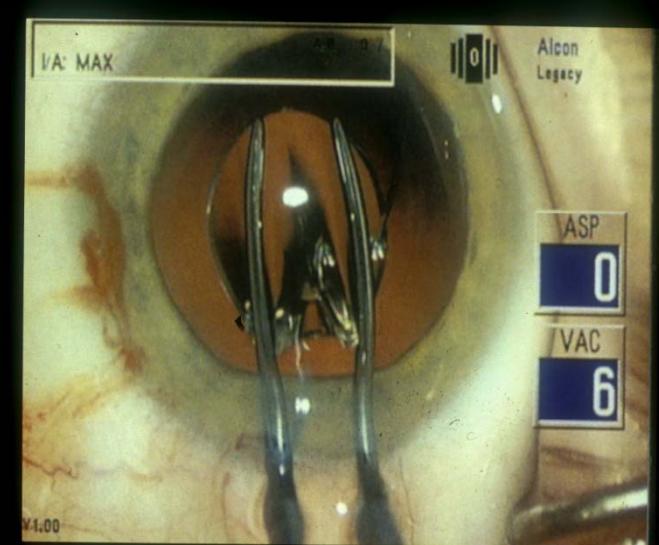


Recent Advances : Cataract surgery and Age related Macular Degeneration



**Vaughan Tanner
Consultant Ophthalmic Surgeon**

Reading

**Royal Berkshire Hospital
Dunedin Hospital**

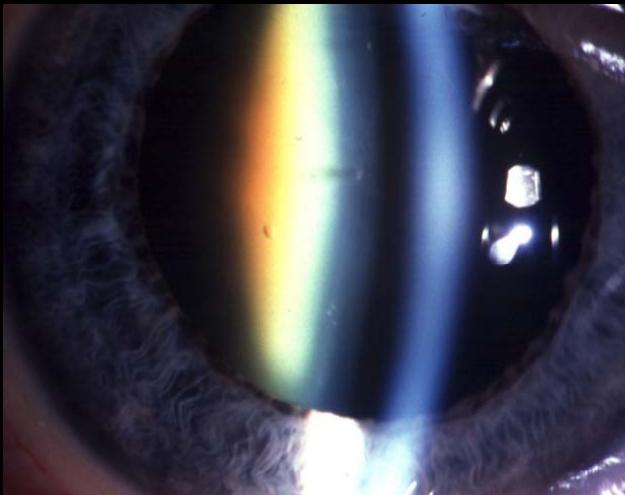
Windsor

**King Edward VII Hospital
Princess Margaret Hospital**

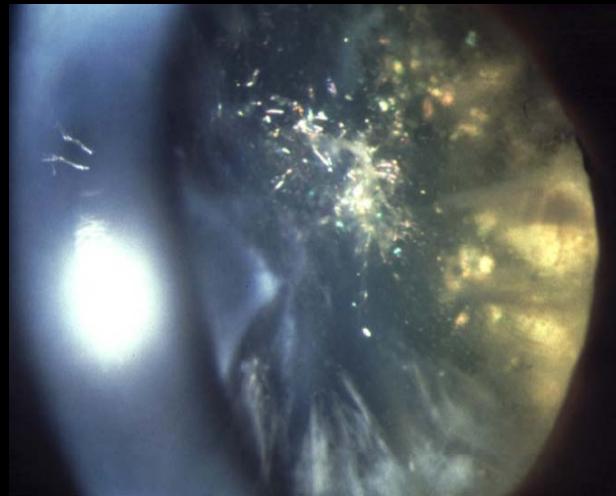
www.tanner-eyes.co.uk

Age-related cataract

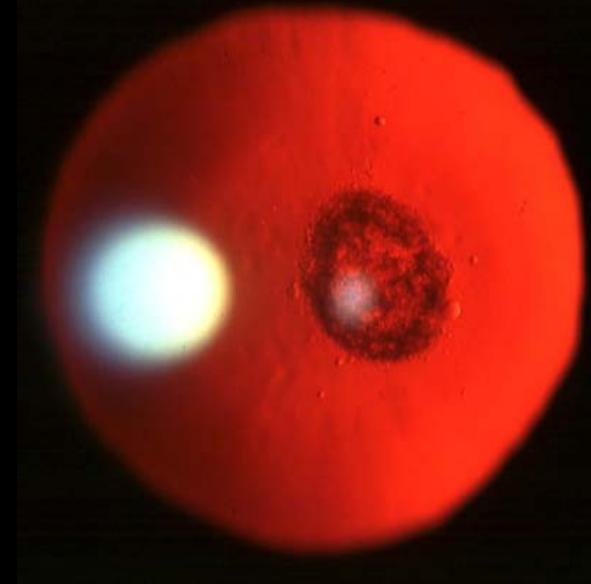
Nuclear sclerosis



Cortical lens opacity

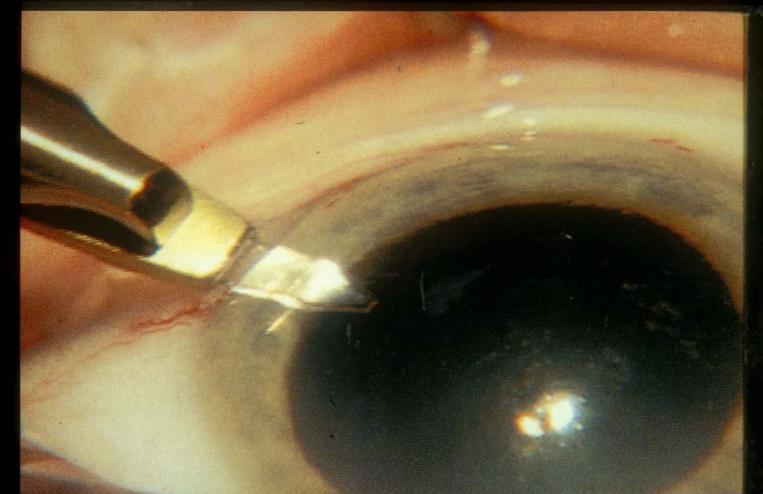


Posterior sub-capsular



Phacoemulsification cataract surgery

- Small incision phacoemulsification has revolutionised cataract surgery
- 1.8 mm – “Micro-incision”
- Quicker rehabilitation
- Less astigmatism
- Day case
- Local anaesthetic



Topical Anaesthetic

- Topical anaesthesia - my preferred technique

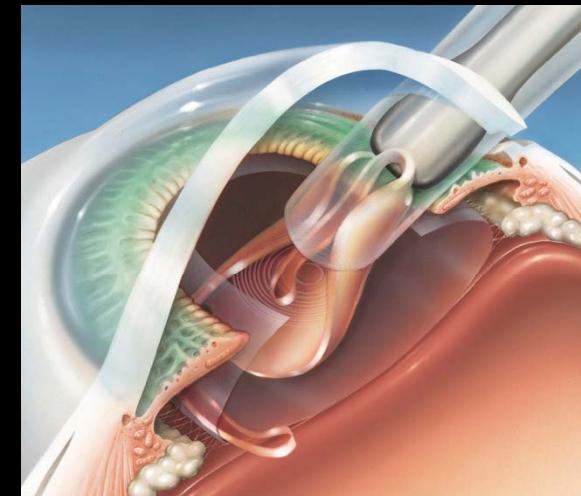
Proxymetacaine and amethocaine

No injection

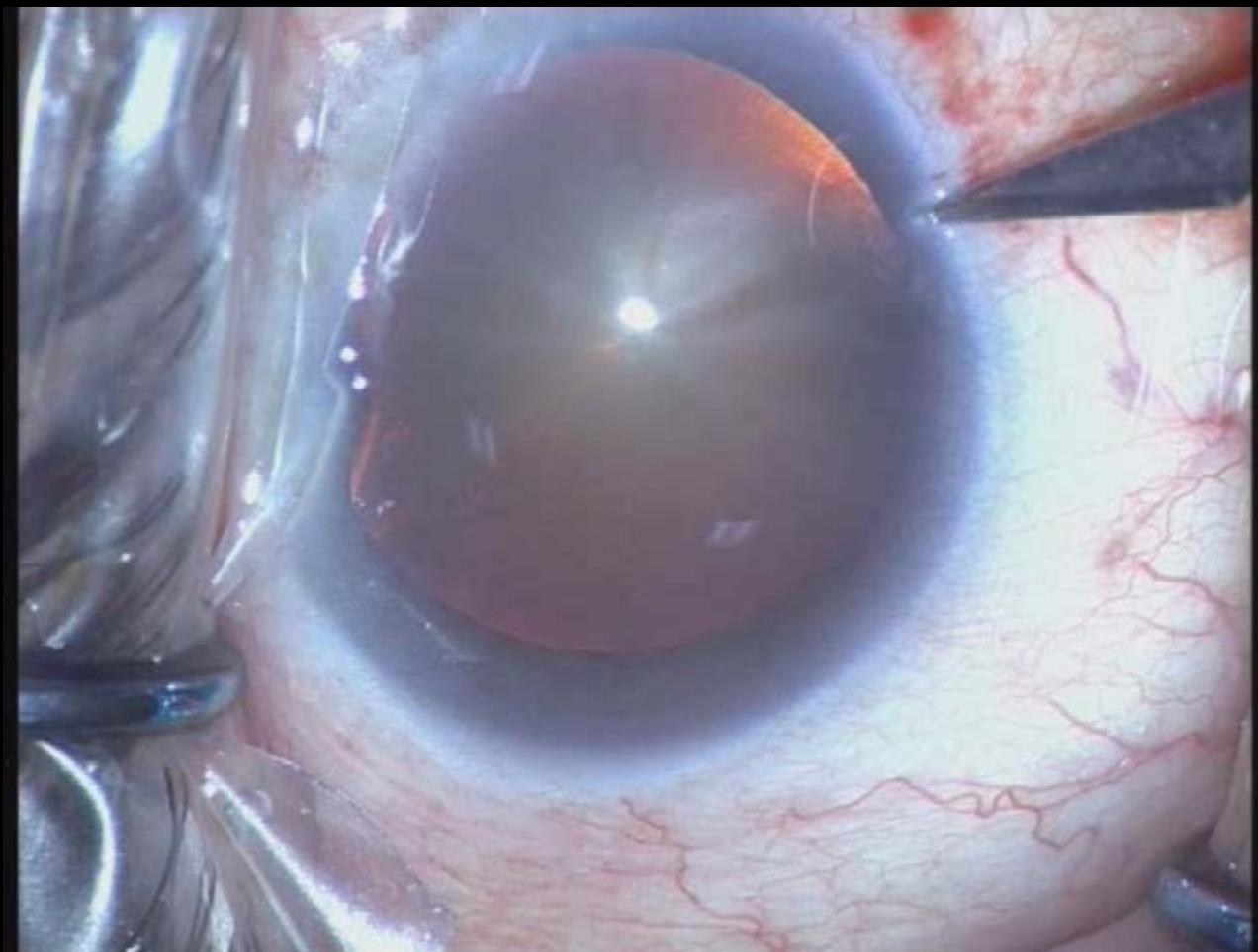
No orbital bruising

No conjunctival bleeding

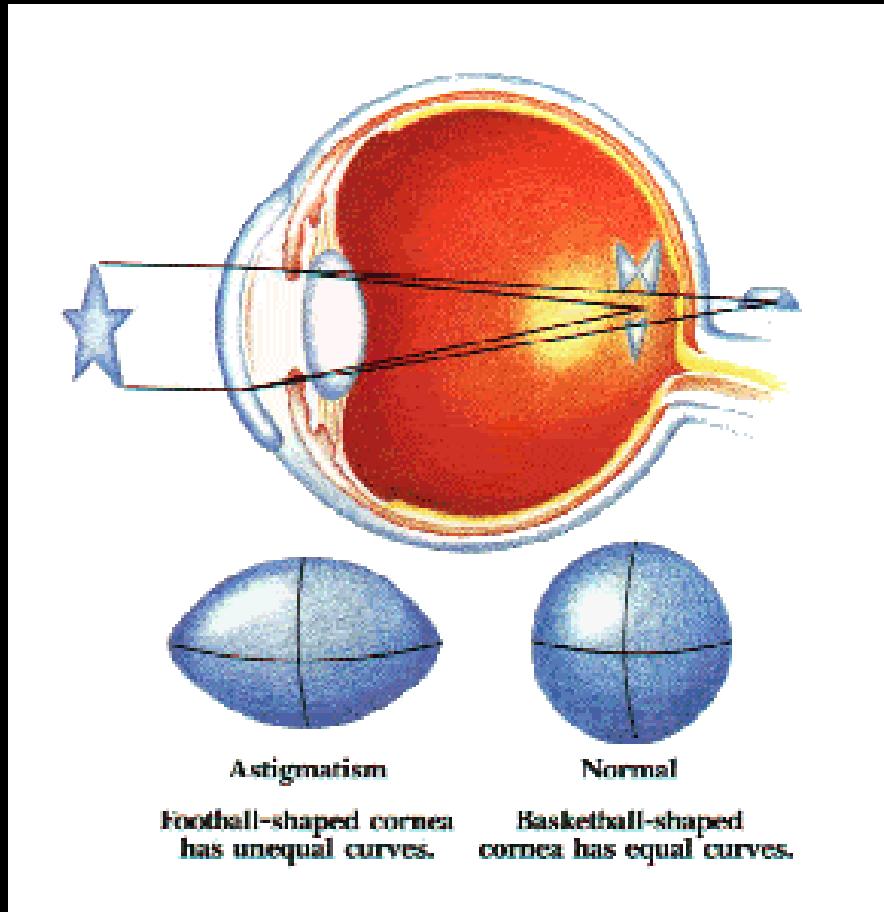
Faster visual recovery



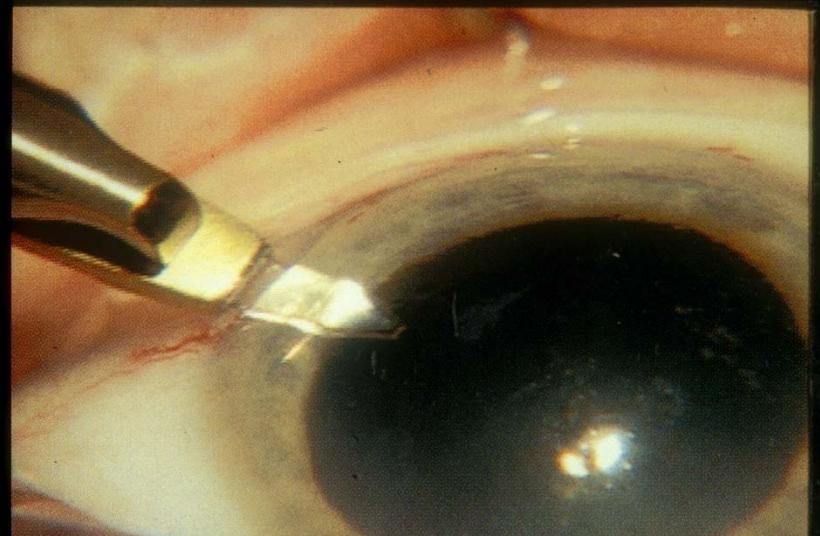
- General anaesthetic if very nervous / young
- Sub-tenons anaesthesia if “blinker”



Astigmatism

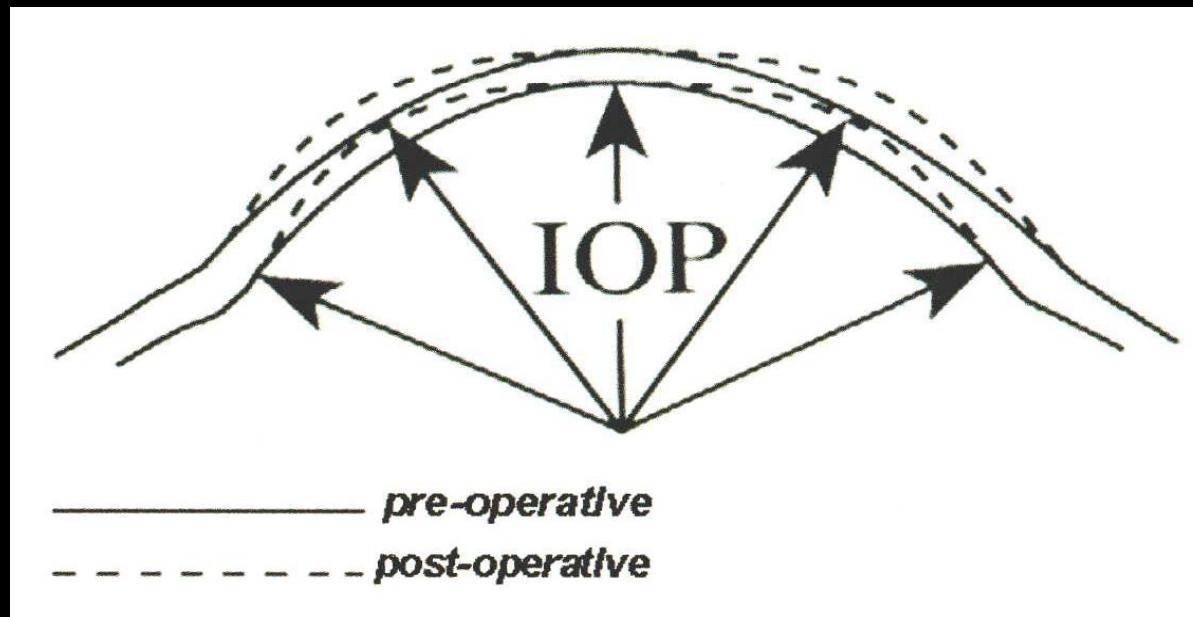


- On axis incision
- Limbal relaxing incisions



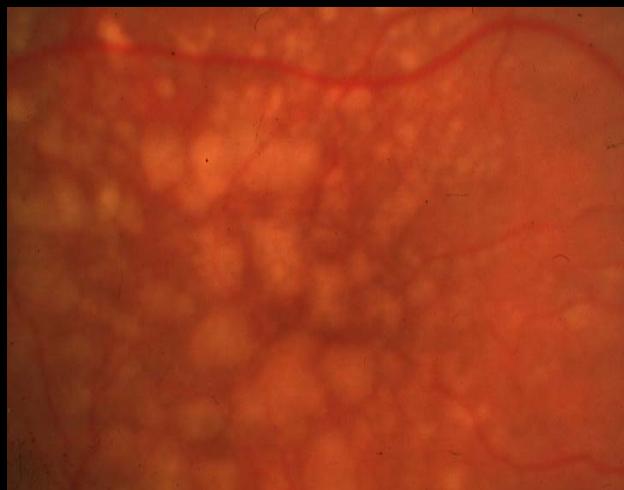
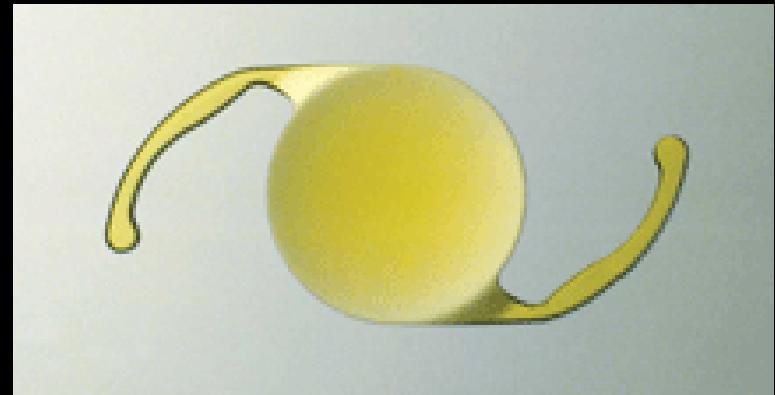
Limbal Relaxing Incisions

- Partial thickness incisions in the cornea result in relaxation of tissue and decrease in astigmatism
- Aim – make cornea closer to a perfect sphere
- Careful not to overcorrect



Acrysof Natural

- Recently released
- Currently use high risk eyes with signs of ARMD
- May start using as routine in all eyes if continued follow up is favourable

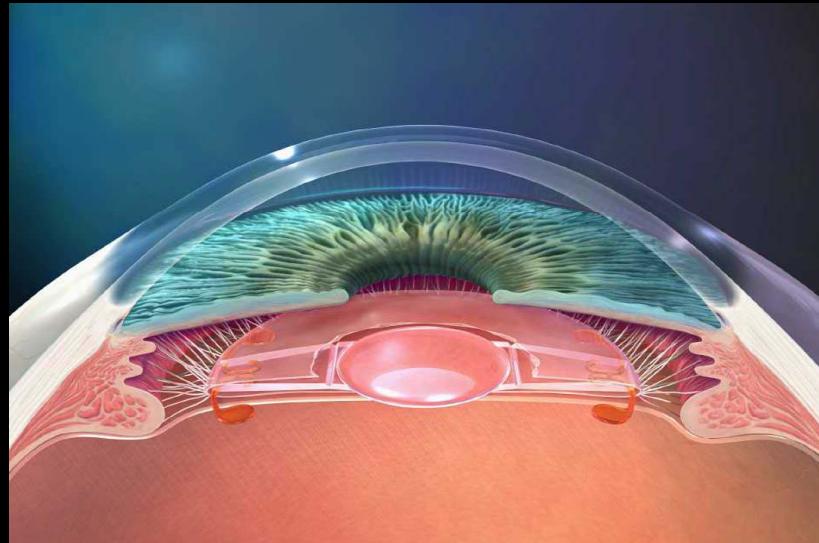


Modern Cataract Surgery so far :

- Predictable lens power
- Topical anaesthesia
- Day case
- Blocked UV light
- Blocked harmful blue light
- Decreased astigmatism

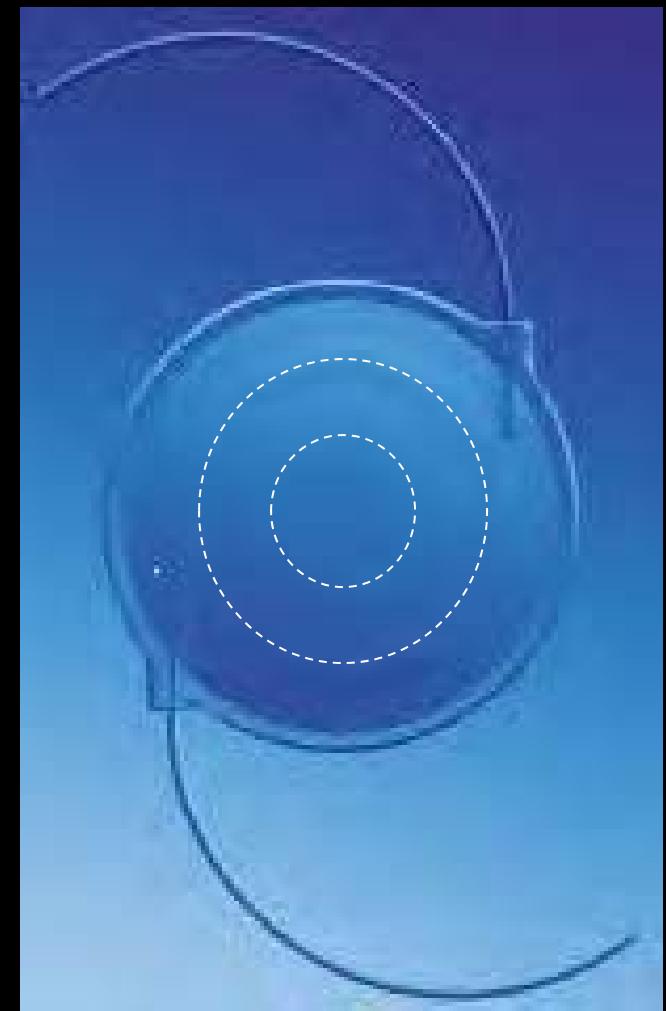
Still can't read without specs Doc !

