A Dissertation on

"A PROSPECTIVE STUDY ON CHANGES IN GLAUCOMA MEDICATIONS AFTER ANTI GLAUCOMA SURGERY IN PATIENTS ATTENDING GLAUCOMA CLINIC IN A TERTIARY EYECARE HOSPITAL"

Submitted in partial fulfillment of requirements of

M. S. OPHTHALMOLOGY

BRANCH – III

REGIONAL INSTITUTE OF OPHTHALMOLOGY AND

GOVERNMENT OPHTHALMIC HOSPITAL

MADRAS MEDICAL COLLEGE

CHENNAI – 600 003

REG NO : 221913004

Submitted to

THE TAMILNADU DR. M.G.R. MEDICALUNIVERSITY

CHENNAI

MAY 2022

CERTIFICATE

This is to certify that **Dr. M. DHARINI**, Post Graduate student in M.S Ophthalmology, at Regional Institute of Ophthalmology and Government Ophthalmic hospital attached to Madras Medical College, Chennai, carried out this dissertation on **"A PROSPECTIVE STUDY ON CHANGES IN GLAUCOMA MEDICATIONS AFTER ANTI GLAUCOMA SURGERY IN PATIENTS ATTENDING GLAUCOMA CLINIC IN A TERTIARY EYECARE HOSPITAL"** under our direct guidance and supervision during the academic period from May 2019 to May 2022.

This dissertation is submitted to the TamilNaduDr.MGR Medical University, Chennai for the fulfillment of award of M.S. Degree in Ophthalmology.

Prof.Dr.R. MALARVIZHI M.S.,D O	**Prof. Dr.E. THERANIRAJAN M.D.,DCH.,**
Director &Superintendent(I/C)	**MRCPCH(UK),FRCPCH(UK).,**
RIO-GOH	**DEAN,**
Madras Medical College,	**Madras Medical College,**
Chennai–8	**Chennai - 3**

CERTIFICATE BY THE GUIDE

This is to certify that **Dr. M. DHARINI,** Post Graduate student (May2019 to April 2022) in the Department of Ophthalmology at Regional Institute of Ophthalmology and Government Ophthalmic hospital attached to Madras Medical College, has done this dissertation work titled **"A PROSPECTIVE STUDY ON CHANGES IN GLAUCOMA MEDICATIONS AFTER ANTI GLAUCOMA SURGERY IN PATIENTS ATTENDING GLAUCOMA CLINIC IN TERTIARY EYECARE HOSPITAL** " under my guidance and supervision in partial fulfillment of the regulations laid down by The Tamil Nadu Dr. M.G.R. Medical University ,Chennai for M.S. Ophthalmology Degree examination to be held in May 2022.

Prof. Dr.M.R.CHITRA M.S

Guide and Chief, Glaucoma unit

Regional Institute of ophthalmology

and Goverment Opthalmic Hospital

Chennai–8 .

DECLARATION

I, Dr. M. DHARINI**,** solemnly declare that the dissertation titled **"A PROSPECTIVE STUDY ON CHANGES IN GLAUCOMA MEDICATIONS AFTER ANTI GLAUCOMA SURGERY IN PATIENTS ATTENDING GLAUCOMA CLINIC IN A TERTIARY EYECARE HOSPITAL"** has been prepared by me. This is submitted to The Tamil Nadu Dr .M.G.R. Medical University, Chennai, in partial fulfillment of the requirement for the award of M.S. Ophthalmology (Branch - III), degree Examination to be held in May 2022.

Place: Chennai **Signature of the candidate**

Date: **DR. M. DHARINI**

CERTIFICATE – II

This is to certify that this dissertation work titled " **A PROSPECTIVE STUDY ON CHANGES IN GLAUCOMA MEDICATIONS AFTER ANTI GLAUCOMA SURGERY IN PATIENTS ATTENDING GLAUCOMA CLINIC IN A TERTIARY EYECARE HOSPITAL**"of the candidate **Dr. M. DHARINI** for the award of **M.S. DEGREE BRANCH-III (OPHTHALMOLOGY).**

I personally verified the urkund.com website for the purpose of plagiarism check. I found that the uploaded thesis file contains from introduction to conclusion pages and result shows **8% (Eight)** percentage of plagiarism in the dissertation.

Guide & Supervisor sign with Seal

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI 600 003

EC Reg.No.ECR/270/Inst./TN/2013/RR-16
Telephone No.044 25305301
Fax: 011 25363970

CERTIFICATE OF APPROVAL

To
Dr.M.DHARINI,
MS Ophthalmology Post Graduate student,
Regional Institute of Ophthalmology (RIOGOH)
Madras Medical College,
Chennai-600008.

Dear Dr. M.DHARINI,

The Institutional Ethics Committee has considered your request and approved your study titled **"A PROSPECTIVE STUDY ON CHANGES IN GLAUCOMA MEDICATIONS AFTER ANTI GLAUCOMA SURGERY IN PATIENTS ATTENDING GLAUCOMA CLINIC IN A TERTIARY EYECARE HOSPITAL"- NO.07122020.** The following members of Ethics Committee were present in the meeting held on **15.12.2020** conducted at Madras Medical College, Chennai 3.

1. Prof.P.V.Jayashankar :Chairperson
2. Prof.N.Gopalakrishnan,MD.,DM., FRCP, Director, Inst.of Nephrology,MMC,Ch : Member Secretary
3. Prof. K.M.Sudha, Prof. Inst. of Pharmacology,MMC,Ch-3 : Member
4. Prof. Alagarsamy Jamila ,MD, Inst. of Patholoy, Stanley Medical College, Chennai : Member
5. Prof.Rema Chandramohan,Prof.of Paediatrics,ICH,Chennai : Member
6. Prof.S.Lakshmi, Prof. of Paediatrics ICH Chennai :Member
7. Tmt.Arnold Saulina, MA.,MSW., :Social Scientist
8. Thiru S.Govindasamy, BA.,BL,High Court,Chennai : Lawyer
9. Thiru K.Ranjith, Ch- 91 : Lay Person

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary – Ethics Committee

MEMBER SECRETARY
INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE
CHENNAI-600 003.

Curiginal

Document Information

Analyzed document	DISSERTATION FINAL.docx (D123633627)
Submitted	2021-12-24T04:38:00.0000000
Submitted by	M.DHARINI
Submitter email	ujayrini92@gmail.com
Similarity	8%
Analysis address	ujayrini92.mgrmu@analysis.urkund.com

Sources included in the report

SA	**Tamil Nadu Dr. M.G.R. Medical University / ywv4f-02l1b-936.pdf** Document ywv4f-02l1b-936.pdf (D87542267) Submitted by: preethishankar1992@gmail.com Receiver: preethishankar1992.mgrmu@analysis.urkund.com	1
W	URL: https://entokey.com/introduction-and-classification-of-the-glaucomas/ Fetched: 2021-12-22T12:07:49.2130000	3
W	URL: http://4eyes.gr/images/4eyes/pdf/glaucoma/Glaucoma__Science_and_Practice.pdf Fetched: 2021-11-02T01:46:20.6130000	8
W	URL: https://pubmed.ncbi.nlm.nih.gov/30681574/ Fetched: 2021-11-13T22:17:47.3200000	4
W	URL: https://worldwidescience.org/topicpages/d/daily+glaucoma+medications.html Fetched: 2021-12-24T04:38:36.4570000	1
W	URL: http://journal.fk.unpad.ac.id/index.php/amj/article/view/723 Fetched: 2021-12-24T04:38:35.3600000	1
W	URL: https://www.nature.com/articles/eye2010179 Fetched: 2019-12-05T17:14:36.8300000	2
W	URL: https://eyewiki.aao.org/Primary_vs._Secondary_Angle_Closure_Glaucoma Fetched: 2020-03-09T21:32:52.0170000	1
W	URL: https://www.nature.com/articles/s41433-021-01668-x Fetched: 2021-12-14T09:12:39.1900000	2

ACKNOWLEDGEMENT

I express my sincere thanks to **Prof. Dr.E. THERANIRAJAN M.D., DCH** Dean , Madras Medical College for permitting me to conduct this study.

I am very grateful to **Prof. Dr. Prof. Dr. R. MALARVIZHI M.S., D.O.,** Director and Superintendent, RIO & GOH, Chennai, for helping me conduct the study.

I express my gratitude to **Prof. Dr. M.R.CHITRA M.S.,** Guide and Unit chief, Department of Glaucoma who with her vast knowledge and experience assigned me the topic of study and provided me all the necessary facilities and guidance and being the experienced single surgeon of all patients.

I am grateful to **Prof. Dr. N.SHARMILA** M.S., D.O., and Assistant Professors **Dr. MOHAN** M.S., **Dr. T.VIMALA** M.S., **Dr. SARANYA MS** for rendering their valuable advice and guidance for the study.

I wish to express my sincere thanks to all the **Professors, Assistant professors** and all my **colleagues** who helped me in bringing out this study.

Finally I am indebted to all my **patients** for their sincere co- operation for completion of this study.

