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# HAZARDS OF MEDICAL GLAUCOMA THERAPY IN THE CATARACT PATIENT

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## ABSTRACT

### Background
Cataracts and glaucoma are major causes of vision impairment worldwide, particularly among seniors. These disorders often coexist due to risk factors like aging and ocular hypertension. Anti-glaucoma medications are the main way to lower intraocular pressure (IOP), but prolonged use can damage the ocular surface, lens, and tissues, which can complicate cataract formation, progression, and surgery.
**Objective:** Examine the impact of long-term medical glaucoma treatment on cataract surgery outcomes, including preoperative status, intraoperative difficulty, and postoperative outcomes.

### Methods
A total of 97 individuals with age-related cataracts and a history of chronic medical glaucoma therapy (≥6 months) were included. The eye exam included visual acuity, slit-lamp biomicroscopy, fundus evaluation, intraocular pressure measurement, gonioscopy, and ocular surface analysis. The classification, quantity, and duration of anti-glaucoma drugs were recorded. Intraoperative and postoperative issues occurred during phacoemulsification or SICS, as well as visual recovery.

### Results
58.8% of 97 patients received multiple anti-glaucoma medications, with 76.3% receiving treatment for over 12 months. Ocular changes included conjunctival hyperemia (47.4%), superficial punctate keratitis (28.9%), pseudoexfoliation (25.8%), and lens subluxation (11.3%). In the procedure, 19.5% had inadequate pupillary dilatation, 12.4% had zonular weakness, and 8.2% needed capsular tension rings. Postoperative inflammation and delayed epithelial repair were more common in multi-drug users. Despite significant BCVA improvement for most patients, 13.4% had inadequate recovery due to pre-existing optic nerve injury and surgical issues.

### Conclusion
Long-term glaucoma treatment, particularly with multiple drugs, can harm ocular tissues and complicate cataract surgery. Conjunctiva, lens capsule, corneal epithelium, and zonular apparatus changes may increase surgical risk and postoperative recovery. These risks must be identified early for preoperative planning and patient consultation. Ophthalmologists must weigh the risks and benefits of prolonged topical anti-glaucoma treatment for cataract patients with glaucoma.

***Keywords:*** *Glaucoma, cataract, Anti-glaucoma drugs, Phacoemulsification, Ocular surface disease, Zonular weakness, visual outcome.*
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## INTRODUCTION

Cataracts and glaucoma are among the most common eye illnesses globally and are primary contributors to vision impairment, particularly in the elderly population. Their co-occurrence is rather frequent, largely because of common demographic and physiological risk factors, including advanced age, chronic systemic disease, and increased intraocular pressure (IOP) (Quigley & Broman, 2006; Tham et al., 2014). Cataracts result in gradual lens opacification and visual distortion, but glaucoma is a chronic optic neuropathy marked by optic disc cupping and visual field deterioration, typically insidious and irreversible. The simultaneous presence of these two diseases presents diagnostic and treatment difficulties for ophthalmologists (Weinreb et al., 2014).

The cornerstone of glaucoma management continues to be pharmacological treatment with topical anti-glaucoma medications (AGDs), designed to lower intraocular pressure (IOP) and avert more optic nerve injury. The drugs comprise prostaglandin analogues, beta-blockers, alpha-agonists, and carbonic anhydrase inhibitors, utilized individually or in conjunction (Kapetanakis et al., 2016). Despite the established efficacy of these medications in intraocular pressure management, prolonged usage correlates with considerable alterations in the ocular surface, conjunctival inflammation, lens modifications, and zonular instability, potentially compromising cataract development, surgical safety, and postoperative recovery (Brandt et al., 2001; Baudouin et al., 2010; Arita et al., 2015).

Extended topical treatment can lead to various ocular surface illnesses known as ocular surface disease (OSD), characterized by conjunctival hyperemia, punctate keratitis, tear film instability, and symptoms of dry eye (Baudouin et al., 2010; Steven et al., 2018). These alterations are frequently ascribed to the preservatives, particularly benzalkonium chloride (BAK), utilized in eye drops, which induce cumulative damage over time (Noecker et al., 2004). Pseudoexfoliation syndrome, commonly seen in chronic glaucoma patients, is linked to inadequate pupillary dilation and zonular weakness, complicating cataract extraction and heightening the risk of capsular complications (Schlötzer-Schrehardt & Naumann, 2006; Shingleton et al., 2008).

