



Various treatment for glaucoma (Eye Disease): A review

Pradnya Jagtap^{1*}, Nayana Mirke², Shabnam Mulani³, Prajakta Tanpure⁴, Ravindra Patil⁵

¹ HOD, Department of Pharmacology Savitribai Phule Pune University, Saswad, Pune, Maharashtra, India

^{2,3,4} Student, Savitribai Phule Pune University, Saswad, Pune, Maharashtra, India

⁵ Principal of SGRS. College of Pharmacy, Savitribai Phule Pune University, Saswad Pune, Maharashtra, India

DOI: <https://doi.org/10.33545/26647184.2019.v1.i1a.5>

Abstract

Glaucoma is a complex condition of the eye. It is an ophthalmic neurodegenerative condition and is characterized by raised intraocular pressure. When left untreated, patients may gradually experience visual field loss, and even lose their sight completely. It is the second leading cause of blindness around the globe. Glaucoma is a group of eye diseases that damage the optic nerve. Glaucoma is often associated with an increased pressure of the eye. The two most common forms of glaucoma, primary open-angle glaucoma and primary angle-closure glaucoma, affect more than 2 million Americans and are increasing in prevalence. Many forms of glaucoma have no warning signs. Risk factors for primary open-angle glaucoma include older age, black race, Hispanic origin, family history of glaucoma, and diabetes mellitus. Risk factors for primary angle-closure glaucoma include older age, Asian descent, and female sex. Advanced disease at initial presentation and treatment non-adherence put patients with glaucoma at risk of disease progression to blindness. Diagnosis of glaucoma requires careful optic nerve evaluation and functional studies assessing a patient's visual field. The goal of treatment with eye drops, laser therapy, or surgery is to slow visual field loss by lowering intraocular pressure. Lowering morbidity from glaucoma through early identification of high-risk patients and by emphasizing treatment adherence in patients with glaucoma. This review provides a summary of reported associations between different systemic medications and the risk of developing glaucoma or experiencing disease progression. The article provides a brief, synoptic overview of this condition and its pharmacological treatment options.

Keywords: glaucoma, optic nerve, primary open-angle glaucoma, primary angle-closure glaucoma, blindness, risk factors, treatment

1. Introduction

Glaucoma is a disease that is often associated with elevated intraocular pressure, in which damage to the eye (optic) nerve can lead to loss of vision and even blindness. Glaucoma is the leading cause of irreversible blindness in the world. Glaucoma usually causes no symptoms early in its course, at which time it can only be diagnosed by regular eye examinations and screenings with the frequency of examination based on age and the presence of other risk factors [1]. Intraocular pressure increases when either too much fluid is produced in the eye or the drainage or outflow channels of the eye become blocked.

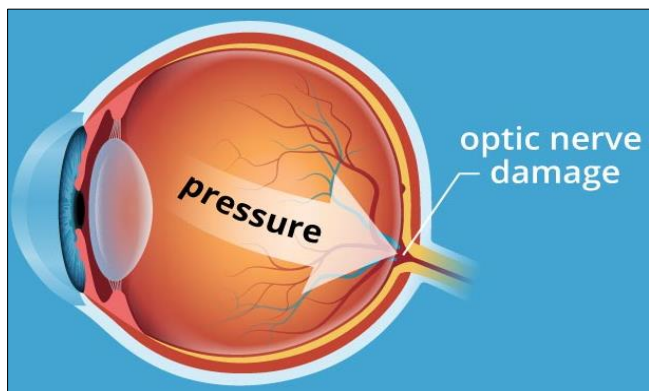


Fig 1: Optic Nerve Damage

1.1 Types

▪ Closed-angle glaucoma (acute angle-closure glaucoma)

It occurs in individual with narrow iridocorneal angle & shallow anterior chamber. The i.o.t remains normal until an attack is precipitated, usually by mydriasis (40-60mmHg) It is an emergent condition with marked congestion of eye & severe headache. Failure to lower intraocular tension quickly may result in loss of sight [2].

▪ Open angle (wide angle, chronic simple) glaucoma

It is probably genetically predispose degenerative disease affecting patency of tubular meshwork which gradually lost past middle age. The i.o.t. rises insidiously and progressively [3]. Primary open-angle glaucoma is when optic nerve damage results in a progressive loss of the visual field [4].

