# 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 . . .

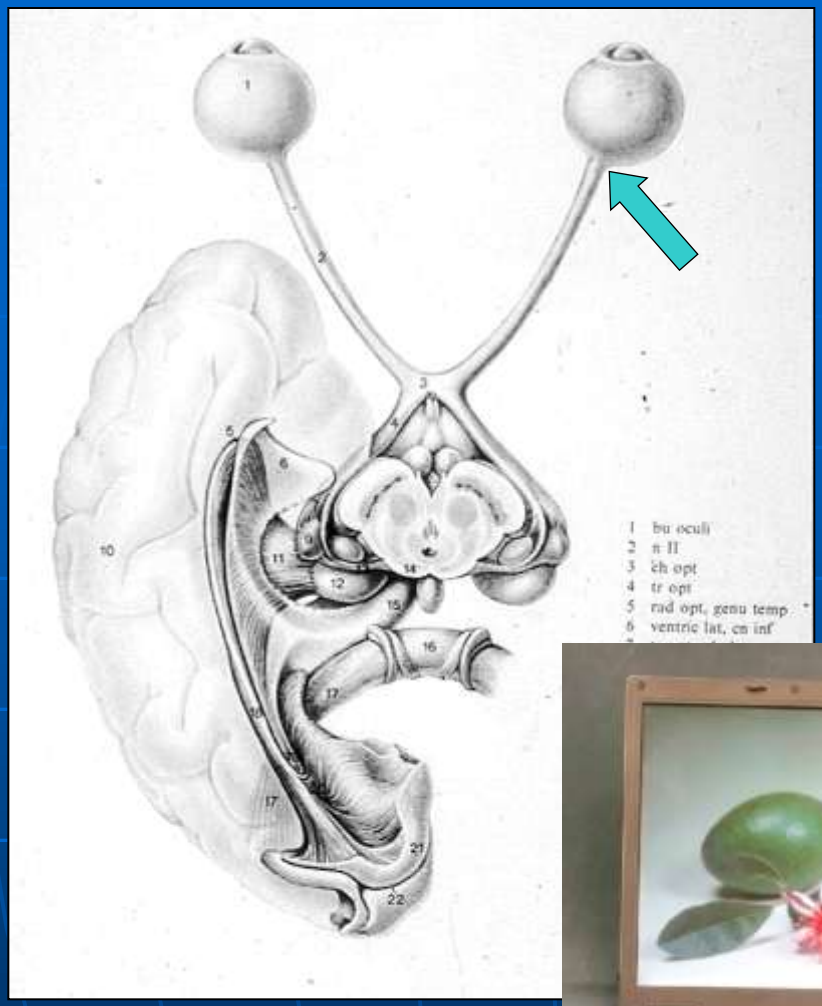
. . . but many

# Glaucoma: the common feature –

- Characteristic damage to the optic disc,

known as
disc "cupping"

There is more to vision than just the eye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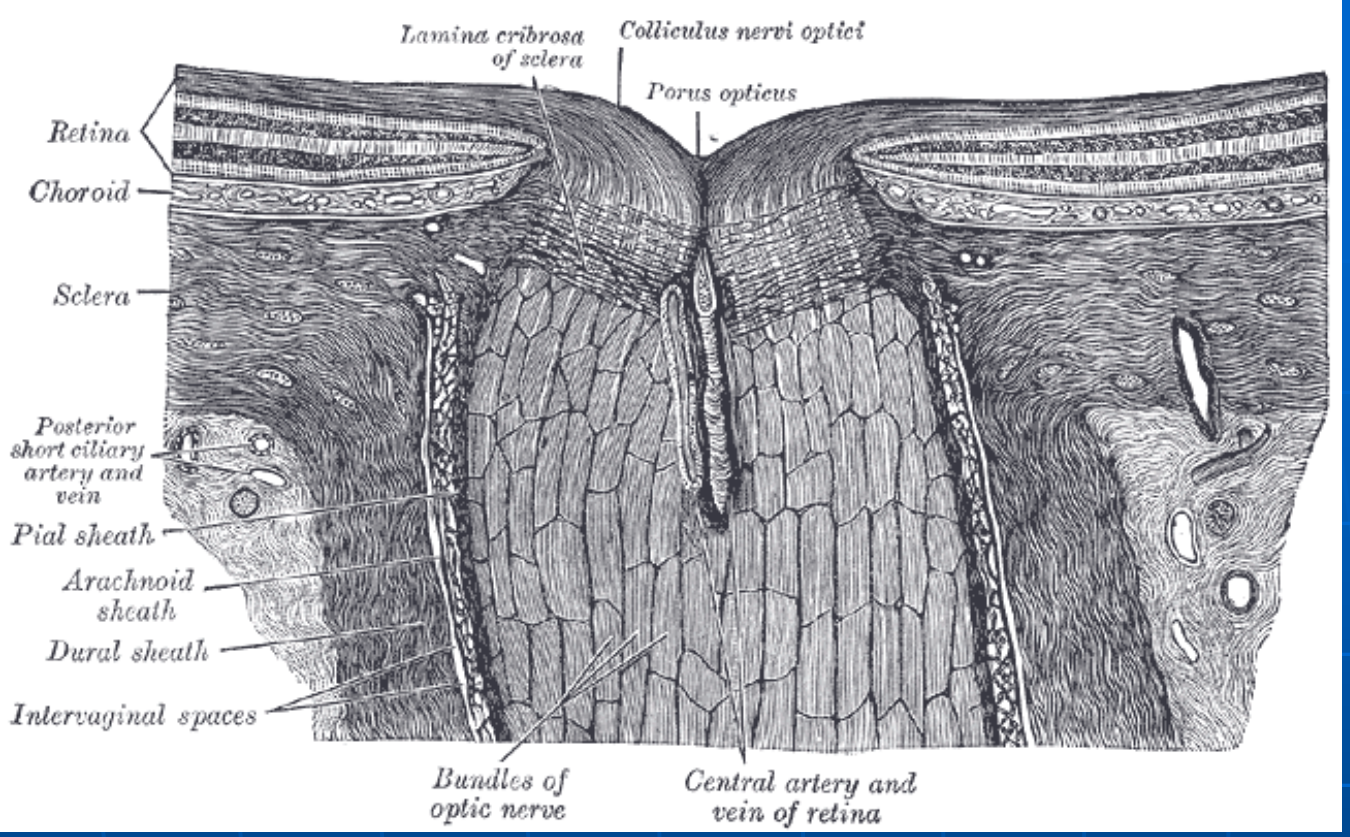
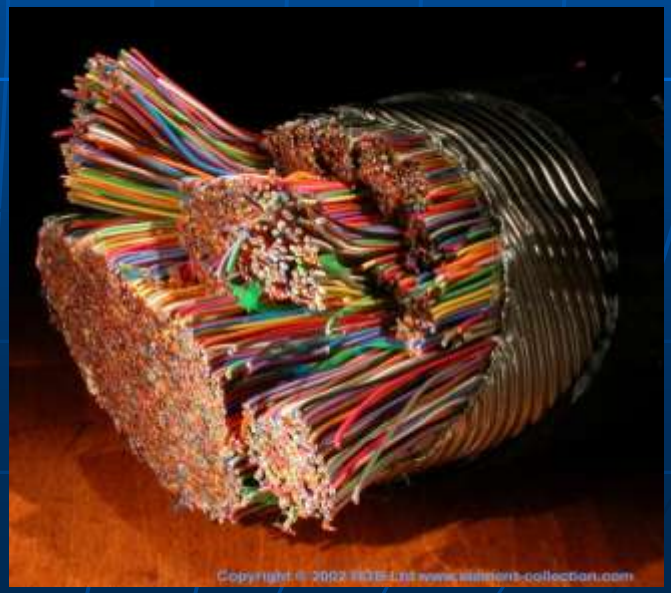
3 ch opt
4 tr opt
5 rad opt, genu temp
6 ventric lat, cn inf



