Glaucoma

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Glaucoma: The Essentials

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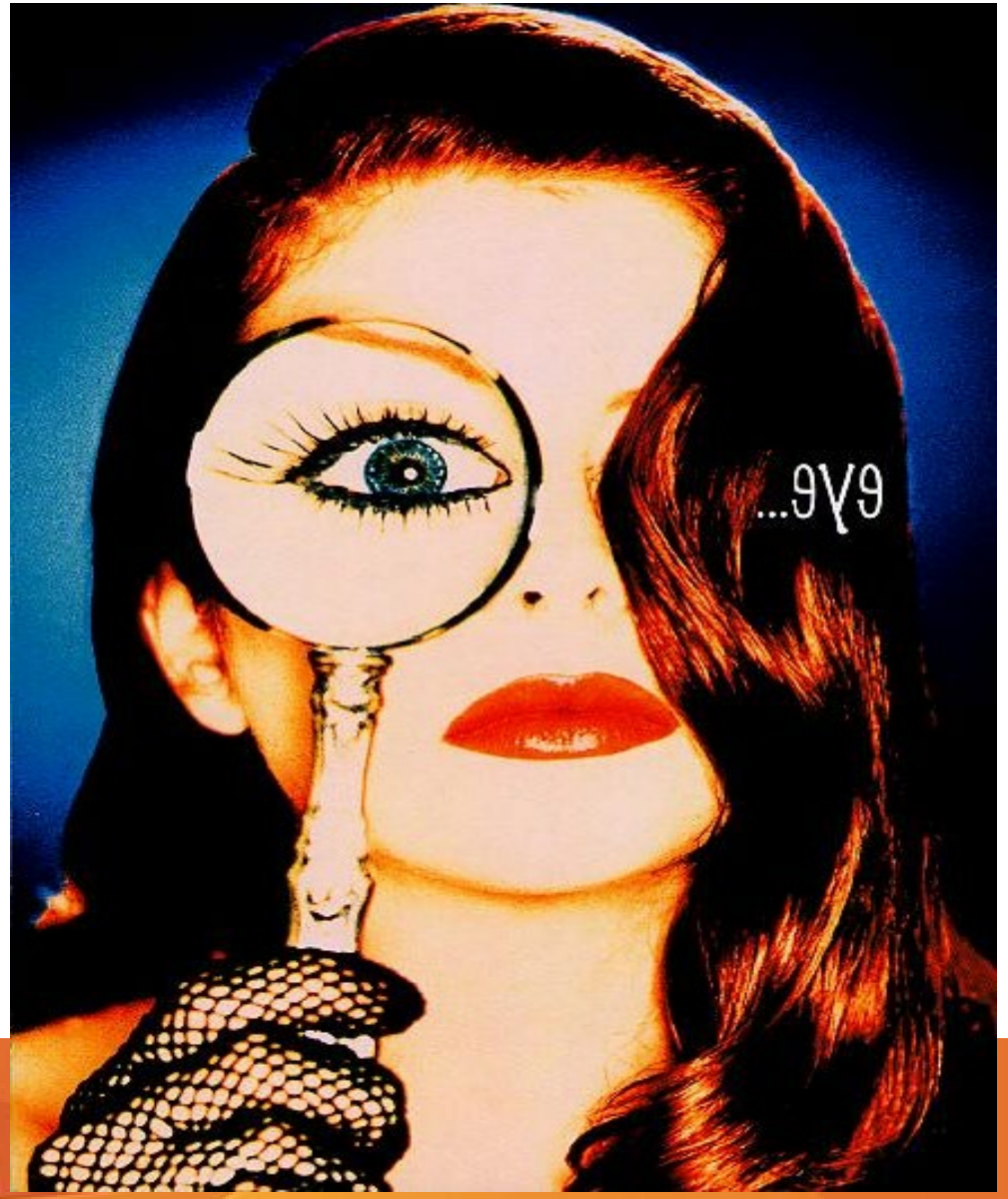

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‘I will have symptoms of pain or decreased vision if I have glaucoma’

True or False?

FALSE

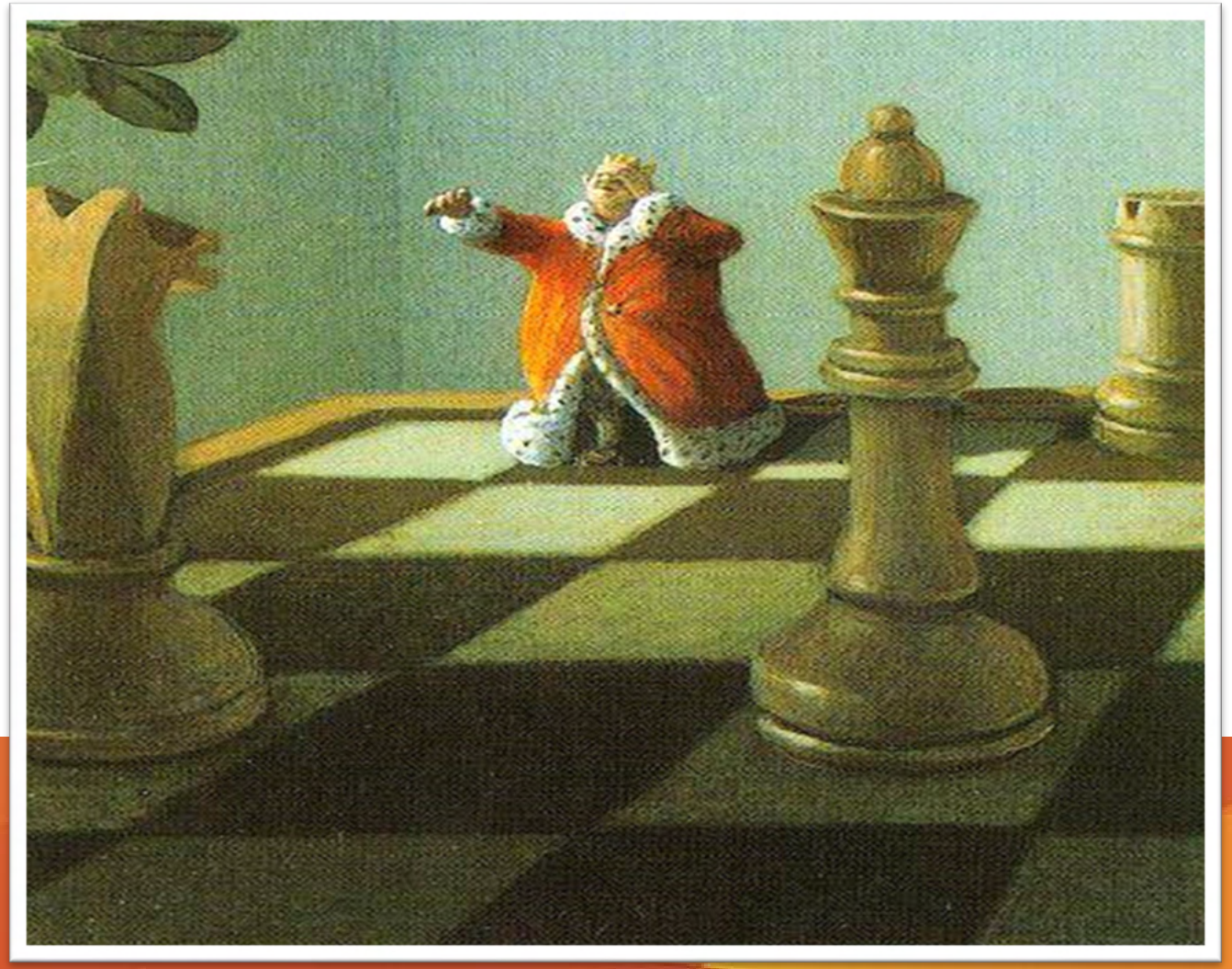
1. Glaucoma is a silent disease

There is a cure for glaucoma.

True or False?

False

2. Glaucoma is a chronic disease



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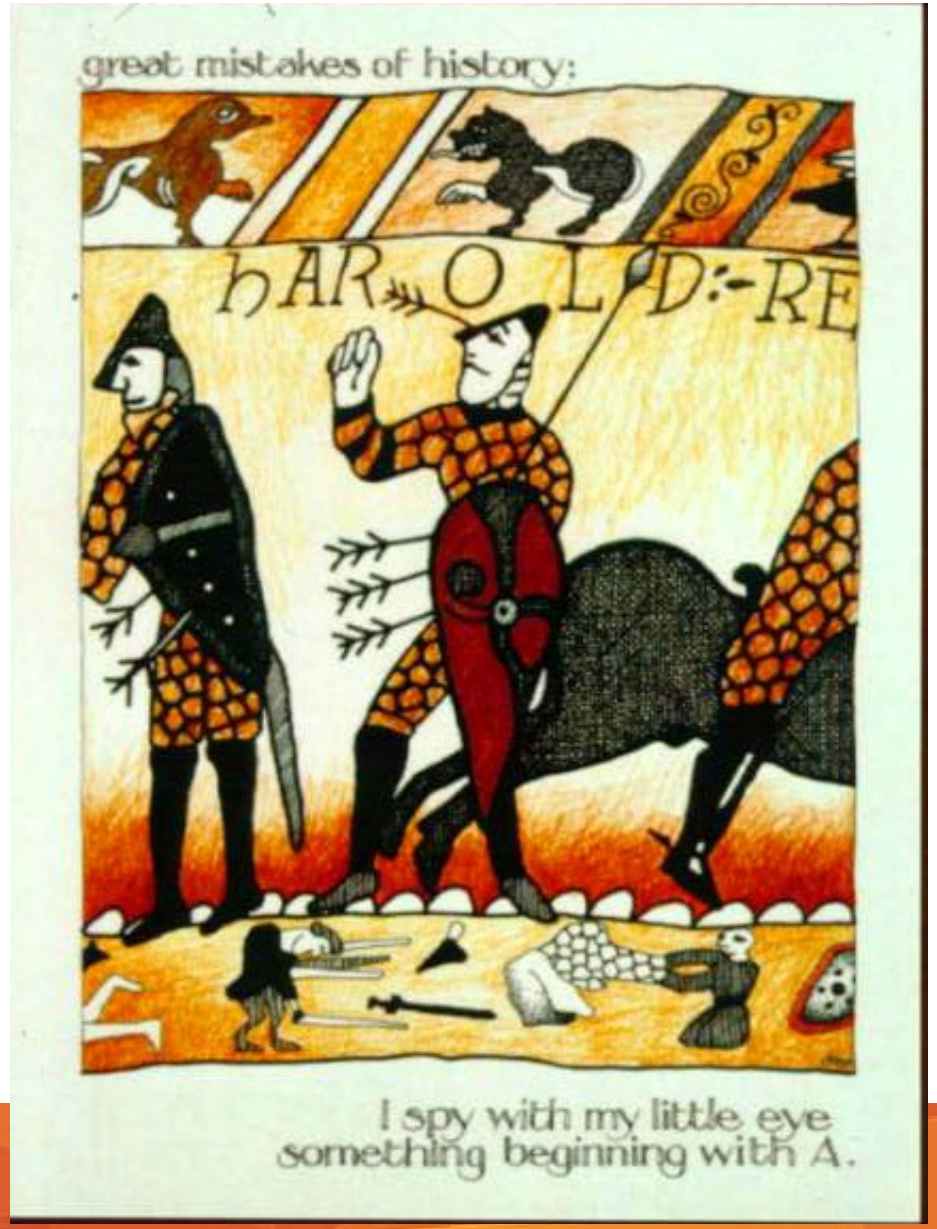
Most people with glaucoma go blind.

True or False?

False

3. If diagnosed early, treated and monitored blindness is RARE



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Battle of Hastings (1066) King Harold killed by a Norman arrow to the eye

Lost eyesight from glaucoma can be restored.

True or False?

False

4. Visual field loss secondary to glaucoma is IRREVERSIBLE!

Dora Maar, Pablo Picasso’s weeping woman

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Treatment for glaucoma is usually lifelong

True or False?

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TRUE

5. Treatment is life-long, but majority avoid surgery.

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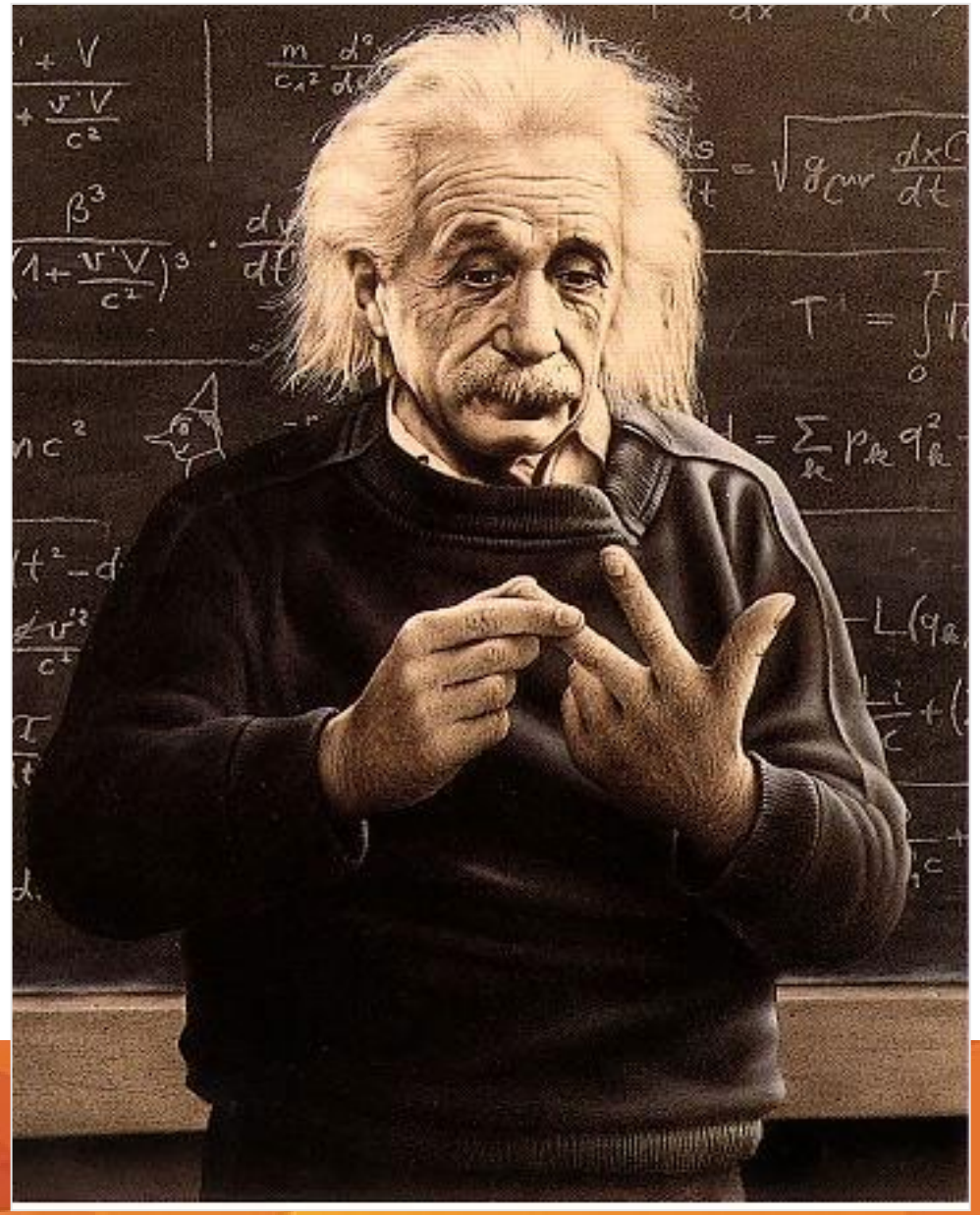
What is glaucoma?



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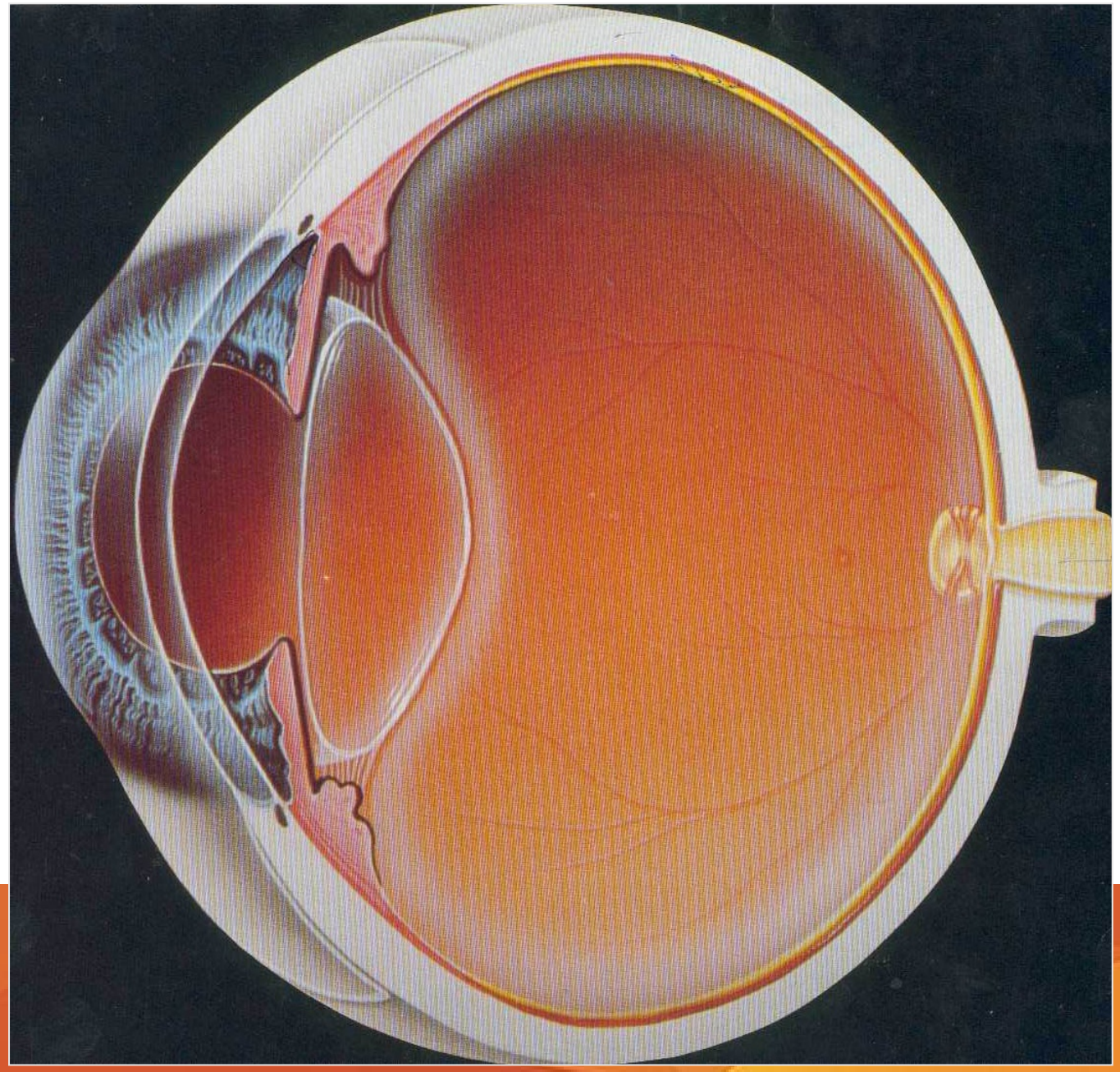

