Glaucoma for GP’s

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Facts

- Glaucoma is the second leading cause of world blindness

- 50% of people with glaucoma do not realise they have it

- Early detection is the key to preventing irreversible sight loss.

- If they comply with treatment 98% of glaucoma patients will not go blind
Q. Is glaucoma relevant to general practice?

A. Yes
B. No
Q. Is glaucoma relevant to general practice?

A. Yes

- Some of your patients are undiagnosed
- Encourage screening of individuals for glaucoma
  - 45+5
- Steroid Rx can cause glaucoma
  - Any delivery
  - Topical Rx, oral Rx
- Recognition of acute glaucoma
Q. Is glaucoma relevant to general practice?
A. No

Can’t diagnose
Don’t initiate treatment
Can’t monitor response to treatment

... So why isn’t there a screening programme?
Today’s Talk:

1. What is glaucoma?
2. Who is at risk of developing glaucoma?
3. How do we treat glaucoma?
4. Laser treatment for glaucoma
5. Surgery for glaucoma
Not one disease . . .

. . . but many
Glaucoma: the common feature –

- Characteristic damage to the optic disc, known as disc “cupping”
There is more to vision than just the eye
Normal optic discs vary in size, shape and cup size

Discs usually but not always have cups

Cup:disc ratio = 0.2

1.75mm

Cup:disc ratio = 0.6
Cupping from glaucoma has certain features:

- More pronounced
- Uneven – the remaining nerve tissue thickness varies at different clock hours
- Symmetry between the two eyes is lost
Glaucoma disc cupping:

- Other specific signs:
  - notching
Glaucoma disc cupping:

- Other specific signs:
  - baring of blood vessels
  - under-mining
Glaucoma disc cupping:

- Other specific signs:
  - Disc haemorrhages
Normal visual field

Abnormal visual field
GLAUCOMA - STAGE ONE
Normal visual field test (test out to 30°)

**Central 24-2 Threshold Test**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixation Monitor: Gaze/Blindspot</td>
<td></td>
</tr>
<tr>
<td>Fixation Target: Central</td>
<td></td>
</tr>
<tr>
<td>Fixation Losses: 0/13</td>
<td></td>
</tr>
<tr>
<td>False POS Errors: 3%</td>
<td></td>
</tr>
<tr>
<td>False NEG Errors: 0%</td>
<td></td>
</tr>
<tr>
<td>Test Duration: 04:47</td>
<td></td>
</tr>
<tr>
<td>Fovea: OFF</td>
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</tbody>
</table>

- **Stimulus:** III, White
- **Background:** 31.5 ASB
- **Strategy:** SITA-Standard
- **Pupil Diameter:** 5.6 mm
- **Visual Acuity:** 6/4.5
- **RX:** +0.00 DS -1.25 DC X 30
- **Date:** 23-11-2004
- **Time:** 08:00
- **Age:** 45

![Visual Field Diagram](image-url)
Early field loss
Moderate field loss

- Left superior notch
Advanced field loss

- Left eye fields – standard, and central “10-2”
RNFL and ONH: Optic Disc Cube 200x200

<table>
<thead>
<tr>
<th></th>
<th>OD</th>
<th>OS</th>
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</thead>
<tbody>
<tr>
<td>Average RNFL Thickness</td>
<td>64 µm</td>
<td>76 µm</td>
</tr>
<tr>
<td>RNFL Symmetry</td>
<td>62%</td>
<td></td>
</tr>
<tr>
<td>Rim Area</td>
<td>0.65 mm²</td>
<td>0.76 mm²</td>
</tr>
<tr>
<td>Disc Area</td>
<td>1.75 mm²</td>
<td>1.55 mm²</td>
</tr>
<tr>
<td>Average C/D Ratio</td>
<td>0.78</td>
<td>0.70</td>
</tr>
<tr>
<td>Vertical C/D Ratio</td>
<td>0.81</td>
<td>0.67</td>
</tr>
<tr>
<td>Cup Volume</td>
<td>0.564 mm³</td>
<td>0.336 mm³</td>
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</tbody>
</table>

Neuro-retinal Rim Thickness

RNFL Deviation Map

Extracted Horizontal Tomogram

Extracted Vertical Tomogram

RNFL Circular Tomogram

Distribution of Normals

Quadrant

Clock Hours
Glaucoma: the Sneak Thief of Sight

- Patients only notice loss of vision late in the disease
- This is one of the major reasons people still go blind from glaucoma
Why is vision loss from glaucoma not recognised sooner?

- Vision loss occurs very slowly,
- Usually the peripheral vision is lost first
- Rather than getting messages in the optic nerve that vision is poor, the brain is just not getting the messages
It’s a bit like someone intercepting your mail – you don’t know there is a problem till your TV is repossessed.
99 times out of 100, glaucoma is only detected in routine eye examination.