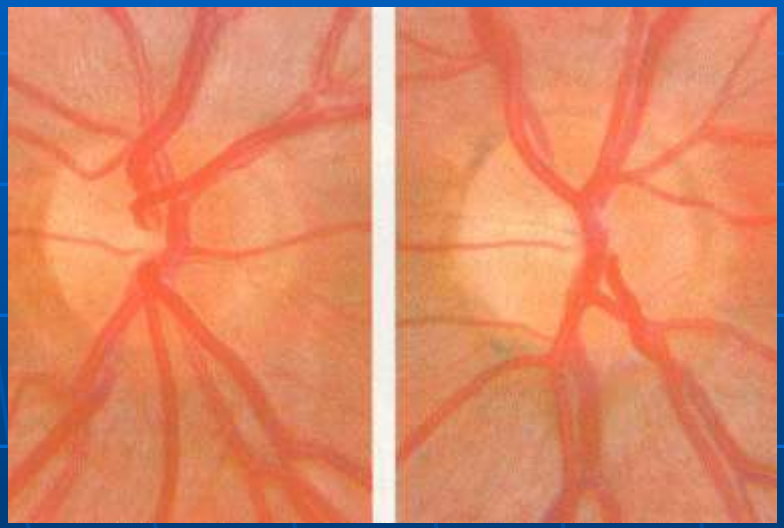

Optic nerve

Telephone Cable

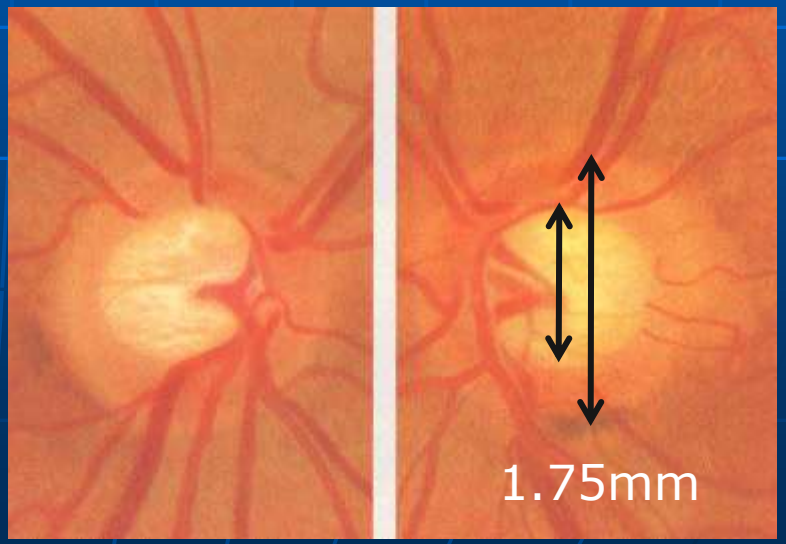


# Normal optic discs vary in size, shape and cup size

Discs usually but not always have cups



Cup:disc ratio
= 0.2



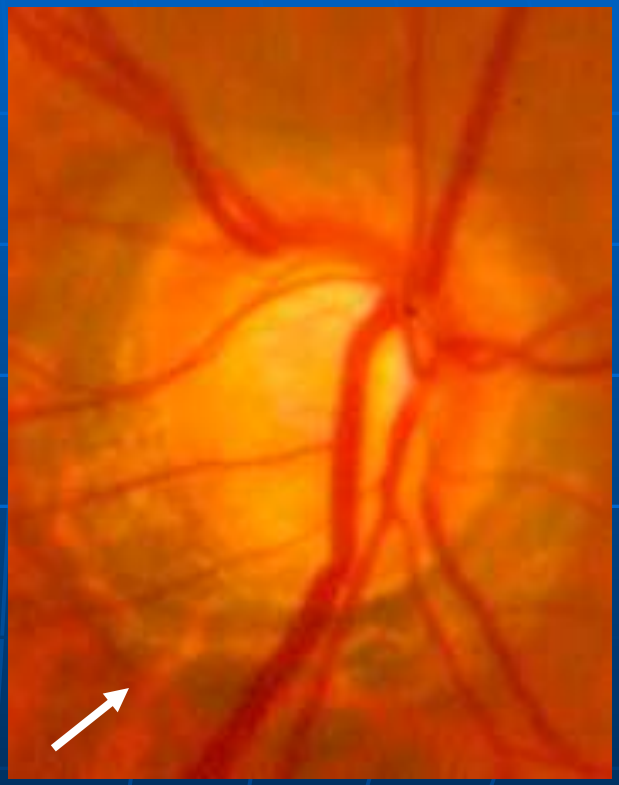

Cup:disc ratio = 0.6

# 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:

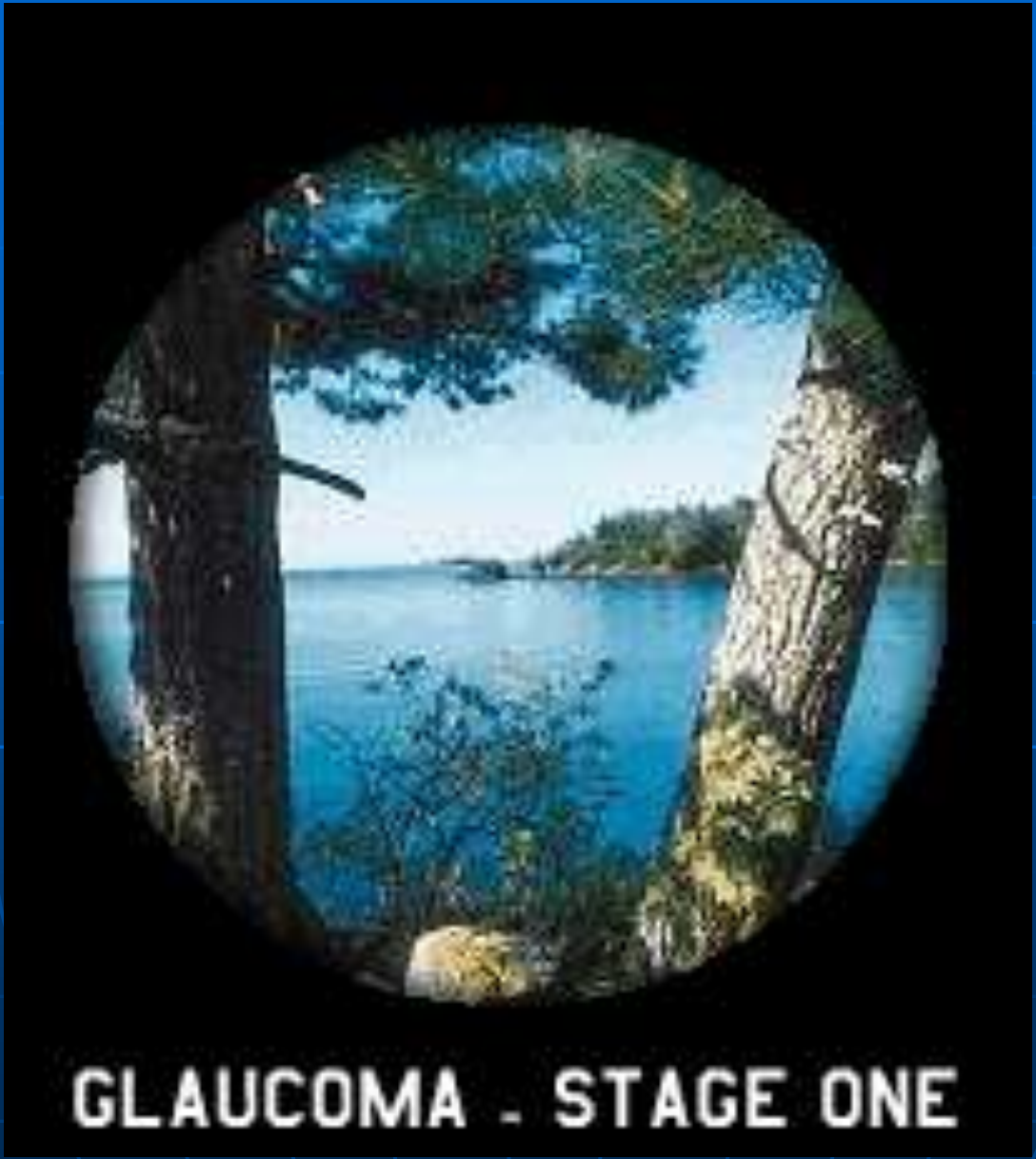
  - baring of blood vessels
  - under-mining

# 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

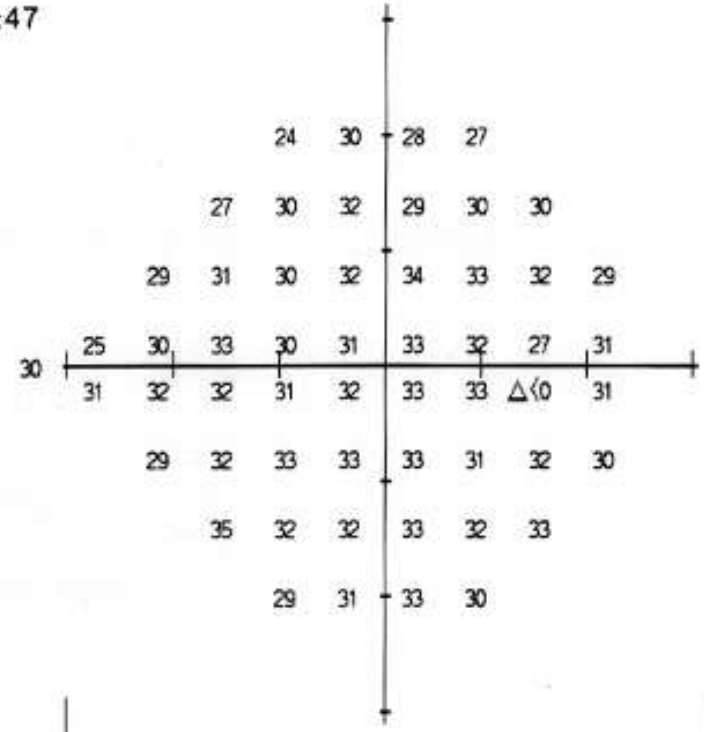
Fixation Monitor: Gaze/Blindspot
Fixation Target: Central
Fixation Losses: 0/13
False POS Errors: 3 %
False NEG Errors: 0 %
Test Duration: 04:47

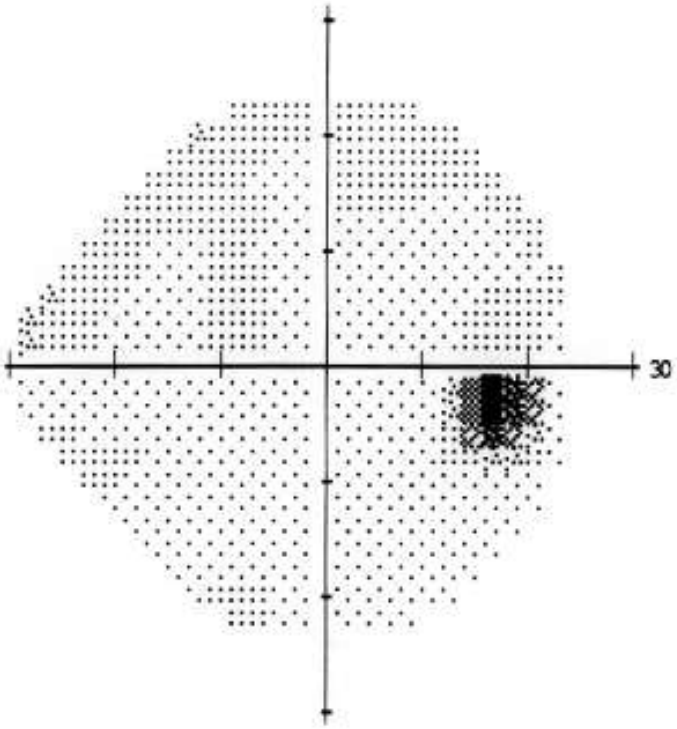
Fovea: OFF

Stimulus: III, White
Background: 31.5 ASB
Strategy: SITA-Standard

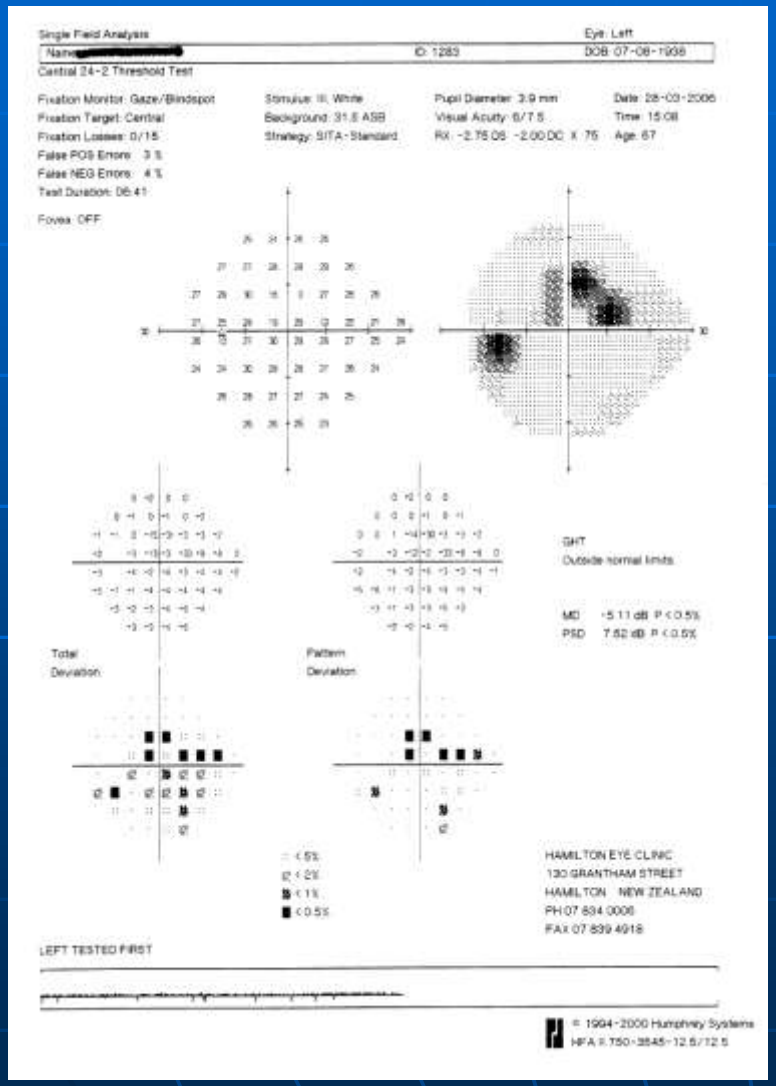
Pupil Diameter: 5.6 mm
Visual Acuity: 6/4.5
RX: +0.00 DS -1.25 DC X 30