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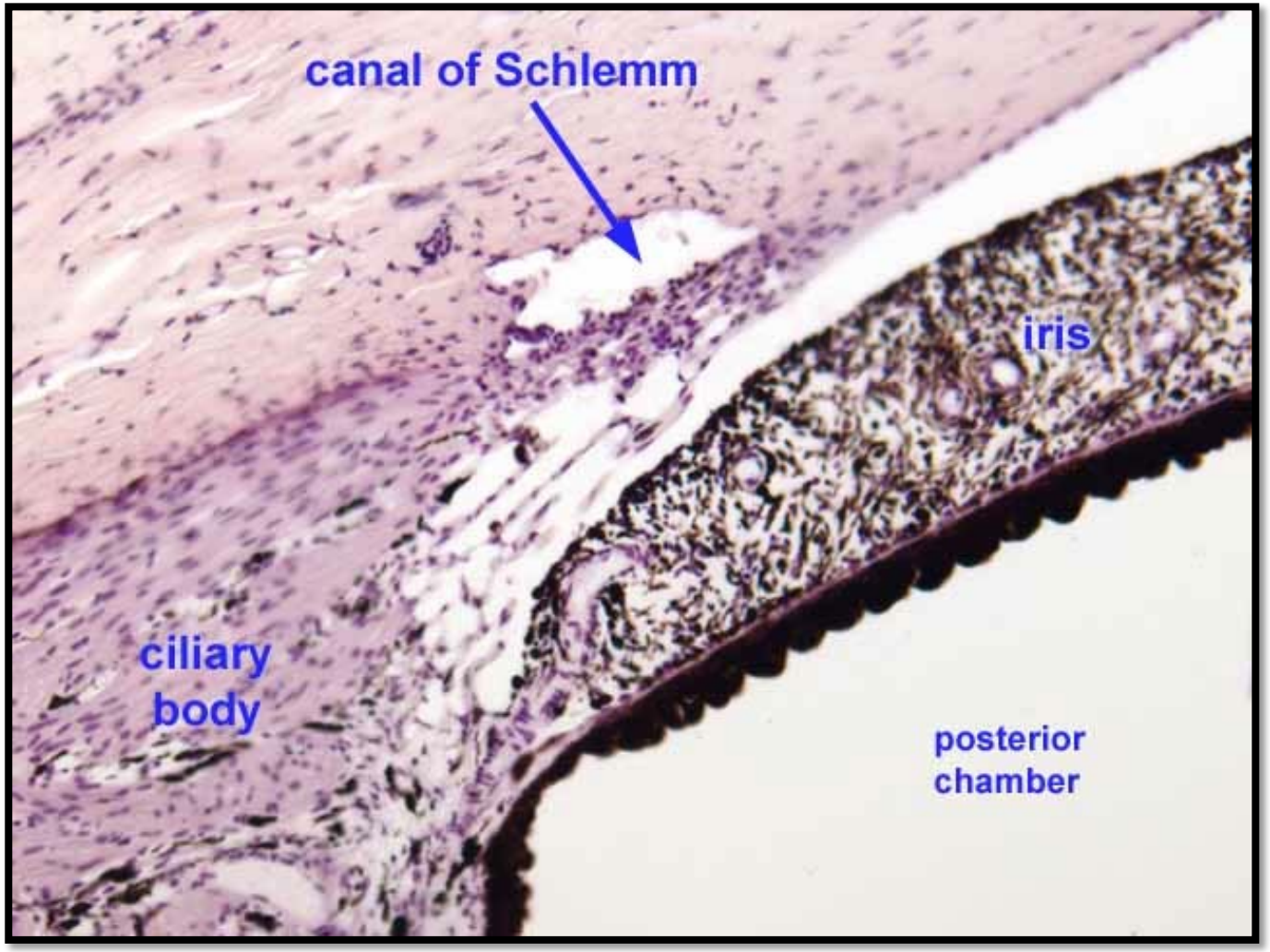
Aqueous humour production and circulation

- *Production*:
  - Continually produced by ciliary processes of ciliary body
- *Circulation*:
  - Flows through lens zonules *(suspensory ligaments)*
  - Past lens
  - Through the pupillary aperture
  - Enters anterior chamber
- *Drainage*:
  - Drainage angle
  - Filtration through trabecular meshwork
  - Into canal of Schlemm
  - Canal of Schlemm drains into extra-ocular veins



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**
  - 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

Other:

- Congenital

Secondary forms:

- Pigmentary
- Pseudoexfoliation
- Traumatic
- Neovascular
- Uveitic
- Irido corneal endothelial syndrome
- Phacomorphic

Four Key Components in Glaucoma Assessment

1. **Intraocular Pressure**
2. **Angle Assessment**
3. **Optic Nerve**
4. **Visual Fields**

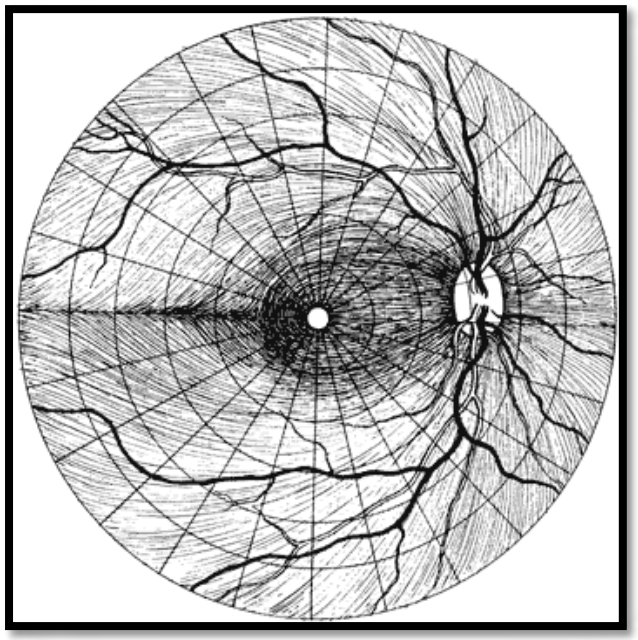
Open Angle Glaucoma

- 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,

Primary open-angle glaucoma

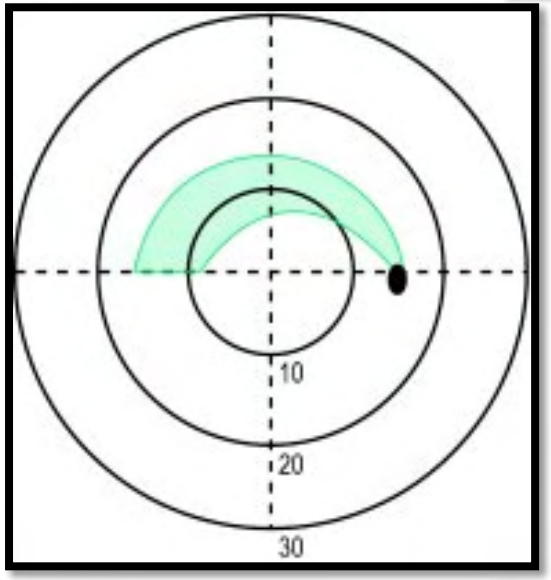
- Commonest form

- Risk factors:
  - Ocular hypertension (↑ IOP)
  - ↑ age
  - Genetics/family history
  - Myopia
  - Vascular/haematological disease



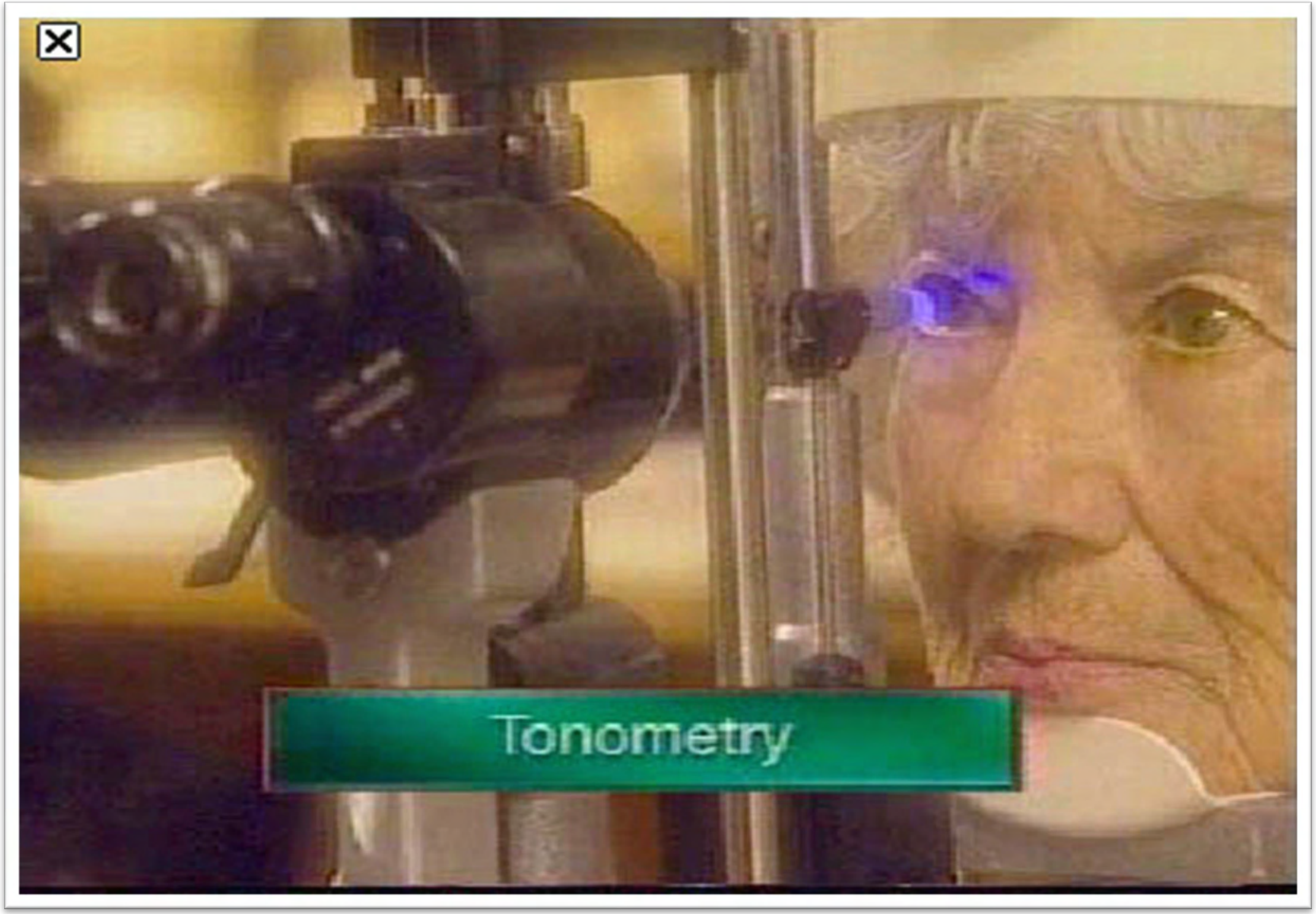
- Clinical features:
  Asymptomatic until advanced
  Visual field defects:

- Peripheral fields loss



- Arctuate scotoma

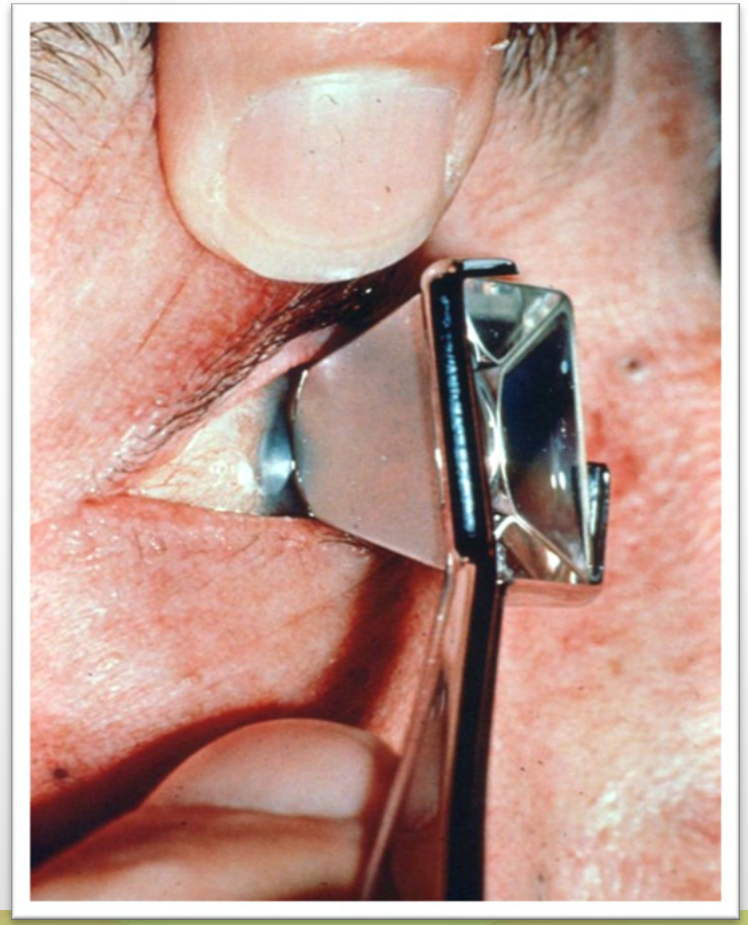
Measuring the eye pressure

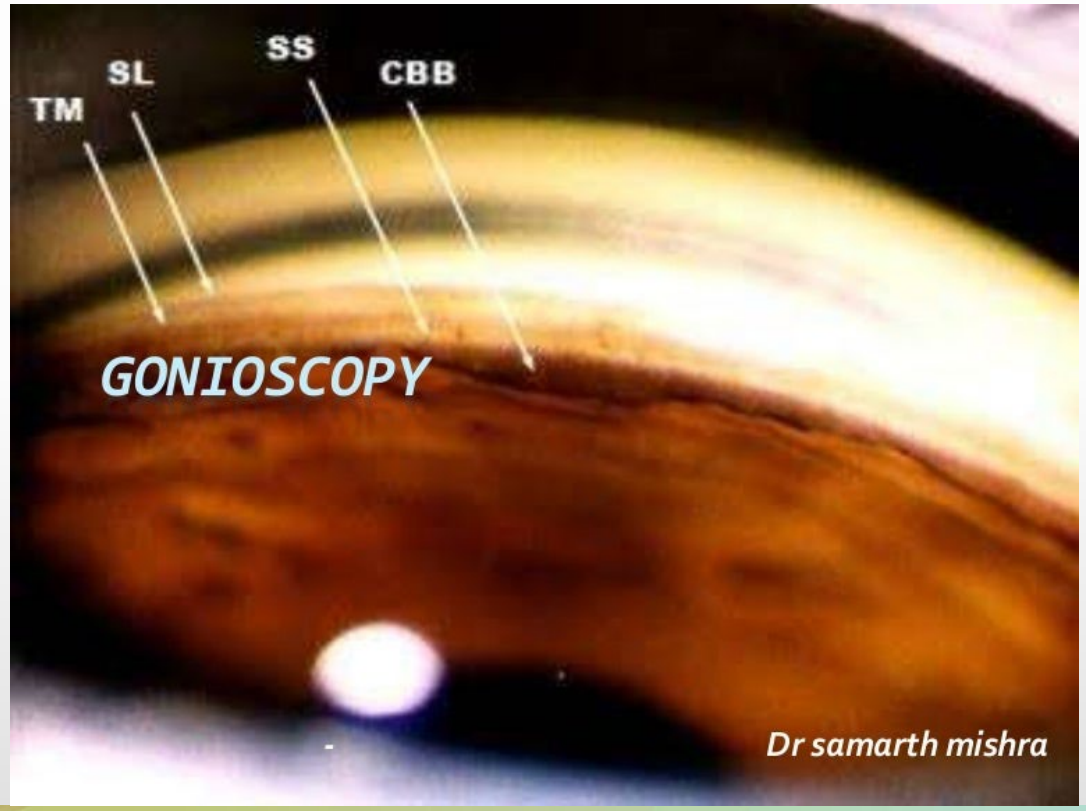


IOP Assessment

- "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

Gonioscopy





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Glaucoma: the common feature –

Characteristic damage to the optic disc,
the beginning of the optic nerve,
at the back of the eye

known as
disc “cupping”

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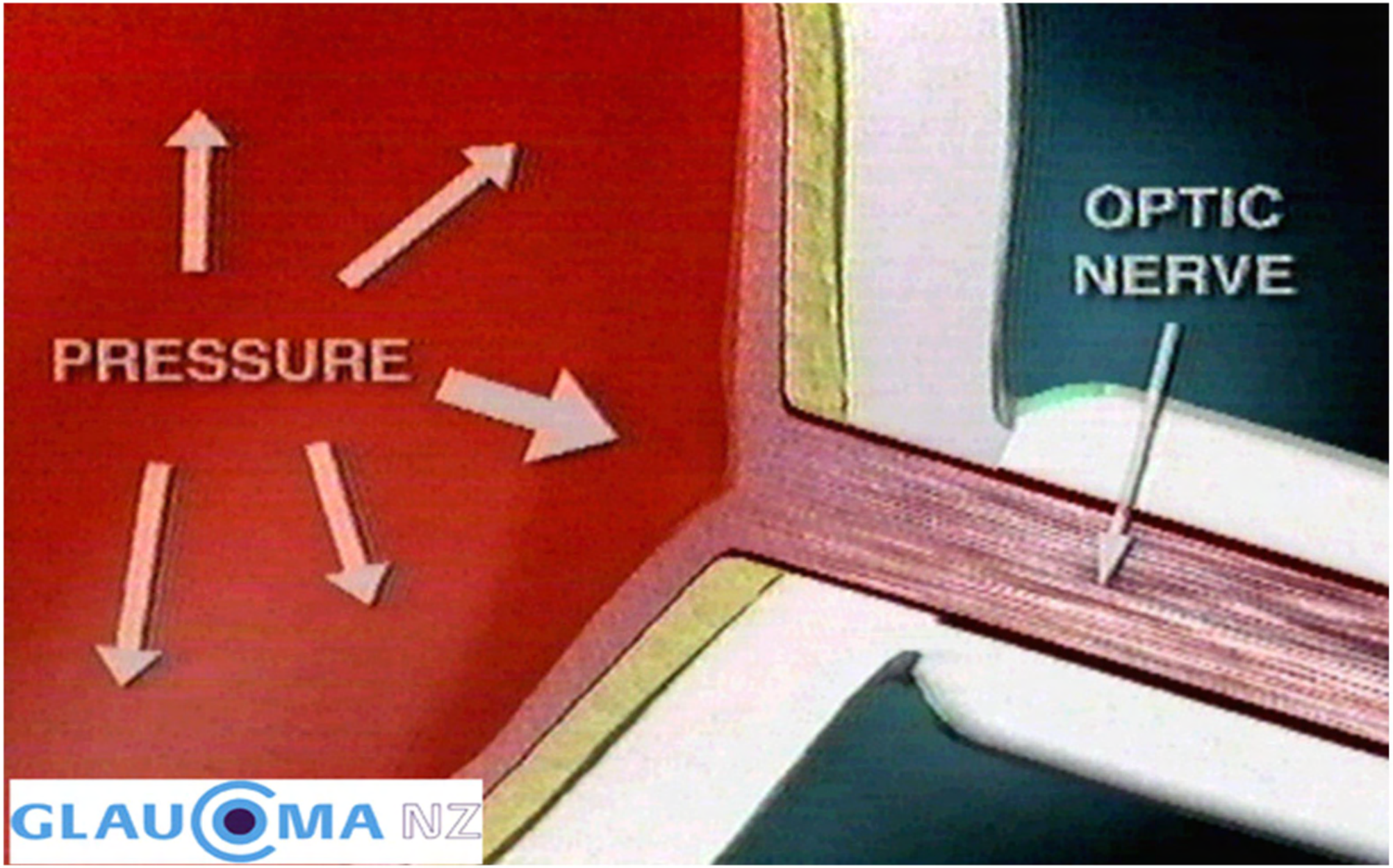

