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An oyster can take five years just to make one pearl.

DELTA STATIONERY

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Glaucoma & Intra Ocular Tumour

Primary Uveal Melanoma.

- Anterior Uveal Melanoma
- Choroidal Melanoma.

Systemic Manifestations

- Metastatic Ca
- M. Melanoma
- Leukemia
- Other
  - Lymphoma
  - Histiocytosis X
  - Multiple myeloma
  - Myelodysplastic syndrome (MDS)

Ocular tumour of Childhood

- Rb
- Medulloepithelioma
- Rhabdomyosarcoma
- Juvenile Xanthogranuloma

Refer Book

Benign tumours of Anterior Uvea:

- Nevi of Iris
- Cysts
- Melanocytomas
- Melanocses
- Adenomas
- Leiomyomas

Phakomatoses

- Sturge Weber syndrome
- Von Recklinghausen NF
- VHL
- Naevus of OTA
- ~~Glaucoma~~
- Incontinentia pigmenti.
- Vasculomi

Pseudouveitis → Iris heterochromia.

Lack of response to IOP lowering &
Lack of " " steroids
Uni/Heavily asymmetric glaucoma.

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(A) **Primary Uveal Melanoma**

- Ant Uveal
  - » Common.
- Choroidal

a) Ant Uveal Melanoma

arising from ciliary body

Cf Smooth domed elevation of overlaping Iris
- gonio → dark brown mass b/t Iris & lens

Types
- ~~Hetero~~chromic heterochromia
- Amelanotic → 2° Vasculature, hypochromic H.

G. Mech

- Outflow obstructed by growth Ex Seeding. Melanin.
- Ring Melanoma
  - Arise from Iris, CB, Iridociliary jxn & spread circumferentially
  - Pigmentary G
    - NVG
- Tapioca Iris Melanoma
  - Low grade spindle type cells
  - CB. Melanoma
    - ACG
    - Compression of root of Iris Pto ACA &.
    - forward displacement of lens into diaphragm.

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D·D
- 1° Intio ⊆ inflammatory nodules
- 1° Cyst
- Iris Naevi / 9. Melanoma
- (D) Choroidal Melanoma

⇒ Acq RD. (Serous / Exudative) + Glaucoma ⟹ Malignant Melanoma

⇒ NVG
⇒ Pigment dispersion in vitreous with Melanomalytic 4.

Masquerade/Confusing
- RD
- InfraOcular Inflammation ⊆ Hmrg
- Dislocated lens / Nucleus (Diff 4)

Diagnostic Adjuncts

USG.	FA	Cytopathological Studies	Biopsy. Section Dx.
↓	↓	↓	↓
diff sclerointal cysts, 4m Tx	diffuse. Confluent F. emanating 4m, Ill defined. Vascular foci	Cells seen in Aqueous by slit lamp.	Identify Tx of Iris
(X) Malig & Benign		Neoplasia – Millipore filter. FNAC.	

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Other Dx

- Gonio
- Transillumination of globe
- Wheechamy associated Dx
- UBM
- FNAC
- AC aqueo aspirator.
- Finger Indectomy tech
- Diagnostic Radio.

Prognosis Melanoma of Iris better prognosis

Mx

CB / Choroidal M + Gl → ↓ IOP intraOp

- Manometeric pressure regulating system
- Use of wire snare to cut ON.

Enucleation

↓

X If. Only seeing eye ≤ useful vision

↓

Local excision of Ant U. M.

Radio Rx

- Palladium 103
- I 125

Altering Dx avoided — seeding of cells into filtering beds.

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Pseudoglioma D-D

- ROP
- PHPV
- Retinal dysplasia
- Coat's disease
- Toxocariasis
- Infantile RD

Variable with higher risk of Malignancy in Melanocytic Tumours

- Dia > 3mm
- Pigment dispersion.
- Prominent Tumour Vascularity
- ↑ IOP
- Tx related Ocular Symptoms

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Dg. asso. c Ocular inflammation

Date 4
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D.D of Uveitis + Refractory Dg

- Infections (Endoph)
- Tumour (Melanoma Lymphoma)
- Acute Acg
- NVG
- 2° rxn to IOFB.

Ocular inflammations

- IridoCyclitis
- Choroiditis & Retinitis
  - VKH.
  - Sympathetic Ophthalmia
  - Other forms — CMV, Whipple, Malaria, Toxocara.
- Keratitis
  - Interstitial K.
  - HSKu.
  - HZKu.
  - Adenovirus Type 10
  - Scleritis.
  - Episcleritis.

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Iridocyclitis

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- Acute
- Subacute
- Chronic

Sudden onset pain photophobia & blurred V.

Ciliary flush.

Aq. flare & cells

± KP.

IOP ↓

×

Accidentally detected

∴

» dangerous.

Remission & exacerbation.

PAS, Posterior, Band shaped K

Clinical forms →

- Acute Ant Uveitis → HLA B27
  - Lungs — Methprednisolone
  - Simvastatin
  - Latanoprost
- Sarcoidosis
- JRA.
- AS - Marie Steumpell disease
- Pars Planitis
- Glaucomatocyclitis Crisis (Posner Schlossmann Syndrome)
- Fuch's Heterochromic Cyclitis
- Behcet's Disease
- Reiter Syndrome
- Giant
- Endemic Dropsy
- Infectious disease → TB
  - Syphilis
  - Hansen
  - Disseminated Meningoc

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- Hmorgic fever ⊆ Renal Syndrome / Nephropathia Epidemica
- AIDS
- Kf Listeria Monocytogenes.

Theories of Mech. of associated ↑.

Aq. Prod.

Inflamm of CB
↓ Aq Prod.
Hypotony

PG → ↑ IOP. × Outflow affected.
∴ ↑ IOP.

Aq. Outflow.

resistance to outflow.

Acute.

↑IOP Angle open

- Disruption of BRB Aq. barrier
- Fibrin & Inflamm debris
- PG → cAMP
- swelling & dysfxn of Trabecular. Lamellae
- Ppt on TM.
- Use of CS for ↓
- Uveal effusion — forward rotatn of CB

Chronic.

- Scarring & obliteration of outflow channels
- Overgrowth of fibroVasc Mems in Open ∠.
- PAS ✓

Mx

Inflammation.

- CS.
  - Topical
  - PeriOcular
  - Systemic
- NSAIDS
- Mydriatics/Cycloplegic.

Glaucoma

- Medical — fibrinous
  - Intracameral TPA
- ↓x avoided — PI-laser>
- Altering ↓x ⊆ Rx Heavy steroid

Trabeculodialysis tech.

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Glaucomatocyclitic Crisis → Posner Schlossman Syndrome

Unilateral, Young to middle age adults
Recurrent attacks of Mild Ant uveitis & ↑↑ IOP.
Ass → allergic conditions, GI disease — Peptic ulcers
HLA-B54, HSV.

Iridocyclitis — Ocular discomfort, Blurred vision, Halos
- Ciliary flush, slight pupillary constriction, Corneal epithelial edema.
- Hypochromia. Early segmental Iris ischaemia
- Faint flare, few fine, Non Pig KP.
- Gonio — Open ∠. (R) PAS.

Glaucoma ↑↑ IOP.
IOP (N) ≤ in attacks
ONH changes +nt
Inflammatory changes in TM +
Histo — Mononuclear cells in Meshwork

Mx — CS.
Antiglaucoma
Aparasonidine.
Rare — filtering Sx.

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Fuch's Heterochromic Cyclitis

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Mild Ant Uveitis, Heterochromia, Cataract, ♀.
Unil, 3-4 decade ♀ = ♂
True Inflammation of Immunological Origin
↓ Ts activity. AutoAb to Cornea.
Ass. Congenital Horner Syndrome → ∴ Neurogenic Mech
≈ Toxo.

Iridocyclitis — Hypochromia. Slit lamp — Aq. flare & cells. fine stellate KPs lower ½ Cornea
Iris atrophy. Transilluminat" of Iris
EM of Iris → scant no. of deep stromal melanocytes ≤ immature Melanin granules
NVA/NVI. Nodule on whole Iris surface.
In Black — Heterochromia ↓↓ ∴ nodules help. making diagnosis
CR scar — Toxo.
As FFA → delayed filling, Sector Ischaemia, NV

Cataract — PeriOp steroid therapy, Synechialysis
Post Op Compli — Hyphaema, AAG, ↑IOP, CME.

Glaucoma ✓✓ ↓ Common than Posner.
after Uveitis subsided. AC — open. ± free Synechiae
Histo — Fibrosis, Trabeculitis. Inflammatory Memb over ∠. Atrophy of Canal & T. Endothelium
× response to steroid Rx

Amsler Sign

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Intra Ocular Hmrg

↓. associated ⊆ ~~Ocular Trauma~~.

↓. associated with hyphaema.

↓. associated with decorticated Ocular Blood.

Blunt Trauma

Penetrating Inj.

H. associated ⊆ Intra Ocular Surgery.

Spontaneous Hyphaema

- Intra Ocular Tx.
- Neo Vascularization
- Vascular tufts at Pupillary Marg.
- Dilatation & Post Synechiae.

During Surgery

After Surgery

- Large Air bubble
- Visco in AC.
- 1:1000 Epi on Sponge.
- Cautery ±.

- Topical steroid — clear fibrin.

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↓ associated ⊆ Hyphaema.

Tear in Iris or ciliary body → causing bleeding frm. small branches of major arterial circle.

Complications - Recurrent Hmg — normal lysis & retraction of clot
- Associated glaucoma — ↑↓ pigmentation, ↑ baseline IOP, ↓ recession & lens displacement & cataract

Total hyphaema ⊆ RBC.

Bright Red.

1/3.

Eight ball hyphaema
↓
dark black blood
↑IOP all cases

- Obstruction of TM.
- Release of Melanin.
- SM. — delayed clearing of blood frm ac
  ↓ deformability, ↑ adherence.

- Corneal Blood staining

Mx

↓ Conservative

↓ ↑cc. of H. clearance

↓ Prevention of Rebleed.

↓ Mx of associated IOP elevat

Conservative → Bed rest
patching
limited pt ambulation
Avoid aspirin & NSAIDS
Shield to protect injured eye.

Hospital if :-
H. large
Ass. O. trau
Sickle cell h
x follow up

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Acc of H. clearance — Hyperosmotic agents.
Intracameal tissue plasminogen Acti

Prevention of rebleed. — Antifibrinolytic agents.
Oral Prednisolone

Aminocaproic acid — 30g/d ×5d ⇒ 100mg/kg every 4hrs.
dizziness
hypotension
Nausea

½ dose 50mg/kg
2% Carboxy polymethyl gel + 30% ACA. (×3·E)

Mx of Associated ↑IOP.
Ag. suppressant — Topical β blocker + CAI.
± CAI in Sickle → ↓ ↑ vdc ⇒ Sickling in

Sx → >4 days hyphaema.
CNH threatens
Evacuation of hyphaema
Corneal tectoflexing needle.
Remove clot by 4th day — Retracted 4m othe s
Tears + PI

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Ghost Cell Glaucoma

deg RBC (ghost cells) in vitreous cavity

↓

Enter AC (obstruct Aq. outflow)

Theories — On Vitreous

RBC → Khaki coloured, spherical, less pliable than ghost cells

Histo — Thin Walled with deg. denatured Hb = Heinz bodies.

Specific Cause

- Cataract Extraction.
  - ↳ Large hyph. 1mm footop
  - ↳ VH before &x → disruption of hyaloid
  - ↳ VH after &x.
- Vitrectomy.
- Vitreoretinal Surgery
  - ↓
  - BJ VH + ghost cell
  - ↓
  - Poisonous Snakes

Clinical features

→ Ghost Cell — Khaki Coloured on Endoth of AC

- Pseudohypopyon — ≤ layer of fresh RBC — Candy Stripe Sign

DD

Hemolytic

Hemosiderotic

NVG

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Mx → Ghost cells lost over months.
Anti glaucoma in b/tn
Surgical removal

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Gl. associated c Ocular Trauma

- Contusion Injury
- Penetrating injuries
- Chemical & Thermal burns
- Radiation damage

Contusion Injury

C/F
- Hyphaema
- Pigment clumps on TM
- Angle recession
  - Irregular widening of CBB.

Histo — Represents a tear bt long & circular msl of CB.

- In Traumatic hyphaema → 60–94%.
- Population → 14% → glaucoma 5·5%

- Iridodialysis — Tear in root of iris
- Cyclodialysis — Seperation of CB from SS.

Sec Trauma.
Recession △ glaucoma. ⇒ Iridoschisis. → patchy > S & I. Quadrants

- Iritis, Cataracts, Dislocat" of lens, CR. Trauma.

Ix
- gonio.
- UBM — To see Traumatic cyclodialysis cleft

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Date
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Mech of glaucoma

Early Post Injury Period.

↓ IOP.

↑ IOP → Uveal effusion
Uveous filling deep AC.
Schwartz Matsuo Syndrome

→ fluctuation in IOP in association
c RD accompanied by tears of
Non pig epithelium of CB.

