Glaucoma

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Glaucoma

- Gradual deterioration in visual acuity over time (Oph07)
- Sudden loss of vision and headache (Oph05)
- Watery eye in an infant (Oph03)
Glaucoma is an optic neuropathy with a specific pattern of axonal loss which may be associated with elevated intraocular pressure and a typical pattern of visual field loss.
A disease of the optic nerves

Two principal types
- Open angle glaucoma
- Closed angle glaucoma
Glaucoma

- **Open Angle**
  - Primary – presumed angle predisposition
  - Secondary – cells, inflammation

- **Closed Angle**
  - Primary – narrow anterior chamber angle
  - Secondary – tumours, synechiae
Open Angle Glaucoma

- It affects 2-3% of people over 60
- 2nd leading cause of blindness in N.Z.
- In N.Z. 95% of glaucoma of this type
- There are significant racial variations
- Risk factors: FHx, myopia, HT
4 Key Components to Glaucoma Assessment

1. Intraocular Pressure
2. Angle Assessment
3. Optic Nerve
4. Visual Fields
Goldman tonometry is the “gold standard”
Applanates over 3.02 mm so tear meniscus pressure and corneal rigidity are balanced
The inward pressure of the tonometer equals the IOP
Will vary with corneal abnormalities
“Normal IOP” is 11 - 22 mmHg
95 % of normals fall within this range
Ocular hypertension > glaucoma
25-30 % of glaucoma in N.Z. is normal pressure glaucoma
Proportion varies markedly with race
Normal aqueous flow

Episceral vein
Aqueous vein
Schlemm's canal
Trabecular meshwork
NARROW ANGLE
Iris
Ciliary body
Aqueous flow
Gonioscopy
Closed Angle Glaucoma

- Represents 5% of glaucoma in N.Z.
- Rapid onset with pain, redness, blurring and a mid-dilated pupil
- Caused by a rapid elevation of pressure inside the eye
- Treated with laser iridotomy
A normal optic nerve has 1,000,000 axons

Half can be lost before any visual loss occurs

Visual loss starts in the periphery and affects the central vision last
Histological changes

Optic Nerve Head

Normal

Glaucoma
Cup:disc Ratio

CUP:DISC < 1:2
Visual Fields
Other causes for VF loss
Incidence: 1:10,000 (1:2500 - 1:20,000)

Usually bilateral, males > females

Usually sporadic. 10% inherited as AR with variable penetrance. 5% sib/child risk

Onset: 40% in utero
50% <1 yr
10% > 1 yr
Infantile Glaucoma

- Hazy corneas
- Tearing/watering
- Photophobia
- Buphthalmos
Glaucoma Treatment

- None
- Medications – local and/or systemic
- Laser - laser trabeculoplasty, iridotomy
- Surgery
  - Paediatric surgery
  - Drainage surgery – trabeculectomy, tubes
  - Cyclodestruction
Glaucoma Medications

Increase Aqueous Outflow Through Trabecular Meshwork

a) Miotics: Pilocarpine

Increase Uveoscleral Aqueous Outflow

Prostaglandin Analogue: Xalatan, Travatan, Lumigan
Glaucoma Medications

Reduce Aqueous Production

a) B-Blockers: Timoptol, Betagan, Betoptic
b) CAI Inhibitors: Diamox, Trusopt, Azopt
c) Alpha Adrenergic Agonists: Iopidine, Alphagan

Reduce Vitreous Volume by Osmosis

Osmotic Agents: Mannitol, Glycerol
Systemic side effects of Beta Blockers

- Bradycardia, heart block, asystole
- Heart failure (may interact with others)
- Shortness of breath and bronchospasm
- Apnoea in infants
- CNS - confusion, delerium, depression
- Reduced exercise tolerance
- Impotence and loss of libido
- Masks symptoms of hypoglycaemia
Ophthalmic Medications

- How many drops should be used per dose?
- Name 5 ways to reduce the systemic effect of drops
- Minimum time between instillation of two different drops to prevent major washout?
- What is the most likely reason a glaucoma drop is ineffective?
- Name an eyedrop that is safe in pregnancy
Marijuana and Glaucoma

- Advocated initially in the 70's
- Limited options for glaucoma treatment:
  - miotics, epinephrine, acetozolamide
- Various studies have produced data from a total of 300 volunteer subjects
- Largest single study group was 40 people
Marijuana and Glaucoma

- Inhaled marijuana lowers IOP in 60-65%.
- One smoke reduces IOP by 25%.
- Impressive results but......

Marijuana and Glaucoma

- Duration of effect only 3-4 hours
- For a consistent response one would have to smoke:
  - 8-9 / day
  - 3000 / year
No green light for grass in glaucoma!
Patients fear glaucoma

Treatment is for a lifetime

Treatment can carry significant morbidity, even mortality

If the signs are soft and the optic nerve still quite healthy, then watch for progression before starting treatment
The more nerve damage the lower the target pressure

Trial a drop and alter if poorly effective

If some effect but not enough add another drop

If control with drops is poor then surgery
Glaucoma Surgery to Improve Aqueous Drainage

- Laser Surgery
  - Laser Trabeculoplasty, Laser Iridotomy
- Paediatric Surgery
  - Goniotomy, Trabeculotomy
- Filtration Surgery
  - Trabeculectomy
- Aqueous Shunt Surgery
  - Molteno Implants
Goniotomy
Trabeculotomy
Trabeculectomy
Antimetabolites reduce scarring giving lower post-op IOP and higher success rates

- Applied intraoperatively
- 5-fluorouracil (5-FU) for routine and lower risk cases. Can be given by post-op injection
- Mitomycin C (MMC) for high risk cases
Molteno Tube Drainage
Glaucoma Surgery to Reduce Aqueous Production

- **Cyclodestruction**
  - Cyclocryotherapy
  - External Laser Cyclophotocoagulation
  - Endoscopic Laser Cyclophotocoagulation
Cyclocryotherapy
External Cyclophotocoagulation
Endoscopic Cyclophotocoagulation
The End

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