

Glaucoma Management Approach: Simple Literature Review

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Abstract

Background: Glaucoma is a progressively acquired neuropathy that affects the optic nerve and can result in vision loss. It is most prevalent in the elderly population and a common cause of blindness. Undetected glaucoma is not uncommon which results in late intervention, increasing the risk of irreversible damages. **Objective:** In this study we aimed to review literature that discussed glaucoma and its management, in order to provide a summarized, yet comprehensive assessment of management plan. **Methods:** PubMed database was used for article selection, and the following keywords were used in the mesh; "glaucoma"[Mesh] and "management of glaucoma"[Mesh]. A total of 25 papers was reviewed and included in the review. **Conclusion:** Detailed eye examinations are necessary in order to discover the risk factors for glaucoma. Physicians should know the risk factors to identify the high-risk groups and refer them to an ophthalmologist when needed. The management of glaucoma mainly should be focused on reducing intraocular pressure, which is the only proven method to treat glaucoma. Nutritional management should be considered as a complementary approach in addition to the conventional treatment of glaucoma.

Keywords: Glaucoma, Diagnosis, Management

INTRODUCTION

Glaucoma is a term explaining a group of ocular disorders that result in optic nerve injury [1]. Glaucoma can be defined as a progressive loss of retinal ganglion cells and axons within the optic nerve. It is an acquired neuropathy that is characterized by optic nerve head appearance resulting in loss of vision [2]. More than 70 million people are affected by glaucoma worldwide and around 10% of them developed blindness bilaterally [3]. In the United States, Glaucoma is considered the second leading cause of irreversible blindness. It is most prevalent in elderly populations [4].

Until glaucoma becomes severe, it mostly remains asymptomatic. The risk of undetected glaucoma is associated with a higher rate of irreversible vision loss [5, 6]. More than half of the glaucoma cases were found to be undiagnosed in a study conducted on elderly urban people in Greece [7]. Identification of the risk factors and screening are important for early detection and early intervention before the occurrence of irreversible damage [8]. In this article, we aimed to review glaucoma management in the published literature.

METHODOLOGY

PubMed database was used for articles selection, and the following keywords were used in the mesh; "glaucoma"[Mesh] and "management of glaucoma"[Mesh]. A total of 25 papers was reviewed and included in the review. Inclusion criteria, the articles were selected based on the relevance to the project, which should include glaucoma.

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Exclusion criteria were all other articles that did not have a related aspect to glaucoma as their primary endpoint or repeated studies.

DISCUSSION

The glaucomas are a group of optic neuropathies characterized by progressive degeneration of retinal ganglion cells. These are central nervous system neurons that have their cell bodies in the inner retina and axons in the optic nerve. Degeneration of these nerves results in cupping, a characteristic appearance of the optic disc and visual loss^[9, 10]. Adult glaucoma is classified into four general categories: primary open angle, angle closure, secondary open, and angle closure glaucoma. Primary open angle glaucoma is the most common type in the United States (Cook). Secondary glaucoma can be caused by trauma and medications, for example, corticosteroids, tumor, or inflammation^[9, 10].

Glaucoma pathophysiology is poorly understood, and how the contributing factors lead to the progression of the condition^[9, 11]. Nevertheless, any patient with risk factors of glaucoma should be referred to an ophthalmologist for examination.

Epidemiology & Risk Factors

The odds ratio for developing primary open angle glaucoma if there is a sibling with glaucoma is 3.7^[12]. Regarding ethnicity, there is a noticeable high prevalence of primary open angle glaucoma in blacks and Hispanics. The severity of presentation and blindness risk is more. On the other hand, primary angle closure glaucoma is more prevalent in people who have an Asian background. In general, developing countries have more prevalence and risk of blindness from glaucoma^[3]. Age increases the risk of developing glaucoma. Glaucoma rate is around 1% in blacks and 1% in Hispanics in the age of 40-49 years, while the rate increases to more than 10% in the same populations who are older than 80 years^[13]. Regarding the white population, primary open angle glaucoma prevalence is also high (9%) in elderly patients who are older than 75 years old^[14, 15].

Diabetic Mellitus is believed to be associated with glaucoma as it increases the risk of developing primary open angle glaucoma and increased intraocular pressure^[16]. Refractive errors, such as hyperopia and myopia have been also found to be risk factors for glaucoma. Therefore, detailed eye examinations are necessary in order to discover the risk factors for glaucoma^[17].