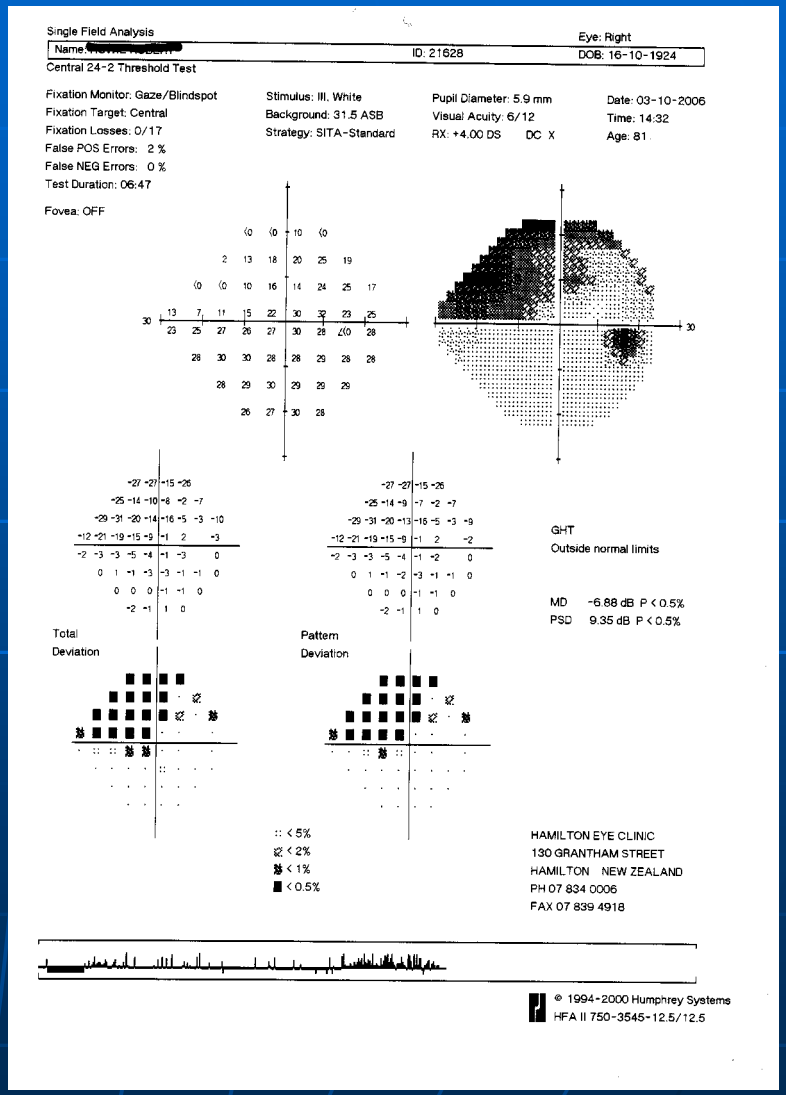
Date: 23-11-2004
Time: 08:00
Age: 45



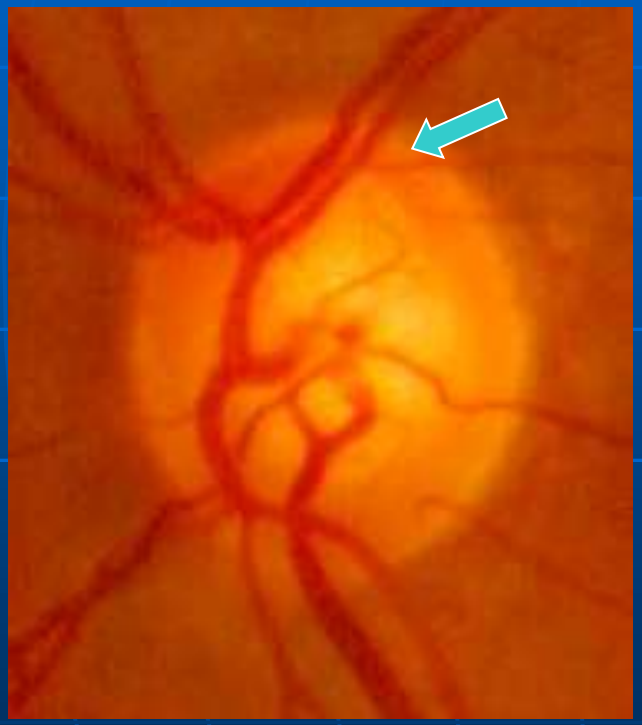
# Early field loss

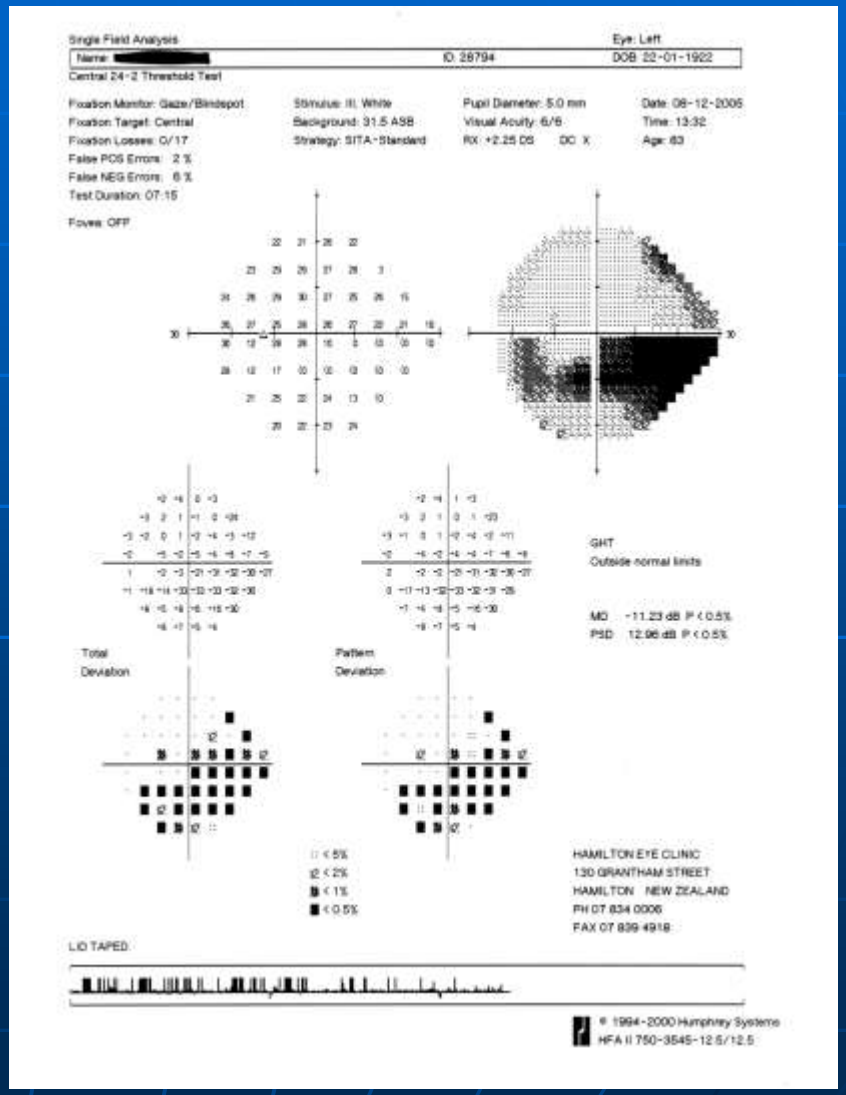


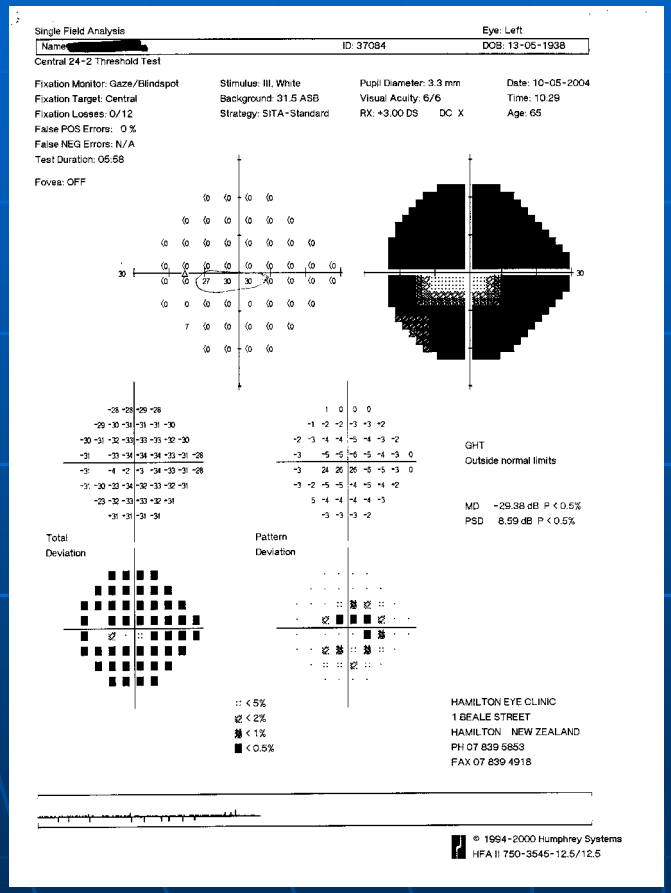
# Moderate field loss

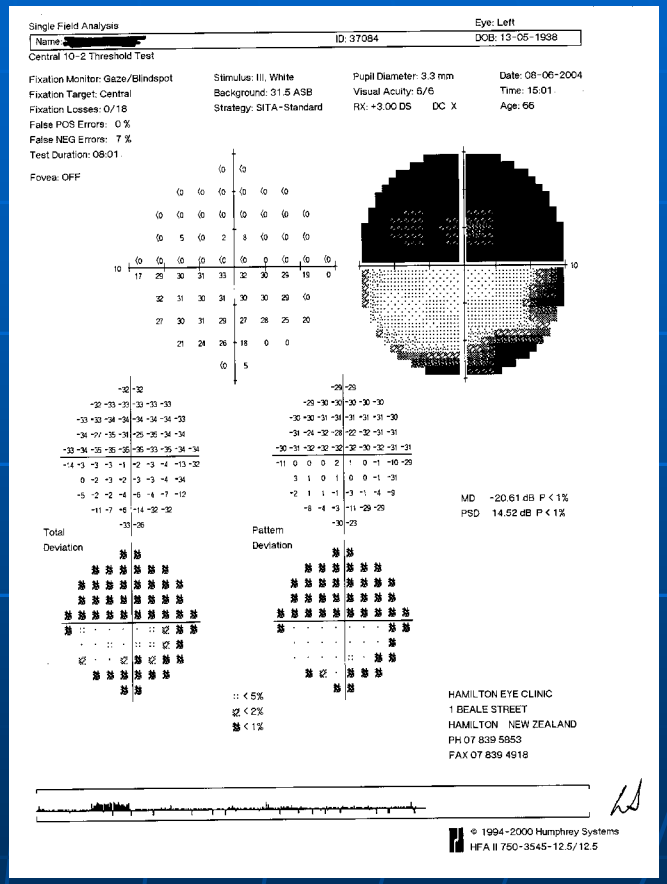
- Left superior notch





# Advanced field loss



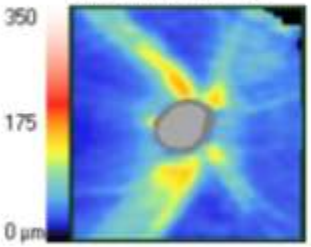




- Left eye fields – standard, and central “10-2”

## RNFL and ONH:Optic Disc Cube 200x200

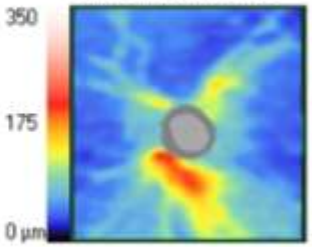
OD ● | ● OS

RNFL Thickness Map

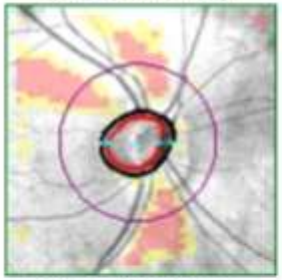



| | OD | OS |
|---|---|---|
| Average RNFL Thickness | 64 µm | 76 µm |
| RNFL Symmetry | 62% | |
| Rim Area | 0.65 mm² | 0.76 mm² |
| Disc Area | 1.75 mm² | 1.55 mm² |
| Average C/D Ratio | 0.78 | 0.70 |
| Vertical C/D Ratio | 0.81 | 0.67 |
| Cup Volume | 0.564 mm³ | 0.336 mm³ |