→ Initial Trauma to TM
↓
Proliferative & deg changes in TM
↓
Obstruction of Aq. flow

Tear → flap (hinged at ss) → Chronic obstruction

→ Extension of an endothelial layer c DM from
Cornea over AC. angle

Mx ↓ Aq. Production
Miotic Rx
Laser Trabeculoplasty

Late Post Injury Period

Angle recession
AR. glaucoma
4-9 %
AR > 180°
⇓
glaucoma
AR is x Cause → Evidence of Trauma

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Penetrating Injury

Mech of Inj

- Tissue disruption.
  - ↑IOP → inflammation
    - Hyphaema.
    - ↓ Vision 4m swollen, disrupted lens
    - Cyclitic Memb.
- Retained IOFB
  - Siderosis
  - Chalcosis

℞

℞ properly initial injury
cs — ℞ cyclitic Memb & scarring in AC

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↓ in Aphakia or Pseudophakia

Aphakic — Pseudo

Acute » Chronic

Mech of IOP rise

- Influence of Visco-elastic substance → Temp obstruction of TM by visco-elastic various agents compared
- Inflammation & Hyphaema → » lens fragment in vitreous or after ECCE. UGH syndrome
  Bleeding / Hyphaema
- Pigment dispersion → IOL rubbing into
- Vitreous filling AC →

Pupillary block

Aphakia
» Congenital C
PI

Pseudophakia
ACIOL — Iris — PI
PCIOL — Inflammation

- PAS or Trabecular damage
- Distortion of AC angle
- Influence of Chymotrypsin → ↑ incidence

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Mx Pressure Reduction. → ↓ Vitreous Vol, IOP

- Selection of IO Lens – Ac lenses
- IntraOp Considerations – PreOp diamox + intraOp Ach., Carbachol.
- Early Post op period → steroids if inflammat^{n} + Make PI.
- Late Post op period → Medical ↑ Sx ↑ cyclo

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↓ associated ⊆ Epithelial Ingrowth & cellular proliferations
of & downgrowth . epi membrane grows into eye
through penetrating wound.
↓
extends over Post surf of Cornea → C. Edema
↓
W. Leak +
Specular → Characteristic pattern of cell borders — Dx value
Memb causes — flattening of stroma.
Histo → gelatinous appearance of membrane
Gomo - PAS.

Mech of ingrowth & gl → Area of Necrosis — PAS —.
pupillary block → desquamated epithelium.

Mx Excising fistula & involved iris → destroying epi
over post cornea. ⊆ Cryo.
GDD.

Fibrous proliferation

Fibrous Ingrowth. | Retrocorneal Memb.

Inadequate Wound closure
Break in C. Endothelium & DM..
↓
Subepithelial CT
Corneal / limbal stroma
↓
fibroblast to enter AC.

) Less progressive & destructive

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Q. after Retinal procedures

Date / DELTA Form

- after PPV
- Scleral buckling
- Photocoagulation

PPV
↓
CF
↓
Fine flame

1st day
↓
CF & FFA
↓
× air travel
10.6mm bubble ≒
Accelerated Aq. Outflow

1wk.
hyphaema, ghost cells.
↓
Overfill of AC.

2-4 wk after SX
↓
NVG & Dil obstructed angle
↓
PI inferiorly And @ 's periphery ×12
↓
Shld enter AC block

Scleral buckling
- Occlusion of vortex vein by encircling band.
- scleral scleral indentation
↓
Congestion & forward rotat" of CB

Rx - Atropine
Steroid
Mx gt ↓
Drainage of Suprachoroidal fluid

Photocoagulation
Swelling of CB.
Outpouching of fluid 4m Choroid No outflow

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Principles of Medical Rx & Management

- Gathering Evidence to evaluate pt
  - OHTS
  - AGIS
  - EMGT
  - CIGTS.
- Approach to pt & Rx
  - New pt
  - Established pt.
- Rx plan
- When to Rx
- How to start → Establishing Target Pressure

Rx	OD	VF	TP
Minimal	Early NRR Inln.	x.	Middle - High teen (15-20)
Moderate.	1 Quad.	Early.	Low to Middle (10-15)
Advanced.	Ext.	Extensive.	High single digits to low teen

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Risk factors

COAG — ACG

COAG
- old age.
- family H/O
- African heritage.
- Myopia.

ACG
- Asian "
- Hyperopia.

1) Selecting Initial Medication.

2) Pharmacokinetics of Topical drugs
- drugs kinetics in Conj Cul de sac
- Corneal & Transconj scleral penetration
- 10 factors influencing drug Bio-availability
- Formulation of Topical drugs
  - Oint
  - Liposomes
  - pH.
  - Molec Wt >500
  - Additive use.

3) Educating & instructing patient
- Pt disease
- Why medication
- Therapeutic regimen
- Administration of eyedrops

- Follow Up → Evaluation of efficacy
  - Diurnal curve
  - Patient reinforcement
  - Contact ⊆ family Physician

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•) When to Quit & move to Sx

* Medical Tx start
↓
↑↑ IOPs
Threat to vision.
H/O medical Rx Gout success
x adherance to Rx.

•) Pharmacogenetics

Mx
↓
• Inability to maintain target IOP
• Progressive Gl damage
• Pt Inability to adhere to Medical regime.

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Prostaglandins & Hypotensive Lipids

Arachidonic Acid (20 C. compound)

LOX → Leukotienes

COX → Cyclic Endoperoxidases

Cyclic Endoperoxidases → Reductase → PGF2α

Cyclic Endoperoxidases → T. Synthase → Thromboxanes

MOA

PG or Prostanoid receptors → GPCR.

D_2	E_2	$F_{2\alpha}$	I_2 & TXA_2
↓	↓	↓	↓
EP	FP	IP	TP

FP → Type A, Type B

Type A → full length Receptor

Type B → splice Variant

full length Receptor + splice Variant → ⊕ PLC

↓

Inositol Phosphate. (2nd Messenger)

↓

Molecular Transduction Cascade

↓

IOP reduction.

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Prostanoids

↓

Uveoscleral Outflow.

Relaxation of Ciliary Mol.

Remodelling of ECM of CM. (a)

(a) → $PGF_{2\alpha}$ → (+) → FP receptors

↓

Induction of NTF & cfos

↓ (+)

API transcription regulatory elements

↓

regulates MMP

↓

Collagen type IV & Myocillin.

Adrenergic Ag + PG

↓ ↓

↑ TM outflow ↑ Uveoscleral outflow.

Administration

Ql – OD

Unoprostone BD

Wash out period – 4-6 wk

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↑ Isolation
Latanoprostene Bunod.

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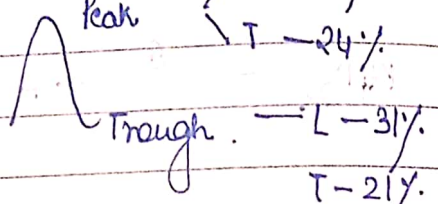
Drugs

Latanoprost — 0.005% HS
lowers IOP night & day
∴ uniform.
↓ effective in ↓IOP in children
In COAG ⇔ Timolol.

Diurnal Curve



31% 23%



POAG → Sx PI done → ↑IOP → given Latanoprost.
Unopened bottles — fridge.

Unoprostone 0.15% ↓US 0.12% Japan BD
↓ effective than Timolol
↓ Latanoprost.
differential effect of Pg explain ↓ efficacy

Travoprost 0.004%
30-35% ↓ » Timolol
In blacks Travo » latano.

Bimatoprost Prostamide.
0.03%
> Timolol

Tafluprost — Preservative free
simple model

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Drug interactions

- CAI Topical

Pg + Brimonidine > Dorzox T.

- Miotics

Additive ⊆ Timolol

Side effects

Conj hyperaemia
Ant Uveitis
CME.
Pigmentation of periOcular skin/iris.
↑ Lash Size — Hypertrichosis
Allergic Contact Dermatitis
Hs Dermatitis
Iris Cyst. (L)

→ Theoretically Induce graft rejection.

Other Uses

↑ Post PI — pressure is high.

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β Adrenergic Receptor Antagonist.

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for heart found to ↓ BP ∴ Eye used.

MOA

β_2 recep. in Ciliary process → ↓ Bld supply to CBs → ↓ Synthesis

→ Catecholamine ⊕ → ↑ AMP → ↑ Synthesis ∴ Blocker ↓ Synthesis

β block

× effect on outflow.

× effective during sleep.

effect on Ocular Blood flow. not clear.

Drugs

Timolol — β_1 β_2 blocker — Non selective. 0.5% BD

✓ → × ↓ E of Anaesthesia, Subcay fibrosis

Contralateral eye affected.

Enantiomer: D, L → >> potent

Timolol — gel also.

Maleate

Timoptic — 0.25, 0.5%

↓ Paediatric

hemihydrate.

Timoptic XE — gelrite phase changer

Other Uses

↳ In t/t of Pyogenic granuloma

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Betaxolol Cardioselective, β_1 adrenergic Antag
0.25% — Suspension
↓ IOP reduction than timolol.
Neuroprotective action

Carteolol 1% Non Selective
Intrinsic Sympathomimetic activity
↳ Early transient Ag response
↓ Bradycardia
↓ O. irritation than Carteolol.

Metipranolol 0.3%
Metoprolol — 3%.
Pindolol 0.5 - 1%
Atenolol 2%.

Administration

» Conc required ≤ dark iris bcoz of non specific binding of drug to pigments.

Effects peak in 4hr remain for 24hrs.
gel forms » imp. efficacy.

If 4hrs effect last for 14 days — conc of drug in melanotic tissue & slow release.

Long term efficacy ↓ ≤ long term use.

2 phases

Short term escape — Long term drift

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Short term escape. → 1wk. ↓↓↓ IOP. then plateau.
↓
as β receptor ↑↑ · x 1wk.
∴ always wait 1mth to predict response.

Long term drift. ↓ in response 3mth – 1yr.
regain responsiveness after washout period.
∴ give Timolol 0.5%. × 6mth
↓
Dipivefrin. × 2 mths
∴ minimise the drift.

Drug Combination.
Combigan → Brimonidine 0.2% + Timolol 0.5%.
Cosopt → Dorzolox 2% + Timolol 0.5%.
+ Oral CAI more efficacious.
If Oral β blocker already given & u add Topical. there is ↓ IOP further.

Side effects

CVS
↓ Pulse Rate.
↓ Myocardial Contractility
Bradycardia.
Arythmia.
Heart failure
Syncope

Resp
- Bronchospasm
- Dyspnoea.
- Apneic Spells

CNS
- Depression
- Anxiety
- Confusion
- Dysarthria
- Hallucination.
- Light headedness
- Drowsiness
- Weakness

effects on Cholesterol
↓ HDL

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- Sexual Impotence

GIT
- Nausea
- Diarrhoea
- Cramping

Dermatological
- Alopecia
- Hives
- Maculopapular rash

C/I → CCB – Verapamil
Quinidine
Sinus Bradycardia
2° Heart Block.
CHF.

Ocular S/E
↓ Mucus layer.
Burning
Coy hyperaemia.
SPK
Corneal Anaesthesia
OCP.

Metoprolol — Granulomatous Ant Uveitis.

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↗ Miosis

α Blocker.

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Names ~~Dalp~~ Tapiprazole
Bunazosin. 0.025 - 0.2%.
Prazosin. — 0.001% — 0.1%.
Coxynanthine
Labetalol. (α+β blocker)

MOA Stimulate dilator mus ⊆ α Adrenergic receptors
↓
Mydriasis & dilation of pupil.
× action on Aq.

Thymoxamine.

× Action of Aq H, IOP, × effect on OAG
× shallowing of AC.

0.1% Thymoxamine — can cause reversal of PE action
✓ ACG → It causes Miosis despite presence of pressure induced Ischaemia of Iris sphincter.

(b) × Vector force on Iris ∴ × PB. aggravate
(c) Pigmentary glaucoma → Contact b/t the pigment epithelium & packets of Lens zonules.
↓
α Block cause Miosis without cycloteopia → ∴ ↓ effect of Pigmentary g.

(d) Medical tx of cyclid retraction. 0.5% → Mydriatic.

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TM Adrenergic stimulators

Date 23
DELTA Pg No.

Apraclonidine , Clonidine , Brimonidine. tartate.

MOA → ↓ Aq. Production.

	Outflow	EVP	UV
Apra	↑	↓	"
Clonidine			
Brimonidine		✕	↑

a) α_{2a} adrenergic receptors in TM
b). ↑ Pg level bt (✕ effect of. flui pretreatment)

3 phases

- Early
  - ↓ Vasoconstriction
  - ↓ Ultrafiltration
  - ↓ Secretion
- Middle
  - ↓ Improved Outflow facility
- Late.
  - ↓ Mech of Metabolism. of PG in TM.

Specific Agents

- Apraclonidine
  - 0.25%
  - 0.5 → Post laser
  - 0.1% → Long term.

↓ IOP.

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→ Before LASER procedure
→ Intravitreal implant — IA — AMD
→ ↓ Intraop bleeding on [illegible] of Co... esp. Canalicular ...