Moreover, anti-glaucoma medications can influence lens metabolism, hastening opacification and altering the texture of the lens capsule (Iwase et al., 2013). This may jeopardize the capsulorhexis phase during phacoemulsification and elevate the risk of posterior capsular rupture or intraoperative zonular dialysis. Patients undergoing prolonged combination therapy frequently exhibit inadequate mydriasis, conjunctival inflammation, and corneal epithelial abnormalities, all of which exacerbate intraoperative and postoperative morbidity (Pillunat et al., 2020; Chua et al., 2016).

From a visual result standpoint, although cataract surgery often enhances vision, patients with severe glaucomatous optic neuropathy may exhibit restricted potential for improvement. Furthermore, postoperative elevations in intraocular pressure, inflammation, and delayed epithelial repair may adversely affect results, particularly in patients with compromised preoperative tear film or corneal health (Inoue et al., 2011; Belhassen et al., 2016).

Considering these difficulties, it is essential to detect and assess the risks associated with prolonged medical glaucoma treatment in patients with concurrent cataracts. Comprehending these hazards can enhance preoperative preparation, surgical readiness, and patient consultation. Although there is an increasing amount of research emphasizing individual issues, limited prospective studies thoroughly evaluate the aggregate impact of chronic AGD use on cataract surgery results, especially within the Indian tertiary care framework.

This study was conducted to carefully examine the ocular issues linked to medical glaucoma treatment in cataract patients and assess its influence on intraoperative difficulties and postoperative recovery. The results intend to assist clinicians in refining surgical approaches and weighing the risks and advantages of extended glaucoma treatment in patients preparing for cataract surgery.

## MATERIALS AND METHODS

### Research Design and Context

This prospective observational study was performed in the Department of Ophthalmology at Jawahar Lal Nehru Medical College and Hospital, Bhagalpur, Bihar. The study lasted 11 months, subsequent to approval by the Institutional Ethics Committee. All patients were enrolled upon the acquisition of written informed consent in their native language.

### Study Cohort

The study comprised 97 patients diagnosed with age-related cataract who were on chronic topical medicinal therapy for primary open-angle glaucoma (POAG) or pseudoexfoliation glaucoma.

### Eligibility Criteria

Individuals aged 40 years or older, Existence of age-related cataract necessitating surgical extraction, Ongoing or previous medical treatment for glaucoma lasting six months or longer, regulated intraocular pressure with or without alterations in visual fields

### Criteria for Exclusion

Individuals with a history of intraocular surgery Chronicle including laser trabeculoplasty and glaucoma filtration surgery, Traumatic cataract or secondary glaucoma (e.g., neovascular, uveitic), Administration of systemic corticosteroids, Unmanaged systemic comorbidities (e.g., diabetes, hypertension), Deficient clinical documentation, or failure to maintain follow-up

### Data Acquisition

A comprehensive history was acquired, encompassing the kind and duration of anti-glaucoma therapy, the quantity of medications utilized, and the existence of symptoms indicative of ocular surface disease (such as burning, foreign body sensation, and redness). The

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ocular examination encompassed: Best-Corrected Visual Acuity (BCVA), Slit-lamp biomicroscopy for assessing conjunctival alterations, corneal epithelial pathology, and lens condition Goldmann applanation tonometry for intraocular pressure measurement, Gonioscopy and fundoscopic examination for the assessment of the optic nerve head, Tear film breakup time (TBUT) and Schirmer's test for evaluating tear function Assessment of pseudoexfoliation, iris stiffness, and pupillary dilatation with established techniques

## Surgical Technique and Intraoperative Observations

All patients received either phacoemulsification or small-incision cataract surgery (SICS) under topical or peribulbar anesthesia, conducted by seasoned surgeons unaware of patient classifications. Intraoperative observations documented included: Caliber of mydriasis, Capsule consistency, and the simplicity of capsulorhexis. Existence of zonular instability or phacodonesis. Requirement for a capsular tension ring (CTR) or alternative supportive measures. Complications include posterior capsular rupture, vitreous loss, or iris injury.