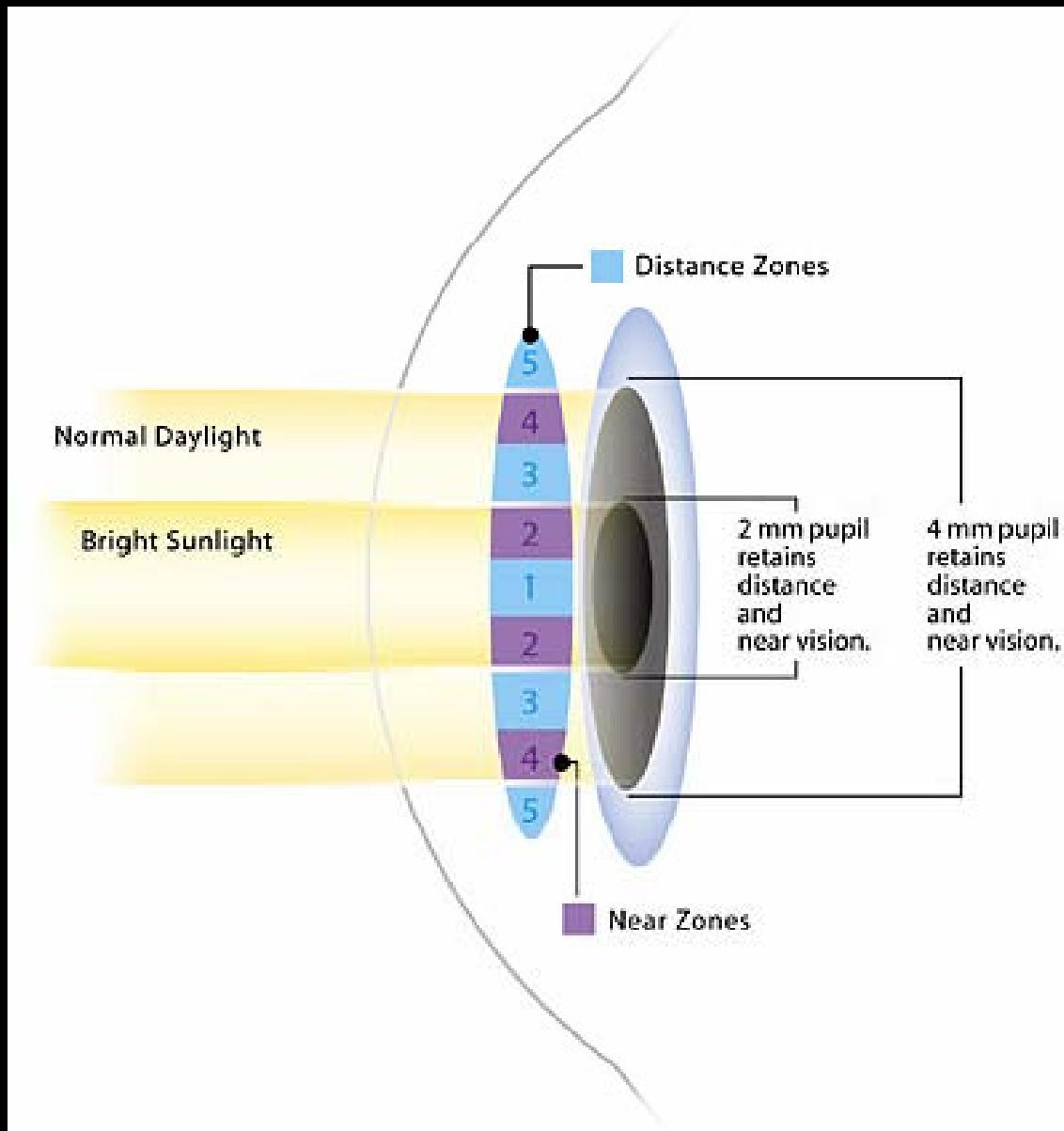
- Can we replace ability to accommodate for near and reverse presbyopia ?
- Many patients can actually read quite well with standard distant focus lens implants



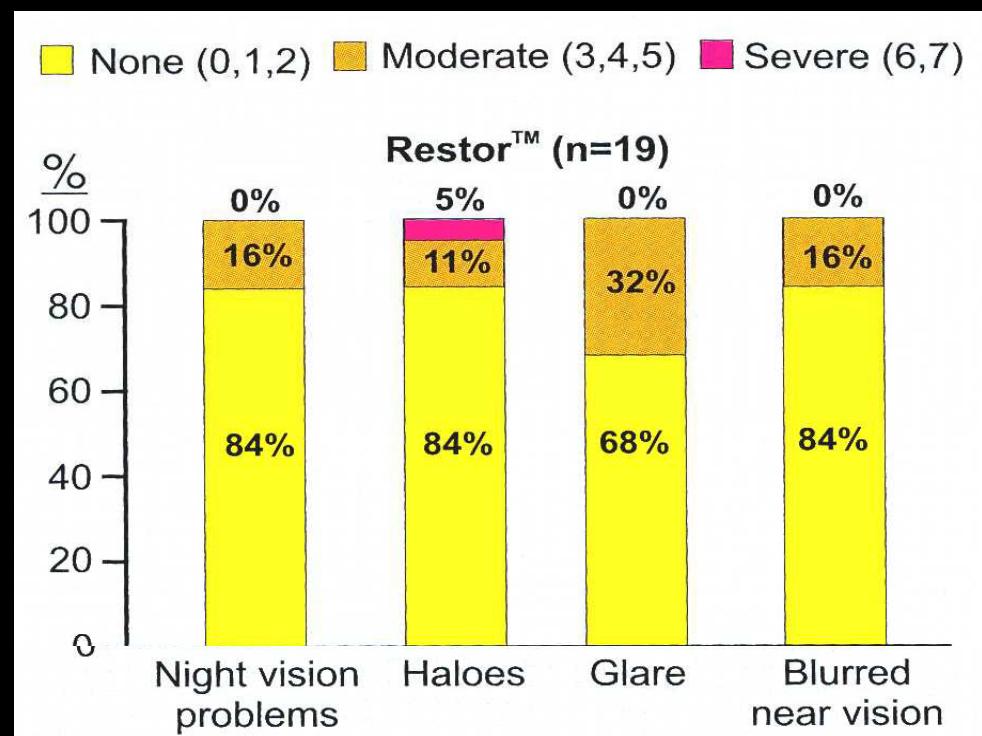
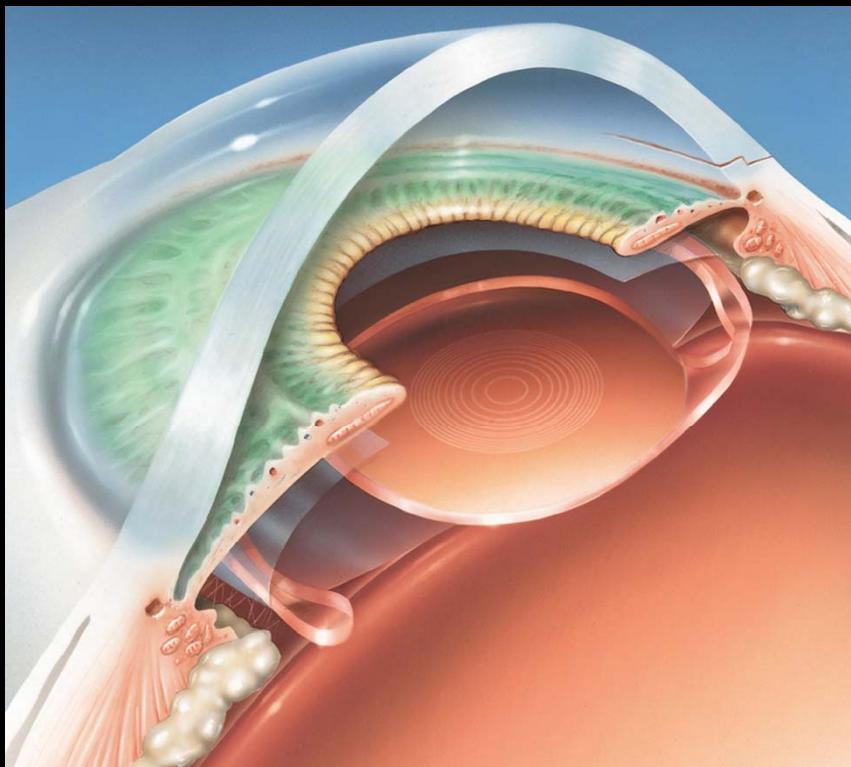
Multifocal Lenses

- Try and use different parts of lens to focus for near and distance
- Introduce optical problems
- Compromise both near and distant
- But – lenses improving

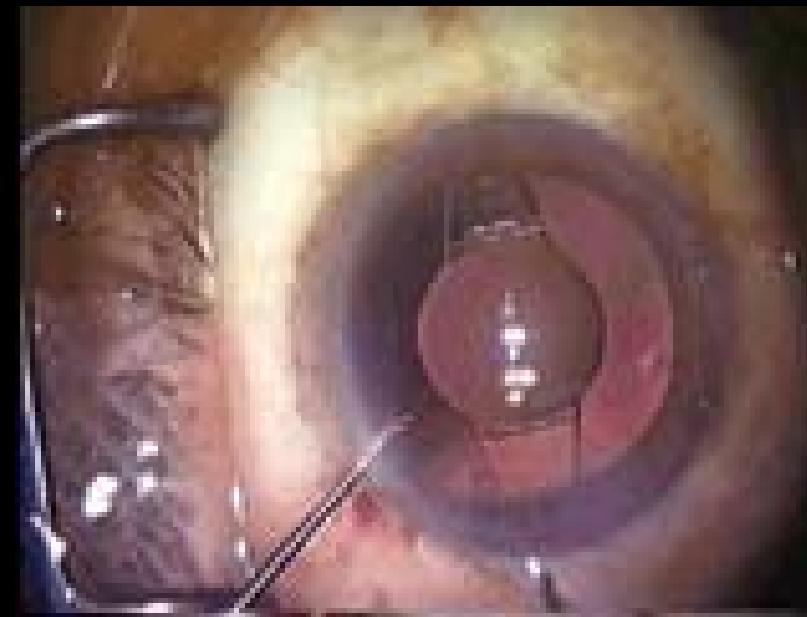
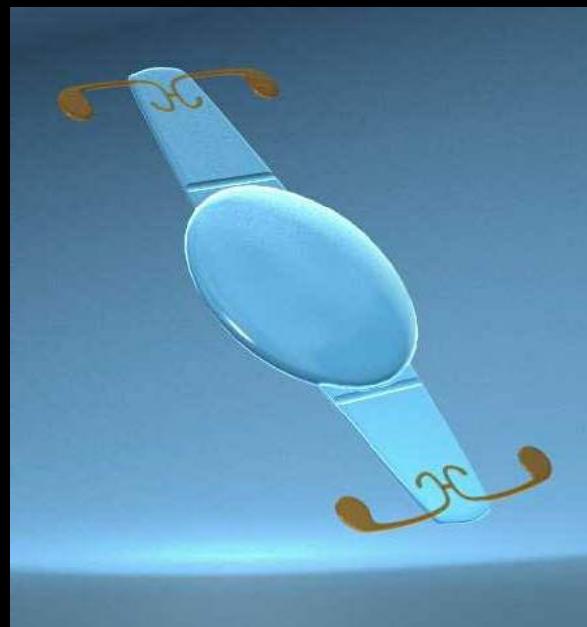
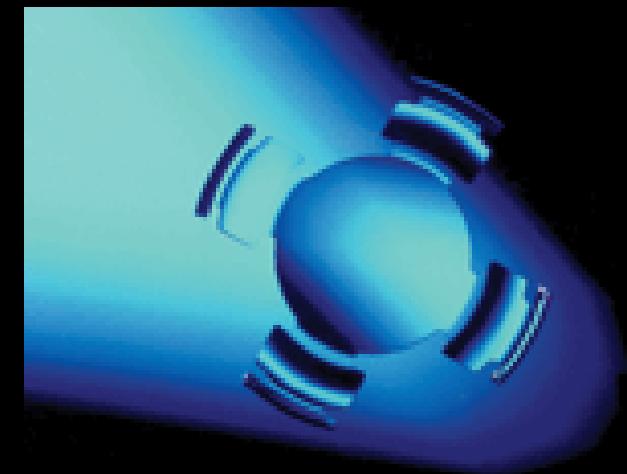




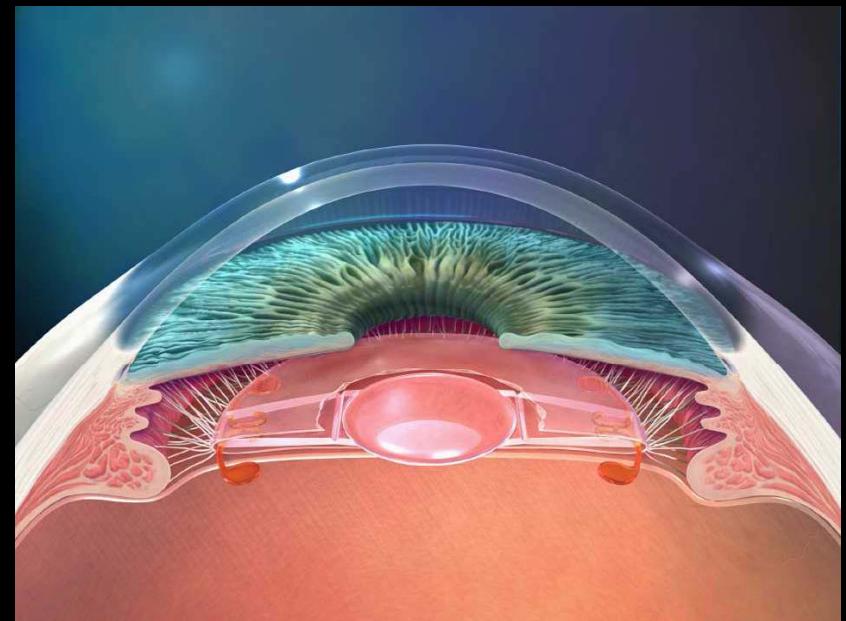
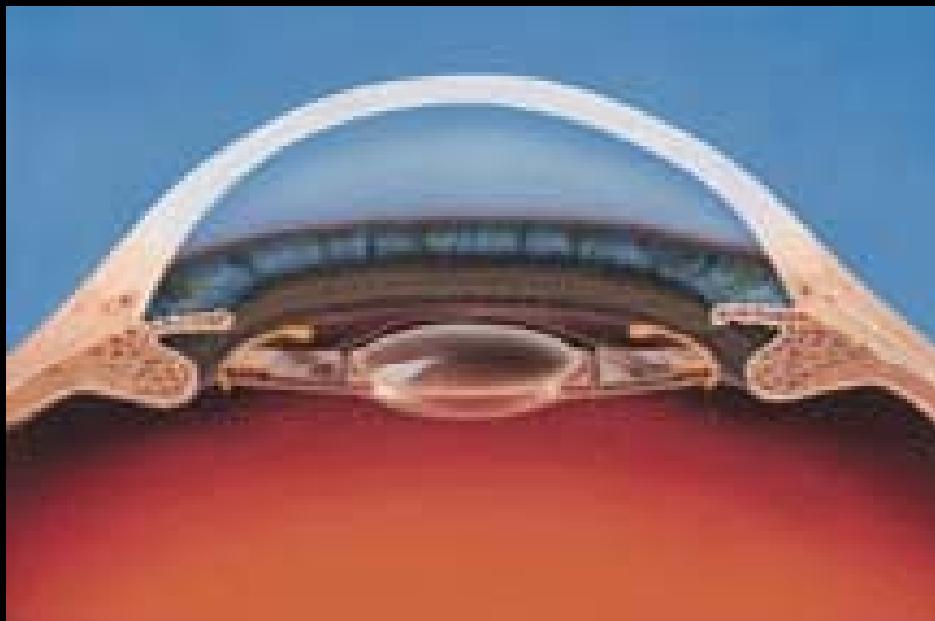
Alcon Restor - Multifocal



Accommodating IOL



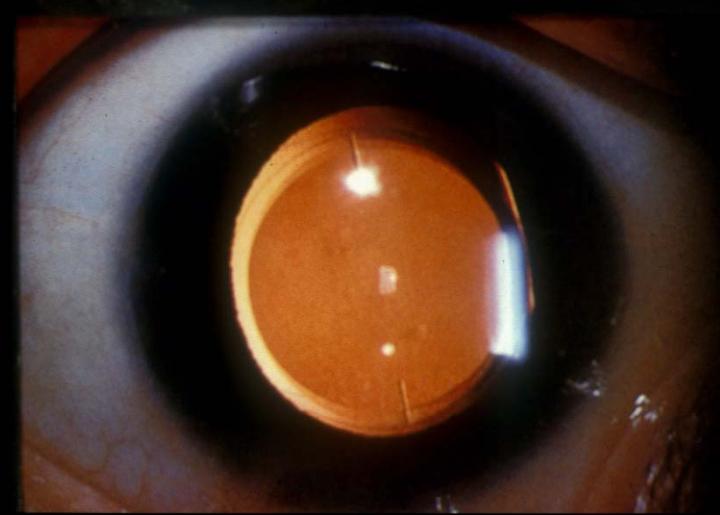
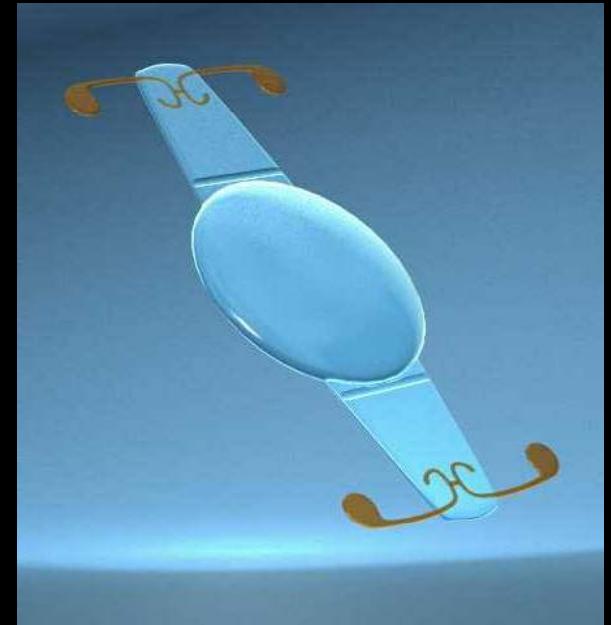
Increase effective power by anterior movement



Accommodating IOL

Problems :

- Post op fibrosis
- Minimal effect – 0.8 dioptre
- Posterior Capsule Opacity

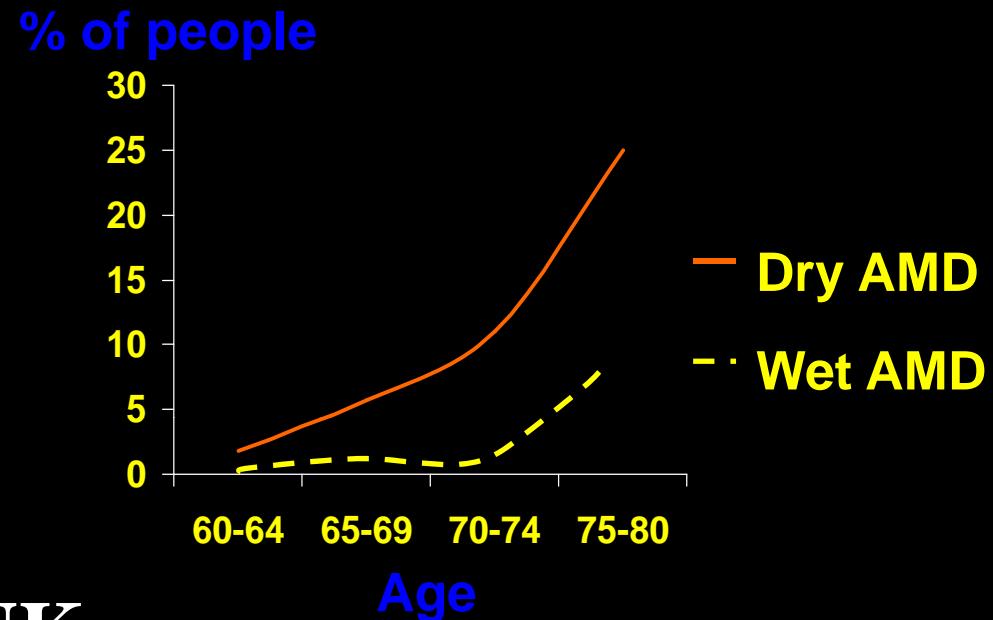


Age Related Macular Degeneration



AMD is the major cause of blindness in western world

Age and AMD



- 2021 – 20 million > 70 in UK
- 1/3 ARMD to some degree
- 1/3 of them will have wet form assoc. with severe visual loss

Impact of AMD on the Patient:

Low vision optical aids help improve vision for people with macular degeneration. Many different types of magnifying devices are available. Spectacles, hand or stand magnifiers, telescopes, and closed circuit television for viewing objects are some of the available resources. Aids are either prescribed by your ophthalmologist or by referral to a low vision specialist or center. Special lamps with brighter illumination are often beneficial. Books, newspapers, and other items available in large print offer further help.