CONTENTS

S.NO	PART – I	PAGE NO
1	INTRODUCTION	2
2	CLASSIFICATION OF GLAUCOMA	2
3	AQUEOUS HUMOR DYNAMICS	5
4	PATHOGENESIS	8
5	BLOOD SUPPLY OF OPTIC NERVE HEAD AND FACTORS AFFECTING IT	10
6	METHODS OF EVALUATION OF GLAUCOMA	13
7	DEFINING FEATURES OF GLAUCOMA , DISC CHANGES, VASCULAR CHANGES, PERIMETRY, GRADING OF GLAUCOMA	22
8	MEDICAL MANAGEMENT	32
9	SURGICAL MANAGEMENT	48
10	REVIEW OF LITERATURE	60
	PART – II	
1	AIM OF THE STUDY	69
2	MATERIALS AND METHODS	71
3	RESULTS	74
4	DISCUSSION	89
5	SUMMARY	92
6	CONCLUSION	93
	PART – III	
1	BIBLIOGRAPHY	95
2	PROFORMA	98
3	KEY TO MASTER CHART	101
4	MASTER CHART	102

PART-I

INTRODUCTION :

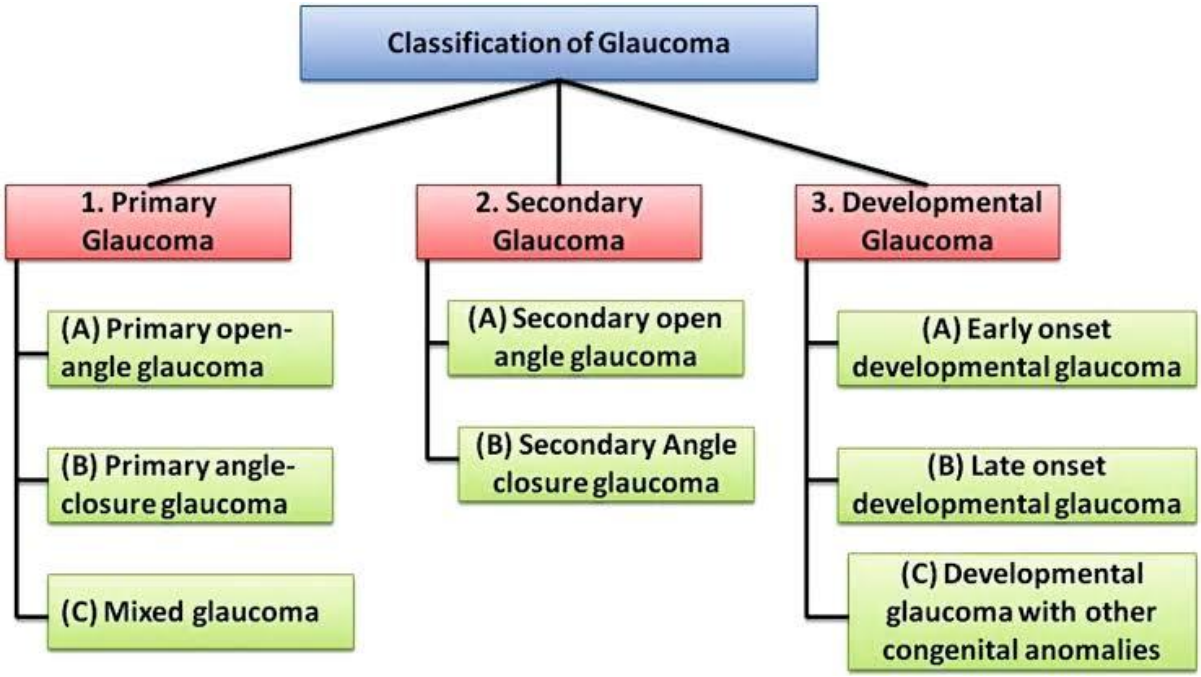
Glaucoma is an irreversible vision-threatening disease that causes progressive optic neuropathy with retinal ganglion cell apoptosis, leading to visual field loss, with elevated intraocular pressure been proven to be the only modifiable risk factor for disease progression.

Intraocular pressure is determined by the balance between the rate of aqueous humour production by the ciliary body, the resistance to aqueous outflow at the angle of the anterior chamber, and the level of episcleral venous pressure . Elevated IOP is usually caused by increased resistance to aqueous humour outflow.

CLASSIFICATION OF GLAUCOMA:

Glaucoma is classified into

1. Angle-closure glaucoma
2. Open angle glaucoma
3. Developmental glaucoma



CLASSIFICATION

1. Open Angle Glaucoma

A. Primary Open Angle Glaucoma

B.Secondary open Angle Glaucoma

a.Pigmentary Glaucoma

b. Pseudoexfolation Glaucoma

c.Post uveitic Glaucoma

d.Post traumatic Glaucoma

e.Lens induced Glaucoma

f.Steroid induced Glaucoma

2. **Angle-closure glaucoma**

A. **Primary angle-closure disease**

a. Primary angle closure suspect

b. Primary angle closure

c. Primary angle-closure glaucoma

B. Secondary angle-closure

1.Anterior segment mechanisms of closure

a. Iris–pupil obstruction (e.g., pupillary block')

b. Ciliary body anomalies (e.g., 'plateau iris syndrome')

c. Lens–pupil block (e.g., 'phacomorphic block' (swollen lens or micro spherophakia))

2. Anterior 'pulling mechanism'

The iris is pulled forward by some process in the angle, by the contraction of a membrane or peripheral anterior synechiae.

a. Neovascular glaucoma

b. Irido corneal endothelial syndromes (e.g., Chandler's syndrome)

c. Epithelial down growth

d. Posterior polymorphous dystrophy

e. Fibrous in growth

f. Flat anterior chamber

g. Inflammation

h. Penetrating keratoplasty

i. Aniridia

2**. Posterior 'pushing mechanism'**

The iris is pushed forward by some condition in the posterior segment. Often the ciliary body is rotated anteriorly, allowing the lens to come forward also.

a. Ciliary block glaucoma -malignant glaucoma

b. Cysts of the iris and ciliary body

c. Intraocular tumours

d. Nanophthalmos

e. Supra choroidal hemorrhage

f. Intra vitreal air injection

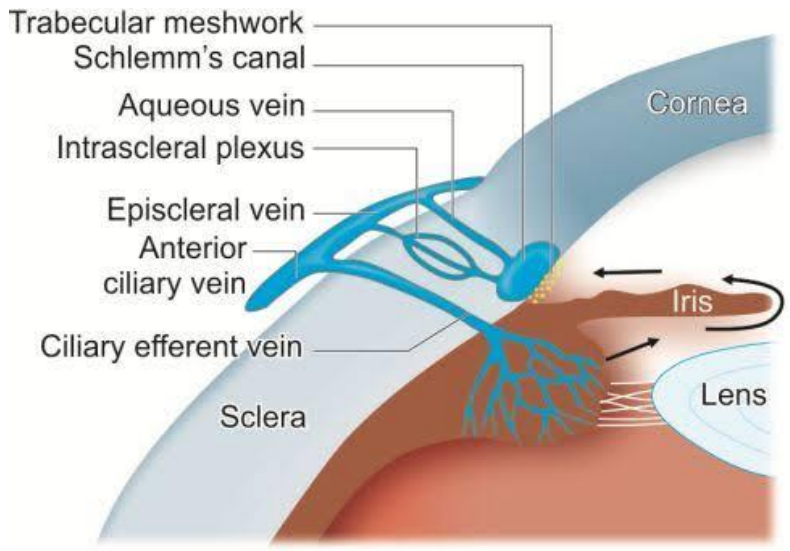
g. Ciliochoroidal effusions

AQUEOUS HUMOR DYNAMICS:

Aqueous humour is a fluid derived from the filtrate of plasma and secreted by the epithelium of processes of ciliary body into the posterior chamber.

AQUEOUS HUMOUR FORMATION AND SECRETION:

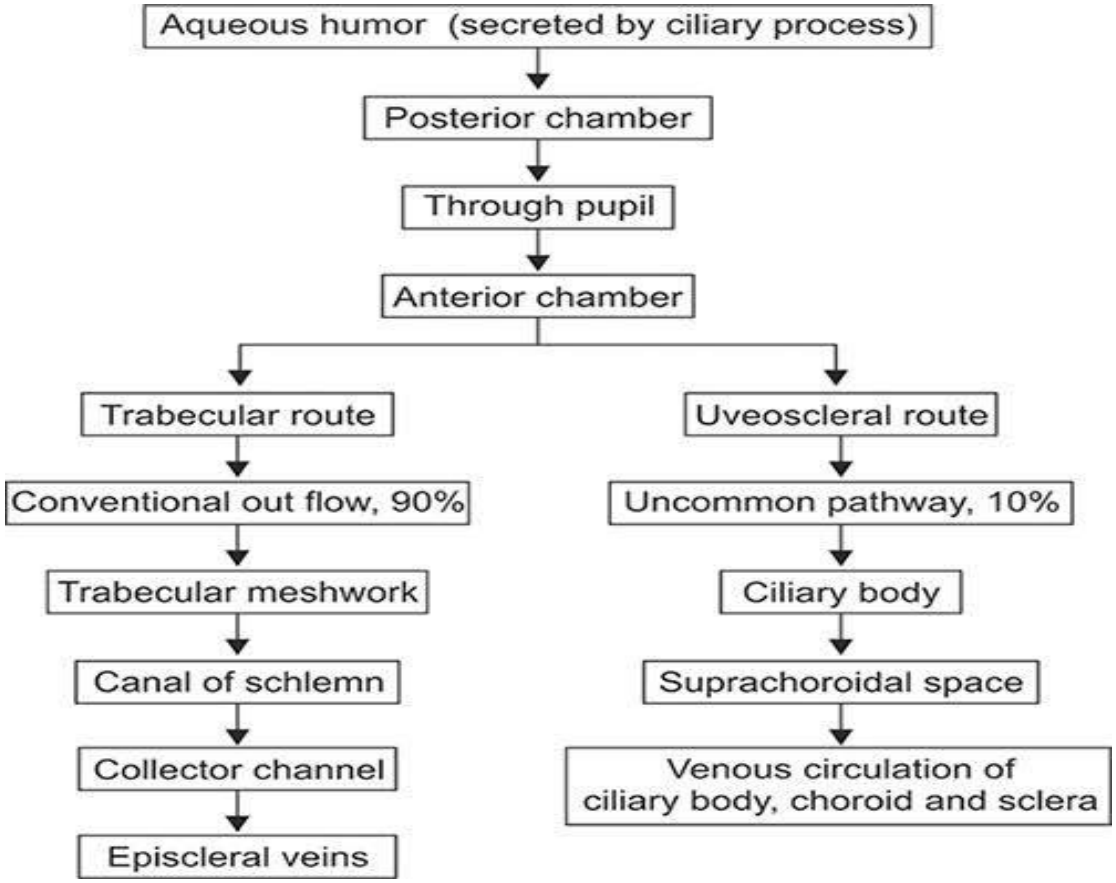
1. Ultra filtration
2. Active secretion
3. Diffusion



AQUEOUS HUMOUR: PATHWAY OF CIRCULATION

Modified from plasma within capillaries of ciliary process, the aqueous humour is secreted into the posterior chamber, flows through the pupil to anterior chamber.

Aqueous humour exits via trabecular meshwork and then the Schlemm's canal and drains into the venous system of collector channels and a part of it drained via uveo scleral pathway.



Factors affecting aqueous humour production:

1. Sleep
2. Age(as age increases aqueous production also decreases)
3. Integrity of blood aqueous barrier
4. Blood flow to the ciliary body

AQUEOUS HUMOR DRAINAGE:

The two main pathways of aqueous humour drainage are:

1.Conventional or canalicular (Schlemm's canal)- occurs down a hydrostatic pressure gradient between IOP and Episcleral venous pressure.