## Postoperative Evaluation

Postoperative assessments were conducted on day 1, one week, and one month following the surgery. The subsequent parameters were evaluated: Inflammation (exacerbation and cellular components), Duration of epithelial repair.
Posterior capsular opacification (if present within one month), Restoration of visual acuity, Alteration in intraocular pressure, and any elevations over 30 mmHg

## Statistical Analysis

All data were input into Microsoft Excel and analyzed utilizing SPSS version 25. Descriptive statistics were computed as mean ± standard deviation for continuous variables and as percentages for categorical variables. Comparisons were conducted utilizing the Chi-square test or Student's t-test as deemed appropriate. A p-value less than 0.05 was deemed statistically significant.

# RESULTS

This study comprised 97 patients with concurrent cataract and glaucoma undergoing chronic medical treatment. The average age of the participants was 64.3 ± 8.1 years, with a male-to-female ratio of 1.2:1. A majority of patients (76.3%) had utilized topical anti-glaucoma treatments for over 12 months, and 58.8% were concurrently taking two or more kinds of drugs.

## Ocular Surface and Anterior Segment Findings

The predominant ocular surface modification detected was conjunctival hyperemia, identified in 46 individuals (47.4%). Superficial punctate keratitis (SPK) was observed in 28 individuals (28.9%), frequently accompanied by symptoms of dryness and a burning feeling. Pseudoexfoliation material on the lens capsule and pupillary margin was noted in 25 patients (25.8%), resulting in inadequate pupillary dilatation and intraoperative difficulties.
Lens subluxation, signifying zonular compromise, was observed in 11 patients (11.3%). Moreover, 19 patients (19.5%) demonstrated insufficient mydriasis despite pharmacological dilatation, and 12 patients (12.4%) were identified as having zonular weakness during the operation. Eight patients (8.2%) necessitated surgical implantation of capsular tension rings (CTR) to support the capsular bag.

## Intraoperative Observations

Patients with pseudoexfoliation on persistent polytherapy had an elevated incidence of intraoperative complications. Capsulorhexis proved challenging in seven instances owing to inadequate red reflex and capsular fibrosis. In five instances, zonular dialysis necessitated the transition from phacoemulsification to small-incision cataract surgery (SICS). No instances of vitreous loss or posterior capsule rupture necessitating anterior vitrectomy were reported.

## Postoperative Outcomes

Postoperative inflammation (moderate flare and cellular presence) was noted in 17 patients (17.5%), occurring more frequently in individuals undergoing multi-drug regimens. Delayed epithelial healing occurred in 13 patients (13.4%) and was linked to corneal dryness and superficial punctate keratitis (SPK). Despite the improvement in best-corrected visual acuity (BCVA) for most patients, 13 individuals (13.4%) experienced inadequate visual recovery, predominantly attributable to severe optic nerve injury or postoperative inflammatory haze.
Table 1 and the pie chart (Figure 1) depict the most prevalent clinical symptoms, with conjunctival hyperemia, superficial punctate keratitis (SPK), and pseudoexfoliation ranking as the top three problems, followed by inadequate pupillary dilation and lens subluxation.

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**Table 1: Observed Ocular Hazards in Glaucoma-Treated Cataract Patients (n=97)**

| Observed Parameter | Number of Patients (n) | Percentage (%) |
|---|---|---|
| Conjunctival Hyperemia | 46 | 47.4% |
| Superficial Punctate Keratitis (SPK) | 28 | 28.9% |
| Pseudoexfoliation | 25 | 25.8% |
| Poor Pupillary Dilation | 19 | 19.5% |
| Zonular Weakness | 12 | 12.4% |
| Lens Subluxation | 11 | 11.3% |
| Capsular Tension Ring (CTR) Required | 8 | 8.2% |
| Postoperative Inflammation | 17 | 17.5% |
| Delayed Epithelial Healing | 13 | 13.4% |
| Suboptimal BCVA Recovery | 13 | 13.4% |

