GLAUCOMA: PREVALENCE IN USA

- 3 million individuals with glaucoma
- 1 million unaware they have glaucoma
- 80,000 blind from glaucoma

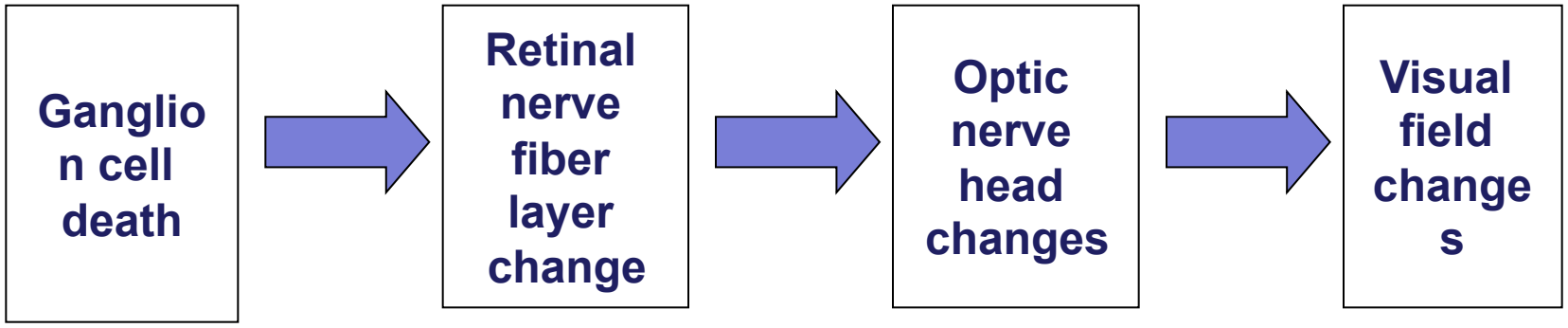
GLAUCOMA: GROUPS AT RISK

- Elderly
- African-Americans
- Individuals with
  - Elevated IOP
  - 1st-degree relatives with glaucoma
  - High myopia?
  - Diabetes?

GLAUCOMA

Definition: an optic neuropathy with characteristic optic nerve head and nerve fiber layer changes

PROGRESSION



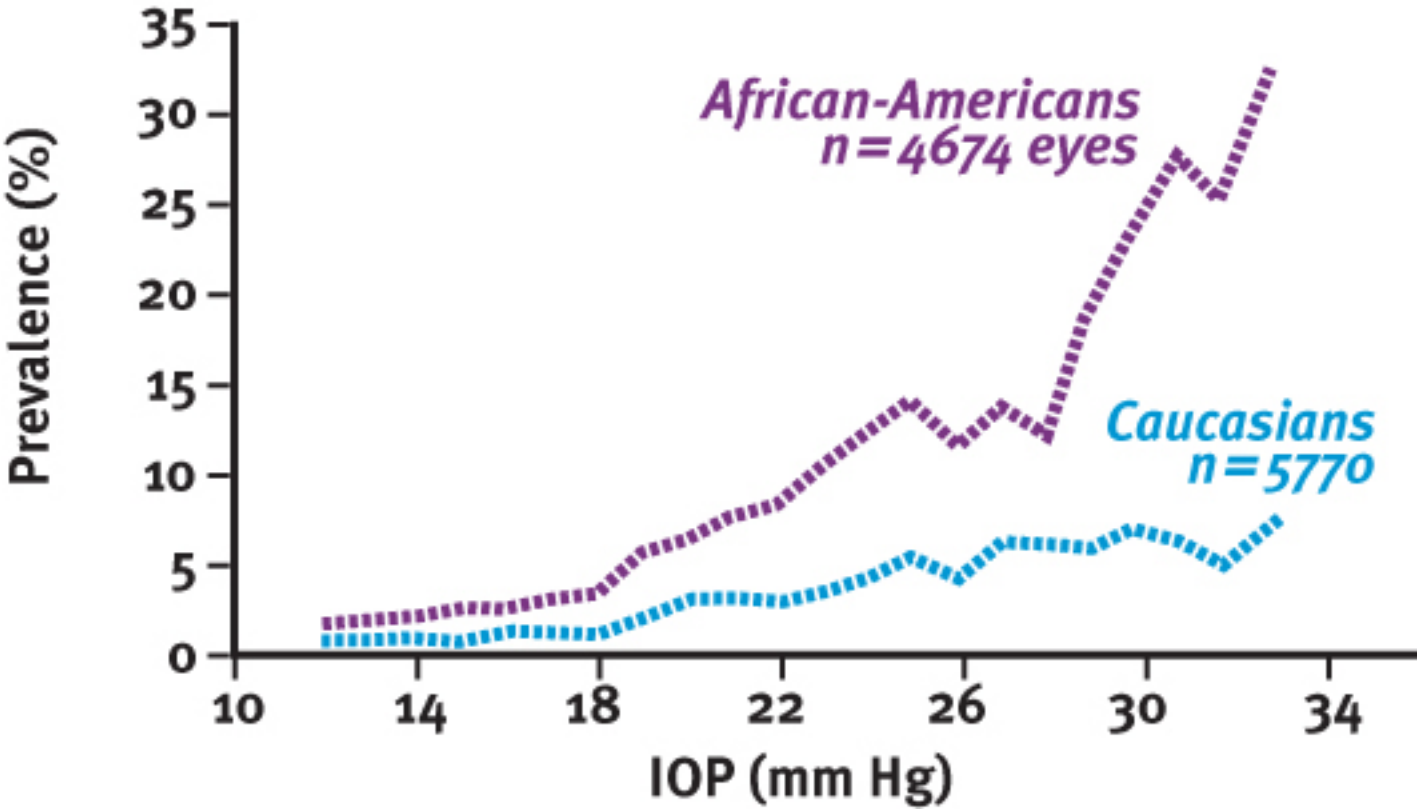
GLAUCOMA: OPTIC NERVE HEAD CHANGES

- Increased size of the cup
- Thinning of disc rim
- Progressive loss of neural rim tissue
- Disc hemorrhages
- Loss of nerve fibers

GLAUCOMA: VISUAL FIELD CHANGES

- Nasal field loss
- Paracentral field loss
- Midperipheral field loss

POAG: PREVALENCE IN RELATION TO SCREENING IOP



Reduce avoidable blindness and severe visual impairment.

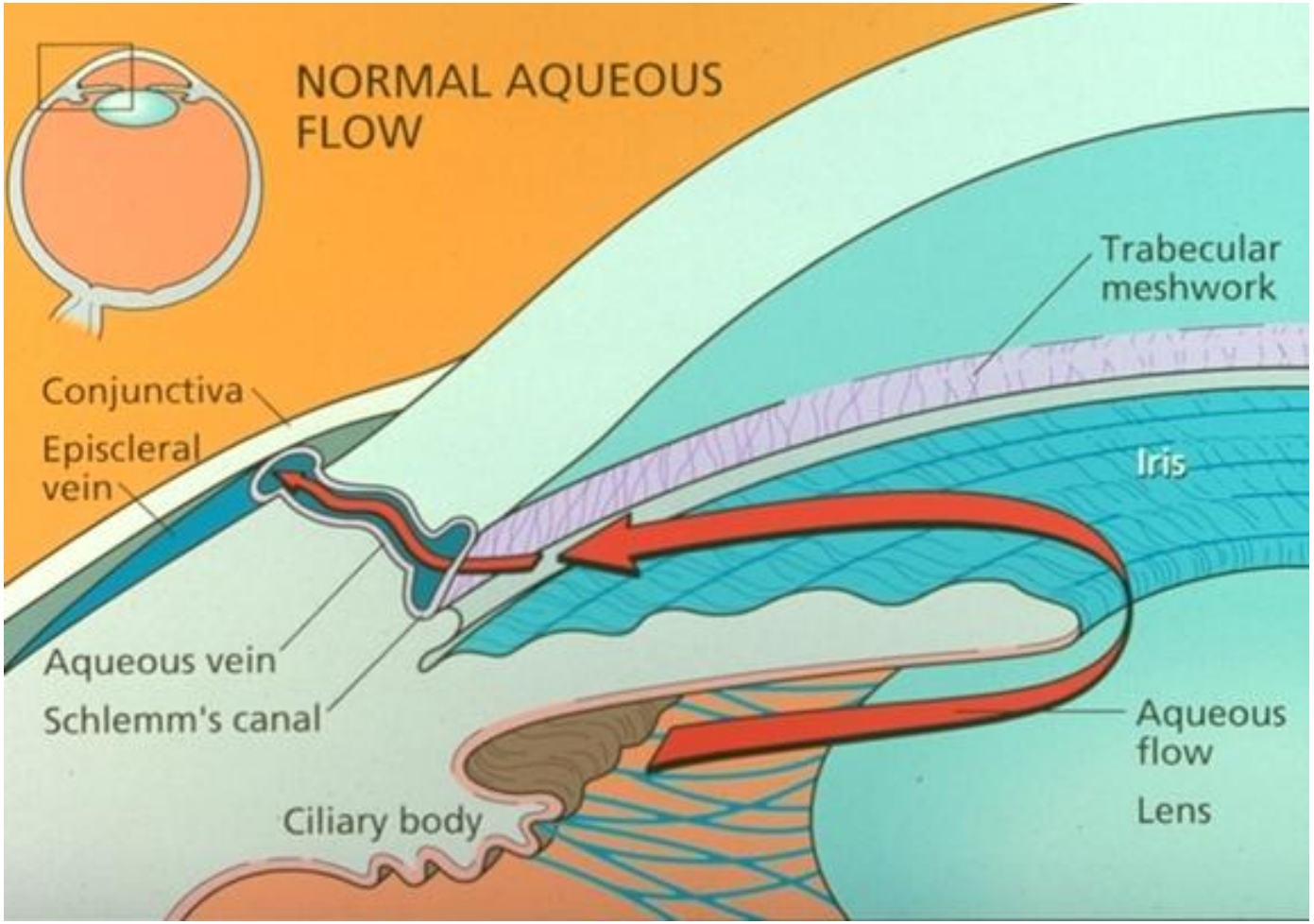
GLAUCOMA: TYPES

- Primary open-angle (POAG)
- Angle-closure
- Congenital
- Childhood
- Secondary

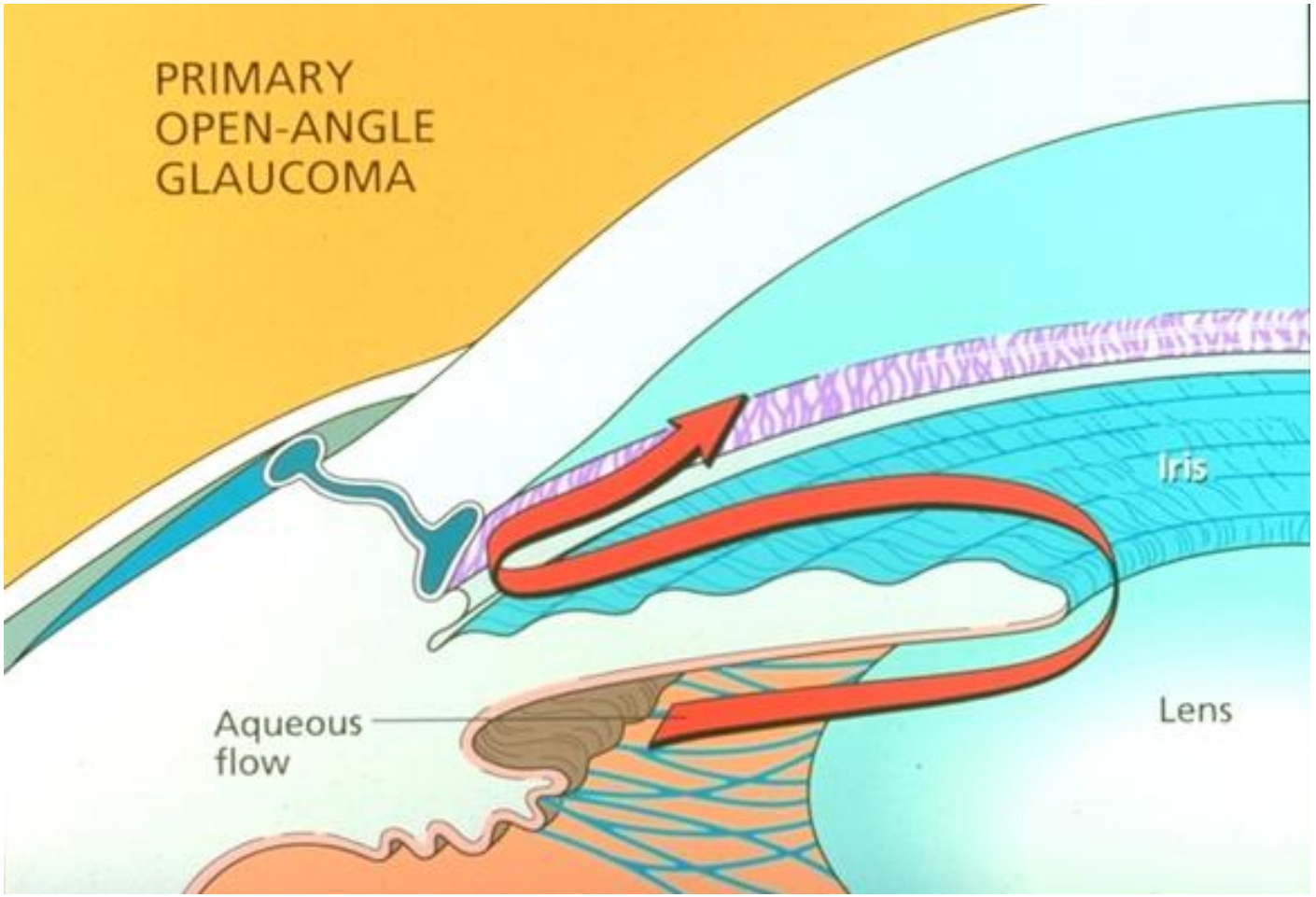
POAG: CHARACTERISTICS

- Most common type of glaucoma
- Bilateral but not always symmetric
- Characteristic optic nerve and visual field damage
- Adult onset
- Open, normal-appearing anterior chamber angles
- Absence of secondary causes

