



A-Review on Glaucoma

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ABSTRACT

Normal anxiety glaucoma (NTG) is an exception in the “glaucoma family” the place the foremost hazard factor, expanded intraocular pressure, is missing. If now not accelerated intraocular pressure, then what different reasons can then lead to glaucomatous optic disc change and visible discipline loss in NTG? Several chances will be discussed. Among them a greater sensitivity to normal pressure, vascular dysregulation, an abnormally excessive translaminar strain gradient and a neurodegenerative manner due to impact cerebrospinal fluid dynamics in the optic nerve sheath compartment. There are many high-quality assessment papers published on regular anxiety glaucoma (NTG). The goal of this paper is consequently no longer to add every other great evaluation on NTG however alternatively to focal point on and to talk about some viable mechanisms that are notion to be concerned in the pathophysiology of NTG and to talk about the improved and weaker components of every concept. The reality that various standards exist suggests that NTG is nevertheless no longer very nicely understood and that no single mechanism on its personal would possibly correctly give an explanation for NTG.

Keyword: hazard factor, dysregulation, anxiety glaucoma.

INTRODUCTION

The time period “normal anxiety glaucoma”, to commence with, is Somehow an sad one, as traditionally the time period glaucoma is strongly related with extended intraocular stress (IOP). Elevated IOP is viewed to be the mechanical Force inflicting optic disc cupping and visible subject loss due to Pressure-induced injury to retinal ganglion cells and retinal axons. Therefore, each time the time period glaucoma is Involved, one tends to companion it with the mechanical force. But the notion of NTG is neither understood nor Is it solved through searching at strain as a sole motive [1–4]. Trying to do this ability to oversimplifying the problem. Several motives will provide an explanation for why. Pressure is a scalar pressure and consequently unlike a vector, it Is now not directed. Visual discipline harm precipitated via a scalar force Would consequently be anticipated to be alternatively homogenous over The complete visible field, as the form of the eye is spherical And the scalar pressure is the identical at each factor in the sphere. Visual subject loss in glaucoma, however, does now not existing as A generalized homogenous defect however it as a substitute begins at Focal factors from the place it enlarges .. Caprioli And Späth [8] located visible discipline defects in NTG to be considerably deeper and nearer to fixation than in other Types of glaucoma. To provide an explanation for such focal defects, Some authors argue that sure populations of ganglion Cells and axons react extra sensitively to strain than Others.

GL aucoma is a very necessary public fitness problem. Worldwide, it is the main reason of irreversible Blindness. Open attitude glaucoma (OAG) is the most Common form, accounting for about 50% of glaucoma Blindness.1 It has been estimated, primarily based on the expected Prevalence of OAG, that in a developed us of a setting, The majority of instances are no longer detected by using current Opportunistic case finding.2 Population screening for OAG should consequently be regarded as an intervention To limit blindness via figuring out folks at an earlier Stage of the disease. However, given the constrained healthcare Resources available, it is vital to understand if the Screening for OAG represents properly price for money, That is, is cost-effective? Judgements about the cost-effectiveness’ of choice screening techniques for OAG Can be knowledgeable through financial evaluation. Economic assessment is the comparative evaluation of Alternative guides of motion in terms of each their costs (resource use) and effectiveness (health effects).3 An Economic comparison would contain assessing the relative Costs and advantages related with choice screening Strategies. Costs are the fee of the assets used to Provide the screening method and the aid penalties of that strategy. More specifically, given that Resources have many doubtlessly really helpful alternative Uses, charges in an financial assessment are used as a proxy For the advantages that would have been got had the Resources been used for their pleasant feasible choice use. can be measured in both scientific terms, for Example, instances of visible impairment averted or more Economic measures, such as excellent adjusted lifestyles years (QALYs), which mix estimates of each nice of life With estimates of size of life. The wider the definition of Benefit used, then the extra in all likelihood it is to measure outcomes of significance to individuals. The glaucomas are a team of optic neuropathies characterised by way of innovative degeneration of retinal ganglion cells. These are central worried gadget neurons that have their Cell our bodies in the internal retina and axons in the optic nerve. Degeneration of these nerves outcomes in cupping, a attribute look of the optic disc and visible loss.1The organic foundation of glaucoma is poorly understood and the elements contributing to its Progression have now not been wholly characterized.2Glaucoma influences extra than 70 million humans international with Approximately 10% being bilaterally blind,3 making it the leading Cause of irreversible blindness in the world. Glaucoma can remain Asymptomatic till it is severe, ensuing in a excessive possibility that the Number of affected persons is plenty greater than the number Known to have it.4,5Population-level surveys recommend that solely 10% To 50% of people with

