بسم الله الرحمن الرحيم
THE GLAUCOMAS
• A complicated group of disorders characterized by optic disc and visual field changes related to a high or a statically normal IOP.

• It involves a study of (1) IOP (2) ON head changes (3) V. field Loss (4) Drainage angles.
• IOP = Aqueous + Vit. Body.
• Production by non pigmented cilary epith. 80% by active secretion (many enzyme systems Na⁺/K⁺ ATP ase).
• 20% by ultrafiltration and diffusion.
• Production Rate: 2.00 micro Litre/min.
• Secreted in posterior chamber, through the pupil, fills anterior chamber and egress through TM.
choroid and sclera (Figure 8.2b). Some aqueous drains via the iris (Figure 8.2c).
• Trabecular Meshwork is small fibroelastic structure about 0.6mm present in the A.A.C. at limbus in deeper part of sclera.

• 90% of drainage. Uveal + corneoscleral and juxta canaliculair ➔ schlemm’s canal ➔ 25-30 collector channels ➔ subepiscleral meshwork ➔ episcleral veins.

• About 10% through ciliary body and iris to suprachoroidal venous system.
CLASSIFICATION

1) Congenital or developmental

2) Acquired
Classification

Congenital Development
- Primary
- Associated
- Secondary

Aquired
- Open Angle
  - Primary
  - Secondary
  - NTG

- Angle Closure
  - Pupillary Block
    - Primary
    - Secondary
  - Without P. Block
    - Primary
    - Secondary
PRIMARY ISOLATED CONGENITAL GLAUCOMA:

(TRABECULODYSGENESIS)

ASSOCIATED: (with Ocular or Systemic Disease)

- e.g. [Anterior Segment dysgenesis, Aniridia, Iris Hypoplasia, Micro Cornea, Micro Spherophakia].
- e.g. [Marfan’s Synd, Homocystinuria, Neuro fibromatosis, Sturge Weber syndrome].

SECONDARY:

- e.g PHPV, ROP, Uveitis, Retinoblastoma, Trauma.
OPEN ANGLE:

Primary Open Glaucoma (Meshwork Sclerosis)

SECONDARY OPEN ANGLE:

1. Pseudoexfoliative Glaucoma
2. Pigmentary Glaucoma
3. Lens Induced Glaucoma
4. Inflammatory Glaucoma
5. Traumatic Glaucoma
6. Intra Ocular Hemorrhage
7. Glaucoma After Cataract Surgery
ANGLE CLOSURE GLAUCOMA WITH PUPILLARY BLOCK:

1. Primary Angle Closure Glaucoma
2. Secondary Angle Closure Glaucoma

Examples:
1. Miotic Induced
2. Swollen Lens
3. Ectopia Lentis
4. Posterior Synechiae (360 degree)
ANGLE CLOSURE GLAUCOMA WITHOUT PUPILLARY BLOCK:

1. PRIMARY ANGLE CLOSURE WITHOUT PUPILLARY BLOCK:  (Plateau Iris)

2. SECONDARY:
   • New Vascular Glaucoma,
   • Epithelial ingrowth,
   • Uveitis,
   • Ciliary Block Glaucoma (Malignant Glaucoma)
   • Cyst of Iris and Ciliary Body,
   • Scleral buckle,
   • Intravitreal air injection
1. Symptoms

• May remain asymptomatic till late when Visual Loss is appreciable due to Central Retinal Involvement. (POAG)

• May Precipitate presbyopia early or aggravate it rapidly.

• Severe Pain, Red Eye, Watering, Nausea & Vomiting indicate acute rise of IOP. (Acute congestive glaucoma: ACG)
• History of Eye Pains with dusk, Winter nights and prolonged work in head down position are signs of Transient rise of IOP(ACG).

• Halos around light is classical of acute congestive Glaucoma with corneal oedema (ACG).

