a common approach to glaucoma treatment when not controlled by conservative measures.[24]

Reduction in intraocular pressure (IOP) post-surgery significantly impacts the optic nerve head (ONH) and retinal nerve fiber layer (RNFL), often leading to structural and functional improvement.[25] Lower IOP mitigates mechanical stress, reducing ONH deformation and preserving capillary density, which is crucial for maintaining visual function.[26] Additionally, RNFL thinning stabilizes, potentially slowing glaucoma progression.[27]

Trabeculectomy significantly influences retinal nerve fiber layer (RNFL) thickness over time, with early post-surgical reductions in intraocular pressure (IOP) stabilizing RNFL integrity.[28] Long-term RNFL preservation may be influenced by surgical techniques, adjunctive treatments, and patient-specific factors.[29]

Variability in retinal nerve fiber layer (RNFL) changes post-surgery includes initial thickening due to rapid intraocular pressure (IOP) reduction, followed by long-term revert to preoperative stage.[25] Understanding this variability is essential for refining post-surgical monitoring and optimizing glaucoma management.[30] These insights can guide clinical decision-making, ensuring personalized treatment strategies to balance IOP control with RNFL integrity.[31]

Evaluation of retinal nerve fiber layer (RNFL) thickness before and after trabeculectomy and assessing structural changes over time. Additionally, it seeks to analyze the correlation between intraocular pressure (IOP) reduction and RNFL alterations to determine the impact of surgical intervention on neuroretinal integrity.

MATERIALS AND METHODS

For this prospective observational pre–post study, 20 eyes of 20 patients were recruited from the Institute of Bangladesh Medical University (BMU), Department of

Ophthalmology, from December 2023 to November 2024.

Diagnosed cases of POAG with medication undergoing trabeculectomy, aged 40-60 years of both sexes were included but patients having other ocular comorbidities affecting the optic nerve head, previous ocular surgery, trauma, and significant media opacities were excluded from the study sample.

Complete clinical evaluations include history, physical examination, relevant ocular examinations, fundus examination, and some special ocular examinations, like IOP, visual field analysis, and gonioscopy were done.

Slit lamp examination of the anterior segment.

The fundus examination was done with the help of a +90D condensing lens.

IOP was measured by a Goldman applanation tonometer.

Angle assessment (by Sussman Four Mirror Gonioscope) was done under low ambient illumination.

The study participants were selected for trabeculectomy, and surgery was done by single surgeon, all patients were treated postoperatively with moxifloxacin 0.5% eye drop and difluprednate 0.05% eye drop. Postoperative measurement of RNFL thickness was conducted using OCT at one month by a trained technician in the Department of Ophthalmology, BMU. The selection of this timepoint was informed by previous research indicating that the one-month postoperative period represents a critical window for detecting early structural changes resulting from IOP reduction. For example, Abo Zeid et al. reported a significant increase in mean RNFL thickness from 60.7±13.9 µm preoperatively to 71.9±14.3 µm at one month following trabeculectomy [15], confirming that clinically meaningful changes in optic nerve head morphology are observable within this timeframe.

Both eyes of each participant were dilated with tropicamide 1% eye drop 10 -15 minutes before OCT scanning by NIDEK RS 330 (software version 1.6.0.0.).

Statistical analysis of the results was done by using computer-based software, SPSS 22 (SPSS Inc, Chicago, IL, USA)

The paired t-test was used to see the difference in RNFL thickness with IOP before and after trabeculectomy.

A probability P value of 0.05 or less was considered as significant.

Ethical Considerations

Prior approval regarding the research protocol was taken from the IRB of BMU before the commencement of this study. All information collected in this study was kept strictly confidential, except as may be required by law. All the investigations & procedures used in this research study were strictly supervised by supervisor, reviewed periodically (after every 05 patients) & stored with a confidential code.

RESULTS

Table I: Distribution of the study patients according to demographic information (n=20)

Demographic information	Number of study patients	Percentage (%)
Age (in years)		
41-50	2	10.0
51-60	18	90.0
Mean±SD	57.1±4.12	
Range(min-max)	48,60	

Table I shows the distribution of the study patients according to demographic information. It was observed that the majority (90.0%) population belonged to age 51-60 years and 2(10.0%) 41-50 years. The mean age was 57.1±4.12 years with ranged from 48 to 60 years.

