Medical management of glaucoma

What happens prior to the OR?

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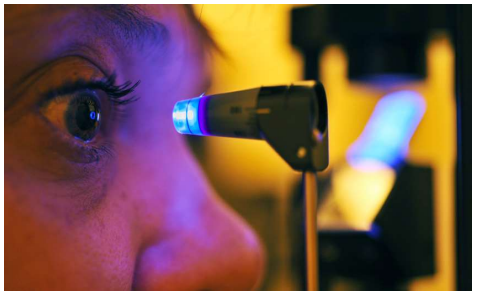
Overview

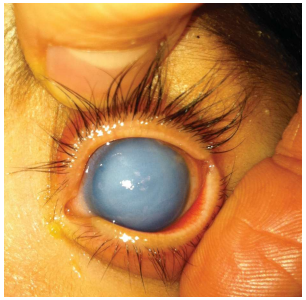
1. What is glaucoma?
2. Relevant anatomy
3. Classification of glaucoma
4. Clinical workup
5. Medical management



What is glaucoma?

- Epidemiology
  - worldwide prevalence ~ 3.5% in those > 40 yrs old

- What is it?
  - group of disorders: **progressive** injury to optic nerve (optic neuropathy): resulting in particular patterns of vision loss



https://www.aao.org/education/image/elevated-iop-in-pediatric-patient

Intraocular Pressure

- What is IOP?
  - describes amount of aqueous humor (production vs outflow)
    - produced 2-3 yL/min via ciliary processes —> leaves via trabecular meshwork

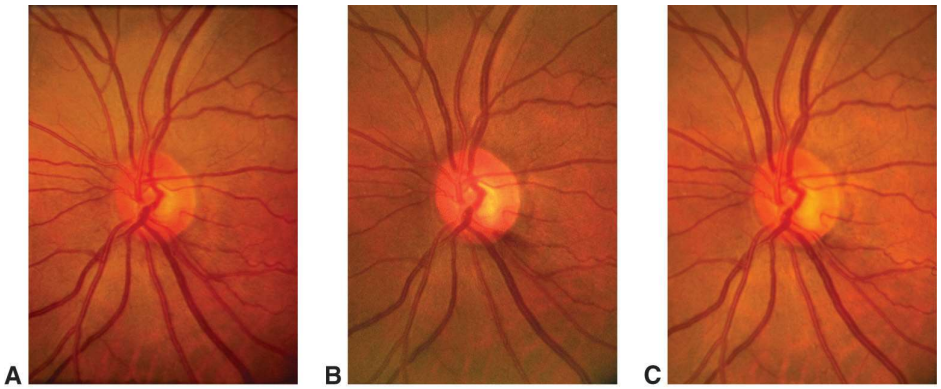
- What is normal IOP?
  - range ~ 10-21
    - fluctuates: diurnal fluctuation 2-6 mmHg
    - glaucomatous eyes >10 mmHg variation
  - differences in IOP are usually painless (unless significantly elevated)

- IOP: target of intervention via medical or surgical intervention
  - Goal: maintain/ slow progression, primarily via visual field

Chandler and Grant's Glaucoma, edited by Malik Kahook, and Joel Schuman, SLACK Incorporated, 2012. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/nyu-library-ebooks/detail.action?docID=840477&Created from nyulibrary-ebooks on 2018-02-05 17:39:47. figures 6-1 and 6-4.

Clinical Workup

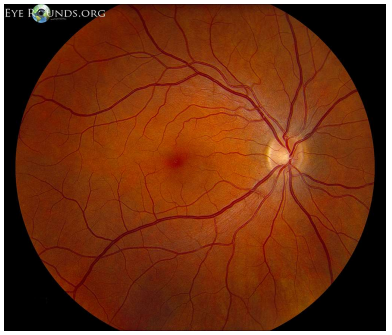
- Clinical exam: tonometry, gonioscopy/ anterior segment exam & funduscopic exam
- Corneal studies e.g. pachymetry
- Imaging
  - OCT: retinal nerve fiber layer (RNFL) & macula, angiography
  - anterior segment: OCT, UBM
- Visual fields