1.2 Risk factors

The following factors can increase the risk for developing glaucoma:

1.3. Age and Frailty

Glaucoma risk increases with age. As a consequence, glaucoma can be expected to be associated with other age-related diseases such as macular degeneration, vascular diseases, and obstructive sleep apnea [5]. However this is not a direct link for most age-related diseases.

1.4. Race

A review of the findings from 11 population-based studies found a wide range in the prevalence of POAG among populations of the “same race” Variable prevalence reported in different studies may have been due to different methods of examination as well as being a consequence of differences in exposure to geographic, social, behavioral and environmental [6]. factors. 37 For certain age groups Racette and co-authors estimated the prevalence of POAG in a black American population, to be six times higher compared to whites [7]. Although black populations have the highest prevalence of OAG, white populations showed the steepest increase in OAG prevalence with age [8].

1.5. Genetics & Family history of glaucoma

1.7. Treatment [12]

A family history of glaucoma was found to carry a relative risk. The risk of inheriting glaucoma may increase with the number of relatives diagnosed with the disease [9]. Approximately 60% of a glaucoma patient sample was found to belong to families in which other members have the disease.

1.6. Myopia

Myopia has been found to be a significant risk factor for glaucoma [10]. That myopia is a risk factor for glaucoma and that it is also more prevalent among Asian patients may help explain increased prevalence. Myopic patients had a two to three fold increased risk of glaucoma compared with that of non-myopic participants independent of other glaucoma risk factors and IOP [11].

Table 1: “Drug for open angle and closed angle glaucoma”

Drug Category	Drug Side	Effect
Beta-blockers	Timolol, levobunolol, carteolol, metipranolol, bronchospasm betaxolol	shortness of breath fatigue, confusion, depression, impotence, hair loss, heart failure, bradycardia. Timolol has also been found to decrease HDL levels and adversely affect the total cholesterol: HDL ratio in women 60 years and older
Non-selective Adrenergic Agonists	Epinephrine, dipivefrin	high incidence of allergic or toxic reactions
α2-Selective Adrenergic Agonists	Apraclonidide brimonidine	-high rate of allergic reactions, tachyphylaxis -dry mouth but less likely to cause allergic reactions
Cholinergic Agonists	Carbachol pilocarpine	-detached retina, GI disturbances, headache, frequent urination -hypertension, tachycardia, bronchial spasm
Cholinesterase Inhibitors	Physostigmine, neostigmine, demecarium, echothiophate iodide, isofluorophate	The latter three in the list cause irreversible rather than reversible miosis; they may be cataractogenic; increase risk of retinal detachment.
Carbonic Anhydrase Inhibitors (oral, IV, topical)	Acetazolamide, methazolamide, dichlorphenamide, ethoxzolamine dorzolamide	fatigue, anorexia, depression, paresthesias, electrolyte abnormalities, kidney stones, blood dyscrasias topical so does not have the side effects of the others
Prostaglandin Analog	Latanoprost	increased pigmentation of the iris; worsening of uveitis

1.8. Laser Therapies [13, 14]

Currently, laser surgery is the most frequently used procedure to treat glaucoma. It normally lowers eye pressure, but the length of time that pressure remains low depends on many factors, including:

- Age of the patient
- Type of glaucoma
- Other medical conditions that may be present

Many cases still need continued medication but possibly in lower amounts.

Your doctor may use laser surgery to treat open-angle, angle-closure, or neovascular glaucoma. He or she will perform laser surgery on an outpatient basis in the office or clinic after numbing your eye.

To reduce eye pressure, the doctor directs a laser toward the:

- Trabecular meshwork (tissue near the cornea and iris that drains the aqueous humor from the eye into the blood)
- Iris
- Ciliary body
- Retina

1.9. Types of laser surgery include Trabeculoplasty

The Trabeculoplasty procedure is often used

To treat open-angle glaucoma. In argon laser trabeculoplasty (ALT), a high-energy laser is aimed at the trabecular meshwork to open areas in these clogged canals. These openings allow fluid to bypass drainage canals and flow out of the eye. In selective laser trabeculoplasty (SLT) a low-energy laser treats specific cells in the trabecular meshwork. Because it affects only certain cells without causing collateral tissue damage, SLT can potentially be repeated [15].

