

Intra-Ocular Pressure: A Short Review

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Abstract

Due to persistence of higher intraocular pressure (IOP) optic nerve may damage and the end result is eye disorder; the glaucoma which if not control vision is lost however people can develop glaucoma that had normal IOP. Various factors are involved in causing Ocular hypertension. Here we have also discussed the involvement of gravitational force for circadian variations in IOP and diet for controlling the IOP.

Keywords: *Aqueous Humor; Trabecular Meshwork; Ocular Hypertension; Gravitational Force; Circadian Variations*

Introduction

Intraocular pressure (IOP) is the pressure in the eyes maintained by the transparent fluid -the aqueous humor. This fluid flows throughout inside of the eye. Normal eye pressure is between 10 to 21 mm Hg; beyond 21 mm Hg pressure causes ocular hypertension. During a 24-hour period, IOP varies by 2 to 6 mm Hg due to the fact that aqueous secretion and drainage is not synchronizing properly. However, ophthalmologists recognized decades ago that, unlike normal patients, glaucoma patients could have fluctuations greater than 10 mmHg [1].

Ocular hypertension is not at all an eye disease in itself but it could manifest glaucoma. Glaucoma is a chronic, progressive eye disease caused by damage to the optic nerve, which leads to visual field loss. The damage of the eye's drainage system can cause fluid to build up which in turn leading to excessive pressure that causes damage to the optic nerve. The excess of aqueous humor outflow is increased by prostaglandin agonists that increase outflow mainly through the uveoscleral pathway, possibly through the activation of matrix enzyme metalloproteinases [2-4] and also through the trabecular meshwork making it in excess. The trabecular meshwork, located within the iridocorneal angle, is the main pathway for drainage of aqueous humor (AH) out of the eye, and its dysfunction is responsible for the IOP elevation [4]. Aqueous humor or having a blockage or other problem with the eye's drainage system, called the size of this angle is an important determinant of the rate aqueous humour flows out of the eye, and thus, the intraocular pressure. The drainage angle is near the front of your eye, located between the iris and the cornea. It usually drains through a tissue located at the angle where the iris and cornea meet [5].

Ocular hypertension is a serious condition that occurs when the pressure within the eye rises above normal limits. High eye pressure can lead to eye conditions, such as tunnel vision and glaucoma and permanent vision loss, if left untreated. Elevated eye pressure happens as the result of a build up of fluid that flows throughout the inside of the eye. This fluid also is known as the aqueous humor. It usually drains through a tissue located at the angle where the iris and cornea meet. This tissue also is called the trabecular meshwork. The trabecular meshwork is part of the drainage angle of the eye. This system is located between the cornea, and the iris. It drains at the point where the iris the sclera [6]. But not everyone with high eye pressure will develop glaucoma and some people with normal eye pressure get glaucoma it depends on the amount of pressure the optic nerve can handle and this amount is different for each person. For most people, eye pressure above 21 is higher than normal [7]. With all types of glaucoma (Figure 1), the nerve connecting the eye to the brain is damaged; usually due to high eye pressure.

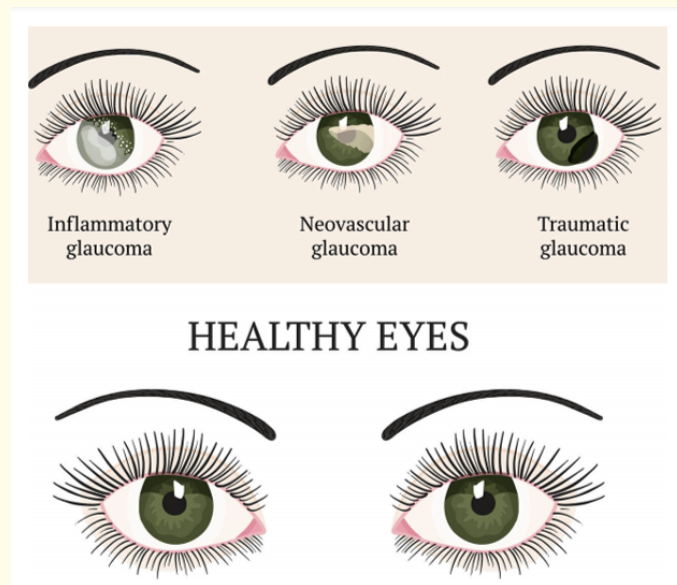


Figure 1: Types of glaucoma.

Circadian variations in IOP

“Pressure is highest typically in the morning, when one just wakes up, and lowest in the afternoon,” says Johnson [8-10]. Although aqueous fluid production decreases during sleep, intraocular pressure actually increases due to blocking of the drainage system when lying flat. The lowest values were found in the early afternoon hours; it is all because of gravitational force [11]. Over the course of a 24-hour period, IOP normally varies by 2 to 6 mmHg as a result of imperfect synchronization of aqueous secretion and drainage. However, practitioners recognized decades ago that, unlike normal patients, glaucoma patients could have fluctuations greater than 10 mmHg.

Stress and IOP

The stressing achievement situation led to significant increases in IOP and to significantly higher increases in myopes than in controls. Relaxation led to significant decreases of IOP in both groups. Heart rate and subjective ratings did not differ between groups under any

condition. The present results point to specific intraocular reaction patterns to stress in myopic persons. The potential impact of this finding for a behavioural approach to short sightedness is high since IOP is considered one of the main variables in the development of myopia. Stress causes and worsens eye conditions. Some of the studies show that reducing stress can help to restore vision. In general, pressures of 20 - 30 mm Hg usually cause damage over several years, but pressures of 40 - 50 mm Hg can cause rapid visual loss and also precipitate retinovascular occlusion [12-14]. However, mindfulness-based stress reduction was associated with a significant decrease in IOP along with an improvement in optic nerve head perfusion and quality of life. Mindfulness-based stress reduction can be considered as a potential treatment option in the management of ocular hypertension [15]. Researchers showed that persistent stress may lead to vision loss [16].

Symptoms of high eye pressure

The most common type of glaucoma (open-angle glaucoma) often has no symptoms other than slow vision loss. Angle-closure glaucoma, although rare, is a medical emergency and its symptoms include eye pain with nausea and sudden visual disturbance.

Mildly high eye pressure does not cause any noticeable symptoms or pain, but a very high pressure (likely 35 or higher) can cause pain in and around the eye and nausea or vomiting. It is also possible to have blurred vision, eyes become red and blind spots in the visual field. Some persons also experience headaches.

Eye pressure affected by age

The relationship between IOP and age has been still controversial. Earlier investigators from Europe and/or America mostly reported an increase of IOP with age [17,18]. On the other hand, among Asian population studies showed decreasing trend of IOP with age [19-21]. Age has also been established as a significant contributing factor to glaucoma [22]. This discrepancy was explained as secondary to ethnic and environmental influences [20]. However in Indian population increasing age correlates with higher risk factors for raised IOP [23].

Foods that reduce eye pressure

Research generated data that show that omega-3 fatty acids containing foods such as salmon, tuna, sardines, and halibut fishes contain high levels of which may help reduce the risk of developing eye disease later in life [24]. Additionally, eating more omega-3s has been shown to decrease glaucoma-related pressure in the eye. One study showed that patients with glaucoma taking a supplement that included magnesium-along with homotaurine, carnosine, forskolin, folic acid, and vitamins B1, B2, and B6-demonstrated a statistically significant reduction in IOP, as well as improved light and contrast sensitivity [25]. Limit your caffeine. Drinking beverages with large amounts of caffeine may increase the eye pressure.

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