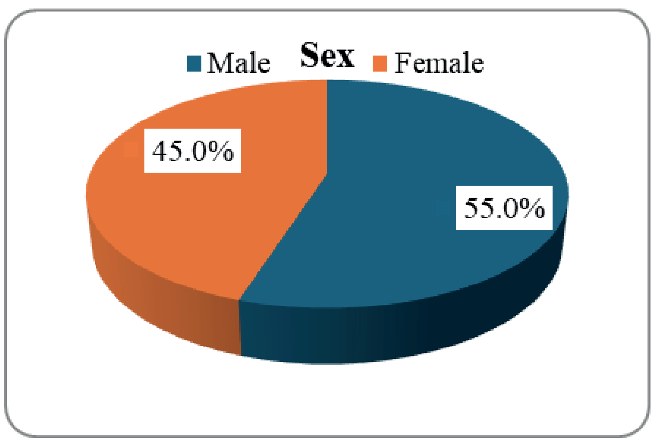

Figure 1: Pie chart shows the sex of study patients More than half (55.0%) of the study patients were male and (45.0%) were female.

Table II: Distribution of the study patients according to BCVA (n=20)

BCVA	Number of study patients	Percentage (%)
0	2	10.0
0.18	9	45.0
0.3	7	35.0
0.48	1	5.0
0.78	1	5.0
Mean±SD	0.2±0.17	
Range (min, max)	0,0.78	

Table II shows the distribution of the study patients according to BCVA. It was observed that almost half (45.0%) of the study population BCVA had found 0.18, 7(35.0%) 0.3, 2(10.0%) 0, 1(5.0%) 0.48 and 1(4.0%) 0.78. The mean BCVA was 0.2±0.17 ranging from 0 to 0.78.

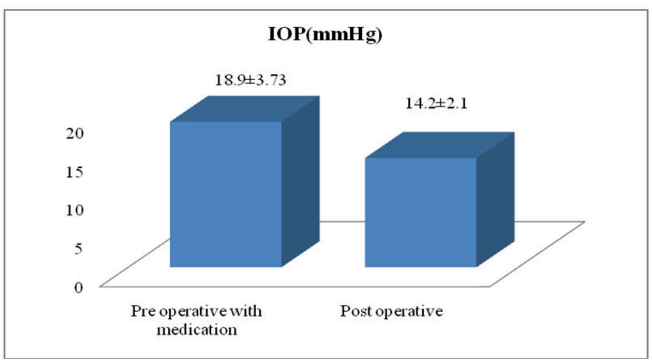

Figure 2: Bar diagram shows the IOP level of study patients

Figure 2 shows the distribution of the study patients according to IOP. The mean pre-operative IOP was 18.9±3.73 mmHg with ranging from 10 to 24 mmHg. The mean post-operative IOP was 14.2±2.1 mmHg with ranging from 10 to 18 mmHg. The mean IOP level significantly declined in the postoperative period compared to the preoperative period.

Table III: Distribution of the study patients according to VCDR (n=20)

VCDR	Number of study patients	Percentage (%)
0.6	4	20.0
0.7	1	5.0
0.8	7	35.0
0.9	8	40.0
Mean±SD	0.8±0.12	
Range (min, max)	0.6,0.9	

Table III shows the distribution of the study patients according to VCDR. It was observed that more than one third (40.0%) population VCDR had 0.9, 7(35.0%) 0.8, 4(20.0%) 0.6, and 1(5.0%) 0.7. The mean VCDR was 0.8±0.12 with ranged from 0.6 to 0.9.

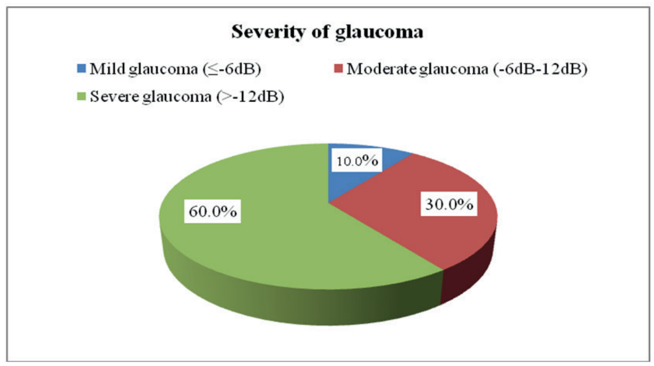

Figure 3: Pie chart shows the severity of glaucoma

Figure 3 shows the distribution of the study patients according to MD. It was observed that almost two thirds (60.0%) patients had severe glaucoma, 6(30.0%) moderate glaucoma, and 2 (10.0%) mild glaucoma. The mean MD was 16.5±9.01 dB ranging from -3.6 to -31.54 db.