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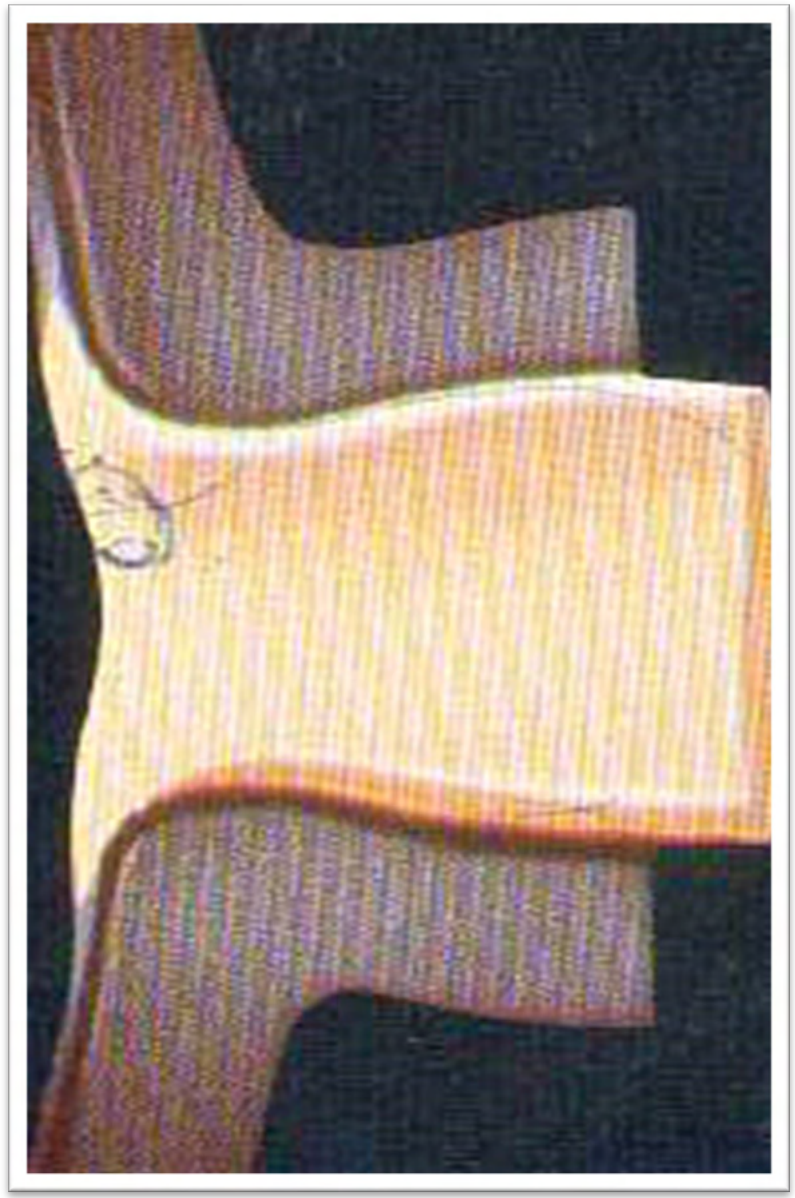
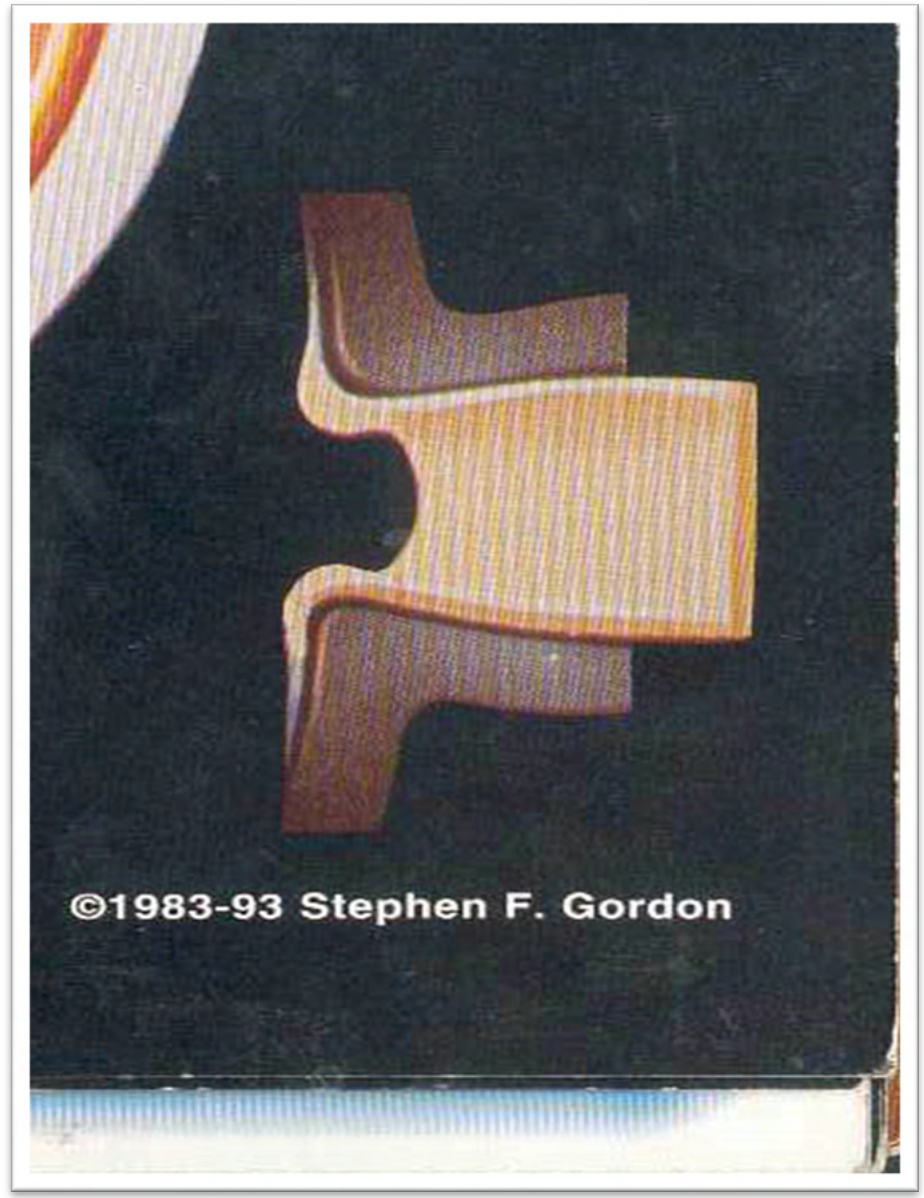
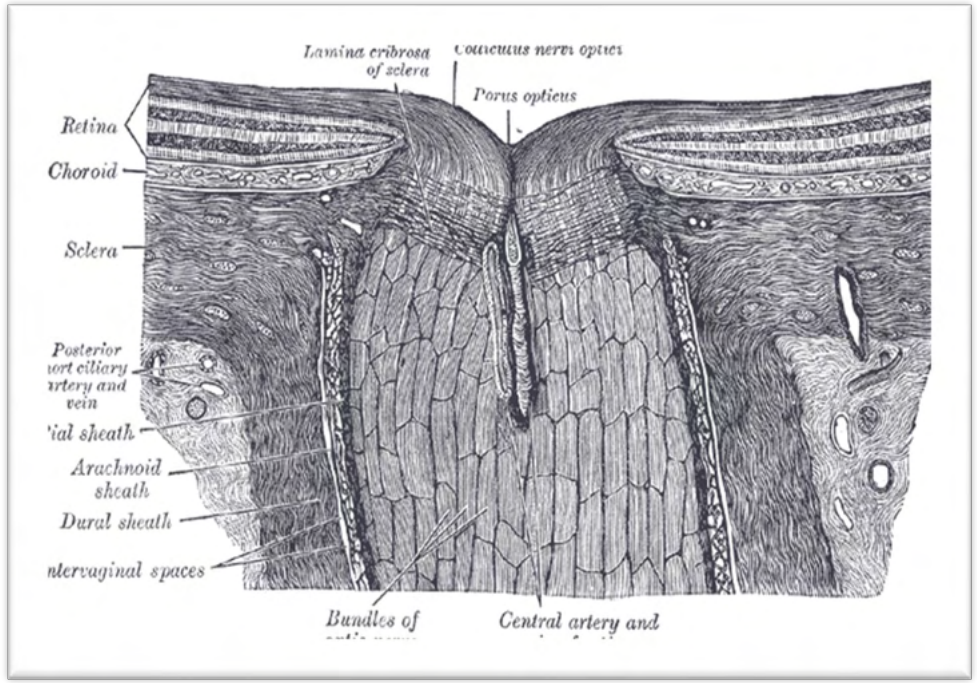
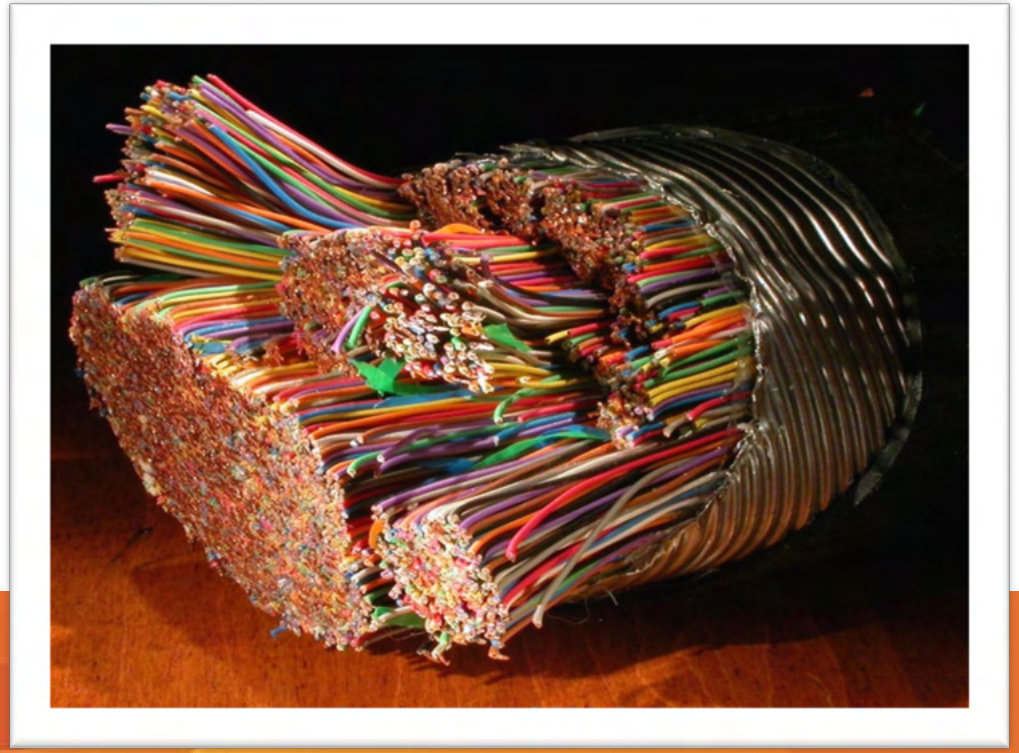



©1983-93 Stephen F. Gordon



Optic nerve

Telephone Cable



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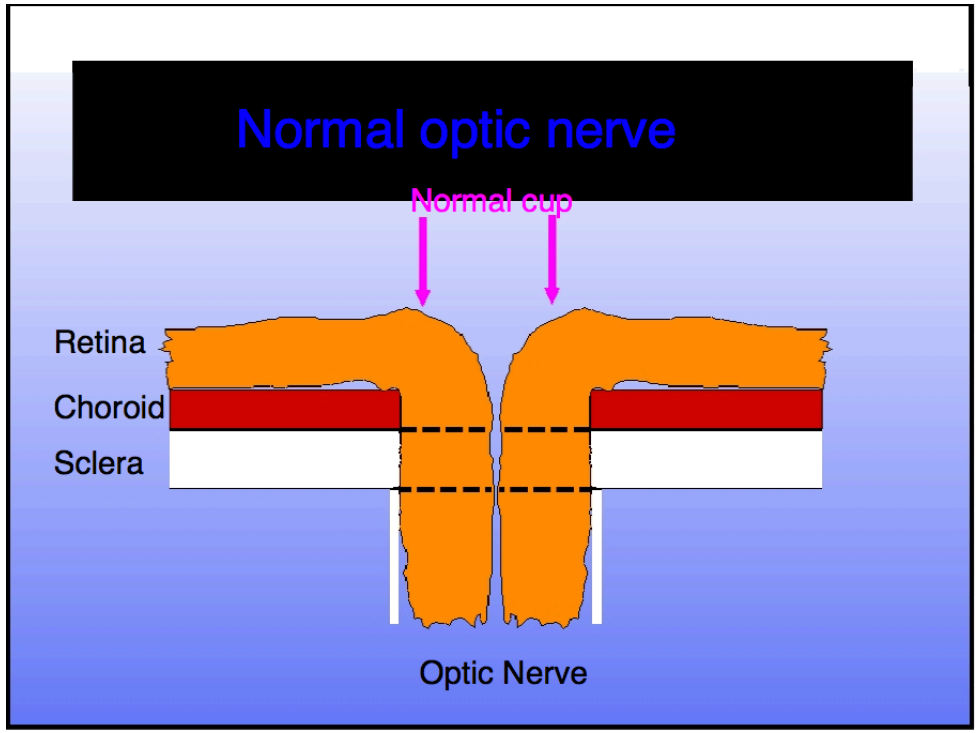
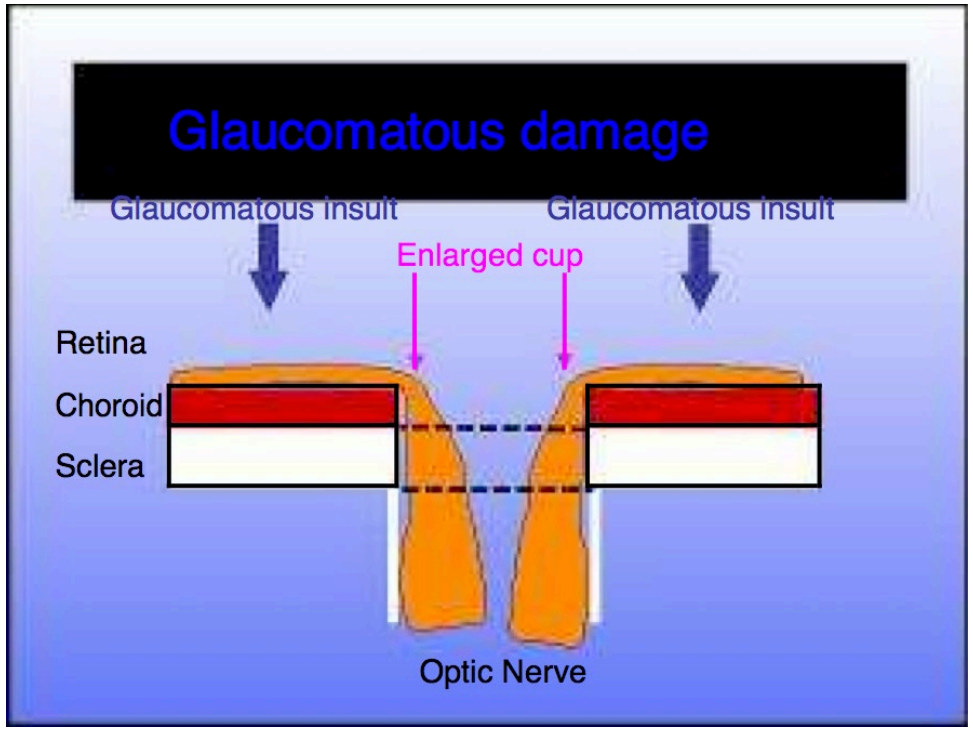
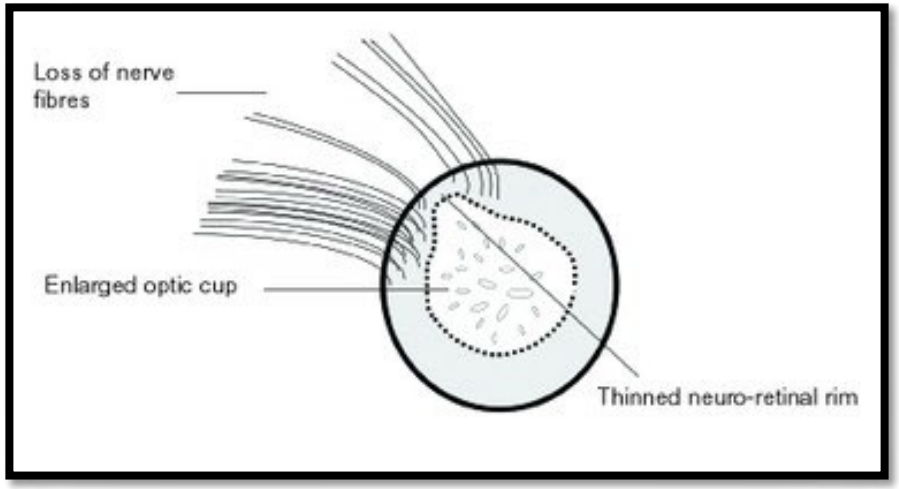

Normal optic nerve
Normal cup
Retina
Choroid
Sclera
Optic Nerve

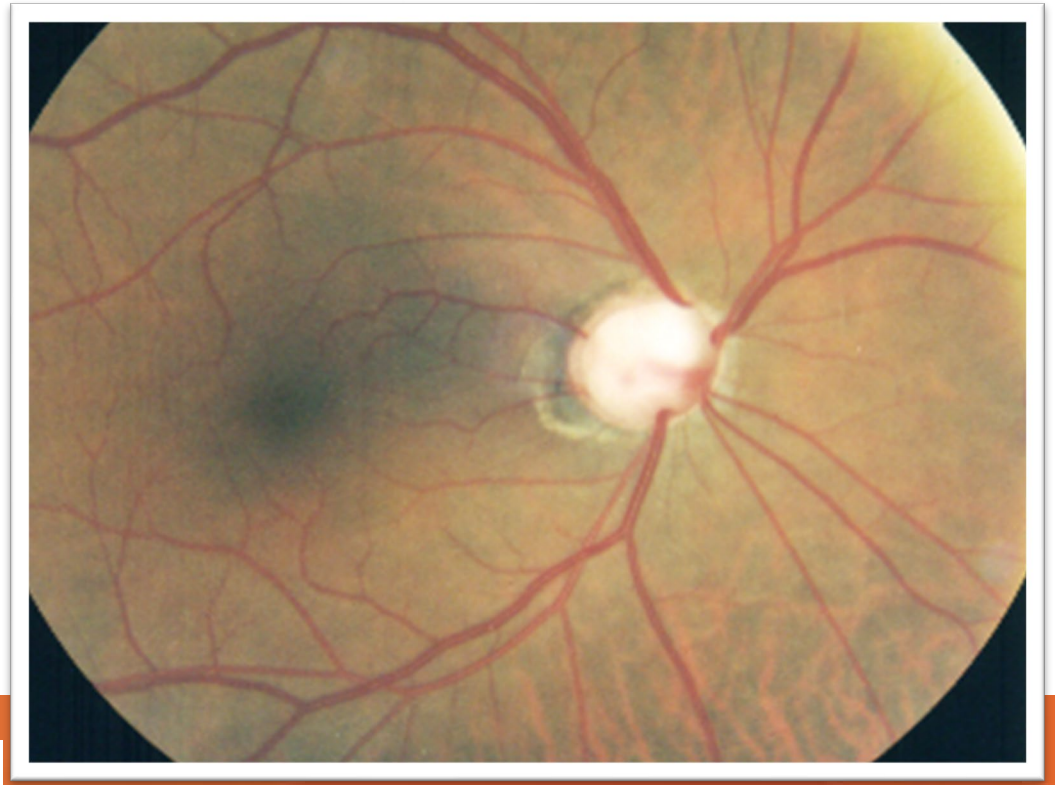

Glaucomatous damage
Glaucomatous insult
Glaucomatous insult
Enlarged cup
Retina
Choroid
Sclera
Optic Nerve