- **Reading**
- **Recognizing faces**
- **Driving**
- **Severe visual loss**

eccentric fixation

Factors linked to AMD

Confirmed

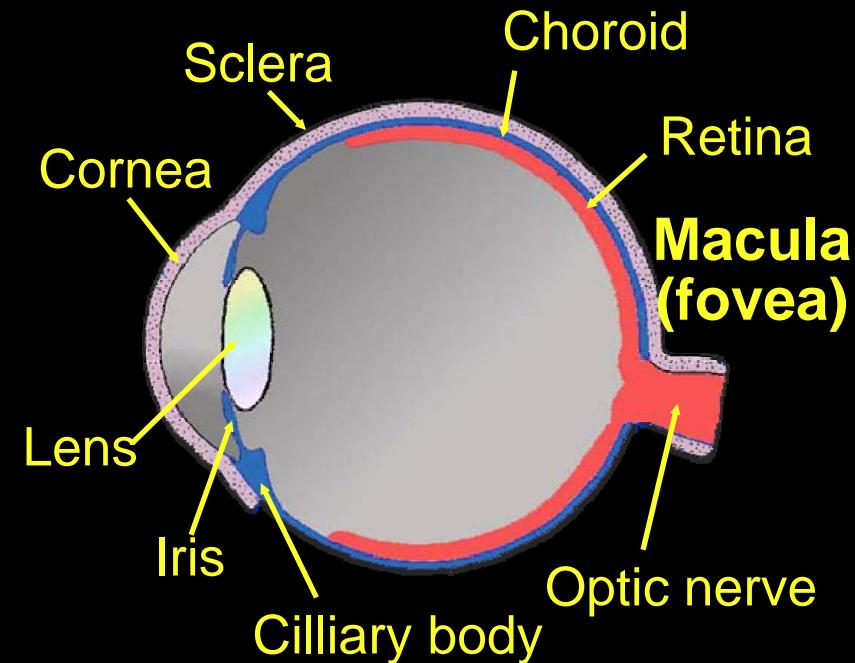
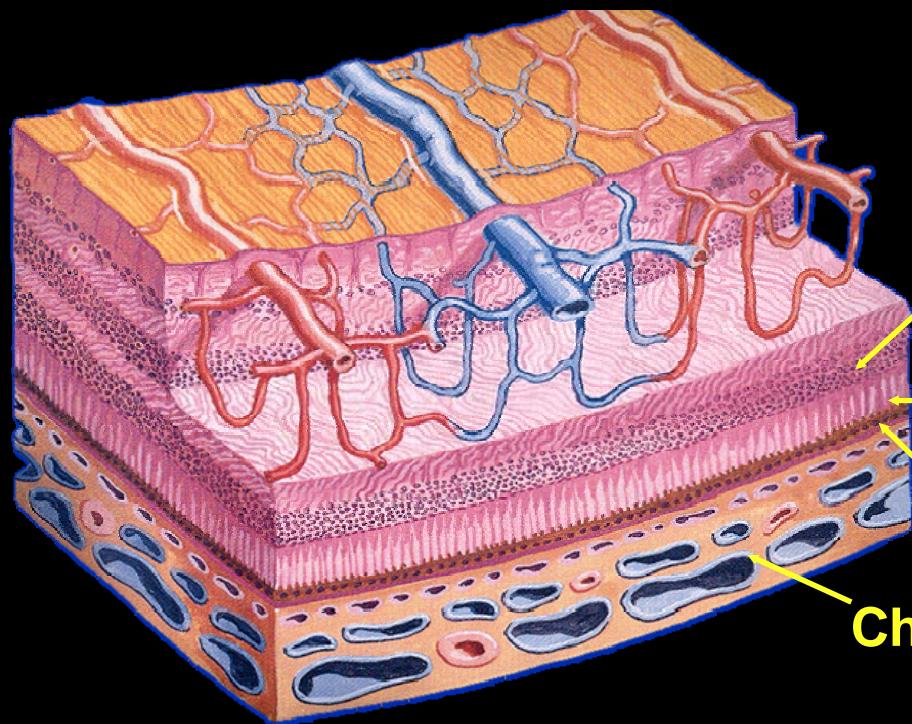
- Age
- AMD in one eye
- Nutrition
- Smoking

Under investigation

- Hypertension
- Cardiovascular disease
- Race
- Family history – complex

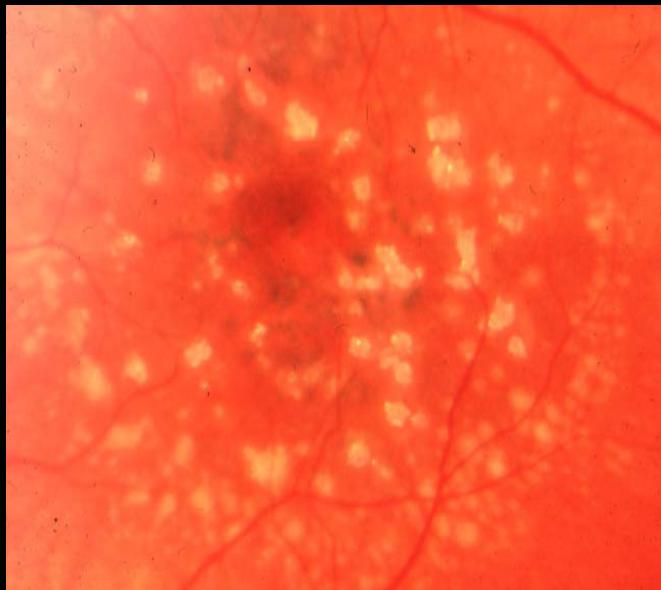


Anatomy of the eye and retina

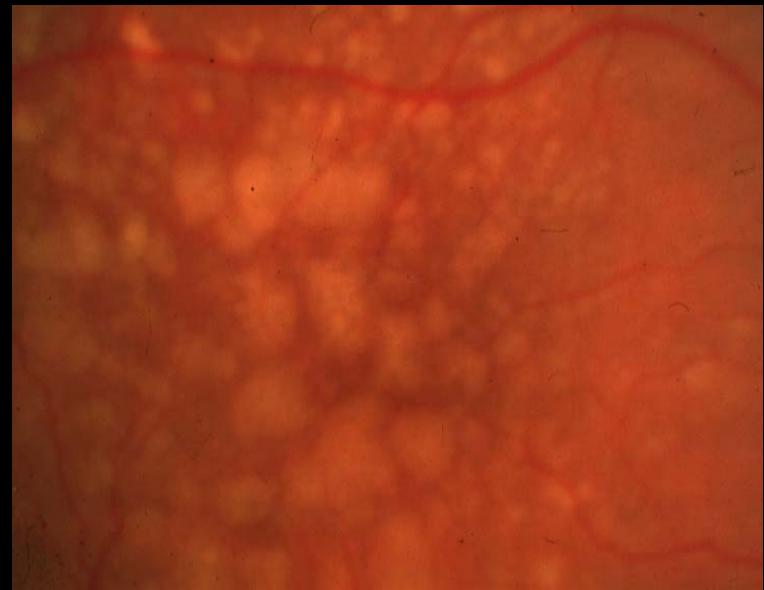


Ageing Retina - Drusen

Hard



Soft



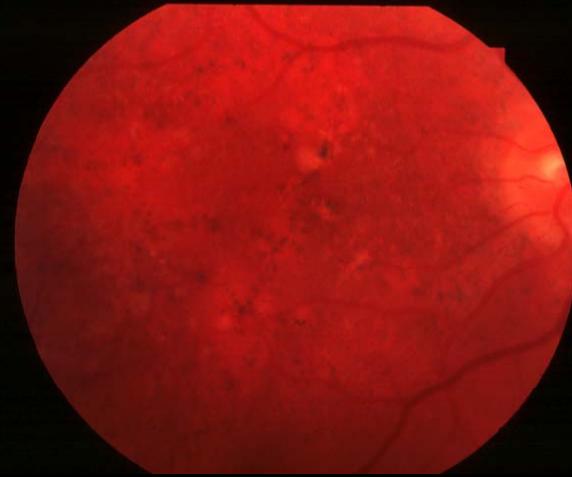
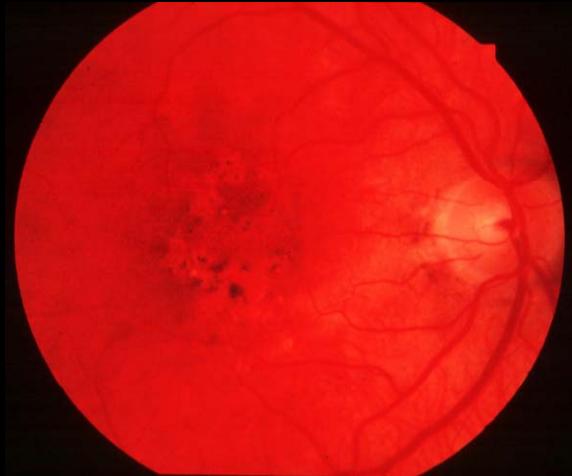
- Small well-defined spots
- Usually innocuous
- Larger, ill-defined spots
- May enlarge and coalesce
- Increased risk of AMD

Main forms of AMD

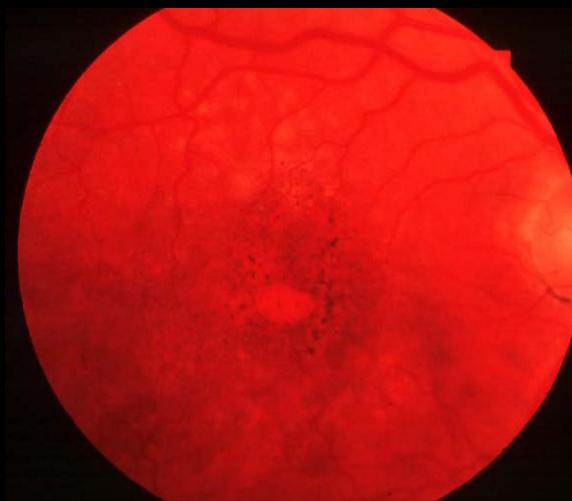
- **DRY - Non-neovascular AMD**
 - Drusen and atrophy of RPE
 - Slow deterioration
 - Untreatable
- **WET - Neovascular AMD**
 - New vessel from the choroidal layer
 - Rapid and severe drop in vision
 - Treatable



Dry or Atrophic AMD



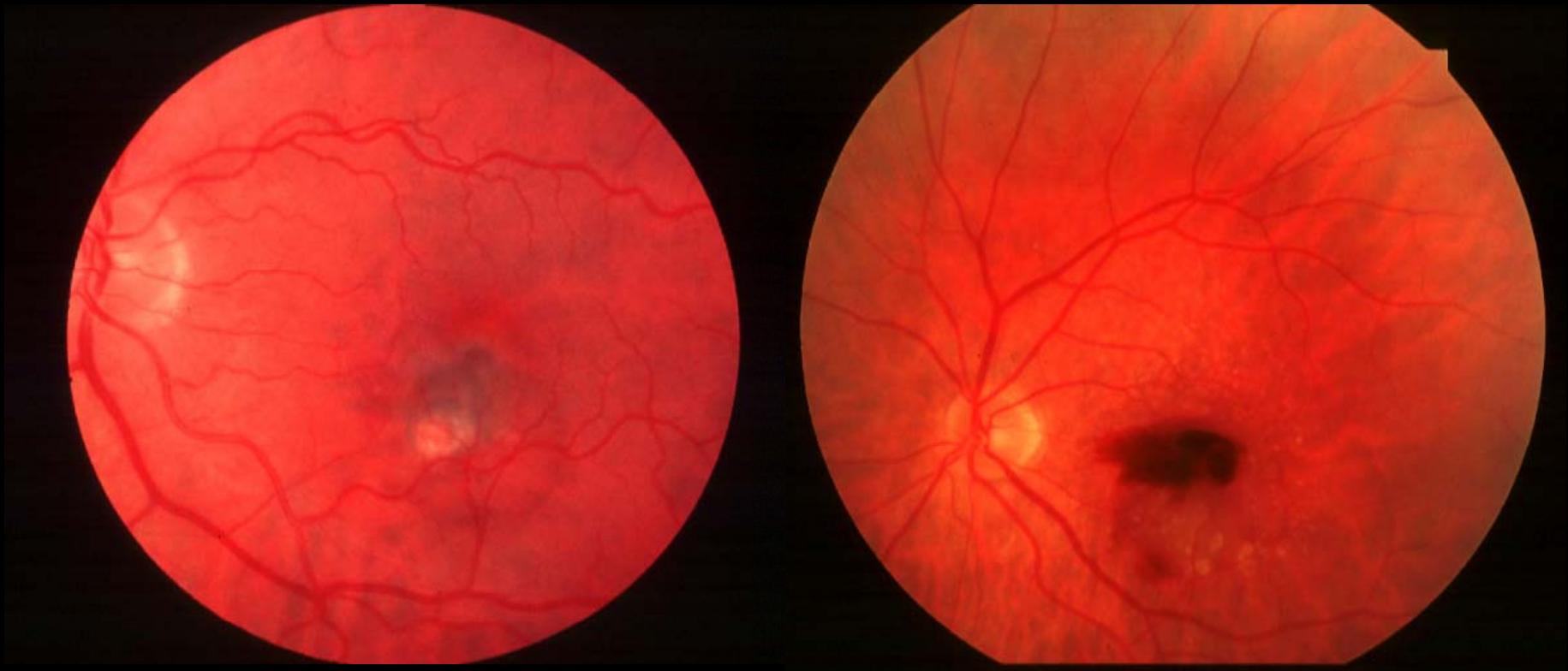
Initially drusen and non-specific RPE changes



Late RPE (geographic) atrophy

WET or Choroidal neovascularization (CNV)

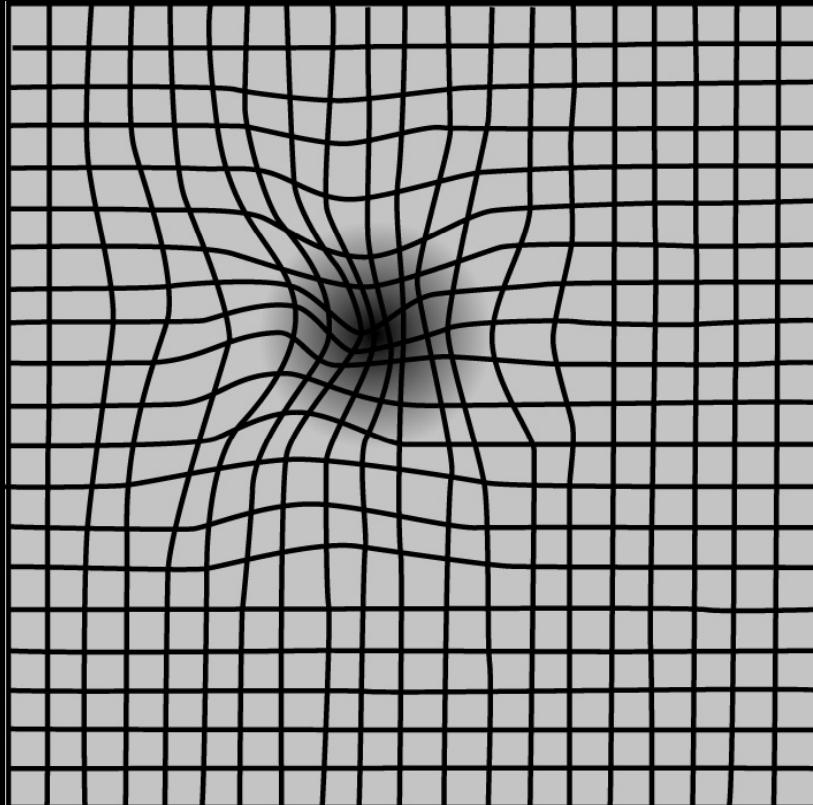
- Metamorphopsia is initial symptom
- Many lesions are not visible clinically



Pinkish-yellow subretinal lesion
with fluid

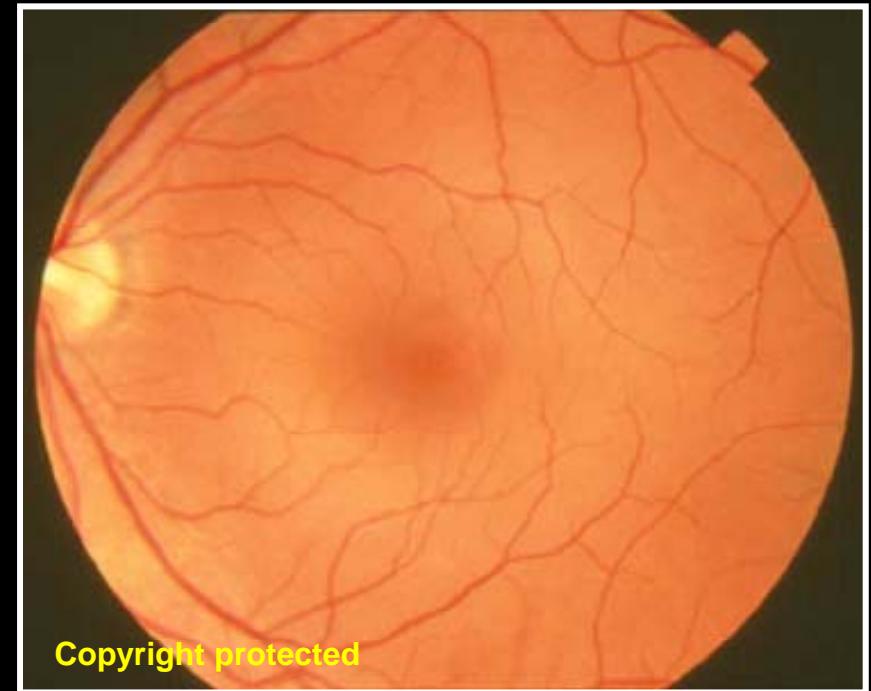
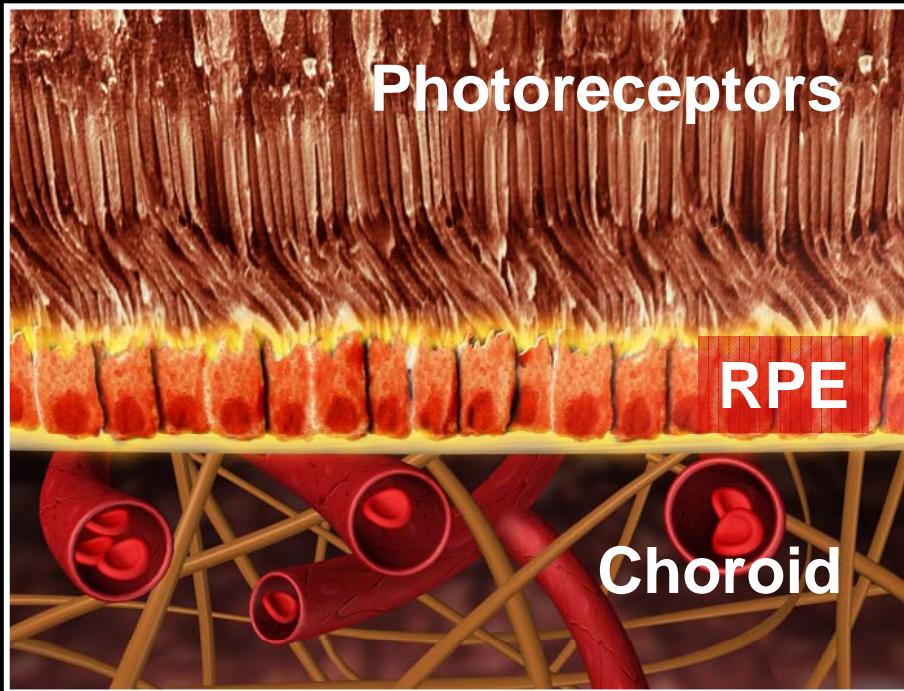
Subretinal blood or lipid

Diagnosis

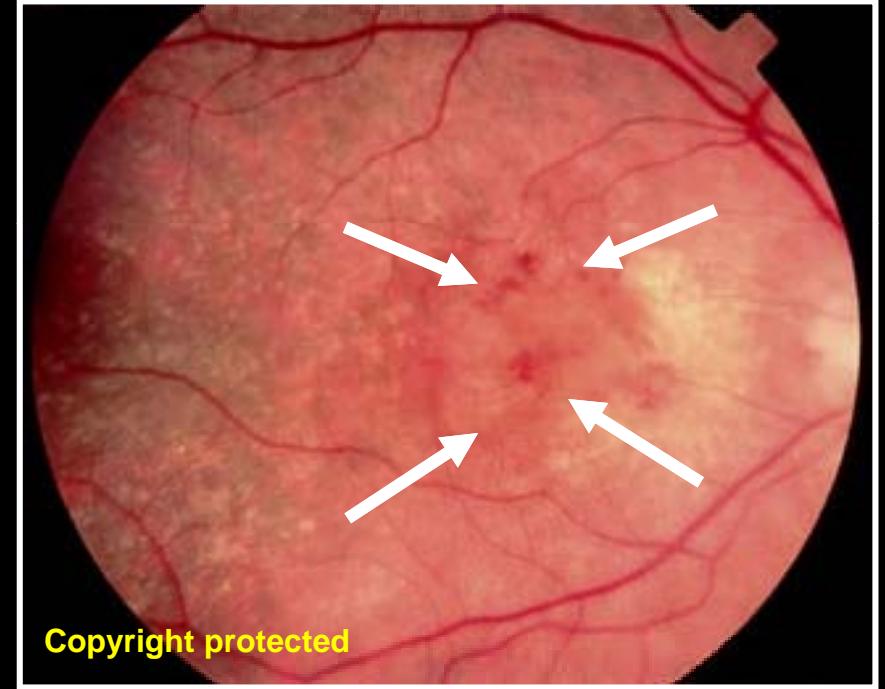
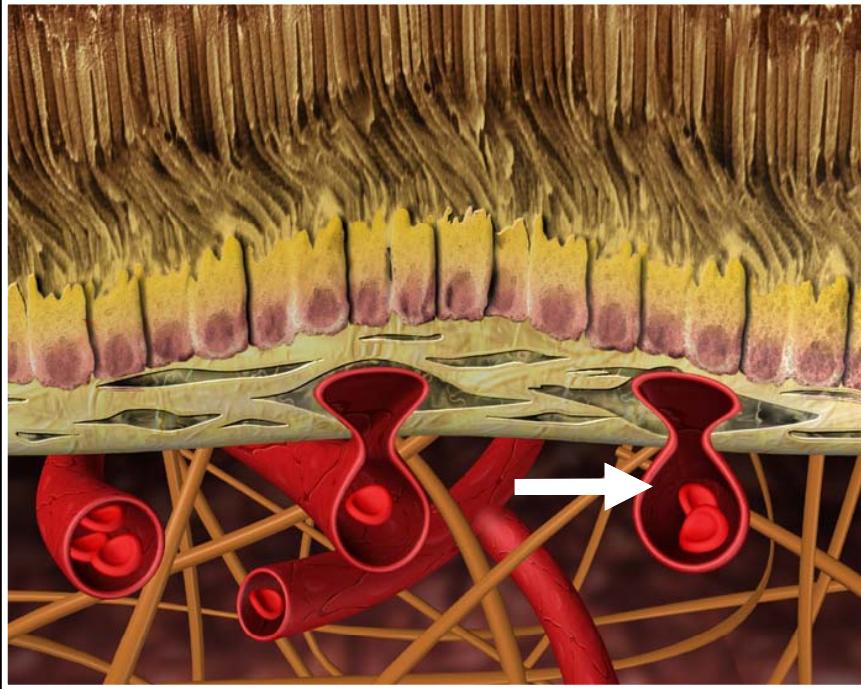


