REVIEW ARTICLE

The nine most common misconceptions in the diagnosis and treatment of glaucoma

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Summary

Diagnosis and treatment of glaucoma have advanced significantly in the past 20 years, but there are still some misconceptions about this group of diseases in everyday ophthalmological practice. The goal of this review is to point out the most common misconceptions in the diagnosis and treatment of glaucoma, which should improve the quality of treatment for our patients.

A review of research articles with the keywords "glaucoma," "misconception," and "intraocular pressure measurement," published in the PubMed database as of June 30, 2025, was conducted.

Some of the most common misconceptions in the diagnosis and treatment of glaucoma are related to the method of measuring intraocular pressure, the time when the measurement is performed, subtracting/adding values according to the nomogram for pachymetry, banning caffeine intake for glaucoma patients, and recommendations for physical activity in all forms of glaucoma.

While significant advancements have been made in the diagnosis and treatment of glaucoma, persistent misconceptions among ophthalmologists must be addressed to improve patient outcomes and quality of life.

Keywords: glaucoma, diagnosis, treatment, misconceptions

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INTRODUCTION

Glaucoma is a group of chronic, progressive, neurodegenerative diseases most often, but not exclusively, associated with elevated intraocular pressure (IOP), and also one of the leading causes of blindness in the world. Current estimates indicate that approximately 80 million people are affected by this incurable disease (1), with the number projected to rise to 111 million by 2040.

While glaucoma cannot be prevented or cured, it can be managed effectively through awareness of risk factors, early diagnosis, and adequate treatment (2). Over the past two decades, significant advancements have been made in the diagnosis and treatment of glaucoma. However, several misconceptions about this group of diseases persist. Given that not all ophthalmologists, particularly general practitioners, specialize in glaucoma management, it is essential to address and correct these common misunderstandings.

The purpose of this review is to highlight the most common misconceptions in the diagnosis and treatment of glaucoma so as to improve clinical practice. This paper draws on a comprehensive literature review, with the selection of misconceptions informed by thirty years of experience in glaucoma practice. The misconceptions outlined below are the ones most frequently encountered over that period.

A review of research articles was conducted using the keywords "glaucoma", "misconception", "intraocular pressure measurement and phasing", "coffee and tea consumption", "pachymetry nomogram", and "physical activity". The search included studies published in the PubMed database as of June 30, 2025. To ensure accuracy, searches were performed separately for each category. The total number of research papers found was over 3400 (glaucoma/misconception 24, glaucoma/intraocular pressure measurement 2761, glaucoma/phasing 51, glaucoma/pachymetry nomogram 2, glaucoma/caffeine consumption 72, glaucoma/physical activity 491).

The following are the most common misconceptions encountered in daily glaucoma practice:

Misconception number 1 - Those who do not have high intraocular pressure (IOP) do not have glaucoma

Normal IOP generally falls within the range of 10–21 mmHg (3, 4). Over the course of my 30 years in ophthalmology practice, I have noticed a tendency to overlook comprehensive IOP measurements when the value hovers around 16 mmHg. This seemingly "magic" number often fosters complacency, prompting some practitioners to perform only a single, superficial measurement. Studies conducted on large populations in the United States indicate that the average IOP is between 15 and 16 mmHg, and approximately 95% of people have an IOP between 10 and 21 mmHg (5). We do not actually know what percentage of the normal population has an IOP of 16mmHg.

On the other hand, there is an important issue of normal tension glaucoma (NTG), which represents the cases of glaucomatous optic neuropathy with IOP within normal limits. NTG is present in 10% to 48% of all primary open-angle glaucoma (POAG) patients in the US, Europe, and Scandinavia, and even in 66% of patients in Japan (6). Since IOP is the only modifiable factor in glaucoma treatment, it is critical to measure it accurately and consistently. Quite often, glaucoma is not a disease that imposes itself with its signs and symptoms, but rather one that requires us to "actively look for". The first step is to check the IOP multiple times (1) precisely. It is strongly recommended that glaucomatologists perform their own IOP measurements for every patient, rather than relying on previous reports, to avoid missing potential glaucoma cases.

Misconception number 2 - Non-contact tonometers are better than Goldmann applanation tonometry (GAT)

The gold standard for IOP measurement was and remains Goldmann's applanation tonometer (GAT) (7). Moreover, it is recommended always to measure IOP using the same tonometer (in the same way) (8). Most ophthalmologists worldwide rely on GAT and, in some cases, the Icare tonometer.

One of the main points emphasized by advocates of non-contact tonometry is the speed with which measurement results are obtained, the lack of contact between the tonometer and the eye, the need to use a topical anesthetic, and the potential risk of contamination. In the era of COVID-19 and the risk of transmission of other infectious diseases, the methods for disinfecting and sterilizing contact tonometer prisms are clearly defined, and disposable prisms are also available for GAT (9). Non-contact tonometers tend to overestimate IOP, are not widely used in glaucoma clinics (10-12), but are very popular among optometrists, where they are offered as a quick and convenient way to measure IOP. We must be aware that an ophthalmologist can only recommend the use of a non-contact tonometer in cases of population screening.