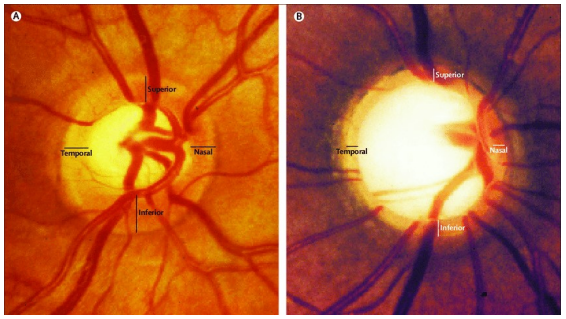


Courtesy of Angelo P. Tanna, MD. https://www.aao.org/education/image/localized-loss-of-neuroretinal-rim

Optic Nerve

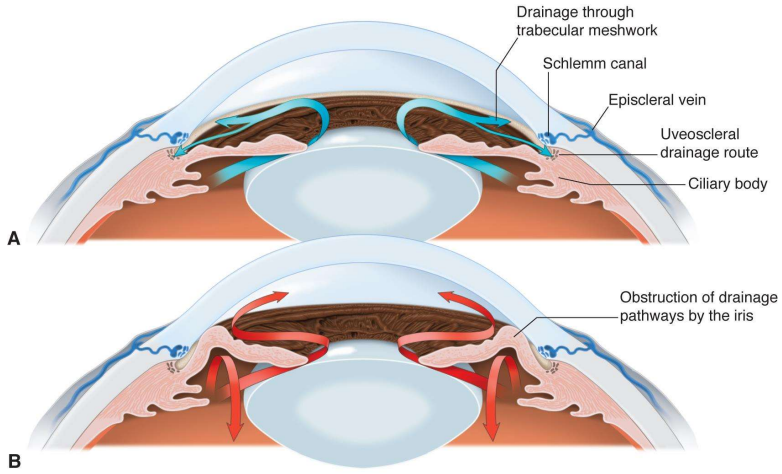
- Optic nerve: 1.2-1.5 million axons





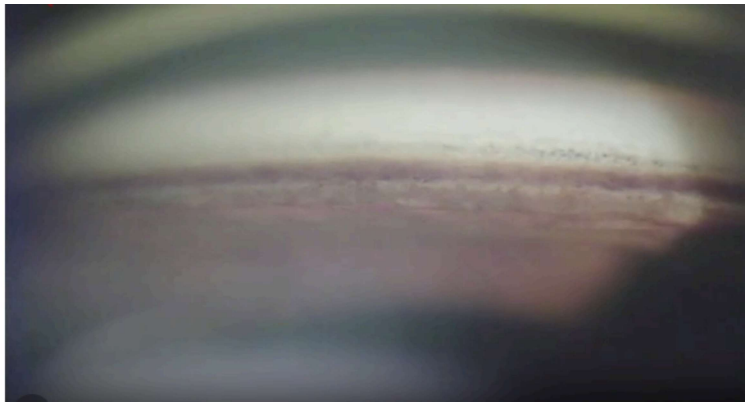
Jonas, Jost & Aung, Tin & Bourne, Rupert & Bron, Alain & Ritch, Robert & Panda-Jonas, Songhomitra. (2017). Glaucoma. The Lancet. 390. 10.1016/S0140-6736(17)31469-1. Figure 1