glaucoma are aware they have it.⁴⁻⁸ Glaucomas can be labeled into two vast categories: open-angle glaucoma and Angle-closure glaucoma. In the United States, greater than 80% of cases are open-angle glaucoma; however, angle-closure glaucoma is accountable for a disproportionate wide variety of sufferers with severe vision loss.^{9,10} Both open-angle and angle-closure glaucoma can be most important diseases. Secondary glaucoma can end result from trauma, certain medicinal drugs such as corticosteroids, inflammation, tumor, or stipulations such as pigment dispersion or pseudo-exfoliation.

METHODS

A literature search was once carried out the use of MEDLINE, the Cochrane Library, and manuscript references for research posted in English between January 2000 and September 2013 on the matters open angle and angle-closure glaucoma. From the 4334 abstracts screened, 210 articles had been chosen that contained facts on pathophysiology and remedy with relevance to predominant care physicians.

Data identification and extraction

In this review, the following on-line databases have been regarded for the literature research: PubMed, US National Library of Medicine National Institute of Health, IEEE Xplore Digital Library, Science Direct and Scopus. All the articles had been posted throughout the duration between January 2014 and August 2019. The search was once confined to the following keywords: "Machine Learning AND Retinal Image", "Glaucoma AND Machine Learning", "Optic Disc AND Machine Learning", "Deep Learning AND Glaucoma". The key phrases search result in 15,228 works. When the exclusion standards have been applied, a whole of a hundred and ten works remained.

Selection and exclusion criteria

The choice manner used to be carried out in accordance to the following exclusion criteria:

- Studies containing the phrases "OCT" and "Visual Field" in the title;
- Papers which did not encompass each "Glaucoma" and "Optic Disc" as keywords;
- Papers which did no longer encompass the phrase "Glaucoma" in the metadata.

In step of learn about selection, the researches had been analyzed thru the studying of the abstract, keywords, and methods. As a result, it used to be viable to accumulate the determination criteria of the studie Data identification and extraction In this review, the following on-line databases have been viewed for the literature research: PubMed, US National Library of Medicine National Institute of Health, IEEE Xplore Digital Library, Science Direct and Scopus. All the articles had been posted in the course of the length between January 2014 and August 2019. The search used to be confined to the following keywords: "Machine Learning AND Retinal Image", "Glaucoma AND Machine Learning", "Optic Disc AND Machine Learning", "Deep Learning AND Glaucoma". The key phrases search end result in 15,228 works. When the exclusion standards have been applied, a whole of a hundred and ten works remained. and exclusion criteria The decision system used to be carried out in accordance to the following exclusion criteria:

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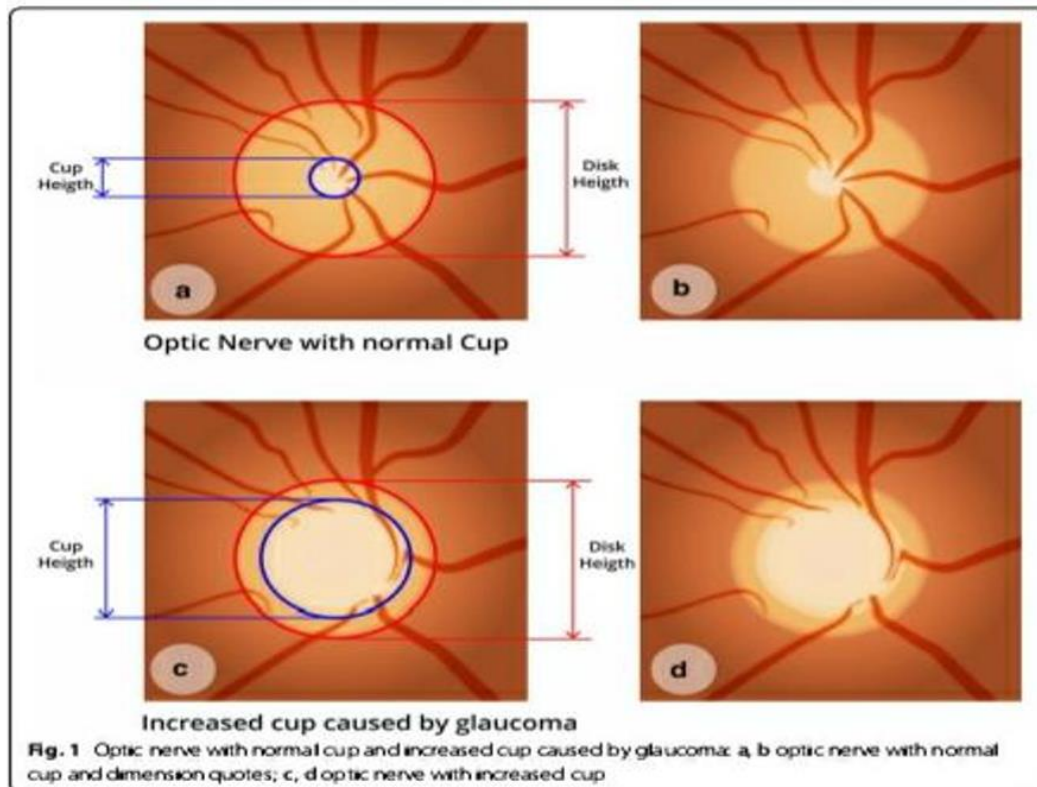
- Data acquisition: retinal image;

Processing techniques: computing device mastering and deep learning;

- Analyzed eye structure: optic disc (OD);
- Methods that covered the photograph classification process;
- The hazard elements in glaucoma detection such as age, household ancestry, and race;
- Journal's influence issue and paper's quotation number;
- Studies posted in complaints had been disconsidered.

BACKGROUND

Glaucoma is a neuropathic sickness that is marked by way of ganglion cells degeneration Tus, an atrophy of the optic nerve fiber is accompanied by using the erosion of the rim tissue, which manifests as a cup enlargement. Currently, the detection of glaucomatous structural damages and adjustments is one of the most difficult factors of the disorder diagnosis techniques.



Moreover, glaucoma is normally identified through the evaluation of the intra-ocular stress (IOP)—that must be greater than 22 mmHg except medication—the glaucomatous cupping of the optic disc, and the glaucomatous visible field defects]. One of the biggest challenges related to glaucoma prognosis is the asymptomatic aspect of the disorder earlier than extreme stages. In this way, the variety of undiagnosed patients is greater than the variety of recognized. Yet the measurement and form of the optic cup disc is some other essential issue to take into consideration in the course of glaucoma analysis. Hence, the vertical expand of the cup is a characteristic of glaucomatous optic neuropathy. By inspecting Fig. 1c, d, it is feasible to become aware of an amplify in the cup if in contrast to Fig. 1a, b. Tat is a clear glaucoma sign. Te foremost sorts of glaucoma can be classified into two categories: major open-angle glaucoma (POAG) and foremost angle-closure glaucoma (PACG)

ETIOLOGY

- Increased intraocular pressure. (more than 24 mmhg)
- Optic nerve dystrophy.