When discussing the reliability of the obtained IOP values, we must also mention the calibration of the tonometer, as one of the most common misconceptions around Goldmann applanation is the "set it and forget it" practice. Calibration is crucial for reliable glaucoma diagnosis and management, as inaccurate IOP readings can lead to misdiagnosis or inappropriate treatment. The calibration process itself is not complicated and does not take long, and the instructions are provided with the tonometer. In extensive ophthalmology facilities, there is regular technical maintenance of the equipment. However, in smaller facilities, it's worth reminding ophthalmologists that they can either learn this technique themselves or request

regular calibration of the tonometers. The recommendations for regular GAT calibration are once a month (13).

Misconception number 3 - The time of day when IOP is measured does not matter

IOP is not a static value; it fluctuates throughout the day, with peak levels typically occurring between 6 and 8 AM. Since mean IOP is a strong predictor of glaucomatous damage, understanding its fluctuations over a 12- or 24-hour period is critical for effective treatment (14).

Thus, it is necessary to measure IOP at different times of the day, both in glaucoma patients and in glaucoma suspects (15, 16).

Recording the time when the IOP was measured by GAT (17) is advised not only for making a correct glaucoma diagnosis, but also for the purpose of evaluating the effectiveness of antiglaucoma drugs, and achieving better glaucoma treatment outcomes (18, 19).

Interestingly, IOP has been found to vary by season and day of the week, being higher in winter than in summer and lower on Fridays compared to other days (20, 21).

Misconception number 4 – IOP phasing is only valid before starting treatment

IOP phasing, which involves monitoring IOP at regular intervals during the day or over 24 hours, is traditionally performed before establishing a glaucoma diagnosis. However, it remains valuable even for patients undergoing treatment, as it provides critical data on the effectiveness of medication. Continuous IOP monitoring devices, such as contact lenses with IOP sensors, can offer detailed reports on IOP fluctuations (22, 23). When doing it by GAT, it is usually done every 2 hours during ophthalmological office hours. Devices for continuous IOP measurement give us a detailed report on specific values and times when the IOP reading was taken, similar to a blood pressure holter. However, in daily outpatient work, we most often use GAT during day hours (7-21h), which provides us with valuable additional information in the management of glaucoma patients (24).

There is a reasonable reason to do IOP phasing during treatment as well, when IOP level is checked during day hours along with regular therapy, as a way to evaluate the effectiveness of glaucoma medication therapy. A single measurement of IOP can be misleading if the values are within normal limits. It is advisable to do this extra-prolonged IOP checking in cases where there is glaucoma progression despite reaching IOP target values (25-28).

Misconception number 5 - IOP values must always be adjusted using CCT nomograms

Numerous publications over the past 50 years have shown that central corneal thickness (CCT) has a significant impact on IOP measurement and is also of great importance for glaucoma progression. According to the European Glaucoma Society Guidelines, a thin central cornea is a considerable risk factor for the onset and progression of glaucoma, but is no longer considered an independent risk factor (29-31).

CCT influences the accuracy of most tonometers, even the most precise ones, such as GAT. Thinner CCT is associated with a higher risk of conversion of ocular hypertension (OH) to glaucoma, and a higher risk of glaucoma progression. To better understand the relationship between CCT and IOP, and to estimate the actual level of IOP more accurately, several tables of nomograms were created. However, those conversion tables are not recommended, since they are not validated, and the relationship between measured IOP and CCT values is not linear. As an unwritten rule, it is understood that for every 50-micron increase in CCT, the IOP should be lowered by 2.5 mmHg (30). In daily clinical practice, the primary concern is whether the cornea is thick or thin. The advice is not to recalculate the IOP values based on CCT; instead, what matters are the actual IOP values measured at that specific moment (32, 33).

Misconception number 6 – In glaucoma follow-up, visual field, OCT, and HRT can be done on different devices.

All glaucoma associations recommend that diagnostic procedures should always be performed using the same devices and the same software, so that the findings can be compared and a conclusion about possible progression can be reached. For visual field testing, the same device and the same strategy are recommended for follow-up tests, and for OCT disc/retinal nerve fiber layer/macula, using the same instrument with software-based analysis. It is strongly recommended that the patient we monitor be always tested on the same machine and with the same program (34, 35). Because different perimeters can have different lighting parameters from the stimulus, and the backlight values in decibels can differ significantly from each other even if they are of the same type, it is not advised to compare visual field test results done on different devices. Standardized visual field testing conditions ensure accurate and reliable results by controlling key variables. These conditions involve patient positioning, refractive correction, fixation, and stimulus presentation, all aimed at minimizing errors and maximizing the detection of visual field defects. This is also the reason why the perimeter needs to be located in a room with controlled conditions, especially in terms of lighting.

Regarding imaging devices, variability in these devices can lead to inconsistent results and hinder the ability to track disease progression (34).

Misconception number 7 - People with glaucoma should avoid coffee and tea

Most medical doctors, including ophthalmologists, will advise a person with glaucoma not to drink coffee or tea/tea or to limit their consumption, and to drink decaffeinated coffee instead. The belief that caffeine consumption worsens glaucoma is mainly anecdotal.