Types of Glaucoma



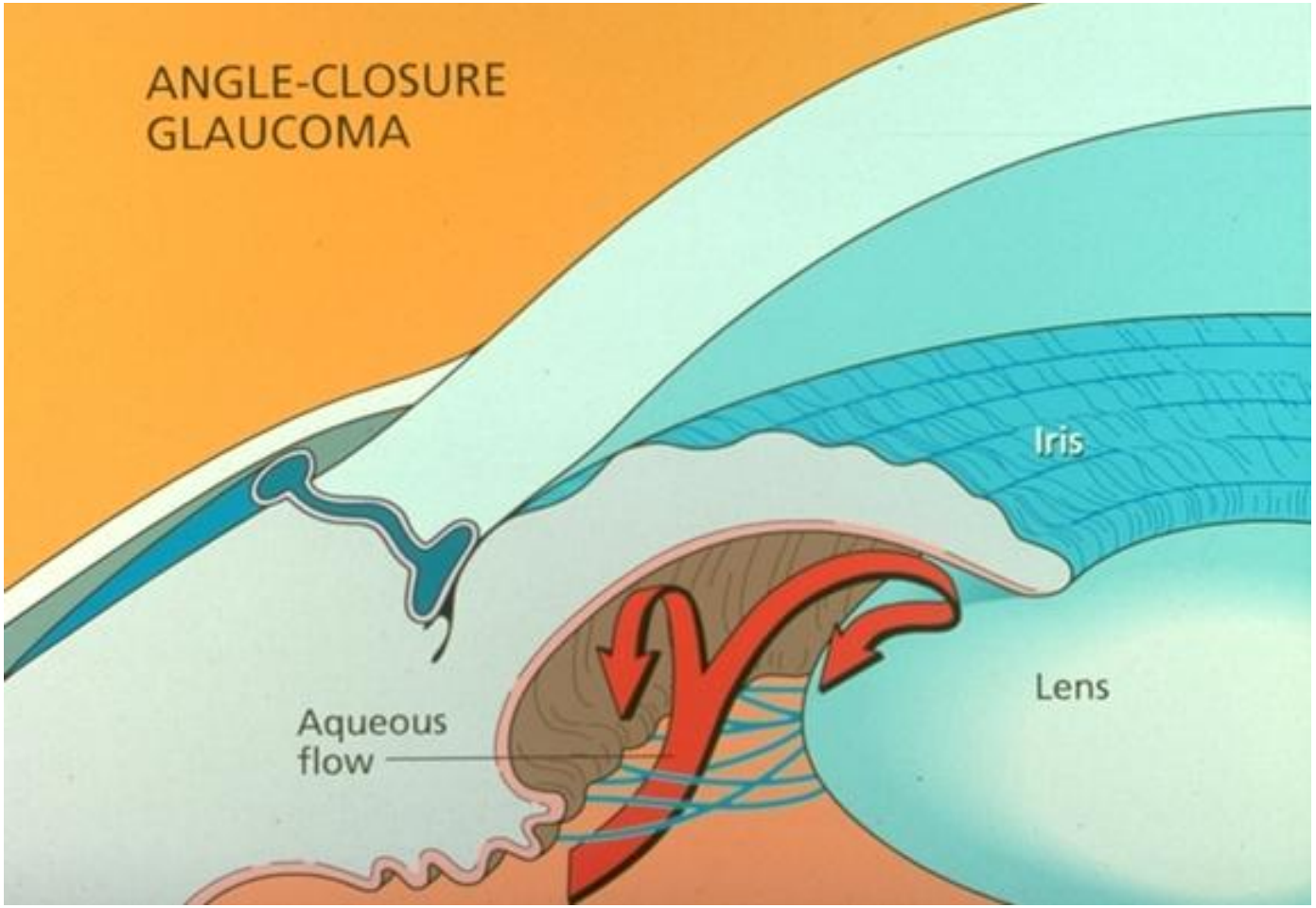
Types of Glaucoma



POAG: PROGRESSION

- Asymptomatic in early stages
- Often marked visual loss has occurred when patient presents with vision symptoms
- Can result in blindness

Types of Glaucoma



Congenital glaucoma

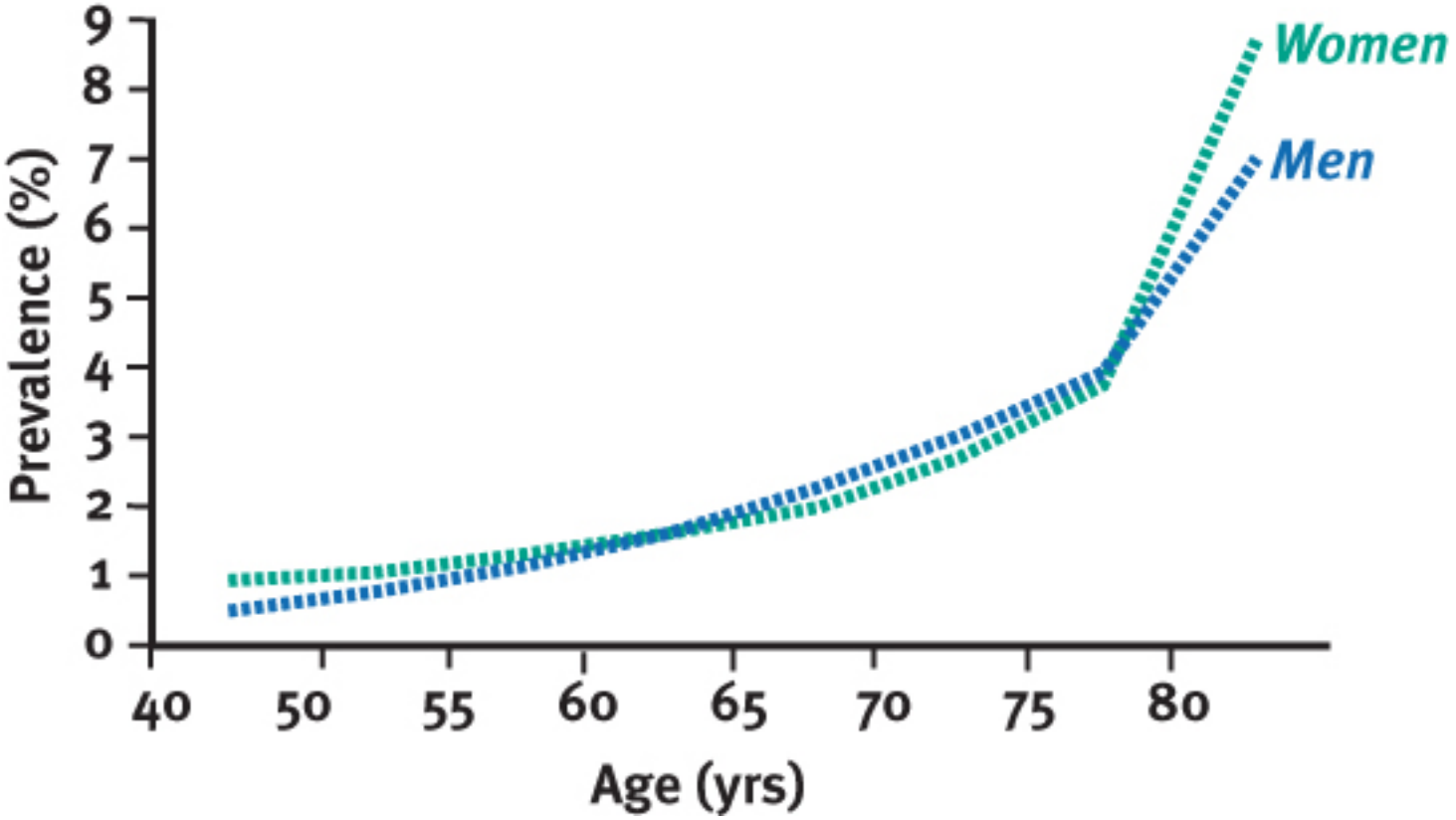
CHILDHOOD GLAUCOMA

- Includes congenital glaucoma
- Asymptomatic in early stages
- Can result in total optic nerve atrophy and blindness

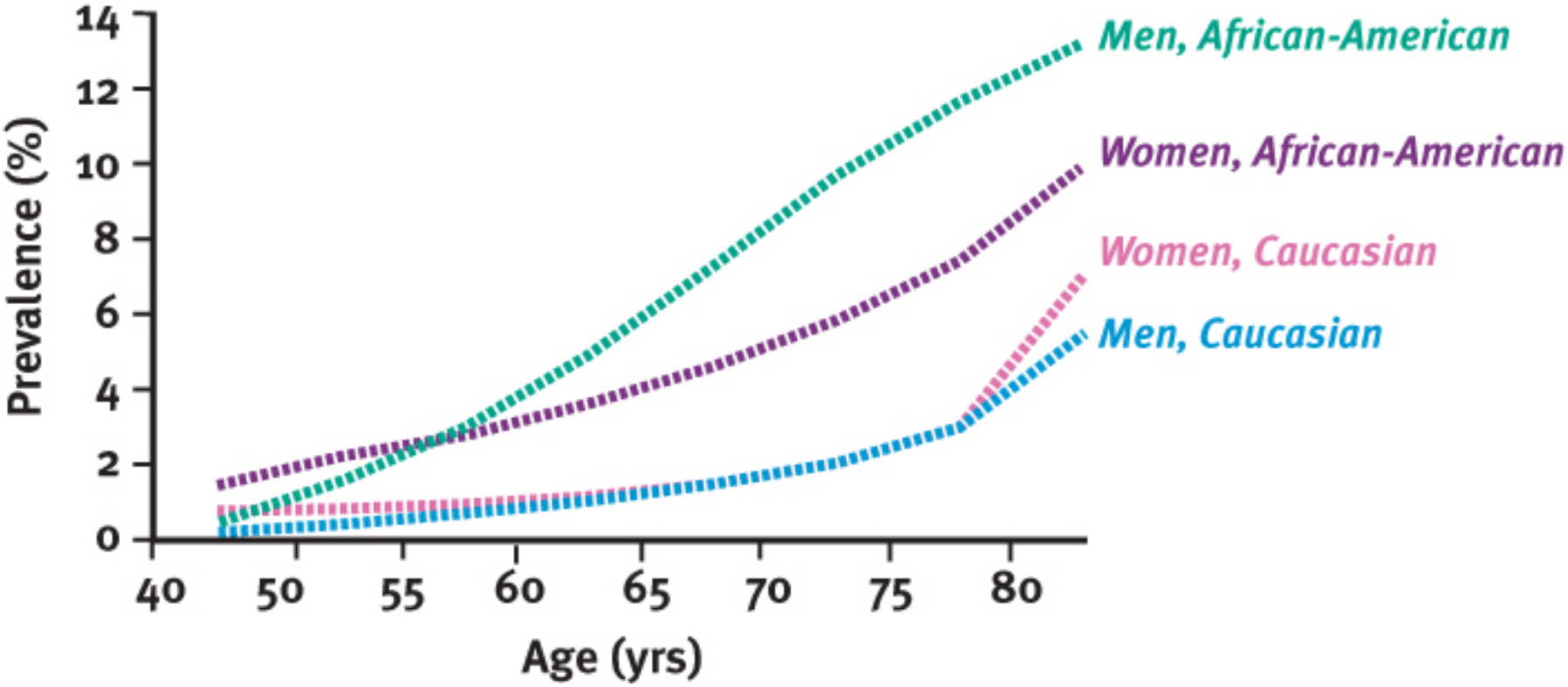
SECONDARY GLAUCOMAS: SOME CAUSES

- Trauma
- Uveitis
- Chronic steroid use
- Diabetic retinopathy
- Ocular vascular occlusion

POAG: PREVALENCE RELATED TO AGE



POAG: PREVALENCE BY AGE, GENDER, AND RACE



POAG RISK FACTOR: AFRICAN-AMERICAN HERITAGE

- Blindness = 3–4 times more common
- Age >70 = 10% prevalence (2% for Caucasians >70)
- POAG occurs at earlier age
- POAG more advanced when discovered

POAG RISK FACTOR: ELEVATED IOP

- High IOP correlates poorly with presence of optic nerve damage
- IOP level is related to POAG prevalence, regardless of race