Normal Angle Anatomy



https://www.aao.org/education/image/aqueous-humor-flow-

Gonioscopic view



http://gonioscopy.org/cases/normal-angle/normal-pigmented-angle.htm

OCT of the Optic Nerve

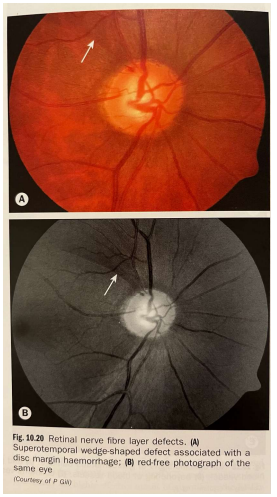
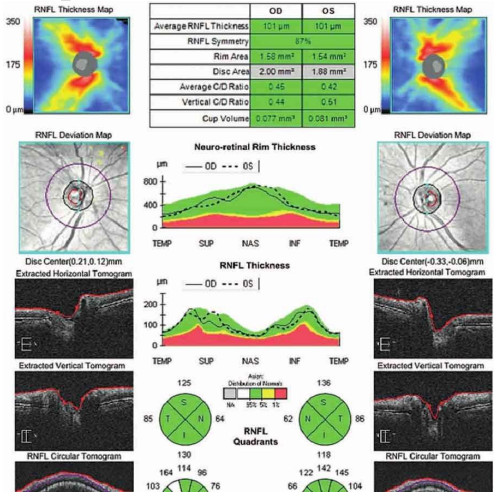
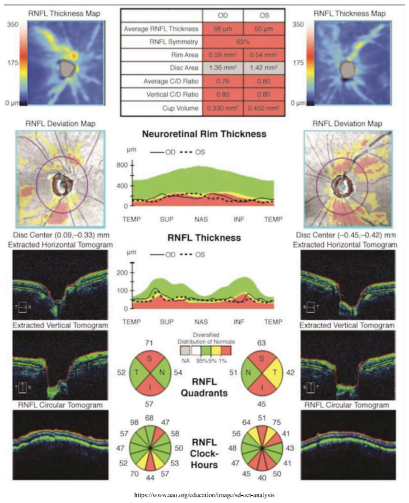


Fig. 10.20 Retinal nerve fibre layer defects. (A) Superotemporal wedge-shaped defect associated with a disc margin haemorrhage; (B) red-free photograph of the same eye

(Courtesy of P. Gili)





https://www.aao.org/education/image/ndc-ocs-analysis

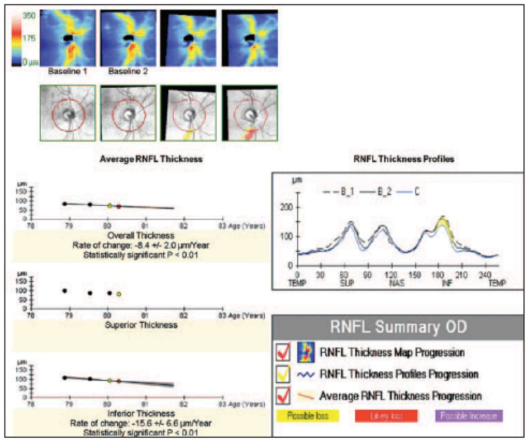
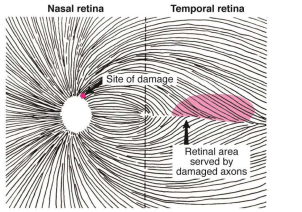


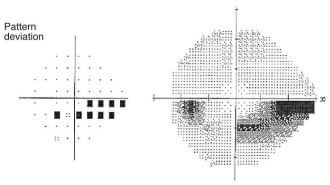
Figure 9-21. RNFL progression analysis for a glaucoma patient showing likely progression (obtained with Cirrus HD-OCT Optic Disc Cube 200 × 200 scan).

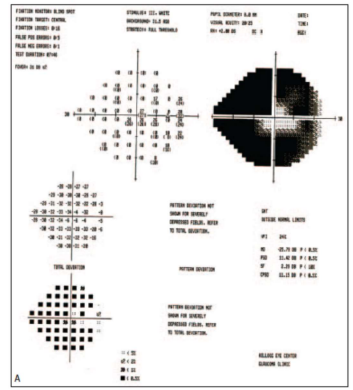
Chandler and Grant's Glaucoma, edited by Malik Kahook, and Joel Schuman, SLACK Incorporated, 2012, ProQuest Ebook Central,http://ebookcentral.proquest.com/lib/nyulibrary-ebooks/detail.action?docID=3404779.Created from nyulibrary-ebooks on 2018-02-05 17:39:47.