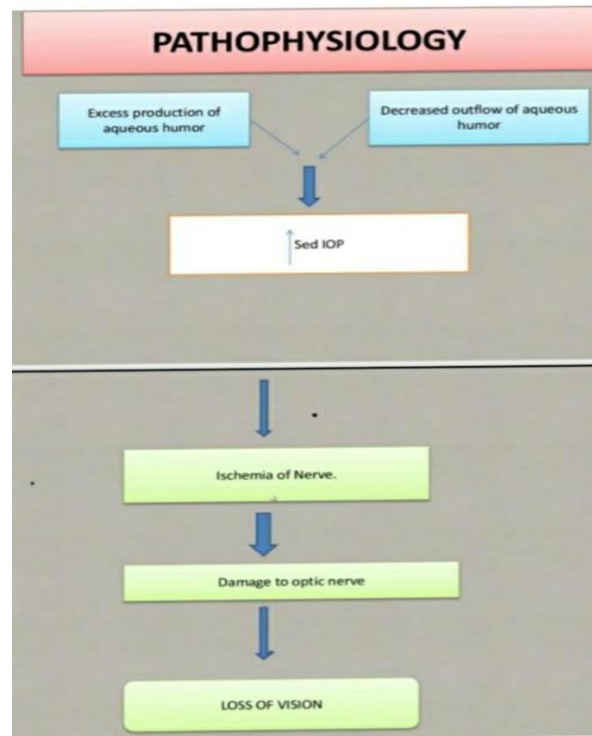
RISK FACTORS

- Genetic Factors: Family history
- Aging.: above 40
- Eye trauma
- Hypertension
- Severe Myopia
- Ocular surgery
- Diabetics mellitus
- Migraine headache
- Having high internal eye pressure (intraocular pressure)
- Being over age 60
- Being black, Asian or Hispanic.
- Having a family history of glaucoma.
- Having certain medical conditions, such as diabetes, heart disease, high blood pressure and sickle cell anemia.
- Having corneas that are thin in the center.

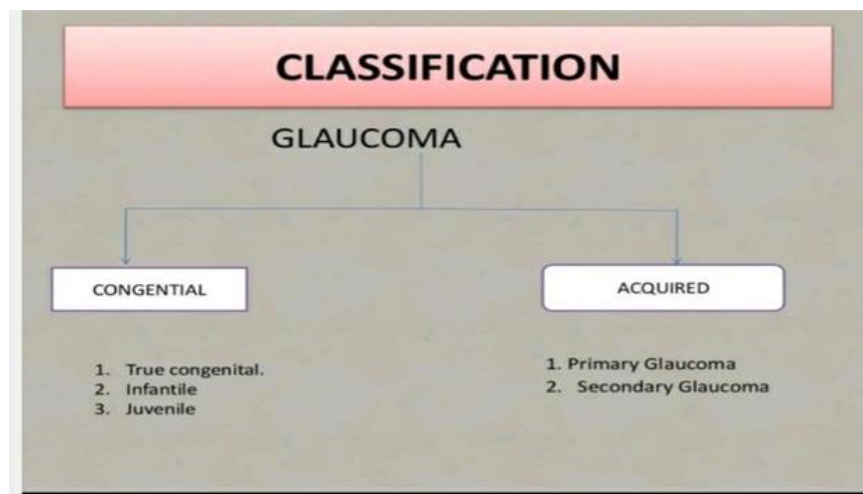
Emotional excitement

- Caffeine consumption (increases IOP)
- Ethnicity (More common in Black people compared to white people)

Pathophysiology



CLASSIFICATION



CONGENITAL GLUCOMA

Rare disease.

Occurs when a congenital defect in the angle of the anterior chamber obstructs the outflow of aqueous humor. If remains untreated causes damage to optic nerve damage and blindness.

1. True Congenital Glaucoma occur when IOP increases during intrauterine period.

Child is born with ocular enlargement. occur in 40% of cases

● INFANTILE GLAUCOMA occurs during third birthday occurs about 10% of cases.

• juvenile Glaucoma

Occurs during 3 to 16 years of life.

Child is born with ocular enlargement. occur in 40% of cases

● INFANTILE GLAUCOMA occurs during third birthday occurs about 10% of cases.

Clinical features of congenital glaucoma

- Lacrimation
- Photophobia
- Corneal oedema
 - Raised IOP
- Eyes Become MYOPIC
- Corneal diameter more than 13mmhg

ACQUIRED GLAUCOMA***PRIMARY GLUCOMA.***

Primary Open angle glaucoma.
 Primary angle closure Glaucoma
 O Chronic angle closure glaucoma.

SECONDARY GLAUCOMA

Lens induced glaucoma
 Glaucoma due to uveitis Neurovascular Glaucoma
 Glaucoma associated with intraocular tumor
 Steroid induced glaucoma

- ***PRIMARY GLAUCOMA.***

Primary Glaucoma is a progressive condition and is most common cause of irreversible blindness across world wide.

a. Primary Open Angle Glaucoma

- Also Called as open angle Glaucoma or chronic simple Glaucoma or simple complex Glaucoma.
- Results from the overproduction of aqueous humour through trabecular Mesh work results in increased IOP and Damage to optic nerve, results in loss of vision.