POAG: EXAMPLES OF **GENETIC FACTORS**

Genetic Locus	Chromosome
MYOC or TIGR gene (GLC1A)	1
GLC1B	2
GLC1C	3
GLC1D	8
GLC1E	10
GLC1F	7

POAG: OTHER RISK FACTORS

Factor	Relative Risk
Age (per decade >40)	2
African-American vs. Caucasian	4
Family history (1° relative)	2–4
Myopia	1.5–3
Decreased corneal thickness	3

Screening for POAG =
IOP measurements
+
Optic disc evaluation
+
Visual field testing

RECOMMENDED FREQUENCY OF PERIODIC EYE EXAMINATIONS

Age	No Risk Factors	Risk Factors
20–29	At least once during interval	Every 3–5 years
30–39	At least twice during interval	Every 2–4 years
40–64	Every 2–4 years	Every 2–4 years
65+	Every 1–2 years	Every 1–2 years

RISK FACTOR WEIGHTING

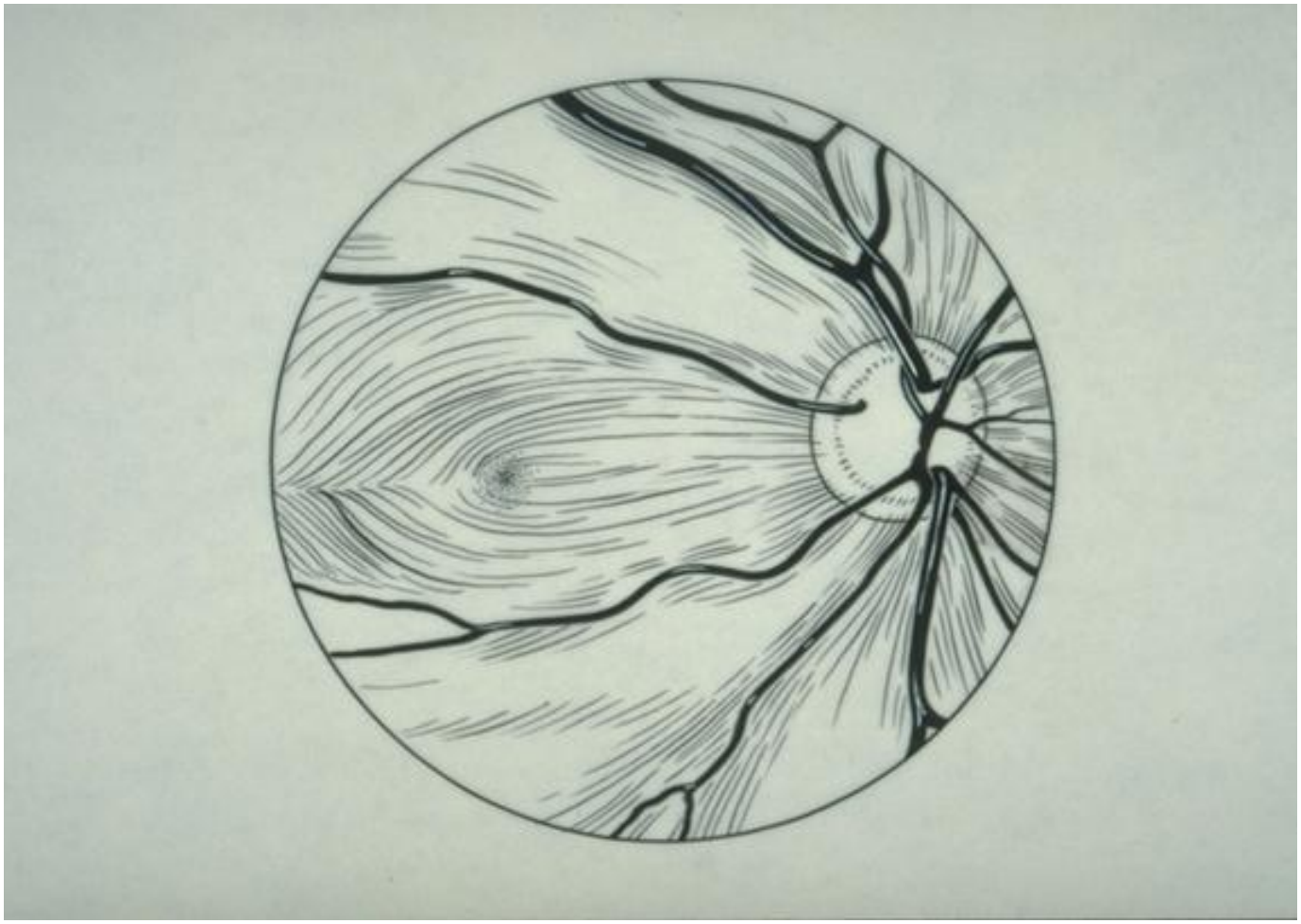
Variable	Category	Weight
Age	<40 years 40–49 years 50–59 years >60 years	0 1 2 3
Race	Caucasian/other Hispanic African-American	0 1 2
Family History of Glaucoma	- or + in non-1° relatives + for parents + for siblings	0 2 4
Last Complete Eye Examination	Within past 2 years 2–5 years ago >5 years ago	0 1 2

RISK FACTOR ANALYSIS

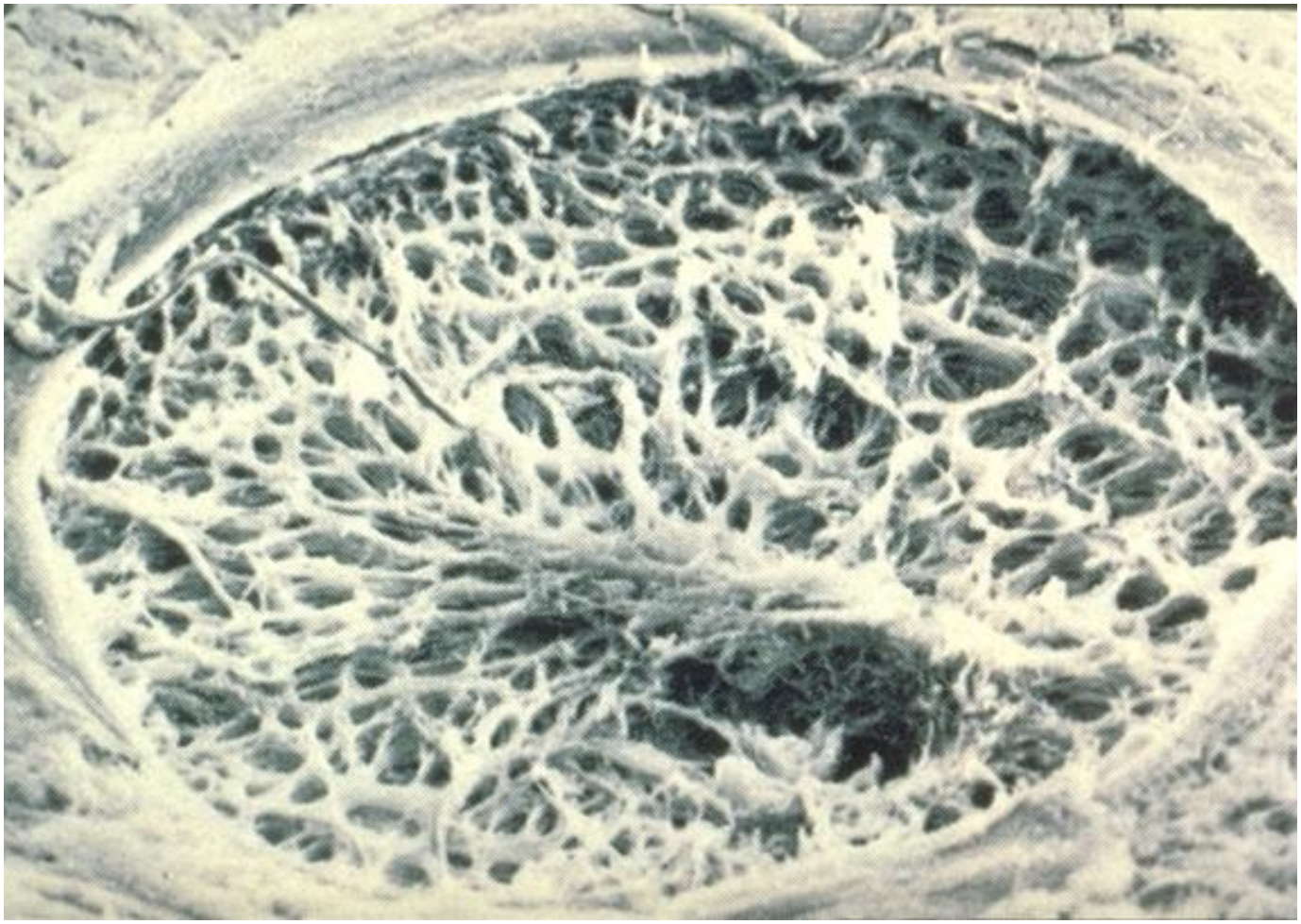
Level of Glaucoma Risk	Weighting Score
High	4 or greater
Moderate	3
Low	2 or less

GLAUCOMA SUSPECTS

Normal visual fields;
Open, normal-appearing angles
+
Elevated IOP and/or
abnormal optic disc/nerve fiber layer