2. uveoscleral pathway

Functions of aqueous humour

1. Brings oxygen and nutrients to cells of lens, cornea, iris

2. Provides optically clear medium for vision Inflates globe and provides mechanism for maintaining intraocular pressure

3. Removes products of metabolism and toxic substances from those structures

4. High ascorbate levels protect against ultraviolet-induced oxidative products

PATHOGENESIS

THEORIES OF THE PATHOGENESIS OF GLAUCOMA :

The optic nerve head is a site of interest in the pathogenesis of glaucoma :

1.Biomechanical Theory

2. Vascular/ Ischemic mechanism.

Biomechanical Theory :

Elevated IOP leads to compression and subsequent neuronal death.

The mechanical theory focuses on two aspects of the optic nerve

1) increased IOP leads to changes in the structural constituent of the framework of supportive cells

2) the glial tissue density in the optic nerve head specifically to the superior and inferior quadrants having larger pores and less glial tissue

corresponding to areas of common early glaucoma damage as the axons RGC pass through the lamina cribrosa.

Vascular or Ischemic Model:

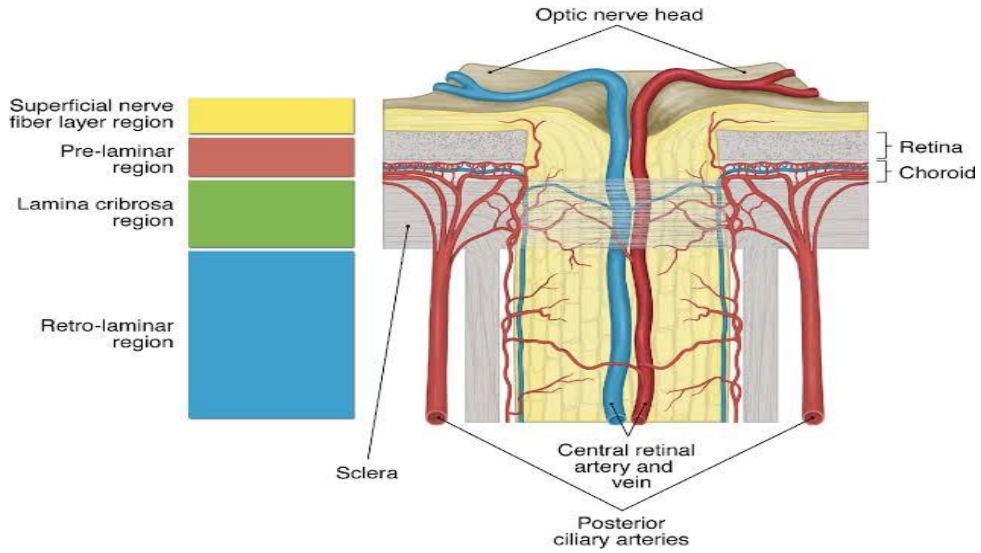
The ischaemic theory suggest that the vascular compromise to the optic nerve head either due to compromised capillaries due to raised IOP or failure of auto regulation or due to vasoactive substance that regulate perfusion pressure (the difference between systolic and diastolic blood pressure). The vasoactive substance of interest in GON is the vasoactive peptide endothelin-1 (ET-1). Patients with elevated serum

ET-1 levels and POAG have been demonstrated to have glaucomatous progression despite adequate IOP control and it plays a role in remodelling the extracellular matrix of the lamina cribrosa.

Anomalous Immunity:

Both humoral and cellular immunity may play a role in glaucoma. When auto antibodies against retinal, optic nerve and optic nerve head antigens were measured in high-pressure glaucoma, normal pressure glaucoma and patients without glaucoma. The small heat-shock proteins (HSP) (e.g. HSP-27, HSP-60 and alpha crystallins) in patients with normal and high-tension glaucoma are found to increase under conditions of ischemia and excitotoxicity.

BLOOD SUPPLY OF THE OPTIC NERVE HEAD



The optic nerve head (ONH) consists of four distinct regions with a unique blood supply. These regions from anterior to posterior aspect are as follows:

Surface Nerve Fiber Layer :

This is the anterior most layer of the ONH. It contains the compact optic nerve fibers as they congregate from all over the retina and bend to run back. This part is essentially supplied by the retinal arterioles from the central retinal artery.

The Pre laminar Region :

This part consists of optic nerve fibers arranged in bundles, surrounded by glial tissue septa, which contain capillaries. This region is supplied mainly by centripetal branches from the peripapillary choroid in a sectoral manner.

Lamina Cribrosa Region :

The lamina cribrosa region is supplied by the centripetal branches arising directly from the short posterior ciliary arteries or from the intrascleral circle of Zinn and Haller, when that is present.

Retro laminar Region :

This part of the optic nerve lies immediately behind the lamina cribrosa. It is enclosed by dura, arachnoid and piamater. The centripetal system is the main and consistent vascular system, formed primarily by the recurrent pial branches from the peripapillary choroid and the circle of Zinn and Haller (or the short posterior ciliary arteries), with additional pial branches from the central retinal artery.

Hence the primary source of blood supply to the ONH is the posterior ciliary artery circulation via the peripapillary choroid and short posterior ciliary arteries (or the circle of Zinn and Haller, when present).

FACTORS INFLUENCING BLOOD FLOW IN ONH

The blood flow depends upon three parameters:

1. Vascular resistance
2. Blood pressure
3. IOP

To calculate the ONH blood flow, the following formula is used**:**

Blood flow = Perfusion pressure /Vascular resistance

Perfusion Pressure: The perfusion pressure is essentially the difference between the mean arterial blood pressure (MABP) and the intraocular pressure (IOP).

Perfusion pressure = MABP – IOP MABP = Diastolic BP +

1/3 (Systolic BP – Diastolic BP).

Based on the above equation it is clear that a decrease in BP or an increase in IOP reduces perfusion pressure.

Vascular Resistance:

The resistance of the vasculature depends upon the state and caliber of the vessels feeding the ONH circulation and rheological properties of the blood which is influenced by a large variety of hematologic disorders. The state and caliber of the vessels feeding the ONH may be altered by many factors, including the following:

1. Auto regulation of blood flow
2. Vascular endothelial vaso active substance

METHODS OF EVALUATION OF GLAUCOMA

It involves

- Measuring IOP by Goldmann applanation tonometry
- Gonioscopy to classify as open angle or closed angle glaucoma
- Optic disc changes with +90Dlens under slit lamp examination
- Visual field analysis by perimetry.

GOLDMAN APPLANATION TONOMETRY:

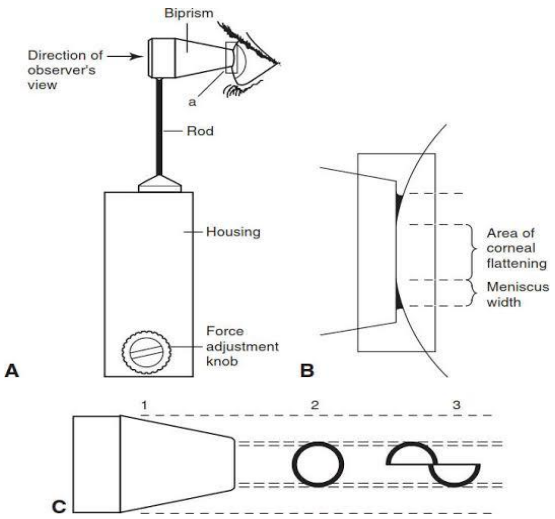
Goldmann Applanation tonometer is clinically gold standard method for measuring IOP.

The Goldmann tonometer determines the force necessary to flatten (or applanate) an area of the cornea 3.06mm in diameter.

For this area of applanation and in a cornea of average thickness, the force required to bend or deform the cornea is approximately equal in magnitude and opposite in direction to the capillary attraction of the tear film for the tonometer head which is based on **Imbert Ficks law.**

Applanation tonometry displaces only about 0.5ml of aqueous humour, which raises IOP by about 3%.

PROCEDURE



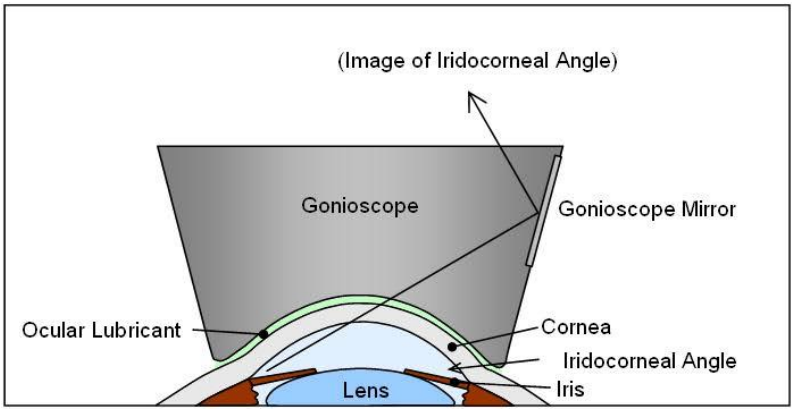
The technique of Goldmann tonometry is as follows:

- The patient is told the purpose of the test and is reassured that the proceduret is not painful. The patient is instructed to relax, maintain position, and hold the eyes open wide.
- One drop of a topical anaesthetic, such as 0.5% proparacaine, is placed in each eye, and the tip of a moistened fluorescein strip is touched to the tear layer on the inner surface of each lower lid.
- The tension knob is set at 1 g. If the knob is set at 0, the prism head may vibrate when it touches the eye and damage the corneal epithelium.
- The 1 g position is used before each measurement. The cobalt filter is used with the slit beam opened maximally.

- The angle between the illumination and the microscope should be approximately 60°. The room illumination is reduced.
- When the clinician looks through the split prism in contact with the eye, he or she sees a central blue circle, the flattened cornea, surrounded by two yellow-green semicircles.
- When the inner margins of the two semicircles are aligned in a smooth S curve at the midpoint of their pulsations, the proper degree of applanation has been achieved. The IOP in milli meters of mercury is equal to the force of the tonometer in grams multiplied by 10 .
- Goldmann tonometry is quite accurate and reproducible if the proper technique is used. Interobserver variability is in the range of 0–3mmHg,6,7 which is less than the diurnal variation of IOP.

