

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.uw.edu/med/eye/ophtho/clinical/ophtho/ophtho.html>

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



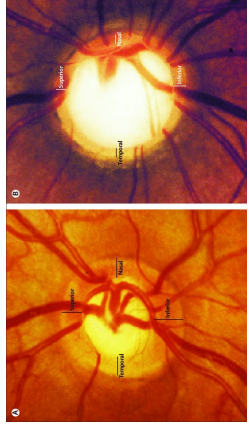
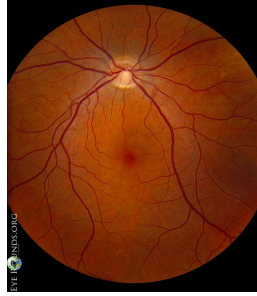
Optic Nerve and Glaucoma: effects on IOP, anatomy, and clinical outcomes. In: Optic Nerve and Glaucoma. 2017. pp. 1-10. DOI: 10.1007/978-1-4939-9999-9_1. ISBN: 978-1-4939-9999-9.

Clinical Workup

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

Optic Nerve

- Optic nerve: 1.2-1.5 million axons



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Normal Angle Anatomy

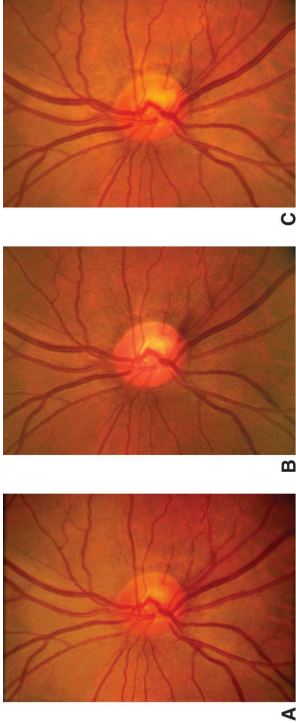


Figure 1-1. Anterior chamber angle. A, Normal angle. B, Normal angle. C, Normal angle.

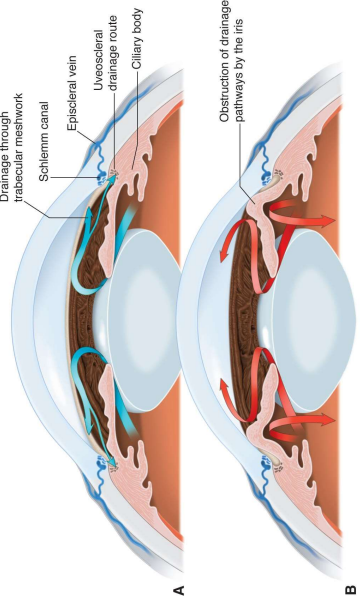


Figure 1-2. Normal angle anatomy. A, Normal angle. B, Normal angle. C, Normal angle.

Gonioscopic view



Figure 1-3. Gonioscopic view of the anterior chamber angle.

OCT of the Optic Nerve

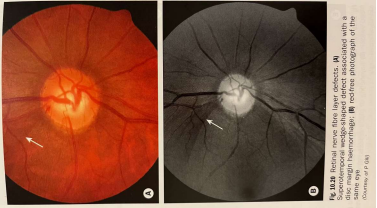
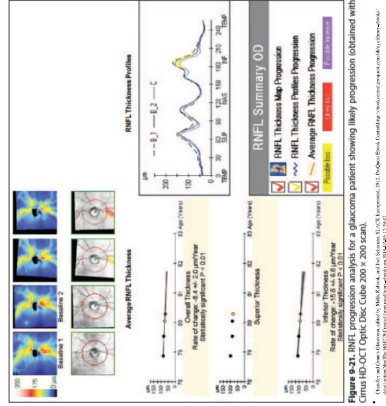
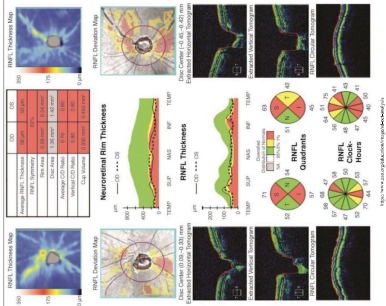
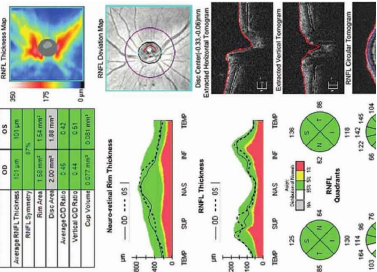


Figure 1-4. OCT of the optic nerve. A, Normal optic nerve. B, Optic nerve with a large cup, indicating glaucoma.