Numerous studies have been conducted, and numerous results have been published on this topic. A meta-analysis showed that coffee consumption does not affect changes in IOP in healthy eyes, but leads to an increase in IOP in glaucoma and OH (35, 36). Caffeine use is associated with its effect on blood pressure, and hence the likely concern that it will lead to a spike in IOP. Caffeine reduces aqueous humor drainage by decreasing the tone of smooth muscles through the blockade of adenosine receptors, which leads to the closure of pores on the trabeculum (37). However, other possible mechanisms by which caffeine may affect IOP and thereby increase the risk of POAG are not well understood. Caffeine may increase IOP by increasing the production of aqueous humor, by inhibition of phosphodiesterase, which leads to the maintenance of high intracellular levels of cAMP in the ciliary body. Caffeine acutely causes a spike in arterial pressure. The elevated arterial pressure increases the hydrostatic pressure, which in turn creates aqueous humor from the plasma in the capillary network of the ciliary processes, potentially leading to IOP spikes. Caffeine also lowers blood flow to the macula, optic nerve, and choroid, which can make the optic nerve more sensitive to IOP spikes. This effect is proven to be more pronounced in younger women. These theoretical considerations, however, have no foundation in the proven practical impact of caffeine on IOP, since one cup of coffee (caffeine 182mg) temporarily leads to an increase in IOP. Still, this change is too small (approximately 1 mmHg) to affect the onset or progression of glaucoma (37).

Caffeine consumption does not increase the risk of glaucoma except in people who have a genetic burden or advanced stages of glaucoma (38). However, it is proven that people who drink more than 3 cups of coffee per day (caffeine > 500 mg) have an increased risk of PEX glaucoma (37).

Valuable data when discussing the connection between caffeine and glaucoma are the positive aspects of regular caffeine consumption, which have been proven. 3-Methyl-1,2-cyclopentanedione, one of the active ingredients in coffee, has a proven antioxidant effect, which may also be related to the health of the optic nerve (39).

Misconception number 8 - Blue eyes are more susceptible to glaucoma

Eyes with light irises (blue or green) have less pigment, and hence the belief that they are more susceptible to diseases. However, from a glaucomatological point of view, the opposite is correct. There is a modest but statistically significant association between a darker iris and IOP level (40). A darker, heavily pigmented iris usually indicates a thicker iris, which can lead to a narrower chamber angle and a higher probability of angle closure glaucoma (41). On the other hand, people with lighter eye color and myopia have a higher risk of developing a variant of pigmentary glaucoma, which is proven to have a genetic basis (42).

Misconception number 9 - All activities are allowed for people with glaucoma

Lifestyle and activities that are recommended or prohibited for people with glaucoma have been well studied. For people with POAG and those with OH, there are generally no limitations in daily activities (43). But, physical activity that should be avoided is anything done upside down or with the head below the level of the heart (handstands, some yoga exercises), which causes the IOP to jump as much as 2 or 3 times more than usual (44). Holding your breath during exercise also causes a drastic jump in IOP (Valsalva). This is notable during GAT, and that is, we ask our patients to breathe normally during IOP taking. If a person engages in weightlifting, it is advised to use smaller weights and more repetitions. People who have pigmentary glaucoma or pigment dispersion syndrome should not engage in strenuous sports (45).

CONCLUSION

Glaucoma is a group of chronic, non-communicable diseases that cannot be prevented or cured. Effective management requires early detection, timely therapy, and lifelong follow-up. While significant advancements have been made in the diagnosis and treatment of glaucoma, persistent misconceptions among ophthalmologists must be addressed to improve patient outcomes and quality of life.

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DEVET NAJČEŠĆIH ZABLUDA U DIJAGNOSTICI I LEČENJU GLAUKOMA

Marija Božić[1,2]

Sažetak

Dijagnostika i lečenje glaukoma su značajno napredovali u poslednjih 20 godina, ali su i dalje u svakodnevnoj oftalmološkoj praksi prisutne neke zablude u vezi sa ovom grupom bolesti. Cilj ovog preglednog rada je da se ukaže na najčešće zablude u dijagnostici i lečenju glaukoma, što bi trebalo da utiče na podizanje kvaliteta lečenja naših pacijenata. U revijskom radu su analizirani naučni radovi publikovani u PubMed bazi podataka do 30.6.2025. godine sa ključnim rečima: glaukom, pogrešno shvatanje, merenje intraokularnog pritiska.

Neke od najčešćih zabluda u dijagnostici i lečenju glaukoma su u vezi sa načinom merenja intraokularnog pritiska, vremenom kada se merenje obavlja, oduzimanjem/dodavanjem vrednosti prema nomogramu za pahimetriju, zabrani unosa kofeina kod glaukoma i preporukama za fizičku aktivnost kod svih oblika glaukoma.

Iako je postignut značajan napredak u dijagnostici i lečenju glaukoma, i dalje postoje određene zablude među oftalmolozima koje se moraju rešiti kako bi se poboljšali ishodi lečenja i kvalitet života pacijenata.

Ključne reči: glaukom, dijagnoza, lečenje, zablude

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