The clinical features of Primary Open angle

Glaucoma includes.

- ✓ Mild ache in the eyes
- ✓ Headache

Increased IOP (more than 24 mmhg)

- ✓ Loss of Peripheral vision
- ✓ Reduced visual acuity at night.
- ✓ Corneal edema
- ✓ Visual field deficit.

Primary angle closure glaucoma

It is also called as Primary closed angle glaucoma, Narrow angle glaucoma, Pupil block glaucoma and acute congestive glaucoma. Onset rapid, ophthalmic emergency. Unless treated promptly the causes blindness in 3 or 5 days.

- This is due to the abnormality of structure in front of the eyes. This result from the obstruction to the outflow of aqueous humor.

Clinical features of primary angle closure glaucoma

Pain and redness in eyes
 Increased IOP

Clinical features of primary angle closure glaucoma

Pain and redness in eyes
 Increased IOP
 Blurred vision
 Headache
 Nausea

Vomiting

Oedematous cornea

- Decreased visual acuity
- Moderate Pupillary dilation.

c. Chronic angle closure Glaucoma

Chronic angle closure Glaucoma may develop as the sequelae to an attack of acute angle glaucoma.

Clinical features include

Increased IOP. visual field defect. Decreased visual acuity.

2. Secondary glaucoma

Secondary glaucoma occurs as a result of

- Chronic angle closure Glaucoma may develop as the sequelae to an attack of acute angle glaucoma.

Clinical features include

Increased IOP. Visual field defect. Decreased visual acuity.

2. Secondary glaucoma

Secondary glaucoma occurs as a result of either diseases within the eyes such as uveitis, Inflammation, Trauma, intra ocular haemorrhage, previous surgeries, diabetics and steroid medication etc

• The major types include

TYPES

- ✓ LENS INDUCED GLAUCOMA
- ✓ GLAUCOMA DUE TO UVEITIS NEUROVASCULAR GLAUCOMA
- ✓ GLAUCOMA ASSOCIATED WITH INTRA OCULAR

TUMOR.

STEROID INDUCED GLAUCOMA

LENS INDUCED GLAUCOMA

LIt occur due to trabecular blockage.

O it occur due to clogging of trabeculae by

Inflammatory material.

GLAUCOMA DUE TO UVEITIS

O IOP is raised due to clogging by inflammatory material & associated trabeculitis.

Neurovascular glaucoma

- Uncommon type of glaucoma
- Difficult to treat
- Caused by proliferative diabetic retinopathy. • Individual with poor blood flow to the eyes are highly at risk for this condition

Glaucoma associated with intra ocular

Tumor

Intraocular tumor such as retinoblastoma & Malignant melanoma may rise IOP.

Steroid induced Glaucoma

Developed due to sensitivity to steroid. • Sudden rise in IOP may occur, this can be prevented by judicious use of steroid.

Pigmentary Glaucoma

Rare Condition

- This is caused by pigment cells sloughing off from the back of the iris & floating around the aqueous humor.

DIAGNOSTIC MEASURES

- History collection
- Patient ocular & Medical history.
- Tonometry (to measure IOP)
- Ophthalmoscopy (To show the cupping of the optic disc) o Gonioscopy (To determine the angle of the eyes anterior chamber)
- Perimetry or visual field test. (To detect loss of peripheral vision)
- Slit Lamp Examination.
- Fundus Photography (To monitor the Disc for changes)
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- Fundus Photography (To monitor the Disc for changes)

Pachymetry

Nerve fiber analysis (to assess the thickness of nerve fiber layer)

MANAGEMENT**Goal of Management measures include**

- ✓ To reduce IOP
- ✓ To prevent the damage of optic nerve.

Management measures mainly include

Medical Management

Surgical management

Nursing Management

MEDICAL MANAGEMENT

- Beta adrenergic blockers: decreases aqueous humor production, eg Timolol, betaxolol.