• Watering, bigger cornea, cloudy cornea (PCG)
SIGNS

• Best Corrected visual Acuity

• IOP: Normal (16.0 mmHg ±5.00) or Raised IOP (22.0 mm or above).

• Disc Findings:
  Increased cup disc ratio (Thinning neural rim), notching of the rim, splinter hemorrhage, nasal shift of b.vessels, Baring of Retinal Blood Vessels, C:D asymmetry > 0.2, bayoneting of disc vessels.
• Ant. Segment, Gonioscopy and IOP: OA or AC, primary / Secondary.

• Fundoscopy.

• Visual fields:

• Others: OCT
• Torch exam and SLE
• IOP measurement
• Gonioscopy
• Fundoscopy
Figure 6.14 Optical principles of gonioscopy: \( n \) = refractive index; \( i \) = angle of incidence
Figure 8.11 Shaffer grading system of angle structures
OPTIC NERVE HEAD EXAMINATION

• 1: Retinal nerve fiber layer.
• 2: Scleral canal and lamina cribrosa.
• 3: Optic cup.
• 4: Cup – Disc Ratio.
Figure 8.18 Pallor and cupping of normal optic discs with arrows delineating areas of cupping. Left: pallor and cupping correspond; right: cupping is greater than pallor.
Figure 8.19 Progression of glaucomatous cupping (see text)
VISUAL FIELDS DEFECTS

• 1: Paracentral scotoma (Bjerrum’s area)
• 2: Seidel scotoma.
• 3: Nasal step (Ronne) or a temporal wedge.
• 4: Arcuate scotoma.
Macrophages plugging trabecular meshwork

Hypermature cataract leaking proteins into anterior chamber
Figure 8.46 Top: bilateral buphthalmos; bottom: Haab’s striae
TREATMENT OPTIONS FOR GLAUCOMA

- 1. Medical treatment
- 2. Laser treatment
- 3. Surgical treatment
- 4. Treatment of end stage glaucoma
# Medical treatment of glaucoma