Figure 4 shows the distribution of the study patients according to RNFL thickness. The mean inferior RNFL thickness was 67.95±13.82 in pre-operative and 65.2±15.86 post-operative. The mean superior RNFL thickness was 75.2±23.7 in pre-operative and 81.6±25.29 post-operative. The mean nasal RNFL thickness was 50.05±10.59 in pre-operative

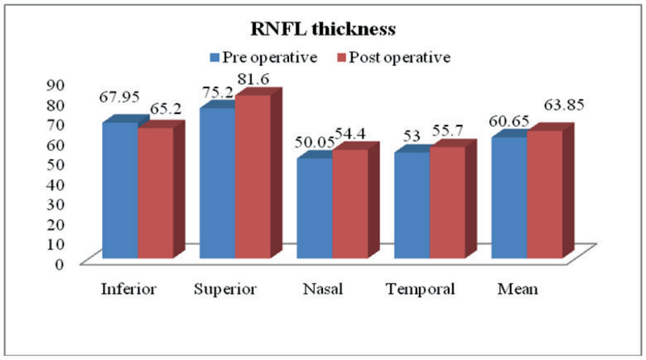

Figure 4: Bar diagram shows the change in RNFL thickness

and 54.4±12.88 post-operative. The mean temporal RNFL thickness was 53±13.71 in pre-operative and 55.7±10.94 post-operative. The mean RNFL thickness was 60.65±10.34 in pre-operative and 63.85±12.74 post-operative. Superior and mean RNFL thickness levels were significantly increased during the postoperative period compared to the preoperative period.

Table IV: Relation of RNFL thickness with severity of glaucoma (n=20)

RNFL thickness	n	Pre-operative	Post-operative	*P*-value
		Mean±SD	Mean±SD	
Mean				
Mild glaucoma	2	66.5±12.02	69±4.24	0.728ns
Moderate glaucoma	6	66.33±10.01	71.17±13.24	0.139ns
Severe glaucoma	12	56.83±9.28	59.33±11.94	0.242ns

ns=not significant

P value reached from Paired t-test

In mild glaucoma cases, 2 (10%) patients had a preoperative RNFL thickness of 66.5±12.02 µm, which increased to 69±4.24 µm postoperatively (P=0.728, ns). Among 6 (30%) patients with moderate glaucoma, the mean RNFL thickness was 66.33±10.01 µm preoperatively and 71.17±13.24 µm postoperatively (P=0.139, ns). In 12 (60%) patients with severe glaucoma, the mean RNFL thickness improved from 56.83±9.28 µm to 59.33±11.94 µm after surgery (P=0.242, ns). Despite an observed increase in RNFL thickness postoperatively in all severity groups, the changes were not statistically significant (P>0.05).

DISCUSSION

Trabeculectomy has been shown to influence RNFL thickness, particularly in the inferior and superior quadrants. Changes in RNFL thickness may result from transient edema or relief of mechanical stress following intraocular pressure reduction. The procedure is associated with early postoperative fluctuations, followed by stabilization over time.[23] The nasal and temporal quadrants exhibit minimal variation, suggesting that trabeculectomy has a localized impact on certain retinal areas. Structural changes in RNFL thickness postoperatively highlight the importance of monitoring glaucoma progression. Trabeculectomy remains a key intervention in reducing intraocular pressure and preserving optic nerve function, though long-term effects on RNFL require further evaluation.

The present analysis revealed that the majority (90.0%) of the study patients belonged to the 51-60 years age group, with a mean age of 57.1±4.12 years, ranging from 41 to 60 years. Comparatively, [31] reported a lower mean age of 51.83±16.24 years. Similarly, [33] found a mean age of 54.47±5.38 years in the trabeculectomy group and 55.80±6.94 years in the medication group. [32]reported a mean age of 53.93±13.92 years. These findings indicate that the mean age in the present study is relatively higher than in the referenced studies, suggesting an increased prevalence of primary open-angle glaucoma among older individuals.

The study patients exhibited a higher proportion of males (55.0%) compared to females (45.0%). This aligns with findings from[18] who reported a male predominance (66.9%) in primary open-angle glaucoma (POAG) cases, emphasizing potential gender-related susceptibility factors. Similar trends were observed by[34] who noted a higher prevalence of POAG in males aged 45–60 years.

The present analysis found that the mean BCVA was 0.2±0.17, ranging from 0 to 0.78. Nearly half (45.0%) of the study population had a BCVA of 0.18, followed by 35.0% with 0.3, while lower percentages were found for BCVA values of 0, 0.48, and 0.78. [30]also measured BCVA in glaucoma patients undergoing trabeculectomy, recording values using LOGMAR. Their study emphasized comprehensive ophthalmic evaluation, including BCVA assessment before and after surgery. The present findings indicate a wide variability in BCVA, which may be attributed to the different stages of glaucoma progression among patients. The lower BCVA values observed in some individuals could suggest advanced glaucomatous damage, while higher values may indicate cases with better-preserved visual function.