- Patient presentation
 - Visual acuity tests
 - Distortion = urgent referral
- Fundoscopy

Progression of Neovascular AMD: Normal Retina

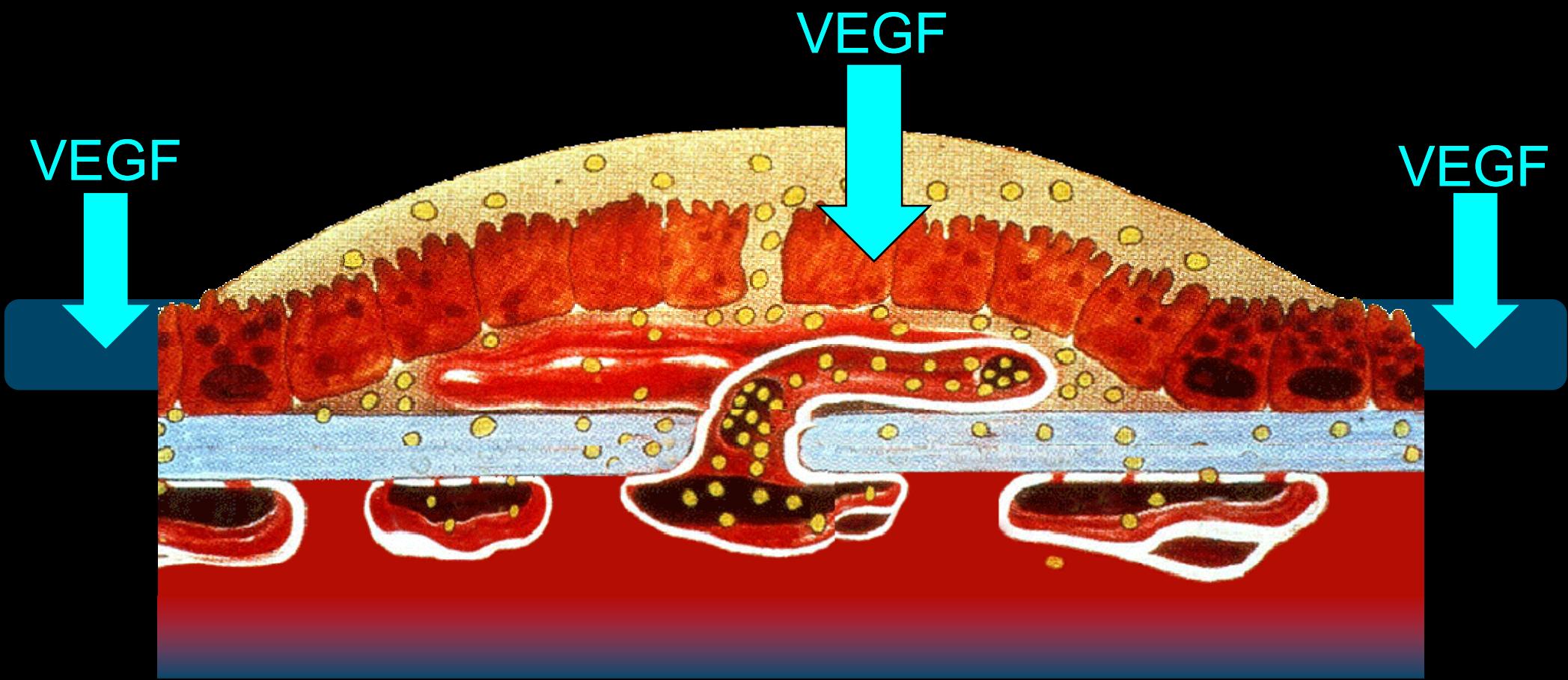


Progression of Neovascular AMD: Formation of New Vessels

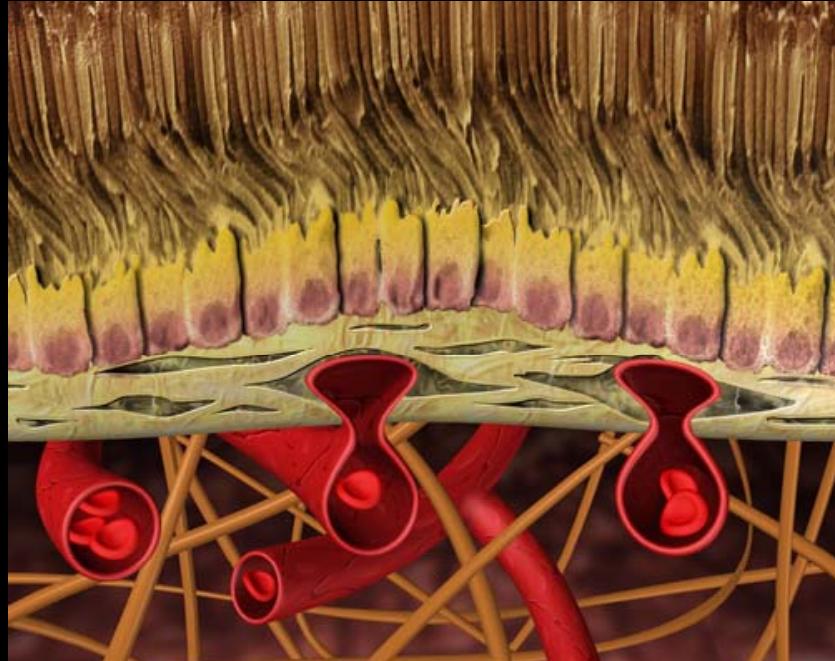


New abnormal blood vessels proliferate
and penetrate Bruch's membrane

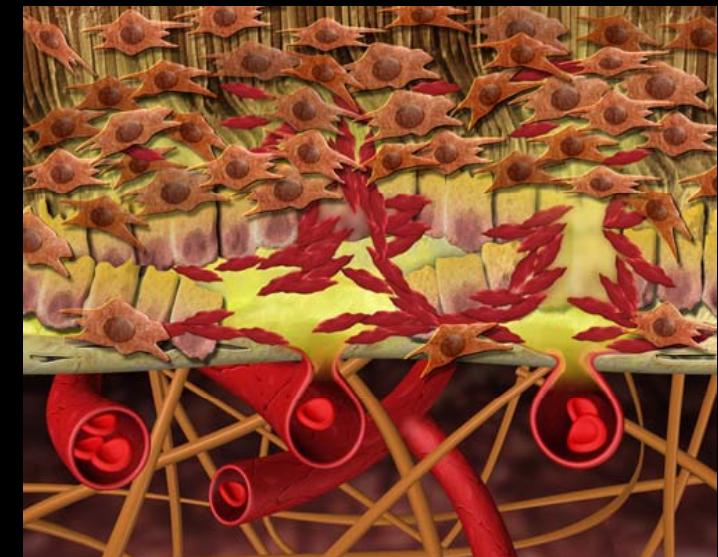
Vascular Endothelial Growth Factor



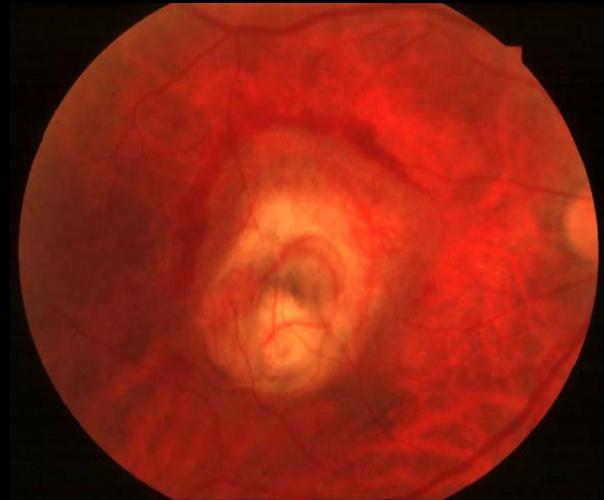
New vessels penetrate
Bruch's membrane



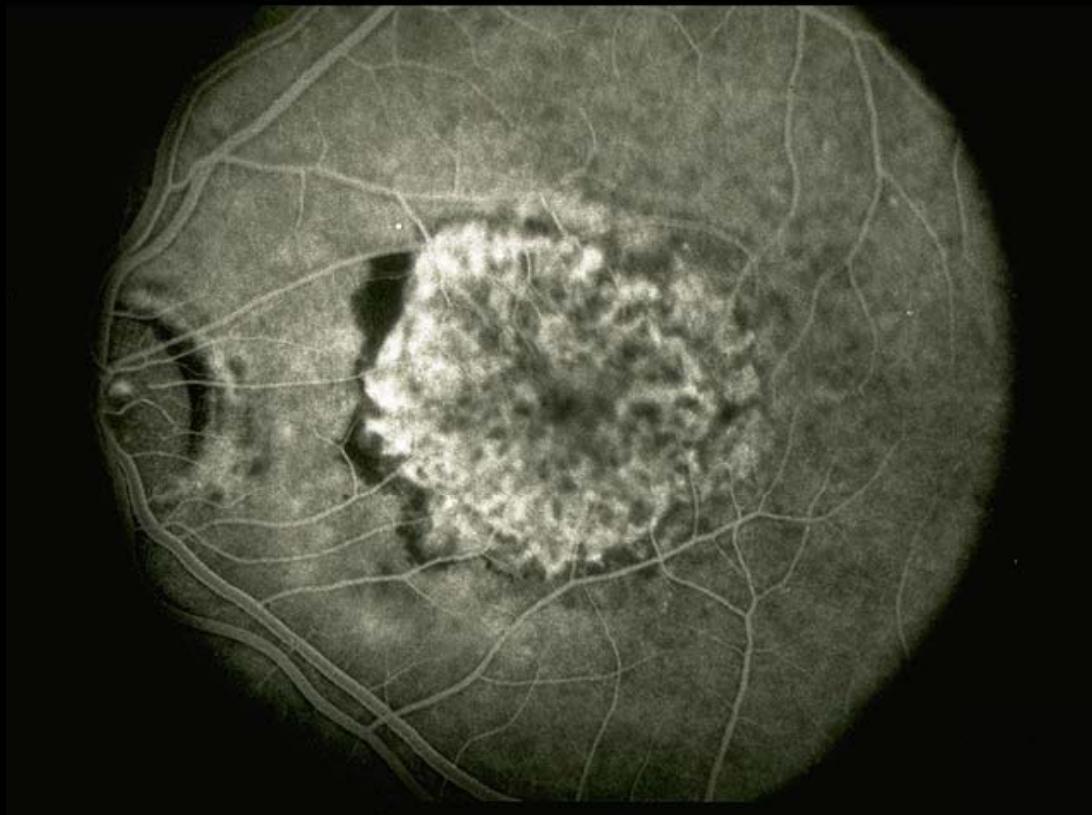
Disciform scar



Possible subsequent course of CNV

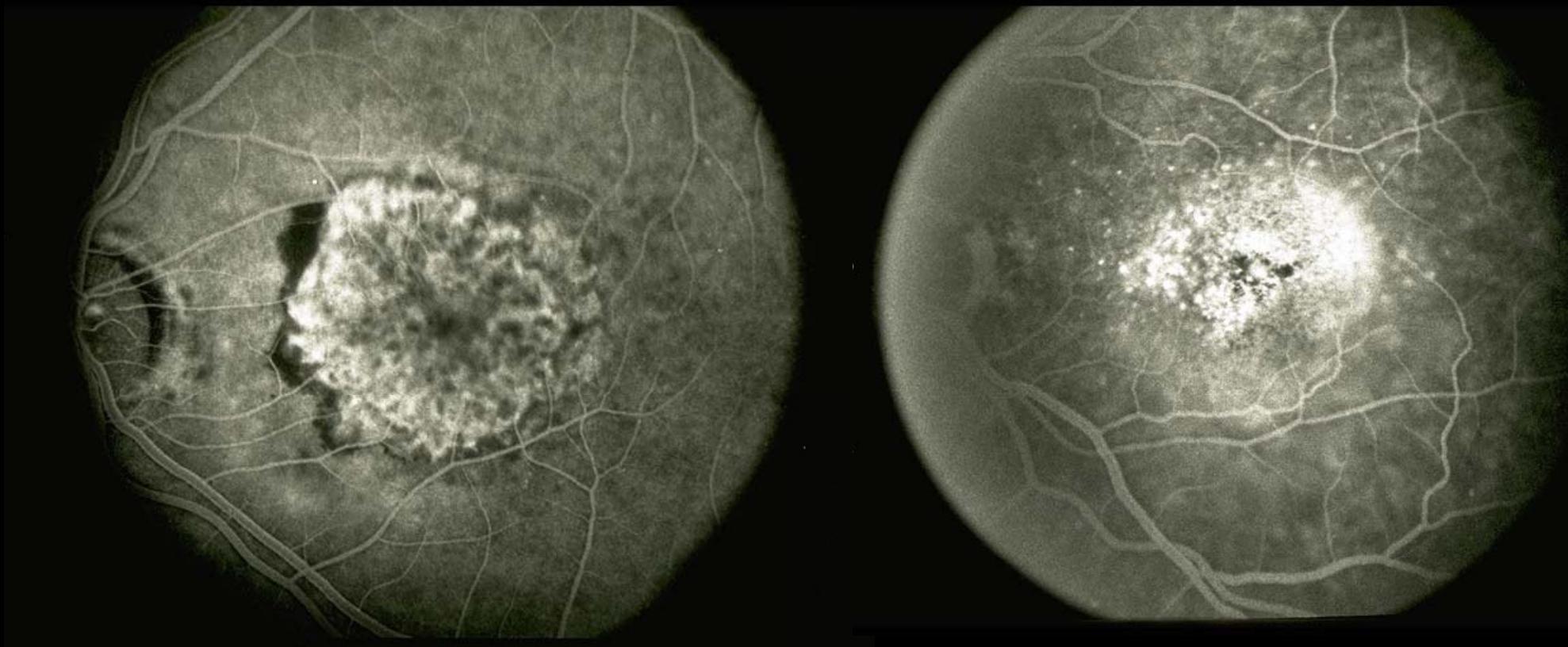


Fluorescein Angiography



**Bright area of
fluorescence from
abnormal leaking
vessels**

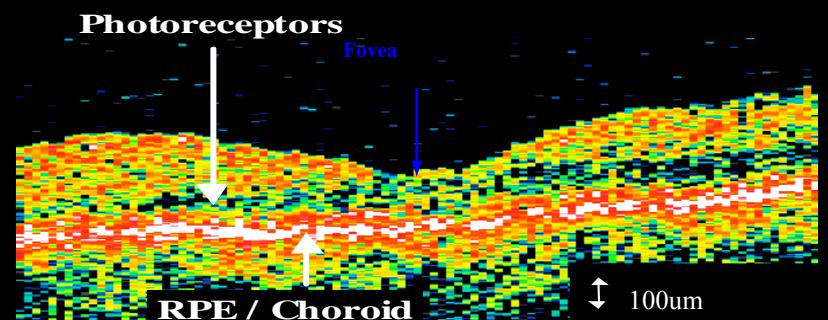
Classic or occult CNV



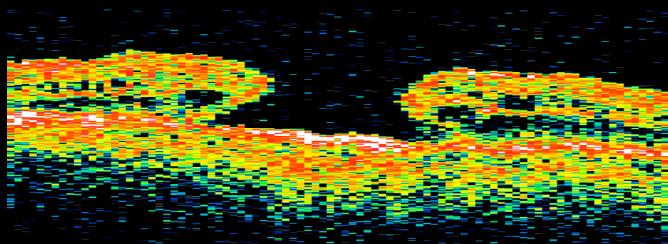
Optical Coherence Tomography (OCT)



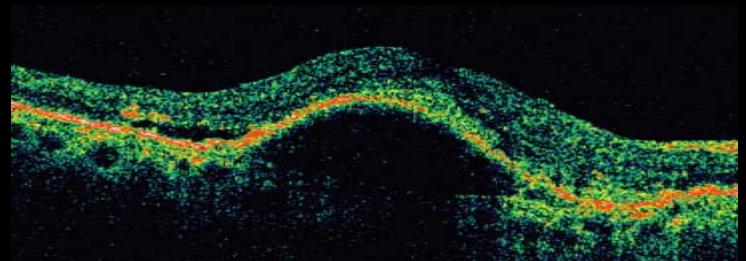
OCT of normal macula



OCT of stage 4 macular hole
(vision 6/60)



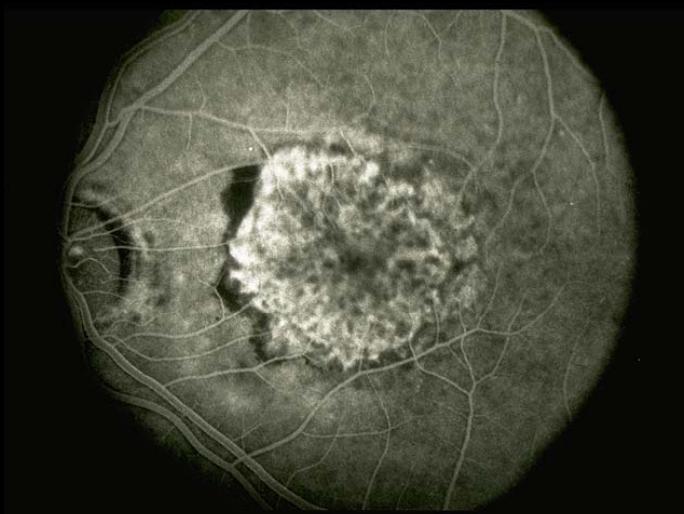
OCT of Wet ARMD



Current treatments for ARMD



- Dietary Supplements
- Laser photocoagulation
- Photodynamic therapy
- Steroid Injection
- Retinal Surgery
- Anti Growth Factor
Injections



Dietary Supplements

- Large study USA (AREDS) - published 2001
- 5000 patients 5 yr follow up
- High dose antioxidants and vitamin supplementation
Vit E, Vit C
- Selenium, Zinc, *b* Carotene
- Current trials –
lutein and omega 3



Trial Preparation

Vitamin C	500mg
Vitamin E	400 IU
Beta Carotene	15mg
Selenium	50ug
Zinc	80 mg

Best product – Viteyes, Ocuvite preservision

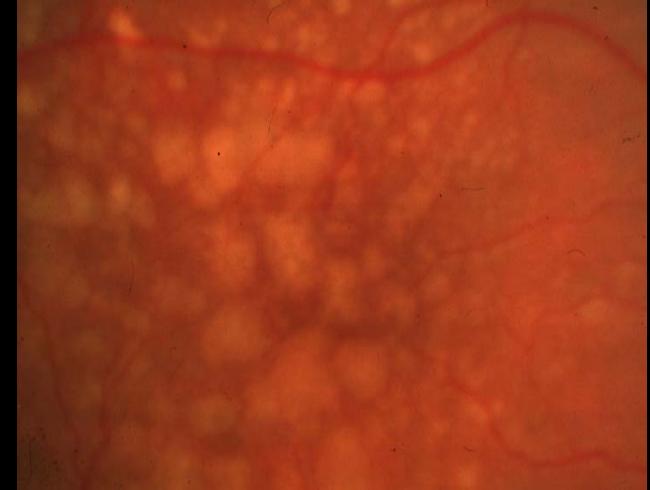
Smokers version – No beta carotene

Increasing evidence for Lutein

www.tanner-eyes.co.uk

Results of AREDS trial
Risk of visual loss from ARMD in
patients with high risk characteristics

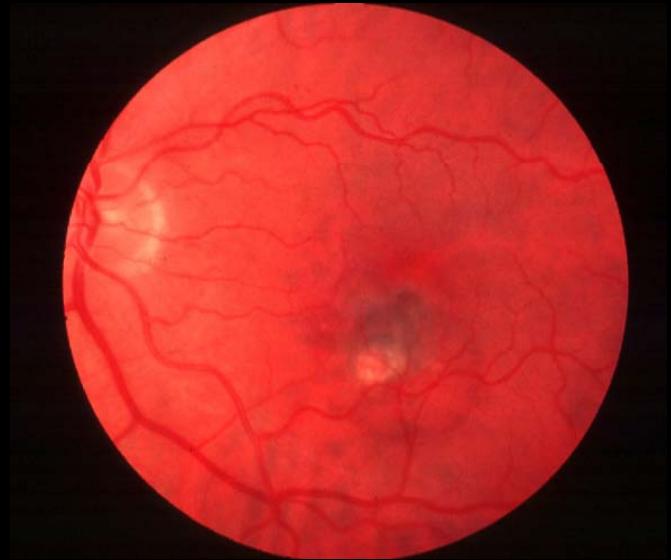
Targeted use supplements



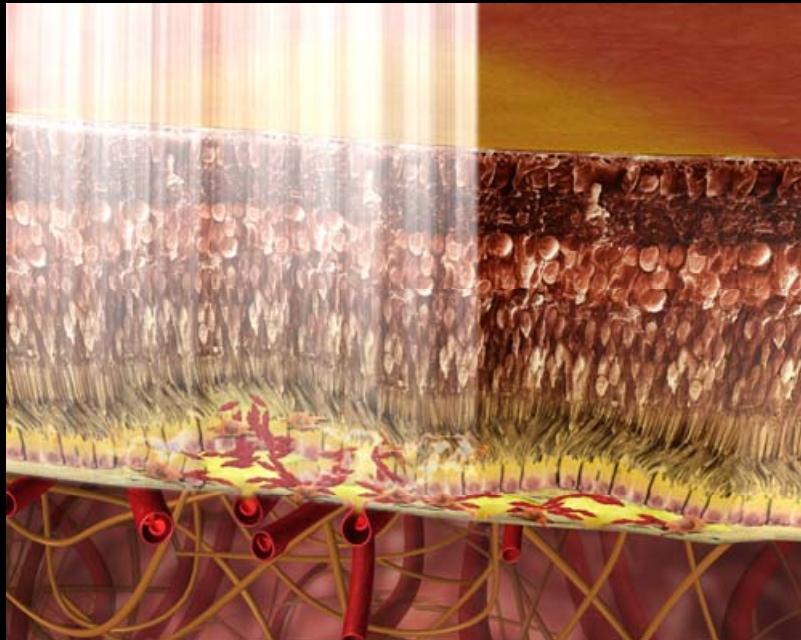
- Visual loss from ARMD in one eye
- Bilateral soft drusen
- In these high risk groups 25% reduction in severe visual loss
- Not all those with early ARMD