Cholinergic (Miotics): Reduces IOP by facilitating the outflow of aqueous humor. Eg Pilocarpine, Carbacol.

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- Cholinergic (Miotics): Reduces IOP by facilitating the outflow of aqueous humor. Eg Pilocarpine, Carbacol.
- Carbonic anhydrase inhibitor: Decreases the formation & secretion of aqueous humor.

Prostaglandin Analogs: Reduces IOP by increasing uveoscleral Flow.

● Osmotic Agents: Iv mannitol 20% or oral glycerine 50% is used to reduce IOP by creating an osmotic pressure between blood and intraocular fluid

SURGICAL MANAGEMENT

Argon Laser Trabeculoplasty:

- ✓ Used to treat open angle glaucoma.
- ✓ Thermal Argon laser burns are applied to the inner surface of trabecular Meshwork to open

SURGICAL MANAGEMENT

Argon Laser Trabeculoplasty:

- ✓ Used to treat open angle glaucoma.
- ✓ Thermal Argon laser burns are applied to the inner surface of trabecular Meshwork to open intra trabecular spaces, thus reduces outflow of aqueous humor and decreases IOP.

Laser Iridotomy: In this surgical procedure, an opening is made by the laser beam in the iris to eliminate pupillary block. Relieve the pressure & preserve the vision

By promoting outflow of the aqueous humor.

Cyclocryotherapy

Application of a freezing probe to the sclera over the Ciliary body that destroy some of the ciliary processes, results in the reduction of the amount of the aqueous humor

Cyclodialysis

Through a small incision in the sclera a spatula type instrument is passed into the anterior chamber, creating an opening in the angle.

Filtering Procedure

For Chronic Glaucoma filtering procedure are used to create an opening or fistula in the trabecular meshwork to drain aqueous humor. This allow the aqueous humor to flow & exit different route.

Trabeculotomy

In this procedure a partial thickness incision is made in the sclera.

Section of sclera is removed to produce an opening for outflow of aqueous humor.

Drainage implants and shunts

- ✓ Used to Shunt the aqueous humor in the Conjunctival space.
- ✓ Implants and shunts are the open tubes implanted in the anterior chamber through sclerotomy

Diagnosis

Your doctor will review your medical history and conduct a comprehensive eye examination. He or she may perform several tests, including:

- Measuring intraocular pressure (tonometry)
- Testing for optic nerve damage with a dilated eye examination and imaging tests
- Checking for areas of vision loss (visual field test)
- Measuring corneal thickness (pachymetry)
- Inspecting the drainage angle (gonioscopy)
- Advertisement

Treatment

The damage caused by glaucoma can't be reversed. But treatment and regular checkups can help slow or prevent vision loss, especially if you catch the disease in its early stages.

Glaucoma is treated by lowering your eye pressure (intraocular pressure). Depending on your situation, your options may include prescription eyedrops, oral medications, laser treatment, surgery or a combination of any of these.

Eyedrops

Glaucoma treatment often starts with prescription eyedrops. These can help decrease eye pressure by improving how fluid drains from your eye or by decreasing the amount of fluid your eye makes. Depending on how low your eye pressure needs to be, more than one of the eyedrops below may need to be prescribed.

Prescription eyedrop medications include:

63.2KB/s Prostaglandins. These increase the outflow of the fluid in your eye (aqueous humor), thereby reducing your eye pressure. Medicines in this category include latanoprost (Xalatan), travoprost (Travatan Z), tafluprost (Zioptan), bimatoprost (Lumigan) and latanoprostene bunod (Vyulta). 4G 66

Possible side effects include mild reddening and stinging of the eyes, darkening of the iris, darkening of the pigment of the eyelashes or eyelid skin, and blurred vision. This class of drug is prescribed for once-a-day use.

Beta blockers

These reduce the production of fluid in your eye, thereby lowering the pressure in your eye (intraocular pressure). Examples include timolol (Betimol, Istalol, Timoptic) and betaxolol (Betoptic). Possible side effects include difficulty breathing, slowed heart rate, lower blood pressure, impotence and fatigue. This class of drug can be prescribed for once or twice-daily use depending on your condition.

Alpha-adrenergic agonists.