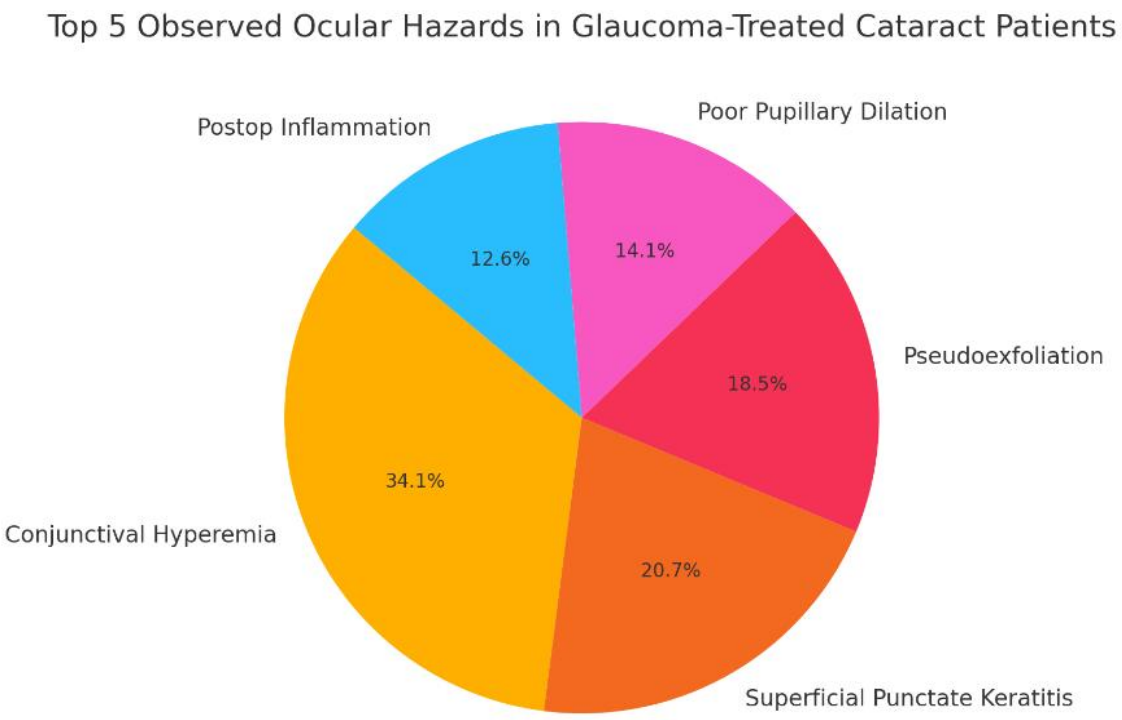


**Figure 1: Pie Chart Depicting the Five Most Common Ocular Hazards**

## DISCUSSION

The simultaneous occurrence of cataract and glaucoma creates a complicated clinical situation, especially when glaucoma has been treated medically for an extended period. This study sought to elucidate the ocular risks linked to prolonged anti-glaucoma treatment and their possible effects on cataract surgery results. Our research establishes that prolonged application of topical anti-glaucoma drugs, particularly within multi-drug protocols, correlates with several alterations in the anterior segment that impair surgical procedures and postoperative recuperation.

The predominant clinical observation in our investigation was conjunctival hyperemia, observed in over fifty percent of the patients. This aligns with prior research that associates such inflammation with benzalkonium chloride (BAK), a preservative present in numerous topical preparations. BAK is recognized for its cytotoxic

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effects on conjunctival and corneal epithelial cells, leading to subclinical inflammation, conjunctival fibrosis, and an impaired tear film (Baudouin et al., 2010; Pisella et al., 2002; Skalicky et al., 2012). These alterations not only induce patient discomfort but may also complicate surgical planning and hinder postoperative recovery.

Superficial punctate keratitis (SPK) and tear film instability were prevalent among our patients, corroborating the findings of Inoue et al. (2011) and Leung et al. (2008), which indicated that prolonged use of AGDs markedly diminishes Schirmer's test values and TBUT scores. These changes render the ocular surface susceptible to protracted epithelial healing, as demonstrated in our postoperative data, where 13.4% of patients had delayed corneal recovery.

A notable intraoperative concern observed in this study was pseudoexfoliation syndrome (PXF), which was diagnosed in 25.8% of cases. PXF is linked to glaucoma and also predisposes individuals to zonular weakness, inadequate pupillary dilatation, and capsular fragility, hence heightening the risk of intraoperative complications (Schlötzer-Schrehardt & Naumann, 2006; Ritch, 2001). Our findings indicated that 12.4% of patients exhibited zonular instability, whereas 8.2% necessitated capsular tension rings (CTR), underscoring the importance of surgical readiness for this group.