Visual Fields

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

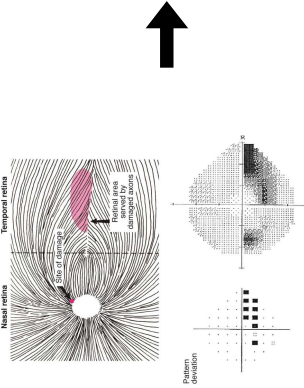


Figure 1-5. Visual field plots. A, Normal field. B, Field with a scotoma.

Classification of Glaucoma

Primary open angle

- Low tension glaucoma
- JOAG-juvenile open angle glaucoma

open angle

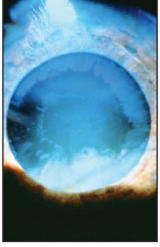


Figure 5-10. Marked exfoliation on anterior lens surface. Exfoliation is often subtle and easily overlooked, especially if the patient is not re-examined at the slit-lamp after dilation.

Secondary open angle glaucoma e.g.:

- Pigmentary glaucoma
 - Pseudoexfoliation
 - Pigment dispersion
- Elevated episcleral venous pressure
- Steroid induced

Primary angle closure

- Acute angle closure
- Chronic angle closure

closed angle

Secondary angle closure

- e.g. uveitic glaucoma (PAS)



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

Medical Management

	gtt dosing	mechanism	side effects	top color
Prostaglandin analogues latanoprost, bimatoprost, travoprost, tafluprost, latanoprostene bidiod	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, carteolol	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 - sulfra allergy - oral: large fluid shifts	orange

Laser Trabeculoplasty



<http://genoscopy.org/cases/normal-angle/normal-angle.html>

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

	ggt 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	

Primary Angle Closure

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

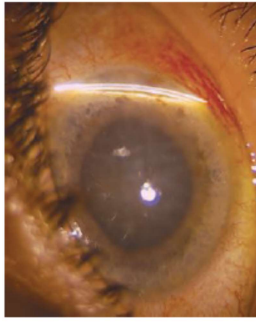
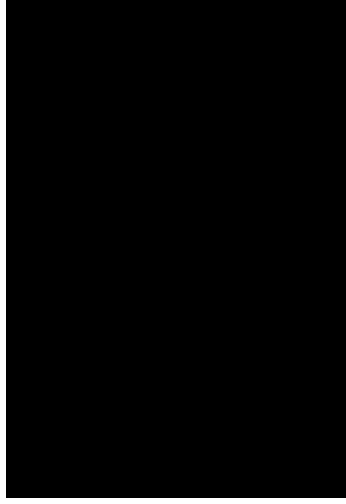


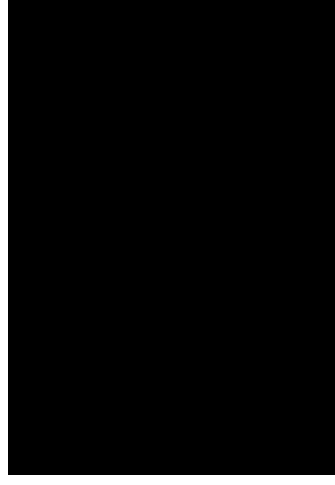
FIGURE 9.4.1. Acute angle-closure glaucoma with mid-dilated pupil and shallow anterior chamber.

Genentech Inc, Adam T. Fabrowsky, Michael R. May 27, 2012, *Wills Eye Manual: Office and Emergency Room Diagnosis and Treatment of Eye Diseases, 10th year Health, Philadelphia*. ISBN: 9781451592004, Figure 9.1, 1 Jan 2013

Slit lamp view: narrow angle



Gonioscopic view: narrow angle



Acute Angle Closure

- Angle closure symptoms: photophobia, pain, nausea, decreased vision
 - signs: mid dilated pupil, injection, K edema, shallow AC, iris bombe
- RX: topical egts, oral/ IV agents, LPI if able, trabeculectomy, early cataract extraction