No Symptoms
Glaucoma NZ Recommends:

- Everyone should have an eye examination at the age of 45
- Then every 5 years until 60
- Then 3 yearly
45 + 5

Those with risk factors for glaucoma need more frequent examinations
Glaucoma is an optic neuropathy characterized by

Optic disc cupping

Corresponding Visual Field defect

Raised IOP

....but
Optic disc cupping: variables

- **Physiologic cupping**
  - myopia (large eyes/large optic discs)
  - Hypermetropia (small eyes)

- **Tilted discs**

So screening for glaucoma by looking at the disc is not enough
Visual Fields: variables

- True glaucoma
- Inattention
- Upper lid effects
- Macular degeneration
- Tumours of the brain and optic nerve

So screening with visual field testing alone is not enough.
IOP in the population

Mean 15.5 mmHg
SD 2.5 mmHg
Upper limit of normal = 21 mmHg
IOP

Ocular Hypertension
- Mean IOP > 22 mmHg
- No evidence of glaucoma damage

Normal Tension Glaucoma
- Mean IOP < 21 mmHg
- 1 in 6 people have normal tension glaucoma
Central corneal thickness

- The IOP measured depends on the thickness of the cornea
  - Thin corneas – underestimate the true IOP
  - Thick corneas – overestimate the true IOP

Need to modify measured IOP depending on central corneal thickness

*So screening with IOP alone is not enough*
The diagnosis of glaucoma requires all 3 investigations

- IOP measurement
- Visual field testing
- Optic disc examination

All the glaucoma experts feel screening would be too costly and consume too many resources.
What causes optic disc damage?

1. Raised eye pressure
2. Blood Supply
3. Vulnerable disc structure
4. Apoptosis - Cell death
Raised eye pressure:

- The entire problem in many cases of glaucoma
- A relevant factor in almost all cases

- At present, lowering eye pressure is the only way we can treat glaucoma
Other factors we believe are involved in glaucoma:

- Problems with blood supply to the optic disc – especially normal tension glaucoma
Other factors we believe involved in glaucoma:

Weakness of the structural support of the disc
Other factors we believe involved in glaucoma:

“Apoptosis” – programmed cell death of the axon
Types of glaucoma
Congenital/juvenile/age related

- There are many types of glaucoma
- Glaucoma can occur in babies, children, young adults and older
  - much more common as we get older
Primary/secondary

- Glaucoma (like hypertension)
  - Primary – eye otherwise normal
  - Secondary – pathology identified to account for the raised IOP
Acute/Chronic

- Glaucoma can occur suddenly and very severely (acute glaucoma)
- Or very gradually (chronic glaucoma – much more common)
Open angle/closed angle

- Glaucoma is divided into two broad categories:
  - Open angle glaucoma
  - Closed angle glaucoma
But the vast majority of people have a type of *chronic open angle glaucoma*
Some types of Chronic Glaucoma

- Primary Open Angle Glaucoma
- Low Pressure Glaucoma (LTG)
- Pseudoexfoliation
Who is at risk of developing glaucoma?
Two types of risk factors for glaucoma

1. Those we all can be aware of
2. Those that can only be found during an eye examination
Risk factors we all can identify

a) Age

b) Having glaucoma in your family

c) Being very myopic

d) Previous significant eye injury

e) Being on steroid therapy
   e.g. prednisone tablets
Age and prevalence of glaucoma (Blue Mountains Eye Study)

<table>
<thead>
<tr>
<th>Age</th>
<th>Prevalence</th>
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<tbody>
<tr>
<td>60’s</td>
<td>1.3%</td>
</tr>
<tr>
<td>70’s</td>
<td>4.7%</td>
</tr>
<tr>
<td>&gt;80</td>
<td>11.4%</td>
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</table>
There are many risk factors that can be picked up by an eye examination

- For example:
  - High eye pressure
  - Narrow angles
  - Disc cupping
  - Loss of visual field
  - Other eye disease likely to cause glaucoma
  - Thin corneal thickness
However, glaucoma is a common condition...

- You don’t have to have a risk factor (eg family history) to get glaucoma

- After reaching 45 we all need regular glaucoma checks
How do we treat glaucoma?
At present, the only way we can treat chronic glaucoma is by lowering the eye pressure...

....the future

neuroprotection
modifying apoptosis
increasing blood flow to the optic nerve head
Pressure-lowering treatments:

1. Eye-drops
   - Prostaglandin analogues
   - Beta-blockers
   - Alpha-agonists
   - Carbonic Anydrase Inhibitors
   - Combination agents

2. Oral Diamox

3. Laser

4. Surgery
Laser for glaucoma

- Laser iridotomy
- Laser iridoplasty
- Laser trabeculoplasty
- Laser ciliary body destruction
Laser trabeculoplasty *pluses*:

- Easy to perform for the surgeon
- Easy to have for the patient
- Very safe
- Can lower eye pressure significantly for many years
- Eye-drops can be avoided
Laser trabeculoplasty *minuses*:

- Often doesn’t work
- May just lower pressure a little.
- May only lower pressure for a limited period
Operations for glaucoma

- Two common procedures:
  1. Trabeculectomy
  2. Tube shunt, e.g. Molteno drain
Surgery first?

- Studies in Britain and USA have justified performing glaucoma surgery as the first treatment for glaucoma.
Glaucoma surgery **pluses:**

- Successful surgery is the best treatment for glaucoma
  - e.g. eye pressure of 9, no eye drops needed, diffuse uninflamed drainage bleb

- Disadvantages of eye-drops:
  - Compliance
  - Cost
  - Complications
Glaucoma surgery *minuses*:

- Serious risks of surgery

- Common problems of surgery
  - Disturbed vision
  - Acceleration of cataract
  - Tear film disturbance

- Many clinics visits

- Blebs can get infected
But . . .

- Far, far more people have been made blind by glaucoma than by glaucoma operations
Trabeculectomy

- The standard glaucoma operation since the 1960s

- Aim: to create a flap-valve still maintaining some eye pressure

- Sometimes anti-metabolite drugs like 5FU and mitomycin used
Trabeculectomy

- Performed under the upper eyelid
- Many variations in technique
Molteno Drain

- The original tube shunt, developed by Professor Molteno
Glaucoma
New Zealand

A charitable trust
to eliminate
blindness from glaucoma