Brimonidine - 0.2% TDS

- ↓IOP
- neuroprotective mech → ↓ loss of RGC in an optic nerve crush injury ~~mod~~

Dipivefun & Epinephrine 0.1% BD.

» lipophilic — ↑ Corneal penetration 17×

Administration

27% IOP reduction of spontaneous Nocturnal rate
0.2% Brimo + 0.5% Timolol → Combination
Brimo ⊎ Dorzox ⊎ Latano.
Brimo — 0.2% TDS

Drug Interaction

Brimo + PG » ↓
Brimo + Timol » Timol + Dorzox

Additive ⊆ all Anti glaucoma except Apraclonidine
L17-19%.

Dipi + Timol → » ↓IOP.

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Date 24
DELTA Pg No.

Side effects

Ocular follicular Conjunctivitis (c ⊆ out) Contact dermatitis
Eyelid retraction
Mydriasis
Conj. blanching
* reactivity ∠ Mullerian
Iris
SM. arterial.

Dipivefrin reactive hyperaemia.
Adrenochrome — deposit in several Ocular tissues
Epinephrine associated CME.

Systemic

Brimonidine	Dipi, Epi
Oral dryness	↑ BP
Sedation	Tachycardia
Drowsiness	Arrhythmia
Headache	Headache
Fatigue	Tremor
Depression	Nervousness
Apnea (children.)	Anxiety
↓ BP Hypotension (children.)	

Wash out = 5wk

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Carbonic Anhydrase Inhibitors

DELTA Pg No.

systemic use.

Sulphonamide group.

Also pnt in renal tubules
Gastric Mucosa
Brain
RBC
Exocrine pancreas

MOA

$$CO_2 + H_2O \xrightleftharpoons{CA} H_2CO_3 \rightleftharpoons HCO_3^- + H^+$$

NPCE

↓ Aq H. flow through inhibition of CA in ciliary epithelium

4 isoforms / eng → CA I - CA IV

Ciliary process — CA II isoforms ✓

of CA II def — diamox does not act

CA I

Acidosis → ↓ → × Cl^- reflux across ciliary epi → ↓ IOP

Ion transport → ↓ Aq formation

fluid movement from retina towards choroid → ↑ SRF absorption i.e. RD promotes attachment

↓ Edema in RPE dis & uveitis

× effect on edema due to Vascular dis

Acetaz — ↓ 33% IOP

+ Timol — 44%

Dorzox — 18%

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Date
DELTA Pg No.

Drug Administration

~~Oral~~ Oral

Acetazolamide
» protein bound
» ↑ dose.

Methazolamide
25mg BD
↓
50mg BD ⟶ 100mg TDS
↓ S.E
↑ plasma ½ life

» IOP lowering

for action 90% CA activity to be reduced

Acetazolamide — highly protein bound
excreted 100% in urine

250mg QID
Sustained SR BD.
5-10 mg/kg/B.wt QID

	Tab.	Cap.	i.v
Peak.	2hr	8hrs	15min
Duration	6hrs	12hrs	4hr

Acg — 250mg (Two tab) i.e 500mg stat.
↓
If not tolerate
250mg i.v

Oral Diamox — Rx of IIH even for yes
BMI reduction
Obese ladies

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Date 26
DELTA Pg No.

Topical

- Dorzox — 2% / — USA (Trusopt)
  0.5% → 1% Japan
  TDS > BD. → ↓IOP.
  BD > TDS — Adherence

Dorzox	Timolol	Betaxolol
23%	25%	21%

Dor + Latano ⟶ +15% ↓

Cosopt Dor + Timol

Brinzolamide (Azopt)

1% BD
↓ Dorzox

Timolol
↓
→
Brinzola — Betanodno
>>
(Marginally)

Use in deep also (24%)

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Side effects

Ocular
- Transient Myopia
- AC Shallowing
- Irritation
- ↓ Blurred vision
- Occasional HST.
- Periorbital dermatitis
- BAK sensitivity

Systemic
- Paraesthesia
- ↑ Urinary freq.
- Metab acidosis
- Symptom complex
  - K^+ depletion
  - GI Symptoms
  - Renal Calculi
- Sulphonamide related
  - Blood dyscrasia
  - Aplastic An
  - Ustacaual types

Topical
- Bitter taste
- Thrombocytopenia
- Erythema Multiforme.

Rf
- Severe Pulmonary obstr
- Hepatic Insufficiency
- Renal failure.
- AC Insufficiency
- ↑ Cl^- Acidosis
- ↓ Na^+/K^+ level

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Other Uses — a) CME due to RP, uveitis
b) Nystagmus & — Bezoldamide

Effect of Bezoldamide, CA inh came from the alteration in proprioceptive sensation from muscle insertion area (enthesis) where fxn of K^+ channels is altered. This ↓ potentials from mid enthesis cause reduced trigger from smooth pursuit generator in B.S responsible for Nystagmus

Qs → x to be used in C graft pt.
L graft edema

x in sickle cell pt esp to control hyphaema
Induced IOP
Wash out - 1-2wk

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Cholinergic Stimulators

Date / DELTA Pg No.

- Pilocarpine.
- Carbachol.
- Ach

MOA

All forms of Open angle glaucoma where aqueous outflow is functionally intact (» TM flow) Not on uveoscleral flow

↓

M_3 receptors on Ciliary mel cell & Iris sphincter

↓

CM contract

↓

Traction on scleral spur & alters configuration of TM & SC.

a) Post internal pull on SS
b) TM space widening
c) Endothelial Meshwork distention.
d) ↑ in giant vacuoles » Major reason ↑ outflow ≠ pressure pump
e) Larger & » frequent pores in inner endothelium of SC

- ↓ Uveoscleral flow → ∴ ↑ IOP
- × change episcleral venous pressure.

Miotic effect

Pilo → M_3 recep of Iris sphincter

↓

Tightens Iris & help open AC island

↓

ACG ↓ by relieving PB

Wash out = 3d

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Date
DELTA Pg No.

Administeation → Carbachol

Dual acton P.NS

Direct Muscarinic — Indirect PNS.

↓

Inhibit Achesterases

Administeation

Pilo good Corneal penetration

HCL . 0.25, 1%. 2%. ,6%.

gel 4%. HS → ↓ Induced Myopia, ↓ Impaired VA

Darkly pigmented 6%. pilo QID. | 2%. BD ⊆ NLD occlusion.

4%. HS ≅ drops QID.

Carbachol Poor Corneal penetration ∴ req. adjuvant BAK

1.5%. TDS 2%. QID

Ech → Ecothiophate I → 0.125%. BD.

Intracameral — Miosis during Sx

Early post op → for IOP control

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Date 29
DELTA Pg No.

Drug interaction — x c miotics

else → IC
CAI.
β block, α Agonist

Side effect

Muscarinic — Diaphoresis
Salivation
Tearing
Bronchial secretion.

GI Contraction — Nausea
Vomiting
Diarrhoea
Bronchospasm.
Abd pain.
GI effect
AV Block.
Cognitive dysfxn.

Ciliary Mol Spasm.
Brow Ache
Transient Myopia.

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Date
DELTA Pg No.

Ocular

- Dim Vision
- Erroneous Visual fields
- ✓ RD
- Macular holes
- ✓ Cataractogenesis (ASC)
- Cicatricial Pemphigoid
- foreshortening of Inf Conj fornix
- Allergic — GPC.
- Toxic — follicular response.
- ✓ Iris Cysts

Other uses

- Before PI in office
- Intracameral pilo to construct pupil.

Diff b/t BPS & Pharmacological dilation
Toxic pupil

Hyperosmotic Agents

Mannitol
Glycerol

MOA

Change in Osmotic gradient b/t blood & Ocular tissues
↓
↓ Viteous Volume
↓
↓ IOP.

Administration

In Emergency
To ↓ Post pressure effect of viteous in supine position.

Mannitol 25%.
1-2g/kg

100 ml 20% = 20g
over 30 min

Glycerine 50%.
1-1.5 g/kg

starts – 10 min
Peaks – 30 min
last – 4hrs

Onset – 20min – 60min
Duration = 2-6 hrs

EC penetration +
Poor Ocular penetration.

If Crystals + ⟶ heat the bottle

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Date
DELTA Pg No.

Drug interaction

Not for long term usage

Side effects

Diuresis	Orientation
Headache	Diarrhoea
Acidemia	Headache
Anaphylactic Rxn.	Intracranial hmrg
Headache.	Pulm Edema
CVS Overload	Renal insuff.
Confusion.	

Mannitol.

Diuresis

↓

Dehydration

1-2g/kg over 30min

25%.

20-60min.

2-6hrs

Glycerine

Sweet taste

> Nausea/Vomiting

↓

Safer.

Caloric Count- 4.32 kcal/g

>>

>>

DM.

1-1.5g/kg

50%.

Peak. 30min

Last 5hrs.

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Investigational Antiglaucoma Drugs

Date / 32 /
DELTA

Diphenylhydeantoin
Anecortave.
Cannabinoids

Cellular Cytoskeletal modulator — Ethacrynic Acid
Latrunculins

Other Cellular signaling pathways — Olmesartan
Lomerizine
Nilvadipine
Neurotrophins

Memantine

iNOS Inhibitor — Aminoguanides

Prostanoid agents — Tafluprost
PF 03187207

Rho Kinase Inhibitor — ROCK 1
ROCK 2.
DE-104
RK 983
INS 117548

Immunomodulation
Gene Based & Cell Based Rx — Target Tissue (TM)
T Cell injections.

Scanned with CamScanner

Name of Drug	Class of Drug	MOA
Anecortave		Angiostatic steroid ⊆ aud fc actor glaucoma, AMD.
Cannabinoids		CB1 receptors on CB. found Majjuan ↓ IOP.
Cellular Cytoskeletal Modulators		
a) Ethacrynic Acid	diuretic	change actn, α actinin, vinculin vimentin in TM
b) Latrunculins	Natural toxin	disrupting actin cytoskeleton
Other Cellular	Signaling pathways	
a) Olmesartan	Angiotensin II recep Antag	As components of RAAS in eye
b) Trabodenoson	Adenosine A1 recep Ag	
c). CF 101	Adenosine receptor A3 agonist.	

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Dosage | A·E | effectivity

x.

Systemic hypotension, Tachy, Euphoria
Palm fibrosis
Conj hyperemia, slight miosis, ↓ tear production.

Corneal toxicity, TM toxicity

Rho kinase Inh.

ROCK1 ROCK2.

Serine Threonine kinase ⊖ → RhoGTPase

regulates SM contraction in Ca^{2+} independant manner
TM → ∴ Aq drainage ↑.

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Date
DELTA Pg No

Lomerizine KE-090	CCB	↓ VF progession loss
Nilvadipine		Posterior choroidal circulation ↑ in 8 patients → potential to improve vascular perfusion to ONH 2mg daily
Neurotrophins		
Memantamine	NMDA recep Antag	used in Parkinsonism, Vasc dementia, Alzheimer disease glutamate → NMDA recep → Neurotransmission process (Memory) glycine excitotoxicity → Intracellular Ca^{2+} overloads neurons & causes cell death through apoptosis Excess Ca^{2+} → Destructive pathways In Astro, ↑NO prod ↷ ↑ CNCs stimulat° of mitogen activated protein kinases based on fact that 5-c glutamate injection → Innec retinal damage
NO Aminoguanidc.	Inhibitor of iNOS	↑ NO → ON astrocytes & Microglia ↓ ON damage ∴ target them by tyrosine kinase Inhibitors.

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Neurotrophins

In glaucoma → obstruction to retrograde transport of neurotrophins at ONH

↓

deprivation of Neurotrophic support to RGC

↓

Apoptotic Cell death

RGC protective effect by — TrkA recep

↗

NGF · affects this

Immunomodulation

glatiramer acetate (Cop-1) — 0.9% saline in AC → ↓ gc death. ⟺ daily intraperitoneal inj of Brimonidine

Gene Based Cell Rx

drug delivery

Implants.

Impregnated NL plugs.