RNFL Thickness Map

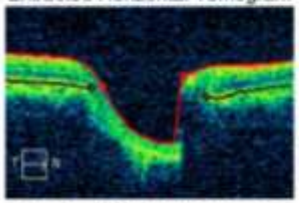



RNFL Deviation Map

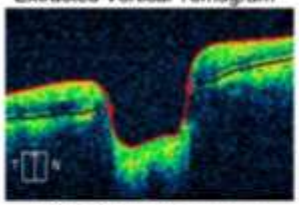


Offset (-0.09,-0.03) mm

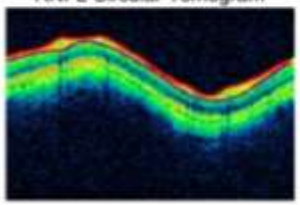
Extracted Horizontal Tomogram



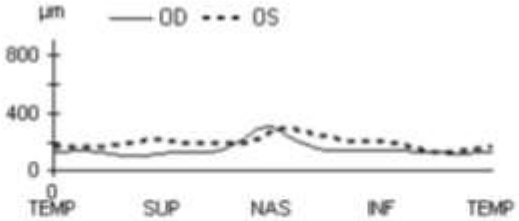
Extracted Vertical Tomogram



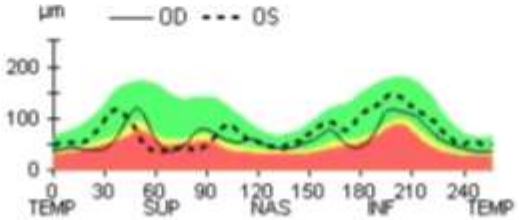
RNFL Circular Tomogram



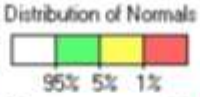
**Neuro-retinal Rim Thickness**



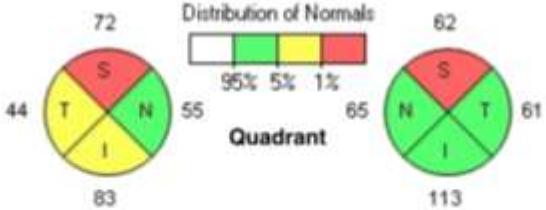

**RNFL Thickness**



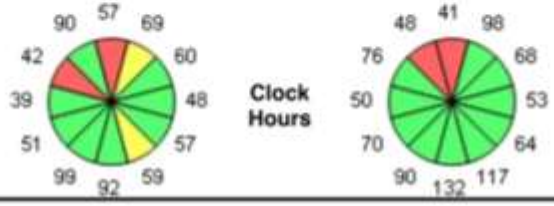

Distribution of Normals



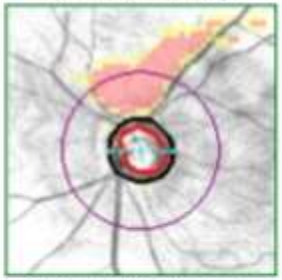

**Quadrant**




**Clock Hours**

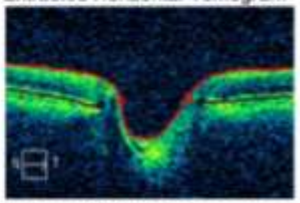



RNFL Deviation Map

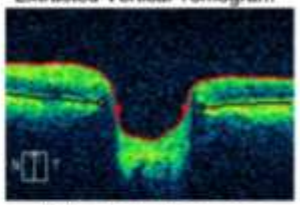


Offset (-0.03,-0.21) mm

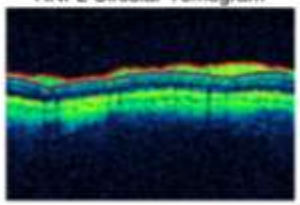
Extracted Horizontal Tomogram



Extracted Vertical Tomogram



RNFL Circular Tomogram



# 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

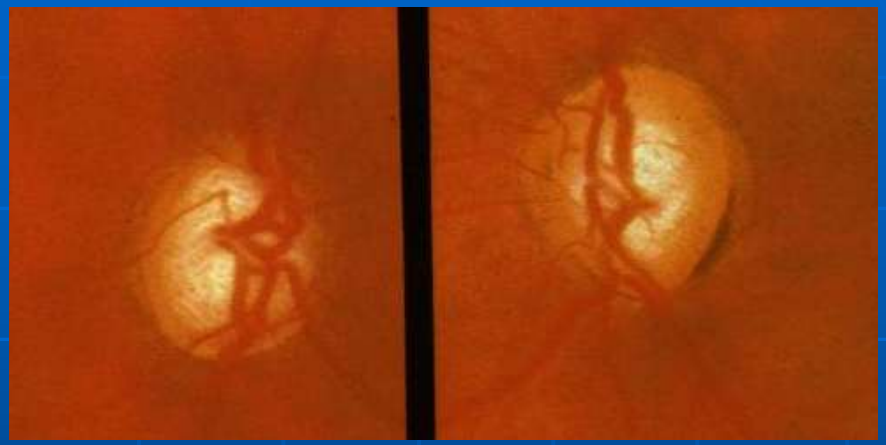
Corresponding Visual Field defect

Raised IOP

*….but*

# Optic disc cupping: variables

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

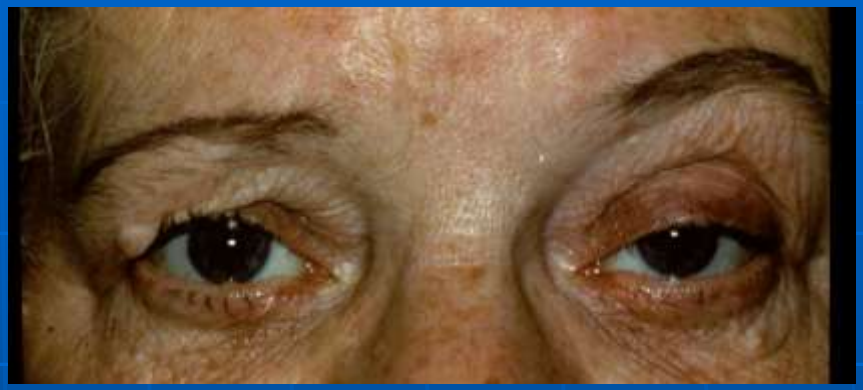


- Tilted discs

So screening for glaucoma by looking at the disc is not enough

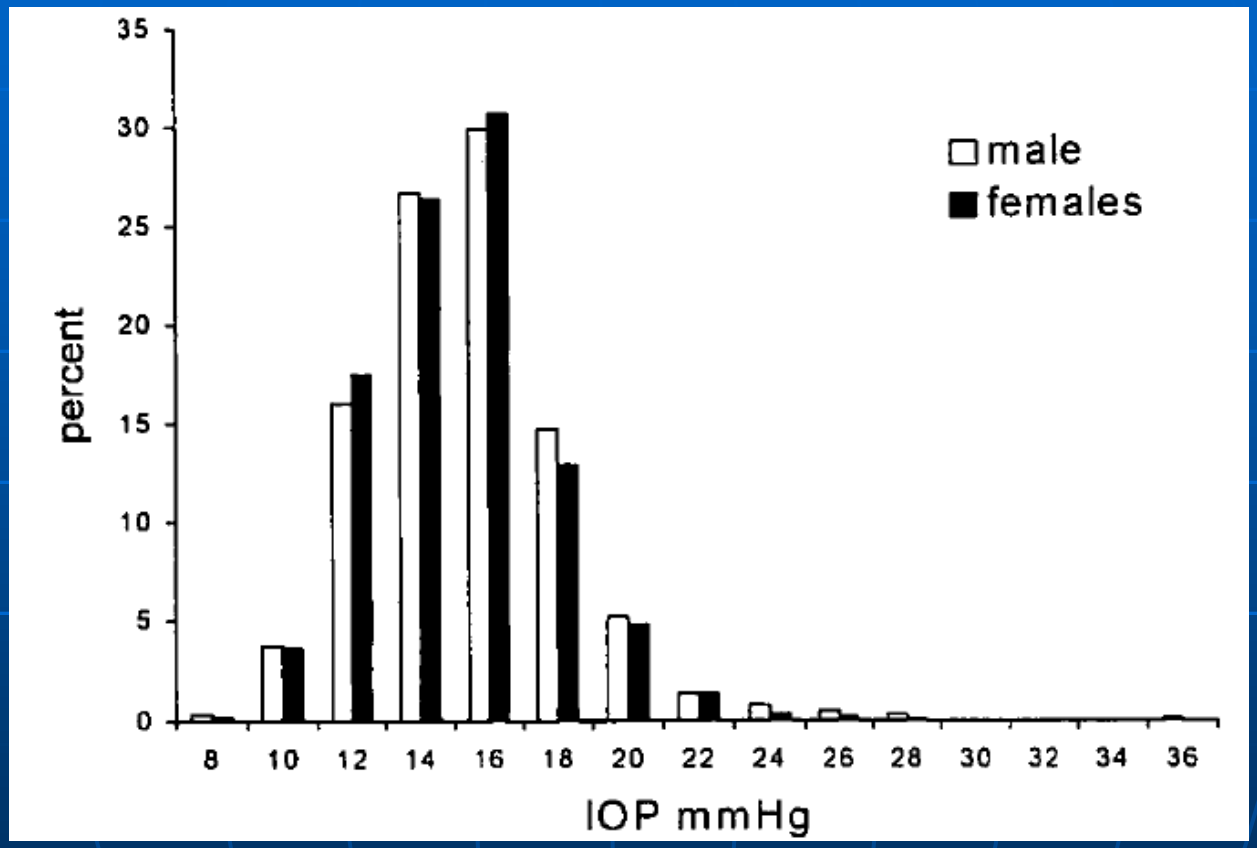
# Visual Fields: variables

- 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 15.5mmHg
SD 2.5mmHg
Upper limit of normal = 21 mmHg

# IOP

**Ocular Hypertension**

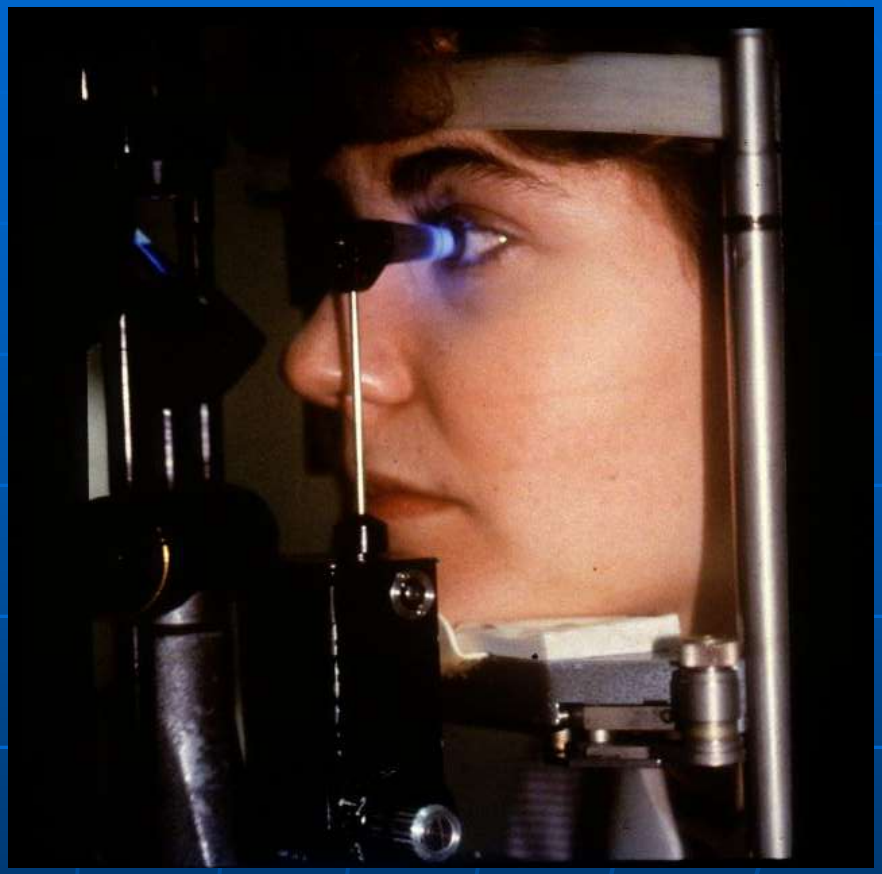
- Mean IOP > 22 mmHg
- no evidence of glaucoma damage

**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:

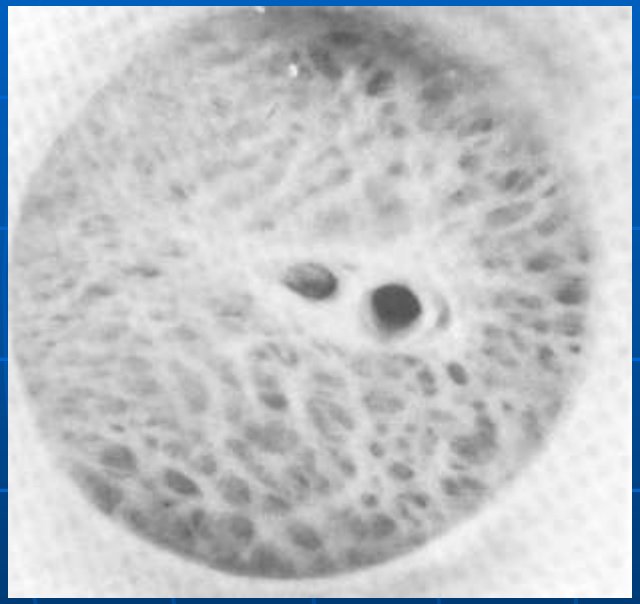
- The entire problem in many cases of glaucoma
- A relevant factor in almost all cases

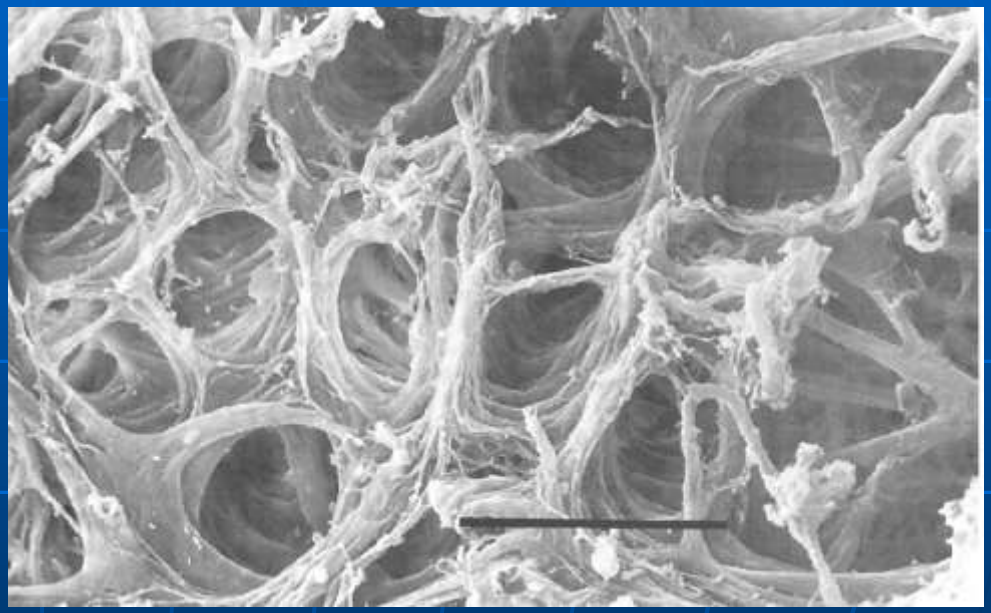
- *At present, lowering eye pressure is the only way we can treat glaucoma*