Pattern of retinal nerve fibers

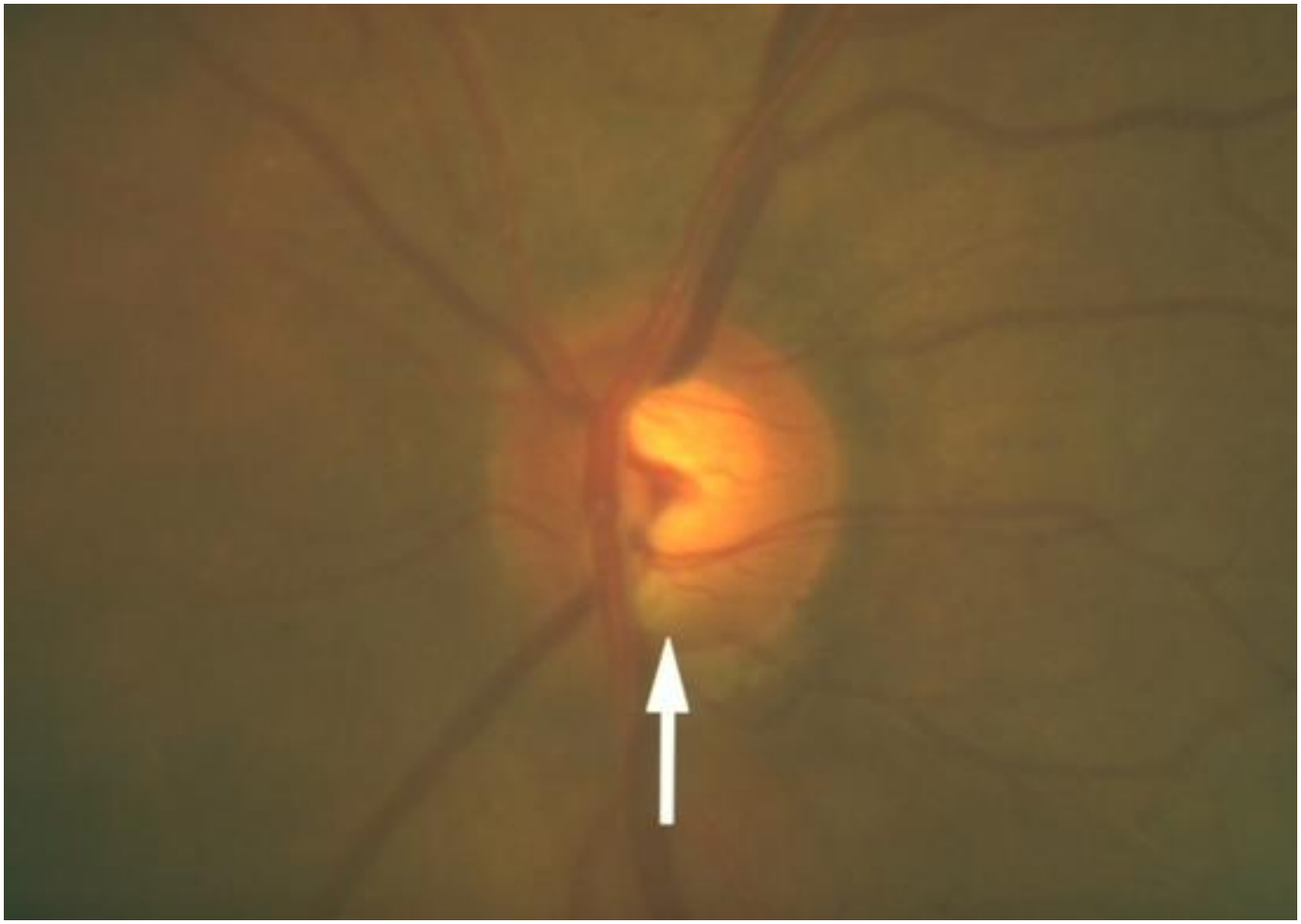


Lamina cribrosa

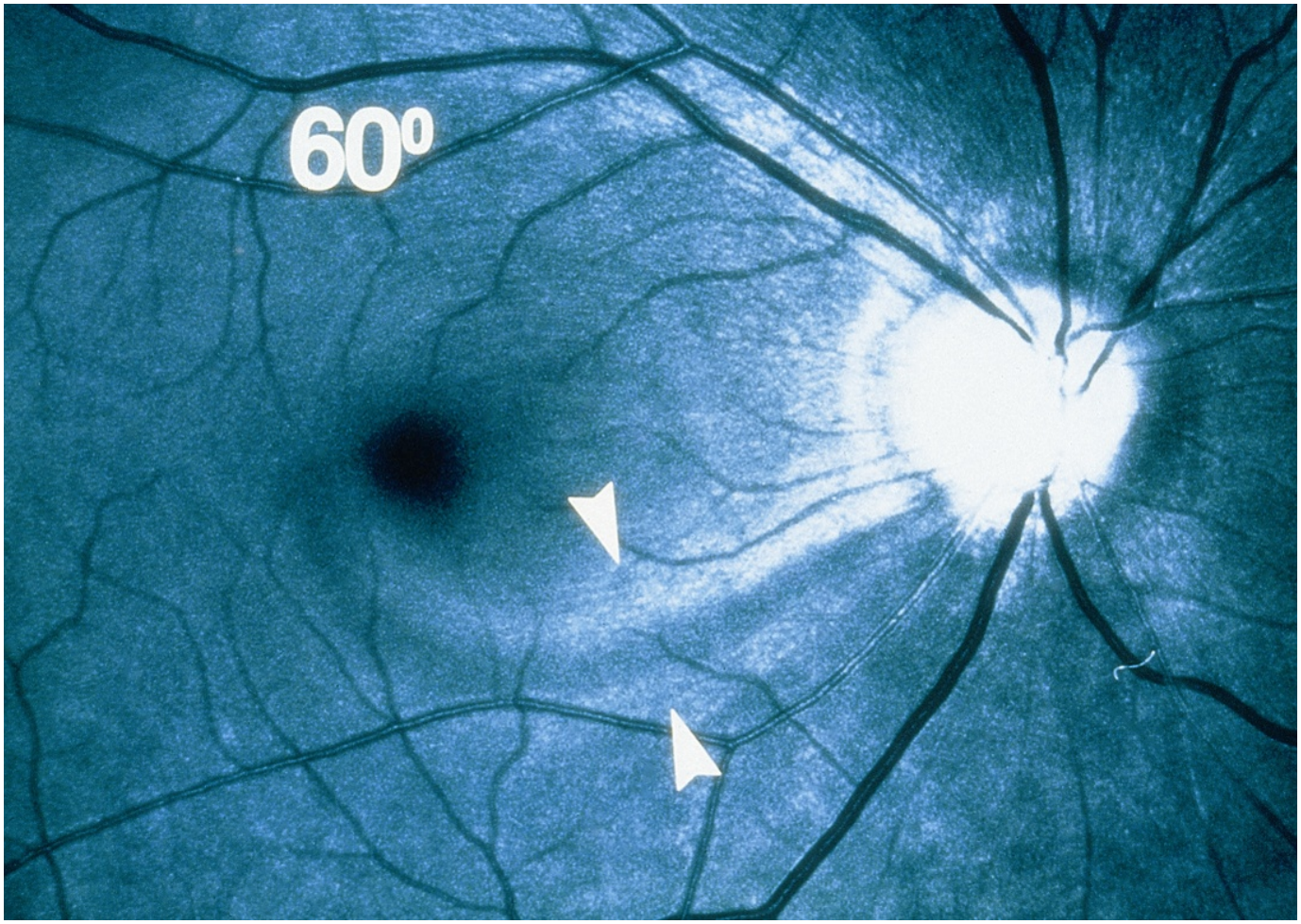
Primary Open-Angle Glaucoma

C:D ratio = 0.3

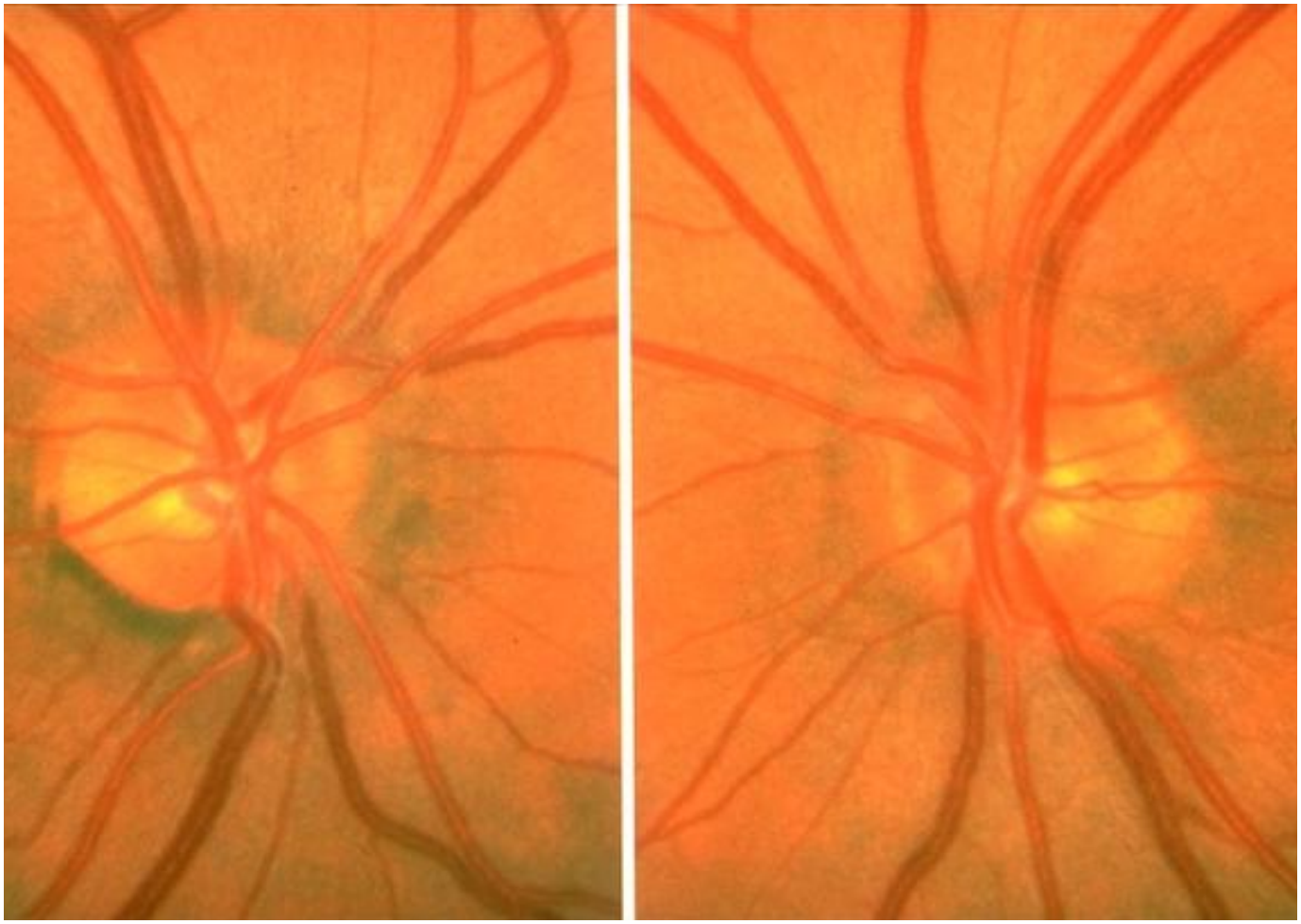
Healthy neuroretinal rim



Thinning neuroretinal rim, elongated cup

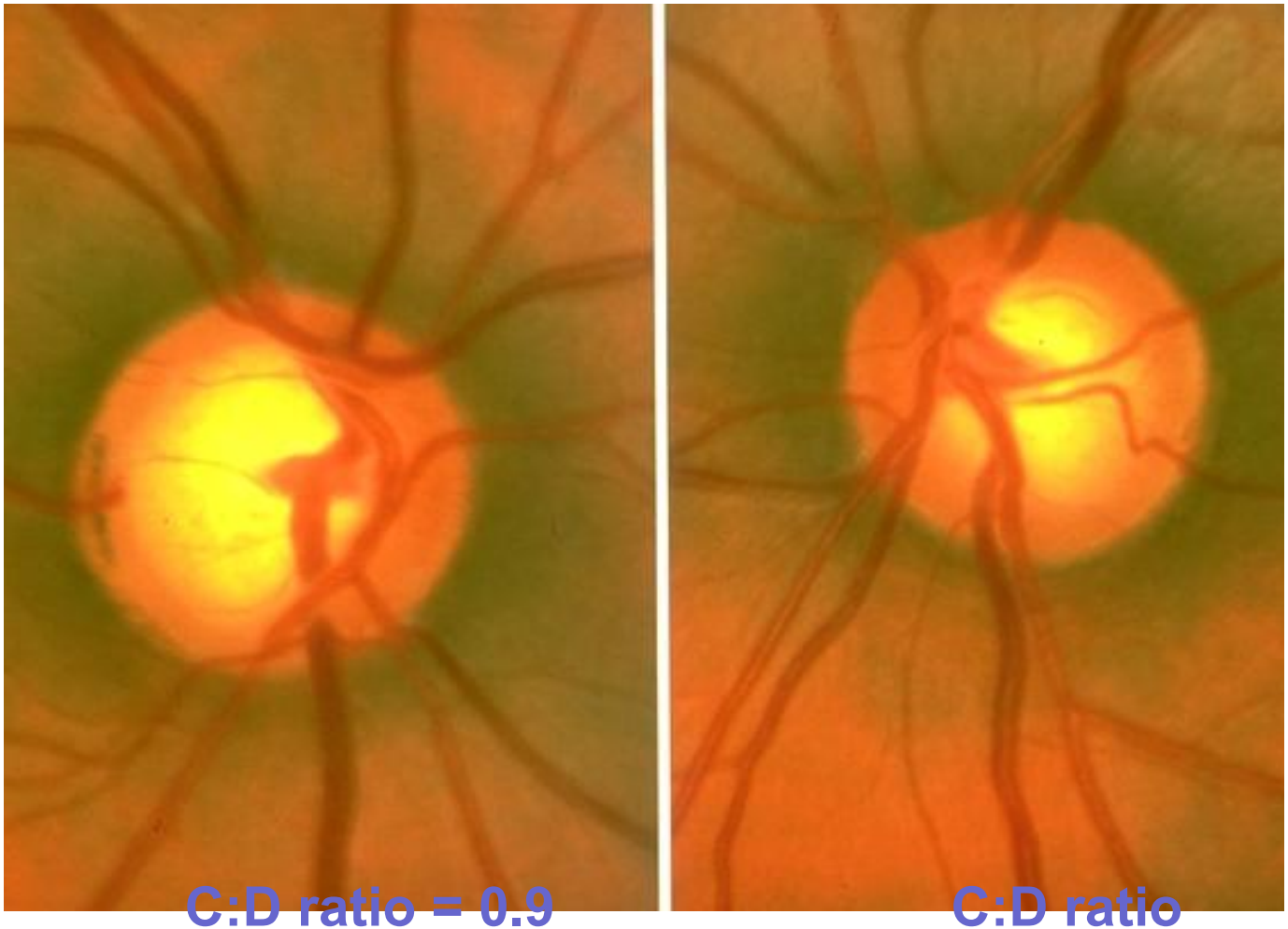


Groove or wedge defect in nerve fiber layer



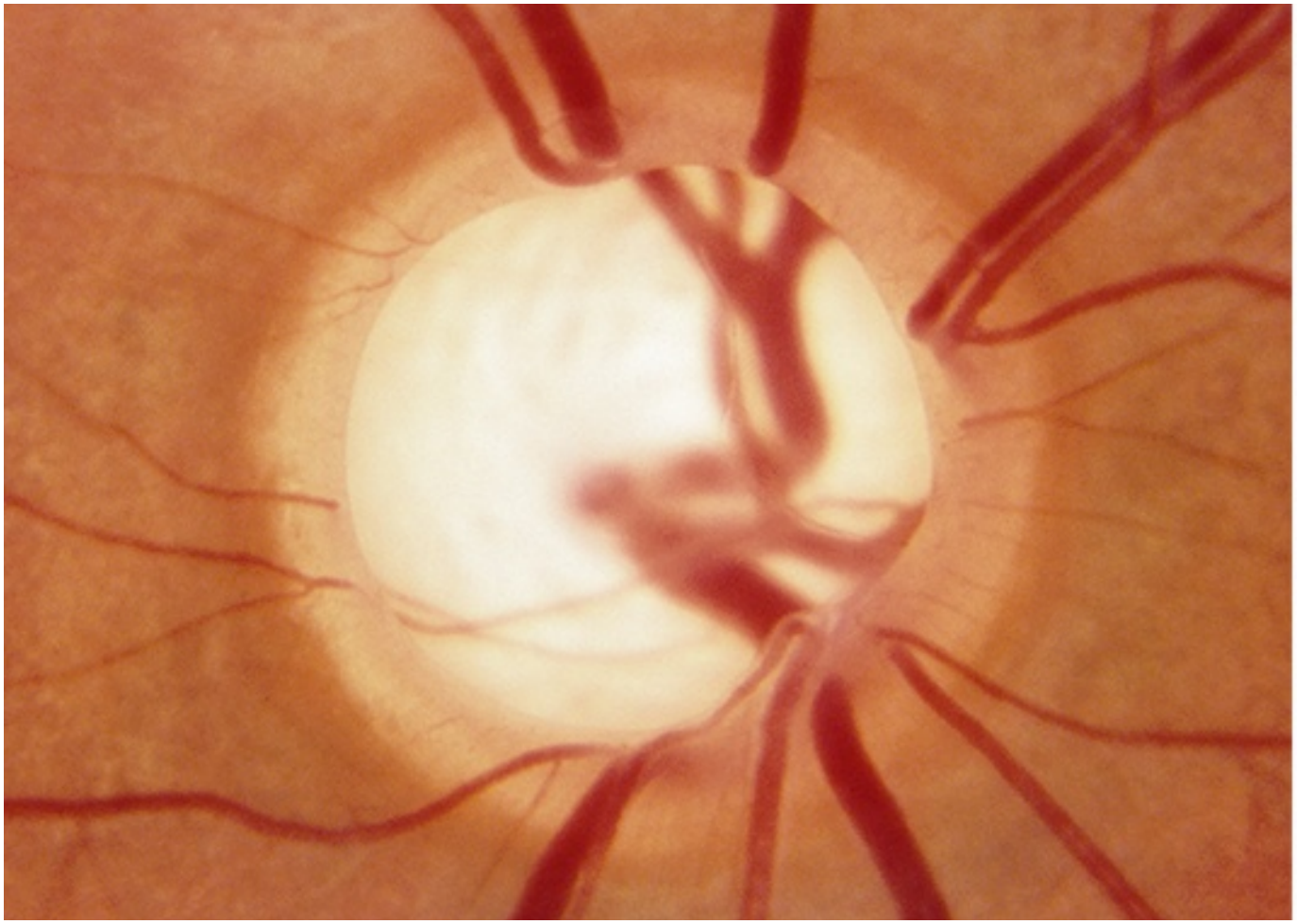
Healthy, symmetric optic nerves

Primary Open-Angle Glaucoma

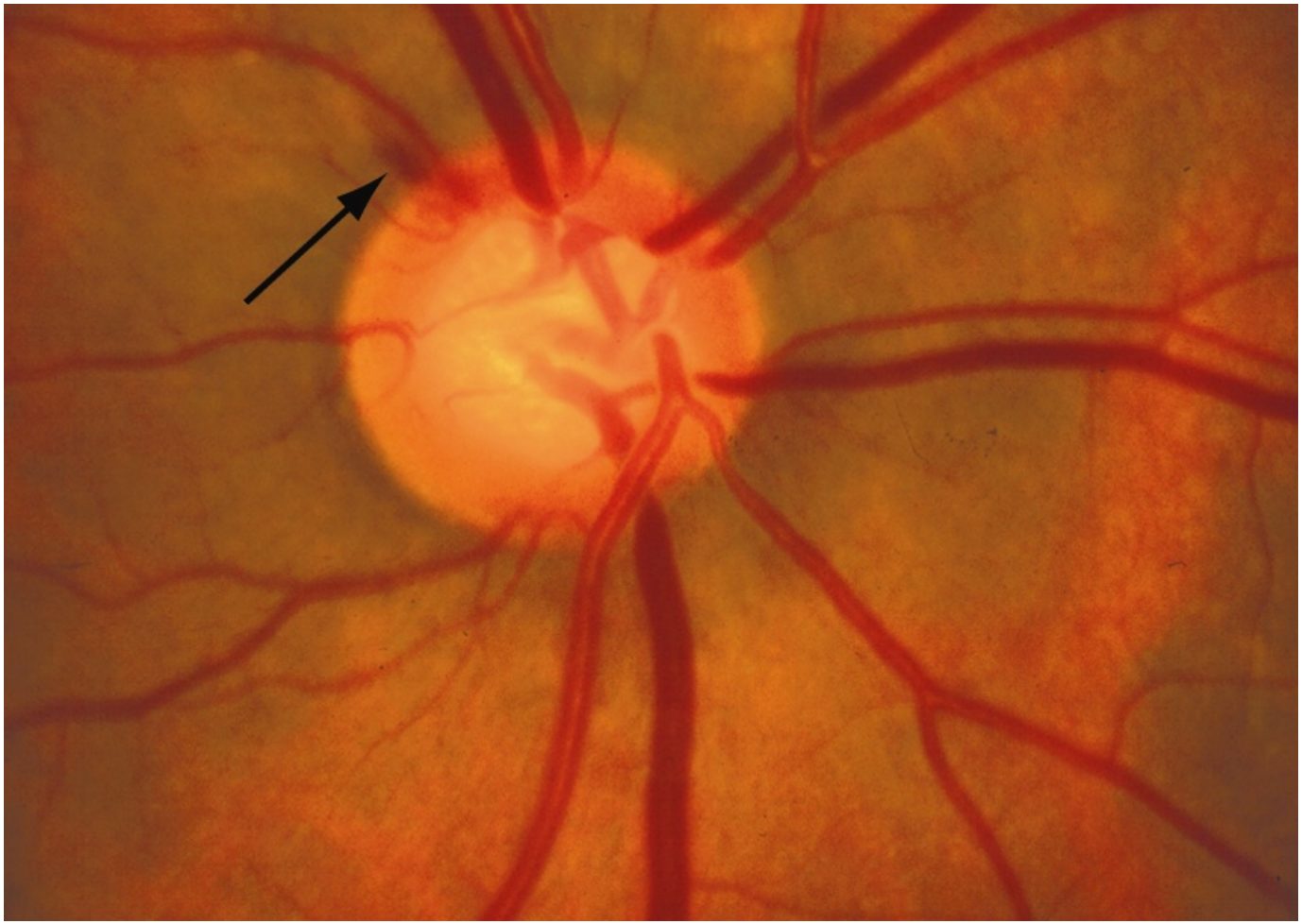


C:D ratio = 0.9

C:D ratio = 0.7

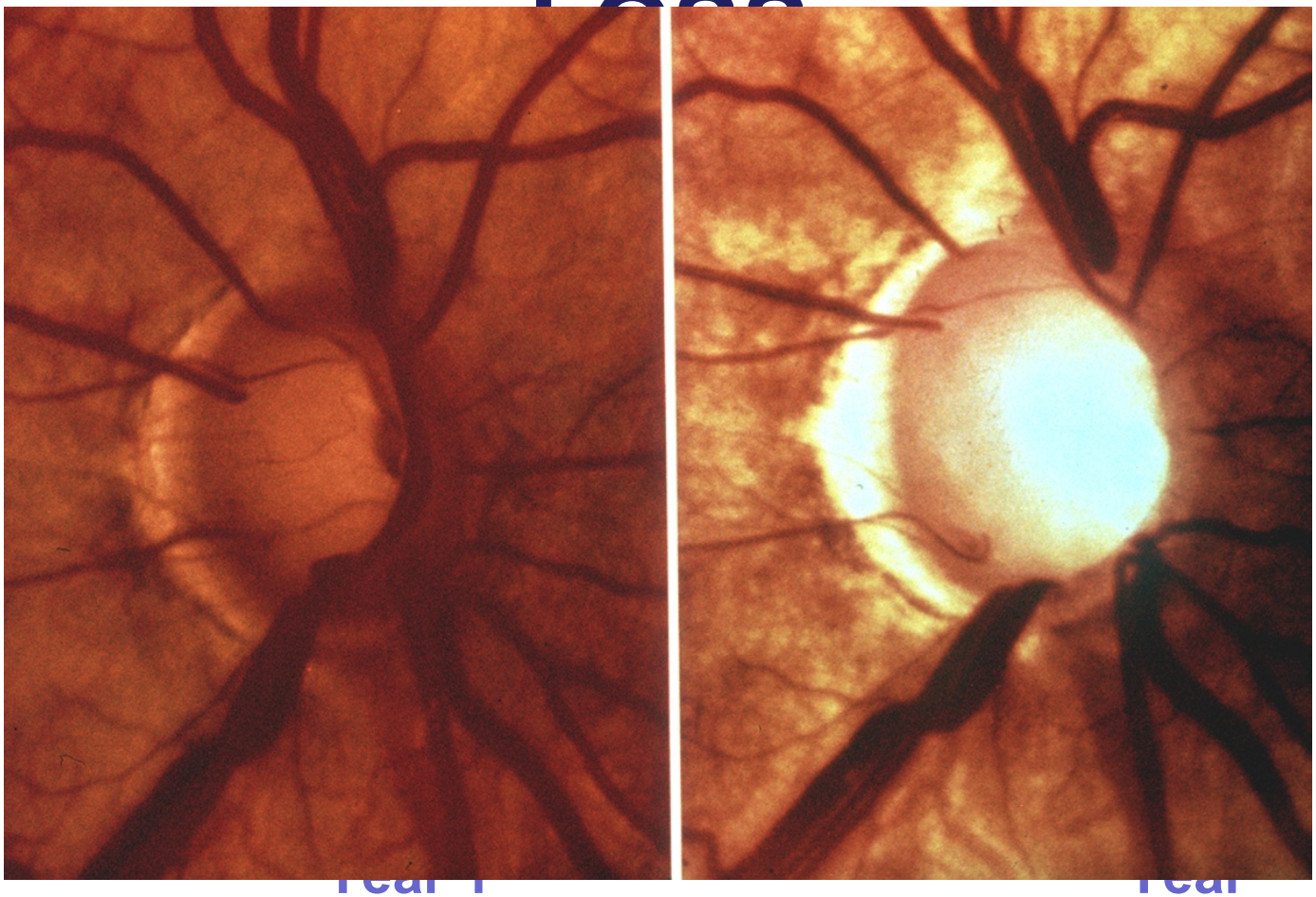


Extensive glaucomatous damage

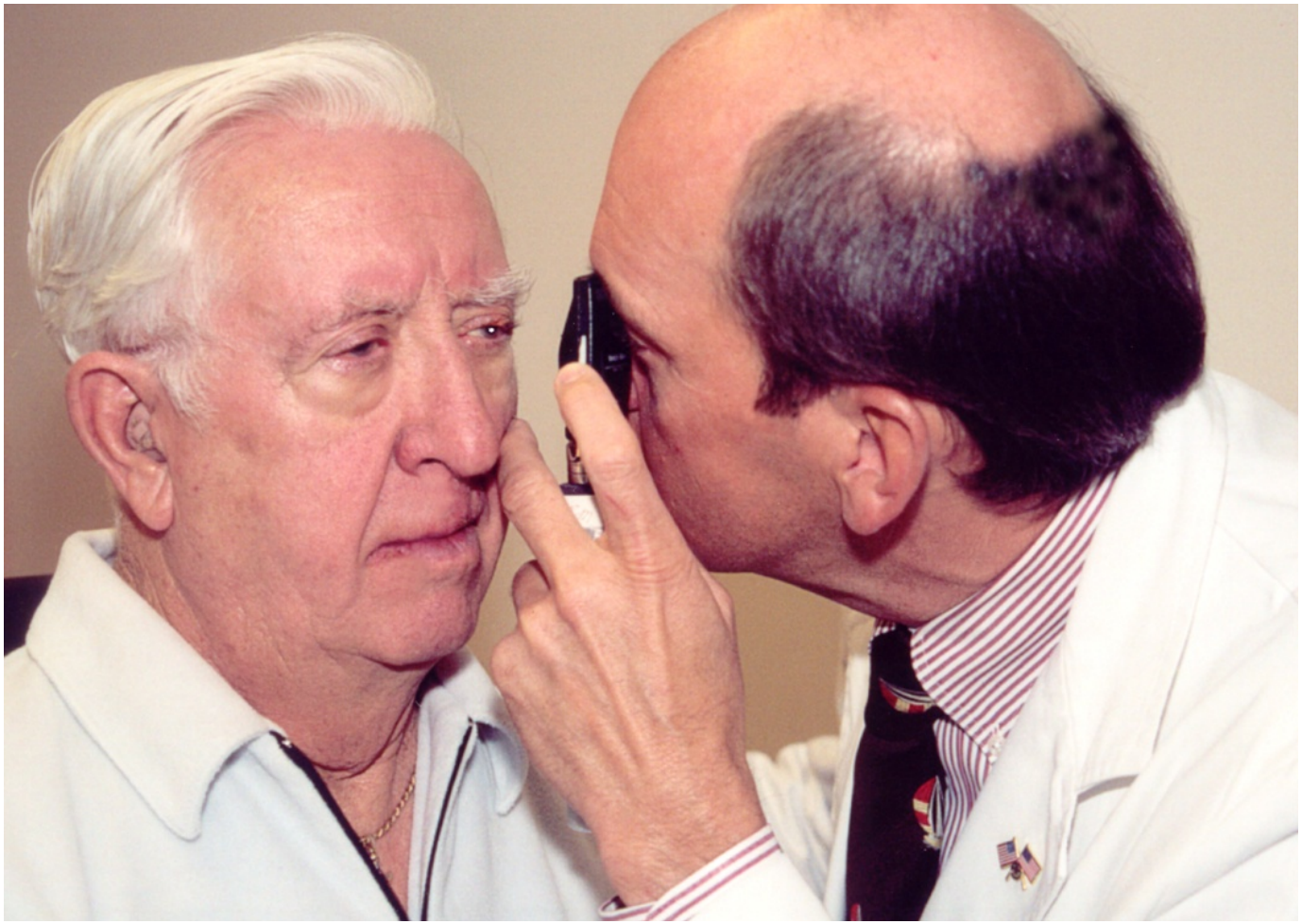


Flame-shaped disc hemorrhage

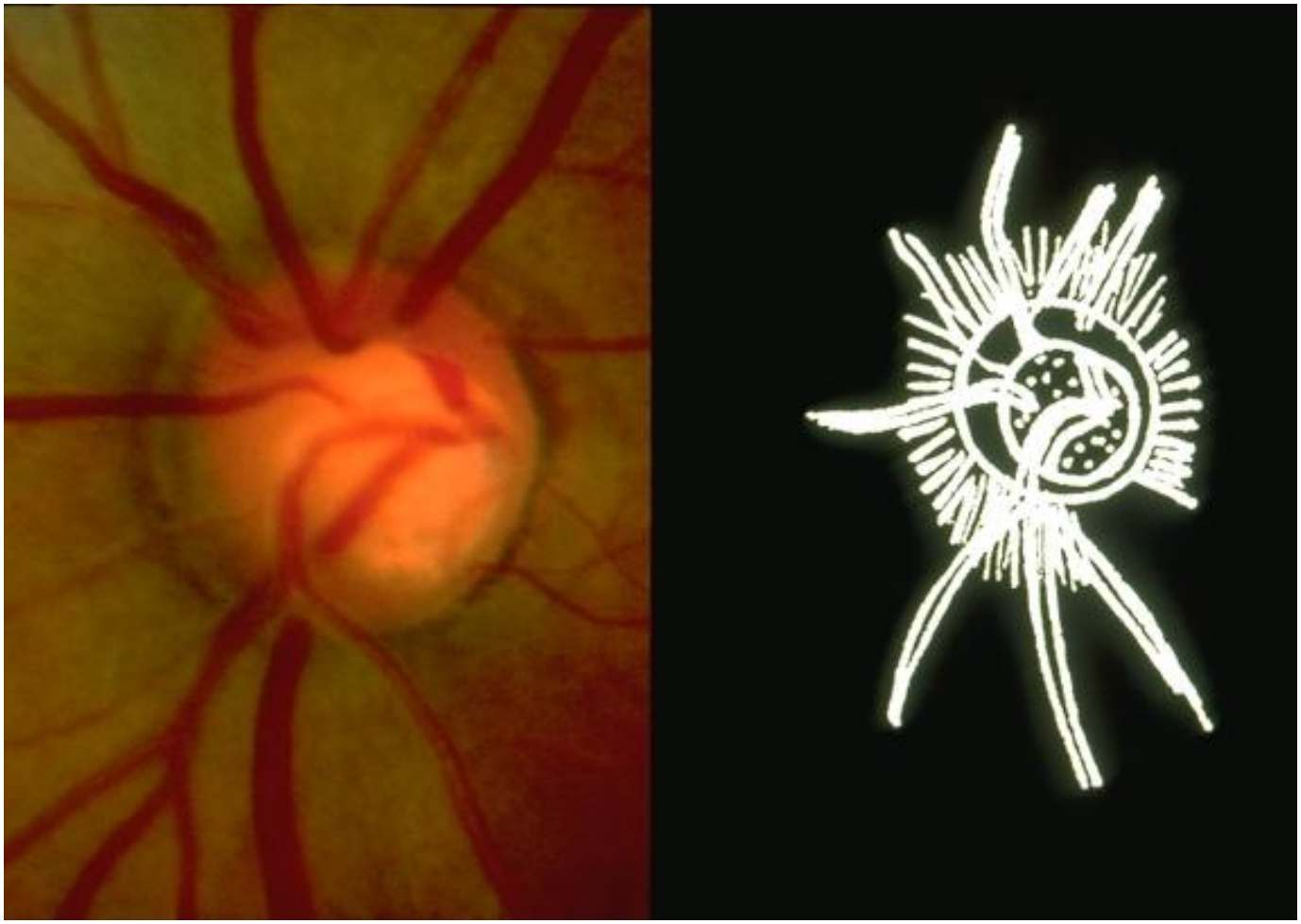
PROGRESSIVE NEURAL TISSUE LOSS



Year 1 Year 12

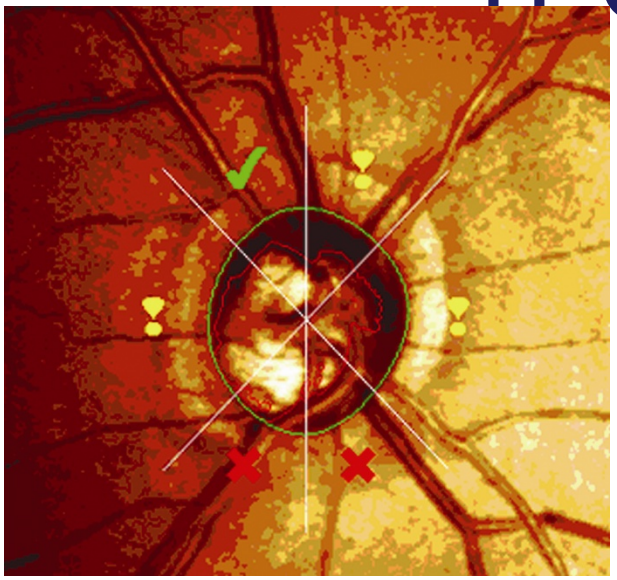


Evaluating optic disc

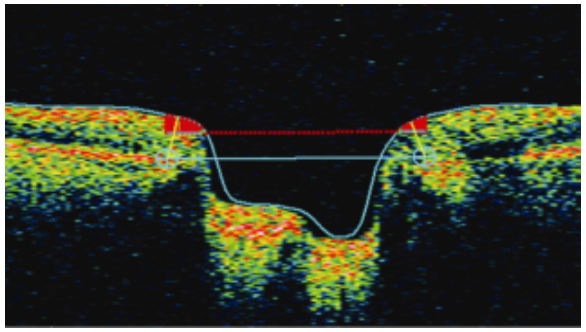


Record optic disc appearance in patient's chart.

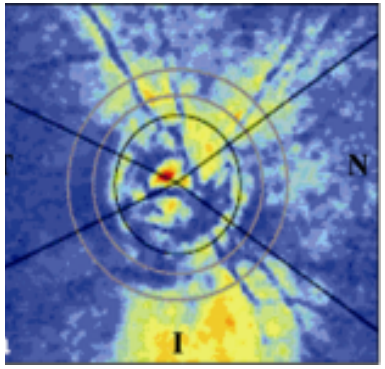
OPTICAL NERVE IMAGING: EXAMPLES OF NEW TECHNOLOGIES



Confocal scanning laser ophthalmoscopy



Optical coherence tomography

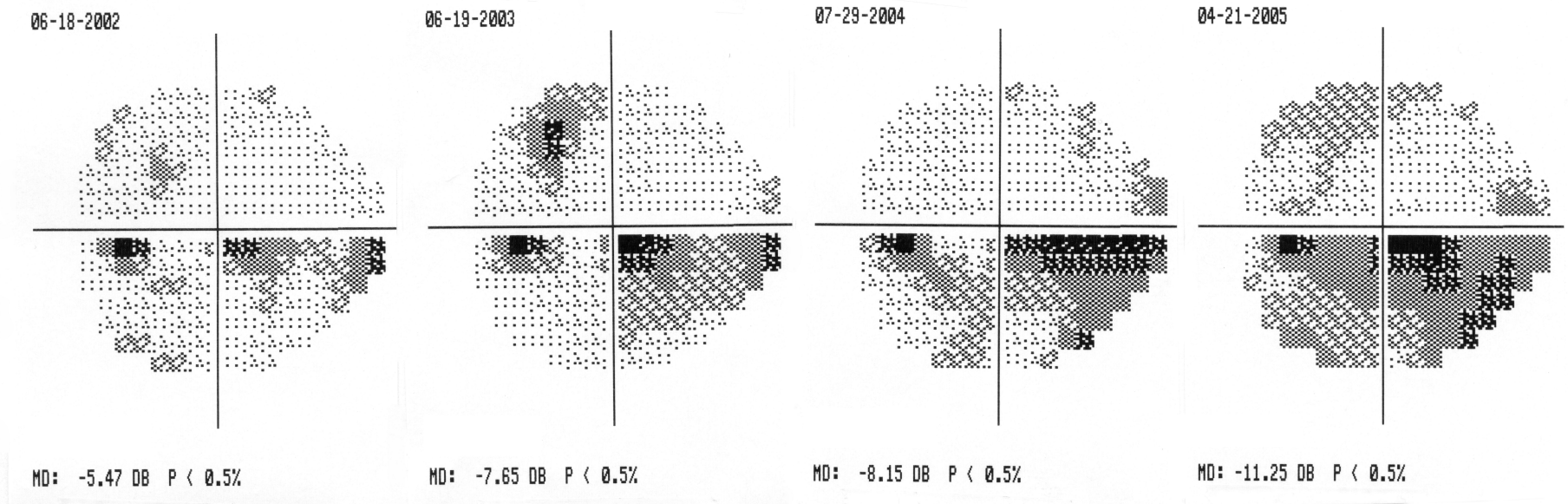


Scanning laser polarimetry

Normal visual field