GONIOSCOPY

Gonioscopy is visualization of iridocorneal angle using a goniolens (gonioscope) with a slit lamp or operating microscope. Under normal conditions, light from the angle undergoes **total internal reflection** at the tear-air interface and the structures cannot be visualized. To overcome this, a lens must be used.



❖**TYPES**: The angle can be examined either directly or indirectly.

DIRECT GONIOSCOPY:

Koeppe, Barkan, Wurst, Swan-Jacob, or Richardson lenses are used.

Direct visualization of the chamber angle is possible.

Direct gonioscopy is done with the patient in supine position.

The viewer get an erect view of the angle structures.

It is useful in angle surgeries & MIGS (Micro invasive Glaucoma Surgeries).

INDIRECT GONIOSCOPY :

Goldmann, Posner, Sussman, and Zeiss lenses are used. This is done with slit lamp.

The viewer gets an inverted image of the opposite angle.

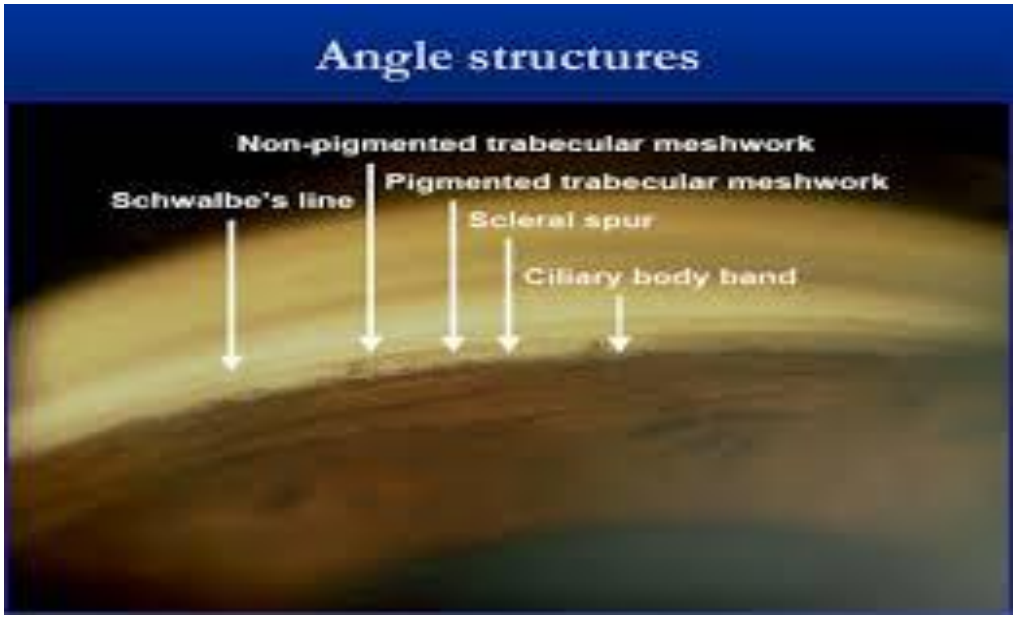
Indentation Gonioscopy:

The Posner, Sussman & Zeiss lenses have a smaller area of contact and allow the examiner to do indentation gonioscopy.

This is performed when the angle is closed, to determine whether the closure is appositional or synechial. The lens is pressed against the cornea forcing the aqueous into the periphery.and pushing the iris posteriorly.

If the angle is closed by apposition between the iris and cornea (**appositional closure**) the angle will open. If the angle is closed by adhesion between the iris and cornea (**synechial closure**) it will remain closed. The Goldmann lens does not allow for this indentation because of the larger size of the contact lens.

❖ The **anatomical structures visible are**:-



1. **Schwalbe's line** is the peripheral edge of Descemets membrane, identified by the "corneal light wedge". To perform this technique, the examiner must use a narrow slit beam and can see 2 reflections, one on the external surface of the cornea and the other on the internal surface. They will meet at Schwalbe's line.

2. **Trabecular meshwork**is the site of conventional aqueous outflow. It has two parts a lightly pigmented anterior part and a darker pigmented posterior part.

3. **Scleral spur** is a white band just posterior to the pigmented trabecular meshwork and it corresponds to the posterior boundary of the Schlemm's canal .

4. **Ciliary body band** represents the anterior aspect of the ciliary muscle, into which the root of the iris inserts and appears as a dark brown band posterior to the scleral spur.

❖ **Grading systems**

1. **Scheie System**: This is based on visibility of the anatomical structures of the angle. This uses Roman numerals to describe the degree of angle closure, with larger numbers denoting a narrower angle.

SCHEIE CLASSIFICATION*

Wide open:	All structures visible
Grade I:	Iris root visible
Grade II:	Ciliary body obscured
Grade III:	Posterior trabeculum obscured
Grade IV:	Only Schwalbe's line visible

** Angle depth system based on structures visualized.*

2. **Shaffer System**: This is based on angularity. It also uses a number system, but is in reverse of the Scheie system. Shaffer grade 4 refers to an open angle.

SHAFFER SYSTEM*		
Grade 4	45° to 35° angle	Wide open
Grade 3	35° to 20° angle	Wide open
Grade 2	20° angle	Narrow
Grade 1	≤ 10° angle	Extremely narrow
Slit	0° angle	Narrowed to slit

* *Based on the angular width of the angle recess.*

	Grade 0	Grade I	Grade II	Grade III	Grade IV
Shaffer	Closed	10°	20°	30°	40°
Modified Shaffer	Schwalbe's line not visible	Schwalbe's line visible	Anterior TM visible	Scleral spur visible	Ciliary band visible

Red = higher risk
Yellow = medium risk
White = lower risk

VAN HERICK GRADING:

van Herick estimate of angle width from anterior chamber depth at the periphery Angle Depth

Van Herick's Grade	Ratio to limbal corneal section
Grade 1	< 1:4
Grade 2	1:4
Grade 3	1:2
Grade 4	1:1 (or >1:1)

SPAETH CLASSIFICATION

SPAETH GONIOSCOPIC GRADING SYSTEM*

Iris Insertion	Angular Approach	Peripheral Iris		Pigmentation of Trabecular Meshwork
A Anterior to Schwalbe's line	0° to 50°	**r** regular	**f** flat	**0** no pigment
B Between Schwalbe's line and scleral spur		**s** steep	**b** bowed anteriorly	**1+** minimal
C Scleral spur visible			**p** plateau iris	**2+** mild
D Deep with ciliary body visible		**q** queer	**c** concave	**3+** moderate
E Extremely deep with >1 mm of ciliary body visible				**4+** intense

** Evaluating iris insertion, angular approach, peripheral iris configuration, and degree of trabecular meshwork pigmentation.*

DEFINING FEATURES OF GLAUCOMA:

The term glaucoma is reserved for people with established, visually significant, end organ damage associated with characteristic structural damage to the optic nerve and associated visual dysfunction.

Structural Changes:

There is a characteristic pattern of damage to the optic nerve head. This is most easily recognised at the superior and inferior poles of the optic disc. The vertical cup:disc ratio (VCDR) has proved to be a simple, relatively robust index of glaucomatous loss of the neuro retinal rim

Clinical Examination of the ONH:

Can be done with

1. Slit-lamp biomicroscopy combined with indirect condensing lens (60, 78, or 90 D) through a dilated pupil is the preferred method,

2**.** Direct ophthalmoscope can also be used.

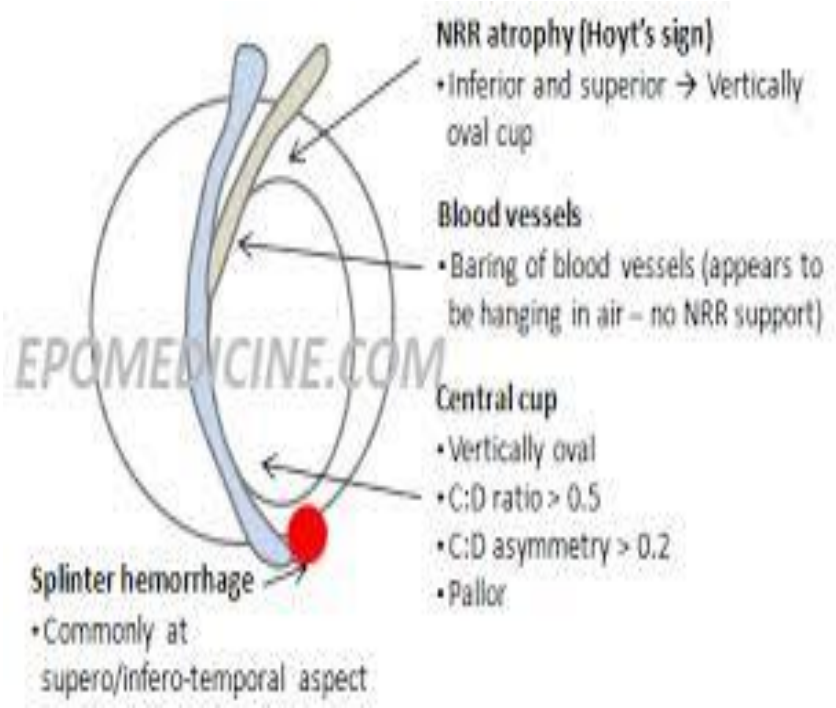
3. Careful documentation by

a) detailed disc drawings or

b)stereoscopic disc photographs is mandatory for comparison at subsequent visits.

Steps in clinical examination of ONH

- ✓ Determine disc size Check for unusual disc shape
- ✓ Determine the vertical cup disc ratio
- ✓ Evaluate neuroretinal rim (NRR) and apply the **ISNT rule**
- ✓ Check RNFL
- ✓ Look for disc hemorrhages
- ✓ Peripapillary atrophy (beta zone)
- ✓ Other vascular changes Correlate visual field with optic disc changes
- ✓ Rule out non-glaucomatous causes of cupping



Disc size: average: 1.5-2 mm. Classify discs as small/average/large. The size can be measured at the slit lamp using a condensing lens.

Correction factor: Volk 60 D × 0.88, 78 D × 1.1 and 90 D × 1.3. Slit beam should be coaxial with observation axis. A narrow beam is used to measure the vertical disc diameter using the inner margin of the white Elschnig's scleral ring as the reference landmark.