1.10. Surgery for glaucoma [16]

If drugs don't work, or if the patient cannot tolerate them, surgical intervention may be an option. The aim of surgery is usually to bring down the pressure inside the eye. Examples of surgery include:

- Trabeculoplasty - a laser beam is used to unblock clogged drainage canals, making it easier for the fluid inside the eye to drain out.
- Filtering surgery (viscocalanostomy) - this may be carried out if nothing else works, including laser surgery. Channels within the eye are opened up to improve fluid drainage.
- Drainage implant (aqueous shunt implant) - this option is sometimes used for children or those with secondary glaucoma. A small silicone tube is inserted into the eye to help it drain out fluids better.

Table 2: “ Herbal drug for Glaucoma”

Sr. No	Common name	Botanical name	Use	Reference
1	Ginkgo biloba	Ginkgo biloba	Protect retinal photoreceptor against light induced damage	[17,18,19]
2	Fennel	Foeniculum vulgare	Antioxidant and NO scavenging	[20]
3	Bilberry	Vaccinium myrtillus	Retard the breakdown of Vit.c Protect against breakdown of rhodospin	[20]
4	Plantago seed	Plantago asiatica	clear away heat, promote diuresis, improve visual acuity	[20]
5	Pansy	Viola species	Antioxidants	[21]
6	Arctigenin	Torreya nucifera Atrium lappa	Inhibit TNF α and NO production	[21]
7	Daucus carota Linn	Daucus carota Linn	Glaucoma	[22]
8	Delphinium vestitum Wall	Delphinium vestitum Wall	Glaucoma	[22]
9	Physostigma venenosum	Physostigma venenosum	Glaucoma	[22]
10	Marijuana (Cannabis)	Marijuana (Cannabis)	Glaucoma	[23]
11	Coleus Forskohlii	Coleus Forskohlii	Glaucoma	[24]
12	Ashwagandha	Ashwagandha	Glaucoma	[24]
13	hoelen	Poria cocos	promote diuresis, eliminate dampness, invigorate spleen, alleviate phlegm retention	[25,26]
14	vitex	Vitex trifolia	expel the wind and heat, ease the eye and the head	[27]
15	Fennel	Foeniculum vulgare	Antioxidant and NO scavenging	[28]
16	Carrot	Daucus carota Linn	Glaucoma	[28]

2. Conclusion

The modern goals of glaucoma management are to avoid glaucomatous damage and nerve damage, and preserve visual field and total quality of life for patients with minimal side effects. A wide variety of plants have been found to have effective against number of ocular diseases. In this review the information is recorded as common name, scientific name, family, part used & reference of the plants used in treatment of glaucoma. This information is very useful for people who suffering from glaucoma. It also provide the information about drug and the treatment of glaucoma.