Nasal visual field and midperipheral vision loss

Automated perimetry



Visual field test results over time: progressive scotoma

Pattern electroretinogram

POAG: GOAL OF TREATMENT

- Halt further visual loss
- Halt further optic nerve damage

Glaucoma medications decrease intraocular pressure by decreasing aqueous production or increasing outflow.

Topical beta-adrenergic antagonists

TOPICAL BETA BLOCKERS

- Nonselective
  - Timolol (Timoptic, Betimol, Istalol)
  - Levobunolol (Betagan)
  - Carteolol
  - Metipranolol (OptiPranolol)
- Selective beta-1 blocker
  - Betaxolol (Betoptic-S)

TOPICAL BETA BLOCKERS: POTENTIAL SIDE EFFECTS

- Congestive heart failure
- Bronchospasm
- Bradycardia
- Depression, confusion
- Impotence
- Worsening of myasthenia gravis

Topical adrenergic agonists

TOPICAL ADRENERGIC AGONISTS

- Epinephrine (Epifrin)
- Dipivefrin (Propine)
- Alpha-2 agonists
  - Apraclonidine (Iopidine)
  - Brimonidine (Alphagan-P)
  - Combination brimonidine and beta-blocker (Combigan)

TOPICAL ADRENERGIC AGONISTS: POSSIBLE SIDE EFFECTS

- Systemic
  - Decreased BP
  - Drowsiness
  - Fatigue
  - Dry mouth
- Ocular
  - Burning on instillation
  - Conjunctival injection