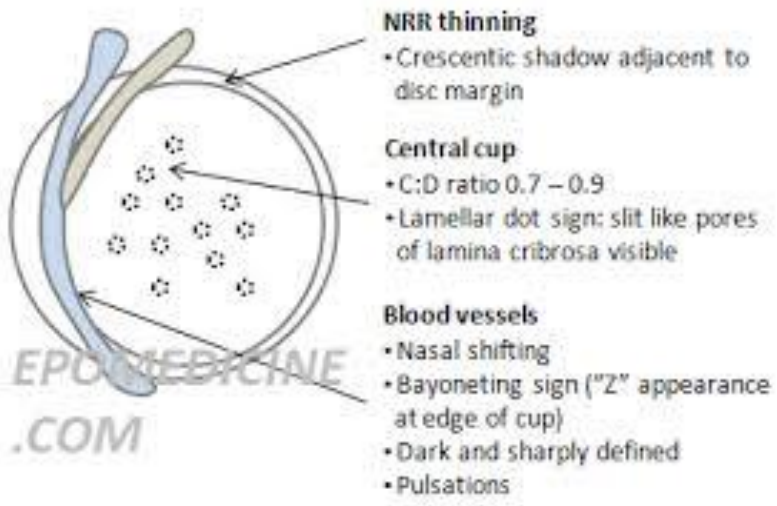
Disc shape: Disc is normally vertically oval with a horizontally oval cup. Margin should be well defined.

Myopic Disc (All myopes should be considered glaucomatous unless proved otherwise).

Tilted Discs

CDR(CUP:DISC RATIO) : Average VCDR is 0.3 - 0.5.

CDR greater than 0.6 or asymmetry greater than 0.2 between fellow eyes is suggestive of glaucoma.



NRR(NEURORETINAL RIM)

Check ISNT rule, followed in 50-60% of cases – the inferior rim is the broadest followed by the superior, nasal and temporal.

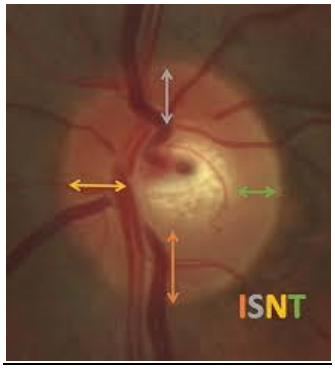
Early rim loss is manifested at superior and inferior poles.

If a small segment of NRR (<450) is lost, termed **notching**, an early sign of damage.

Disc Damage Likelihood Scale is the best method to document NRR changes but more prefered for research purposes.

DISC DAMAGE LIKELIHOOD SCALE

	The Thinnest Width of the Rim (Rim/Disk Ratio)			Examples		
Stage	Small Disk < 1.5 mm	Average Size Disk 1.5 – 2.0 mm	Large Disk > 2.0 mm	Small Disk	Average Size Disk	Large Disk
0a	0.5	0.4 or more	0.3 or more			
0b	0.4 up to 0.5	0.3 – 0.4	0.2 – 0.3			
1	0.3 up to 0.4	0.2 – 0.3	0.1 – 0.2			
2	0.2 up to 0.3	0.1 – 0.2	0.05 – 0.1			
3	0.1 up to 0.2	0.01 – 0.1	0.01 – 0.05			
4	0.01 – 0.1	no rim < 45 degrees	no rim < 45 degrees			
5	no rim < 45 degrees	no rim 45 – 90 degrees	no rim 45 – 90 degrees			
6	no rim 45 – 90 degrees	no rim 91 – 180 degrees	no rim 91–180 degrees			
7	no rim > 90 degrees	no rim > 180 degrees	no rim > 180 degrees			



Disc colour:

Disc is usually orange-pink in colour, pallor more than cupping is suggestive of neurological disc.

RNFL Loss:

Wedge or streak shaped RNFL loss should be looked for in disc photographs or by examination with red free (green filter) light.

The minor parameters indicating glaucomatous loss are as follows:

- **Disc hemorrhage**

The splinter shaped or flame shaped hemorhage at the border of optic disc, most commonly inferotemporally. It is a risk factor for glaucoma especially NTG.

Vascular signs:

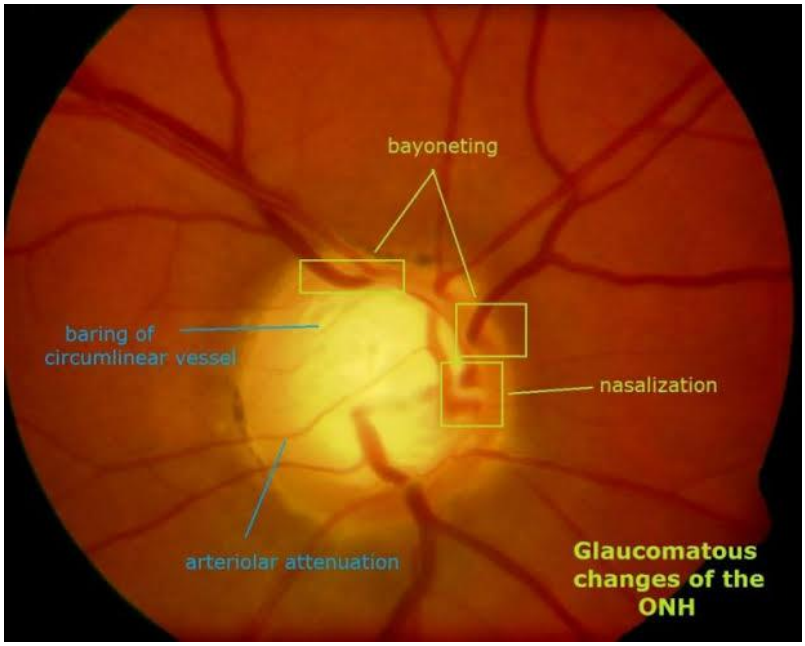
Baring of Circum linear Vessel (BCLV): is a sign of early thinning of the NRR. A small branch of central retinal artery or vein following a curved path along the optic cup margin, recedes from the inner disc margin as the cup enlarges.

Bayonetting of vessels: is characterized by double angulation or a sharp bend of a blood vessel.

Nasalization of vessel: In advanced glaucoma, the only structural support remains along the nasal rim due to severe loss of superior, inferior and temporal rim tissue. Overpass cupping: When the underlying

rim is lost, the vessel may appear to “hang in the air” without any contact with the underlying tissue.

<u>Peripapillary atrophy (PPA)</u>: Best remembered by the mnemonic ABC where A is Alpha zone which is outermost and C is Cup and inner most. The hypo pigmented beta zone is larger and more significant in NTG .



Functional damage:

This results in visual field loss. Characteristics of glaucomatous field defects:

1.Asymmetrical across the horizontal midline (in early/moderate cases)

2.Located in the mid-periphery (in early/moderate cases)

3.Clustered in neighbouring test points

4.Reproducible on at least two occasions

5.Not explained by any other disease

6.Considered a valid representation of the subjects functional status (based on performance indices such as false positive rate)

7.The glaucoma hemifield test is graded “outside normal limits” and a cluster of three contiguous points at the 5% level on the pattern deviation plot, using the threshold test strategy with the 24-2 test pattern of the Zeiss-Humphrey field analyzer.

STATIC PERIMETRY

In static perimetry, the test stimulus size usually remains constant throughout the test .

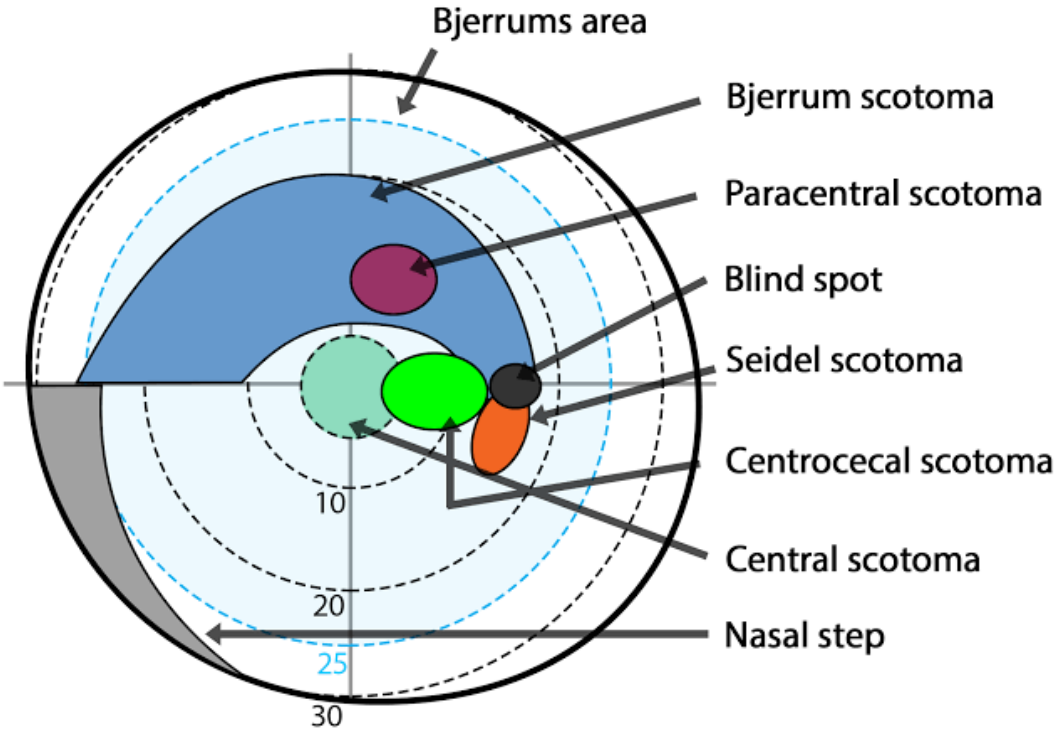
The most widely used modification of standard repeat-bracketing threshold testing is the Swedish Interactive Testing Algorithm (SITA) program used on the Humphrey Field Analyzer, which adjusts the starting and ending points of the bracketing procedure during the examination based on the patient’s responses.

This is done in a fashion that reduces redundancy, decreases testing time, and increases accuracy and patient acceptance without compromising the sensitivity and specificity of the test.