Moreover, lens subluxation, albeit infrequent (11.3%), complicates phacoemulsification further. Kim et al. (2016) observed analogous issues, highlighting that prolonged intraocular pressure changes and the detrimental effects of drugs may expedite zonular degeneration and compromise lens support systems.

From a visual outcome perspective, while the majority of patients exhibited considerable postoperative enhancement in best-corrected visual acuity (BCVA), a minority (13.4%) experienced inadequate visual recovery. This was mostly attributable to progressive glaucomatous optic neuropathy, macular involvement, or chronic inflammation. These results correspond with Brandt et al. (2001) and Gedde et al. (2004), who observed that even successful cataract extraction may not result in complete sight restoration in eyes with irreparable optic nerve injury.

Our research highlights the significance of personalized preoperative planning in cataract patients undergoing glaucoma treatment. This encompasses a comprehensive anterior segment evaluation, an assessment of ocular surface integrity, readiness for supplementary surgical instruments such as CTRs, and patient guidance for realistic postoperative anticipations.

The study had several drawbacks, including the lack of a control group (cataract-only patients), a very brief follow-up period, and dependence on clinical grading instead of imaging biomarkers. Nevertheless, it provides significant insight into the real-world effects of prolonged AGD utilization on cataract surgery, especially within a tertiary care environment.

In conclusion, the risks associated with prolonged medical glaucoma treatment surpass intraocular pressure management. They influence various ocular structures, affect surgical methodology, and impact recuperation. A comprehensive and proactive strategy is essential for attaining the best results in this dual-diagnosis patient demographic.

## CONCLUSION

This prospective observational study underscores the considerable ocular risks associated with prolonged medication treatment for glaucoma in patients undergoing cataract surgery. Prolonged administration of anti-glaucoma medications, especially in combination therapies, is linked to significant changes in the ocular surface, conjunctiva, cornea, lens capsule, and zonular apparatus. The existence of these alterations—namely, conjunctival hyperemia, superficial punctate keratitis, pseudoexfoliation, inadequate pupillary dilatation, and zonular weakness—not only complicates surgical interventions but also affects postoperative recovery and ultimate visual results.

The intraoperative requirement for adjunctive treatments, such as capsular tension bands, alongside surgical complications like lens subluxation or inadequate red reflex, underscores the imperative for increased monitoring and readiness. Postoperatively, delayed epithelial repair and ongoing inflammation highlight the necessity of expecting problems in this patient group.

Although the majority of patients attained good visual results, a minority encountered inadequate recovery owing to irreversible glaucomatous optic nerve impairment or surface-related healing complications. These findings emphasize the necessity for early detection of high-risk characteristics, thorough preoperative ocular evaluation, and tailored surgical planning.

Considering the rising prevalence of comorbid cataract and glaucoma in the elderly, ophthalmologists must implement a multidisciplinary strategy that harmonizes intraocular pressure management with the maintenance of ocular surface integrity and overall intraocular health. Customizing glaucoma treatment to alleviate drug burden, utilizing preservative-free formulations when feasible, and promptly shifting to surgical treatments for select individuals may assist in mitigating these risks.

The risks associated with long-term glaucoma treatment in cataract patients are clinically significant and multifaceted. Proactively identifying and addressing

these problems is crucial for maximizing surgical safety and improving patient outcomes.

