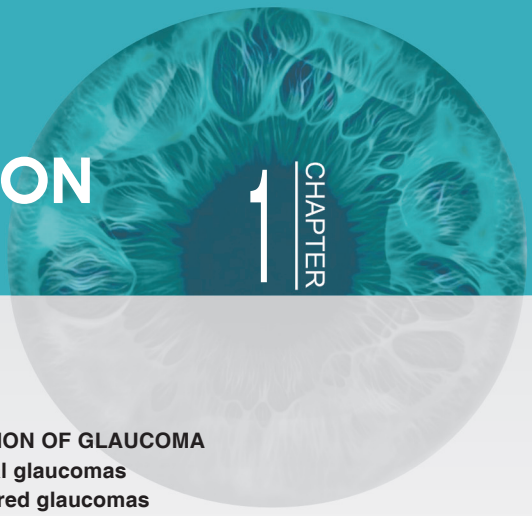
GLAUCOMA: INTRODUCTION AND CLASSIFICATION



INTRODUCTION

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CLASSIFICATION OF GLAUCOMA

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- Primary open-angle glaucoma
- Primary angle-closure disease

Secondary glaucomas

- Depending upon the mechanism of rise in IOP
- Depending upon the causative primary disease

INTRODUCTION

Although the modern concepts of glaucoma can be traced back to the middle of 19th century, this group of ill-understood disorders was recognized as early as 400 BC by the Greeks when Hippocrates coined the term 'glaucosis' for the bluish-green hue of the affected eye. It was in 10th century that an association with raised intraocular pressure was found.

Glaucoma is a leading cause of irreversible blindness throughout the world. Although it more commonly affects older adults, it occurs in all segments of society, with significant health and economic consequences, making it a major public health problem. Being characterized by widely diverse clinical and histopathologic manifestations, it is not commonly appreciated by the general public, or even by a portion of the medical community, which frequently leads to confusion. Once the blindness of glaucoma has occurred, there is no known treatment that will restore the lost vision. In nearly all cases, however, blindness due to glaucoma is preventable making it prudent for the ophthalmologists to recognize the early clinical manifestations of the various glaucomas. Appropriate treatment requires an understanding of the pathogenic mechanisms involved, as well as a detailed knowledge of the drugs and surgeries that are used to control the IOP.

GLAUCOMA TERMINOLOGIES

DEFINITION

- *Glaucoma is not a single disease process* but a group of disorders characterized by a progressive optic neuropathy resulting in a characteristic appearance of the optic disc and a specific pattern of irreversible visual field defects that are associated frequently but not invariably with raised intraocular pressure (IOP).
- *Common denominator of the glaucoma* is a characteristic optic neuropathy, which derives from various risk factors that include but are not limited to increased IOP.
- *IOP is thus the most common risk factor* but not the only risk factor for development of glaucoma.
- Consequently, the term *'Ocular Hypertension'* is used for cases having constantly raised IOP (>21 mm Hg) without any associated glaucomatous optic disc or visual field damage.
- Conversely, the term *normal* or *low tension glaucoma (NTG/LTG)* is suggested for the

typical cupping of the disc and/or visual field defects associated with a normal or low IOP.

GLAUCOMA AND IOP

- *Level of IOP* is unimportant for the diagnosis of glaucoma, although in equivocal cases an abnormal IOP makes the diagnosis more certain.
- *IOP contributes significantly* to the development and progression of glaucoma.
- *Non-IOP factors* also contribute to the aetiology of glaucoma and must be considered.
- *IOP is the only modality*, we currently have available to reduce the risk of glaucoma even in the presence of non-IOP contributing factors.

GLAUCOMA AND OPTIC NEUROPATHY

Glaucoma has a characteristic pattern of damage to the optic nerve head; prominently recognised at the superior and inferior poles of the optic disc. The vertical cup:disc ratio (VCDR) has been used as an index of glaucomatous loss of the neuroretinal rim. But it should be kept in mind that just like intraocular pressure, VCDR is a continuous variable within the population.

VCDR is not a very robust defining feature for glaucoma as there exists variation in the size of the optic disc between individuals, variation in the number of axons in the optic nerve, from a minimum of 8,16,000 to a maximum of 15,02,000 (mean 11,59,000 plus or minus 1,96,000) and the observation that larger optic nerves have a larger neuroretinal rim area and contain more axons. Hence, correction for variation in disc size when assessing the VCDR has been suggested.

GLAUCOMA AND VISUAL FIELD DEFECTS

For all practical purposes, for a visual field defect to be labelled as glaucomatous, the glaucoma hemifield test must be graded "outside normal limits" along with a cluster of three contiguous points at the 5% level on the pattern deviation plot, using the threshold test strategy with the 24-2 test pattern of the Zeiss-Humphrey field analyser 2. We do not imply that this device is the only acceptable tool for field analysis but we consider it the standard as most centres in India and across the globe use this device.