Visual Fields

- structural damage—> functional change
- patients are unable to detect changes early in disease process







Chandler and Grant's Glaucoma, edited by Malik Kahook, and Joel Schuman, SLACK Incorporated, 2012, ProQuest Ebook Central,http://ebookcentral.proquest.com/lib/nyulibrary-ebooks/detail.action?docID=3404779. Created from nyulibrary-ebooks on 2018-02-05 17:39:47. figure 11-11.

Classification of Glaucoma

Anatomic classification

open angle

Primary open angle
- Low tension glaucoma
- JOAG- juvenile open angle glaucoma

Secondary open angle glaucoma e.g.:
- Pigmentary glaucoma
  - Pseudoexfoliation
  - Pigment dispersion
- Elevated episcleral venous pressure
- Steroid induced

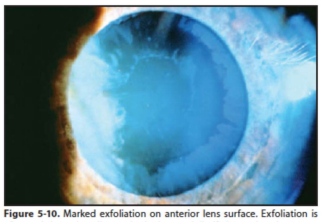


Figure 5-10. Marked exfoliation on anterior lens surface. Exfoliation is often subtle and easily overlooked, especially if the patient is not re-examined at the slit-lamp after dilation.

closed angle

Primary angle closure
- Acute angle closure
- Chronic angle closure

Secondary angle closure
- e.g. uveitic glaucoma (PAS)

Primary Open Angle Glaucoma

- Prevalence: 1.86% (95% CI 1.75- 1.96%) US population > 40 = 2.2 million
- Risk factors
  - age
  - family history
  - high myopia (~ defined as > -6D): delayed diagnosis
  - ethnicity: AA
  - thin corneas (CCT, pachymetry): falsely low, +/- structural differences in lamina cribrosa
  - sex (?)

Medical Management

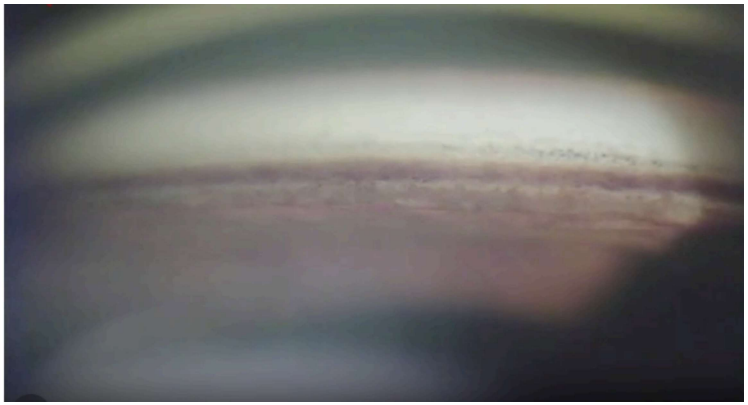
Considerations:
- cost
- side effects: systemic and local toxicity
- adherence

	gtt dosing	mechanism	side effects	top color
Prostaglandin analogues latanoprost, bimatoprost, travoprost, tafluprost, latanoprostene budnod	qHS	increase uveoscleral outflow	- hyperemia - loss of peri orbital fat - darkening of iris/ skin - eyelash growth - considerations for inflammatory states	teal
Beta blockers timolol, betaxolol, cartelol	qAM or BID	decrease production of aqueous humor	- bradycardia/hypotension - CNS depression/fatigue - masking of hypoglycemia - bronchospasm	yellow
Carbonic anhydrase inhibitors dorzolamide, brinzolamide oral: acetazolamide, methazolamide	BID-TID	decrease production of aqueous humor	- renal dysfunction, metabolic acidosis, hypokalemia - GI discomfort, sickle cell crises - sulfa allergy - oral: lage fluid shifts	orange