Downside of supplements

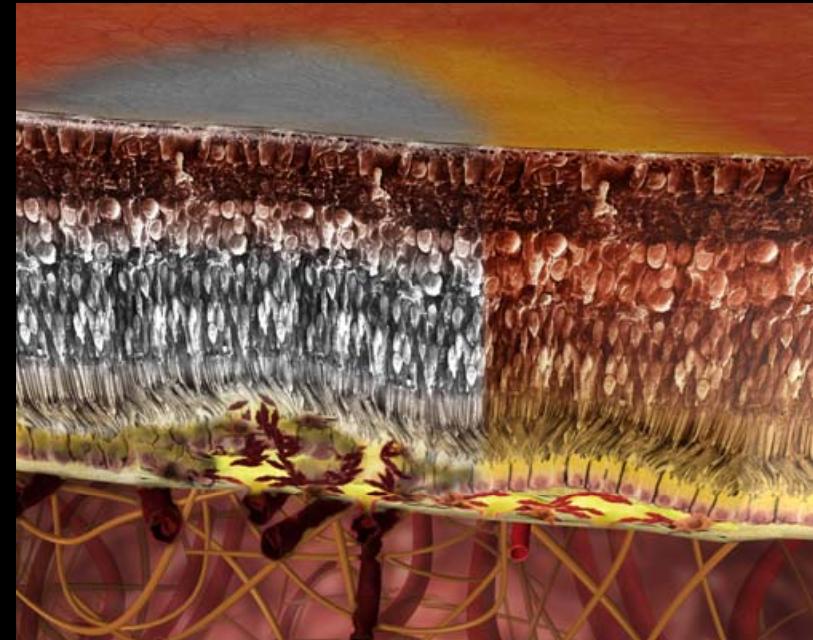
- Cost £10 per month
- Skin tint - mild
- Gastric upset
- *B* Carotene and smoking



Argon laser photocoagulation

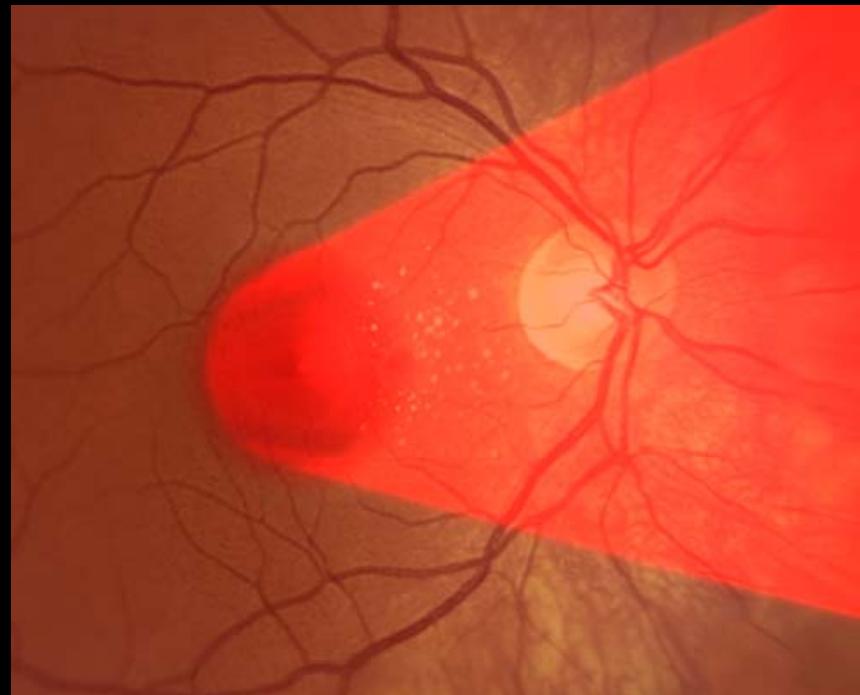


Laser beam aimed
at CNV



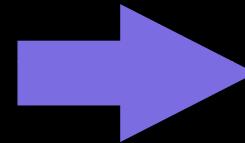
Damage caused to RPE and
photoreceptors

Photodynamic therapy with verteporfin

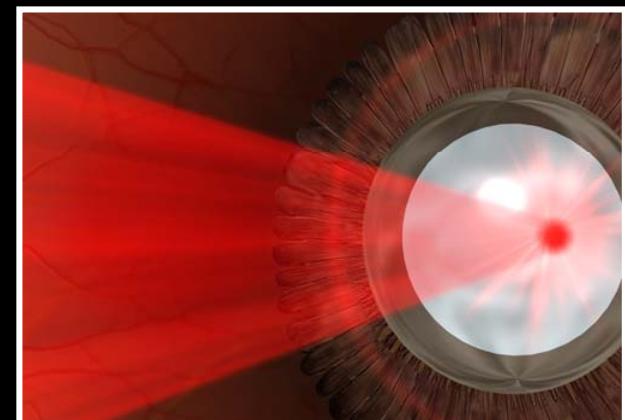
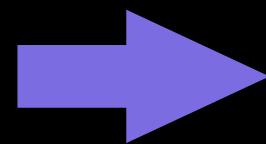
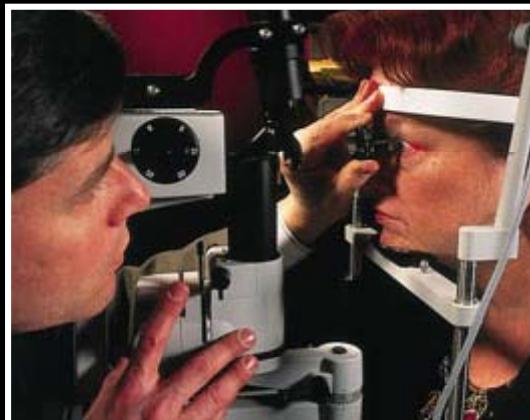


Photodynamic Therapy

Step 1

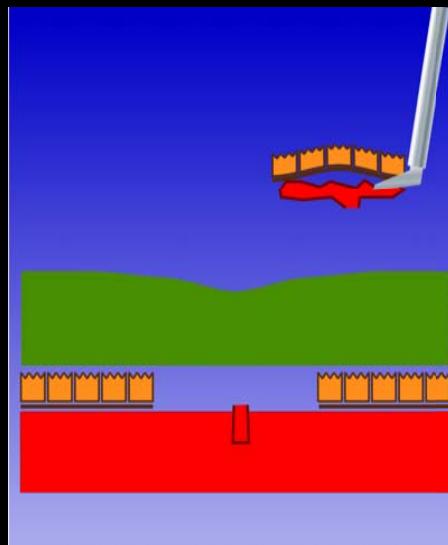
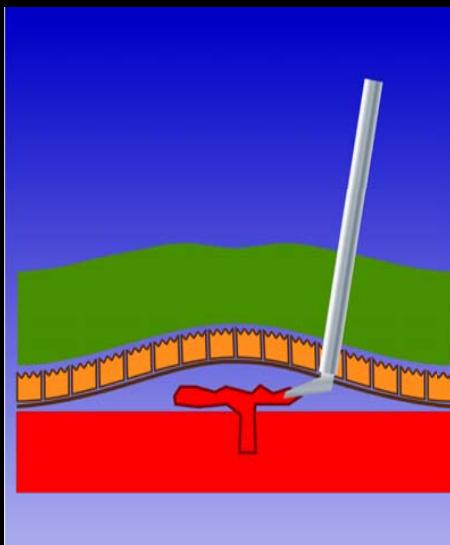


Step 2

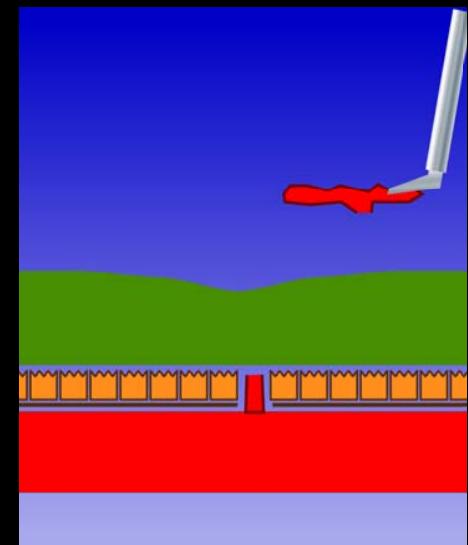
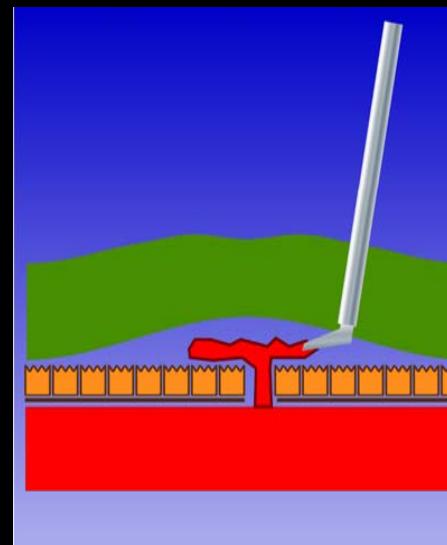


Surgical removal of sub-foveal CNV

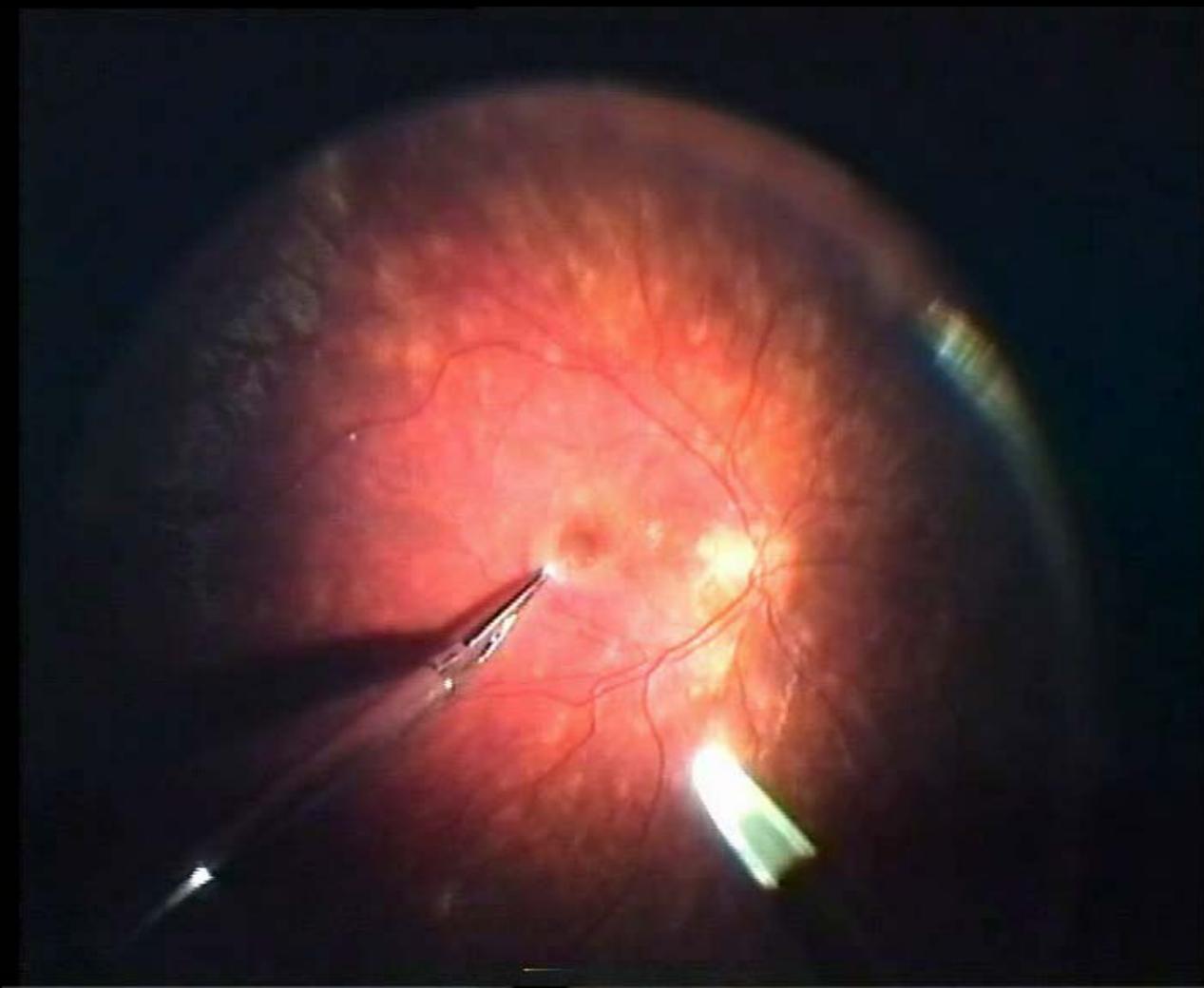
Wet ARMD



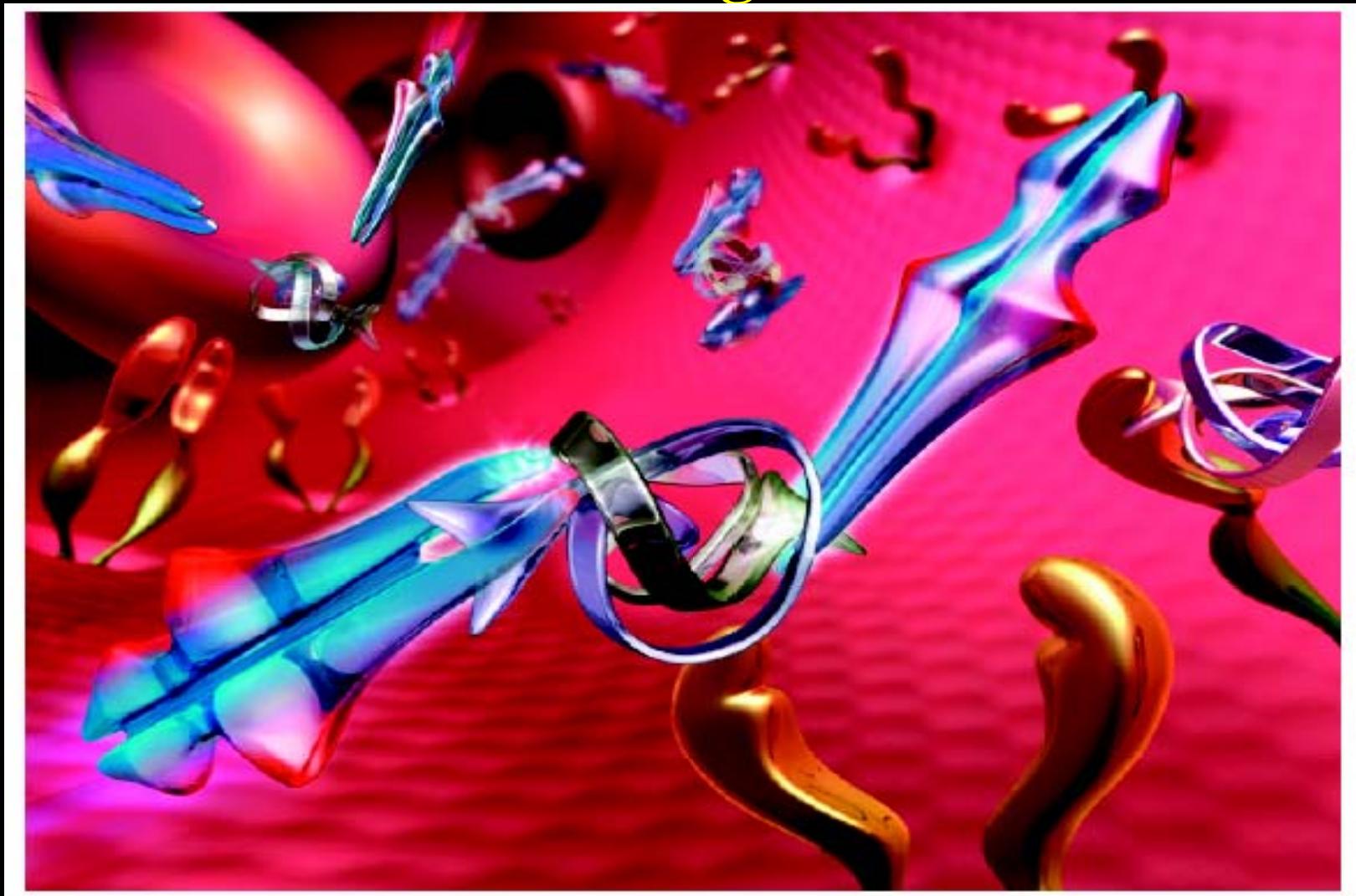
Type 2 - Chorioretinitis



Removal of SRNVM

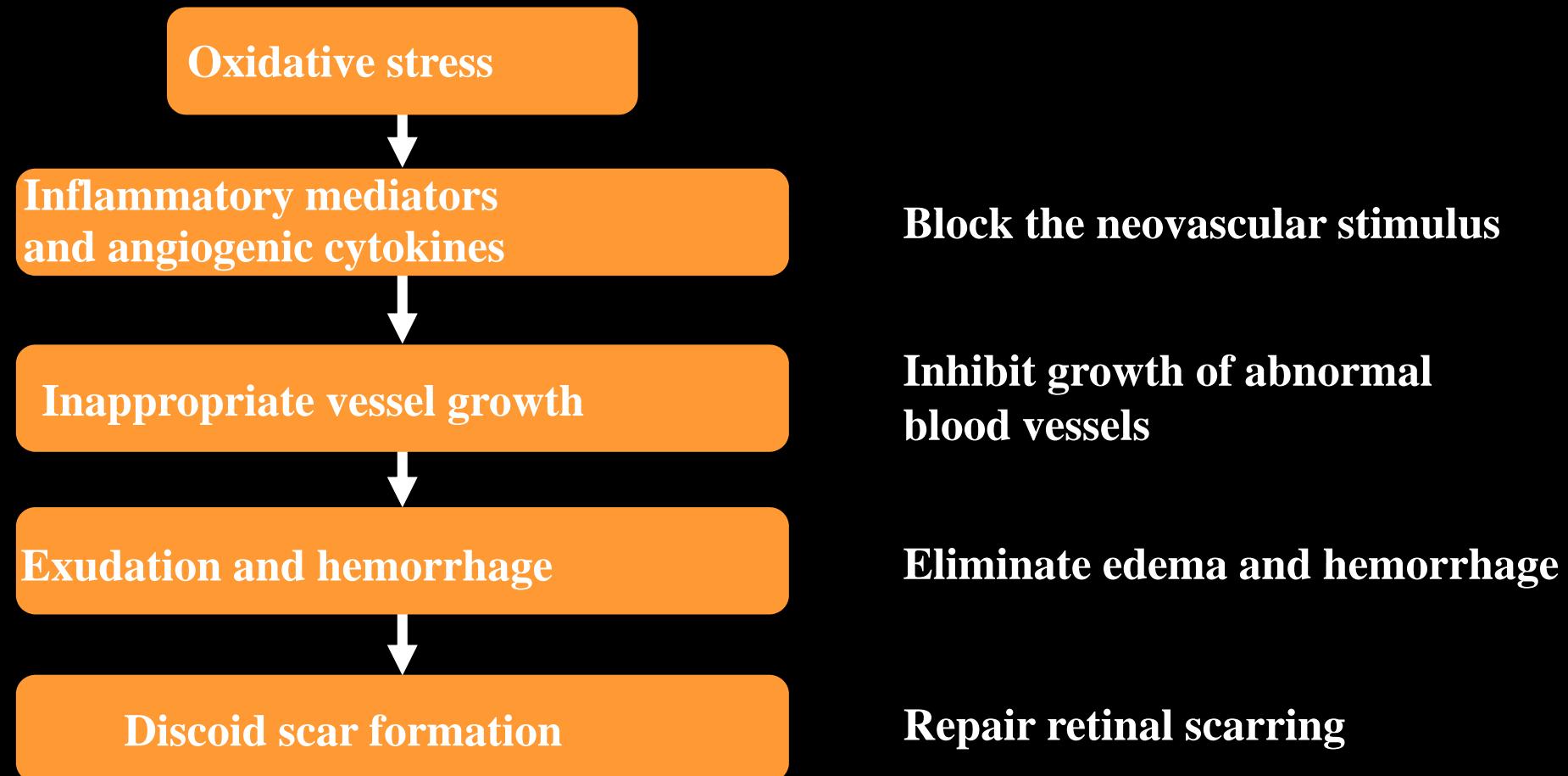


Lucentis (ranibizumab) Antibody Therapy
- binds VEGF Interior of blood vessel showing
Lucentis binding to VEGF-A