VISUAL FIELD DEFECTS

Glaucomatous visual field defects

Functional loss as determined by visual field testing has long been a diagnostic criterion for glaucoma. A variety of field defects are seen in early- and mid-stage glaucoma, all progressing to the dense defects of late-stage glaucoma.



Nasal step or depression

The nasal portion of the visual field is often affected early in glaucoma, and defects may persist until the last stages of the disease.

The nasal area is the most important region of the midperipheral and peripheral field to test

Depression may be evidenced by hesitancy in patient response when testing this area, as an inward turning of the isopter in manual perimetry, or by reduced sensitivity on static testing.

If a true step that respects the horizontal raphe develops, a defect is present. Such defects may occur centrally, peripherally, or both and may be isolated or associated with other Bjerrum area defects

Temporal step or depression

A temporal depression or step may develop as an isolated finding or in conjunction with other glaucomatous defects

They may be detected at any stage of glaucoma but are more commonly found as a component of late-stage disease.

Enlargement of the blind spot

Enlargement and baring of the blind spot are considered nonspecific changes that can occur in normal patients .

If the blind spot enlarges in an arcuate manner, it is called a **Seidel's scotoma** and may be seen in early glaucoma

Isolated paracentral scotomata

Careful manual perimetry using combined static and kinetic techniques may demonstrate small paracentral scotomata.

Early glaucomatous defects may have a small, dense center. If the glaucoma is progressive, these defects enlarge, deepen, and coalesce over

time to form **arcuate scotoma.** . Inconsistency of responses in the paracentral area may be an early sign of glaucomatous change.

The most commonly used computerized perimeters use the equivalent of the 30-2 spacing of test spots which are 6° apart; scotomata smaller than 6° may be missed.

If one is concerned about identifying or monitoring a paracentral scotoma, both the Octopus and the Humphrey have programs that increase the density of tested spots within the central 10° of the visual field – the G-1 or the 10-2 respectively

GRADING OF GLAUCOMA

A grading system has been recommended by the American Academy of Ophthalmology by quantifying glaucomatous damage so that an approximate target IOP could be set.

•**Mild glaucoma:** Characteristic optic nerve abnormalities consistent with glaucoma, but with visual normal fields. Recommended target pressure 20% reduction of untreated IOP or an IOP of 17-18 mm Hg.

•**Moderate glaucoma**: Visual field abnormalities matching optic disc changes in one hemi field, but not within five degrees of fixation. A 30% reduction or IOP in mid teens (14-16 mm Hg) is recommended.

•**Severe glaucoma**: Visual field abnormalities in both hemifields or within five degrees of fixation. 35–40% reduction or an IOP less than 12 mm Hg is considered appropriate. Eyes with advanced glaucoma may require IOP in very low teens or even in single digits to prevent progressive glaucomatous damage

	Mild	Moderate	Severe
AAO[21]	Optic disc cupping but no visual field loss	Glaucomatous neuropathy with visual field loss not within 5° of fixation	Visual field loss in both hemispheres or within 5° of fixation
Canadian guidelines[30]	C: D ratio <0.65 or mild visual field defect not within 10° of fixation	C: D ratio 0.7-0.85 or visual field defect not within 10° of fixation or both	C: D ratio >0.9 or visual field defect within 10° of fixation or both
International Classification of Diseases 10	Optic nerve abnormalities consistent with glaucoma + normal fields	Optic nerve abnormalities consistent with glaucoma + one hemifield abnormality, not within 5°	Optic nerve abnormalities consistent with glaucoma + both hemifield abnormality or within 5°

AAO: American Academy of Ophthalmology

MEDICAL THERAPY

Medical therapy has been the mainstay of initial glaucoma treatment for over a century. The vast majority of patients respond to a simple regimen with a desirable reduction in IOP. Side effects are usually few and tolerable. When they do occur, side effects are often easily reversible by stopping the medication. Only rarely are vision- or life-threatening side effects seen. Medical therapy is little costly over the long

term, and because many glaucoma patients are elderly, the cost of medical treatment may exceed that of surgery.

Guidelines for medical treatment of glaucoma

1. Establish a target pressure.
2. Adjust the treatment program to the patient and his/her lifestyle.
3. Initiate or change therapy through a therapeutic trial in one eye.
4. When therapy is ineffective, substitute rather than add drugs.
5. Continually monitor the assumptions related to the target pressure and change as indicated.
6. Ask about and monitor potential ocular and systemic side effects.
8. Teach patients the proper technique for instilling eyedrops.
9. Provide written directions.
10. Communicate with the patient's family physician.
13. Educate patient about his/her illness and its treatment.
14. Stop treatment periodically to determine continuing effectiveness.
15. Measure IOP at different times of the day and at different intervals after the last administration of medication.

Target pressure is defined as a range of IOP enough to limit the progression of visual field loss to a rate that will preserve his/her visual function and maintain daily pattern without affecting quality of life.

In other words it is an estimate of mean IOP obtained with treatment that is expected to prevent further glaucomatous change.

It may be a percentage reduction or an absolute reduction from baseline IOP.

Life expectancy, severity of glaucoma, baseline or highest recorded IOP should be taken into account while setting the target.

Monotherapy

In most patients a single drug may be adequate to lower the IOP to the target IOP. For many years beta blockers have been the drug of choice for the first line of therapy. They are effective and also well tolerated topically in healthy individuals. The systemic side effects are a limiting factor. Over the past few years, there has been an increasing trend towards the use of prostaglandin analogues as the first line of treatment. Sufficient IOP reduction may not be possible with monotherapy. The indicators would be progression even at target IOP, target IOP not achieved or not maintained.

The options available are: •

1.Switching /New Monotherapy :

- Medications that do not lower the IOP must be stopped.
- If the IOP lowering is 0% the medication should be stopped and changed.
- If the IOP lowering is10–20% the medication should be switched.

However this must be documented in the patients' records as the drug may be used later on as an adjunct.

Note Do not use a single IOP reading to asses the effect of treatment.

The new mediation can be from a different class of medications are from this same class. Switching with in the same class is only done for prostaglandin analogue.

Adjunctive Treatment

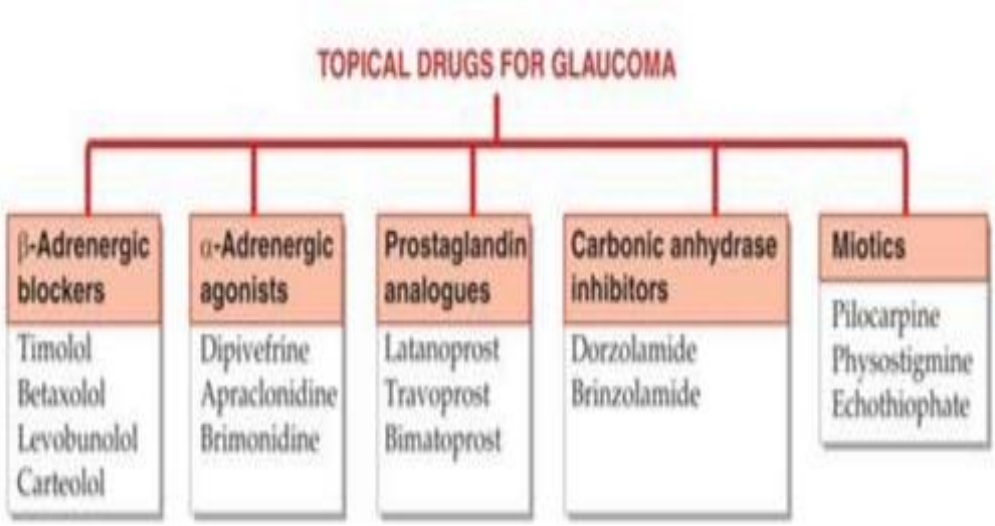
- A second agent is added if the initial treatment has not lowered the IOP adequately.
- Usually a drug from a different class of medication is added.
- The efficacy depends upon the mechanism of action.
- Usually drugs with different mechanisms of action act as an effective combination therapy

Maximal Medical Therapy

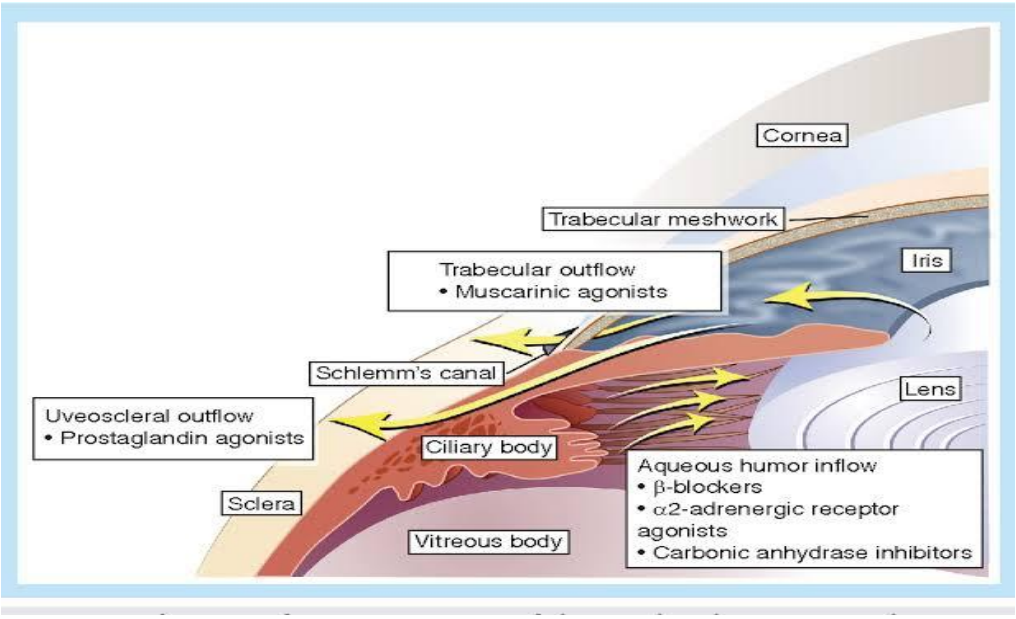
- ✓ At one time this included every AGM available.
- ✓ MMT is the use of >/=3 classes of topical anti-glaucoma agents to achieve maximal intraocular pressure reduction .
- ✓ MMT attempts to achieve the best possible therapeutic outcome with medications with minimizing adverse effects and compliance challenges.

- ✓ Availability of Fixed Drug Combinations helps to achieve MMT with different classes of medications but with a simplified instillation regimen.