  - Pupillary dilation
  - Allergic or toxic reactions

Topical cholinergic agonists

TOPICAL CHOLINERGIC AGONISTS

- Short-acting
  - Pilocarpine (drops and gel)
  - Carbachol
- Long-acting
  - Echothiophate iodide
    (Phospholine Iodide; limited availability)

TOPICAL CHOLINERGIC AGONISTS: SIDE EFFECTS

- Systemic
  - Increased bronchial secretion
  - Nausea, vomiting
  - Diarrhea
  - Apnea*
- Ocular
  - Increased myopia
  - Eye or brow pain
  - Decreased vision

*With acetylcholinesterase inhibitors after succinylcholine administration

Systemic carbonic anhydrase inhibitors

CARBONIC ANHYDRASE INHIBITORS

- Oral
  - Acetazolamide (Diamox)
  - Methazolamide (Neptazane)
  - Dichlorphenamide (Daranide)
- Topical
  - Dorzolamide (Trusopt)
  - Brinzolamide (Azopt)

Topical carbonic anhydrase inhibitors

CARBONIC ANHYDRASE INHIBITORS: SIDE EFFECTS

- Malaise, anorexia, depression, paresthesias
- Serum electrolyte abnormalities
- Renal calculi
- Blood dyscrasias

Prostaglandin analogs

PROSTAGLANDIN ANALOGS: SIDE EFFECTS

- Conjunctival hyperemia
- +Iris pigmentation
- Eyelash growth
- Periocular skin pigmentation

Use with caution in patients with cystoid macular edema and history of uveitis.