The present analysis revealed a significant reduction in intraocular pressure (IOP) following trabeculectomy, with the mean preoperative IOP recorded at 18.9±3.73 mmHg and the mean postoperative IOP at 14.2±2.1 mmHg ($p<0.05$). This decline is consistent with findings reported by[26] who observed a greater IOP reduction, from a preoperative mean of 28.55±8.47 mmHg to 14.8±5.97 mmHg at three months postoperatively. Similarly, [25]reported a preoperative IOP of 30.23±9.02 mmHg, which significantly decreased to 9.52±2.42 mmHg at one week, 12.35±4.59 mmHg at one month, and 13.6±2.31 mmHg at three months. The IOP reduction in the present study, though significant, appears to be lower in magnitude, possibly due to variations in baseline IOP, surgical techniques, or population characteristics. Nevertheless, these findings reinforce the effectiveness of trabeculectomy in achieving sustained IOP control in primary open-angle glaucoma.

The findings indicate that a significant proportion of study patients exhibited a vertical cup-to-disc ratio (VCDR) of 0.9 (40.0%), followed by 0.8 (35.0%), 0.6 (20.0%), and 0.7 (5.0%). The mean VCDR was 0.8±0.12, with a range of 0.6 to 0.9. This aligns with prior studies demonstrating an association between elevated VCDR and glaucomatous optic neuropathy. [35]reported that VCDR correlates with visual field defects.

The present analysis indicated that 60.0% of the study patients had severe glaucoma, 30.0% had moderate glaucoma, and only 10.0% had mild glaucoma. The mean deviation (MD) was recorded at 16.5±9.01 dB, ranging from 3.6 to 31.54 dB. The high percentage of severe glaucoma cases suggests that many patients seek treatment at an advanced stage, which may be attributed to delayed diagnosis or a higher level of deprivation and lack of awareness regarding early disease symptoms.[36] The variation in MD values reflects differing levels of glaucomatous damage among patients, with more negative MD values indicating greater visual field loss. [36] The earlier stage of glaucoma intervention is related to the reversal of ONH cupping.[25] Trabeculectomy, by lowering intraocular pressure, aims to slow down further visual field deterioration, highlighting its role as a crucial surgical approach in managing advanced primary open-angle glaucoma.

The present analysis demonstrated that the inferior RNFL thickness was 67.95±13.82 µm preoperatively and 65.2±15.86 µm postoperatively, with no statistically significant increase observed postoperatively ($p>0.05$). [21] reported a similar trend, where the mean inferior quadrant thickness was 63.3±8.978 µm preoperatively and increased significantly to 69.48±9.002 µm at one week postoperatively ($p=0.000$). Compared to the present findings, the early increase in inferior RNFL thickness in the referenced study might be attributed to transient postoperative edema, which subsequently stabilized.

The present analysis demonstrated a significant increase in superior RNFL thickness following trabeculectomy, with the mean preoperative thickness at 75.2±23.7 µm and postoperative thickness at 81.6±25.29 µm ($p<0.05$). This finding aligns with[15] who reported a superior quadrant mean RNFL thickness of 61.60±15.80 µm preoperatively, increasing to 71.50±18.10 µm ($p=0.001$) at one month postoperatively. [3] show a significant increase in RNFL thickness from 85.8±25.1 µm to six months postoperatively 96.7±23.2 µm ($p=0.0210$. While both studies observed a significant increase in superior RNFL thickness postoperatively, the magnitude of change in the present study appears more pronounced. This could be attributed to differences in baseline RNFL values, and surgical techniques.

The present analysis indicated that the mean nasal RNFL thickness increased from 50.05±10.59 µm preoperatively to 54.4±12.88 µm postoperatively; however, this increase was not statistically significant ($p>0.05$). [24] also reported a similar trend, with the mean nasal quadrant thickness measuring 61.41±15.88 µm preoperatively and increasing to 62.86±15.25 µm at one month postoperatively ($p=0.45$). While both studies observed a postoperative increase in nasal RNFL thickness, the lack of statistical significance suggests that trabeculectomy does not induce major structural changes in this quadrant. Differences in baseline RNFL thickness and follow-up duration could explain the variations in postoperative measurements.