# Other factors we believe are involved in glaucoma:


- Problems with blood supply to the optic disc – especially normal tension glaucoma

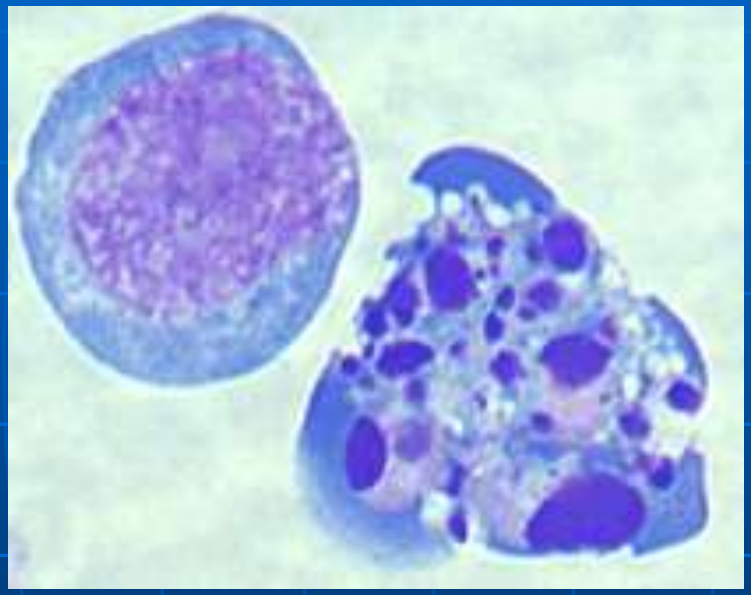
# Other factors we believe involved in glaucoma:





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

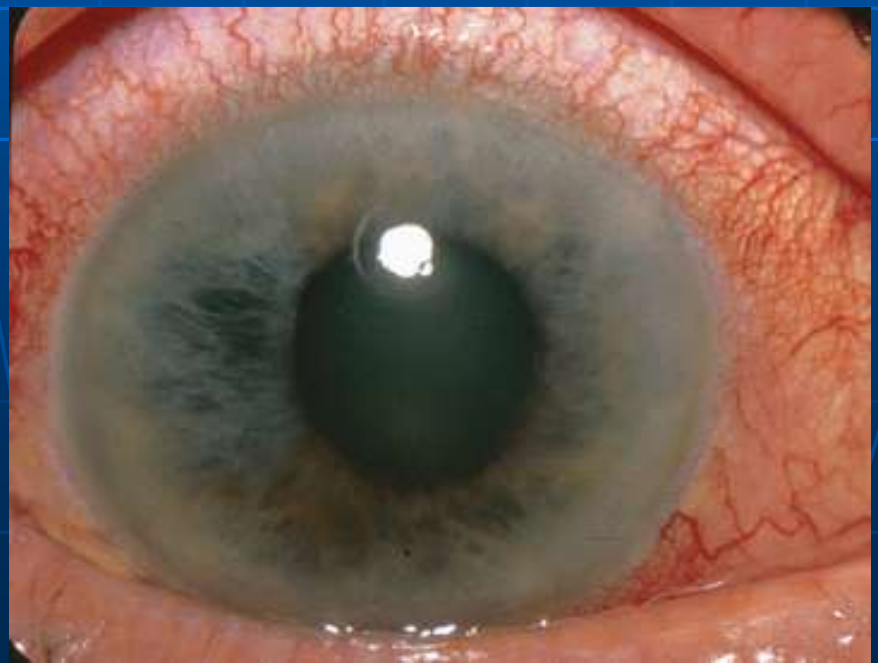
- There are many types of glaucoma
- Glaucoma can occur in babies, children, young adults and older
  - much more common as we get older

# Primary/secondary

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

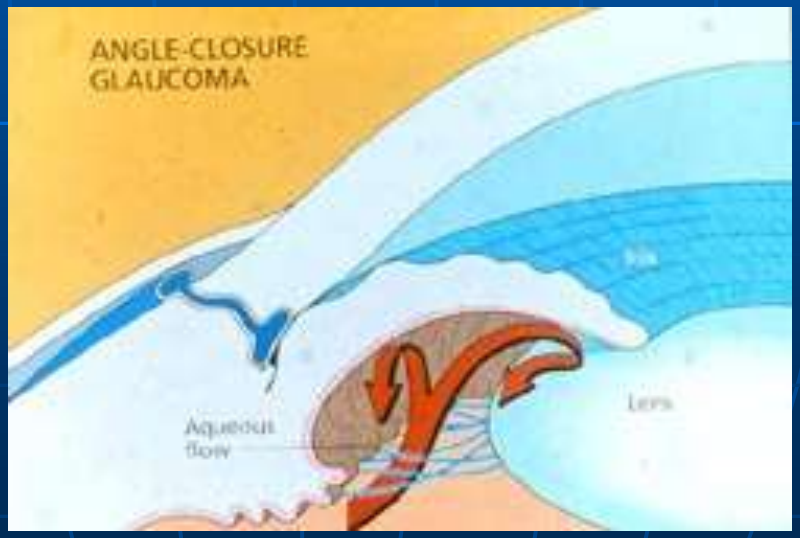
# Acute/Chronic

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



# Open angle/closed angle

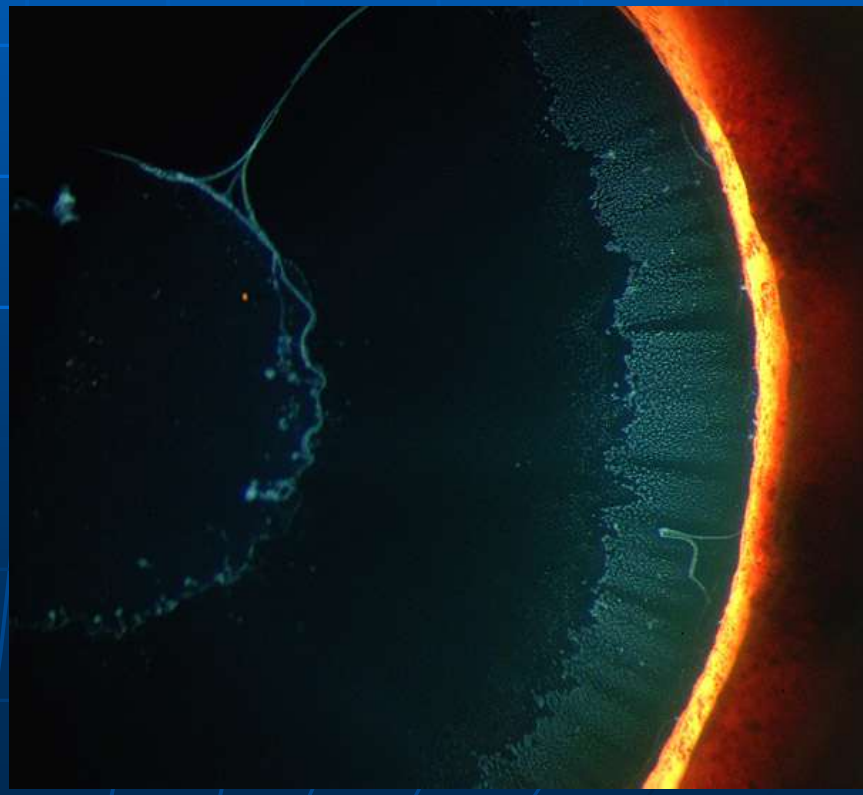
- Glaucoma is divided into two broad categories:
  - Open angle glaucoma
  - Closed angle glaucoma



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)

| Age | Prevalence |
|---|---|
| 60's | 1.3% |
| 70's | 4.7% |
| >80 | 11.4% |

# 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:

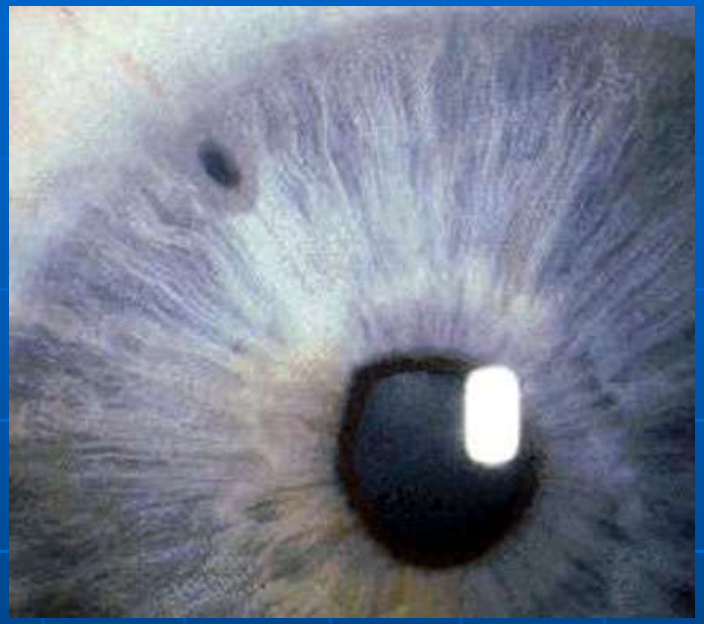
1. Eye-drops
   - Prostaglandin analogues
   - Beta-blockers
   - Alpha-agonists
   - Carbonic Anydrase Inhibitors
   - Combination agents
2. Oral Diamox
3. Laser
4. Surgery

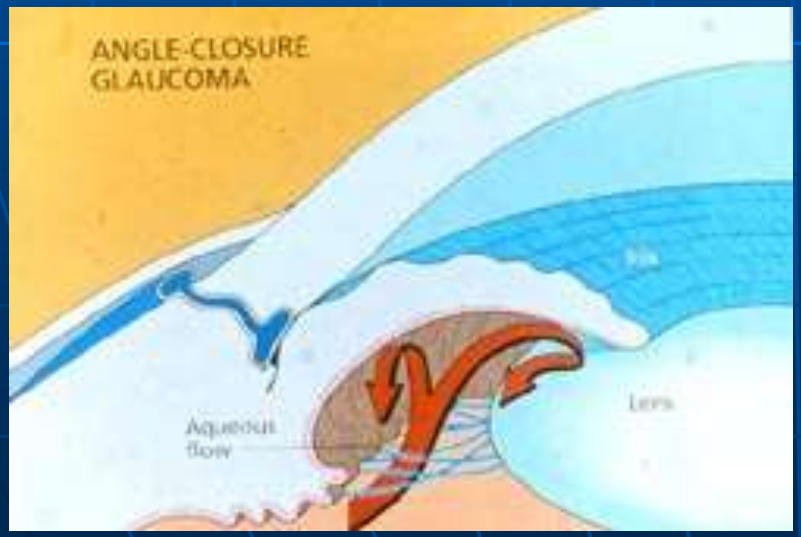
# Laser for glaucoma

- Laser iridotomy

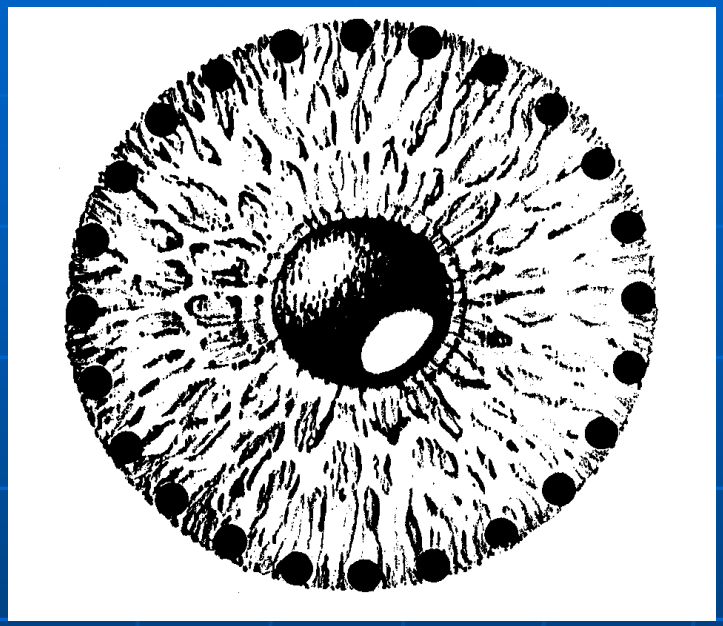
- Laser iridoplasty
- Laser trabeculoplasty
- Laser ciliary body destruction