Inhibiting systemic absorption of eye drops by occluding lacrimal puncta

PATIENT COMPLIANCE IMPROVED WITH

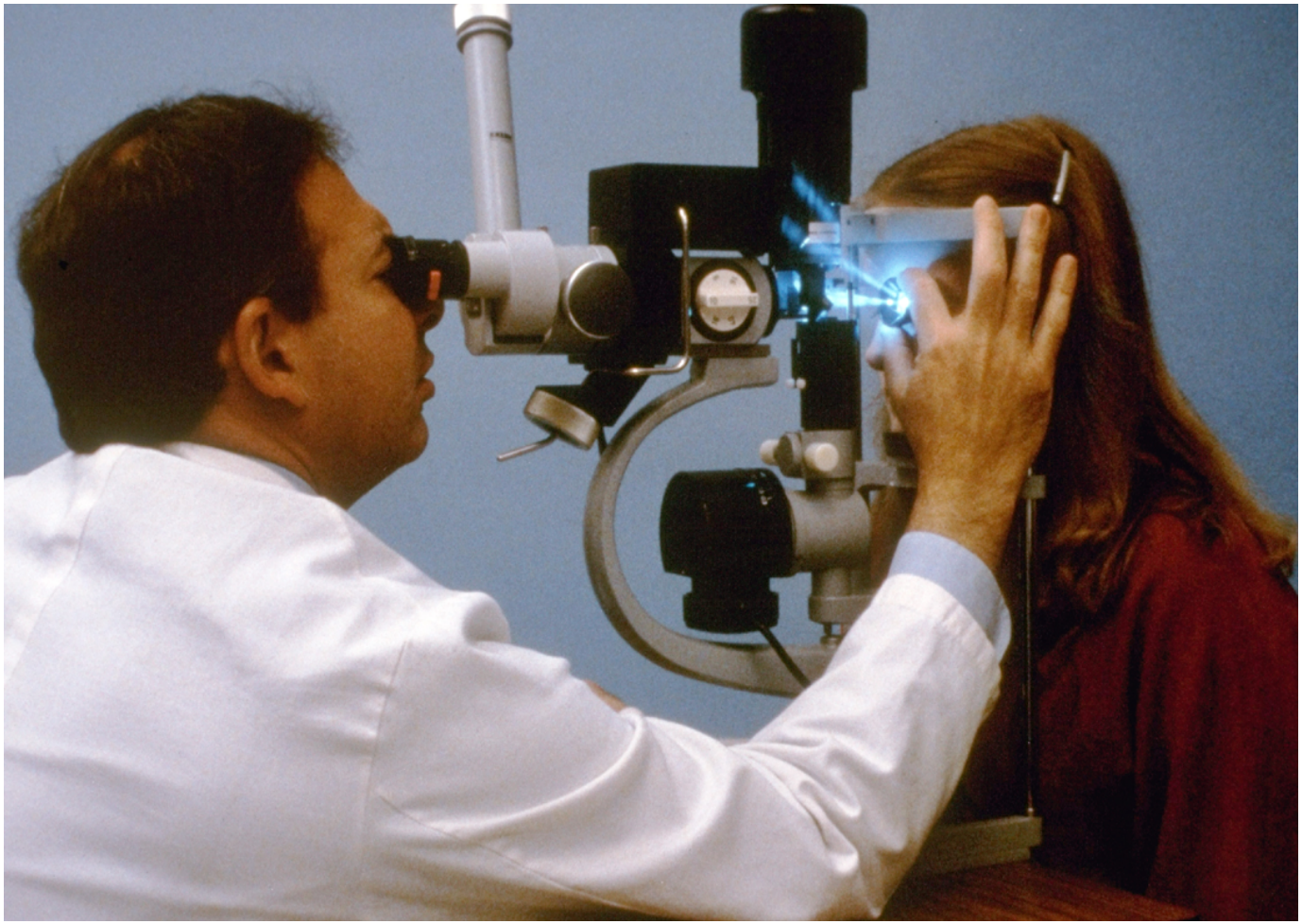
- Patient education
- Informed participation in treatment decisions

WHY MEDICAL THERAPY MAY FAIL

- Target pressures not low enough
- Poor patient compliance
- Fluctuations of IOP with medicines

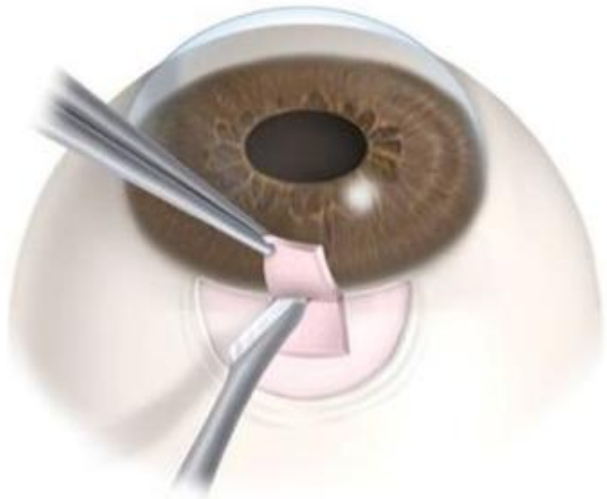
GLAUCOMA: SURGICAL PROCEDURES

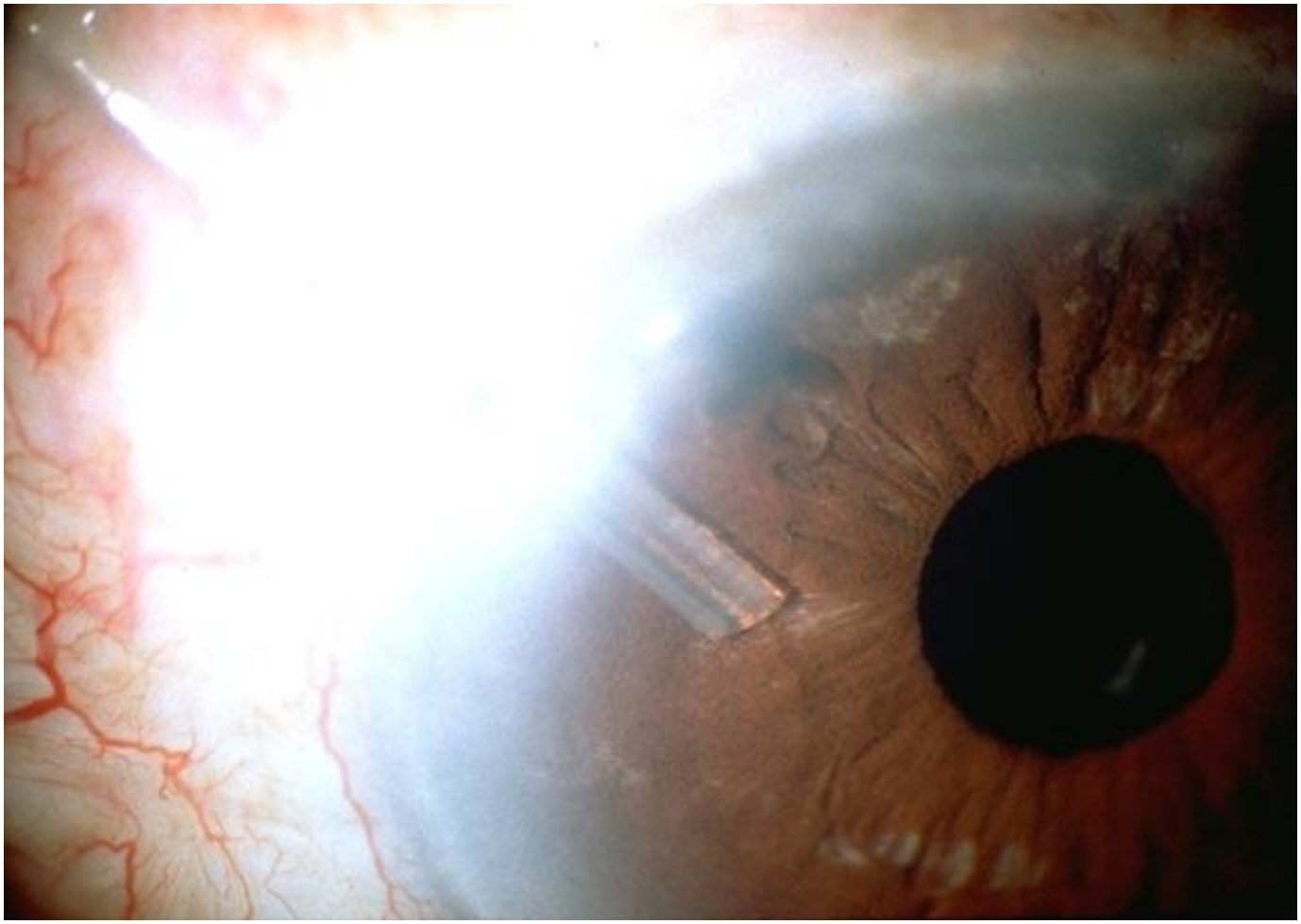
- Laser trabeculoplasty
- Filtering surgery (trabeculectomy)
- Drainage implant surgery
- Cyclophotocoagulation



Laser trabecular surgery

FILTERING SURGERY





Drainage implant

Glaucoma can be controlled but not cured!

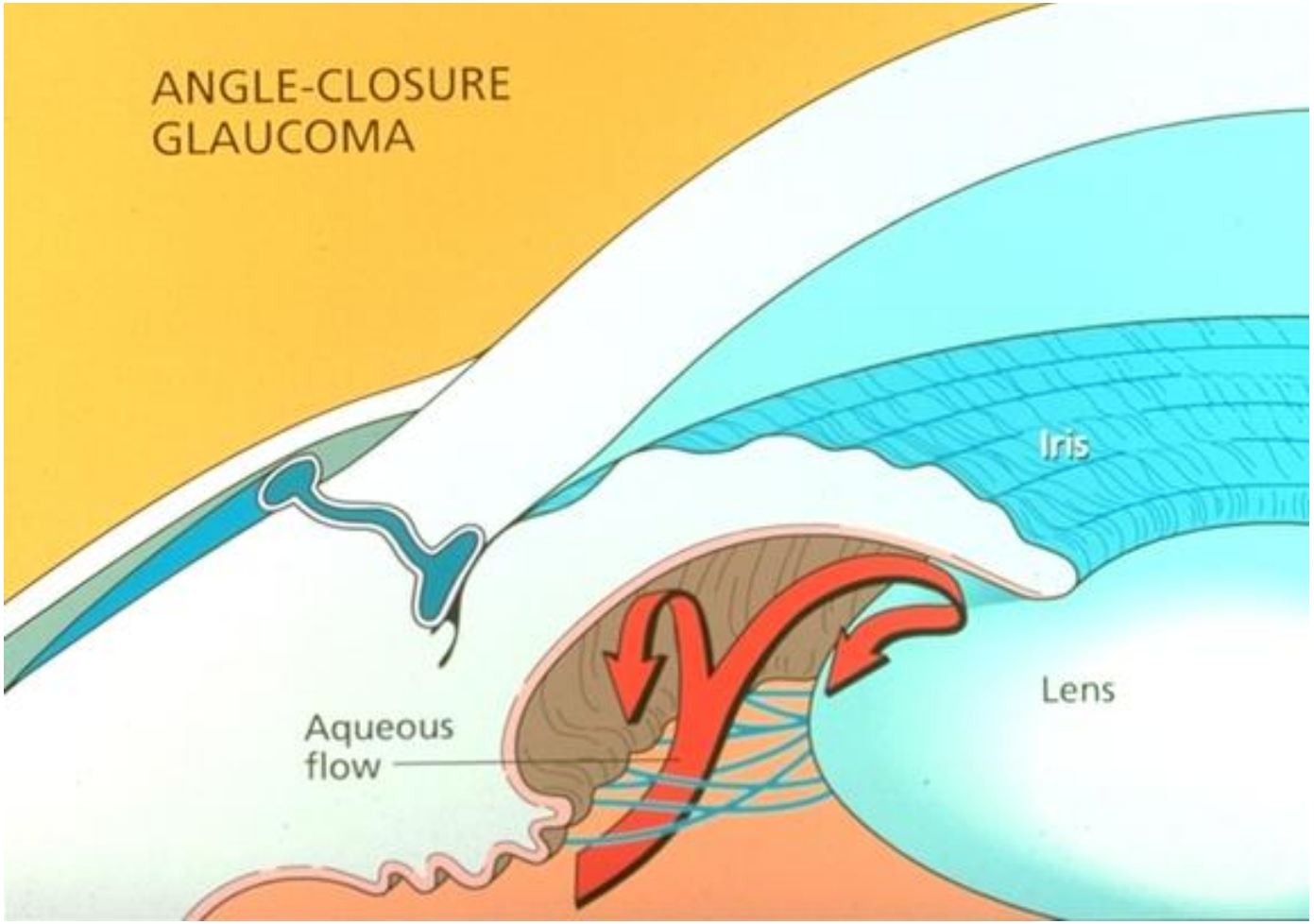
POTENTIAL NEUROPROTECTIVE AGENTS

- Protect ganglion cells from apoptosis
- Glutamate blockers

ANGLE-CLOSURE GLAUCOMA: HIGH-RISK GROUPS

- Elderly
- Hyperopic patients
- Positive family history of angle closure
- Females
- Eskimos
- Asians