The present analysis demonstrated that the mean temporal RNFL thickness increased from 53±13.71 µm preoperatively to 55.7±10.94 µm postoperatively, but this increase was not statistically significant (p>0.05). [21] reported similar findings, with a mean temporal RNFL thickness of 50.81±9.915 µm preoperatively and a slight increase to 51.85±10.117 µm at three months postoperatively (p=1.000). Both studies indicate that trabeculectomy does not significantly impact the temporal quadrant, possibly due to its relatively lower susceptibility to glaucomatous damage compared to the superior and inferior quadrants. The observed numerical increase in temporal RNFL thickness may be attributed to transient postoperative changes, such as mild edema or reduced mechanical compression of nerve fibers following intraocular pressure reduction.

The present analysis revealed a significant increase in mean RNFL thickness following trabeculectomy, with values rising from 60.65±10.34 µm preoperatively to 63.85±12.74 µm postoperatively (p<0.05). This finding aligns with[30] ,who reported an increase in mean RNFL thickness from 52.56±17.40 µm preoperatively to 58.48±20.20 µm postoperatively (p<0.0001). Both studies indicate that trabeculectomy contributes to RNFL thickening, potentially due to reduced mechanical stress on retinal nerve fibers following intraocular pressure reduction.

Regarding the relation of RNFL thickness with severity of glaucoma in this study it was observed that mild cases, comprising 10%, exhibited a preoperative RNFL thickness of 66.5±12.02 µm, increasing to 69±4.24 µm postoperatively (P=0.728, ns). Among 30% with moderate glaucoma, RNFL thickness rose from 66.33±10.01 µm to 71.17±13.24 µm post-surgery (P=0.139, ns). In 60% with severe glaucoma, RNFL thickness improved from 56.83±9.28 µm to 59.33±11.94 µm postoperatively (P=0.242, ns). Despite these observed increases, the changes were not statistically significant (P>0.05), suggesting trabeculectomy did not significantly enhance RNFL thickness within the study period. Similar findings were reported by[23], who observed a significant RNFL thickness reduction from 67.8±2.6 µm to 62.9±2.6 µm at 12 months post-trabeculectomy (P<0.01), indicating continued RNFL thinning despite effective intraocular pressure reduction.

CONCLUSION

This study evaluated changes in retinal nerve fiber layer (RNFL) thickness before and after trabeculectomy in patients with primary open-angle glaucoma. Superior and mean RNFL thickness showed a significant increase after surgery, while inferior, nasal, and temporal RNFL thickness exhibited mild changes. The results suggest that trabeculectomy effectively reduces IOP and may contribute to structural changes in RNFL thickness.

LIMITATIONS

Although this study can offer helpful information about the initial changes in the structure of the retinal nerve fiber layer (RNFL) after trabeculectomy, one has to admit a number of limitations when explaining the findings. The greatest weakness is that the postoperative follow-up was only one month long, not enough time to evaluate the long-term trend in RNFL thickness, but sufficient to determine the immediate postoperative changes in the optic nerve cupping or the short-lived appearance of RNFL edema following rapid intraocular pressure drop in glaucoma patients in chronic and progressive disease. Lack of data at 3, 6 and 12 months after surgery does not allow specifying whether the observed RNFL thickness improvement could be permanent architectural change or a temporary effect since earlier studies have established that early postoperative swelling progression may be succeeded by a plateau phase or gradual loss of the effect to baseline values by the end of the edema process and eye acclimatization to the new IOP case. Moreover, the short duration of follow-up does not allow us to match the results of early structural changes in the RNFL with functional visual outcomes because progression in visual fields typically takes months to years, and it is out of the question to infer that the one-month rapid RNFL thickening can be converted into retained visual performance unless the visual fields are measured at later-time points as well. It further restricts the picture of the disease trajectory with the optic nerve head undergoing continuous remodelling, so that the absence of intermediate and late follow-up points can rule out the possibility of late-onset thinning that might indicate continuing glaucomatous damage despite successful IOP reduction. Thus, such findings can mainly be applied to the first postoperative stage and cannot be projected onto the long-term patient care when the clinicians will need longitudinal information on the evolution of RNFL to be able to make effective judgments about the success of the surgery and the necessity of other interventions.

RECOMMENDATIONS

To overcome these limitations, we reiterate our proposed future multicentric research (with a longer follow-up period of 3, 6, and 12 months) and larger sample size in our paper. This is needed so that the long-term effects of trabeculectomy on RNFL integrity, as well as its association with functional visual outcomes, can be completely explained.

CONFLICTS OF INTEREST

All the authors declare no conflict of interest.

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