Diagnosis

Glaucoma diagnosis should be based on careful examinations and thorough assessment of the eye. Intraocular pressure measurement, stereoscopic optic nerve examination, and formal visual field testing should be conducted repeatedly in order to evaluate the optic nerve head. Careful evaluation is needed to detect neuroretinal tissue loss if there is any.

Routine examinations by the ophthalmoscope are not enough to examine the retina properly as well as optic nerve head^[12]. In addition, high-risk groups should be screened, because early detection has shown to be a cost-effective approach and it was associated with the high positive predictive value of screening tests^[18]. Any physician should know the risk factors to identify the high-risk groups and refer when needed. A family history of glaucoma is associated with a significant increase in the risk of glaucoma, especially in a first-degree relative^[12].

Management

In the management of glaucoma, we should mainly focus on reducing intraocular pressure which is the only proven method to treat glaucoma. If there is any factor that can play a part in glaucoma development, it should be treated as well, for example, hypertension, sleep apnea, or cardiac problems^[19]. The main targets of managing a case of glaucoma are to stop or even slow the progression of the disease and to preserve the quality of life. Quality of life can be affected early in glaucoma patients. This increases the importance of early detection and intervention^[20].

Huge efforts are required from the ophthalmologist in managing a glaucoma patient by maintaining the intraocular pressure in a stable range in order to stop any progression of optic neuropathy. In order to achieve that, aggressive interventions are needed and the treatments should be changed frequently depending on the individual circumstances of each case^[21]. Studies have shown that reducing intraocular pressure is beneficial in preventing glaucoma development and slowing the progression^[22, 23].

• Open Angle Glaucoma Management

The best approach is to try to achieve the target intraocular pressure with the least number of medications to minimize the side effects. Medications should be chosen depending on the cost, adverse effects, and dosing schedules. The first line of medical treatment is prostaglandin analogs. They lower intraocular pressure by decreasing the outflow resistance, which will lead to an increase in the aqueous humor flow via the uveoscleral pathway. Prostaglandin analogs should be administered once daily at night. Patients may develop a few systemic adverse effects. Locally, adverse effects are more common, such as conjunctival hyperemia, and elongation and darkening of eyelashes. Periocular skin pigmentation and iris darkening are also common local side effects^[9].

• Closed Angle Glaucoma Management

Angle closure glaucoma patients are managed depending on the severity of the condition and the stage of the disease. The first-line treatment of angle closure is laser peripheral iridotomy. It is done to eliminate the pupillary block by creating a full-thickness hole in the iris. Laser peripheral iridotomy can be performed easily in the clinic without any complications. Nevertheless, complications may occur after iridotomy, for example, transient increases of intraocular pressure and corneal decompensation. Recurrence of

intraocular pressure in the same eye is also common after iridotomy. Therefore, follow-up is essential to detect early recurrence after iridotomy. The efficacy of iridotomy has been found the most in the early stages of the disease. On the other hand, its beneficial impact decreases in more severe stages, especially, when the synechial angle closure becomes extensive and optic neuropathy develops [24].

Nevertheless, long-term medical therapy is indicated if the intraocular pressure stayed high after iridotomy. As in open angle glaucoma, medical treatment of angle closure glaucoma include prostaglandin analogs, topical β -blockers, and α 2-agonists. Nevertheless, intraocular pressure lowering efforts sometimes fail and optic neuropathy progresses despite medical and laser treatment. In this case, surgical intervention is indicated. The procedure of choice is trabeculectomy, which is highly recommended in advanced cases of open angle glaucoma. In cases where there is an impaired vision due to cataracts, trabeculectomy should be combined with lens extraction. In chronic or recurrent glaucomas, it is recommended to use glaucoma drainage implants with trabeculectomy [9].

• Role of Diet in Management of Glaucoma

Recently, a new topic dragged the attention of some ophthalmologists as well as glaucoma patients regarding glaucoma management, which is, a therapeutic intervention targeting non-intraocular pressure-dependent mechanisms. Owaifeer et Taisan [25] conducted a review on the role of diet in glaucoma and they found a considerable amount of published data suggesting that diet has an impact on intraocular pressure as well as the incidence of glaucoma and its progression.