<table>
<thead>
<tr>
<th>Sr no.</th>
<th>Name of drug</th>
<th>Group</th>
<th>Mode of action</th>
<th>Side effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Timolol E/ Dps (.25-.5 % BD)</td>
<td>B-Blocker</td>
<td>↓ aqueous secretion.</td>
<td>Ocular: Allergy, PEE, Dry eye</td>
</tr>
<tr>
<td>2</td>
<td>Betaxolol (betoptic) E/dps (.5 % BD)</td>
<td>B-Blocker Cardio selective.</td>
<td>↓ aqueous secretion.</td>
<td>Systemic: bronchospasm (ex. Betaxolol), Bradycardia, hypotension,</td>
</tr>
<tr>
<td>3</td>
<td>Levobunolol (betagan) (.5% BD)</td>
<td>B-Blocker</td>
<td>↓ aqueous secretion.</td>
<td>Sleep disorder, hallucinations, confusion, depression, fatigue, headache.</td>
</tr>
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<td></td>
<td>(alphagan) (0.2 % BD)</td>
<td>agonist</td>
<td></td>
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<tr>
<td>5</td>
<td>Apraclonidine</td>
<td>Alpha-2</td>
<td>↓ aqueous secretion and ↑ u.s outflow.</td>
<td>Tachyphylaxis + more than brimonidine.</td>
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<tr>
<td></td>
<td>(1% BD)</td>
<td>agonist</td>
<td></td>
<td></td>
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<tr>
<td>6</td>
<td>Pilocarpine E/Dps (.5 %, 1 %, 2% or 4 % BD)</td>
<td>Miotics</td>
<td>Parasympathomimetic stimuation of ciliary and sphincter muscles.</td>
<td>Miosis, visual drop, headache, myopic shift, V.F constriction, RD and uveitis.</td>
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<tr>
<td>7</td>
<td>Dorzolamide (trusopt) E/Dps (2% TDS or BD)</td>
<td>CA Is</td>
<td>Inhibits aqueous secretion.</td>
<td>Allergic blepharo conjunctivitis, endothelial dysfunction, bitter taste.</td>
</tr>
<tr>
<td>8</td>
<td>Brinzolamide (azopt) 1 % TDS or BD</td>
<td>Alpha-2 agonist</td>
<td>Inhibits aqueous secretion.</td>
<td>Lesser incidence of side effects. Lesser than dorzolamide.</td>
</tr>
<tr>
<td>9</td>
<td>Latanoprost (xalatan) E/Dps (0.005 % once daily) Travoprost (0.004 %), bimatoprost (0.03 %), tafluprost (0.0015 %)</td>
<td>PGF2 alpha analogues.</td>
<td>U.S outflow.</td>
<td>Conj. hyperaemia, conj. Pigmentation, iris pigmentation, lengthening, thickening, ↑ pig. and ↑ number of eye lashes, ↑ pig. Periocular skin, CMO, ant. Uveitis and rec. herpetic caratitis. Migraine, URTI and teratogenesis</td>
</tr>
<tr>
<td>Name of drug</td>
<td>Combination</td>
<td></td>
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<tr>
<td>Cosopt</td>
<td>(timolol + dorzolamide) (BD)</td>
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<td>Xalacom</td>
<td>(timolol + latanoprost) (OD)</td>
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<tr>
<td>Timpilo</td>
<td>(timolol + pilocarpine) (BD)</td>
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<tr>
<td>Combigan</td>
<td>(timolol + brimonidine) (BD)</td>
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<td>1</td>
<td>Acetazolamide (tab 250 mg (1-4tabs / day) and inj. 500 mg)</td>
<td>CAI</td>
<td>Inhibits aqueous secretion.</td>
<td>Paraesthesia, malaise complex, GI complex, renal stone, S-J synd, blood dyscrasias and hypokalaemia.</td>
</tr>
<tr>
<td>2</td>
<td>Dichlorphenamidem (tab 50 mg BD/TDS)</td>
<td>CAI</td>
<td>Inhibits aqueous secretion.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Methazolamide (tab 50 mg BD/TDS)</td>
<td>CAI</td>
<td>Inhibits aqueous secretion.</td>
<td></td>
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<tr>
<td>1</td>
<td>Inf. Mannitol (20% 5ml/ kg body weight I/V 30-60 mins)</td>
<td>Osmotic agent</td>
<td>Osmotic gradient b/w blood and vitreous.</td>
<td>Cardiovascular overload, urinary retention, headache, nausea and confusion.</td>
</tr>
<tr>
<td>2</td>
<td>Oral glycerol (50% with lemon juice 2 ml /kg body weight )</td>
<td>Osmotic agent</td>
<td>Osmotic gradient b/w blood and vitreous.</td>
<td>Sweet and sickly taste , hyperglycaemia.</td>
</tr>
<tr>
<td>3</td>
<td>Oral isosorbide (same as glycerol)</td>
<td>Osmotic agent</td>
<td>Osmotic gradient b/w blood and vitreous.</td>
<td>Minty taste.</td>
</tr>
</tbody>
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LASER THERAPY

• ARGON LASER TRABECULOPLASTY (ALT)

• SELECTIVE LASER TRABECULOPLASTY (SLT)

• DIODE LASER CYCLOABLATION (CYCLODIODE)

• LASER IRIDOPLASTY
Figure 8.57 Argon laser trabeculoplasty. Left: correct focus with round aiming beam; right: incorrect focus with oval aiming beam
Figure 8.58 Argon laser trabeculoplasty: (a) blanching of trabeculum—correct reaction; (b) small bubble—also correct reaction; (c) large bubble with heavy pigment fallout—excessive reaction; (d) peripheral anterior synechiae caused by burn applied too posteriorly.
Figure 8.60 Technique of trabeculectomy (see text)

Figure 8.61 Technique of trabeculectomy (continued—see text)
THANK YOU