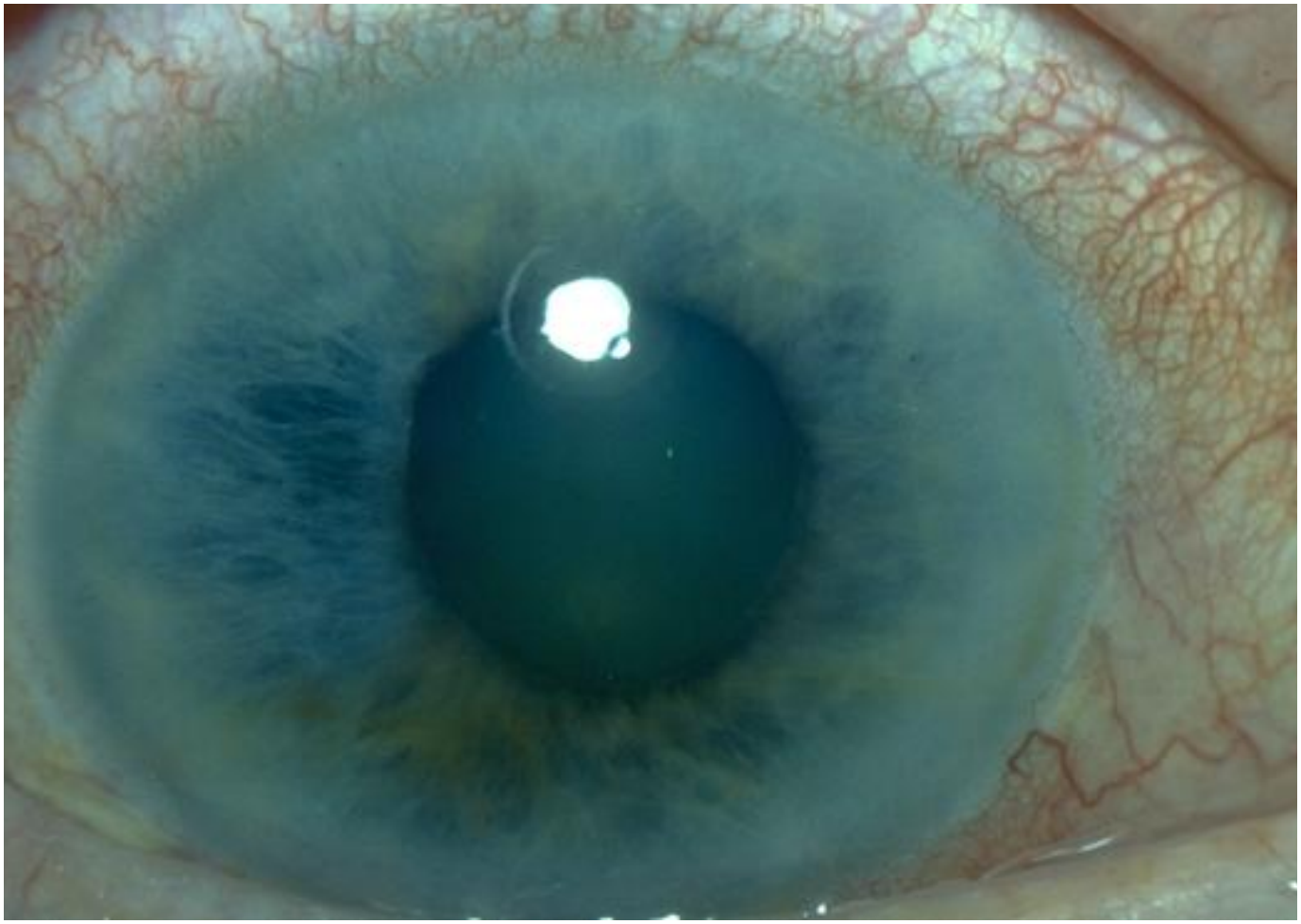
Angle-Closure Glaucoma



Penlight examination of chamber angle

ACUTE GLAUCOMA: SYMPTOMS AND DIAGNOSIS

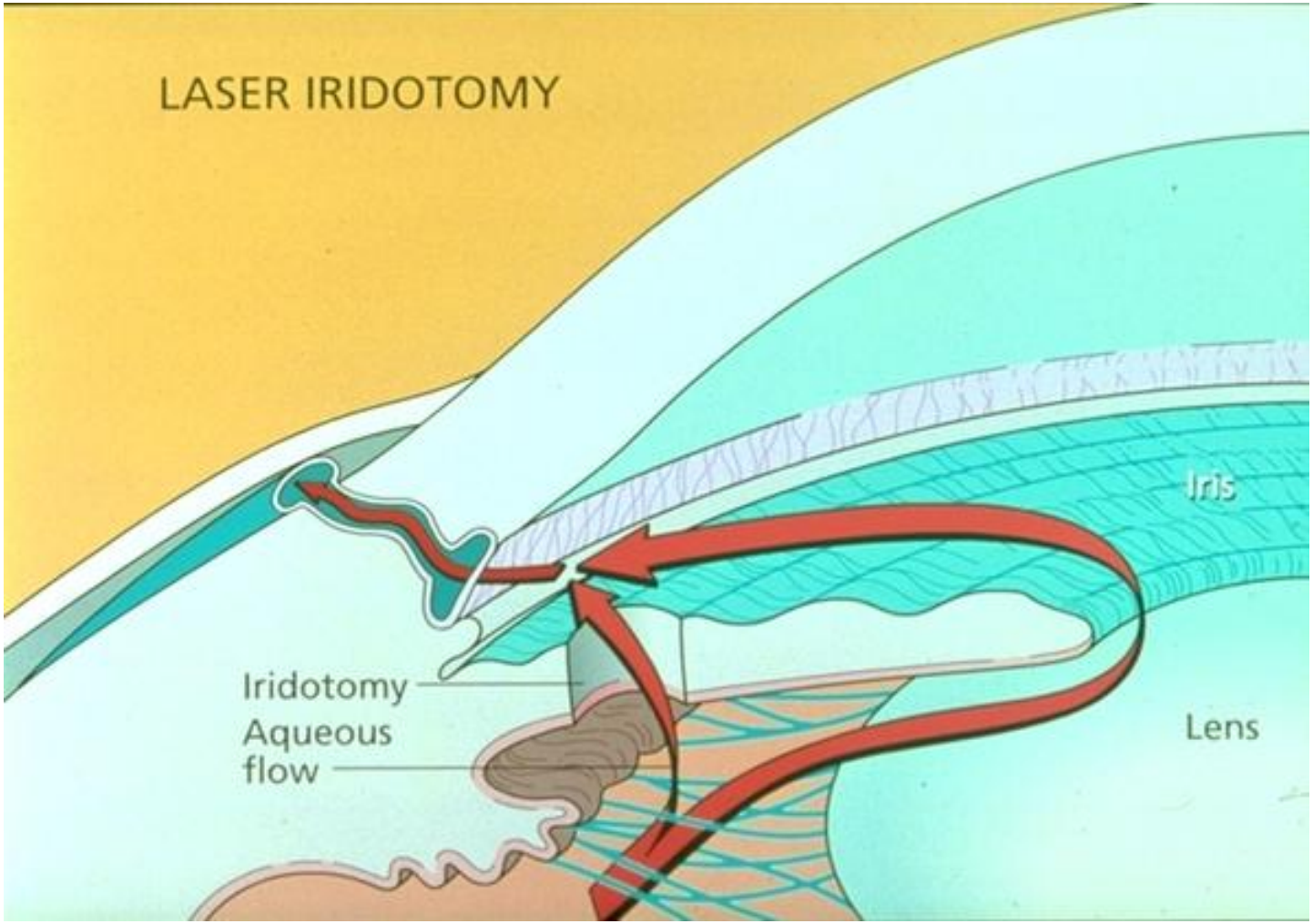
- Severe ocular pain, redness
- Blurred vision
- Halos around lights
- Headache
- Nausea and vomiting
- Diagnosis aided by gonioscope exam



Acute angle-closure glaucoma

Acute angle-closure glaucoma is an emergency!

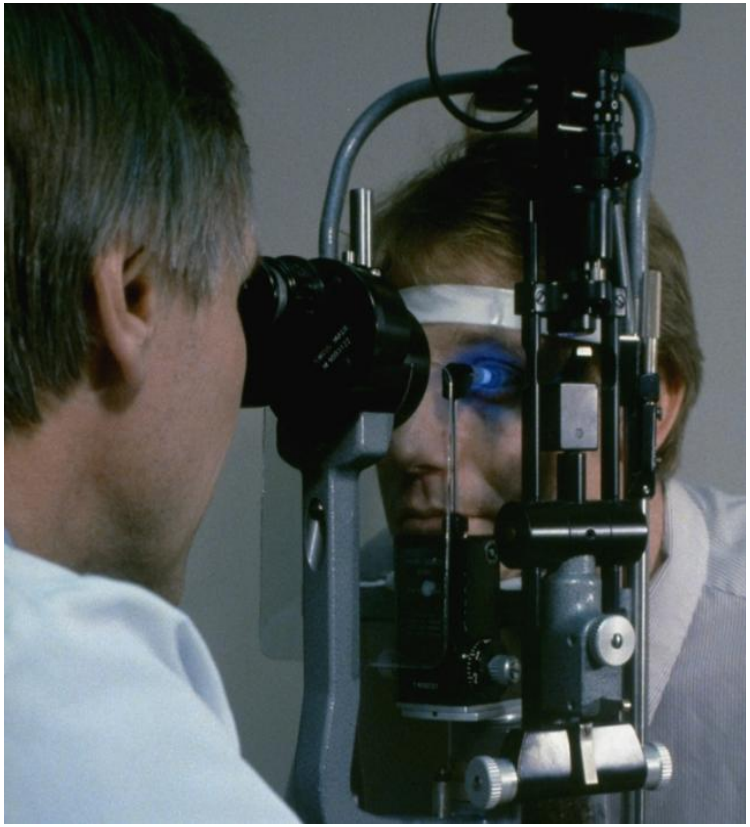
Angle-Closure Glaucoma



Incisional iridectomy

ACUTE GLAUCOMA: EMERGENCY MEDICAL CARE

- Evaluate patient
- Measure IOP
- Initiate medical treatment



Goldmann tonometry

Hand-held tonometer

ACUTE GLAUCOMA: INITIAL TREATMENT

- Pilocarpine 2% gtt q 15 min x 2
- Timolol maleate 0.5% gtt
- Apraclonidine 0.5% gtt
- Acetazolamide 500 mg po or IV
- IV mannitol 20%, 1.5–2 g/kg/body weight, infused over 30–60 min

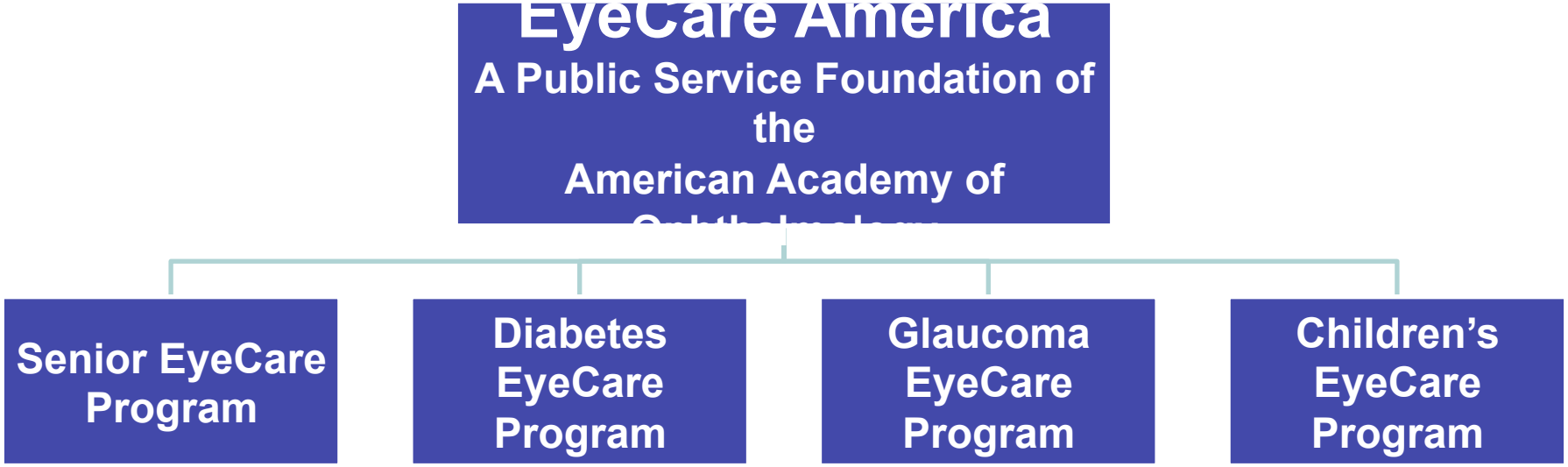
FELLOW EYES: MANAGEMENT

- At risk for acute angle-closure glaucoma
- Prophylactic iridotomy if chamber angle is narrow
- Miotics are not a substitute for iridotomy

Angle-closure glaucoma requires long-term follow-up.

Primary care providers are essential in the diagnosis and management of glaucoma.

EYECARE AMERICA: COMMITTED TO THE PRESERVATION OF SIGHT



THE GLAUCOMA EYECARE PROGRAM

Designed for people who:

- Are US citizens or legal residents
- Have not had an eye exam in 12 months or more
- Are at increased risk for glaucoma (family history, race, age)
- Do not have eye care insurance through an HMO or the VA

THE GLAUCOMA EYECARE PROGRAM

Promotes early detection and treatment of glaucoma.

- Provides glaucoma eye exams to at-risk, eligible callers (family history, age, and race)
- Uninsured patients are examined at no charge
- Insured patients are billed and responsible for any co-payment and/or deductible

GLAUCOMA EYECARE PROGRAM: EXAM AND CONTINUING CARE

- Patients seen as soon as possible after referral
- Continuing care for up to 1 year for eligible patients through Seniors Program

EYECARE AMERICA HELP LINE: INFORMATION AND PATIENT REFERRAL

1-800-391-EYES

(1-800-391-3937)