Multiple studies have shown that there is an association between obesity and increased intraocular pressure. This might be due to the increased oxidative stress in obesity or due to increased orbital fat impeding aqueous outflow; however, the exact mechanism is still unclear [26]. In addition, a noted intraocular pressure elevation has been found after the consumption of coffee [27, 28]. This elevation was found in patients with different types of glaucoma as well as in some healthy individuals. Coffee is a rich source of caffeine, which can attribute to the stimulation of aqueous humor production [27].

Therefore, patients with glaucoma should be advised to maintain a healthy diet and consider the nutritional management as a complementary approach in addition to the conventional treatment of glaucoma. The dietary advice should include maintaining a normal weight, avoiding excessive coffee intake, and increasing the consumption of vegetables and fruits [25]. Fruits and vegetables have shown the ability to decrease the risk of developing glaucoma because they are rich with antioxidants, which reduce vascular dysregulation in glaucoma cases [25, 29].

CONCLUSION

Glaucoma, is a progressive optic nerve damage that is usually associated with increase in intraocular pressure, and is considered as a leading cause of blindness worldwide. Still the pathophysiological process that stand behind its development is poorly understood, and the current therapeutic are not curative.

Detailed eye examinations are necessary in order to discover the risk factors for glaucoma. Any physician should know the risk factors to identify the high-risk groups and refer to ophthalmologist when needed. The management of glaucoma mainly should be focused on reducing intraocular pressure, which is the only proven method to treat glaucoma. Nutritional management should be considered as a complementary approach in addition to the conventional treatment of glaucoma.

REFERENCES

1. Yaghoobi G, Heydari B, Heydari SR, Poorabdolahi F, Sharifzadeh G. Chronic Open-Angle Glaucoma and Its Association with The Cup Shape in Referral Ophthalmology Centre. *Pharmacophore*, 2018; 9(6): 65-70.
2. Jonas, Jost B, Tin Aung, Rupert R Bourne, Alain M Bron, Robert Ritch, and Songhomitra Panda-Jonas. *Glaucoma*. *The Lancet*, 2017; 390(10108): 2183–93. [https://doi.org/10.1016/s0140-6736\(17\)31469-1](https://doi.org/10.1016/s0140-6736(17)31469-1).
3. Quigley HA, Broman AT. The number of people with glaucoma worldwide in 2010 and 2020. *British journal of ophthalmology*. 2006 Mar 1;90(3):262-7.
4. Cook C, Foster P. Epidemiology of glaucoma: what's new?. *Canadian Journal of Ophthalmology*. 2012 Jun 1;47(3):223-6.
5. 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 Feb 1;110(2):376-82.
6. Shon K, Wollstein G, Schuman JS, Sung KR. Prediction of glaucomatous visual field progression: pointwise analysis. *Current eye research*. 2014 Jul 1;39(7):705-10.
7. Topouzis F, Coleman AL, Harris A, Koskosas A, Founti P, Gong G, Yu F, Anastasopoulos E, Pappas T, Wilson MR. Factors associated with undiagnosed open-angle glaucoma: the Thessaloniki Eye Study. *American journal of ophthalmology*. 2008 Feb 1;145(2):327-35.
8. McMonnies CW. Glaucoma history and risk factors. *Journal of optometry*. 2017 Apr 1;10(2):71-8.
9. Weinreb RN, Aung T, Medeiros FA. The pathophysiology and treatment of glaucoma: a review. *Jama*. 2014 May 14;311(18):1901-11.
10. Weinreb RN, Khaw PT. Primary open-angle glaucoma. *The Lancet*. 2004 May 22;363(9422):1711-20.
11. Nickells RW, Howell GR, Soto I, John SW. Under pressure: cellular and molecular responses during glaucoma, a common neurodegeneration with axonopathy. *Annual review of neuroscience*. 2012 Jul 21;35:153-79.
12. Gupta D, Chen PP. Glaucoma. *Am Fam Physician*. 2016; 93(8): 668-74.
13. Varma R, Ying-Lai M, Francis BA, Nguyen BB, Deneen J, Wilson MR, Azen SP, Los Angeles Latino Eye Study Group. Prevalence of open-angle glaucoma and ocular hypertension in Latinos: the Los Angeles Latino Eye Study. *Ophthalmology*. 2004 Aug 1;111(8):1439-48.
14. Friedman DS, Jampel HD, Munoz B, West SK. The prevalence of open-angle glaucoma among blacks and whites 73 years and older: the Salisbury Eye Evaluation Glaucoma Study. *Archives of ophthalmology*. 2006 Nov 1;124(11):1625-30.
15. Friedman DS, Wolfs RC, O'Colmain BJ, Klein BE, Taylor HR, West S, Leske MC, Mitchell P, Congdon N, Kempen J; Eye Diseases Prevalence Research Group. Prevalence of Open-Angle Glaucoma