Laser iridotomy



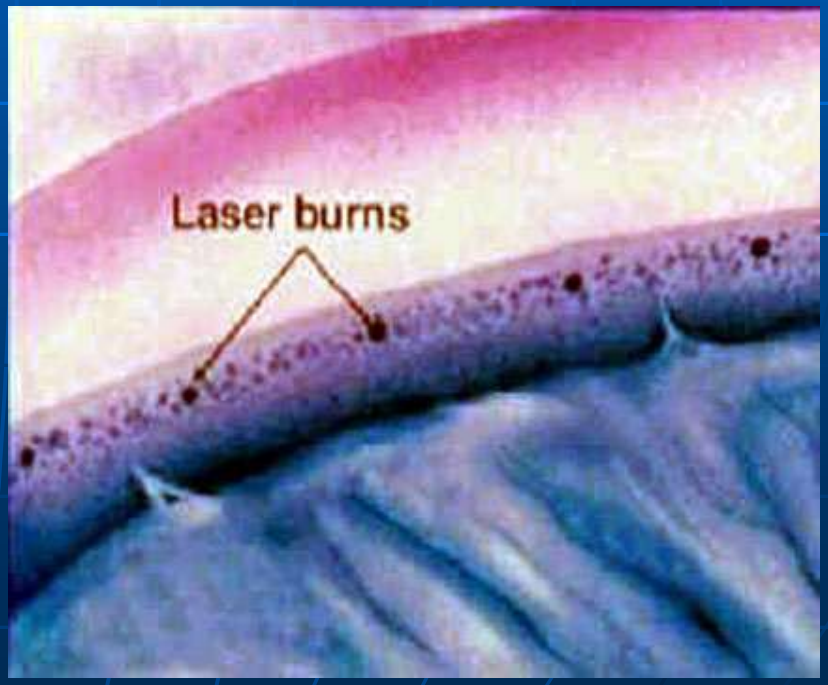


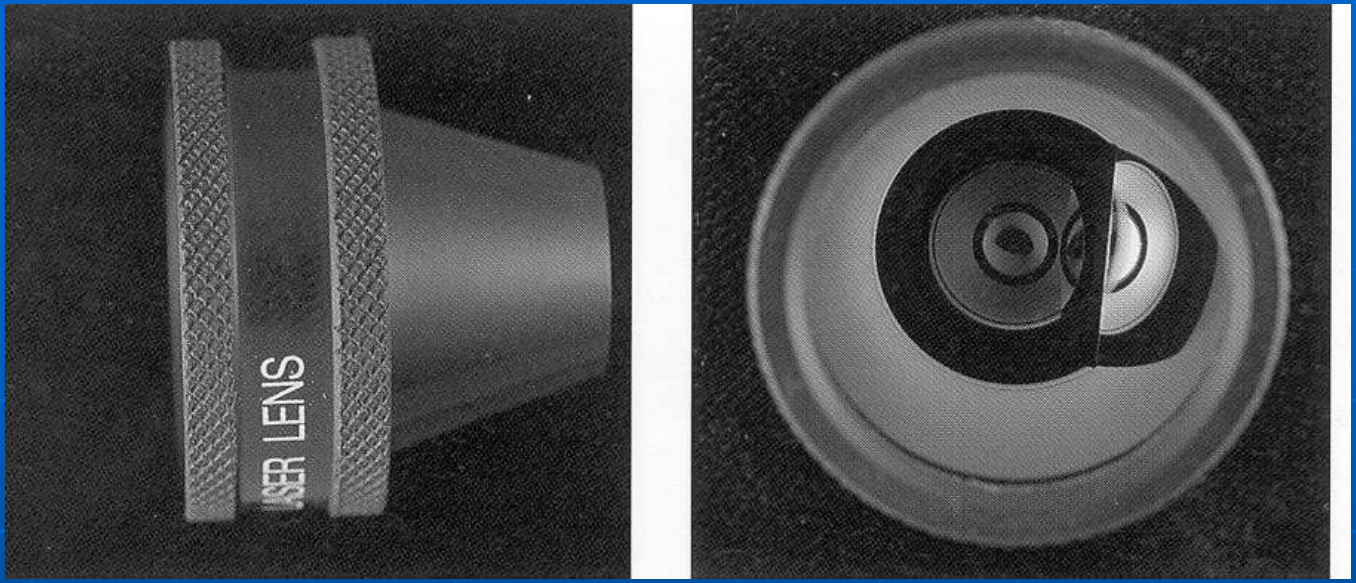

Laser iridoplasty

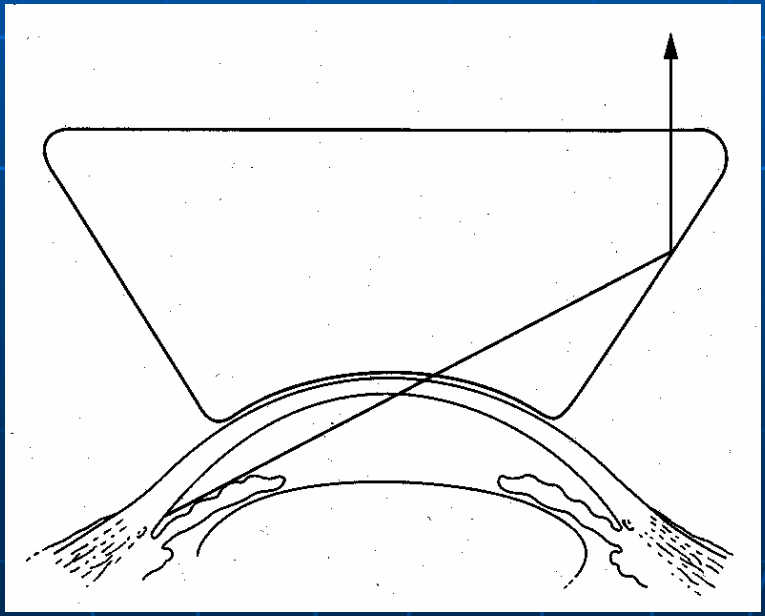


# Laser trabeculoplasty *pluses*:

- 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 burns


LENS



# 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 . . .

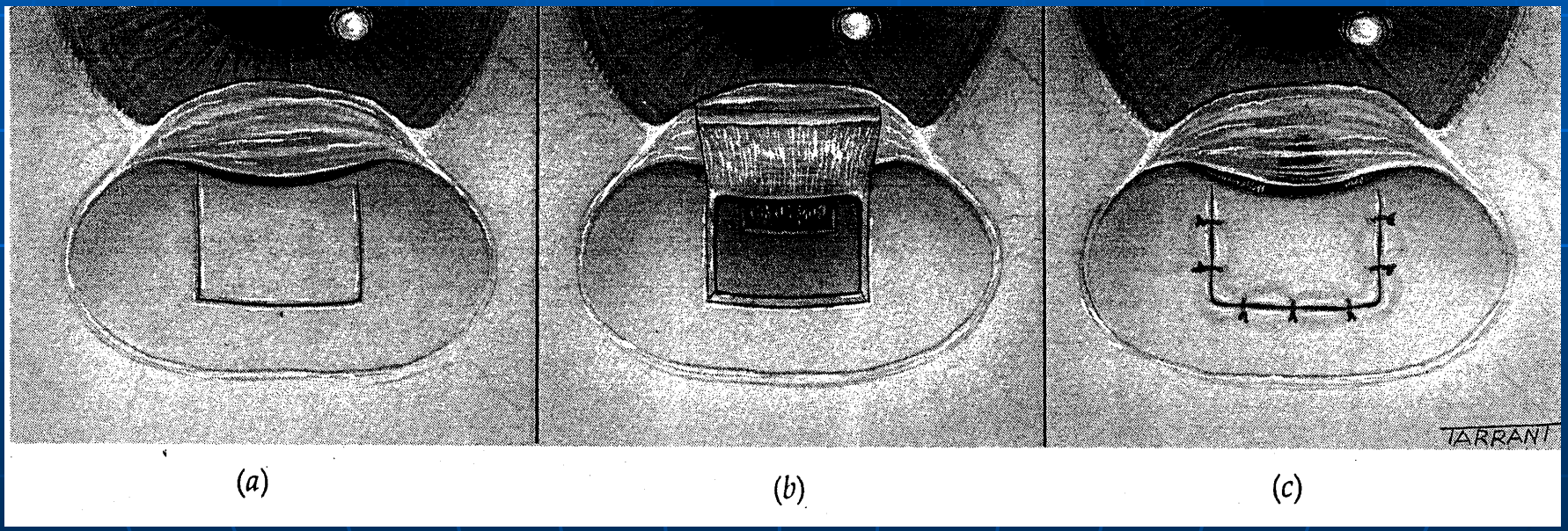
- Far, far more people have been made blind by glaucoma than by glaucoma operations