Prostanoid Agents

Tafluprost — 0.0015% OD

synthetic $PGF_{2\alpha}$ ag. preservative free formulat^{n}

- DE -117
- ONO 9054

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NEWER ANTIGLAUCOMA MEDICATIONS

me of drug	Class of drug	Mechanism of action	Dosage	Mean IOP lowering effect in phase II/III trials	Adverse effects
opressa™ etarsudil hthalmic lution 0.02%) R 13324; Aerie armaceuticals, orth Carolina, SA]	Rho kinase inhibitor and norepinephrine transporter (NET) inhibitor	Improved outflow through the trabecular meshwork and the uveoscleral pathway, decreasing episcleral venous pressure, and decreasing aqueous production	OD (Bedtime)	5.5 mm Hg	Conjunctival hyperemia, conjunctival hemorrhage, and cornea verticillata.
oclatan™ ixed-dose mbinations netasurdil ith latanoprost 005%)	Rho kinase inhibitor and norepinephrine transporter (NET) inhibitor plus prostaglandin analogue	Improved outflow through conventional and uveoscleral pathway	OD (Bedtime)	Average reduction in IOP of 1.8mmHg greater than those receiving latanoprost, and 2.7mmHg greater than those receiving Rhopressa.	Conjunctival hyperemia, Instillation site pain, cornea verticillata.
lanatec™ Ripasudil 0.4%; -115, Kowa Ltd, agoya, Japan)	Rho-associated coiled-coil-forming protein kinase (ROCK) inhibitor	Selective inhibition of the actin cytoskeleton contractile tone of smooth muscle in the trabecular meshwork; resulting in increased aqueous outflow directly through the conventional pathway.	BD	2.7-3.7 mm	Conjunctival hyperemia
rabodenoson INO 8875) (Inotek harmaceuticals, SA)	Adenosine A1 receptor agonist	Alters ECM turnover by TM cells and increases conventional outflow facility	500mcg	4.1mm Hg	Conjunctival hyperemia
F-101 Can-Fite Biopharma)	Adenosine receptor A3 agonist.	Stimulate secretion of (MMPs) in the endothelial cells lining the trabecular meshwork causing cell volume shrinkage and extracellular matrix remodeling, which ultimately facilitates conventional aqueous outflow.	1 mg BD oral	1.1. (12 weeks)	Constipation Headache Palpitations
DE-117 (Santen Pharmaceutical, Japan)	EP2 agonists Prostanoid receptor agonist	Relaxation of endothelial cells in the Schlemm's canal→ Facilitating uveoscleral outflow. Increase conventional outflow by decreasing cell contractility and collagen deposition	OD	Phase III ongoing 7.1 ± 1.8 mmHg	Conjuntival hyperemia ocular hyperaemia, photophobia

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Name of drug	Class of drug	Mechanism of action	Dosage	Mean IOP lowering effect in phase II/III trials	Adverse effects
Taprenepag isopropyl (PF-04217329)	EP2 agonist	Facilitates uveoscleral outflow by decreasing cell contractility and collagen deposition	BD	Phase II; 30-50 % decrease in mm hg	Conjunctival hyperemia dose-related iritis Increased corneal thickness
ONO-9054; 0.003% (Ono Pharmaceuticals, Japan)	EP3 agonist and FP receptor agonist	Facilitates uveoscleral outflow	OD (Evening) 30mcg/ml	7.3 mm Hg 28-31% IOP reduction	Hyperemia Dry eye
Bamosiran (SYL040012) (Sylentis, Spain)	Small-interfering RNA	Specific gene silencing and causes beta-2 adrenergic receptor blockade→ Decreasing aqueous production	OD 600 µg/eye/day	Phase IIb 20% reduction of IOP in individuals with a higher baseline IOP	Darkening of the iris color, lash growth, periocular pigmentation, and hyperemia
Vyzulta™ (Latanoprostene Bunod, 0.024%)	Prostaglandin F2-alpha analog and nitric oxide	Enhances uveoscleral outflow by upregulating MMP's and remodeling of the ciliary muscle's ECM Linked to an NO-donating moiety enhances conventional outflow by inducing cytoskeletal relaxation via the soluble guanylyl cyclase-cyclic guanosine monophosphate (sGC-cGMP) signaling pathway	OD	7.5 -9 mm Hg (22 % IOP reduction)	Conjunctival hyperemia (5.9%), Eye irritation (4.6%); Eye pain (3.5%).
Mikeluna™ (OPC-1085EL; Otsuka Pharmaceutical Co., Ltd.)	Carteolol hydrochloride 2%, and the prostaglandin analog, latanoprost 0.005%	Reduce aqueous production and increase uveoscleral outflow	OD (Morning dose)	Phase III (3.5 mm Hg)	Conjunctival hyperemia, Blepharal pigmentation, and punctate keratitis

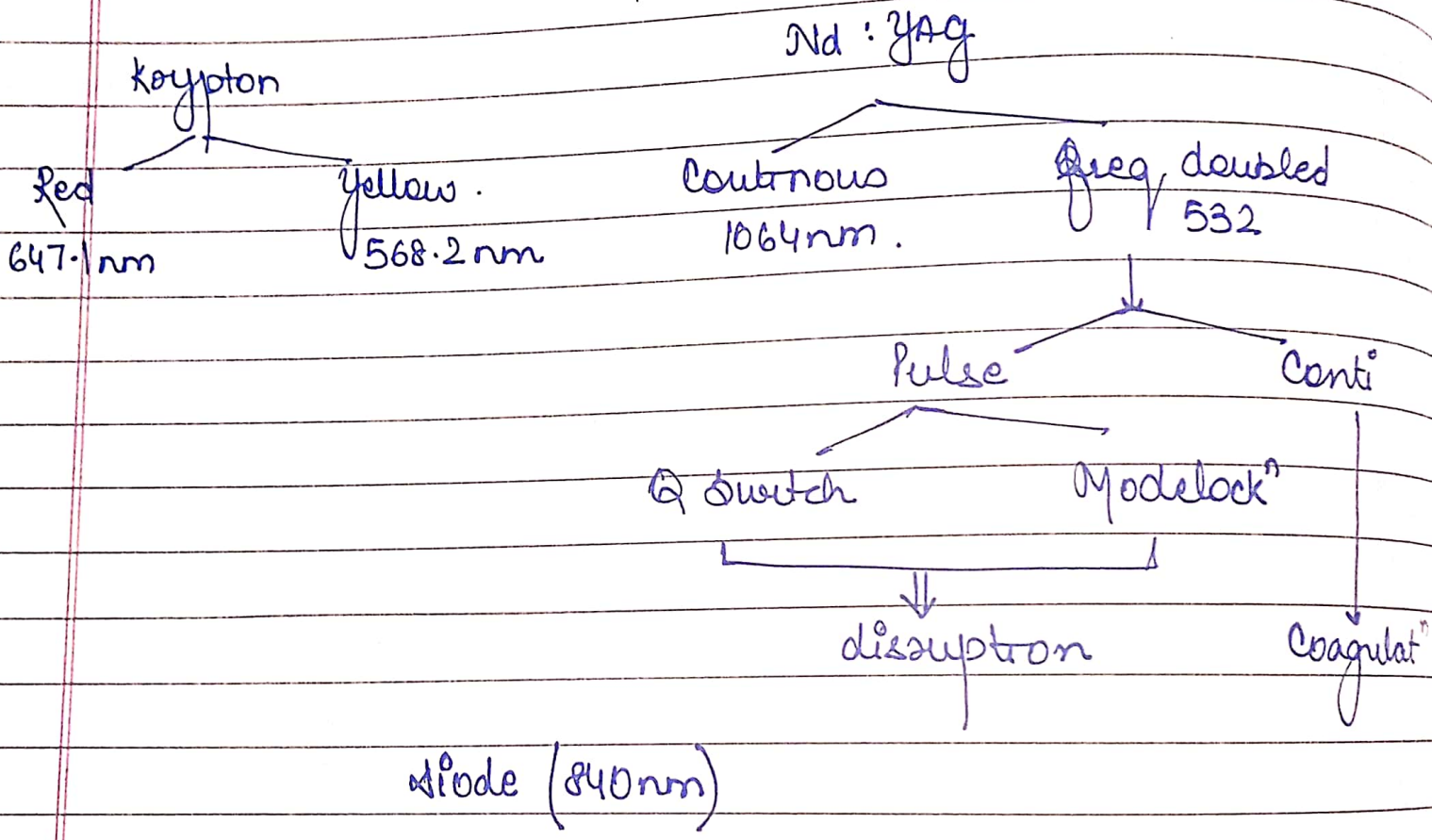


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Date
DELTA Pg No.

for LASER trabeculoplasty



Diode (840nm)

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Laser Trabeculoplasty

Date DELTA Page 36

MOA ↓ IOP by improving facility of outflow

Argon (ALT)

a) Thermal energy → shrinkage of collagen (TM)
↓
shortening of Meshwork
↓
- Expand spaces b/t. 2 fx sites
- " ↓ IL by pulling meshwork centrally
↓
fibronectin mediated att of Trabecular beam supporting adhesive tightening of trabecular components.

b) Induction of MMPs → to maintain normal turnover of TM
↓
Breakdown ECM.
MMPs — Stromelysin & Gelatinase B.
└ Juxta canalicular region
T. proteoglycans (outflow resistance) —Stromelysin→ degrade
↑ (+)
IL-1α
TNFα.

Ix
- COAG
- Exfoliation Syndrome
- Pigmentary ↓ OAG

→ effect — Pseudophakic
Extracapsular ↓

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Instrument used

Laser

- Continous Wave
  - Argon
    - Blue-green (454-528)
      - Colour Vision ✗
      - ✱ 50µ → 70µ spot
    - Ag green 514nm
- Q Switched Nd YAG 532nm

Lenses

a) Goldmann 3 mirror → 59°] Needs rotation
b) 1 mirror]

c) Thorpe 4 mirror — 62°

d) Ritch trabeculoplasty — 59° (Inf ∠)
64° (Sup ∠)

+17D planoConvex button ⇒ 1.4✱ magni

✱ 50µ → 35µ

e) Latina lens — 63° ∠ 1✱ magni
400µ spot size

Factors affecting response → ↑ IOP

- favourable in COAG, Exfoliation syn. Pigmentary
- darkly pigmented ↑IOP spike ∴ ↓ SLT power recommended
- Young age. not fav

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Gonio Consideration

- Degree of pigmentation
  - Darkly
    - pigmented SL
    - Heavy pig → ∴ Inspect all areas
  - Lightly
    - 2ns processes identify
    - CBB, SL.
- Width of Chamber L
  - Narrow L
    - Peripheral Iris thickness
    - Configuration of Iris
      - Rotate SL
      - ∴ Look in direct of mirror.
      - → Iridoplasty < Iridotomy / Gonio P.

Protocol

- Original
  - Wise & Hitter
  - Duration = 0.1s
  - Spot size = 50µ
  - Power = 700-1500 ⇒ 1000mW
    - To produce depigmentation spot
    - Small gas bubble at Rx site
  - Power ∝ 1/pigmentation
  - 100 spot 360 deg.
- Alternative
  - > burn ↓ area = ↓ burn > area
  - 100 × 360° = 50 × 180°
  - 1) Area ↓
    - ∴ Complete = 2 session
    - session
    - ↓
    - as ↓ IOP spike.
  - 2) Placement of burns in Ant 1/2 portion of TM.
    - ✓ → ↓ PAS
    - ✗ → Cellular proliferation from C. Endothelium over TM.

Scanned with CamScanner

Failure predictors → Pre-Op IOP > 31mm Hg
VFD
Light pigmentation of TM

Complications of LT →
Pressure check in few hrs

a) ↑ IOP spike & Meshwork pigmentation
↓ LT theories

Inflammatory exn & fibrinous material tissue debris

Contraction of TM in response to Endothelin-1

b) Iritis — ↓ by Topical CS.
c) PAS
d) Endothelial layer over Ant surf

℞

Pre procedure:
Topical steroid.
NSAIDs

Post procedure
1% Pred QID × 5d

IOP ↓ Rx → 1% Apra = 0.2% Brimonidine = 4% pilo
↓
If pt already on apraz & Adrenergic Ag

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Selective (SLT)

MOA — Selectively targets pigmented TM cells.
- cracking of intracytoplasmic pigment granules
- disruption of T. endothelial cells

SLT = ALT in response bcoz of = changes in TM
- disruption of T. beams
- cellular debris
- fragmentation of endothelium

SLT → free O_2 radical generation → inflammatory complications.

(*) SLT after failed SLT & ALT

SLT special lenses — YAG bonded ↑ antireflection coating
- Latina
- Ocular Magno View
- Pollack Iridotomy (Big — Iridotomy; Small — SLT, ALT)

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60-70 spots over 180°

Energy :- 0.5 - 1.2 mJ/pulse

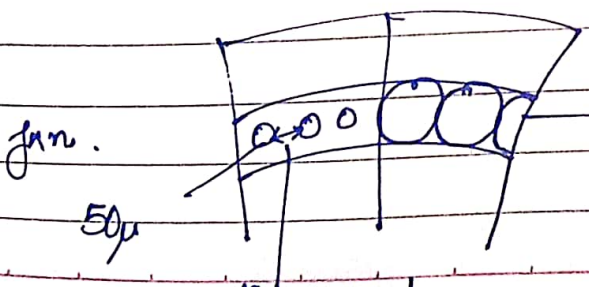
↓

Titeate till Champagne bubble come

↓

Then decrease the energy

ALT		SLT
TM		Pigmented TM
360° — 100μ		50-60μ — 180°
↓	Post op. Rx	No.
✓	QC. ↑n	>>
✗	PAS formatn	✗
✗	failed procedure	✓
	TM maintained for future filtern Sx	✓
Argon	Type of LASER	freq. double Nd YAG
500-1000 mW	Energy	0.6-1mJ
50μ	Spot size	400μ ✓
50/100	No. of laser shots	50
0.1s	Pulse duration	3nS
Blanching +/- bubble formatn	End pt.	✗ ✗
Jxn of Pig vs Non pig TM	Site of focus.	Entire Ht of TM
Structural, PC damage results in Crater	Tissue damage.	✗ damage.
Goldmann 3 mirror lenses used. 1-Mirror/Latch		Latina SLT gonio. Pollack, Ocular Magna ✓
✗	Repeat ALT/SLT	



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Laser Iridotomy

Date 40
DELTA Pg No.