GLAUCOMA: PREDISPOSING AND RISK FACTORS

Everyone should be concerned about glaucoma and its effects. It is important for each of us, from infants to senior citizens, to have our eyes checked regularly, because early detection and treatment of glaucoma are the only way to prevent vision impairment and blindness.

Primary open-angle glaucoma (POAG)

1. *Heredity*. POAG has a polygenic inheritance. The approximate risk of getting disease is 10% in the siblings, and 4% in the offspring of patients with POAG.
2. *Age*. The risk increases with increasing age. The POAG is more commonly seen in elderly between 5th and 7th decades.
3. *Race*. POAG is significantly more common, develops earlier and is more severe in black people than in white.
4. *Myopes* are more predisposed than the normals.
5. *Diabetics* have a higher prevalence of POAG than non-diabetics.
6. *Cigarette smoking* is also thought to increase its risk.
7. *High blood pressure* is not the cause of rise in IOP, however, the prevalence of POAG is more in hypertensives than the normotensives.
8. *Thyrotoxicosis* is also not the cause of rise in IOP, but the prevalence of POAG is more in patients suffering from Graves' ophthalmic disease than the normals.

Primary angle-closure glaucoma (PACG)

Predisposing factors for **PACG** can be divided into anatomical and general factors:

I. *Anatomical factors*. Eyes anatomically predisposed to develop primary angle-closure glaucoma (PACG) include:

- Hypermetropic eyes with shallow anterior chamber.
- Eyes in which iris–lens diaphragm is placed anteriorly.
- Eyes with narrow angle of anterior chamber, which may be due to: small eyeball, relatively large size of the lens and smaller diameter of the cornea or bigger size of the ciliary body.
- Plateau iris configuration.

II. ***General factors*** include:

- *Age*. PACG is comparatively more common in 5th decade of life.
- *Sex*. Females are more prone to get PACG than males (male to female ratio is 1 : 4)
- *Type of personality*. It is more common in nervous individuals with unstable vasomotor system.
- *Season*. Peak incidence is reported in rainy season.
- *Family history*. The potential for PACG is generally believed to be inherited.
- *Race*. In Caucasians, PACG accounts for about 6% of all glaucomas and presents in sixth to seventh decades. It is more common in South-East Asians, Chinese and Eskimos but uncommon in Blacks. In Asians, it presents in the 5th to 6th decades and accounts for 50% of primary adult glaucomas in this ethnic group.

CLASSIFICATION OF GLAUCOMA

Glaucoma can be classified variously, but all classification schemes are considered arbitrary and limited. However, till the complete understanding, it will be worthwhile to stick to the traditional clinico-etiological classification, which is as below.

A. DEVELOPMENTAL GLAUCOMAS

I. ***Primary developmental glaucomas*** (without associated anomalies)

- Newborn glaucoma (true congenital glaucoma)
- Infantile glaucoma
- Juvenile glaucoma

II. ***Developmental glaucoma associated with ocular abnormalities***

III. ***Developmental glaucoma associated with systemic abnormalities***

B. PRIMARY ACQUIRED GLAUCOMAS

I. ***Primary open-angle glaucoma (POAG)***

- Classical POAG with IOP, higher than normal range, and
- Normal tension glaucoma (NTG) with IOPs within normal range

II. ***Primary angle-closure disease***

Stages based on natural history

- Primary angle-closure suspect (PACS)
- Primary angle-closure (PAC), and
- Primary angle-closure glaucoma (PACG)

Types based on mechanism of angle-closure

- Pupillary block,
- Plateau iris syndrome, and
- Phacomorphic mechanism.

C. SECONDARY GLAUCOMAS

I. Depending upon the mechanism of rise in IOP

1. ***Secondary open-angle glaucomas*** in which aqueous outflow may be blocked by:

- Pretrabecular membrane
- Trabecular clogging
- Oedema and scarring, or
- Elevated episcleral venous pressure.

2. ***Secondary angle-closure glaucoma*** which may or may not be associated with pupil block.

- Anterior 'pulling mechanism': The iris is pulled forward by some process in the angle, often by the contraction of a membrane or peripheral anterior synechiae.
- Posterior 'pushing mechanism': The iris is pushed forward by some condition in the posterior segment. Often the ciliary body is rotated anteriorly, allowing the lens to come forward also.

II. Depending upon the causative primary disease, secondary glaucomas are named as follows:

1. Lens-induced (phacogenic) glaucomas.
2. Inflammatory glaucoma (glaucoma due to intraocular inflammation).
3. Pigmentary glaucoma.
4. Neovascular glaucoma.
5. Glaucomas associated with iridocorneal endothelial syndromes.
6. Pseudoexfoliative glaucoma.
7. Glaucomas associated with intraocular haemorrhage.
8. Steroid-induced glaucoma.
9. Traumatic glaucoma.
10. Glaucoma-in-aphakia.
11. Glaucoma associated with intraocular tumours.

SUGGESTED READING

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