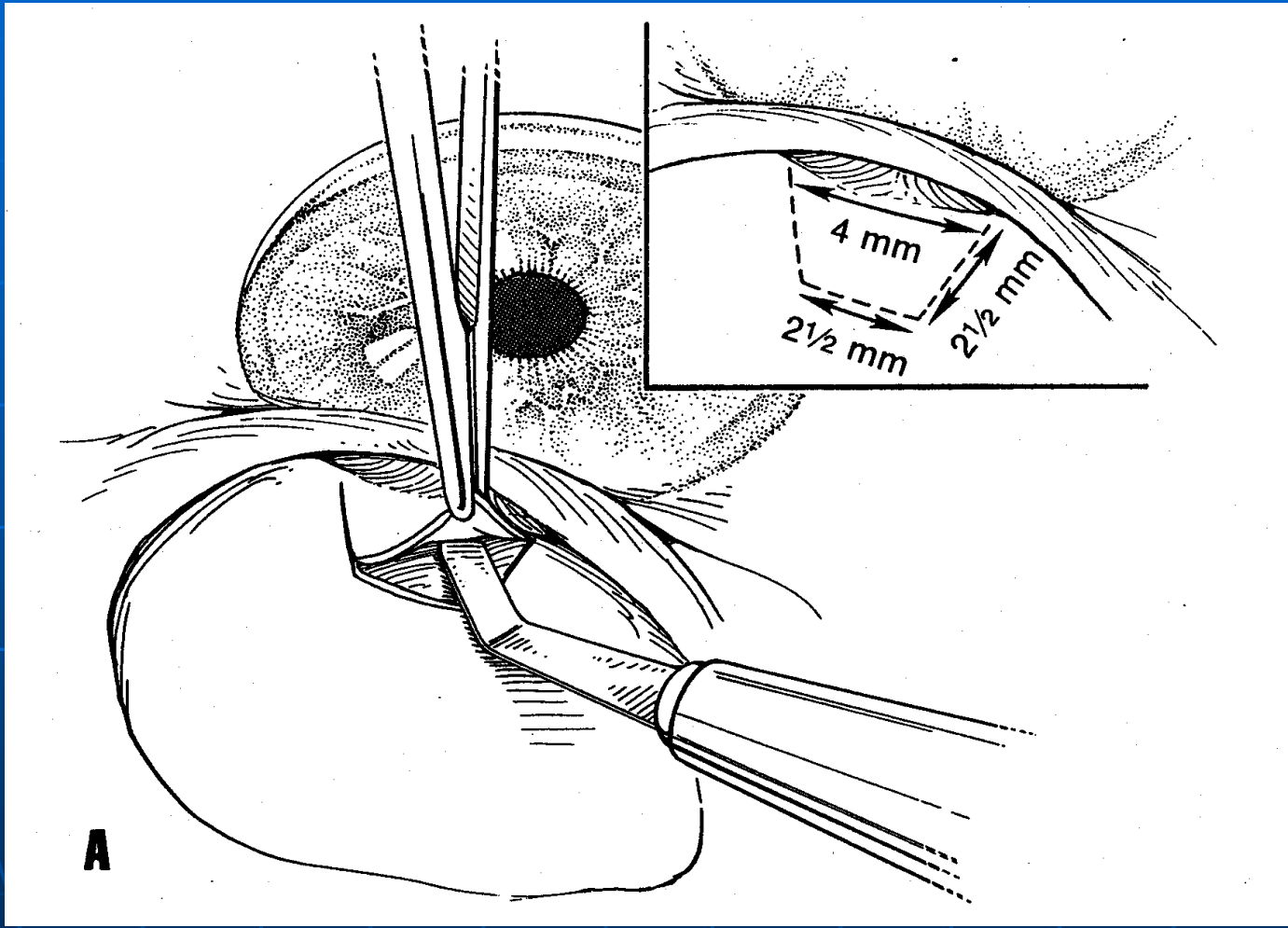
# Trabeculectomy

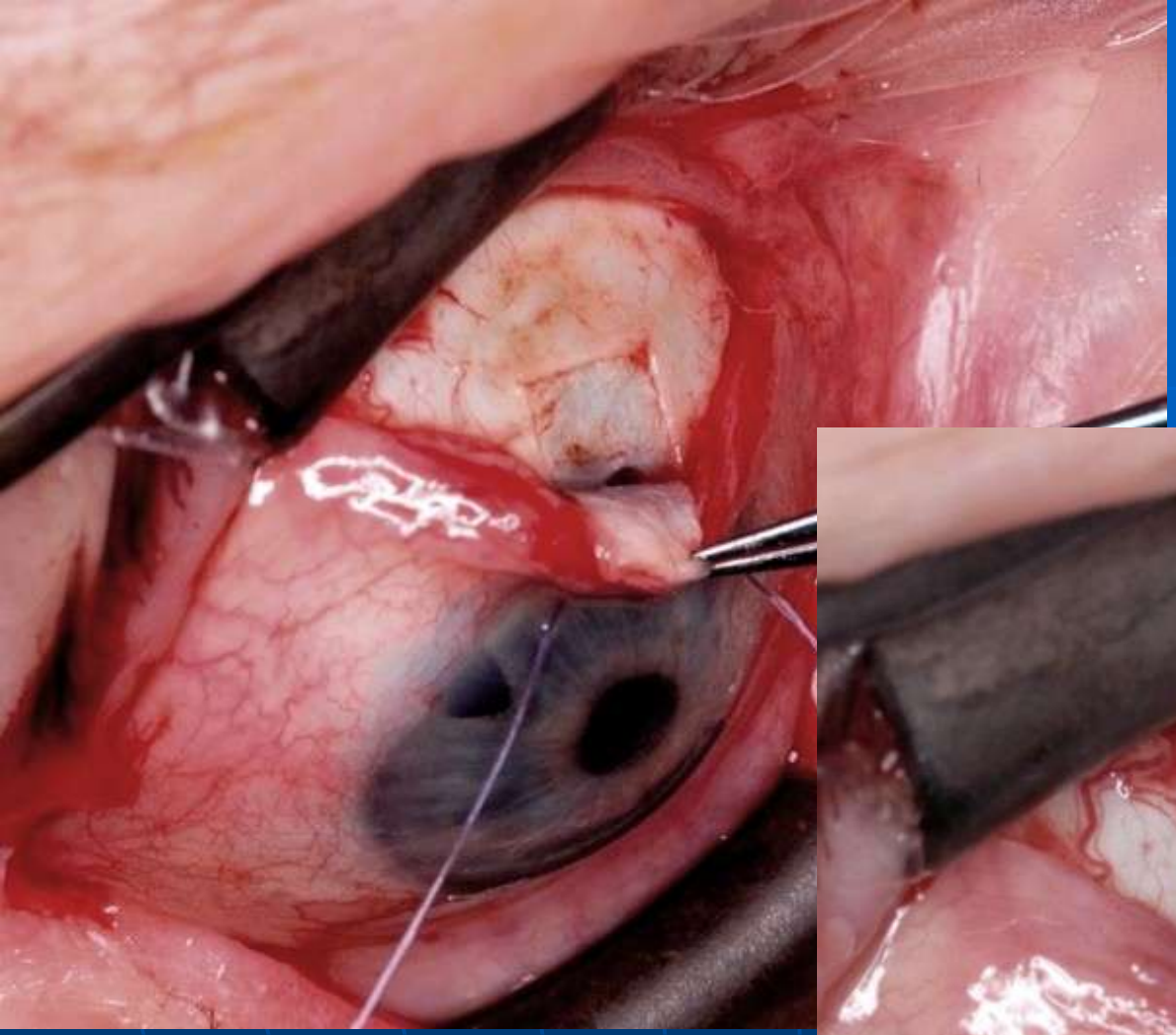
- The standard glaucoma operation since the 1960s
- Aim: to create a flap-valve still maintaining some eye pressure
- Sometimes anti-metabolite drugs like 5FU and mitomycin used

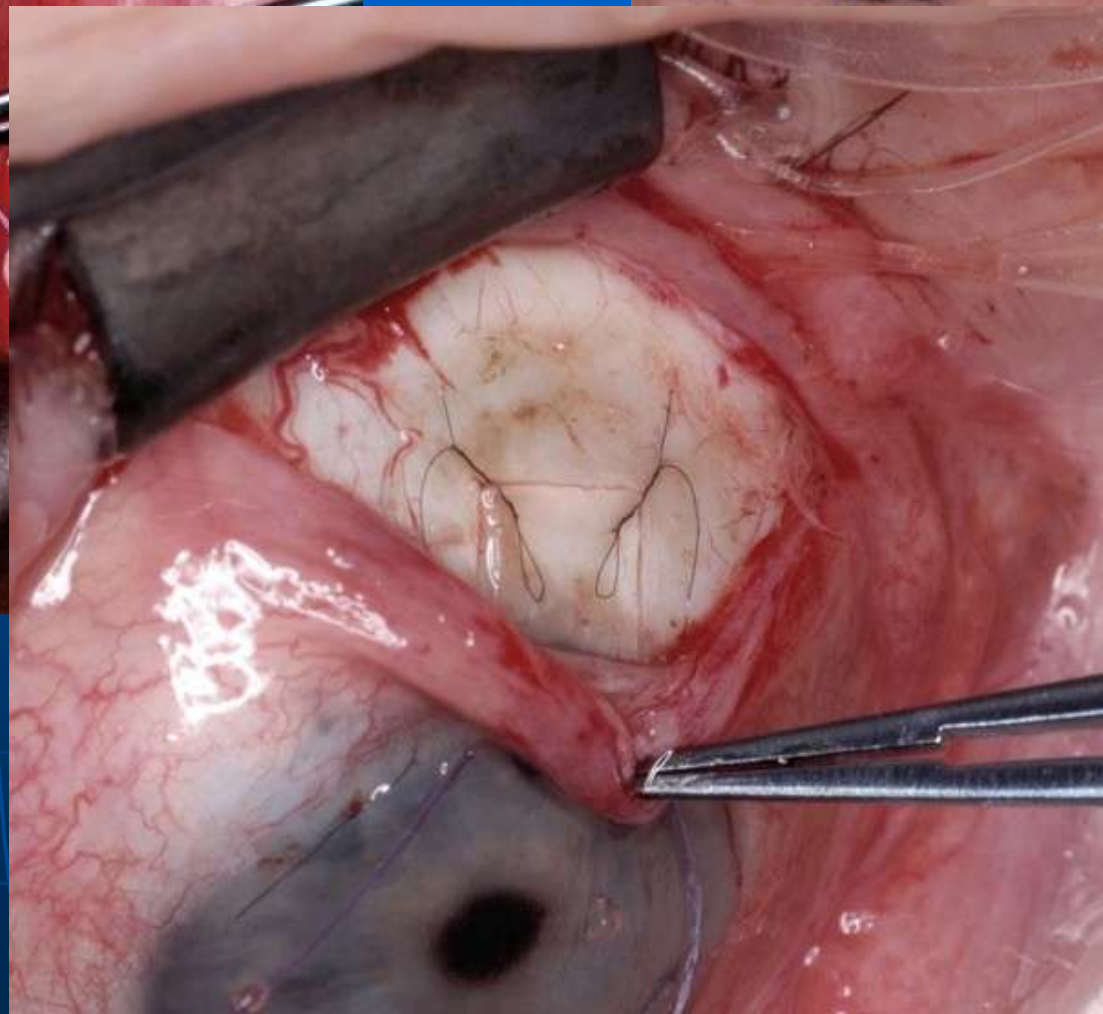
# Trabeculectomy

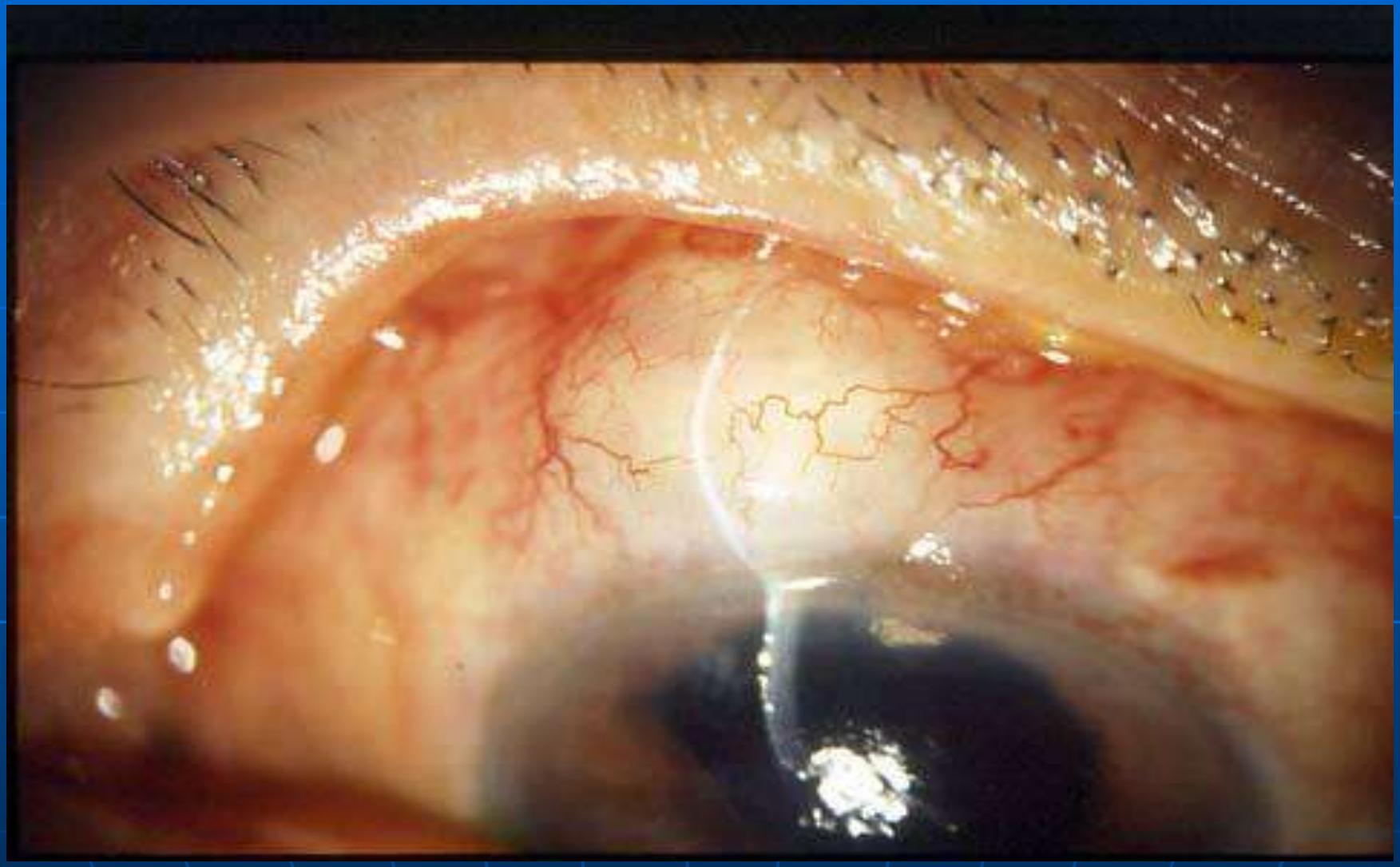
- Performed under the upper eyelid
- Many variations in technique