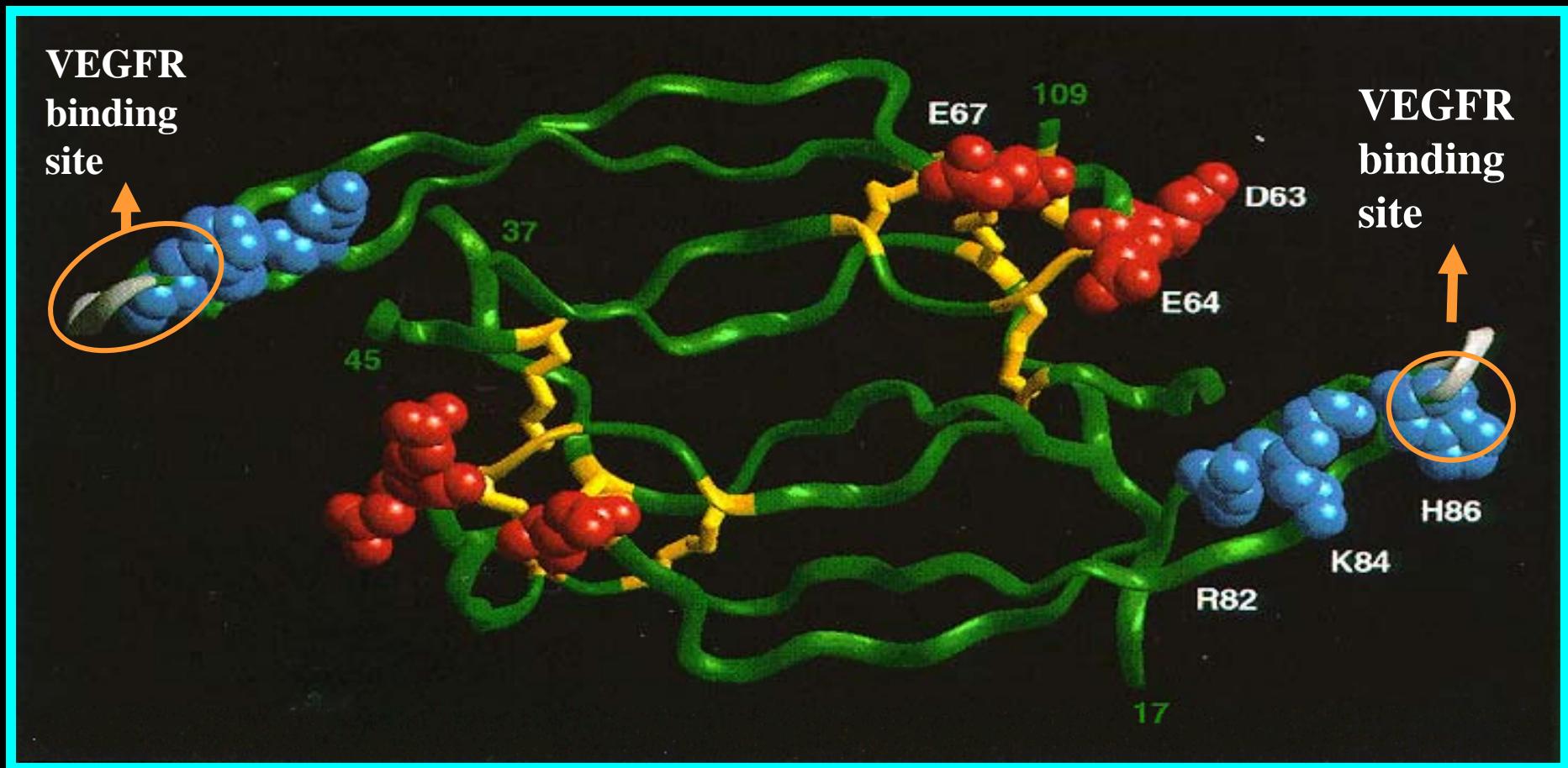


Wet ARMD

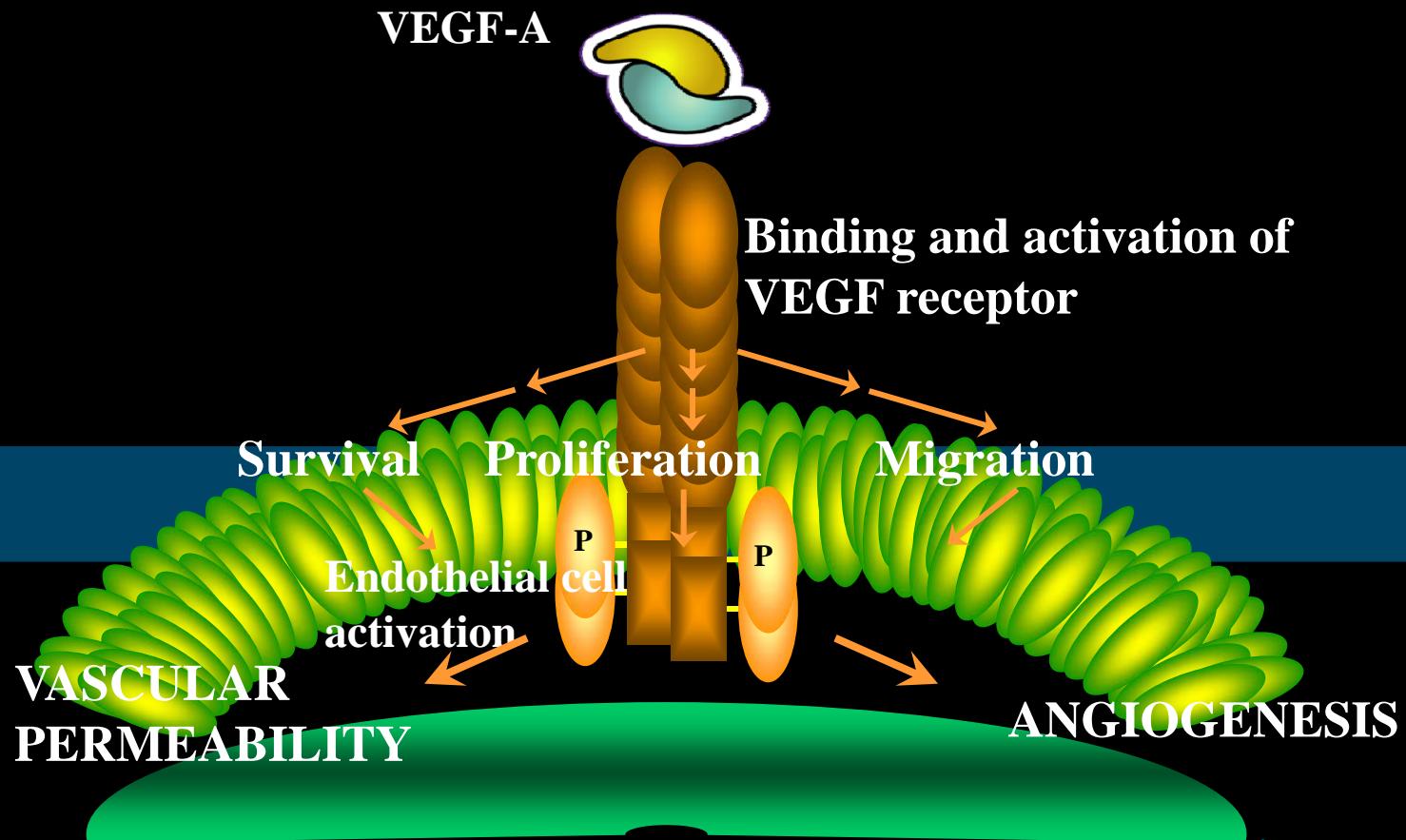
Choroidal neovascularisation



VEGF-A binds to dimeric VEGF receptors



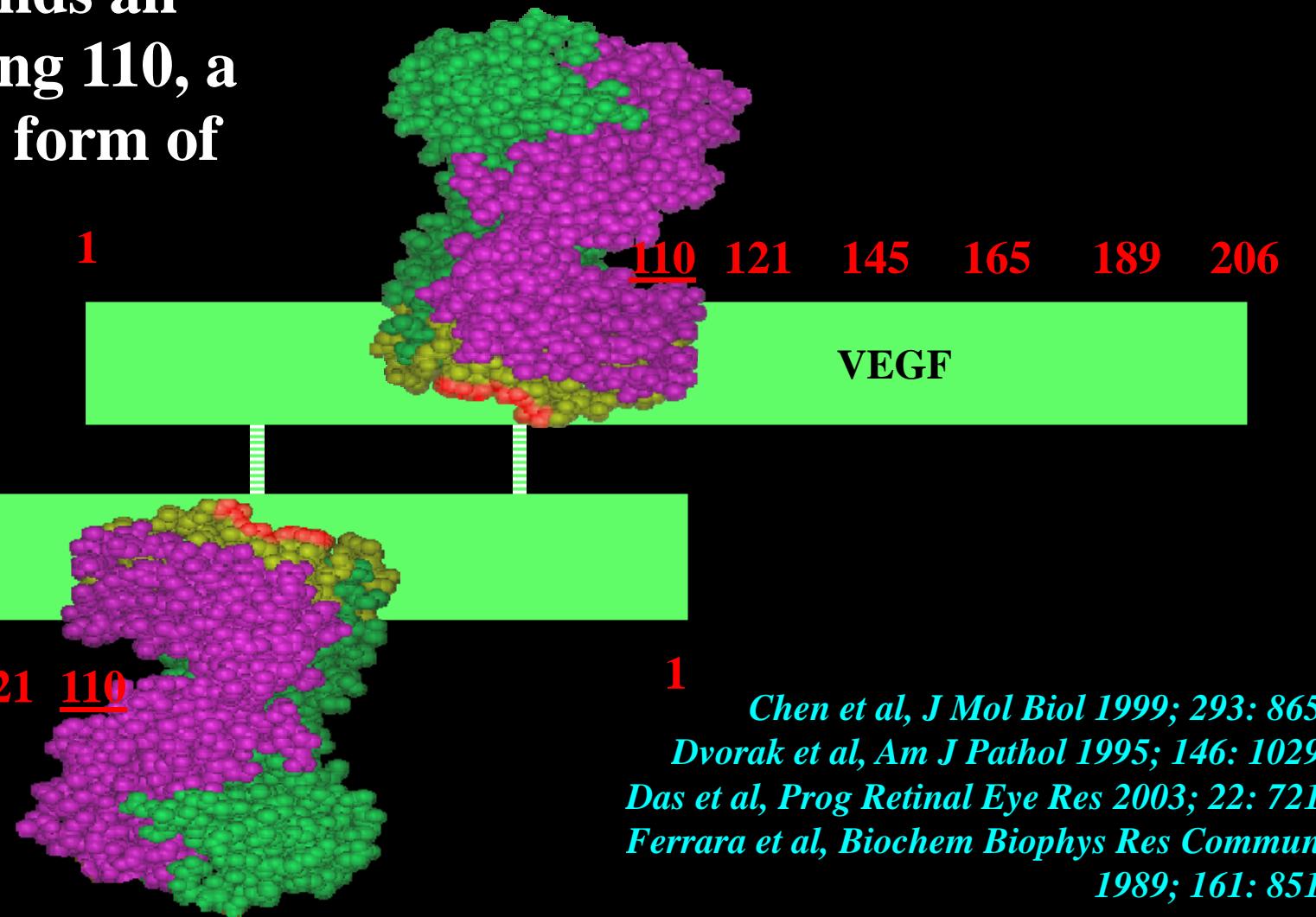
VEGF-A: Key mediator of angiogenesis and vascular permeability



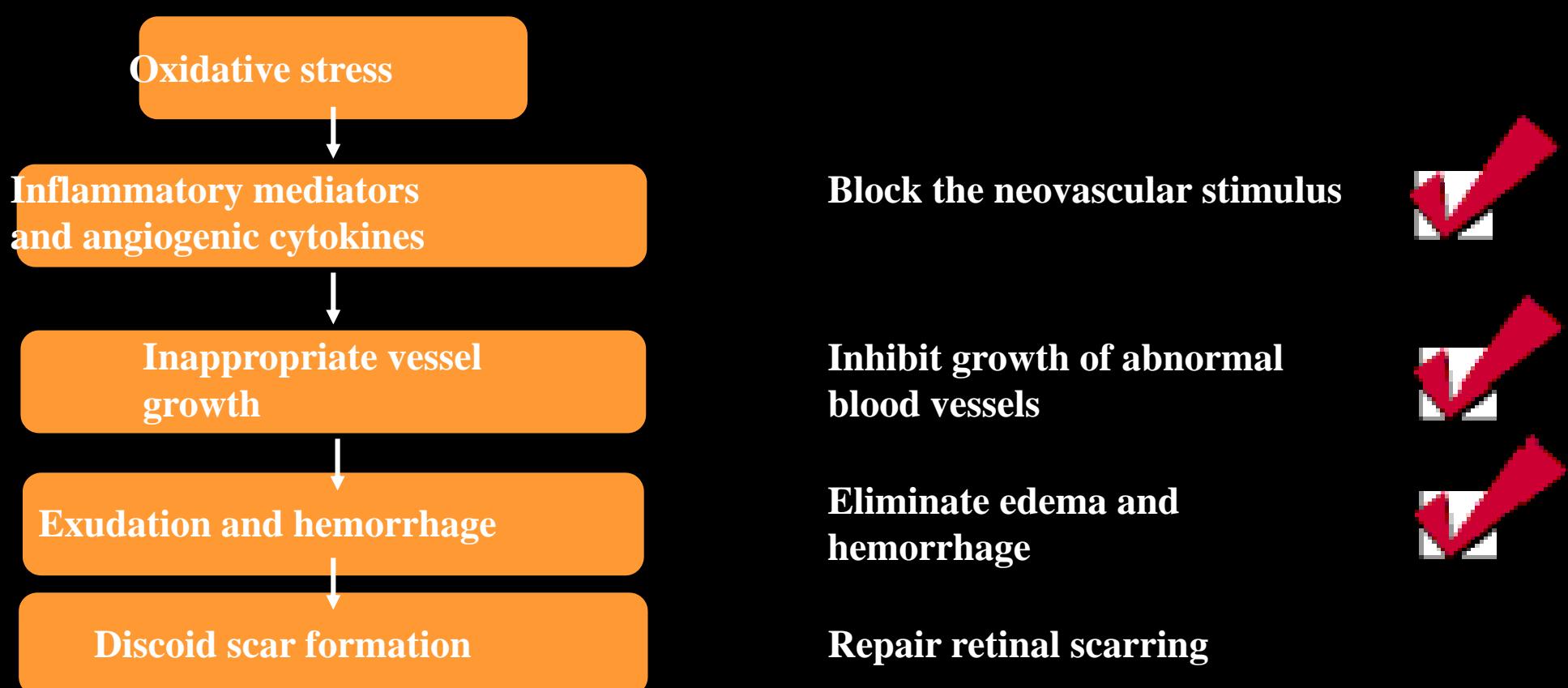
Ferrara et al, Nat Med 2003; 9: 669

Ranibizumab

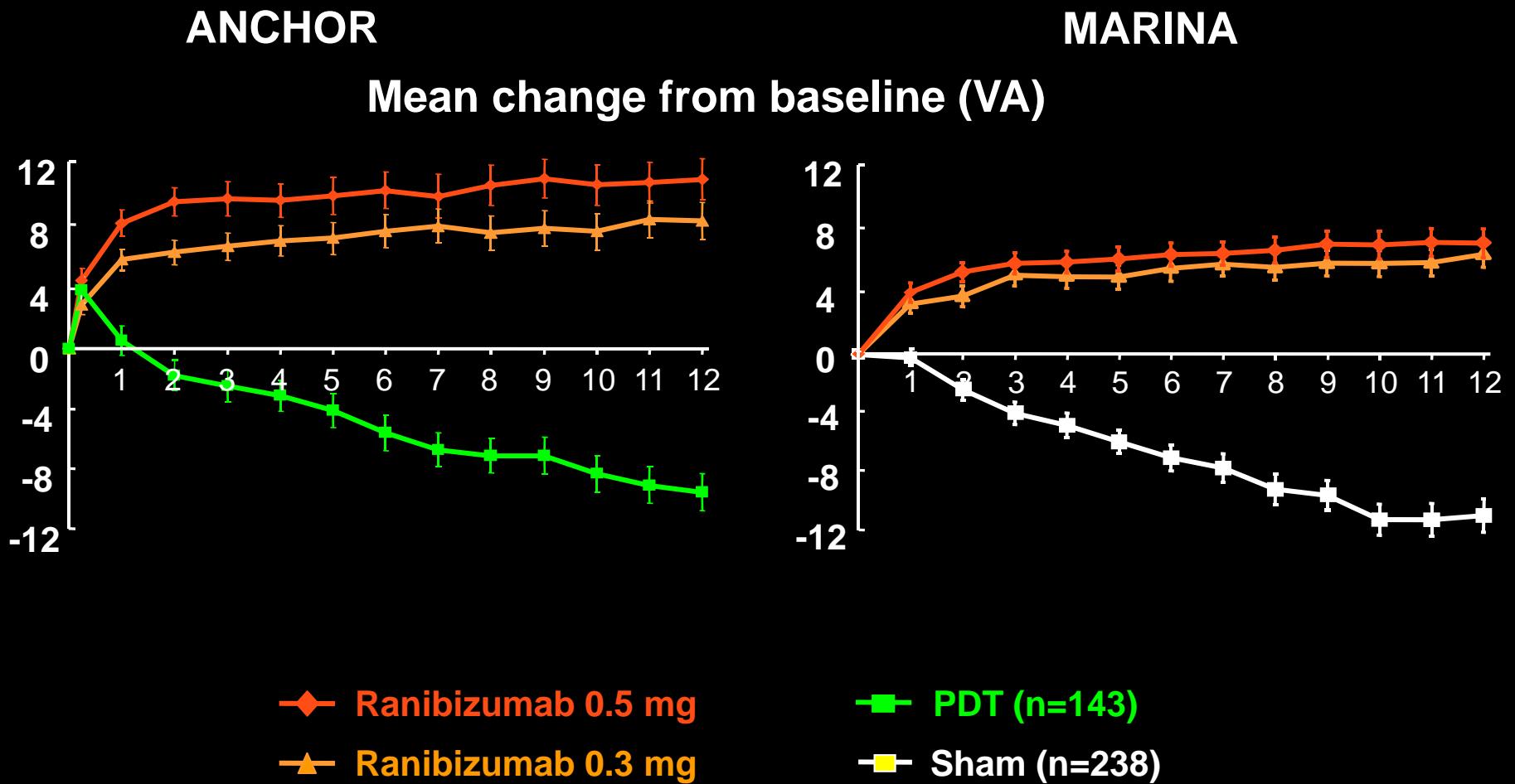
- Ranibizumab binds all isoforms including 110, a plasmin-cleaved form of VEGF



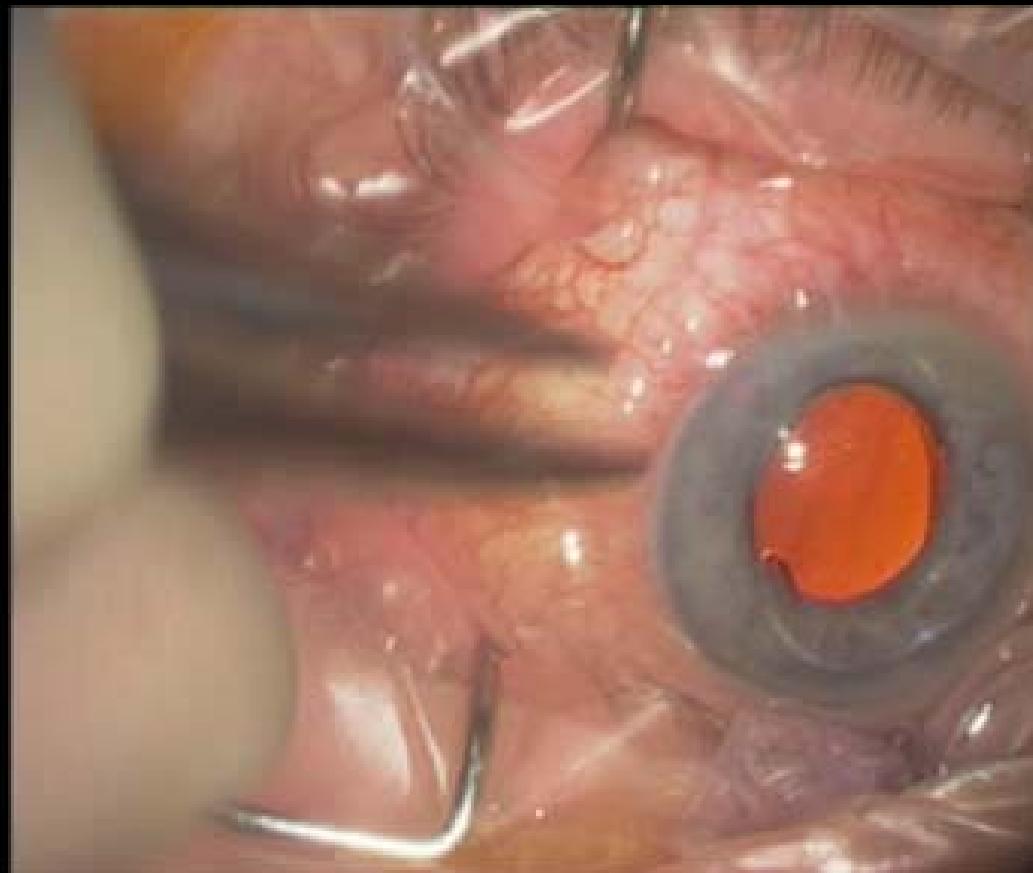
VEGF-A Inhibition targets multiple components of AMD



Secondary Endpoint: Mean change in VA from baseline



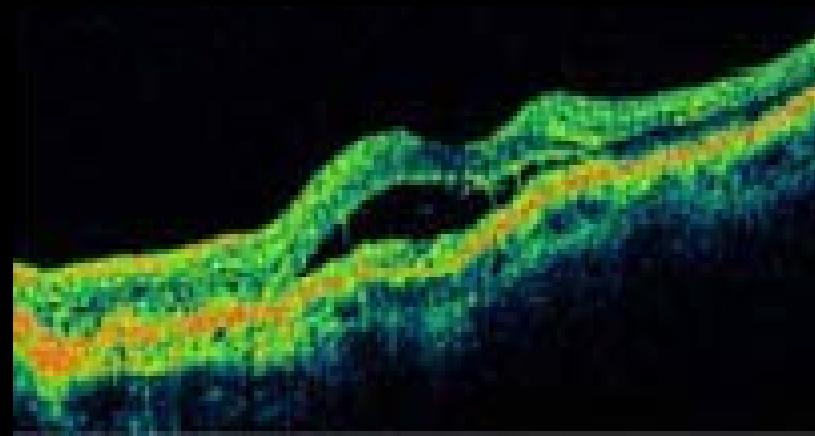
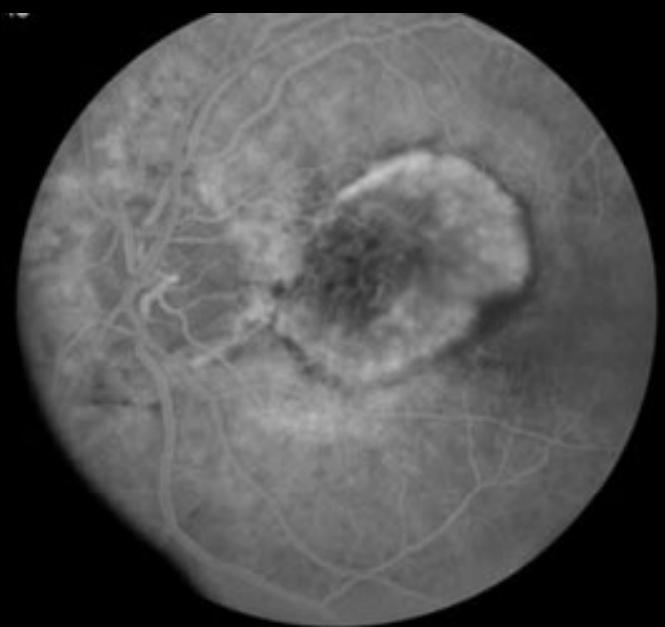
Intra-vitreal injection