Loss of nerve fibres
Enlarged optic cup
Thinned neuro-retinal rim

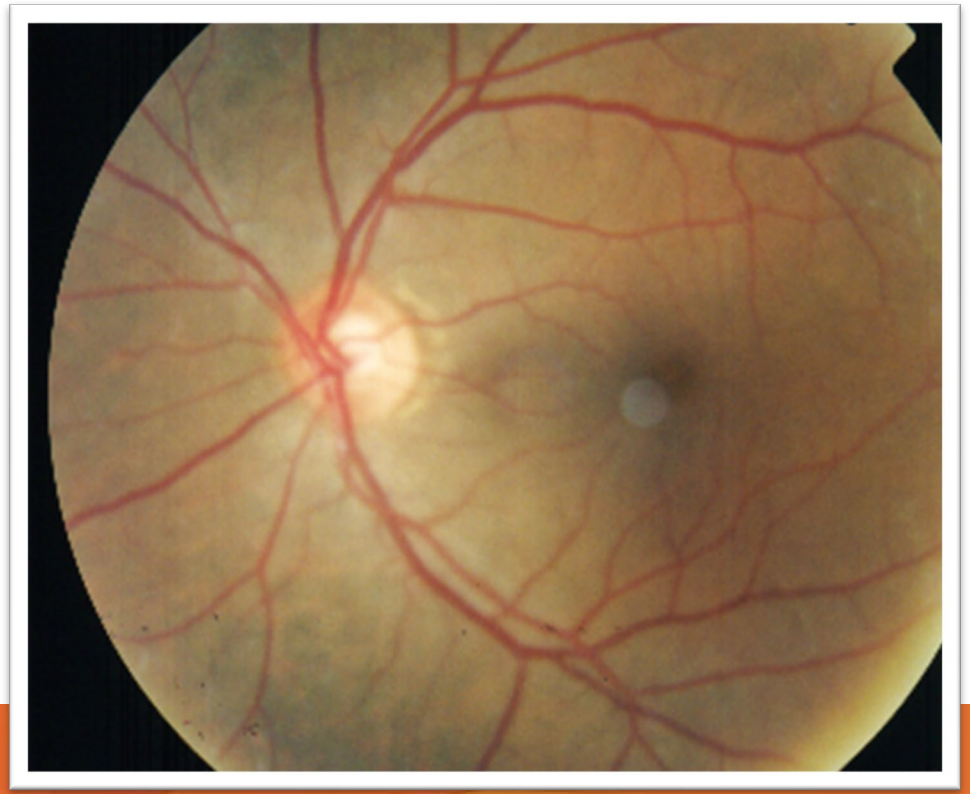
Worsening of Disease

Advanced Glaucoma in the Right Eye

Right Eye



Left Eye



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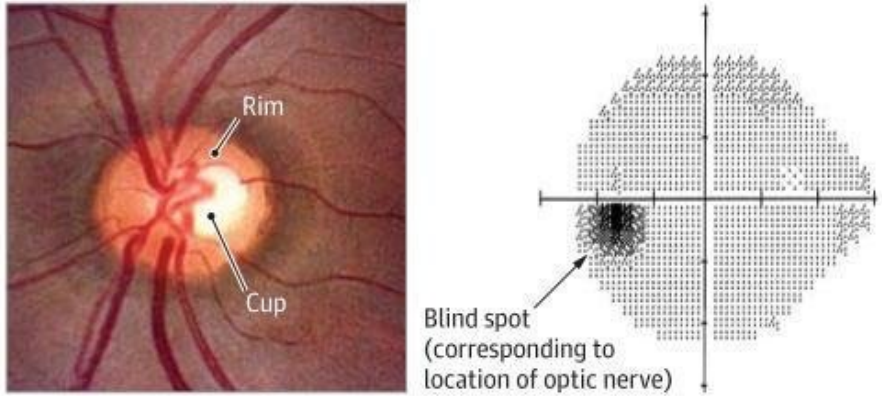
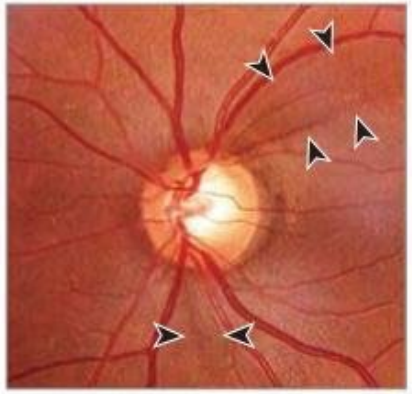
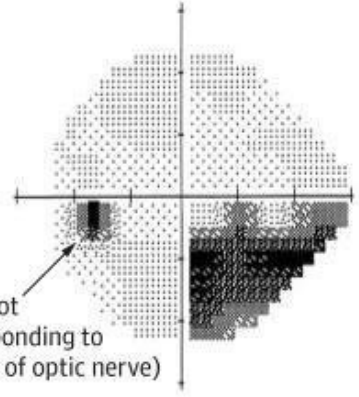
A Normal optic nerve head and visual field

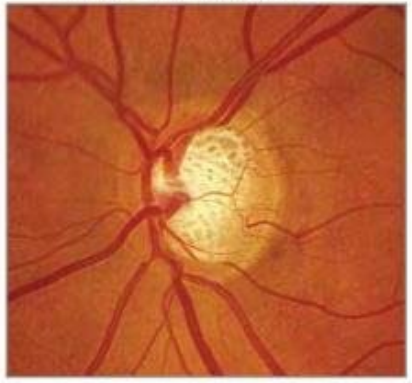


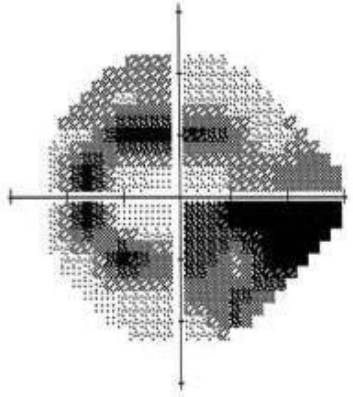
B Glaucomatous optic nerve head and associated inferior visual field loss



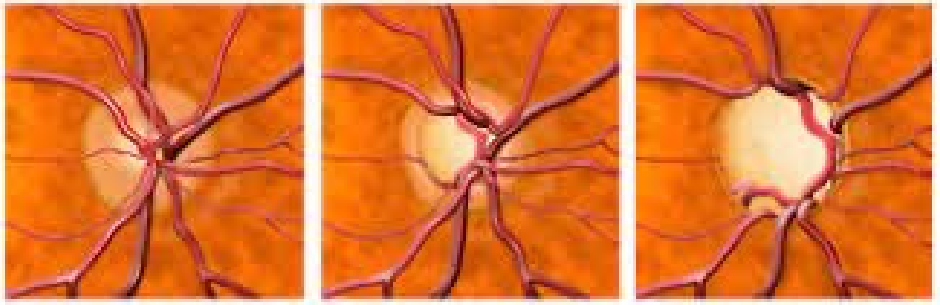


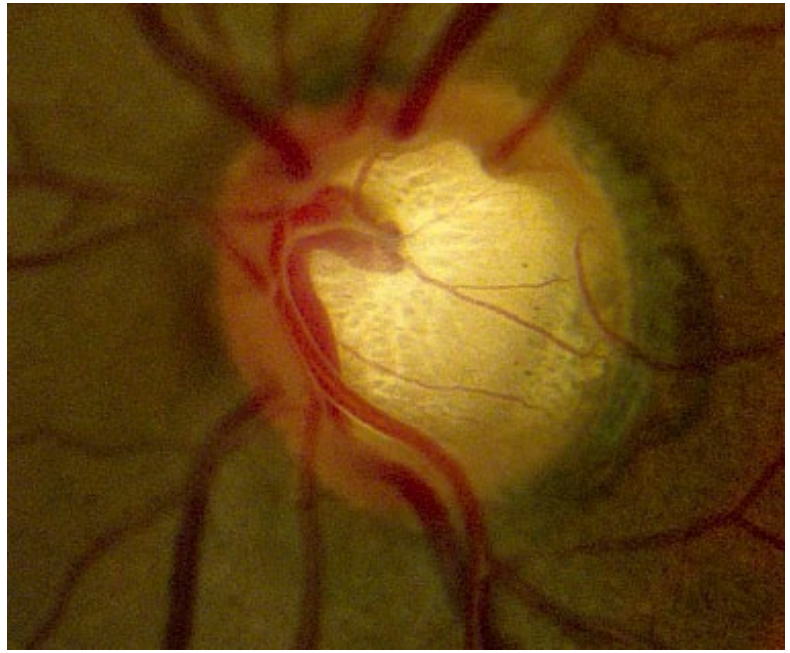
C Extensive neural tissue loss in severe glaucoma and associated severe visual field loss



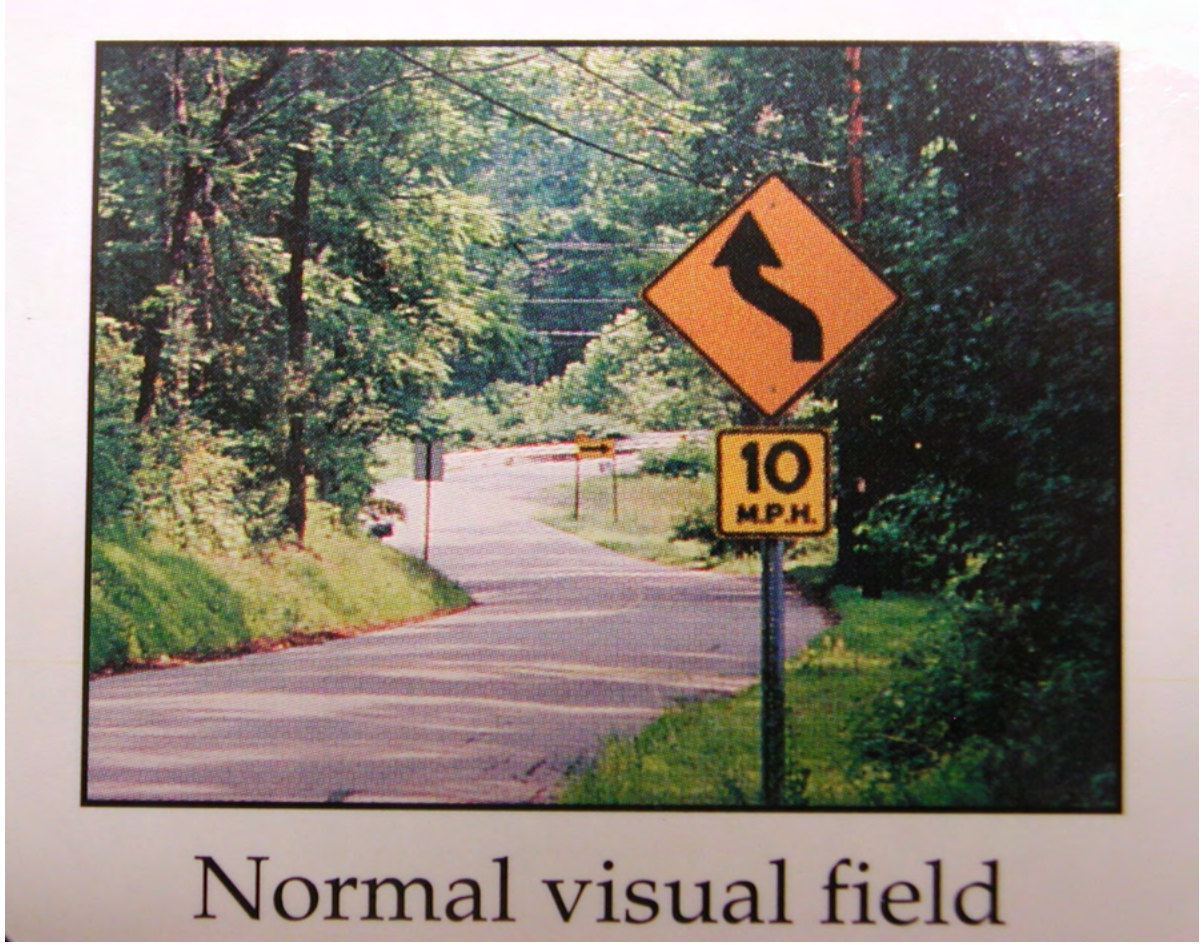


Optic nerve head cupping progression





How does glaucoma cause damage?



Normal visual field

Abnormal visual field

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Glaucoma steals the peripheral vision

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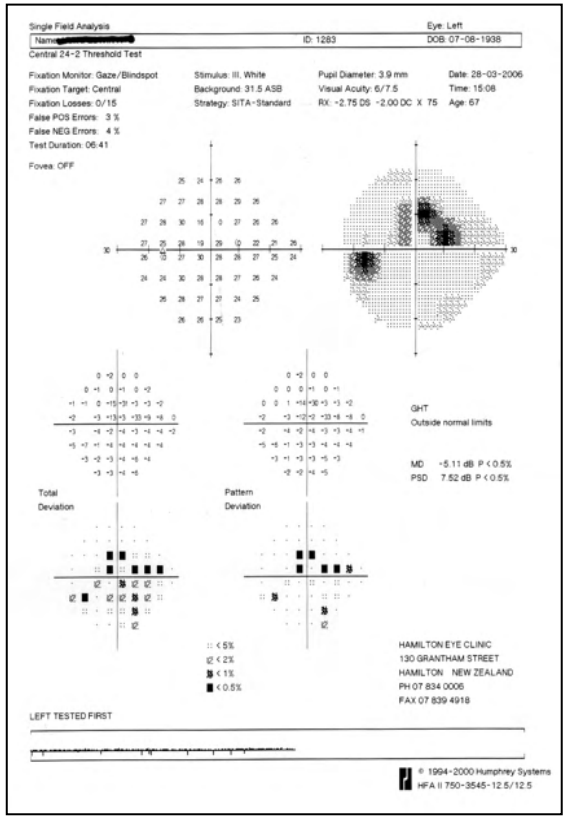
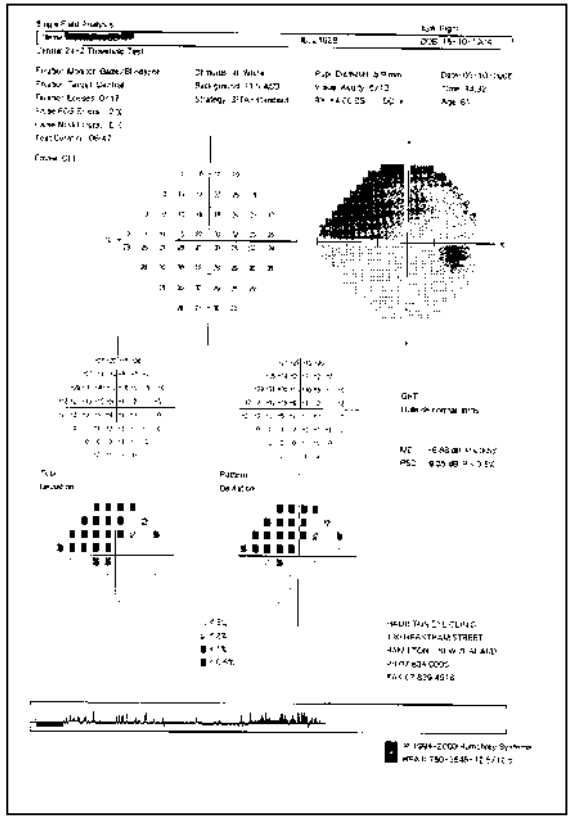
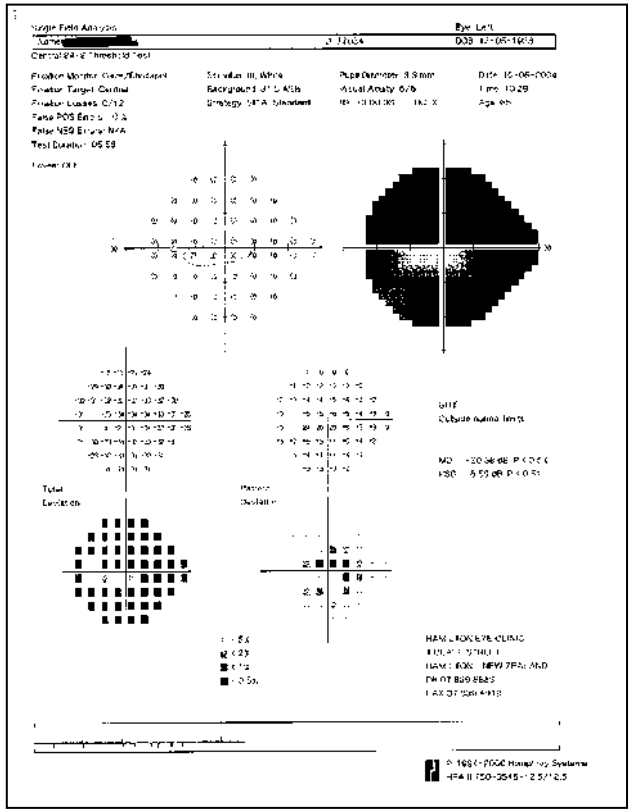
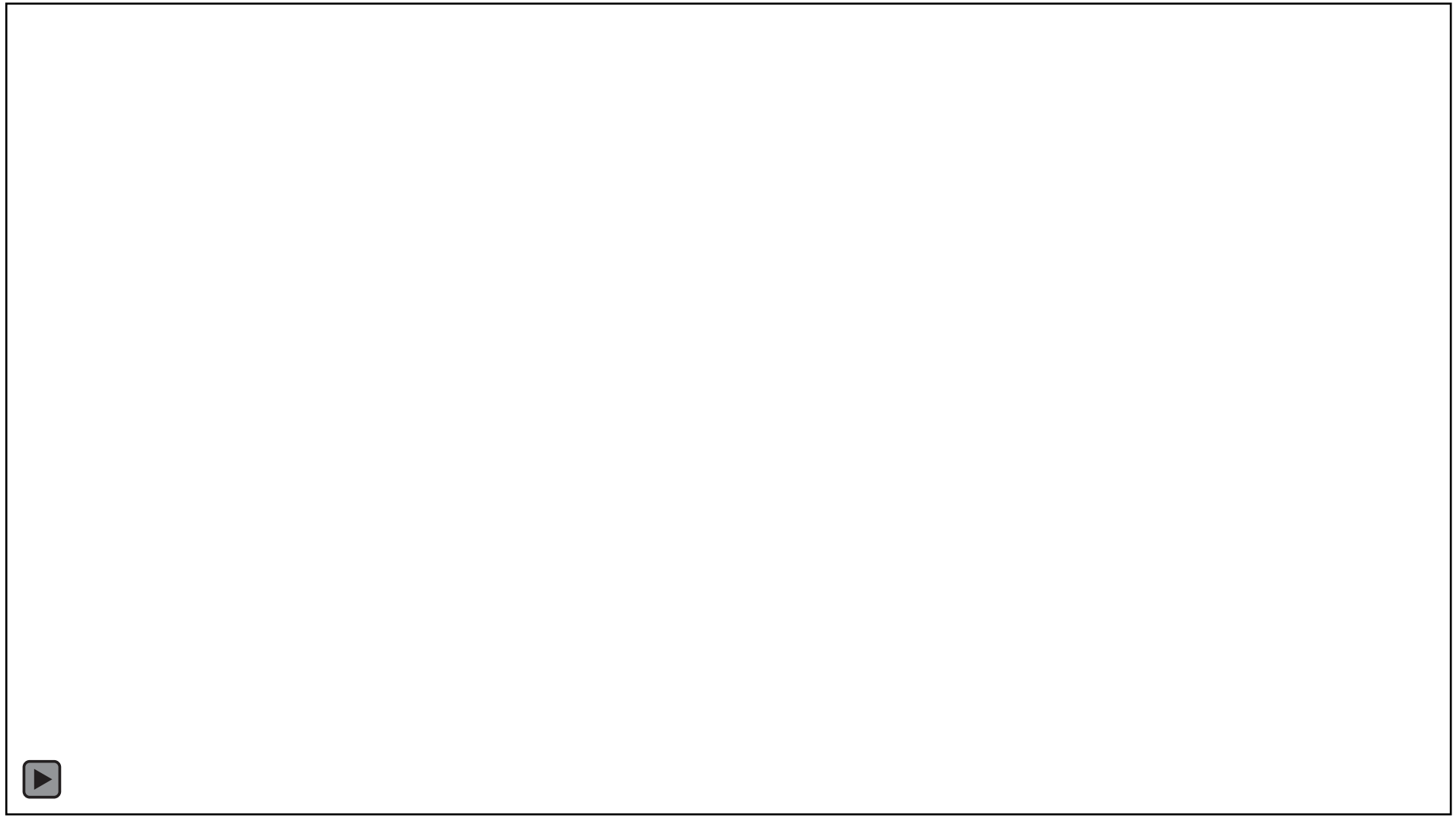
Peripheral Visual Field Loss