Iridotomy — LASER procedure
Iridectomy — Surgical

Tech — Equalizes pressure b/t AC & VC
Deepening of AC
Opening of AC angle

Instruments

- Continous wave Argon
- Pulsed Nd YAG
- Krypton LASER

CL — keep lids seperated
↓ Corneal epi burns by acting as a heat sink
Control of eye movement

- Abraham Lens
  - ↓ 66D planoConvex
  - ↓ Double laser beam dia at Cornea.
  - 1/2 at Iris
  - ∴ 1/4 th Power at Cornea & 2x at iris.
- Nise Iridotomy - Sphincterotomy lens
  - 103 D
  - ↓ Decentered at 2.5 mm
  - ∴ ↓ Iris focal spot.

» Implication of Argon LASER.

Slit lamp 40 * Magnification.

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Selection of Rx site → Use Topical pilocarpine :— To maximally stretch the iris.

11— 1 O clock or temporally so that lid doesn't bisect → transient ghost images
blurring, glare
shadows
halos

* 12 O clock — gas bubbles interfere.
∴ at 6 O clock for Silicon Oil Eye — Arndt's procedure.

Middle to peripheral 3rd of eye. Select large crypt
In ↓ pigmented eye — select freckle.

Tech

Argon laser → Mushroom head.
→ Large burn
→ Central burn

Nd YAG laser → Hump.
→ Large burn
penetrating hump & small burn.

Other laser → directly to penetrating burns

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Medium Beacon
Duration – 0.1-0.2s
Spot size – 50μ
Power – 700-1500mW

Dark Brown
Chipping tech.
0.02-0.05s
50μ
700-1500mW

Blue
Pris
2 settings

final burn: 100μ, 500-700mW | 50μ, 200-600mW

Chipping Method

30-60 laser spots

Tech. of Nd YAG
Pulse energy = 5-15mJ
Duration = 12ns
no. of pulses/burst = 1-3 pulses/burst
Spot size
Fixed
Multiple focal pt
Larger lesion
2-3 spots req.

Desired Dia of Endotamy – 150-200μ dia
If bleed on Nd YAG → just give pressure with CL
Vaporation in tech → Stromal Gates → Nd YAG
Argon + Nd YAG

Other →
Pulsed Argon laser
Nd:YAG laser.
Semiconductor diode laser

Scanned with CamScanner

Date
DELTA Pg No.

Argon. Photocoag		Nd YAG Photodisruption
		↑ Energy
		↓ exposure times
α	Pigment Abs	α
x	Blue iris	✓
x	All Iris	✓
30-60	Spot no.	2-3
x	Damage to iris vessel	✓
Extensive edema		circumscribed
» tissue destruction		↓
» Obstructed ± pigment dpn		↓ chance
		freq bleeding
» Iritis		
Pupillary distortion		
Late closure of Iridotomy		

Prevention & Mx of Complication

Transient IOP rise
Ant uveitis
Closure of Iridotomy
Corneal damage
Hyphaema
Cataract formation
Retinal injuries
Malignant glaucoma
Mono-ocular Blurring

Scanned with CamScanner

Laser Peripheral Iridoplasty (gonioplasty)

MOA

Immediate → Heat shrinkage of collagen

late → Co-contraction of fibro-blastic memb.

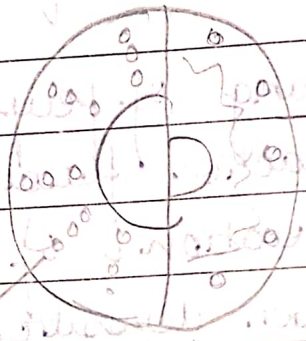
HPE changes
- Tightening of peripheral iris
- Contraction furrow formation
- Proliferation of fibroblast like cells
- Collagen deposition on iris surf
- denaturation of stromal collagen
- Coag. Necrosis of B.V

Ix
-) RBS where ↓ PI due to Corneal Edema
-) Patent PI fail to relieve ACG
  - Crowding of L → Micro-ophthalmic, Nano-ophthalmic
  - Eye ⊆ plateau iris
  - Iris cyst
  - Forward rotation of CB
  - RD Sx
  - Extensive PAS
  - Open persistent & recurrent synechial closure after incisional gonio synechialysis

Tech
- Spot size – 50 – 500μ
- Duration – 0.5s
- Power – 150 – 1000mW
- No. of burns – 10 – 15

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Complications →
- IOP rise
- Iritis
- C. Endothelial burns
- Iritis
- focal iris atrophy



Endoplasty / Exoplasty

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Laser Iridoplasty

Dilation of pupil

Parameter

200 - 500 µ.

0.2 - 0.5 s

200 - 500 mW

Ix

Corneal edema —— PI x possible

PBC in Aphakic & Pseudophakic

Chemically constricted pupil

Complication →

Iritis

↑IOP.

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Date / DELTA Pg No.

Iris Sphincterotomy

Linear Cuts across iris

Argon LASER.

0.01 – 0.05

50μ

1.5W

Incisional Indectomy

Long A req. filtration. Sx >> than Incisional Indectomy

Cannot sit on slit lamp
Too cloudy cornea

Iris prolapse → Cut
└ If x think of -:

a) Inaccurate placement of incision
b) Hypotonus eye
c) PAS.
d) Hole elsewhere in iris
e) Ciliary Iridial processes

a) If cc invasion then Cay presoved for future filtering Sx

b) Pigment Vaccum Indectomy → PPL implantation
└ Steomal layer removed by Sx incision
└ Pigment layer — yes Vaccum aspiratn

c) Sector Indectomy → Truly Basal indectomy

IntraOp
Hmrg
Incomplete Indectomy
Injury to Lens

Post op
IOP ↑
Hyphaema
Cataract
Endophth almitis

flatAC → Scon indectom
deepAC
└ Malig gl

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Trabeculotomy

Creation of an opening in TM to establish a direct communication b/t AC & Schlemm Canal

Canal Based surgery

- Canaloplasty → Ab externo approach (sclera)
- Thermal ablation of TM using Trabectome → Ab interno approach (cornea)

Incisional Trabeculotomy → Mainly for childhood glaucomas

Tech →
- Conj. flap prepared
- ½ thickness scleral flap dissected
- Radial incision made across sclerolimbal jn until Schlemm Canal is entered
- 1 arm of Mc Pherson or Harm's Trabeculotome is threaded in SC
- Rotated TM tears through it in AC
- Procedure repeated on other side of radial incision
- Closure of sclera & Conj like other Sx.

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Variations →

Suture Trabeculotomy
↓
360° suture passed
- Nylon
- Prolene

180° apart incisions made
- exposed ends pull taut

Combined Trabeculotomy - Trabeculectomy
↓
If SC x located with certainty
↓
Remove limbal tissue beneath scleral flap
↓
Trabeculotomy fistula beneath scleral flap
→ Sturge Weber
→ Corneal Opacification

Combined Trabeculotomy - Cataract Sx
↓
to ↓ flat AC
> 70yr effective
+ Hyphaema.
↓
Phaco +
- Trab. → ↓ Post op fibrin formn → Perforation of DM.
- Visco Canalostomy → > VA than Visco.

Combined Trabeculotomy - Sinusotomy
↓
procedure for externalization of SC
↓
↓ IOP.

Ab interno goniotrabeculotomy
Sx incision of IridoCorneal ∠ to establish direct communicat° bt AH. of AC & SC
↓
post op Complicat°

Muscle Variations
↓
Using electro cautery.

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Complications → SC not properly identified

↓

- false passage in AC
  Suprachoroidal space

↓

Cyclodialysis cleft.
Hyphaema.

Convert to Trabeculectomy

Probe

↙ ↘

Stop DM. | Damage iris Lens

- Post op bleeding
- Infection

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Ab Interno Trabeculotomy

↓

Trabectome

Removal of TM from internal approach

- Trabeculo puncture
- Gonio photoablation
- Laser Trabecular Ablation
- Gonio Cussetage
- Use of Trabectome

Variations of goniotomy (Incision ± out removal of TM)

AC – SC direct communication

Tech →

Temporal clear corneal approach

↓

Probe inserted thru TM ⟷ SC

↓

~~Thru tempos~~ Thermal ablation — to remove Nasal TM & internal wall of SC 60-140°

(*) Transient hyphaema as a result of reflux bleeding 4m collecting channels

Canaloplasty

Ext transCorj approach

↓

Cutdown to SC made to unroof Outer Wall of SC.

↓

flexible microCathetar is used circumferentially to inject Visco-elastic

↓

To . Dilate SC

↓

10-0 Prolene tied under tension in SC.

↓

Inner Scleral flap removed

Outer " " closed

DM , TM left Intact → × Considered a penetrating procedure

Mech → Dilatation of TM

+

Chronic Stretch of TM (induced by Prolene)

⇓

a) ↑ Aq Outflow

Transudation of Aq thro SM window

↓

Intrascleral lake

↓

Intrascleral Bleb

↓

fluid Sclero → Uveo → Suprachoroidal space.

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Laser trabeculotomy / Trabeculopuncture

Date / Pg No. 47

Q switched Nd YAG

Erbium doped Nd YAG

↓

Sealed by proliferation of corneal endothelium.

Scar tissue.

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Trabeculodialysis

TM scraped from scleral sulcus ± flat side of goniotomy blade

↓

Useful in glaucoma ass ± inflammation because Trabecular tissue is friable & easily scraped off in these cases.

Complications →
- Hyphema
- Improper position of spatula
  - IRM stripping
  - Corneal damage
  - Tearing of CB / SS
  - Lens injury
  - Vitreous loss
- Sudden ↑IOP → closure of cleft
- Hypotony
- Penetrating → cyclodiathermy / Cyclotherapy

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Cyclodialysis

Date / DELTA PG NO.

Alt to filtering Sx
esp in Aphakic eyes
in Combination c Cataract extraction

Theories of Mech → Seperation of Ciliary body from Scleral spur
↓
Direct communication b/t AC & Suprachoroidal space
↓
↑ Pressure dependent UV outflow
↓ Aq production due to alteration in CB anatomy.

Tech Sup Quad b/t 2 recti insertion
↓
Conj/Tenon → 8mm from limbal jxn
↓
full thickness 3-4 mm Scleral incision
↓
4-6 mm from Anat limbus is made
↓
Cyclodialysis Spatula inserted into Supra ciliary space
↓
Tip enters AC
↓
Separate 1/3 CB from SS
↓
Close Conj only

Ways to maintain Cyclodialysis cleft
- Implants
- Scleral folded / pedicles forward
- Irido-Cyclo retraction
- Emp [Air / NaHyaluronate

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Date
DELTA Pg No.

Goniosynechialysis

» Synechial Angle closure glaucoma (recent onset)

Deepening of AC ⊆ Na hyaluronate

↓

Seperating synechiae 4mm TM ⊆ Irrigating Cyclodialysis spatula under direct gonio visualization

Also done in PK.

VSG → Successful AC deepening after goniosynechiolysis

Panniophotocoagulation

Date DELTA Pg No 49

NVG
Argon laser
0.2s
150μ
100-300mW

✓ NVA
bt not in advanced NVG
↳ Hmvg
↳ Accellated closure of AC L.

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Trabecular Aspiration.

Irrigation - Aspiration → for removal of pigment & exfoliation material 4m TM in eyes associated ⊆ Exfoliation Syndrome

Goniotomy vs. Trabeculotomy

Repeat procedure ↓

> Juvenile/Adult

> Steroid induced ↓

Gonio & Cut TM ⊆ Knife.

↓ Raw Loop & put instrument/suture in SC

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Filtering Surgery

Date / 30
DELTA Pg No.

Incisional ⊗x refered to as filtering ⊗x.

MCA a) Drainage fistula is made
a) Opening is made at limbus
↓
Direct communication b/t AC & SubConj space
↓
Bypass TM, SC
↓
from SubConj space → Aqueous abs in SubConj tissue
↓
Conj epithelium
↓↓
Drains & tears thro NLD.

b) Filtering Bleb — Elevation of Conj at ⊗x site.
∝ Extent
Elevation
Vascularity.

Filtering Bleb
↓ Vascularity &
numerous microcysts
in epithelium
↓ as diffuse
> Circumscribed & Elevated.