CLASSIFICATION OF TOPICAL ANTIGLAUCOMA MEDICATIONS:



MECHANISM OF ACTION OF VARIOUS ANTIGLAUCOMA DRUGS



PROSTAGLANDIN ANALOGUES

Duration of action may extend for several days, though administration once every day (at bedtime) is generally recommended.

If one prostaglandin fails to show adequate efficacy, inter-individual receptor variation means that an alternative preparation may be superior in a given patient.

Agents

• **Latanoprost** may cause fewer ocular adverse events than other PG agents and so is often used first line.

Approximately 5–10 % of patients show no response (IOP reduction of less than 10%) to latanoprost, but may respond to one of the other prostaglandins.

•**Travoprost** is similar to latanoprost but fewer patients tend to be non-respondents. Polyquad® is a novel proprietary preservative introduced by a major pharmaceutical manufacturer in its travoprost formulation that may reduce ocular surfacerelated adverse effects.

• **Bimatoprost 0.03%** has a slightly greater IOP-lowering effect than latanoprost, but is more likely to cause conjunctival hyperaemia.

A new 0.01% preparation has a comparable IOP-lowering effect to latanoprost with less hyperaemia. Preservative-free bimatoprost is available.

• **Tafluprost**is a relatively new prostaglandin derivative and was the first available in preservative-free form.

Its IOP-lowering efficacy may be slightly less than that of other PG agents, but it is well tolerated and seems to cause less disruption of the ocular surface.

Side effects

• Ocular

○ Conjunctival hyperaemia is very common

. ○ Eyelash lengthening, thickening, hyper pigmentation

○ Irreversible iris hyper pigmentation

○ Hyperpigmentation of periocular skin is common but reversible.

○ Periocular atrophy

○ **Preoperative use of PG agents may increase the likelihood of cystoid macular oedema following cataract surgery**

• **Systemic side effects** include occasional headache, precipitation of migraine in susceptible individuals, malaise, myalgia, skin rash and mild upper respiratory tract symptoms

BETA BLOCKERS

Introduction Beta-blockers reduce IOP by decreasing aqueous production, mediated by an effect on the ciliary epithelium.

A reduction of 21–27% from baseline can be expected in most patients.

In approximately 10% of cases the response decreases with time (tachyphylaxis), sometimes within only a few days.

Beta blockers should not be instilled at bedtime as this medication may cause a significant drop in blood pressure while the individual is asleep, thus reducing optic disc perfusion and potentially causing visual field deterioration.

The IOP-lowering effect is also believed to be less marked during sleep, as nocturnal aqueous production is normally less than half the daytime rate.

Side effects

• **Ocular**

. allergy and punctate keratitis.

Granulomatous uveitis has been reported with metipranolol.

Systemic.

.Bronchospasm. This may be fatal in asthma or other reversible airways disease and it is critical to exclude a history of asthma before prescribing a beta-blocker.

Cardiovascular. There is a strong suggestion that cardiovascular mortality is higher in patients taking a topical beta-blocker. Effects include heart block, bradycardia, worsening of heart failure and hypotension, induction of the latter by topical beta-blocker having been reported as a common cause of falls in elderly patients.

Agents

• **Timolol** is available in 0.25% and 0.5% solutions used twice daily.

Betaxolol 0.25% and 0.5% twice daily has a lower hypotensive effect than timolol.

However, optic nerve blood flow may be increased due to a calcium-channel blocking effect. Betaxolol is relatively cardioselective (beta-1 receptors)

• **Levobunolol**is a long-acting beta-blocker and is used once or twice daily with a similar profile to timolol.

• **Carteolol** twice daily is similar to timolol and also exhibits intrinsic sympathomimetic activity. It has a more selective action on the eye than on the cardiopulmonary system .

ALPHA AGONIST

Ocular alpha-2 receptor stimulation decreases aqueous synthesis via an effect on the ciliary epithelium and increases uveo scleral outflow. There is probably a **neuro protective effect**. This medication crosses the blood–brain barrier and should be used with great caution in young

children, in whom severe CNS depression and hypotension have been reported **(contraindicated under the age of 2years**).

. **Agents**

• **Brimonidine** 0.2% twice daily as a single agent .

Allergic conjunctivitis is common, but the onset may be delayed for up to 18 months after commencement of therapy. Granulomatous anterior uveitis can occur, but is rare

Systemic side effects include xerostomia and fatigue, the latter sometimes being severe.

Apraclonidine 1% (or 0.5%) is used principally to prevent or treat an acute rise in IOP following laser surgery on the anterior segment.

The 0.5% concentration is typically used as a temporizing measure over the course of several weeks, such as whilst a patient is awaiting glaucoma surgery.

CARBONIC ANHYDRASE IHIBITORS

Topical carbonic anhydrase inhibitors

The CAI are chemically related to sulfonamide antibiotics. They lower IOP by inhibiting aqueous secretion and via the topical route are used three times daily as monotherapy or twice daily as adjunctive treatment.They precipitate corneal decompensation in patients with corneal endothelial dysfunction.Idiosyncratic bone marrow suppression can occur. Contraindicated in patients allergic to sulfonamide antibiotics.

. Agents

• **Dorzolamide**. The main adverse effects are stinging and a transient bitter taste , allergic blepharoconjunctivitis

• **Brinzolamide** is similar to dorzolamide, but is less likely to cause stinging and local allergy.

MITOTICS

Miotics are cholinergic agonists that are predominantly used in the treatment of angle closure. Miotics also reduce IOP by contraction of the ciliary muscle, which increases the facility of aqueous outflow through the trabecular meshwork.

Local side effects include miosis, brow ache, myopic shift and exacerbation of the symptoms of cataract. Visual field defects appear denser and larger.

Systemic side effects are rare, but include confusion, bradycardia, bronchospasm, gastrointestinal symptoms and urinary frequency.

Agents

• **Pilocarpine** 0.5%, 1%, 2%, or 4% solution as four times daily monotherapy is equal in efficacy to beta-blockers.

• **Carbachol** is an alternative to pilocarpine.

HYPEROSMOTIC AGENTS

Osmotic agents lower IOP by creating an osmotic gradient so that water is ‘drawn out’ from the vitreous into the blood.

They are employed when a short-term reduction in IOP is required that cannot be achieved by other means or when the IOP is very high prior to intraocular surgery.

Side effects include cardiovascular overload as a result of increased extracellular volume (caution in patients with cardiac or renal disease), urinary retention (especially elderly men), headache, backache, nausea and confusion.

Agents

• **Mannitol** is given intravenously (1 g/kg body weight or 5 ml/kg body weight of a 20% solution in water) over 30–60 minutes, with a peak action within 30 minutes

. • **Glycerol** is an oral agent (1 g/kg body weight or 2 ml/kg body weight of a 50% solution) with a sweet and sickly taste and can be given with lemon (not orange) juice to avoid nausea. Peak action occurs within 1 hour. Glycerol is metabolized to glucose and careful monitoring with insulin cover may be required if administered to a (well-controlled only) diabetic patient.

Systemic carbonic anhydrase inhibitors

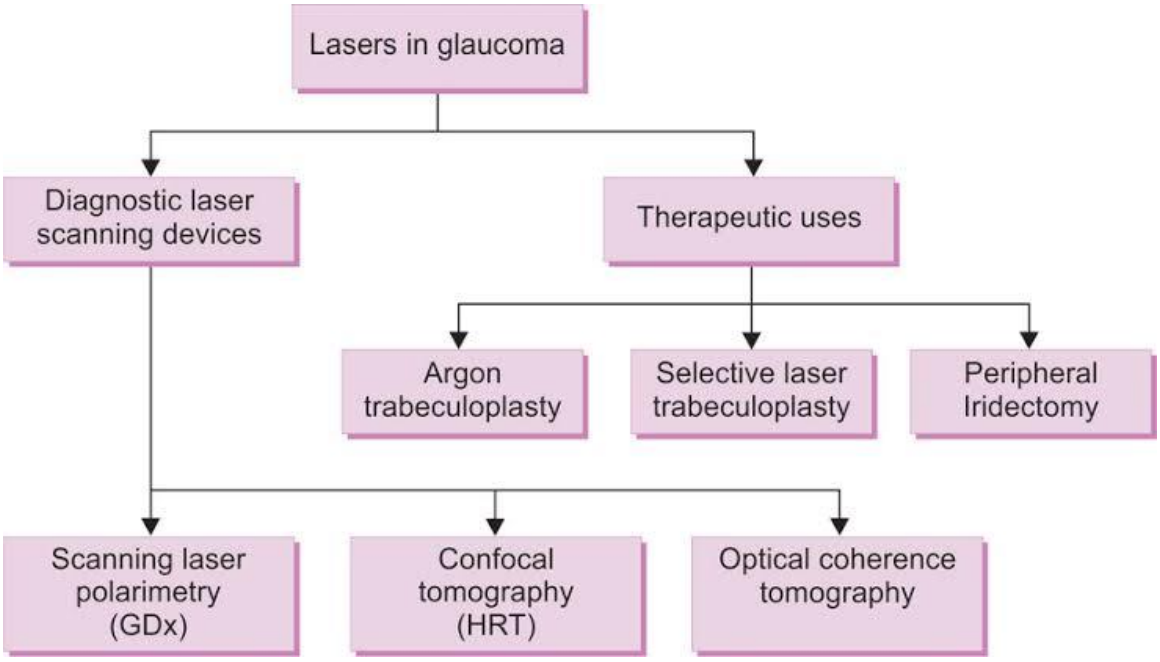
Systemically administered CAI are generally used for short-term treatment, particularly in patients with acute glaucoma.

Because of their systemic side effects, long-term use is reserved for patients at high risk of visual loss. Sulfonamide ('sulfa') allergy is a relative contraindication.

Agents

• **Acetazolamide** is available as 250 mg tablets (250–1000 mg daily in divided doses)

LASER TREATMENT OF GLAUCOMA



Laser trabeculoplasty

Laser trabeculoplasty (LTP) involves the delivery of laser to the trabecular meshwork with the aim of enhancing aqueous outflow and thereby lowering IOP.