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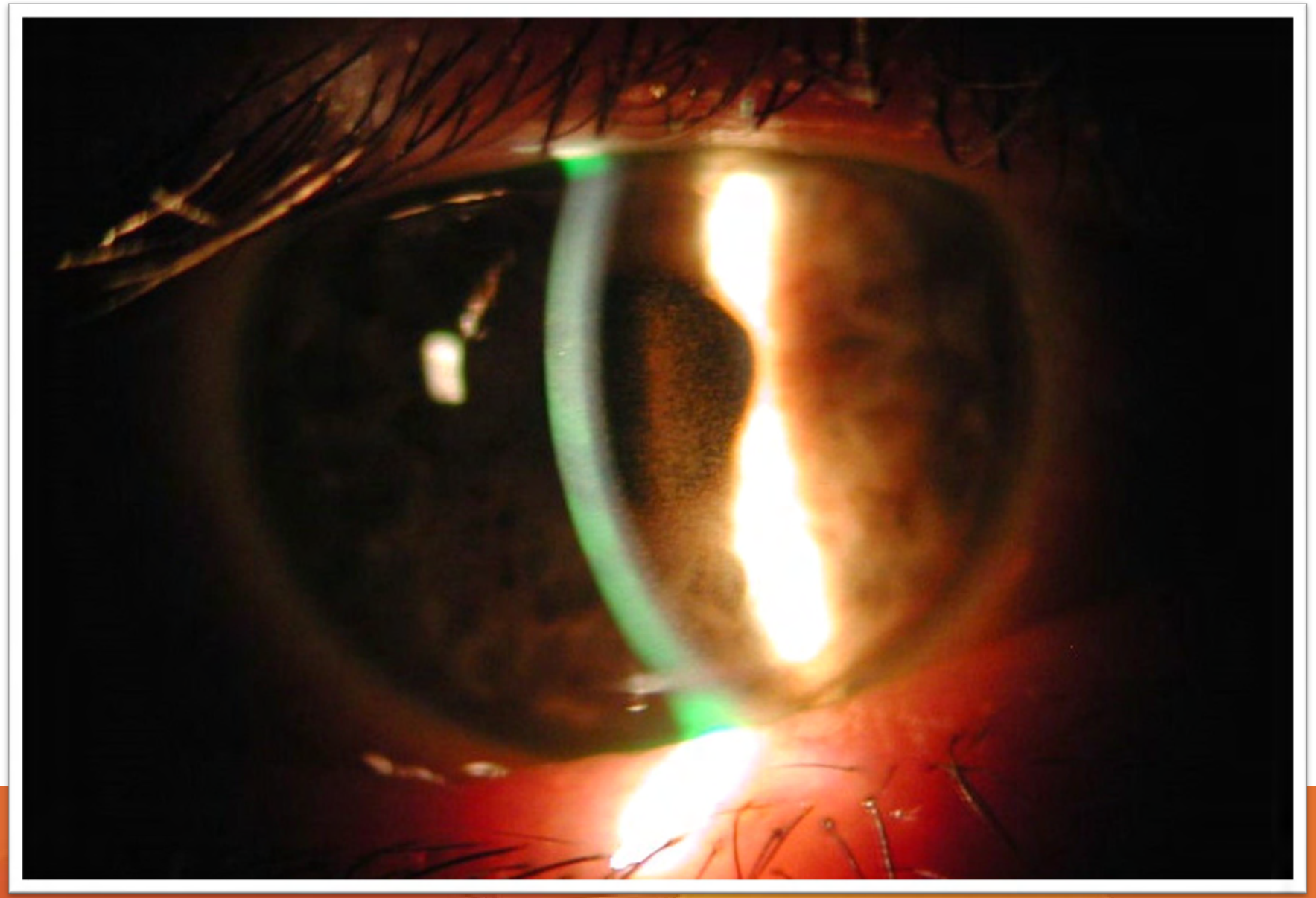
Glaucoma Risk Factors

- Age
- Family history
- Elevated eye pressure
- Myopia (short sightedness)
- African Descent
- Steroid medication
- High blood pressure
- Migraine sufferers

For example:

Pigment dispersion



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Observing the optic disc

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Testing the visual field

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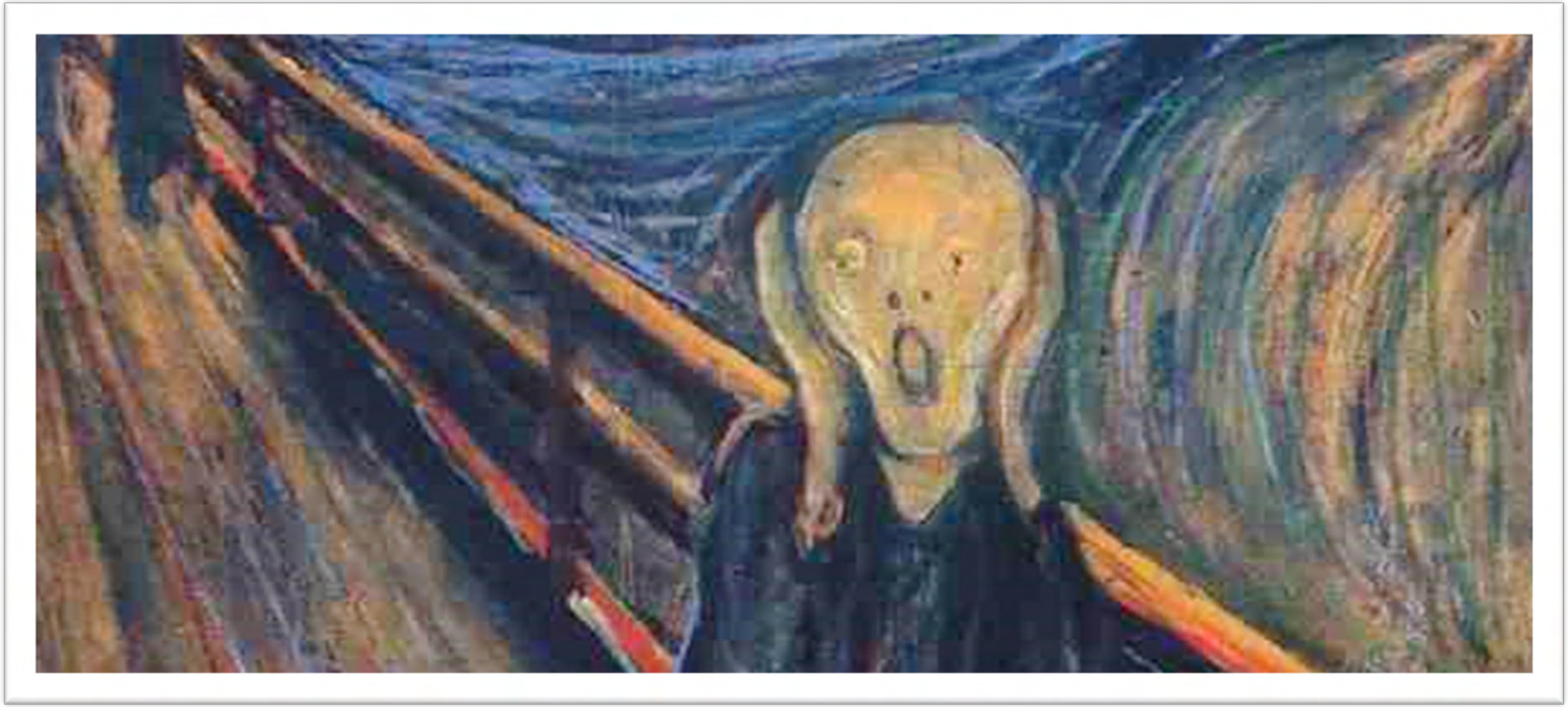
How do we treat glaucoma?

Myth: Eye Drops do not have side effects outside the eye

Side-effects of Glaucoma Treatment



"I stopped taking the medicine because I prefer the original disease to the side effects."

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Prostaglandin Analogues

↑ *uveoscleral outflow*

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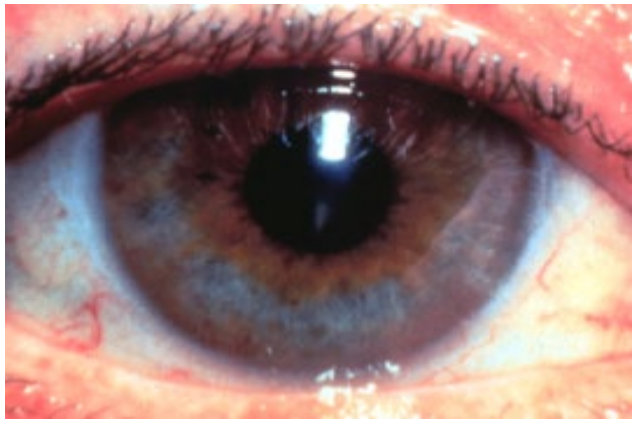
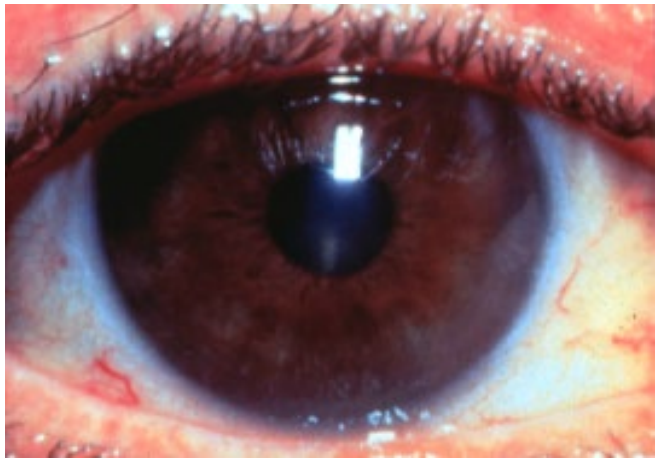
Side Effects





1. Eyelash Growth
2. Change in Eye colour

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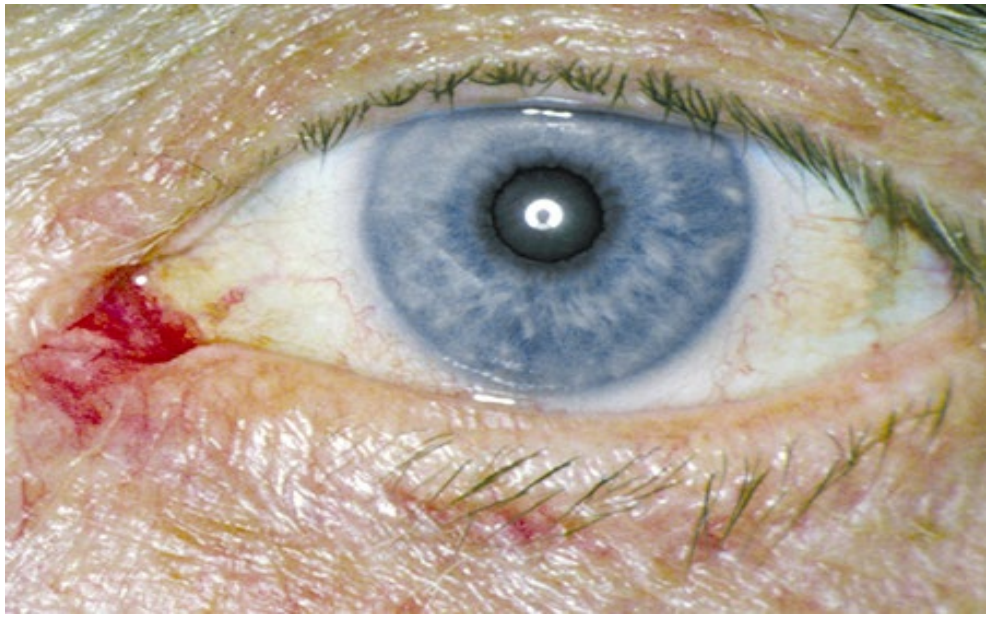

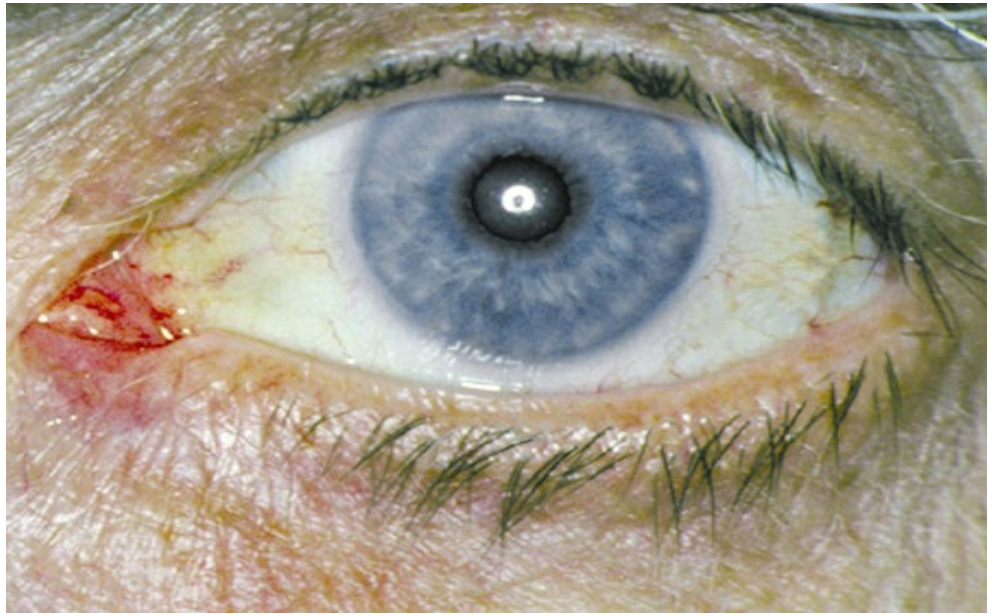

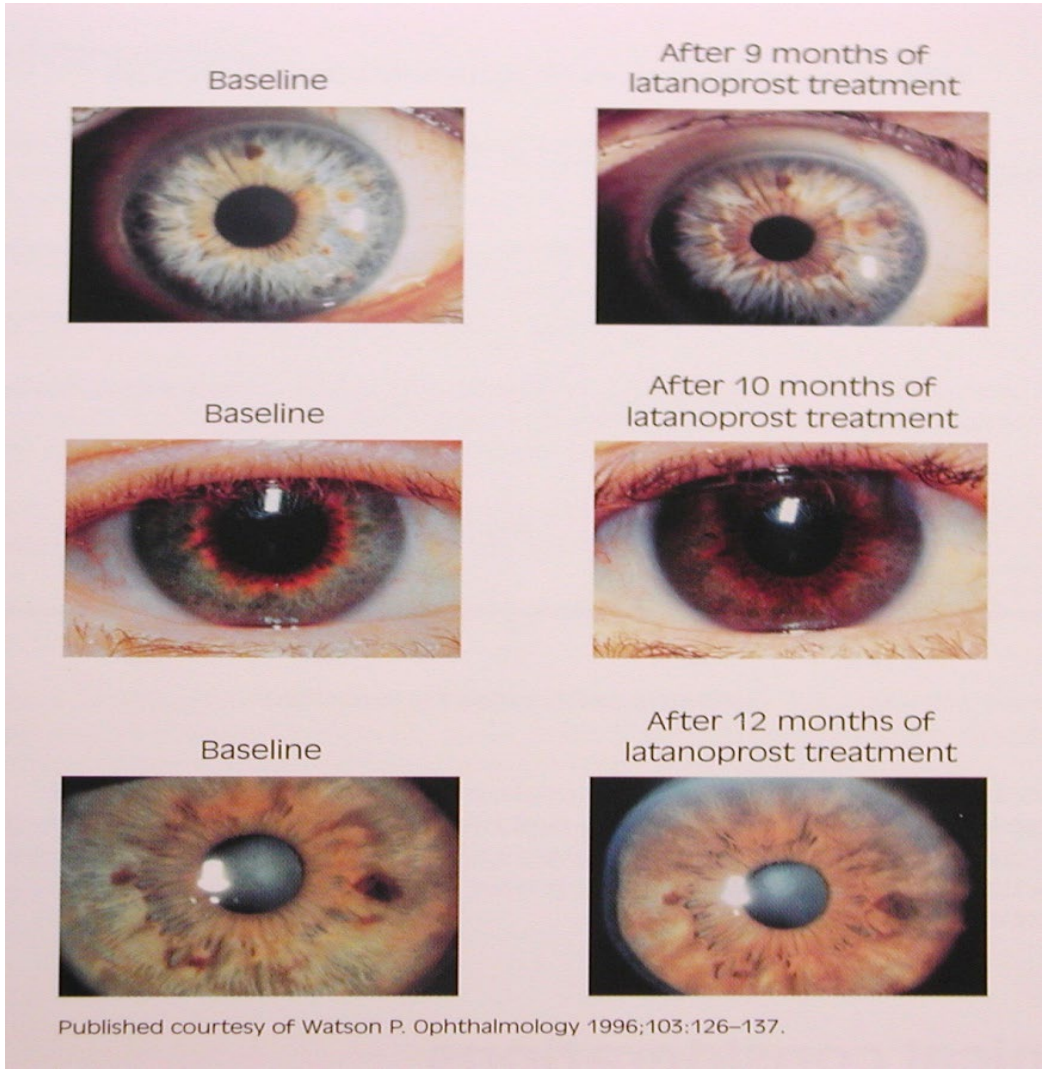

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Beta Blockers

↓ aqueous humour production

- Asthma
- Lower Blood Pressure
- Slower Pulse
- Dizziness

■Depression

■Vivid Dreams

■Impotence

■Hair Loss

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Alpha Agonists
Alphagan

↑ uveoscleral outflow
↓ aqueous humour production
Neuroprotective [brimonidine]

- Allergies
- Fatigue
- Somnolence
- High Blood Pressure
- Dry Mouth
- Altered Taste

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Carbonic Anhydrase Inhibitors

↓ aqueous humour production

- Drugs Available: Trusopt and Azopt
- Local Side Effects:
  - Stinging/burning
  - Conj hyperemia
  - Crusty Eyelashes
- Systemic Side Effects
  - Bitter taste

Summary of topical medications

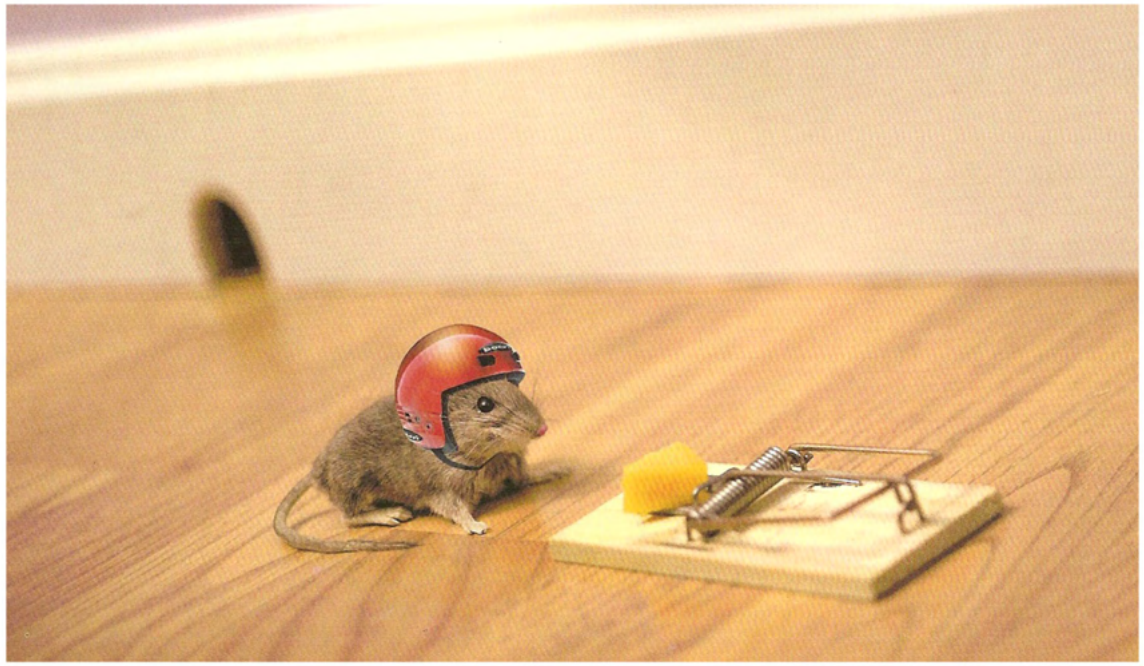
Drug class:	Mechanism of action:	Examples:	Adverse effects:
Prostaglandin analogues	↑ uveoscleral outflow	Latanoprost Travoprost Bimatoprost	Eyelash growth (trichomegaly) Iris pigmentation Peri-ocular skin pigmentation Conjunctival injection (‘red eye’)
Beta blockers	↓ aqueous humour production	Timolol	Bronchospasm (asthma contraindication) Bradycardia Hypotension Fatigue Major depressive disorder Erectile dysfunction
Carbonic anhydrase inhibitors	↓ aqueous humour production	Dorzolamide Brinzolamide	Paraesthesia Malaise complex (fatigue, depression, anorexia, weight loss, libido loss) Gastrointestinal complex (gastric irritation, abdominal cramps, diarrhoea) Renal calculi
Alpha-2 agonists	↑ uveoscleral outflow ↓ aqueous humour production Neuroprotective [brimonidine]	Brimonidine Apraclonidine	Allergic conjunctivitia Xerostomia (dry mouth) Drowsiness and fatigue

Diamox and Sulphur allergy?