⊗xn bleb		failed bleb.
same	HPE at epithelium.	same
Loosely arranged tissue & clear spaces	subepithelial tissue	dense collagenous CT

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if fistula covered by ½ thickness scleral flap

MOA

a) Lymphatic vessels near scarred margins of surgical area

b) Atypical, newly incorporated Aq. Veins

c) Normal Aq. Veins

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Types of Bleb

Date 5/

Moorfield classification

Diffuse	Thin wall	large SA	↓ elevation
Microcystic Type II	"	large "	Moderate "
Flat III	Microcystic str.	x elevation as Microcysts	
Encapsulated IV	Thick wall		Cystic app ↑ elevat^n & demarcat^n seen

Migdal & Hitching's Bleb classificat^n

Type 1	Type 2	Type 3	Type 4
↓↓ IOP	↓ IOP	↑ IOP	↑ IOP
Elevated	elevated (Ideal)	↓ localized Bleb flat	↑ Localized
Thin good filtrat^n	Thin, diffuse → Microcysts Rel. avascular	x Engorged vessels Non filtering	Encapsulated ✓ Cysts like cavities of hypertrophied Tenon

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Yes Tech

Date
DELTA Pg No

a) Traction Sutures
- a) SR bridle suture
- b) clear Corneal traction suture
- c) Teron traction sutures

a)
X → SubCay thrug Hole in Cay → Leak X

b)
preffered → distort Cornea
QC.

Temporally for injecting fluid

Wait if Augmentation is to be done. to avoid drug in QC.

Can be done after raising Scleral flap.

c)
Scaring is main complication.

Separation of flap

12 o clock → wide limbus

Superior Quadrant → Other ½ still available in future

Inferior Quad → ↑ risk of endophthalmitis

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(d) Limbal based / fornix based flap :-

Limbus based
↓
Initial incision in the fornix.
↓
Tighter wound closure
↓
Difficult to dissect.
↓
Limbus based flap ← Difficult to dissect & cut creating holes in Conj.
↓
May cut Scar tissue & pull new edge forward.

fornix based
» popular
better for corneal diffuse blebs
Rel cases & > Exposure
↓
flap may caused in case of previous scleral buckling & Scar tissue at limbus

(e) Nx of Tenon Capsule

Tenon is main site of fibroblasts to area of Conj flap
Preserve Tenon.
∴ dissect bt Capsule & Episclera
» used in (excessively thin & leaking cases) antifibrotics against antifibrotic agents to avoid
↓
∴ Modified fornix based tech. → Microtab.
Blunt dissected
Reflect flap & non toothed forceps
Min Handling of Conj

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Use of Visco → Healthyal → Prevent post op hypotony & ↓ Suprachoroidal effusion.
↓ Intra-Op bleeding

Complicat^n of Intracameral Visco → Iris prolapse during Sx
↑ IOP post-op
↳ (pause pilocarpine
↓ tight sutures to sclera)

Temp solution to post op flat AC.

PI — after fistula has been prepared.
If Iris prolapse
↓
Iridectomy (beyond margins of sclerotomy)
↓
Complete fistula.

Complications → Inflammation
Hyphaema
Iridodialysis

PI can be omitted in pseudophakes or pt ⊆ deep AC.

Closure of Scleral flap → Watertight closure
10-0 polyglactin
or Running suture ⊆ close bites — provides tightest closure
↓
Then loosen or tighten accordingly
use fluorescein in the end. If req.

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Post op Mydriatics → Topical Mydriatic - Cycloplegics

Fistulizing tech

full thickness

↓

× more as Antifibrosis Agents
Lead suture lysis

1/2 thickness

Partial Thickness fistula (Trabeculectomy) →

(X) → Excessive Aq. filtration
↳ flat AC.
Decompensation of Cornea
Synechiae formation
Cataracts
Thin filtering bleb — Rupture
Danger of Endophthalmitis

⇓

1/2 thickness flap over fistula

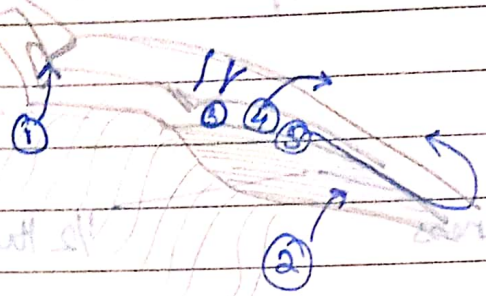
↓

K/C/O → Trabeculectomy.

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Theories of Mechanism

Pg 492



1. Aqueous flows into cut ends of SC
2. Cyclodialysis
3. filtration through Outlet channels in scleral flap
4. filtration through CT substance of scleral flap
5. filtration around margins of scleral flap.

Scleral flap raised

↓

Cautery done

↓

limbal based flap ≤ further 1mm deep into bluish black zone.

↓

fistula made to enter AC

↓

Radial incisions extended 1mm radially (May use scleral punch)

↓

After making PI, scleral flap approximated with 10-0 Nylon sutures

↓

to maintain Optimal AC depth, that much sutures required

>> Imp in Anti fibrotic agents
- >> filtration
- >> hypotony

↓

some ppl. prefer tight closure

- based suture lysis
- releasable suture.

Modification in Tech of Trab

Variations in scleral flap

- Square
- Triangular
- Trapezoid flap

- Thin flap → filtration ↓ IOP
- Apply cautery to margin
- Excise Margin

Pre fibrosis Rx.

- place AMG in s/t scleral flap to prevent fibrosis
- Scleral tunnel tech like Phaco.

Modification for previous 10 Rx

↓

Conj scarred / used due to previous / Phaco Rx

↓

Then make fornix based flap.

↓

» put Rx (Tube)

Variations in fistulizing Tech

Dissection of tissue block post over CB.

↓

By trephinations / Sclerotomies

Thermal "

CO_2 "

New use -:

Kelly BM punch

Ozaluron-de-Laage punch.

Modification in NVG

↓

To prevent intra-op complication of hyphaema

↓

Excision of large TM segment

↓

1/2, Non penetrating cyclodiathermy in scleral bed

↓

½ ablation of Abn iris vessels ≤ wide sector iridectomy

↓

Adjunctive devices

Ex Xpress Mini. glaucoma shunt

↓

↓ IOP post op

↓

Trabeculectomy (guarded filtration)

≤

x PI req.

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Wound healing / Scarring Post Trab

M.C cause of failure

↑ amt of collagen
↓
Proliferation of fibroblasts
↓
Production of Collagen & GAG

a) AH → Non proliferative as has inhibitory factors for fibroblast proliferation (↑ conc of HA)
↓
Cytotoxic to Tenon's fibroblasts

b) FGF β — healing process after glaucoma Sx
↓

c) Chemoattractant activity is > in eye ≤ failed bleb for fibroblast.

Factors affecting it → No. of goblet cells in Conj as ↓ them
↓ Inflammation
Cs with prior → ↓ chances of failure.

Antifibrotic Agents

a) Cs → Cs
NSAIDs
Subcony triamcinolone — may improve success rate

(b) 5FU — thymidylate synthesis → Inhibit fibroblast proliferation

5mg 5-FU subcony inj BD ×7d
OD ×7d

↓

(x) → ↑ risk for bleb leakage.
→ Corneal epi defects.
→ Wound leaks.

(c) Mitomycin C → Anti Neoplastic antibiotic isolated from Steptomyces Caespitosus. Inhibition of fibroblast proliferation.

MMC ↓↓ prolonged effect 5FU.

to both — Cytotoxic — ✓ fibroblasts
not to Vascular endothelial cell

↑ Superior — Bleb duration
10% lowering efficacy

Post Op Complication
↓ C. Epi toxicity ✗
↓ Wound leak ✗

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0.2 mg/ml × 2min

Other factors — a) Mitocel
b) Beneath the scleral flap
c) ↓ dose of MMC application
d) Irrigation — Not better than (c)

Other fibrinolytic Agents

Cytosine Arabinoside	Adriamycin	Cytochalasin B.
Bleomycin	5f-Orotate	Colchicine.
Rapamycin.	Heparin	Immunotoxins
Doxyrubicin.	Taxol	Ifn α2b.
Suramin.	β irradiations	

Tranilast → TGF-β_2 inhibitors.

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Entire full thickness fistula.

Sclerectomy

Limbal fistula.
Dissect opening thru full thickness limbal tissue

- Ant lip of Wound
- Sclerectomy with a punch.
- Post lip. Sclerectomy

Trephination.

fistula by trephine just behind Cornea-limbal jxn. (Limbus Scleral)

Ant trephine (Clear Corneal)

» Thin bleb.
∴ post. tech preferred.

Thermal Sclerostomy (Schie Procedure)

Application of light Cautery 1x5mm

↓

5mm ⊥ limbal scratch incision

↓

Cautery applied to lips of incision

↓

Wound edge separate by 1mm

Iridencleisis

Wedge of iris incarcerated into limbal incision to maintain patent channel for Aq outflow

» chances of Sympathetic Ophthalmia.

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Laser Sclerostomy Tech

Ab Externo → full thickness
THC: YAG used
2100 nm.

⊥ exit of laser beam from tip of fibre-optic probe

↓

Subcon advancement of probe

Continuous wave > pulsed

Other → giant pulsed Nd YAG
Nd YLF
Semiconductor diode

⊥ exit of laser beam from tip of fibre-optic probe

↓

Subcon advancement of probe

CW > pulsed.

Ab Interno → No dissection of conj eg/
- Q switched Nd YAG x > Energy
- Staining sclera with Methylene blue — Iontophoresis & using pulsed dye — 660 nm.
- Contact laser probes

Other Internal Sclerostomy tech

Automated keephune
Bipolar cautery
Diathermy probes.

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Non Penetrating Procedures

Sinusotomy

↓

Flap of sclera is excised to expose portion of SC.

✓ » Aphakic eyes
× PI req.
↓ Post op hypotony
shallow AC
hyphaema
Choroidal effusions.

→ Canalostomy

Deep Sclerectomy

↓

DM window created

↓

Aq to escape in AC forming low filtering bleb

↓

addition of collagen implant in scleral bed

↓

Maintain scleral drainage

Visco Canalostomy

↓

Deep scleral dissection & a filtering window

↓

Or Laser can use to dissect TM

⇓

Subconj drainage
» Component

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Glaucoma Surgery

Date

DELTA PAPER

Basic Tech

Traction suture on Cornea (6-0 Vicryl)

↓

Fornix based Conj-Tenon Capsule flap is created Superiorpically

↓

Blunt dissection done.

⑥ Avoid SN quadrant due to risk of staburnus

Aqueous valve in SN Quad comes ≤ 1mm of ON

↓

Irrigate Aqueous valve with BSS to ensure tube is open

↓

Ext plate tucked on Sub tenon space

Suture to Sclera ≤ 9-0 Prolene/Nylon thru Ant holes



Ant plate 8-10mm from limbus

Baerveldt → Under adj rectus mm

Schocket type → dissection of ↳ Quad

Ahmed → Reservoir has to be 5-8mm back

If Non Valved

↓

2 Stage Implantation Tech

External plate in Conj space → ≤ 2 out Inserting tube in AC → Insert tube 6-8 wk later.

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Modificat^{n}

Occlude tube by ligature of suture (Vicryl) before inserting it into AC.

↓

This prevents AH drainage till 4-6 wk post op

∴ prevent 2 stage procedure

↓

After 4-6 wk → tube is cut, bevel up 2-3mm in AC

Cautenge that limbal area ↔ insert tube

↓

Paracentesis IT for Visco inj

↓

Needle track made tube threaded through s/t Cornea & ins ⊆ tube insertion forceps

↓

To prevent erosion of sclera & Corj

↓

5×7mm Tutoplast, donor sclera, dura & fascia lata is placed

↓

Peritomy closed

↓

Subconj steroids & AB injected.

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Modification of Basic Tech →

Incised Cut
↳ 8mm from limbus.
Limbal based flap
↳ SN & IT Quad

b) How to occlude the tube

c) Which patch graft to be placed.

d) Excessive fibrosis → Antifibrotic fibrotic agents.

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Special situation

Sau Plana Insertion

Hoffmann elbow

Boerveldt implant after PPV & AFE.

✗ → Eyes eg, PPV also

✓✓ → Corneal grafts (Tube away from Cornea)

→ ↓ risk of epithelial down growth

Pre-existing Scleral buckle

Scleral buckle ? Smith

↓

Silicon tube in AC & distal end into fibrous capsule of pre existing buckle.

Serves as reservoir for Ext drainage

↓

Since buckle is already fibrosed ∴ ✗ lig of tube — to restrict flow is necessary.

Long Kouplin Denver.

Pre-existing Corneal graft.

PPV

In Ciliary Sulcus

↓

✗ in phakic eye for risk of inj to Crystalline lens.

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Complications

Date 61
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- Hypotony
- ↑IOP.
- Migration / Extension / Erosion.
- Endophthalmitis

- Visual loss.
- Corneal decompensation & graft failure
- Diplopia. Ocular Motility Disturbances
- Other Complicatn

HYPOTONY → ≤ Non Valved Temp obstruct the tube

- Suture lig
- Occlude the tube ≤ stent
- 2 Stage Implantation
- Use of Valved Implant

↑IOP

Hypotensive phase ↓

Hypertensive → ✕ edema.

fibrous tissue in deeper layer.

Obstruction of tube by fibrin, blood, Ins, Viscous, & Oil

- Nd YAG laser membranectomy
- Needling can be done.