Medical Management

	gtt dosing	mechanism	side effects	top color
Alpha adrenergic agonists brimonidine, apraclonidine	BID-TID	decrease production of aqueous humor, Incr. uveoscleral outflow	- local allergy: follicular conjunctivitis - vasoconstriction (desirable- Lumify) - NOT to be used in young children (risk central apnea) - dry mouth	purple
Rho Kinase inhibitors rhopressa	qHS	improve uveoscleral outflow	injection	white
Miotics pilocarpine, echothiophate	BID-QID	increases outflow via TM	myopia (desirable- Vuity)	green
Hyperosmotics mannitol, oral glycerol			large fluid shifts, risk of CHF, careful in diabetics	

Laser Trabeculoplasty



http://gonioscopy.org/cases/normal-angle/normal-pigmented-angle.htm

Primary Angle Closure

- risk factors for angle closure:
  - age
  - sex: f
  - hyperopes
  - Inuit/ Asian descent
- narrow angles —> primary angle closure (acute angle closure attack) —> primary angle closure glaucoma

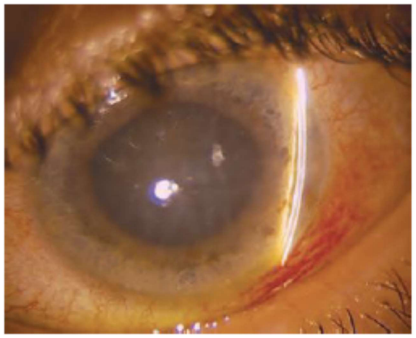


FIGURE 9.4.1. Acute angle-closure glaucoma with mid-dilated pupil and shallow anterior chamber.

Gerstenblith, Adam T.; Rabinowitz, Michael P., May 27, 2012, Wills Eye Manual : Office and Emergency Room Diagnosis and Treatment of Eye Disease, Wolters Kluwer Health, Philadelphia, ISBN: 9781451186024, Figure 9.1.1 ture 9.4.1

Slit lamp view: narrow angle

http://gonioscopy.org/cases/pupillary-block/narrow-angles-slit-lamp-only.htm

Gonioscopic view: narrow angle

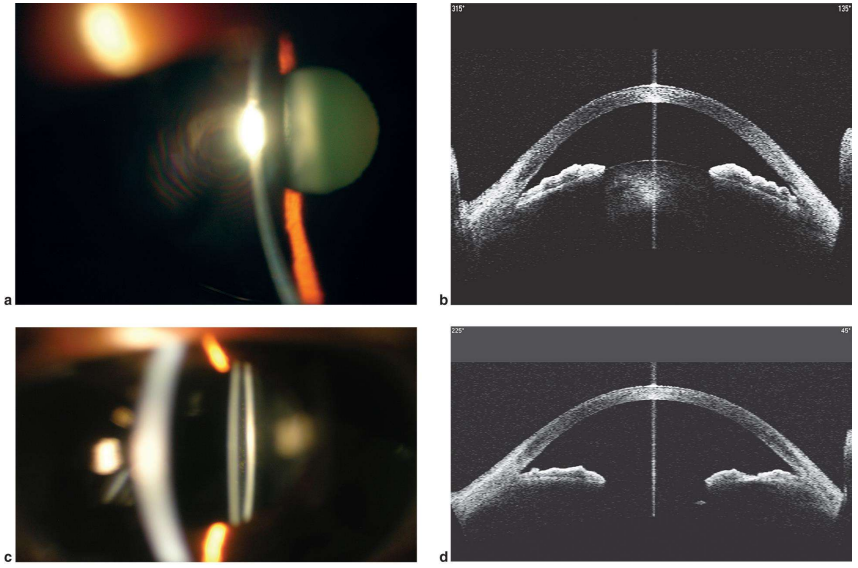
http://gonioscopy.org/cases/pupillary-block/narrow-angle-pupillary-block.htm

Acute Angle Closure

- Angle closure symptoms: photophobia, pain, nausea, decreased vision
  - signs: mid dilated pupil, injection , K edema , shallow AC, iris bombe

- RX: topical gtts, oral/ IV agents, LPI if able, trabeculoplasty, early cataract extraction

http://gonioscopy.org/cases/pupillary-block/pupillary-block.htm



https://www.aao.org/education/image/before-after-lens-extraction

Thank you