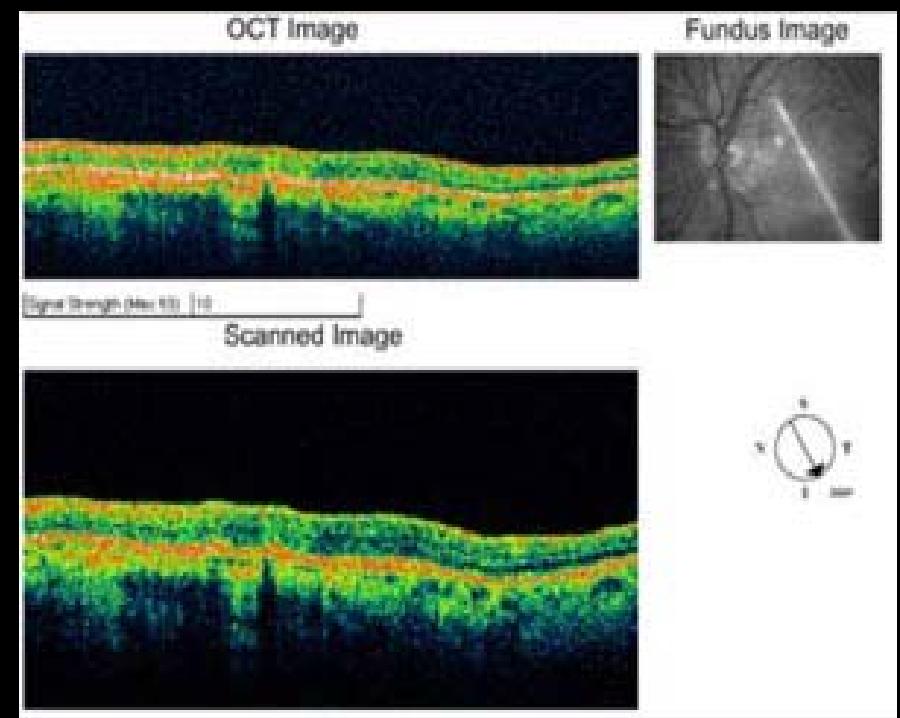
Lucentis treatment regime

- All sub types wet
- Recent visual loss and active leakage
- Some useful vision – better than 3/60
- 3 injections one month apart
- Then review VA and OCT – if further leak – re-inject

76 yr old male – Vision Count Fingers



Post 3 Lucentis Injections – Vision 6/12



Lucentis treatment regime

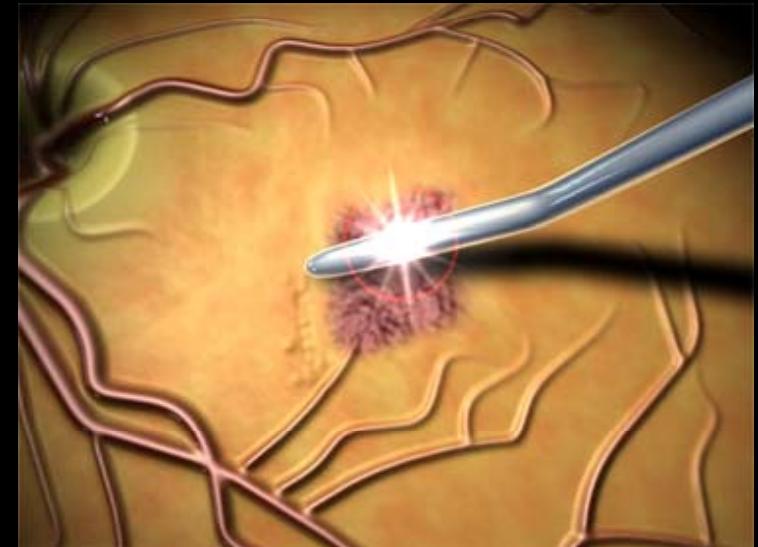
- About 40% significant improvement, rest stabilise
- If catch early and treat urgently = save vision
- Initial trials suggested monthly injections for 2 years
- I tend to do six and then review
- About 40% only need 6 but require close f/up
- Rest very variable but may require prolonged treatment
- NICE have indicated funding should be available both eye
- Retinal vein occlusions and diabetes

Lucentis Junkies

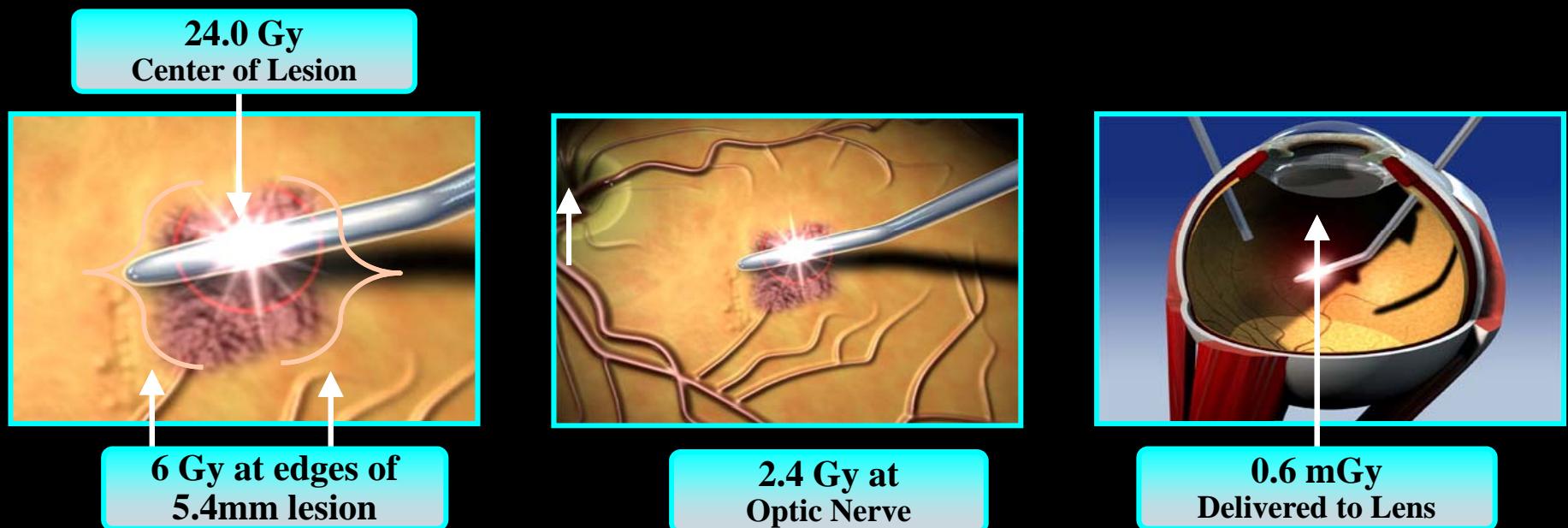
- Major problem – economics, patient convenience, on-going risk
- Radiation treatment offers “exit strategy”
- Offering places on national trial next year
- Delivered via vitrectomy procedure

Epimacular Brachytherapy for the Treatment of Neovascular AMD

EPIRAD



Radiation Dose to Ocular Structures



Tissue	Effect	Dose for Clinically Observable Damage	Dose Delivered by NeoVista Strontium 90 Device
Lens	Cataract	2 Gy	.00056 Gy
Retina	Radiation Retinopathy	35-55 Gy	24 Gy
Optic Nerve	Optic Neuropathy	>55 Gy	2.4 Gy

Reference: Finger PT, Berson A, Ng T, Szechter A. Ophthalmic plaque radiotherapy for age-related macular degeneration associated with subretinal neovascularization. *Am J Ophthalmol.* 1999 Feb;127(2):170-7. Adapted from Bardenstein, Char and Rosenblatt

Why Use Beta Radiation?

**Ionizing Radiation
has Strong
Inhibitory Effects**

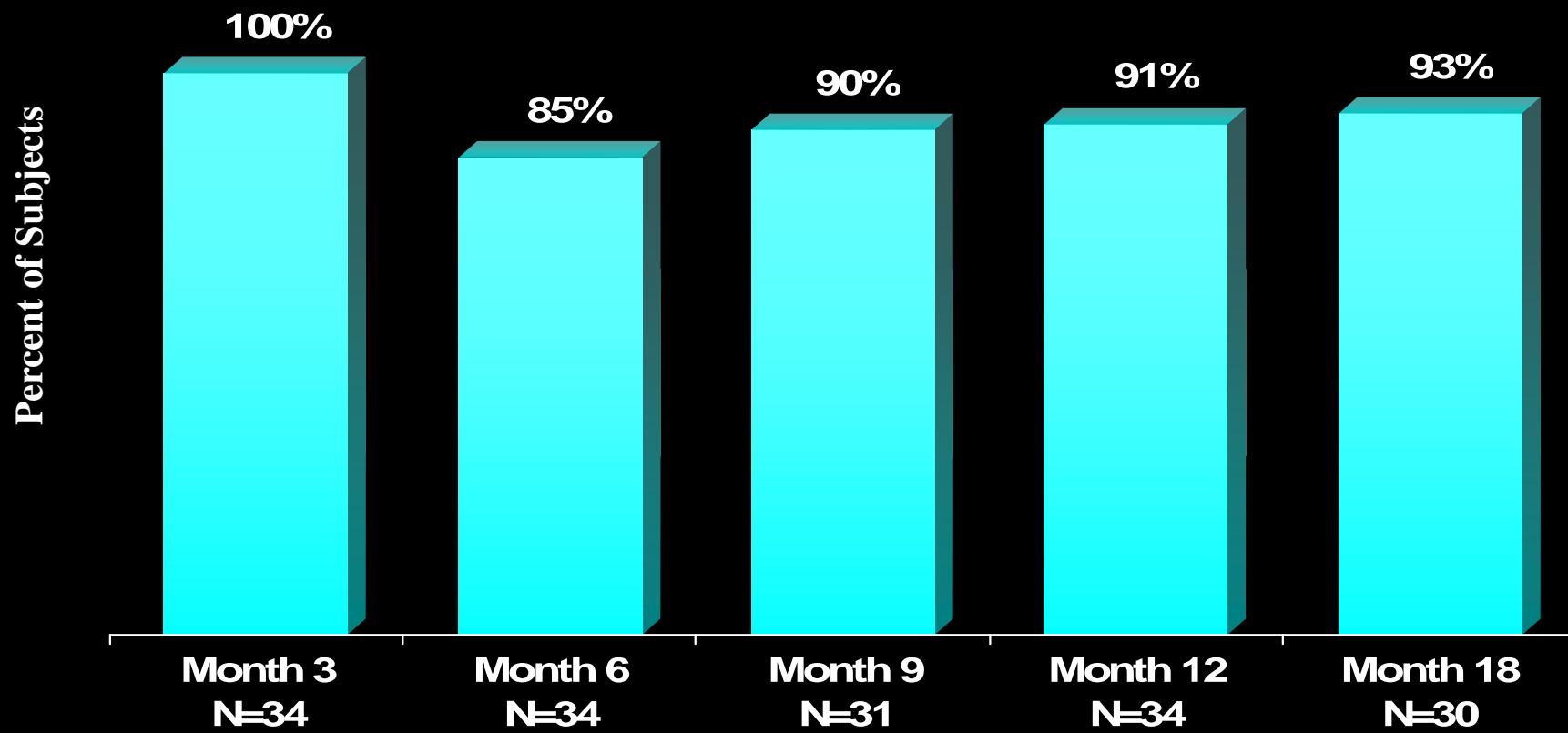
**Targeted Radiation
Treats Only the
AMD Lesion**

**Rapid Energy
Dispersion Means
Less Exposure**

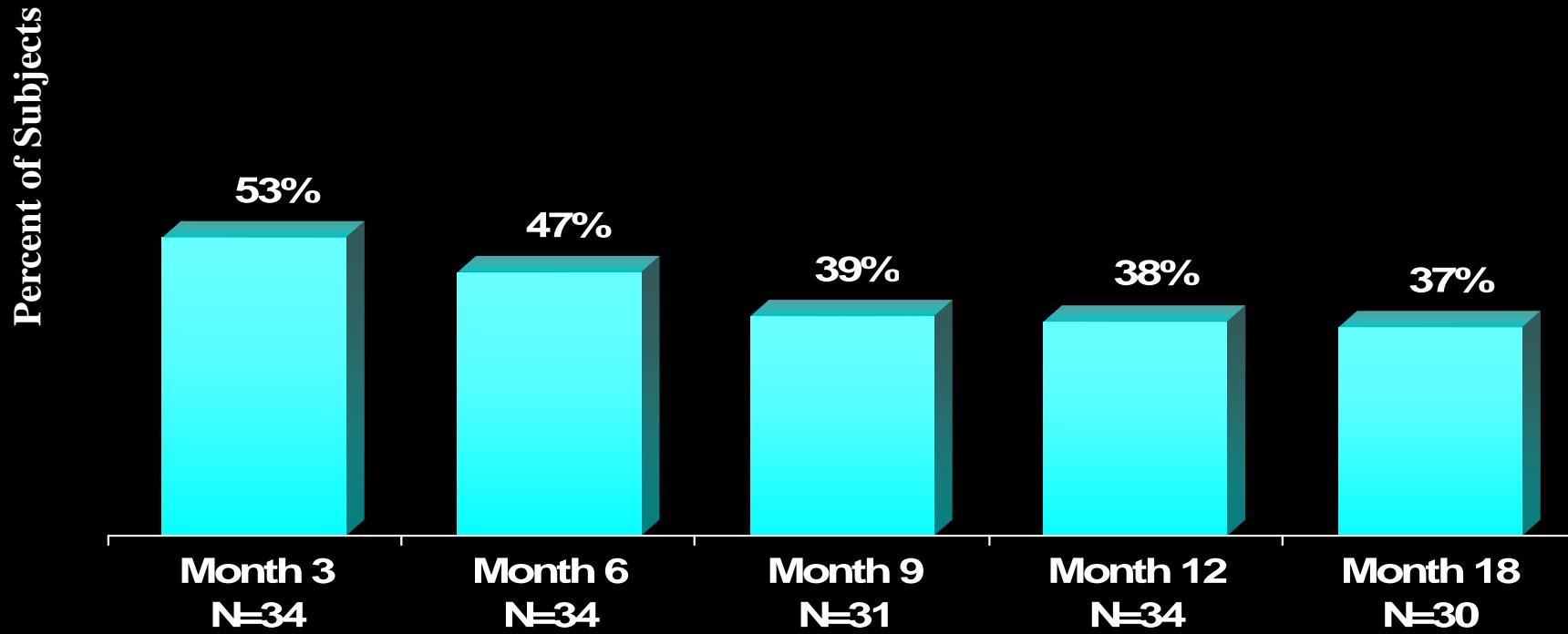
- Anti-angiogenic (inhibits blood vessel growth)
- Anti-inflammatory (inhibits inflammation)
- Anti-fibrotic (inhibits scar formation)

- Effective dose at lesion site, but little penetration to other parts of the eye
- Whole-body exposure for patient is less than that received from a routine chest x-ray

Proportion of Patients Losing ≤ 15 Letters



Proportion of Patients Gaining ≥ 15 Letters



EPIRAD potential to dramatically decrease number of lucentis injections

- ***18 Months***
 - 73% of patients did not require additional tx*
 - Mean gain of +6.6 ETDRS letters
 - 37% of patients gained 3-lines or more

* Additional tx was administered per investigator discretion based upon evidence of lesion activity

IOL-VIP

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Good Health

Daily Mail, Tuesday, April 24, 2007

Telescope that can save sight

A UK SURGEON has restored a blind patient's sight using pioneering surgery to implant a miniaturised telescope in her eye.

The patient, Beryl Haslow from Cheshire, suffers from age-related macular degeneration — AMD — which affects almost three million people in the UK and is the most common cause of sight loss in the

by ANGELA BROOKS

surgery last month — the first of its kind in the UK — Mrs Haslow, who was previously registered blind, can read again and her eyesight is almost good enough for driving.

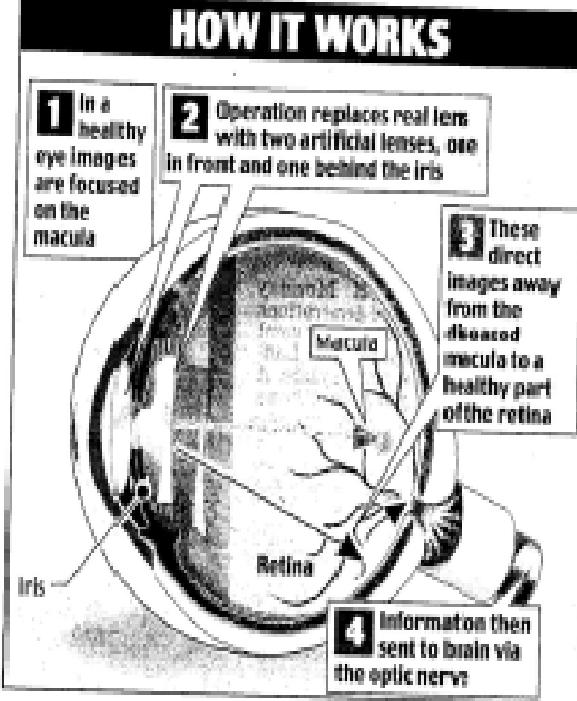
Macular degeneration destroys cells in the macula, the small central part of the light-sensitive retina at the back of the eye.

The macula is responsible for distinguishing fine detail necessary

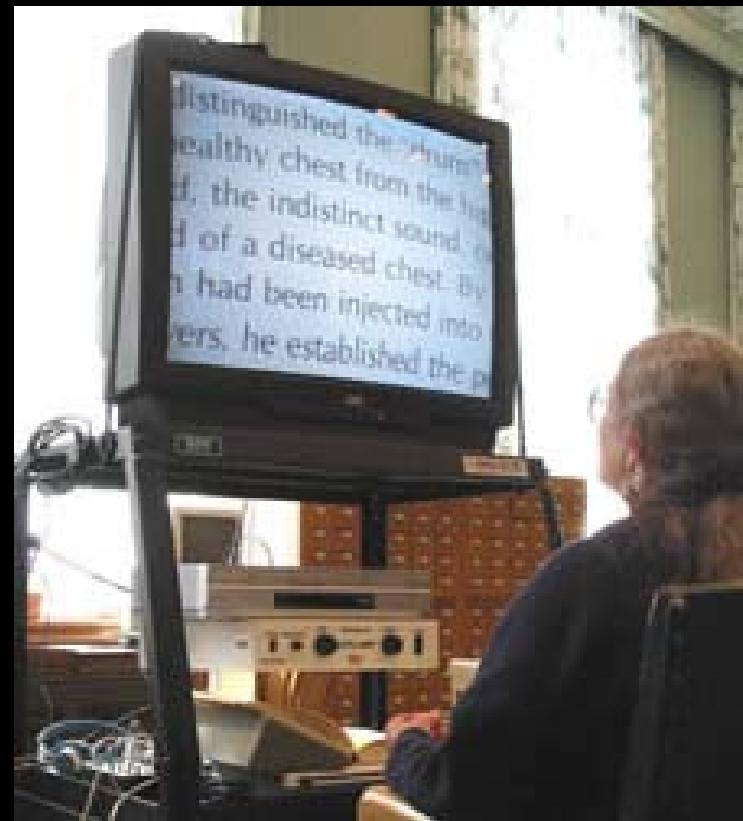
patient's eyes before surgery on a simulator — a device that allows the surgeon to try out different lenses attached to the patient's glasses to pinpoint the optimum angle for improving eyesight.

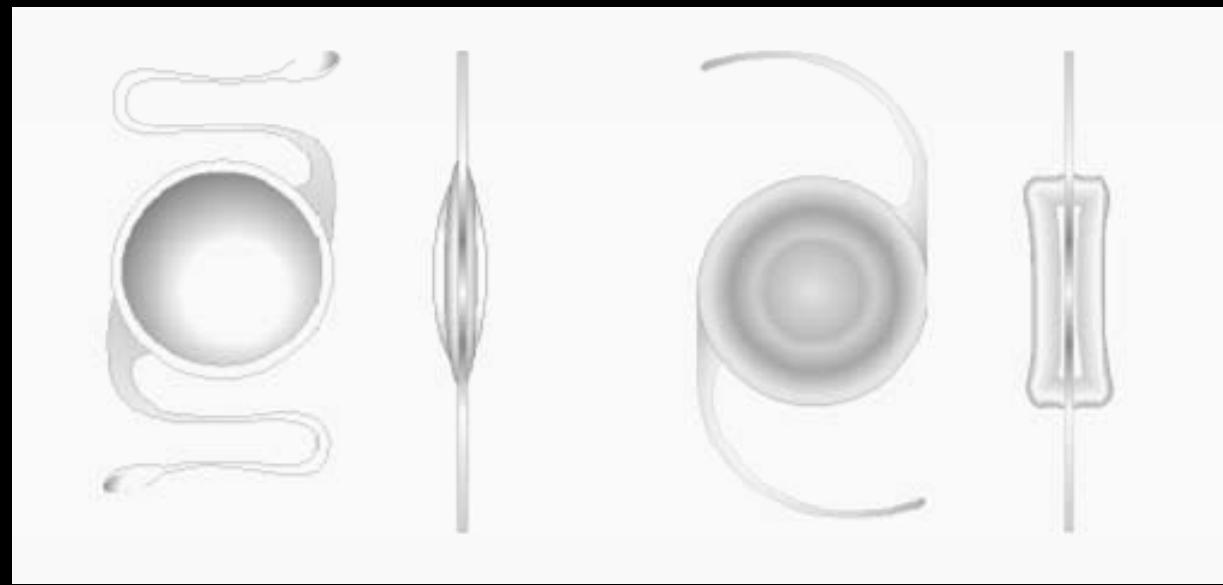
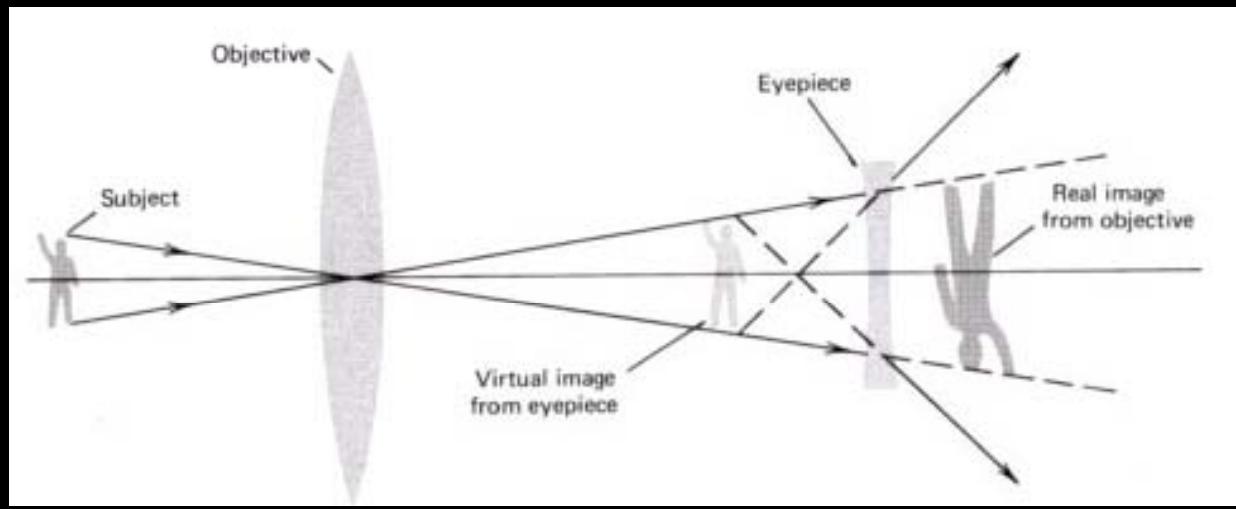
During surgery, a tiny incision is made in the cornea — the transparent surface of the eye covering the iris and the pupil.