Reference

- Debjit Bhowmik, Sampath Kumar K P, Lokesh Deb, Shraavan Paswan, Dutta Glaucoma AS. A Eye Disorder Its Causes, Risk Factor, Prevention and Medication Glaucoma - A Eye Disorder Its Causes, Risk Factor, Prevention and Medication Submitted 04.02.2012. Accepted for publication 23.02.2012.
- Tripathi KD. Essentials of Pharmacology, Seventh Edition, JAYPEE Publication.
- Quigley HA, Addicks EM, Green WR, Maumenee AE. Optic nerve damage in human glaucoma, II: the site of injury and susceptibility to damage. Arch Ophthalmol. 1981; 99(4):635-649.
- International Journal of Medicine Research ISSN: 2455-7404; Impact Factor: RJIF 5.42 www.medicinesjournal.com. 2016; 1(2) 35-53
- Shing leton BJ, Richter CU, Dharma SK. Long-term efficacy of argon laser trabeculoplasty: a 10-year follow-up study. Ophthalmology. 1993; 100(9):1324-1329.
- Hollands H, Johnson D, Hollands S, Simel DL, Jinapriya D, Sharma S, *et al*. Do findings on routine examination identify patients at risk for primary open-angle glaucoma? JAMA. 2013; 309(19):2035-2042.
- Rotchford AP, Kirwan JF, Muller MA, Johnson GJ, Roux P. Temba glaucoma study: a population-based cross-sectional survey in urban South Africa. Ophthalmology. 2003; 110(2):376-382.
- Budenz DL, Barton K, Whiteside-de Vos J. Tema Eye Survey Study Group. Prevalence of glaucoma in an urban West African population: the Tema Eye Survey. JAMA Ophthalmol. 2013; 131(5):651-658.
- Friedman DS, Wolfs RC, O' Colmain BJ. Eye Diseases Prevalence Research Group. Prevalence of open-angle glaucoma among adults in the United States. Arch Ophthalmol. 2004; 122(4):532-538.
- Sivak-Callcott JA, O'Day DM, Gass JDM. Evidence-based recommendations for the diagnosis and treatment of neovascular glaucoma. Ophthalmology. 2001; 108:1767-78.
- Deva NC, Insull E, Gamble G, Danesh-Meyer HV. Risk factors for first presentation of glaucoma with significant visual field loss. Clin Experiment Ophthalmol 2008; 36:217-21.
- Singh K, Shri vastava A. Medical management of glaucoma: principles and practice. Indian J Ophthalmol. 2011; 59:S88-S92.
- Reuser T, Flanagan DW, Borland C, Bannerjee DK. Acute angle closure glaucoma occurring after nebulized bronchodilator treatment with ipratropium bromide and salbutamol. J R Soc Med. 1992; 85(8):499-500.
- Singh K, Shri vastava A. Medical management of glaucoma: principles and practice. Indian J Ophthalmol. 2011; 59: S88-S92.
- Mc Alinden C. Selective laser trabeculoplasty (SLT) vs other treatment modalities for glaucoma: systematic review. Eye. 2014; 28:249-258
- Rulli E, Biagioli E, Riva I. Efficacy and safety of trabeculectomy vs nonpenetrating surgical procedures: a systematic review and meta-analysis. JAMA Ophthalmol. 2013; 131(12):1573-1582.
- Boland MV, Ervin AM, Friedman DS. Comparative effectiveness of treatments for open-angle glaucoma: a systematic review for the US Preventive Services Task Force. Ann Intern Med. 2013; 158(4):271-279.

18. Miglior S, Pfeiffer N, Torri V, Zeyen T, Cunha-Vaz J, Adamsons I. the European Glaucoma Prevention Study (EGPS) Group Predictive factors for open-angle glaucoma among patients with ocular hypertension in the European Glaucoma Prevention Study. *Ophthalmology*. 2007; 114:3-
19. Nateras OSE, Harrison JM, Muir ER. Choroidal blood flow decreases with age: an MRI study. *Curr Eye Res*. 2014; 39:1059-1067.
20. Lin CC, Hu CC, Ho JD, Chiu HW, Lin HC. Obstructive sleep apnea and increased risk of glaucoma. *Ophthalmology*. 2013; 120:1559-1564.
21. Rudnicka AR, Mt-Isa S, Owen CG, Cook DG, Ashby D. Variations in primary open-angle glaucoma prevalence by age, gender, and race: a Bayesian meta-analysis. *Invest Ophthalmol Vis Sci*. 2006; 47:4254-4261.
22. Kosoko-Lasaki O, Gong G, Haynatski G, Race Wilson R. ethnicity and prevalence of primary open-angle glaucoma. *J Nation Med Assoc*. 2006; 98:1626-1629.
23. Racette L, Wilson MR, Zangwill LM, Weinreb RN, Sample PA. Primary open-angle glaucoma in blacks: a review. *Surv Ophthalmol*. 2003; 48:295-313.
24. Agarwal R, Gupta SK, Agrawal SS, Srivastava S, Saxena R. *I J Physiol Pharmacol*. 2008; 52(1):77-83.
25. Ritch R. *Medical Hypotheses*. 2000; 54(2):221-35.
26. Blumenthal. *The Complete German Commission E Monographs: Therapeutic Guide to Herbal Medicines*. American Botanical Council. Austin, TX, 1998.
27. *Vaccinium myrtillus* (Bilberry). *Alternative Medicine Review*. 2001; 6(5):500-504.
28. Meena AK, Rao MM. *Asian Journal of Traditional Medicines*. 2010; 5(1):19-31.