- Among Adults in the United States. *Archives of Ophthalmology* 122, 2004; 4(532): 532. <https://doi.org/10.1001/archophth.122.4.532>.
16. Zhao D, Cho J, Kim MH, Friedman DS, Guallar E. Diabetes, fasting glucose, and the risk of glaucoma: a meta-analysis. *Ophthalmology*. 2015 Jan 1;122(1):72-8.
 17. Marcus MW, de Vries MM, Montolio FG, Jansonius NM. Myopia as a risk factor for open-angle glaucoma: a systematic review and meta-analysis. *Ophthalmology*. 2011 Oct 1;118(10):1989-94.
 18. Burr JM, Mowatt G, Hernández R, Siddiqui MA, Cook J, Lourenco T, Ramsay C, Vale L, Fraser C, Azuara-Blanco A, Deeks J. The clinical effectiveness and cost-effectiveness of screening for open angle glaucoma: a systematic review and economic evaluation. Health technology assessment (Winchester, England). 2007;11(41):1-90.
 19. Caprioli J, de Leon JM, Azarbod P, Chen A, Morales E, Nouri-Mahdavi K, Coleman A, Yu F, Afifi A. Trabeculectomy can improve long-term visual function in glaucoma. *Ophthalmology*. 2016 Jan 1;123(1):117-28.
 20. McKean-Cowdin R, Wang Y, Wu J, Azen SP, Varma R, Los Angeles Latino Eye Study Group. Impact of visual field loss on health-related quality of life in glaucoma: the Los Angeles Latino Eye Study. *Ophthalmology*. 2008 Jun 1;115(6):941-8.
 21. Harasymowycz P, Birt C, Gooi P, Heckler L, Hutnik C, Jinapriya D, Shuba L, Yan D, Day R. Medical Management of Glaucoma in the 21st Century from a Canadian Perspective. *Journal of Ophthalmology*, 2016: 1–22. <https://doi.org/10.1155/2016/6509809>.
 22. Kass, Michael A. The Ocular Hypertension Treatment Study. *Archives of Ophthalmology*, 2002; 120(6): 701. <https://doi.org/10.1001/archophth.120.6.701>.
 23. Heijl, A. Reduction of Intraocular Pressure and Glaucoma Progression. *Archives of Ophthalmology*, 2002; 120(10): 1268. <https://doi.org/10.1001/archophth.120.10.1268>.
 24. Alsagoff Z, Aung T, Ang LP, Chew PT. Long-term clinical course of primary angle-closure glaucoma in an Asian population. *Ophthalmology*. 2000 Dec 1;107(12):2300-4.
 25. Al Owaifeer AM, Al Taisan AA. The role of diet in glaucoma: a review of the current evidence. *Ophthalmology and therapy*. 2018 Jun 1;7(1):19-31.
 26. Jang HD, Kim DH, Han K, Ha SG, Kim YH, Kim JW, Park JY, Yoon SJ, Jung DW, Park SW, Nam GE. Relationship between intraocular pressure and parameters of obesity in Korean adults: the 2008–2010 Korea National Health and Nutrition Examination Survey. *Current eye research*. 2015 Oct 3;40(10):1008-17.
 27. Wu CM, Wu AM, Tseng VL, Yu F, Coleman AL. Frequency of a diagnosis of glaucoma in individuals who consume coffee, tea and/or soft drinks. *British Journal of Ophthalmology*. 2018 Aug 1;102(8):1127-33.
 28. Chandrasekaran S, Rohtchina E, Mitchell P. Effects of caffeine on intraocular pressure: the Blue Mountains Eye Study. *Journal of glaucoma*. 2005 Dec 1;14(6):504-7.
 29. Giaconi JA, Yu F, Stone KL, Pedula KL, Ensrud KE, Cauley JA, Hochberg MC, Coleman AL, Study of Osteoporotic Fractures Research Group. The association of consumption of fruits/vegetables with decreased risk of glaucoma among older African-American women in the study of osteoporotic fractures. *American journal of ophthalmology*. 2012 Oct 1;154(4):635-44.