4 mm
2½ mm
2½ mm
A

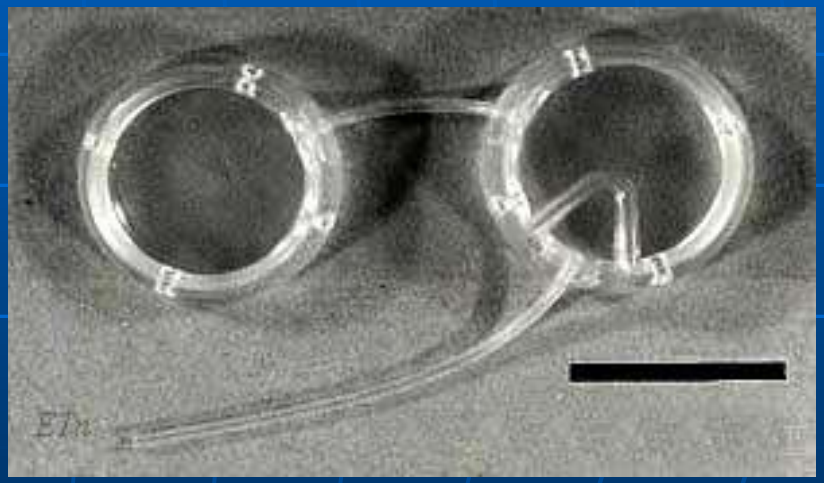


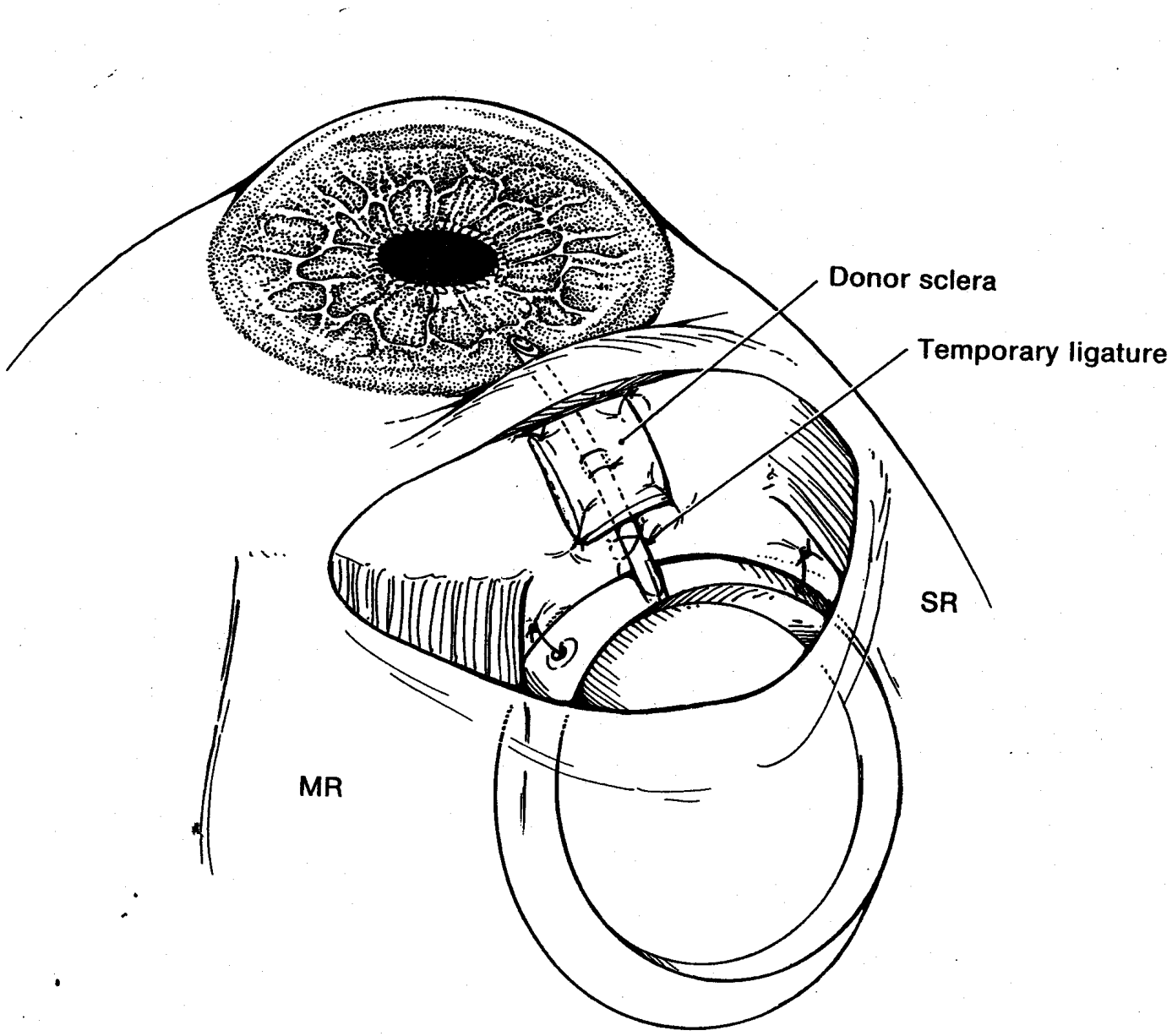


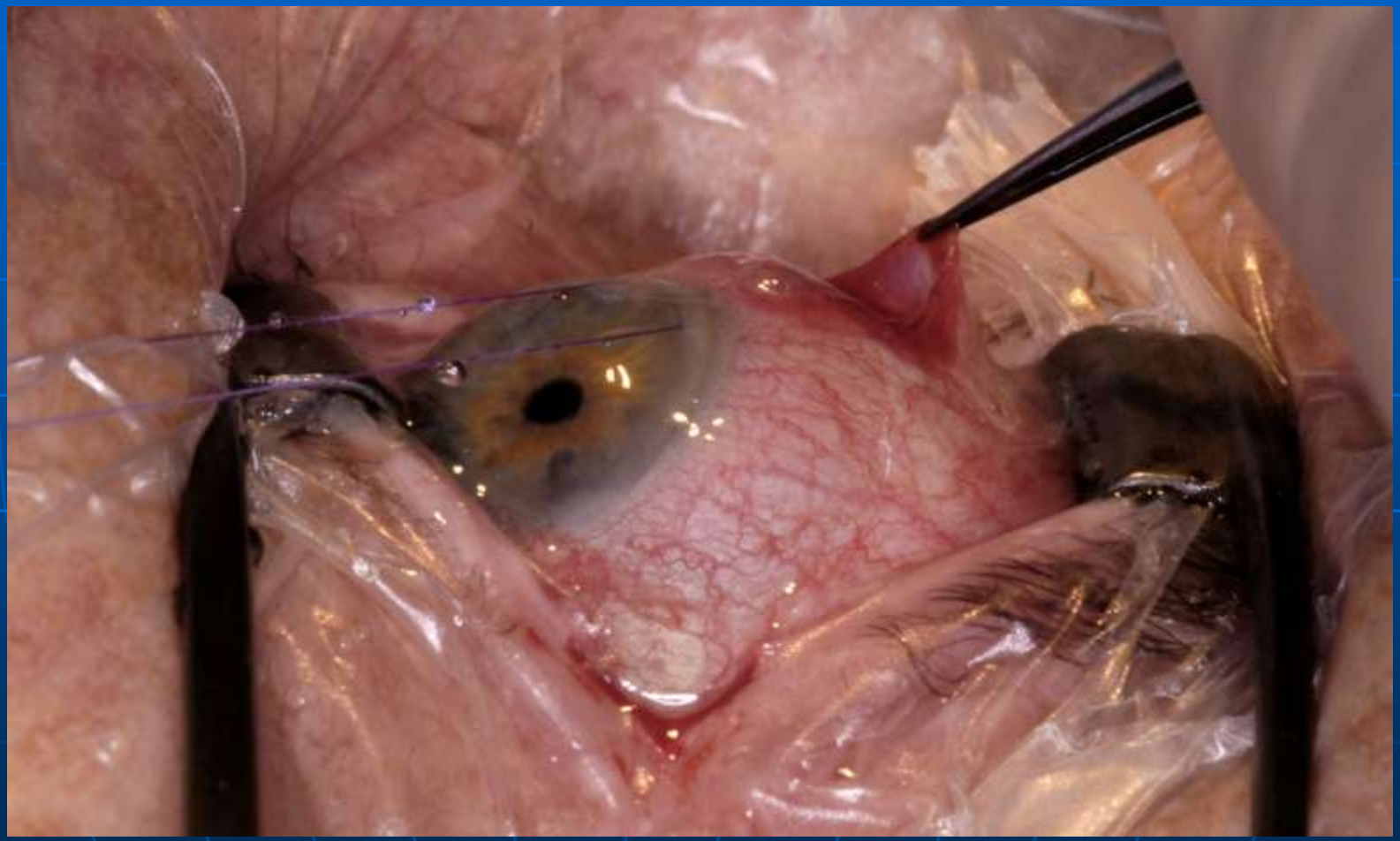


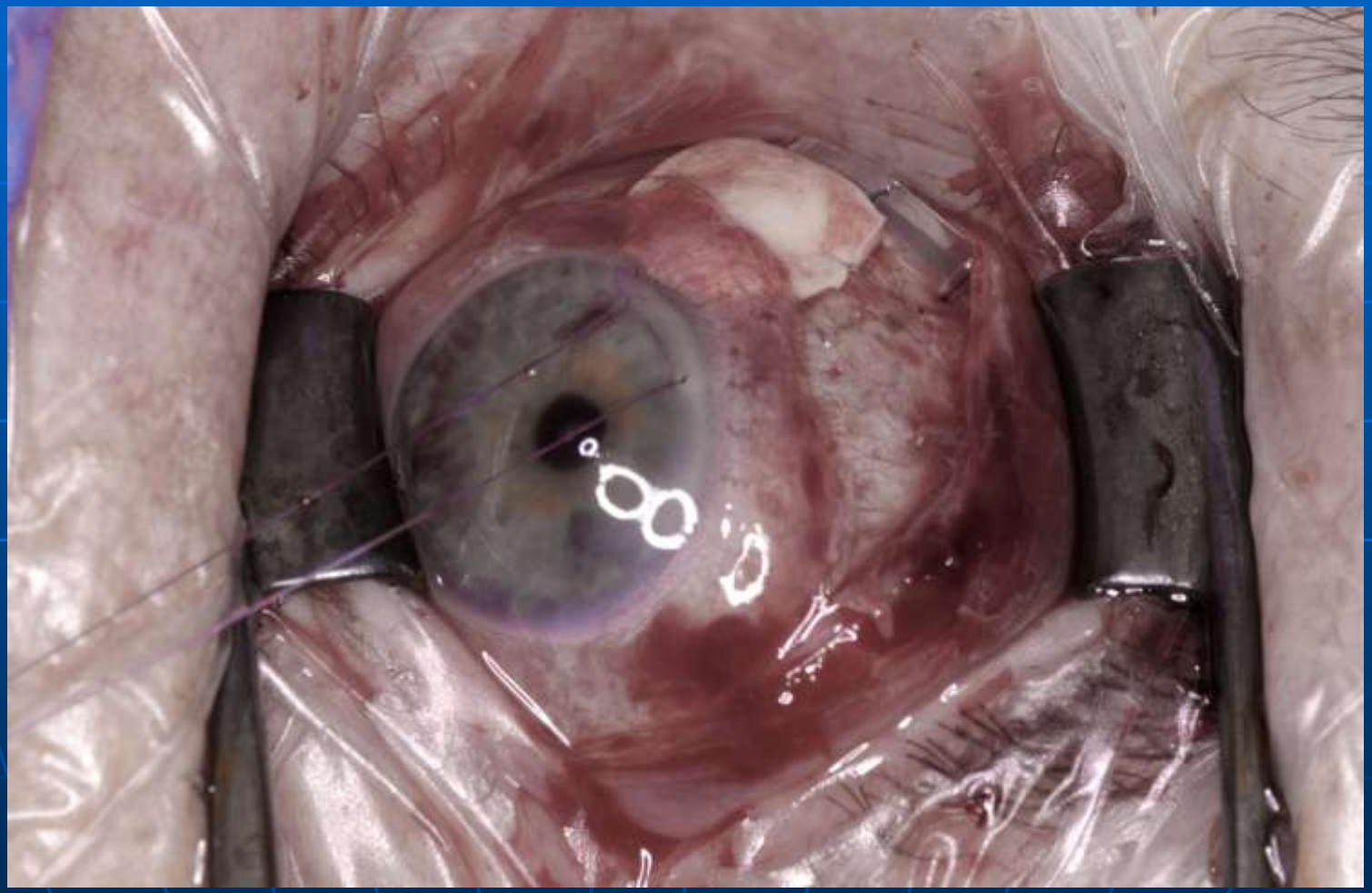
# Molteno Drain

- The original tube shunt, developed by Professor Molteno




Donor sclera
Temporary ligature
SR
MR





# Glaucoma New Zealand

A charitable trust
to eliminate
blindness from glaucoma

GLAUCOMA NZ
TO SAVE SIGHT