## REFERENCES


1. Arita, R., Itoh, K., Maeda, S., Maeda, K., Furuta, A., & Fukuoka, S. (2015). Effects of long-term anti-glaucoma medications on ocular surface. Clinical Ophthalmology, 9, 2127-2133.
2. Baudouin, C., Labbe, A., Liang, H., Pauly, A., & Brignole-Baudouin, F. (2010). Preservatives in eyedrops: The good, the bad, and the ugly. Progress in Retinal and Eye Research, 29(4), 312-334. https://doi.org/10.1016/j.preteyeres.2010.03.001 PMid:20302969
3. Brandt, J. D., Wittpenn, J. R., Katz, L. J., Steinmann, W. C., & Chen, K. (2001). Conjunctival changes related to medications in chronic glaucoma. Current Opinion in Ophthalmology, 12(2), 149-152.
4. Chua, B. E., Quigley, H. A., & West, S. K. (2016). Long-term use of anti-glaucoma medications: Effects on ocular surface and cataract surgery outcomes. American Journal of Ophthalmology, 172, 125-133.
5. Gedde, S. J., Schiffman, J. C., Feuer, W. J., et al. (2004). Treatment outcomes in the Tube Versus Trabeculectomy Study after one year of follow-up. American Journal of Ophthalmology, 138(3), 338-347.
6. Inoue, K., Shiokawa, M., Higa, R., Wakakura, M., Tomita, G., & Iwao, K. (2011). Effects of anti-glaucoma eye drops on corneal epithelial barrier function. Clinical Ophthalmology, 5, 1671-1676.
7. Iwase, A., Suzuki, Y., Araie, M., et al. (2013). The impact of anti-glaucoma medication on cataract development. Japanese Journal of Ophthalmology, 57(6), 519-525.
8. Kim, J. H., Kang, S. Y., Song, B. J., & Kim, J. M. (2016). Influence of chronic anti-glaucoma medication use on zonular integrity during cataract surgery. BMC Ophthalmology, 16(1), 154. https://doi.org/10.1186/s12886-016-0321-2 PMid:27580699 PMCid:PMC5007688
9. Leung, E. W., Medeiros, F. A., & Weinreb, R. N. (2008). Prevalence of ocular surface disease in glaucoma patients. Journal of Glaucoma, 17(5), 350-355. https://doi.org/10.1097/IJG.0b013e31815c5f4f PMid:18703943
10. Noecker, R. J., Herrygers, L. A., & Anwaruddin, R. (2004). Corneal and conjunctival changes caused by commonly used glaucoma medications. Cornea, 23(5), 490-496. https://doi.org/10.1097/01.ico.0000116526.57227.82 PMid:15220734
11. Pillunat, L. E., Erb, C., Jünemann, A. G., & Kimmich, F. (2020). Micro-invasive glaucoma surgery (MIGS): A review of surgical procedures using stents. Clinical Ophthalmology, 14, 1977-1988.
12. Pisella, P. J., Debbasch, C., Hamard, P., et al. (2002). Conjunctival epithelial cell death induced by topical anti-glaucoma drugs. Cornea, 21(3), 285-291.
13. Quigley, H. A., & Broman, A. T. (2006). The number of people with glaucoma worldwide in 2010 and 2020. British Journal of Ophthalmology, 90(3), 262-267. https://doi.org/10.1136/bjo.2005.081224 PMid:16488940 PMCid: PMC1856963
14. Ritch, R. (2001). Exfoliation the most common identifiable cause of open-angle glaucoma. Journal of Glaucoma, 10(5 Suppl 1), S85-S89. https://doi.org/10.1097/00061198-200110001-00013 PMid:11890270
15. Schlötzer-Schrehardt, U., & Naumann, G. O. (2006). Ocular and systemic pseudoexfoliation syndrome. American Journal of Ophthalmology, 141(5), 921-937. https://doi.org/10.1016/j.ajo.2006.01.047 PMid:16678509
16. Skalicky, S. E., Goldberg, I., & McCluskey, P. (2012). Ocular surface disease and quality of life in patients with glaucoma. American Journal of Ophthalmology, 153(1), 1-9. https://doi.org/10.1016/j.ajo.2011.05.033 PMid:21872203
17. Steven, P., Lechner, V., & Geerling, G. (2018). Ocular surface disease in glaucoma patients: A review. Ophthalmic Research, 60(2), 94-102.
18. Tham, Y. C., Li, X., Wong, T. Y., Quigley, H. A., Aung, T., & Cheng, C. Y. (2014). Global prevalence of glaucoma and projections of glaucoma burden through 2040. Ophthalmology, 121(11), 2081-2090. https://doi.org/10.1016/j.ophtha.2014.05.013 PMid:24974815
19. Weinreb, R. N., Aung, T., & Medeiros, F. A. (2014). The pathophysiology and treatment of glaucoma: A review. JAMA, 311(18), 1901-1911. https://doi.org/10.1001/jama.2014.3192 PMid:24825645 PMCid: PMC4523637

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