- “Sulfur” or “Sulphur” allergy is a misleading term
- Sulphonamide diuretics don’t contain the arylamide group which is responsible for hypersensitivity reactions (Aust Presc. 2008:31:8-10)
- Diamox should not be contraindicated in patients who have had reactions to sulphonamide antibiotics


HARDIN
"In the computer model the only side effect was a dry mouth."

Medications to reduce IOP - must get into the eye to work!



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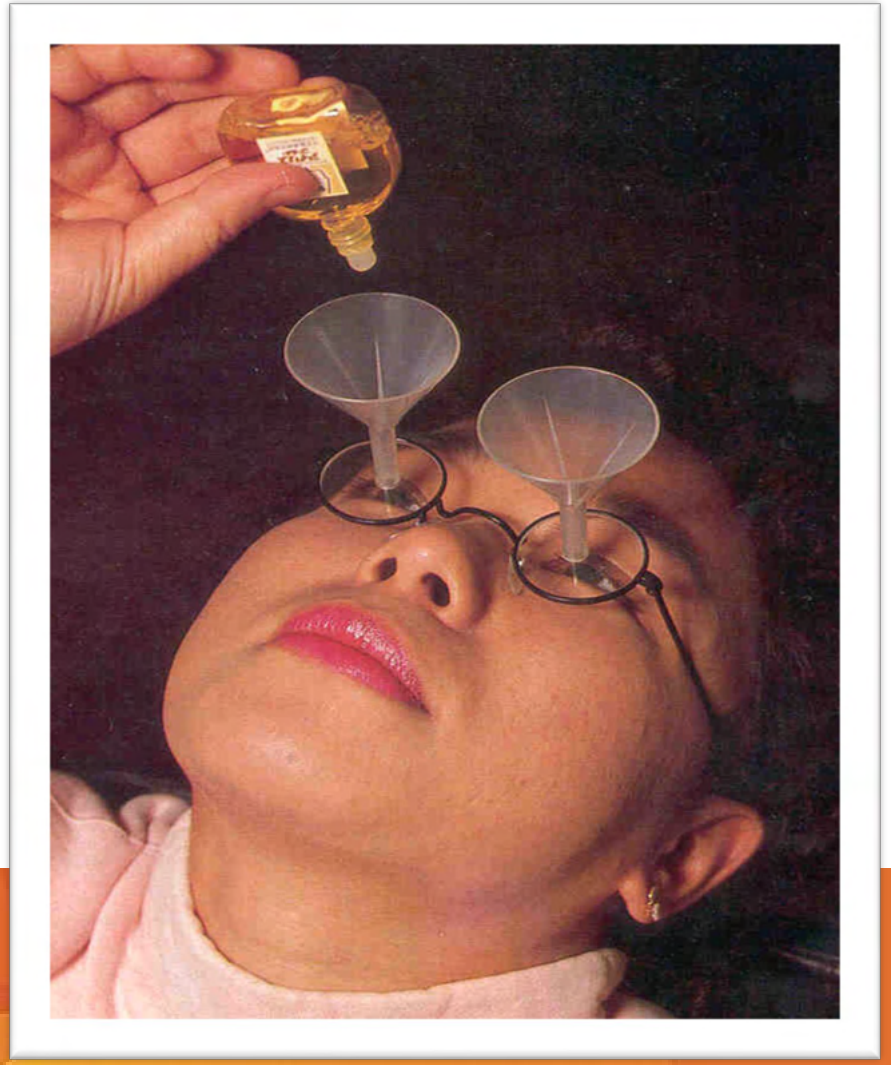
Most common treatment is eye drops

Need to confirm patient is using correct technique for getting drops in the eye



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Laser Treatment for Glaucoma

- Non-invasive
- Works by improving the natural drainage of fluid out of the eye
- Painless
- Takes 2-3 minutes

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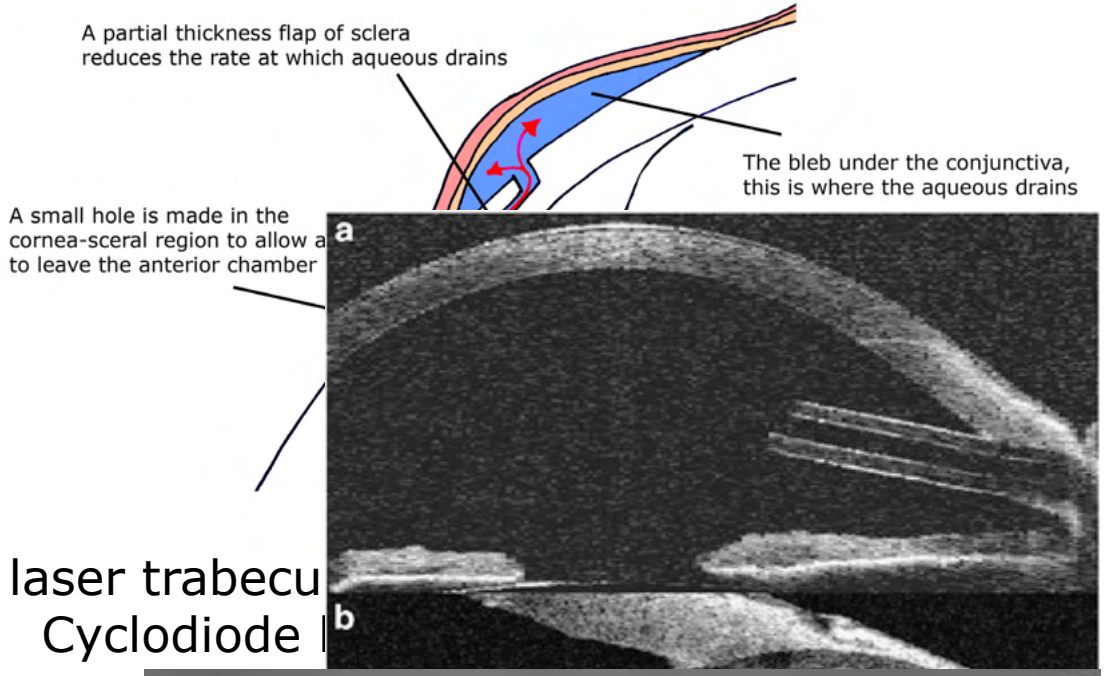
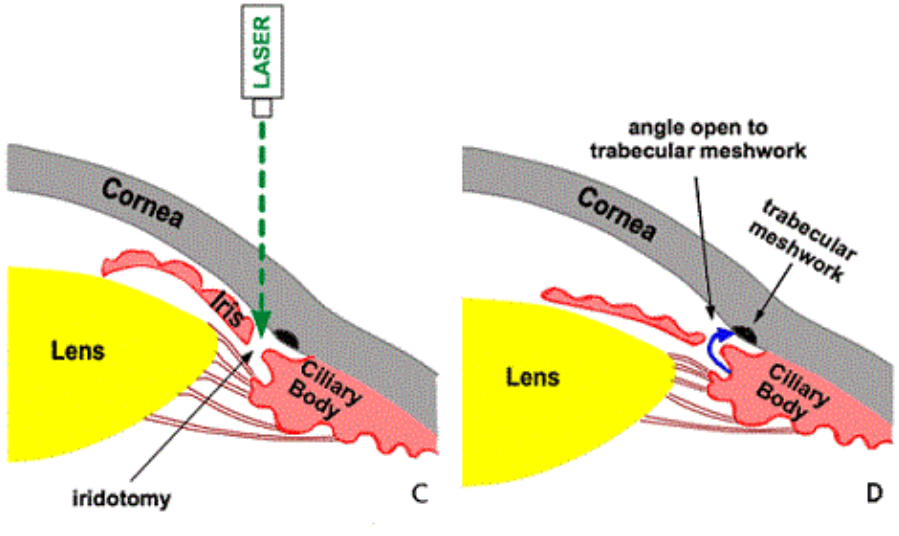
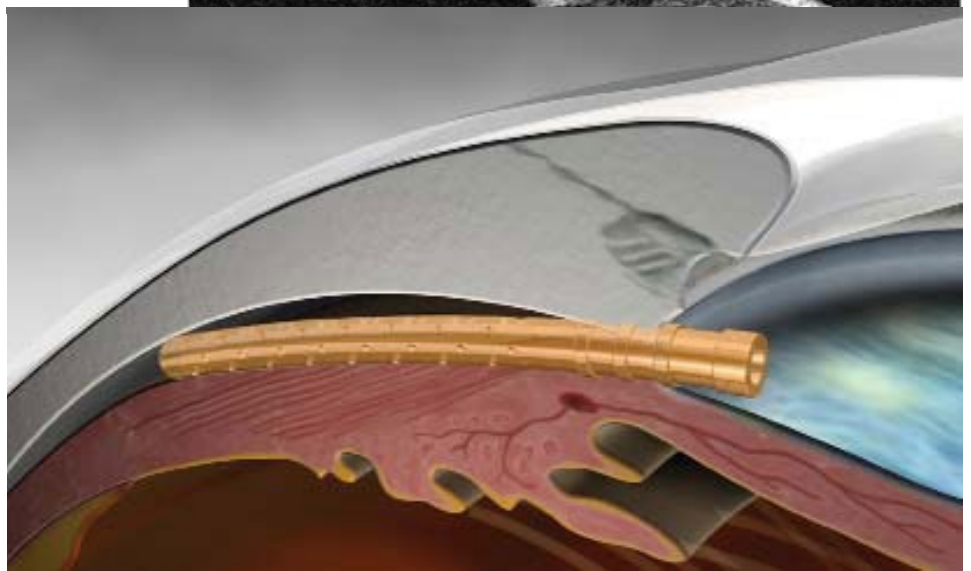
- *Surgical*: Trabe

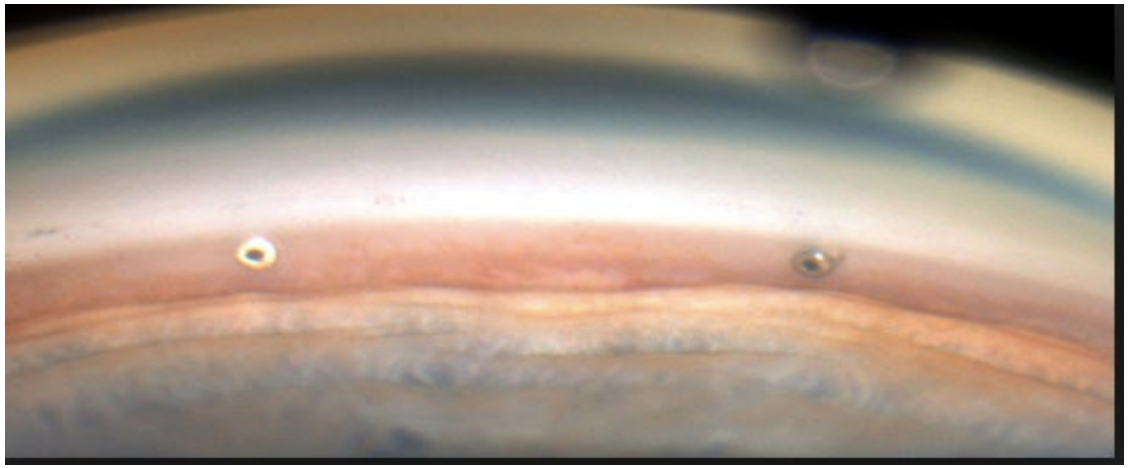


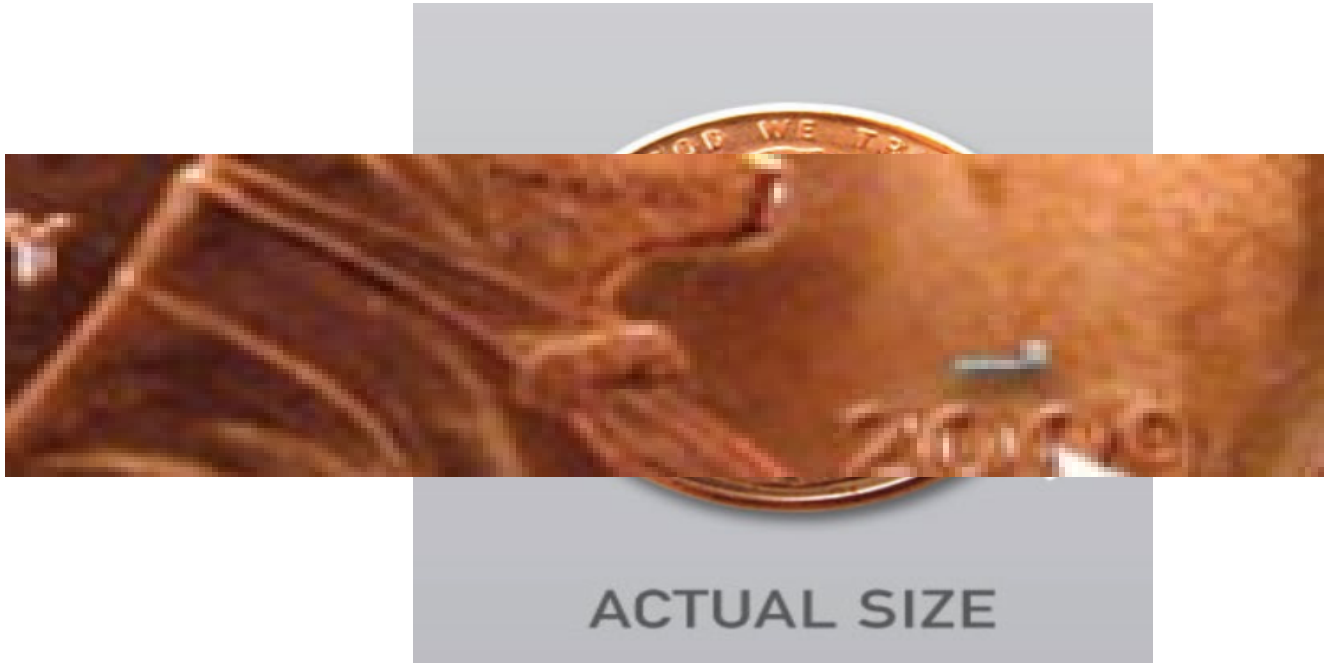
- *Laser therapy*: Argon laser trabecu
  Cyclodiode l





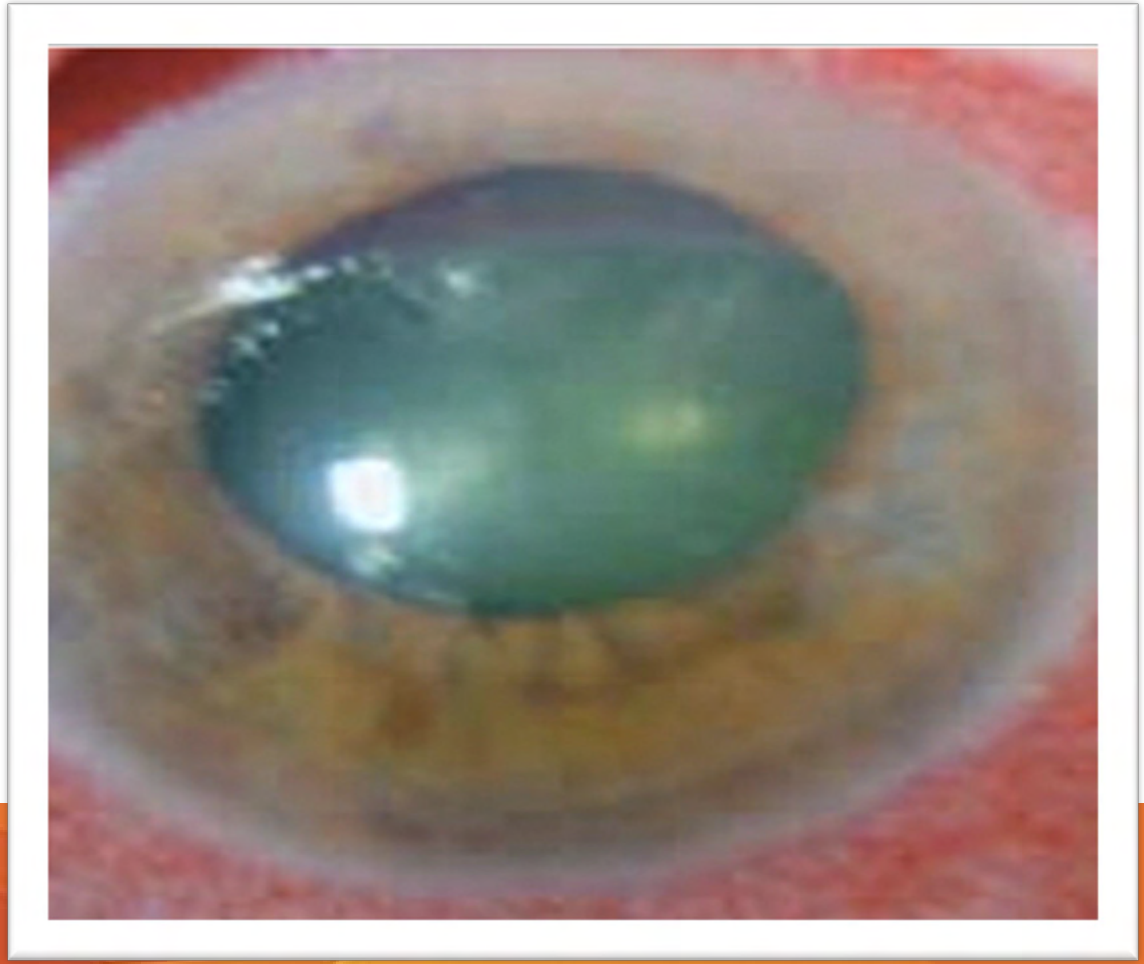
New Microstents: iStent





What is angle closure glaucoma?