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Migration, Extrusion & Erosion.

Ant — Dislocat^{n} of Ext plate
Post — Repositioning of Tube

Ant Migration Post Migration

- Rejection of an implant → place under GR Mal after trauma

- Erosion of tube → Scleral graft → Other harms too.

Thick → Keller formatn

Thin → Erosion

Immune Rxn to melting

Endophthalmitis
Needling.
Ex. Propionibact Acnes. In Molteno device

Visual loss — Hypotony
Shallow AC.

Corneal decompensation & graft failure
Tube Corneal touch — Removal of tube
Shortening of tube
Phosphonyl Choline polymer coating of tube

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Diplopia & Ocular Motility → Exotropia
Hypertropia

Others
- Epithelial downgrowth
- Implant failure
- Corneal decompensation.
- True tenon Cyst
- Cosmetic deformity
- Motility disturbance.

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Date

Cyclodestructive Procedures

DELTA Pg No.

↓ rate of Aqueous production by partially eliminating fkn of ciliary processes.

Ix - Operation has failed
- Surgeon wishes to avoid incisional Dx
- Eyes with limited visual potential
- ↑ risk 10 Complications

Procedure - destructive energy source
- Route by which energy reaches ciliary P

Laser Cyclophoto Coagulation ← Therapeutic USG → Microwave Cyclodestruction

Delivery Route

Transscleral ↓ Transpupillary ↓ Endoscopic.

Transscleral
- ✓ Non invasive, Pt quick/easy
- ✗ - ✗ able to visualise processes being treated
  - Damage to adjacent tissue
  - Unpredictable result

Conj → sclera → Ciliary Mol.

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Early Cyclodestructive Procedures

- Penetrating Cyclodiathermy
  - Diathermy probe penetrate sclera
  - 2 rows of lesions
  - 2.5–5mm behind limbus for 180 deg
  - ✗ → Hypotony Phthisis.
- β irradiation
  - Use of radium over ciliary body
  - ✓ → ↓ Vascular supply to CB.
  - ✗ — Damage to lens
- Cryocoagulopexis
  - ↓ freq galvanic current to create a chemical rxn in ciliary body
  - formation of NaOH.
  - Caustic to tissue in CB.

- Therapeutic USG
  - focused trans-scleral ultrasonic radiation to produce localized destruct of CB.
  - ✗ → Immediate post op IOP ↑
    - Mild Iritis
    - Scleral thinning
    - Mild Iritis/Phthisis
    - ↓ VA.
- Trans-scleral Microwave Cyclodestruction
  - ↑ freq electromag radiation
  - Δ induce damage to CB c/ spairing of Conj & Sclera.
- Excision of CB.

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Laser Cyclodestruction

Transscleral Cyclophotocoag → Xenon Arc
Ruby laser
Nd YAG
Semiconductor Diode lasers

Lasers

- Nd:YAG
  - 1064 nm
  - All modes used
  - x available commercially
  - ✓ → transverse sclera efficiently
- Semiconductor diode lasers
  - 730–850 nm
  - ✓
    - >> abs by melanin
    - Solid state construction & compact size
    - ↓ Maint. Req.
    - x req. for electric Outlet/ H_2O cooling
      - Oculight SLx
        - CW
        - Contact delivery
        - λ = 810 nm
        - Power Output = 2.5–3W
        - Duration = 0.9s
        - G Probe → 600μ quartz fibreoptic
        - retracted 0.7mm from handpiece
        - 1.2mm behind Sx Limbus & // to visual axis
      - Back of G Probe
        - pushes lid away
        - and in spacing
  - x
    - Not traversed by sclera
- Krypton laser
  - ✓
    - > Uveal pig abs.
  - x
    - Poor scleral penetration
    - Endo Optics
      - EPC Dag
      - fibreoptic for video Monitoring
      - Illuminat^{n} in 20G probe. Lens – 70° view
      - 1.2W
      - 670 nm – aiming beam
      - focal distance = 0.75mm from tip
      - depth of focus – 0.20 mm

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Theories of Mech

↓ Aq. Production.

→ Coagulative necrosis of ciliary epithelium (Pars plicata)

↓

destruction of ciliary vessels in overlying area.

↑ Aq. Outflow.

Diode.

» tissue disruption

» contraction of CP

↓

Sparing CB and ⊆ & architectural disorganisation

Nd YAG

Non Contact free running

- White lesion of Cil Epi
- Bluish like elevat^{n} of epi layers 4m adj stroma
- » disrupt^{n} of Pig epi
- ↓ change in CH/Sclera

Exposure time ∝ Coag. Shrinkage of lesion.

Contact CH

- Smaller
- > Coag
- ↓ bluish like elevat^{n}

+ fibrin
+ Scant Inflamm Cells
x change in CB Vasculature

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Endo.

↓

- Some reperfusion ↑ over time

Transscleral

↓

↓ Blood flow in area of treatment

↓

Remained Non perfused

↓

Chronic poor perfusion

↑ Outflow

⇒ peripheral placed lesions over PP | peripheral retina

post

↓

↓ IOP.

↓ Aq. Production due to Inflammatory response

↑ Outflow

Ciliary vasc. destruction

Chronic inflammat°

↑ Outflow — due to PP transscleral flow.

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c)

Date
DELTA Pg No

Protocols

Semiconductor Diode, CW → foot plate of ϕ probe on conj & short side adj to limbus

↓

1.2mm behind limbus

1750mW for 2s

keep probe ⊥ so that excess energy goes Ant than towards Macula.

Popping sound ✓ ↓250mW

× ↑250mW ⟹ sound = Excessive tissue destruction

(b) ↓ power ↑ duration 1250mW × 4s — dark pig

1500mW × 3.5s → Lightly pigmented

a) 17-19 application × 270 deg

b) 24 " × 360 deg

× at 3, 9 O clock → ↓ chances of occluding long post ciliary vessels

↓ chances of Ant Seg ischaemia

for Endo Cyclophoto Coag

Limbal

↓

Paracentesis at temp limbus

↓

full AC & Visco

↓

PC expansion by Visco (hyaluronate)

P. plicata — edges approach

PP

↓

- PCIOL + nt
- Post PR (bad view)

↓

2000 ms.

400 - 600mW

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↓

Do take out Visco

↓

give. Dubtenon Dexa

↓

Post op — A·B
Cycloplegics
Ag. Suppressants.
Pain killers

Ix

APK, PBK
NVG
~~CORG~~ CPCG
Inflammatory g
Tx associated g
Pt ⊆ multiple failed PK.

] good Prognosis

To Comment on effect wait for 1mth

ECP → for eyes having vision potential
as ↓ risk of hypotony, phthisis
severe vision loss.

Complications →
Corn hyperaemia
oc flare & cells
fibrin clots & hypopyon
Hypopyon
Neovascularising Sclerutis
Transcl Loss of VA

ECP → fibrin exudates, Post op IOP spike, hyphaema, CME, ↓ vision & Choroidal Detatchment

If Visco does not work — Pro hook

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Nd YAG

Prominent whitening

Contraction of ciliary epi

Predominant coagulation

Disruption of C. epithelium

↓

Visual loss

Diode

Deeper tissue contraction

↓ epi defect

>> Coag response

Cyclophoto Coag

Intra Ocular.

↓

Argon laser

↓

Do PPV

↓

↓ IOP.

Do Scleral indentation

↓

Bring CP into transpupillary view.

Transpupillary

↓

Sufficient Ciliary process seen gonioscopically

Possible

✓

↓

Aphakia

Large iridectomy

Retraction of iris

Adv. NVG

0.1-0.2s.

100-200μ

Zero - 1000mW

⇒ 3-5 spot to Rx complete ciliary process

✗

↓

Eyes on miotics

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Cryo Cyclotherapy

Date
DELTA Pg No

Def:

Type > Cyclocryo > Penetrating

MOA → ↓ pain by

Biphasic

Intracellular ice crystal formation → Rapid freeze & thaw Tech → freezing of ECF conc the remaining solutes → Cellular dehydration

Ischaemic Necrosis → Superimposed thrombo infarction → obliteration of microcirculation in feogen tissue

Freeze — ↓ retinal

Slow thaw — formation of larger crystals

Tech

Cryoinstruments
- N_2O, CO_2 gas
- dia : 1.5-4mm
- 2.5mm is optimum
- Modification — 3×6mm tip to ↓ no. of application

Cryoprobe placement
- 1mm 4m CL fxn
- temporally, Inf, Nasally
- 1.5mm superiorly
- By applying pressure
- Use Transillumination to visualize the not visible

No. of cryo application
- 90 → 180
- 270°

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Date / /
DELTA Pg No

Freezing Tech temp −60 − −80°C.
duration < 60s
» value → ↑ risk of phthisis

Repeat 1 or > times.

Post op Mx Steroid Analgesics
Subcon. steroids

Complications

a) Transient IOP ↑ →
b) Uveitis → fibrin clot
PG induced → ↓ by Aspirin before Rx
c) Pain.
d) Hyphaema. » NVG
e) Hypotony

Other — CD.
flat AC.
Ant Seg Isch.

Ix — PE
CDAG
Congenital gl.
NVG Mx.

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Co-existing glaucoma & Cataract

Cataract extraction alone

↑ PCR risk (+ Exfoliation)

→ ECCE

→ better control

→ Induction of potential steers response in TM by USG

Glaucoma Sx alone

- Borderline gl
- Visually significant cataract

→ allow AC

Choroidal Detachments

Combined Cataract + glaucoma

(X)

- ↑ risk of post op complication
  - ↑ inflam
  - hyphaema
  - hypotony

→ ↓ early IOP rise

Sx

1. Borderline control despite Medical & laser Sx
2. Adequate IOP control + significant drug induced side effects
3. Adequate IOP control on well tolerated Medical Sx but advanced GON
4. Uncontrolled glaucoma

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Tech

Cataract surgery in eyes with glaucoma

(1) Miotic Pupil → Irreversible miosis from chronic miotic ↓

Sector iridotomy
≤
2 inf. sphincterotomies
↳ close ≤ suture
↳ left open if lens haptics rotated horizontally away

Peripheral iri
↑
Multiple ↓

5-4pt Beehler pupil dilator
↓
2-3 extendable fingers through 2.5-3m incision
↓
dilate upto 7mm

flexible Nylon Hooks

Malyugin Ring

Mechanical stretching of pupil
↓
Iris suture Tech

Manoeuvre of tucking iris pillars of sector iridectomy

Pupil expanding Ring

Stabilize Ant Capsule with Iris hooks.

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Visco-elastic substance →

✓
- Ant capsulotomy
- Maintaining deep AC
- Protecting corneal endothelium
- Providing ⊕ pupillary dilatation

✗
- Post op IOP spike
- Viscosity ∝ spike

Capsulorhexis size → <5-6 mm

<5-6 mm
↓
✗ IOL dislocat^{n} into AC
↓
∴ ✗ need for Post op pupil constriction

Pupil constrict^{n} if req
↓
Use intracameral Carbachol

Include flap of Lens capsule in Trabeculectomy site

IOL selection →

Silicon IOL

Acylic IOL
↓
» IOP spike

No ACIOL
if req,
Semiflexible 1piece Open loop ACIOL
↓
else scleral fixated IOL

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Filtering Sx ↷ Cataract Sx.

→ Try to maximize bleb survival

→ » tendency of vitreous loss ⟶ Bleb failure

Try giving temporal incision.