These reduce the production of aqueous humor and increase outflow of the fluid in your eye. Examples include apraclonidine (Iopidine) and brimonidine (Alphagan P, Qoliana) Possible side effects include an irregular heart rate, high blood pressure, fatigue, red, itchy or swollen eyes, and dry mouth. This class of drug is usually prescribed for twice-daily use but sometimes can be prescribed for use three times a day.

Carbonic anhydrase inhibitors.

These medicines reduce the production of fluid in your eye. Examples include dorzolamide (Trusopt) and brinzolamide (Azopt). Possible side effects include a metallic taste, frequent urination, and tingling in the fingers and toes. This class of drug is usually prescribed for twice daily use but sometimes can be prescribed for use three times a day .

Rho kinase inhibitor. This medicine lowers eye pressure by suppressing the rho kinase enzymes responsible for fluid increase. It is available as netarsudil (Rhopressa) and is prescribed for once-a day use. Possible side effects include eye redness, eye discomfort and deposits forming on the cornea. Miotic or

cholinergic agents. These increase the outflow of fluid from your eye. An example is pilocarpine (Isopto Carpine). Side effects include headache, eye ache, smaller pupils, possible blurred or dim vision, and nearsightedness. This class of medicine is usually prescribed to be used up to four times a day. Because of potential side effects and the need for frequent daily use, these medications are not prescribed very often anymore. Because some of the eyedrop medicine is absorbed into your bloodstream, you may experience some side effects unrelated to your eyes. To minimize this absorption, close your eyes for one to two minutes after putting the drops in. You may also press lightly at the corner of your eyes near your nose to close the tear duct for one or two minutes. Wipe off any unused drops from your eyelid. If you have been prescribed multiple eyedrops or you need to use artificial tears, space them out so that you are waiting at least five minutes in between types of drops.

Oral medications

If eyedrops alone don't bring your eye pressure down to the desired level, your doctor may also prescribe an oral medication, usually a carbonic anhydrase inhibitor. Possible side effects include frequent urination, tingling in the fingers and toes, depression, stomach upset, and kidney stones.

Surgery and other therapies

Other treatment options include laser therapy and various surgical procedures. The following techniques are intended to improve the drainage of fluid within the eye, thereby If you have been prescribed multiple eyedrops or you need to use artificial tears, space them out so that you are waiting at least five minutes in between types of drops.

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Other treatment options include laser therapy and various surgical procedures. The following techniques are intended to improve the drainage of fluid within the eye, thereby Minimally invasive glaucoma surgery (MIGS). Your doctor may suggest a MIGS procedure to lower your eye pressure. These procedures generally require less immediate postoperative care and have less risk than trabeculectomy or installing a drainage device. They are often combined with cataract surgery. There are a number of MIGS techniques available, and your doctor will discuss which procedure may be right for you. After your procedure, you'll need to see your doctor for follow-up exams. And you may eventually need to undergo additional procedures if your eye pressure begins to rise or other changes occur in your eye.

Treating acute angle-closure glaucoma

Acute angle-closure glaucoma is a medical emergency. If you're diagnosed with this condition, you'll need urgent treatment to reduce the pressure in your eye. This generally will require both medication and laser or other surgical procedures.

Prevention

Get regular dilated eye examinations. Regular comprehensive eye exams can help detect glaucoma in its early stages, before significant damage occurs...
Know your family's eye health history. Glaucoma tends to run in families. ...
Exercise safely...
Take prescribed eyedrops regularly. ...
Wear eye protection.

Conclusion

Te glaucoma severity is particularly proportional to the optic disc cup's enlargement, even When there is no direct affiliation diploma between these two features. Te techniques Which used some computer mastering methods recommended that the CDR metric and the ISNT are giant facts for glaucoma diagnosis. Moreover, all the works indicated that the gain of creating an computerized approach for ocular shape analyses is to limit the variability inside scientific information agreements. All the authors highlighted the significance of the improvement of CAD structures in Order to diagnose the ailment in the preliminary stages, given that it will increase the efficiency of the Screening process. Each evaluated approach in this evaluate diagnoses glaucoma in a Generic way and does now not take into account its variations. Hence, enhancing the prognosis efficiency and growing computational strategies to effectively classify the glaucoma Variations are some challenges for future researches.

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