- Angle closure crisis is painful with significant morbidity
- It is generally ACUTE compared to Open angle which is CHRONIC



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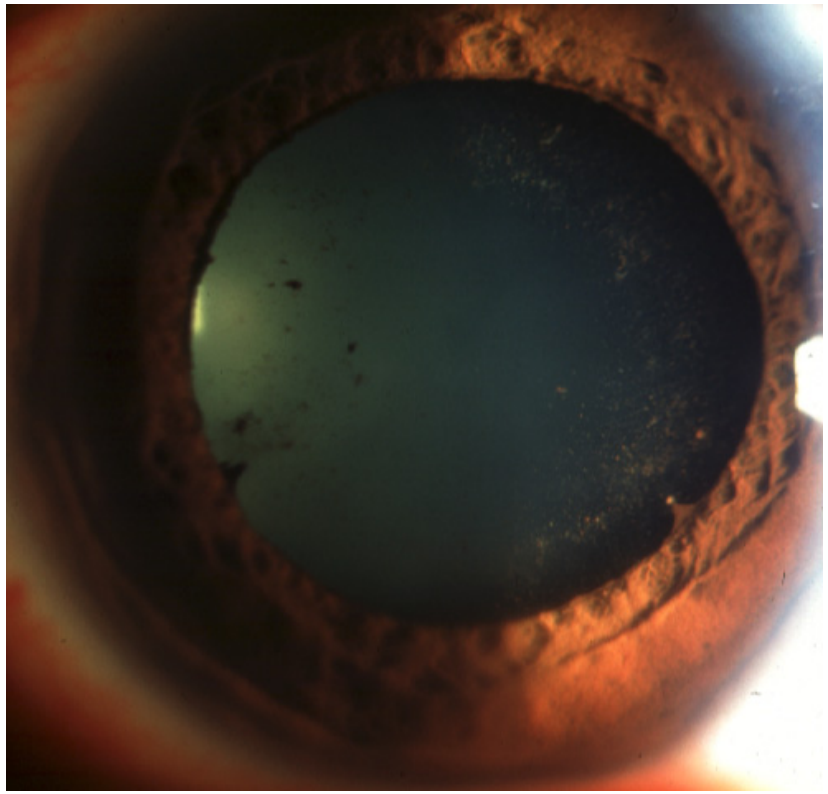
Acute angle closure

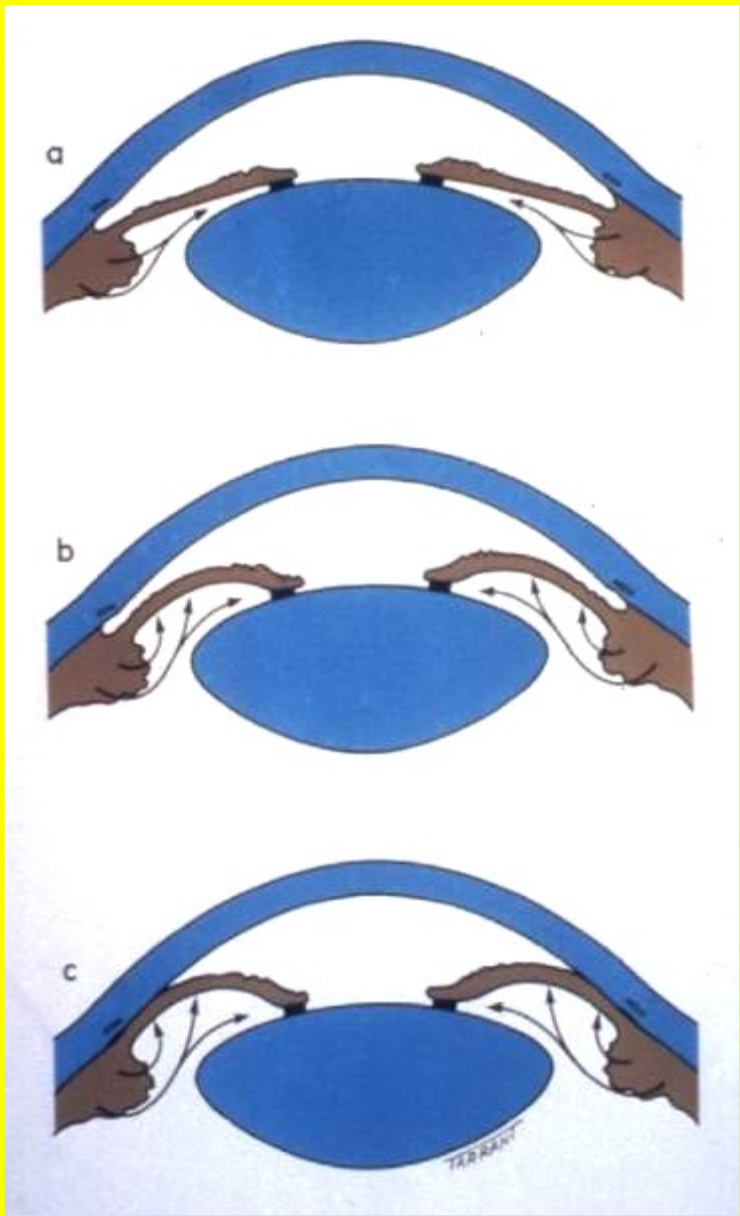
- **Symptoms and signs**
  - *sudden onset painful red eye*
  - pain may -> *vomiting*
  - may see *rainbow halos* round lights
  - *decreased visual acuity* due to corneal oedema
  - *semidilated oval pupil*
  - *stony hard eyeball*

- **This is an emergency ! They will shortly go irreversibly blind.**



Pupil block

Pilocarpine!



- Increase in physiological pupil block

- Dilatation of pupil renders peripheral iris more flaccid
- Increased pressure in posterior chamber causes iris bombé

- **Angle obstructed by peripheral iris and rise in IOP**

(intra-ocular pressure)

78 year old woman

- Acute red eye
- Painful eye
- Blurred vision
- Nausea and vomiting
- Other symptoms
  - Halo around lights

At Risk

1. Age over 60
2. Females greater than males (4:1)
3. Hyperopia
4. Asian ethnicity
5. Family history of angle closure with first degree relatives

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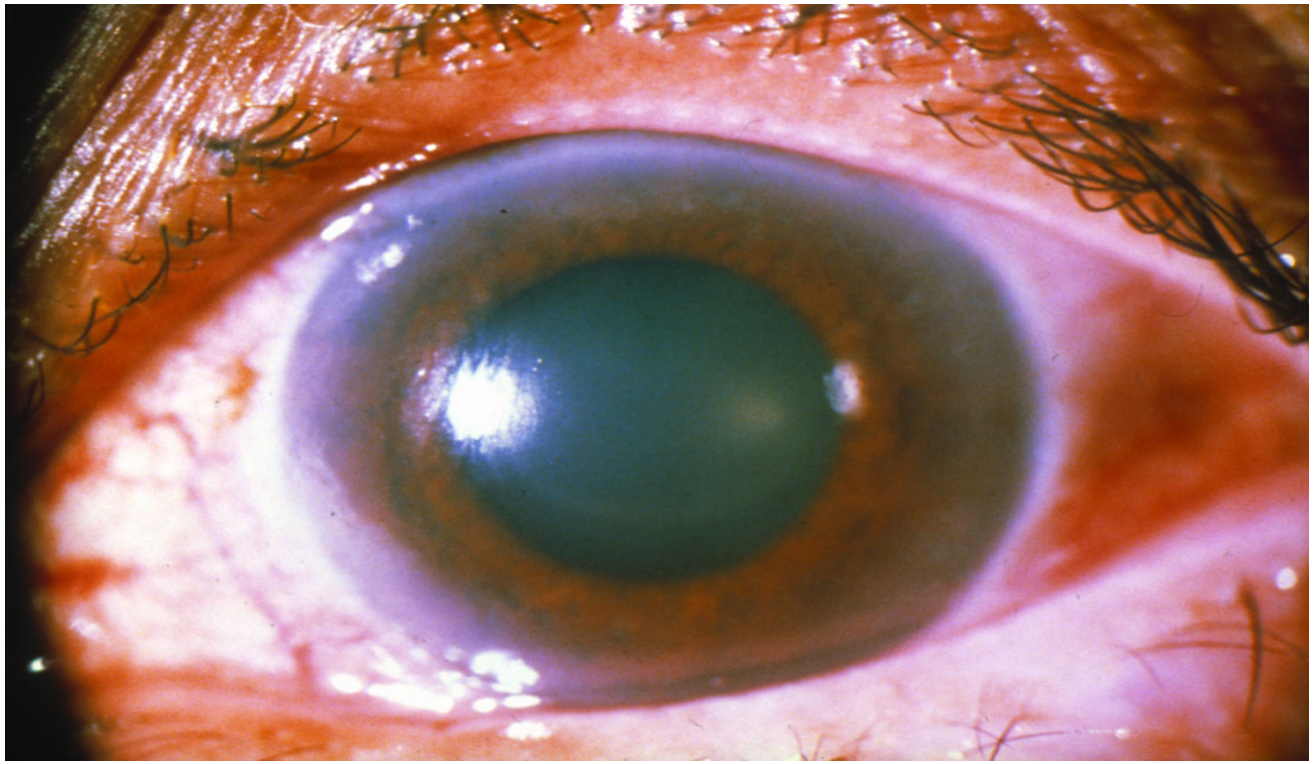
Aims of early management in acute angle closure

- Eliminate severe pain and nausea
- Lower IOP and clear the cornea which allows for definitive management
- Prevent permanent visual loss



Treatment of acute angle closure glaucoma

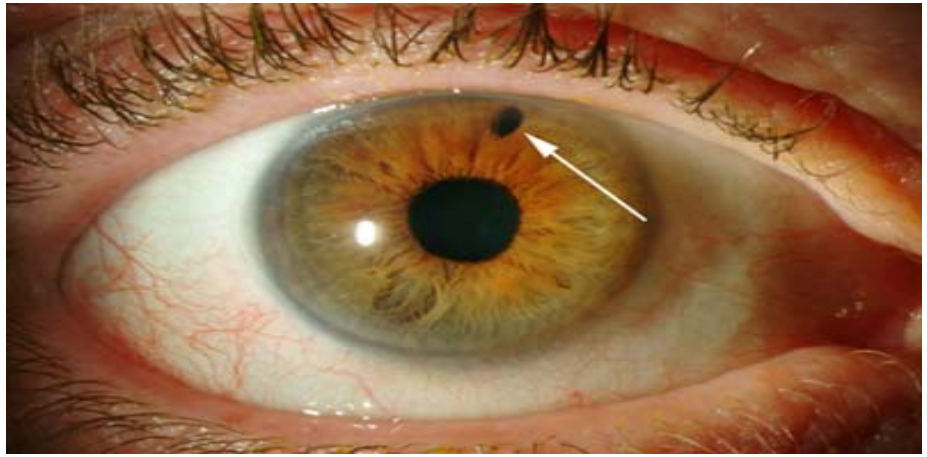
Drops

Stat: pilocarpine, timolol
(and any other pressure lowering
Drop you can find)

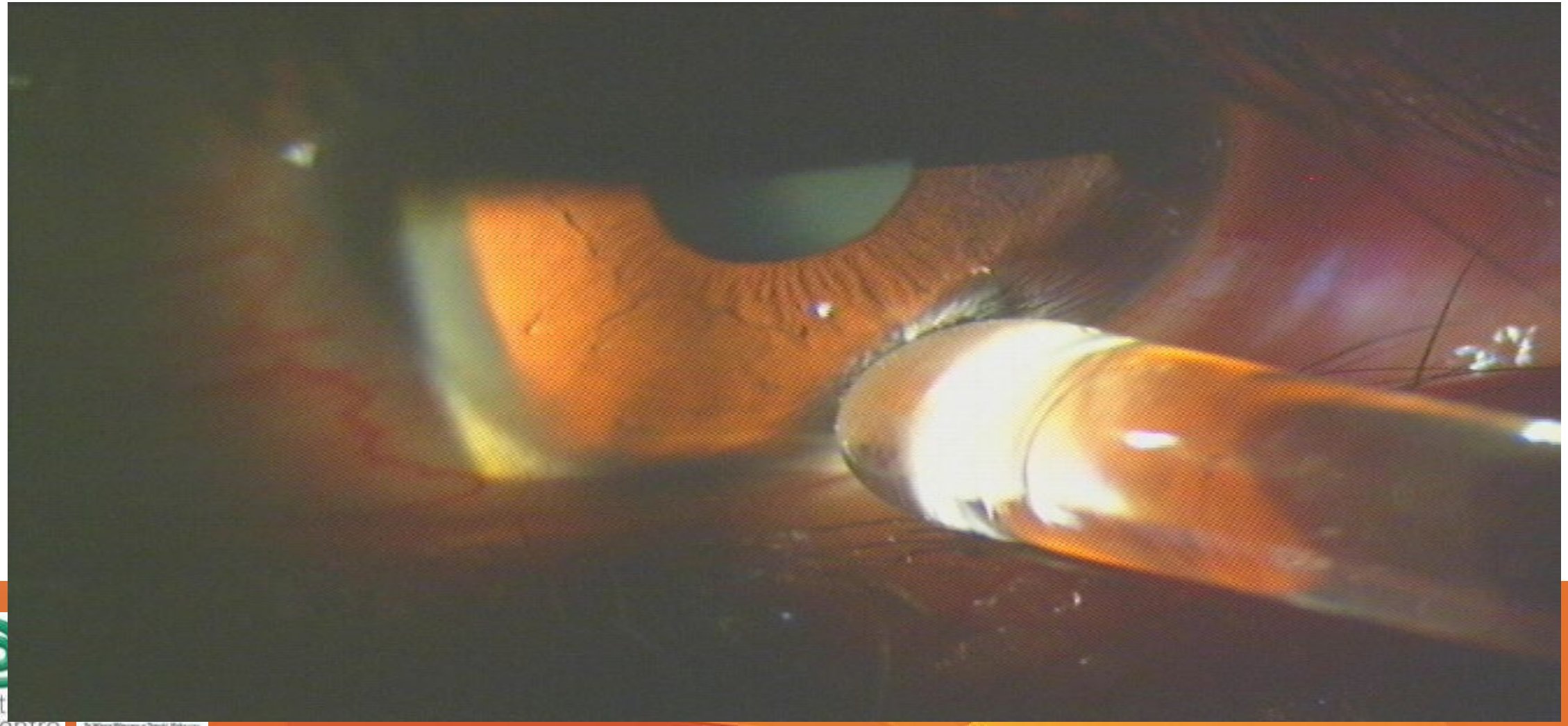
IV/Oral

Oral acetozolamide 500mg-1mg
IV acetozolalmide
IV mannitolr

Laser



Corneal Indentation



Corneal indentation aims to break the attack by:

- Forcing aqueous into the peripheral anterior chamber opening the angle.
- If the angle can be forced open, the IOP will fall rapidly (within minutes)
- Definitive management can follow

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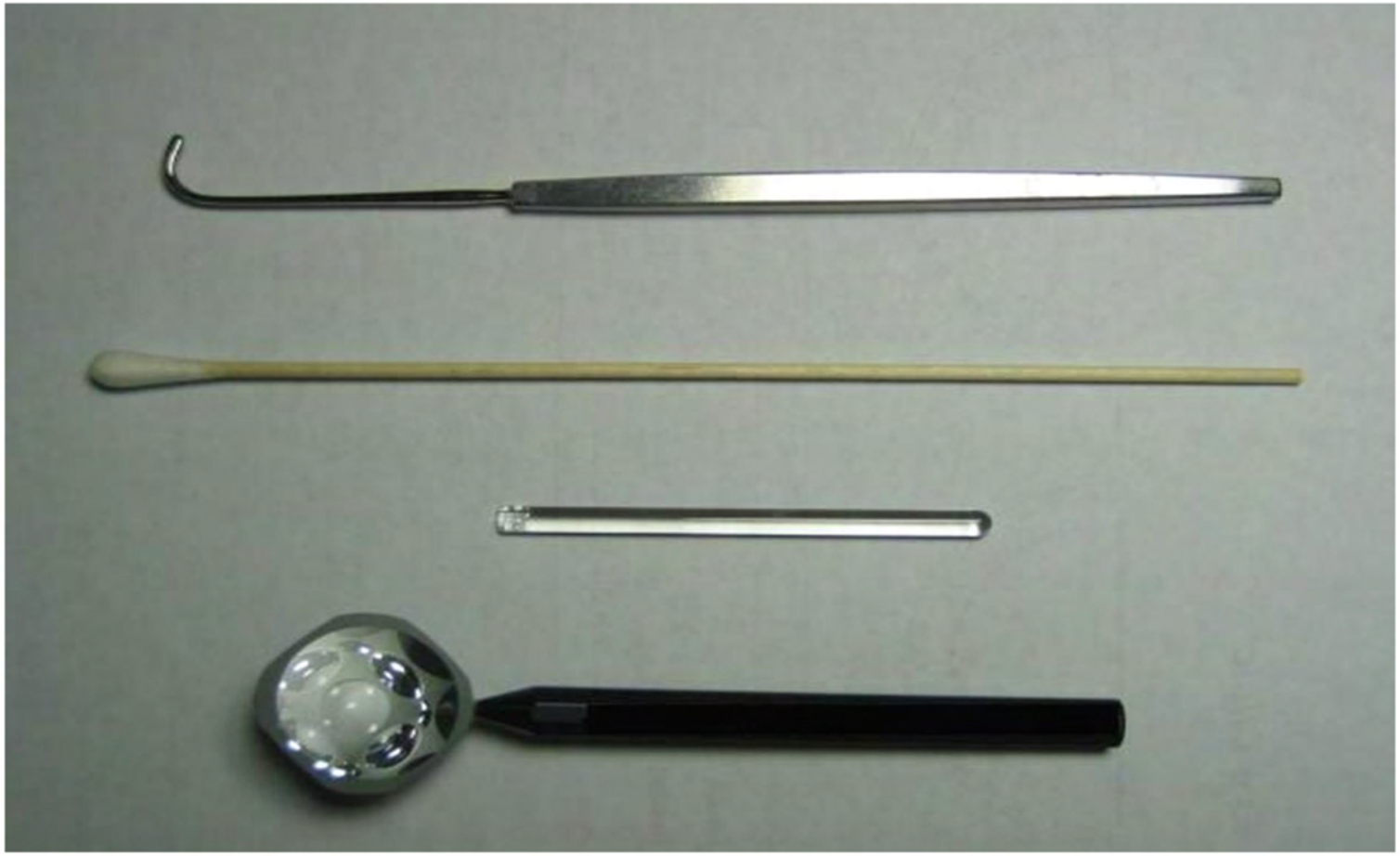
Preferred instruments



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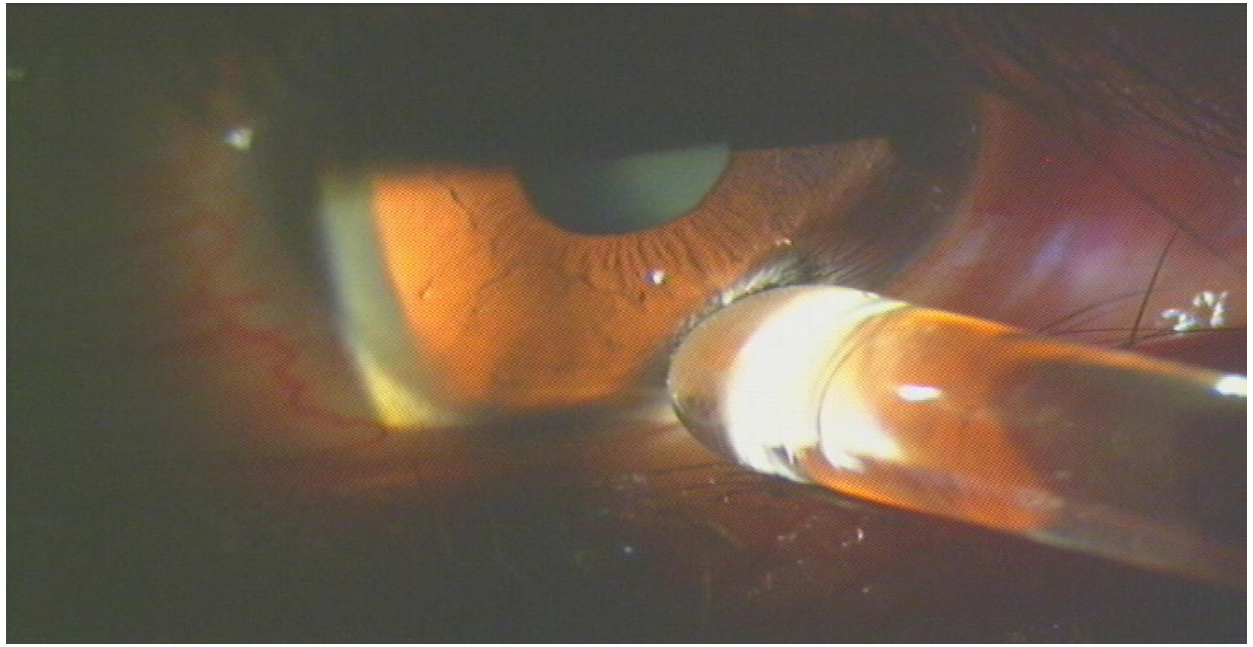
Technique

- Topical anaesthetic
- Pressure in cycles
  - 30 seconds on / off
- IOP response in 3-4 cycles
- Inferior cornea
- End points
  - Iris contour → convex
  - Pupil margin movement



