Glaucoma

Prof. Helen Danesh-Meyer
MBChB MD PhD FRANZCO

Dr Hussain Patel
MBChB MD FRANZCO
Senior Lecture & Consultant Ophthalmologist
Glaucoma

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.
Glaucoma

• A disease of the optic nerves

• Two principal types
  o Open angle glaucoma
  o 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
- 2\textsuperscript{nd} 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
IOP Assessment

• 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
IOP Assessment

• “Normal IOP” is 21 mmHg or less
• 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
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
Optic Nerve Cupping

• 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
Visual Fields
Case Example 1

- 68 year old male
- Ocular history: nil of note
- Fhx – not known
- Medhxs: Hypertension on Atenolol

- VA 6/7.5, 6/7.5 corrected
- No RAPD, Normal colour vision
- IOP: 19T21
- CCT: 552, 560
- Ant segment: NAD OU
- Gonio: open angles
Case Example 1: Discs
Case Example 1: OCT
Case Example 1: Visual Fields

Left VF

Right VF
What is the Diagnosis?

- Normal tension glaucoma
- But could be POAG with systemic b-blocker masking elevated IOPs
Other Causes for VF Loss
Infantile Glaucoma

- 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 year
  - 10% >1 year
Infantile Glaucoma

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

- **None**
- **Medications** – local and/or systemic
- **Laser** - laser trabeculoplasty
- **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?
• How can you 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
Diagnose with Care

- 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
Treat Aggressively

• 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
Selective Laser Trabeculoplasty (video)
Goniotomy
Trabeculectomy
Trabeculectomy with Antimetabolites

- 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
The iStent

• **Mechanism**
  - Smallest medical device ever approved by the FDA (1.0 × 0.3 mm)
  - Improves outflow by creating a bypass between AC & Schlemm’s canal

• **Indication**
  - FDA approved for use in conjunction with cataract surgery for the reduction of IOP in patients with mild/mod open-angle glaucoma currently treated with ocular hypotensive medication

• **Outcomes**
  - Multicentre RCT: Greater IOP lowering & fewer medications when istent used with cataract surgery versus cataract surgery alone, similar safety profile\(^9\)
iStent® trabecular micro-bypass (video)

Source: www.glauckos.com/istent
Video
Xen Gel Stent

- Most significant advancement in surgical glaucoma for many years. Will likely replace trabeculectomy surgery for most patients

- Similar efficacy when compared with trabeculectomy surgery but significantly less invasive, much faster (15 min vs > 1 hour) and much less risk of intra and post operative complications

- So far I have used Xen Gel Stents in 8 patients over last 2 months – 7 out of 8 working very well thus far
Simple Steps of Implanting XEN Glaucoma Tube at PVSC

Step 1: The XEN injector is passed through the Anterior Chamber

Step 2: The XEN injector is passed through the Sclera into the Subconjunctival space

Step 3: The XEN Tube is pushed into the Subconjunctival Space to connect it to the Anterior Chamber

Final: The XEN Tube is in proper position draining the Anterior Chamber fluid into the Subconjunctival space
Xen Gel Stent Video
Xen Gel Stent
Molteno Tube Drainage
Glaucoma Surgery to Reduce Aqueous Production

Cyclodestruction

- Cyclocryotherapy
- External Laser Cyclophotocoagulation
- Endoscopic Laser Cyclophotocoagulation
Cyclocryotherapy
External cyclophotocoagulation
The End

Material contained in this lecture presentation is copyright of The Department of Ophthalmology, New Zealand National Eye Centre, University of Auckland, and should not be reproduced without first obtaining written permission.