Combined Sx

Use trabeculectomy

guarded fistula & Cataract extraction

3mm incision for IOL insertion

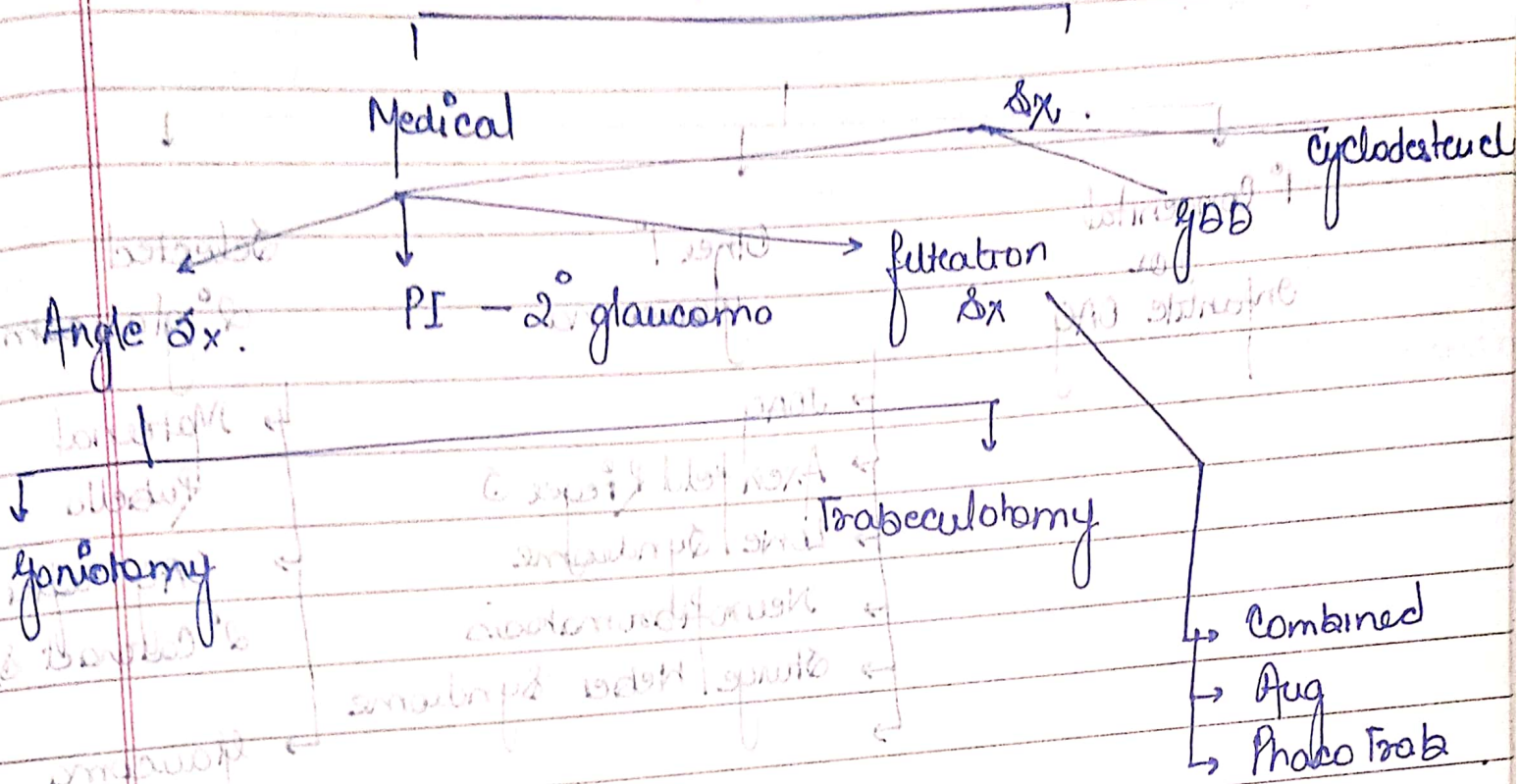
Use 2 site tech ⟨ Cataract — Temp.
Trab — Sup.

↓ 1-2mm ↓ IOP rise.

Adjunctive use of Antimetabolites →
↓ fibrosis

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Childhood Glaucoma



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Goniotomy

Ix

- 1° Congenital or infantile OAG
- Other 1° glaucoma
  - JOAG
  - Axenfeld Rieger ʃ
  - Lowe Syndrome
  - Neurofibromatosis
  - Sturge Weber Syndrome
- Selected 2° glaucoma
  - Maternal Rubella
  - OAG after 2° Cataract ʃx
  - Glaucoma ass c Chronic Ant uveitis.

Procedure

- Adequate view
- Clear Corneal edema
- Put goniolens
- Stabilize globe & practice rotation
- Enter 1ome — 25 guage, 1.5 inch, making Incision into peripheral cornea // to iris
- Incision in ATM 1 — other side
- Rotate globe bt ʌ c needle
- Constrict pupil & go //
- ↓ bleeding

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Trabeculotomy

Date 72
DELTA Pg No

Ix

» If Corneal opacification not after 2 goniofail
Combine ⊆ Trabeculectomy

Procedure

Optimize location of ✕ Pass → NT Incision abv & below horizontal to spare conj & facilitate scleral flap
↓
Maximize chances of finding SC
Make radial incision
Watch for transverse fibres
Blood Aq. reflux
↓
To ↓ false passage — Pass blunt 6-0 prolene into canal ⊆ Confirm ⊆ 4 mirror goniopraxis
↓
~~Blood Aq~~ Pass Ham's Trabeculotome
↓
↓ bleeding by filling ⊆ Visco after 1st is passed
↓
Close Conj
↓
Close scleral flap.

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Trabeculectomy

Dx

Combined

- when T. ectomy cannot be completed.

- failed previous ↙ ↓x

ectomy (Aug)

- ↓ & reasonal visual potential & Unsclerosed Conj

- ↓ success & ~~filtration~~ ↙ ↓x

Phaco Trab

↓

x usually recommended

Procedure

stablize globe

↓

Fornix Based Conj flap

↓

Limbal ← Thin Sup limbus / ↑ risk & flat AC (Aniridia)

↓

Apply Mito C → 0.2-0.4 mg/ml for 2-5 min

↓

Flap closure — Conj close (Releasable sutures)

↓

Hypotony prevention.

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GSS

Ix

- Infants & aphakic eyes ⊆ failed L Sx
- failed Trab ⊆: Intraop Mutomycin C
- ↑ risk of complicatn ⊆ filtration Sx (Sturge Weber)
- " " failure 4m Sclering
- Ipsi LR recession (Pt ⊆ CXO & planned Baerveldt
- Combined C & gl Sx

Procedure

Fornix based
↓
choice of Implant ← ST location
← Suture plate 7-8mm from limbus
← 8-0 Nylon suture
↓
Ex Exotropia
↓
Optimize tube position
↓
Wound closure & hypotony prevention
↓
give Anti inflam Rx

choice of Implant

↓ Immediate pressure ↓ → Valved implant

→ Baerveldt's 350mm².

AL - 21mm
↓
S2
FP-7 Ahmed
- 1mm back of plate
- Place close to limbus

Cyclodestructive procedures

Date
DELTA Pg No.

Ix

- **Transscleral**
  - Failed L Sx
  - Trab, GDD ≤ poor Vision
  - IOP too high after GDD
  - Anatomy disorganised
  - gravely ill pt
- **Endoscopic**
  - Inflamm risk ↑
  - DLCP failed
  - Phakic/Pseudophakic
- **Cyclocryo Rx**

Procedure

Limit to 3 Quad to prevent hypotony
2 Quad Cyclocryo
↓ excess inflamm
↓ risk of phthisis
to tell pt

MIGs

Date 74
DELTA Pg No.

Minimally invasive glaucoma Sx. .·. Bleb based also.

These procedures avoid formation of bleb by shunting fluid across obstructed Trabecular Meshwork into Schlemm's Canal or Supraciliary space.

MIGs def - lop lowered by improving outflow of eye fluid
- device or procedure can be approached from inside eye or outside
- Min Sx manipulation of Sclera & Conj.

Advantages	Disadvantages
» Bleb independent	- Only NPAS (Non Penetrat" Deep Sclerectomy) has proven benefit
less invasive	- ↑ cost of Sx
Faster Visual Rehab	
↓ Complications	
- flat learning curve exc. VC plasty & NPAS	

Ix →
Mild to Moderate G →:
POAG
Pseudoexfoliation
PDG

- Age > 18
- c. Concomitant Cataract Sx.

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Contraindications

- ACG
- 2° Glaucoma
- Moderate Adv of
- Previous of Sx
- Uncontrolled IOP.

Classification

(a) Subcon filtration strategy

- Ab externo.
  - Ex-Press implant
  - CO_2 laser assisted Sclerotomy Sx (CLASS)
  - Innfocus Micro Shunt
  - Fugo blade trabeculectomy filtration
- Ab interno
  - XEN implant

(b) ↑ filtration into SC strategy → (*) Schlemm Canal

- Ab externo.
  - Canaloplasty (Ellex Catheter)
  - Stegmann Canal Expander (SCE)
  - Fugo blade goniotomy
- Ab interno
  - iStent Glaukos
  - High freq deep sclerotomy (HFDS)
  - Ab interno Trabeculotomy
  - Hydrus implant
  - Kahook Dual Blade
  - ELT
  - Trabectome

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(C) Suprachoroidal filteration Strategy

- Ab interno
  - CyPass implant
  - iStent supra implant
- Ab externo
  - Starflo implant
  - gold solx ..
  - Aquashunt



- Trabecular bypass
  - iStent
  - " inject
  - 4 FDS
- Schlemm Canal
  - Ab interno Canaloplasty
  - Hydrus
  - Visco 360
- Trabeculotomy
  - GATT
  - Trabectome
  - Kahook Blade
  - Excimer laser Trabeculotomy

→ Total Trabeculectomy

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Devices	Ix	C/I	Complication
• Trabectome — NeoMedix. AB interno. MIGS ablat° under gonio guidance for controlled electrocautery of dec of TM. providing Aq. direct access to CC. Aspirated debris ∴ ↓ inflammat°	- POAG, PEX, PDS. - OAG & failed filtrat° Sx	Acq ± cat PAS.	Transient hyphaema Iridodialysis Cyclodialysis IOP spike
• iStent Trabecular Micro Bypass stent — Glaukos. AB interno placed in SC in lower Nasal Quad. channel for direct trans trabecular outflow from AC to CC. Retable	early-moderate OAG PEX PDS	Uveitis, Ocular Inf Acq	PAS.
Kahook Dual Blade (KDB) — facilitate goniotomy. ↓↓ goniotomy: leave flap. KDB: excise strip, direct opening. × filtering bleb.			
Xen gel & System — FDA approved. ↓ IOP by creating subcon drainage pathway. 6mm long, 45mm dia. 6-8mm flow resistance which ↓ post op hypotony. maintain microfistula b/t AC & subcon space	Refractory g	Narrow ∠ g, ↓° g	wound leak, Retrocorneal Hyphaema, Hypotony, Ag. Misdirection, Implant Migration
Cypass (Alcon) — Biocompatible polyimide tube 6.35mm length ⌀ 300μ lumen placed in Supraciliary & Suprachoroidal space to ↑ UV → create small Cyclodialysis	Mild to moderate POAG	"	Retrocorneal, Implant Migration
Hydrus (Ivantis) — SC scaffolding device, restores conventional outflow into SC avoiding risk for hypotony bcos of resistance by EVP. 8mm Nitinol — resides in lumen of SC ± aut obstruct° CC ostia	Mild to Moderate	"	
Gold Microshunt — 10x 10x gold shunt — AB externo supraciliary/suprachoroidal transscleral shunt ≈ Controlled Cyclodialysis	failed trabeculectomy ± SC procedure	Recent ACG, Uveitic g, Active Ocular Inf, No suitable Quad.	Mild hyphaema, Hypotony, Choroidal effusion, Shunt Migration
Cypass — Bidirectional shunt diverts Aq from AC directly into SC	early to moderate OAG	Recent ACG, Uveitic, ICE, Traumatic	Hypotony, Refractory ↑ IOP
Xen Gel Stent (Aqueous Shunt) — plateless microshunt made from Inert biomaterial (SIBS). AB externo Implanted beg Conj Incision >> Scleral tunnel Xen	Refractory g	NVG, Could dis	Wound leak, Hyphaema, Hypotony

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Ab Interno Canaloplasty using iTrack 250A Microcatheter ABiC	opens up whole outflow system, visodulates all sites involved in control of Aq. Outflow. Insert via: Canal incision → restores natural outflow pathway & minimal trauma by visodulation. Leaves no F.B in eye. *) Only Rigs to address Collector channel blockage	- Early to moderate OAG - PDS - PEX.	Scarring for prior Trabeculectomy - Pt c obvious scaring - Anomalies in AC L.	- Mucohyphaema Early & Late IOP elevation - Wound Hmrg - Suture Extension - BMD - Hypotony.
Excimer LASER Trabeculostomy (ELT)	Ab Interno Trabeculotomy. — ablates TM & out causing thermal injury. ∴ scarring of surr tissue Uses XeCl excimer laser — long term anatomic opening AC & SC. Pneumatic Canaloplasty			

Foll does not fit into Rigs def

Non Penetrating GS Ax A	Aq. egress at SC level & its eff leaving intact innermost TM ↓ resistance to Aq. outflow Residual memb retains degree of residual outflow resistance Since AC not entered, this gp of Sx called Non penetrating glaucoma Sx	OAG Glaucoma in ↑ Myopes PDS / PEX Useful in JO Aq. Glaucoma c ↑ EVP	~~Perforat~~ NVG Rel - Narrow L g - Post-trauma angle recession - Status Post Laser Trabeculoplasty	Same
CO_2 LASER assisted GS	Ablates underlying sclera layer by layer — until roof of SC exposed feeble percolates in Uveoscleral & prevent ablation ∴ prevent ↓ & ↑ IT perforat^ ✓✓ fairly safe. ↓ perf	OAG "		Perforation Failure Hyphaema Drip Prolapse
Canaloplasty	rely on dilation of SC to ↓ outflow resistance. Tensioning suture c/n SC & pulls as well as helps in maintaining patent canal lumen	Early to late PDS PEX	Scarring 4m prior AC L anomalies	Mucohyph Early & late IOP elevation Wound hmrg Suture extension
Express	Control IOP by allowing limited outflow of Aq into Intrascleral space & into Subcon space	- Aphakic & Pseudophakic - OAG c failed filtration & Sturge Weber	ACG Ocular Dx + Rx - existing pathology	Ext blockage Dislocation into AC

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