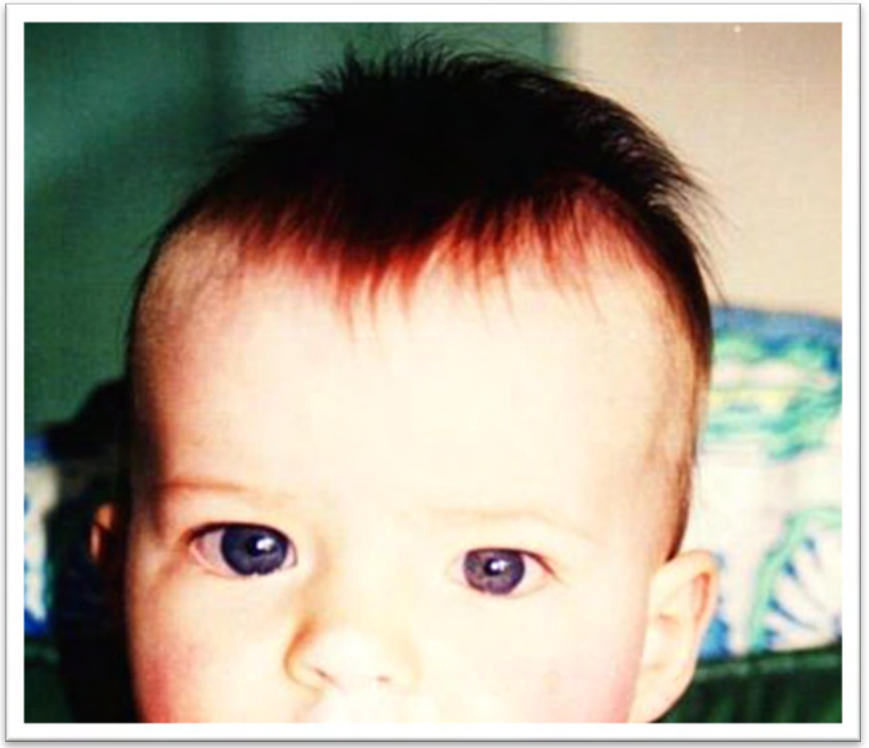
Case 1: 69 year old male

- PC: Acute onset severe pain and nausea 3-4 hours following pupil
- IOP 72mm Hg OD, 14mmHg OS
- Oral Diamox, Pilocarpine.Timolol and Brimonidine

- Minimal decrease in IOP after 45 min.
- IOP OD 11mmHg after corneal indentation
- Definitive Rx with laser iridotomies (OD same day, OS next day)

Infantile Glaucoma

- Hazy corneas
- Tearing/watering
- Photophobia
- Buphthalmos



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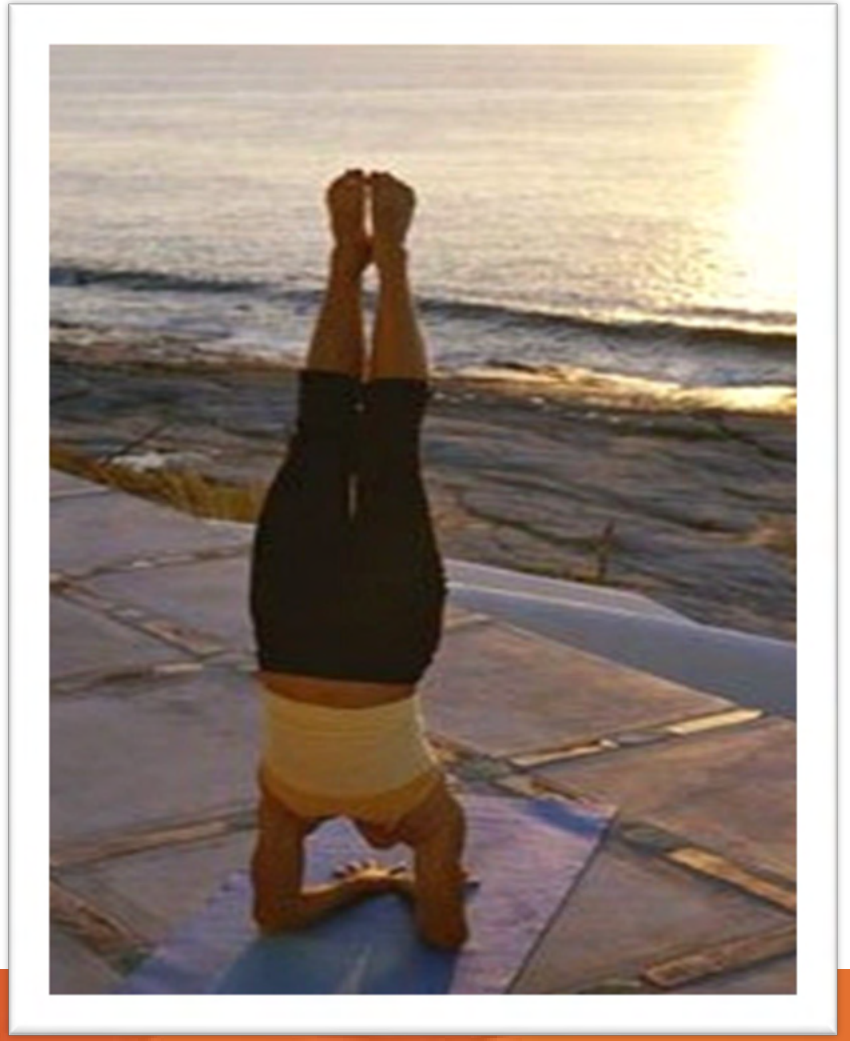
“IS THERE ANYTHING I CAN DO?”

Lifestyle and Glaucoma

Effect of yoga on IOP

- 10 subjects
- IOP measured sitting and immediately after headstand position
- IOP 14 +/- 2mmHg increased to 32 +/-4 mmHg.



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Yoga positions

Asanas with Props

The ancient yogis used logs of wood, stones, and ropes to help them practice asanas effectively. Extending this principle, Yogacharya Iyengar invented props which allow asanas to be held easily and for a longer duration, without strain.

YOGACHARYA IYENGAR IN SETUBANDHA SARVANGASANA

This version of the posture requires considerable strength in the neck, shoulders, and back, requiring years of practice to achieve. It should not be attempted without supervision

!

Australian yoga

Other variables influencing IOP

- Head position at night
  - Flat-head sleeping position increase nocturnal IOP by 20-30%

Wind instrument and IOP

- Does playing a wind instrument affect glaucoma?

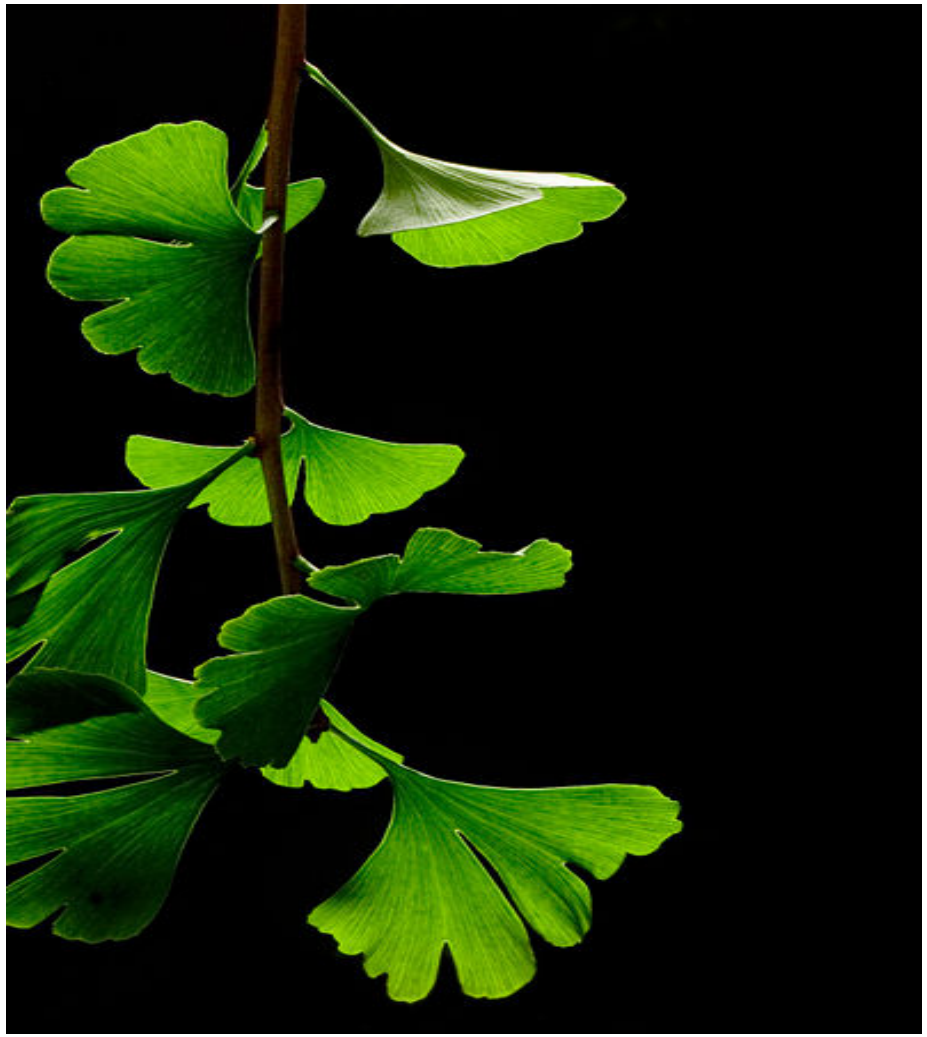
Yes.. ☹

Role of Diet: inconclusive evidence

- Omega-3 Fatty Acids
- Green collards
- Carrots

Gingko Biloba

- 3 potential effects of gingko extract: flavonoids and terpenoids
  - improvement in blood flow
  - protect against oxidative cell damage/free radicals
    - Glaucoma patients decrease mitochondrial function
    - Gingko improve
  - Anti-inflammatory effect



Flammer et al,
Molecular Vision 2012

Cannabis?


THE GREEN DOCTORS
Do you suffer from Migraines, Insomnia,
Chronic Pain, Glaucoma, Nausea,
ADD, ADHD,
310.985.2233
310.347.2071

AMERICAN ACADEMY OF OPHTHALMOLOGY®

Greater Physical Activity Is Associated with Slower Visual Field Loss in Glaucoma

Moon Jeong Lee, BS,[1] Jiangxia Wang, MS,[2] David S. Friedman, MD, PhD,[1] Michael V. Boland, MD, PhD,[1] Carlos G. De Moraes, MD, MPH,[3] Pradeep Y. Ramulu, MD, PhD[1]

Ophthalmology 2019;126:958-964 © 2018

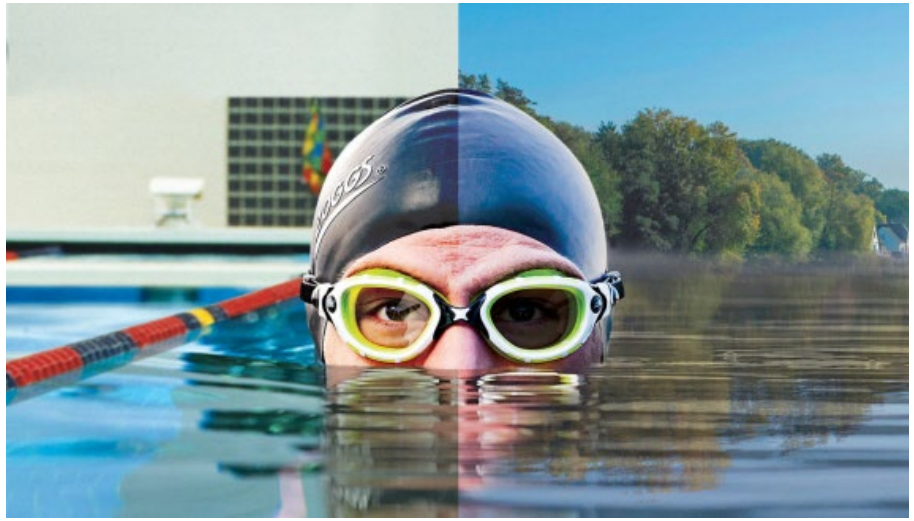
- Purpose: Association between physical activity levels and VF loss
- Design: Longitudinal, observational study.
  Participants: 141 OAG /suspect Methods: Accelerometers for 1 week to define average steps per day, minutes of
- moderate-to-vigorous activity, and minutes of non-sedentary activity.
- Main Outcome Measures: Poin-twise changes in VF sensitivity associated with physical activity measures.

- Conclusions:
  - Increased walking,
  - greater time spent doing moderate-to-vigorous physical activity,
  - More time spent in non-sedentary activity were associated with slower rates of VF loss
  - Additional 5000 daily steps or 2.6 hours of non-sedentary physical activity decreasing the average rate of VF loss by approximately 10%.

Swimming

1. IOP increased while wearing goggles by 4.5 mm Hg.

2. A smaller goggle face area was consistently associated with greater IOP elevation.



Morgan WH et al, Wearing Swimming Goggles Can Elevate Intraocular Pressure.
Br J Ophthalmol. 2008;92(9):1218-1221.

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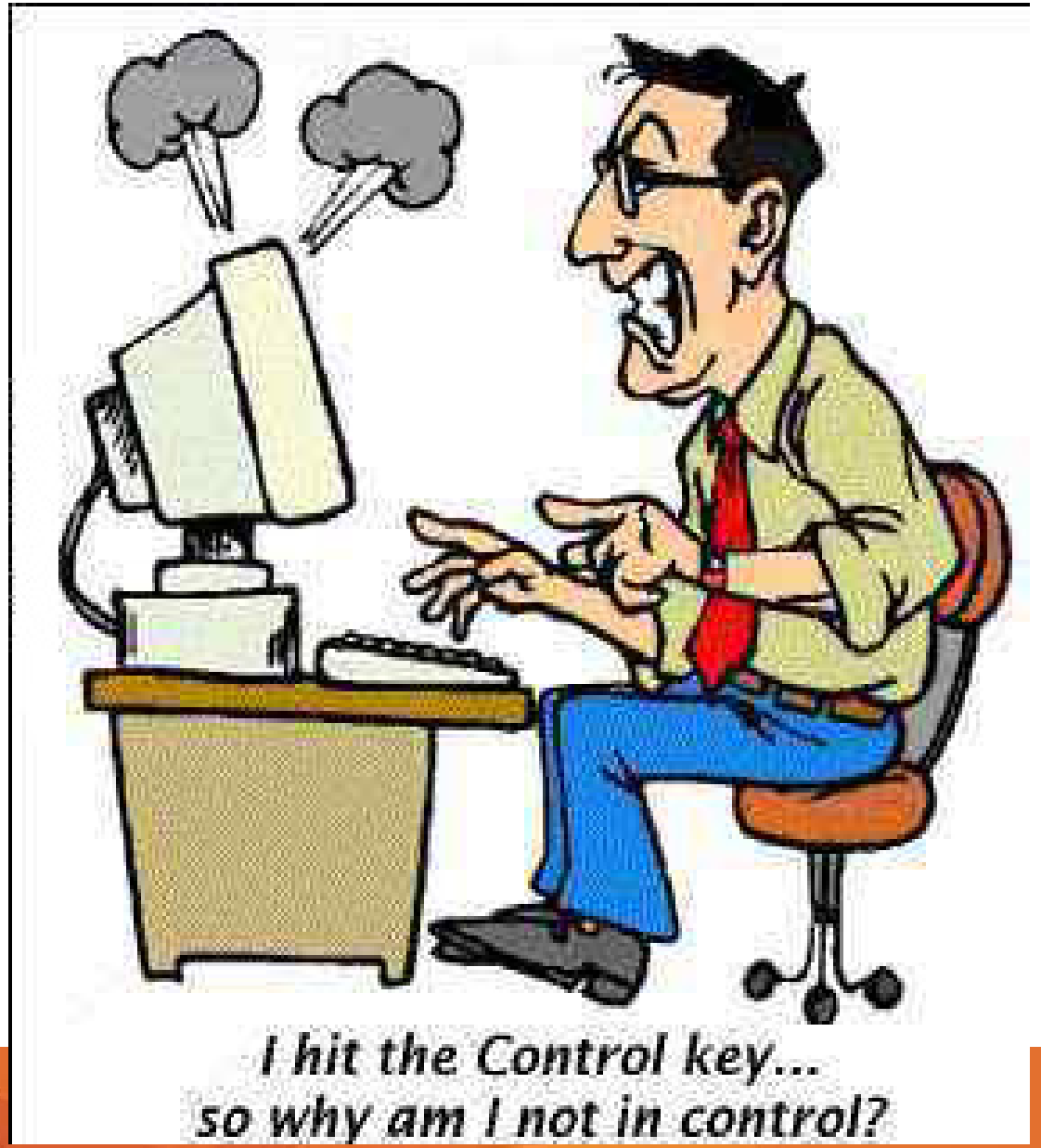
It is not harmful to use your eyes- no evidence Computer use causes any damage



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Stress and IOP

- No strong evidence.
- Psychosocial stress questionaire
- Positive correlation in female between stress score and IOP.

Journal of Physiological Anthropology

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Conclusions

- ✓ Glaucoma is the leading cause of preventable blindness
- ✓ Silent disease requires regular eye assessments
- ✓ Treatment involves eye drops
- ✓ New treatments include laser procedures and microstents

A FULL VISUAL FIELD IS IMPORTANT

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Conclusions

- ✓ Lifestyle effects still being investigated
- ✓ Glaucoma patients should be cautious with yoga positions
- ✓ Cannabis lowers pressure but not recommended

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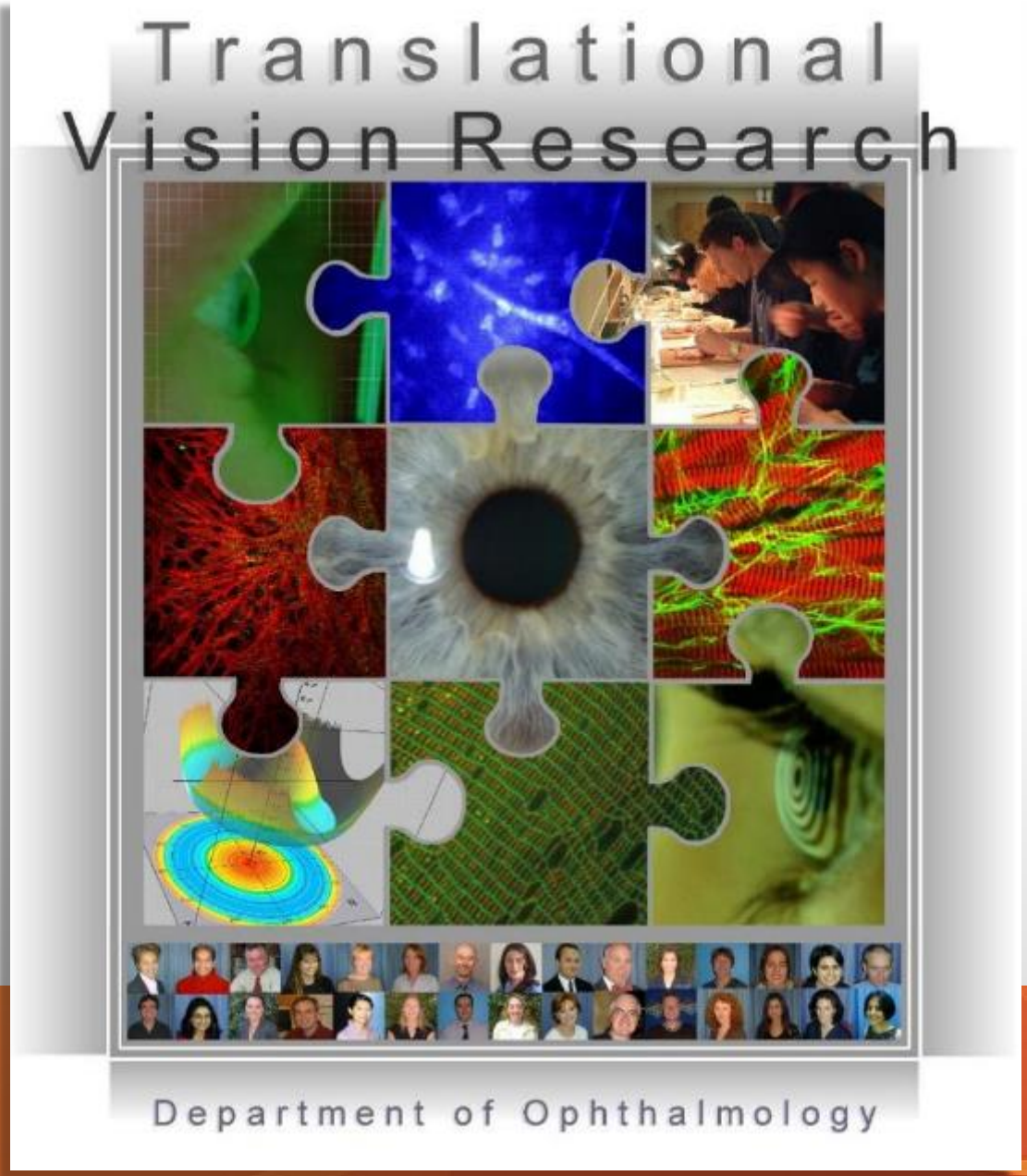

The End

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