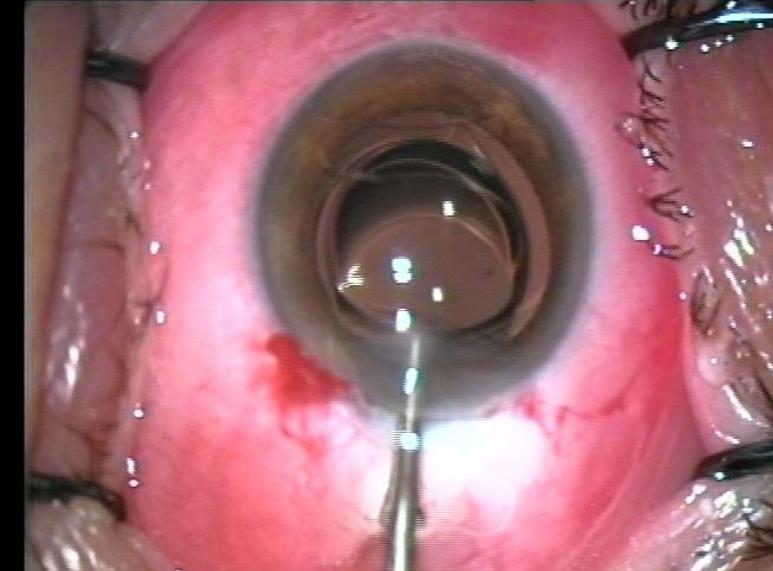
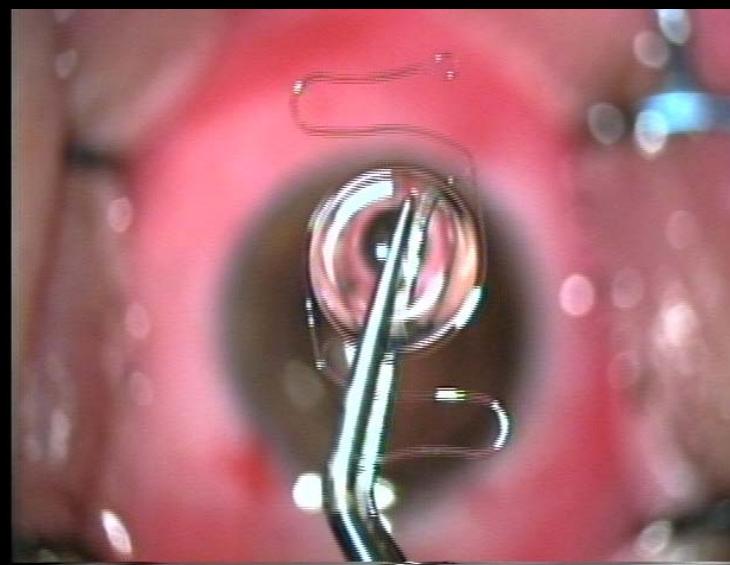
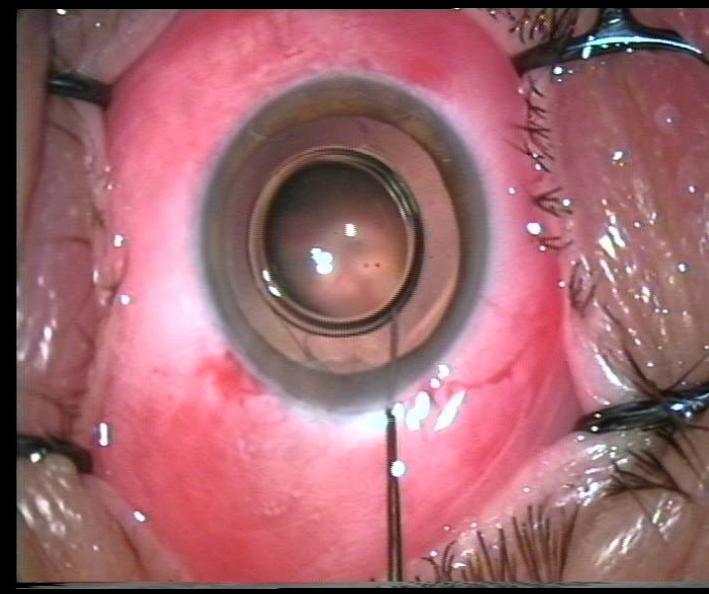
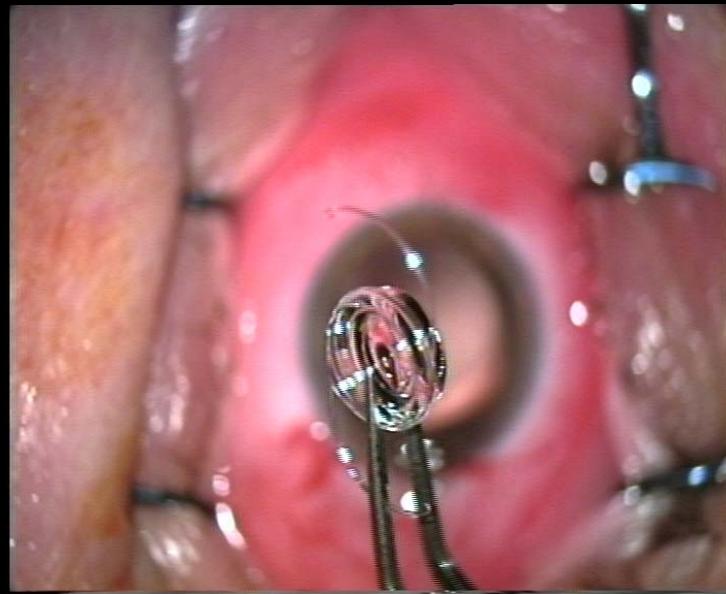
This is where the natural lens behind the iris is removed to be replaced by a flexible miniature



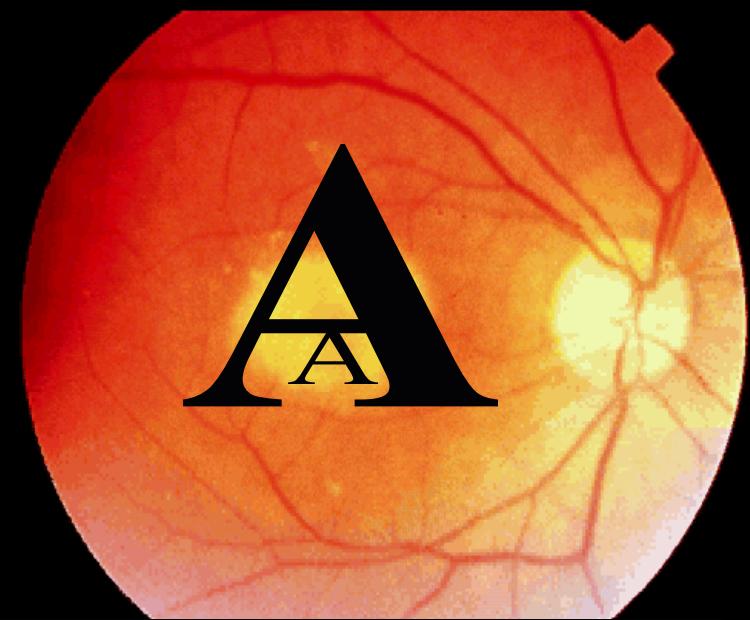
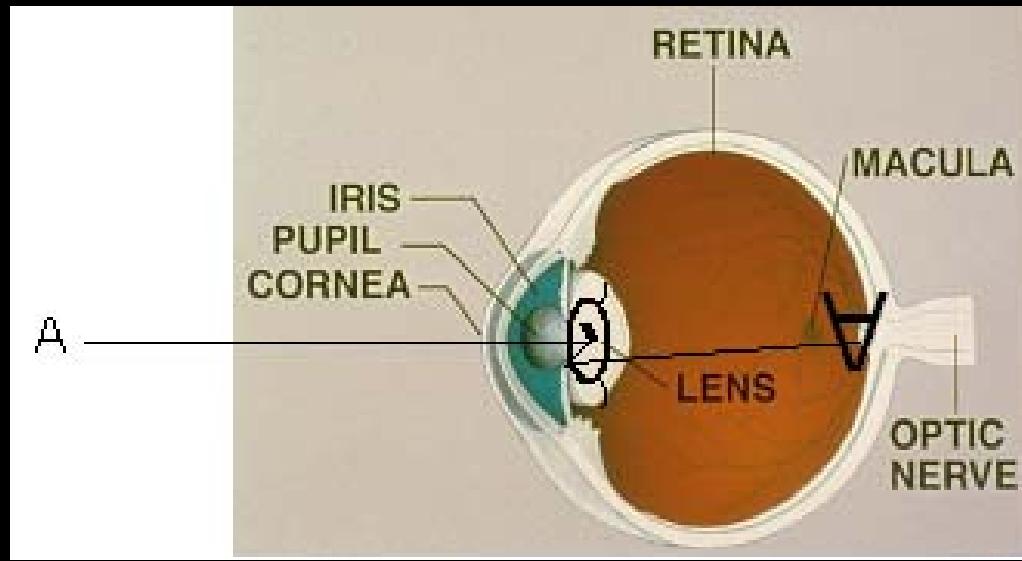
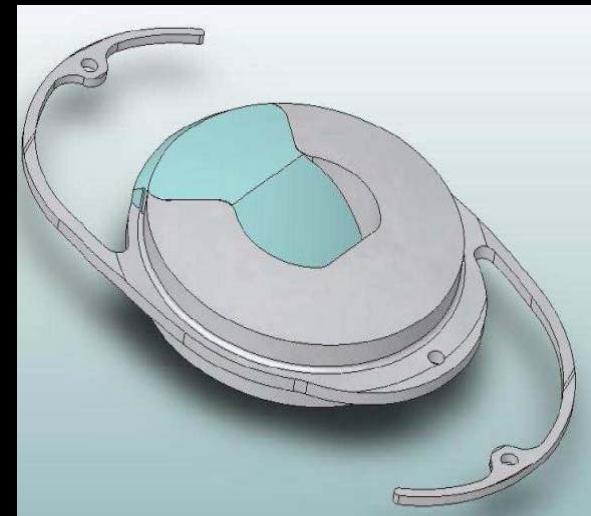
©Operation Mrs Haslow was able to... Eye already made to...
www.dailymail.co.uk







LMI implant



Magnified central vision but retained peripheral



Natural Image



External Telescope -
A magnified image



Implant with Magnified
center & obscured
periphery

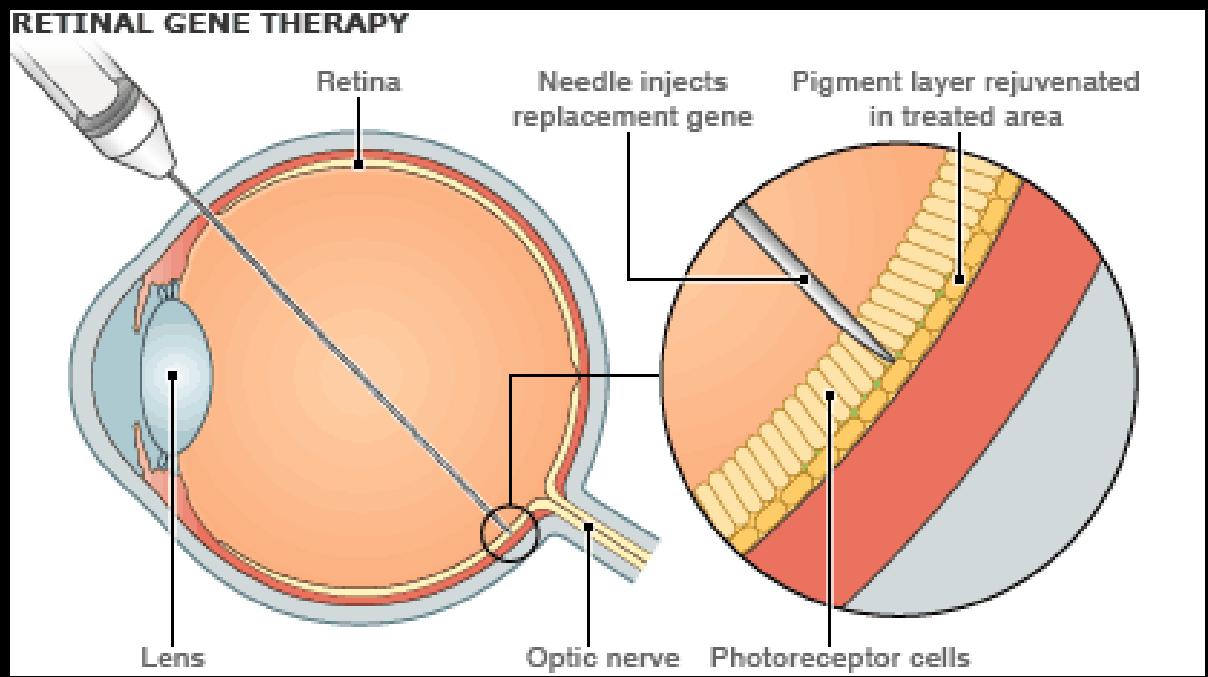
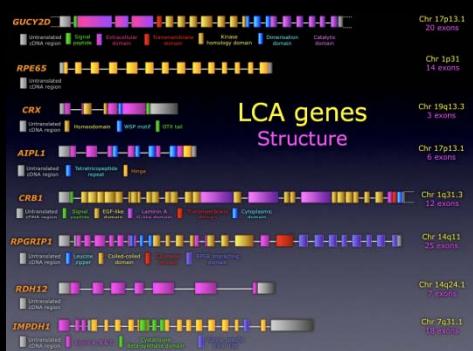


AMD

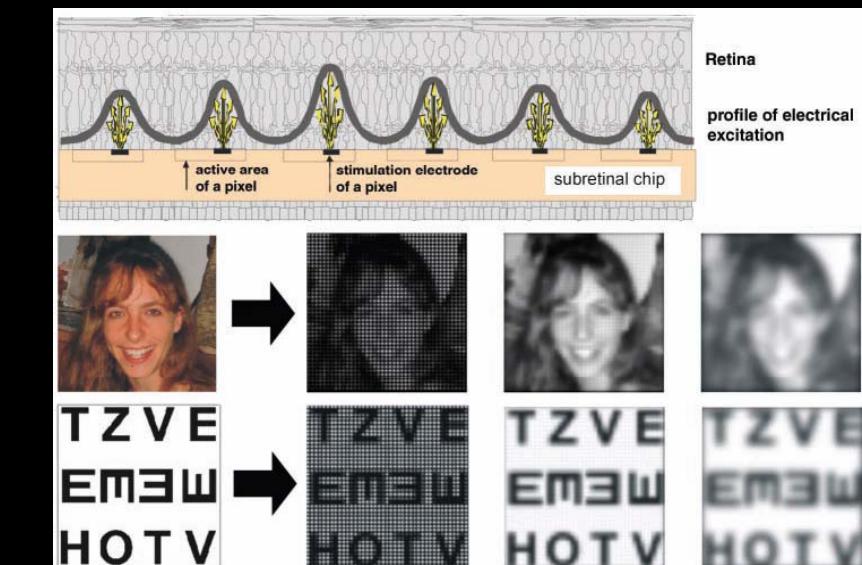
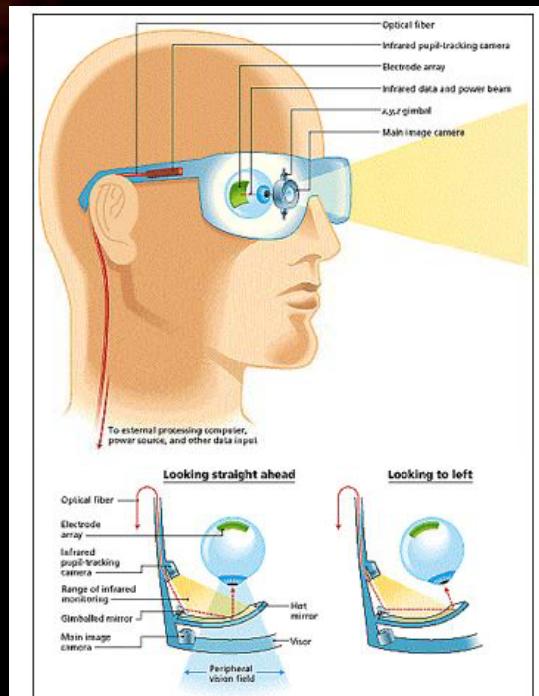
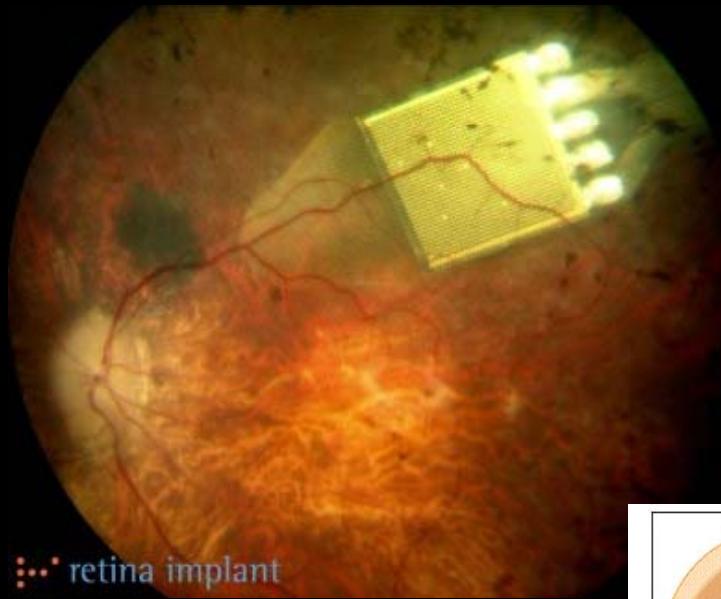


LMI – magnified central
image & unchanged
periphery

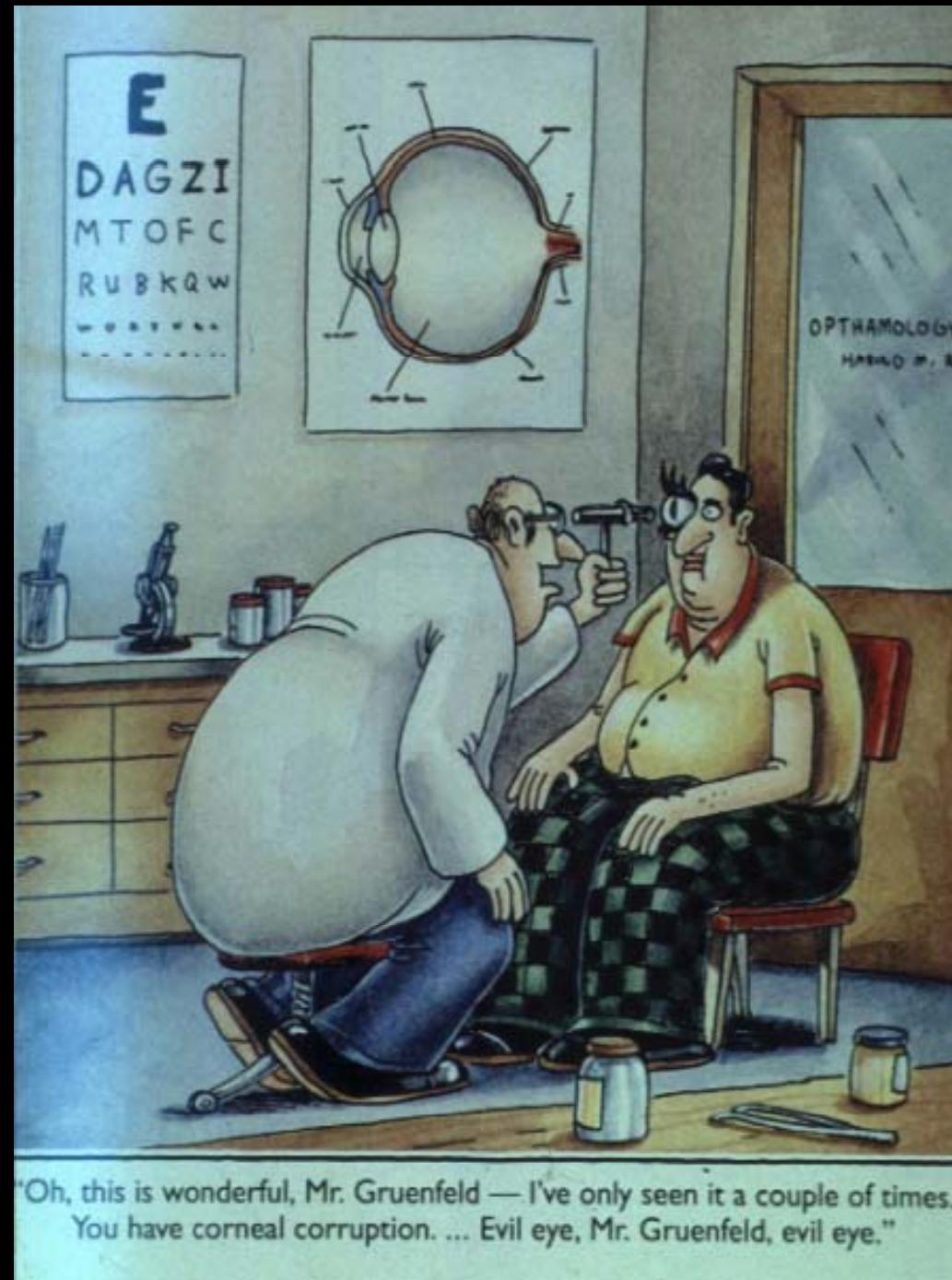
Gene Therapy – Lebers Congenital Amaurosis



Retinal Implant



Thank you



"Oh, this is wonderful, Mr. Gruenfeld — I've only seen it a couple of times.
You have corneal corruption. ... Evil eye, Mr. Gruenfeld, evil eye."