• **Selective laser trabeculoplasty (SLT)**

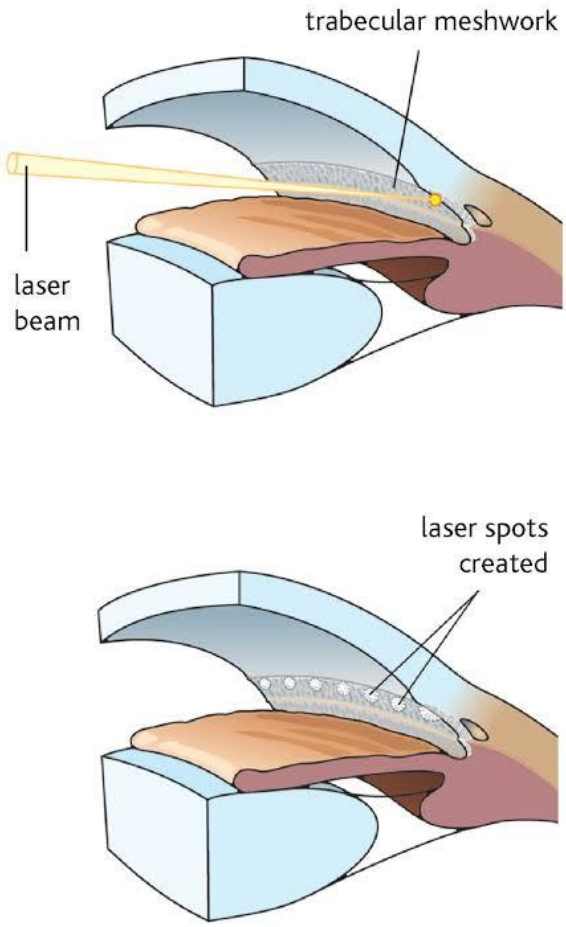
A Predominantly 532 nm frequency-doubled, Q-switched Nd :YAG laser is used to selectively target melanin pigment in TM cells, leaving non pigmented structures.

The mechanism is stimulation of TM cell division, macrophage and extracellular matrix recruitment. Laser application is made easier by a broad targeted and treated area which may lead to more consistent results. Reported protocols (e.g. 180° or 360° TM treatment) and results vary markedly, but IOP reductions of 10–40% can be expected after 6 months in responsive patients, with 25% being common.

. • **Argon laser trabeculoplasty (ALT**) is a long-established procedure that uses laser burns to achieve IOP reduction comparable to SLT.
Mechanisms may also be a mechanical opening of the trabecular spaces.

As the TM sustains thermal damage, repeat treatment is of limited benefit and is infrequently performed.

Complications include peripheral anterior synechiae, acute elevation of IOP (should be monitored carefully over subsequent weeks in patients with severe glaucomatous damage), cystoid macular oedema and anterior uveitis (usually mild).



Micropulse laser trabeculoplasty (MLT) is a relatively new modality that uses extremely short duration pulses of laser to deliver thermal energy to the TM to stimulate cells without damage. Unlike SLT and ALT, there is no visible tissue reaction.

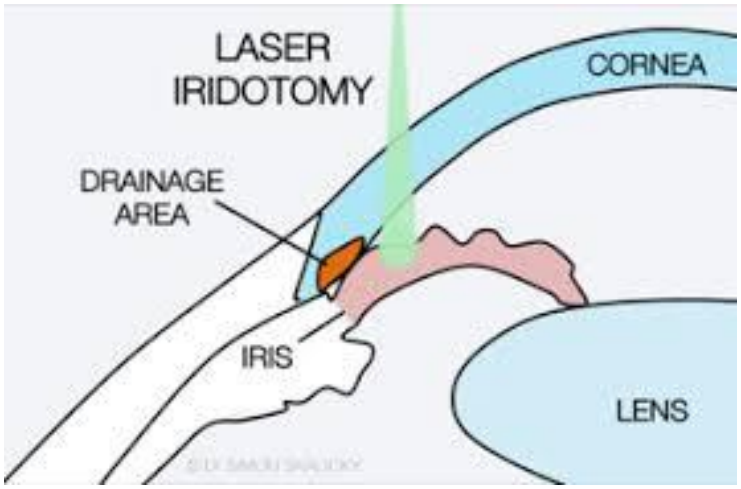
A smaller area is targeted than in SLT, limiting potential collateral effects on adjacent tissue. Initial results suggest a benign safety profile with results comparable to other LTP forms.

1. Indications: Type of glaucoma- LTP can be used in primary and secondary open-angle glaucoma (including primary, pseudoexfoliative and pigmentary) and can also be used in ocular hypertension.
2. Primary therapy- As SLT has increasingly demonstrated a favourable safety profile, its use as a primary alternative to topical medication has increasingly been considered.
3. Failure of adherence to the medical regimen.
4. Adjunctive treatment to avoid poly pharmacy.
5. Intolerance of topical medication including allergy.
6. Failure of medical therapy, as a less aggressive treatment measure than surgery.

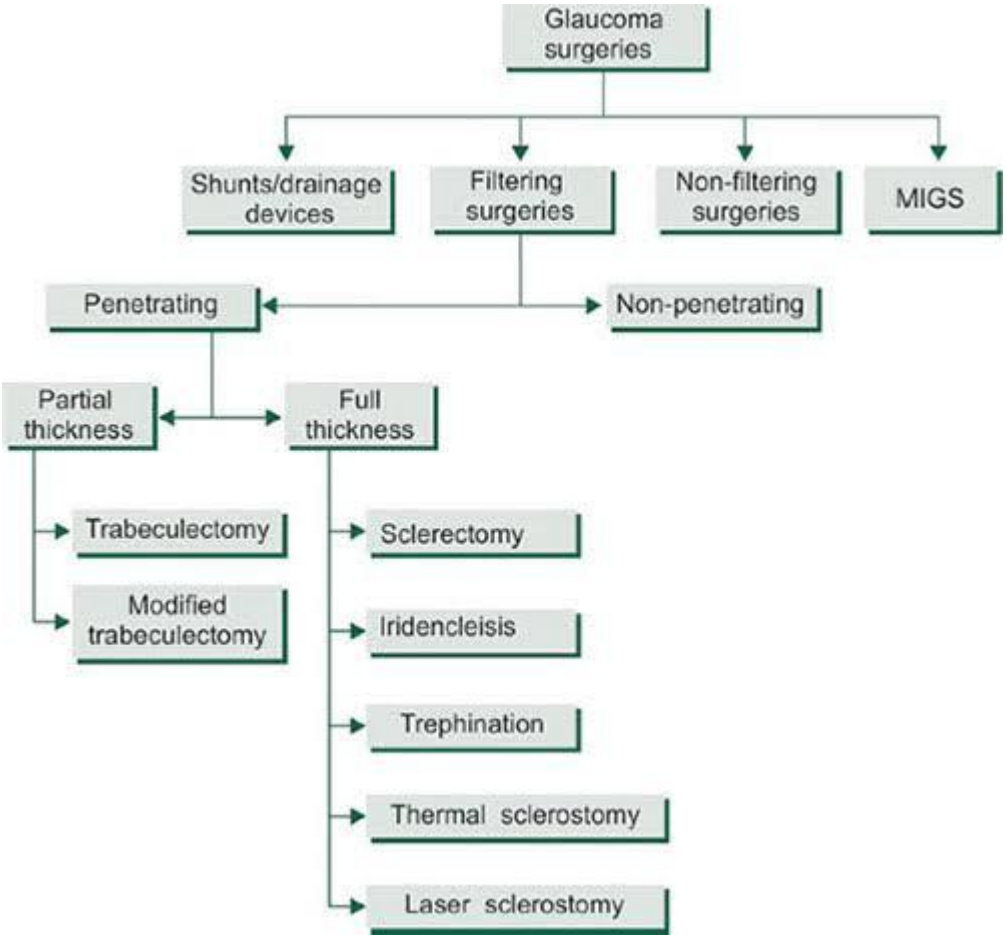
Laser iridotomy

Laser iridotomy is used principally in the treatment of primary angle closure, but may also be indicated in secondary angle closure with pupillary block.

This procedure creates a hole I the iris , thereby allowing aqueous humor to traverse directly from the posterior to the anterior chamber, relieving the pupilllary block.



SURGICAL MANAGEMENT

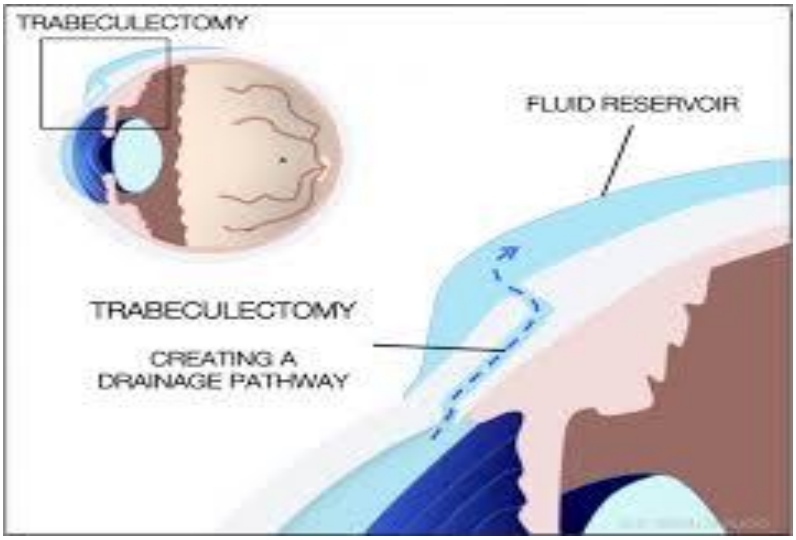


Indications for filtering surgery

1. Documented visual field and optic nerve damage, despite maximum tolerated medications and laser therapy, that threatens the patient's vision.
2. Anticipated progressive damage (e.g., experience in the same or fellow eye that indicates the current course will lead to loss of vision) or intolerably high IOP. Medication failure because of ineffectiveness, intolerance, poor compliance, or complications.
3. Intraocular pressure that is high enough to place the future health of the optic nerve at significant risk. This pressure will differ dramatically, depending on the condition of the nerve and the patient's prior history.
4. For example, if the patient has extensive fixation threatening field loss, pressures in or near the 'normal' range may be too high for the nerve to tolerate. If the physician waits for further progression before operating, central vision may be lost.
5. Dysfunctional ocular tissues (corneal edema or bullous keratopathy, pulsating central retinal artery).
6. Combined with cataract procedure if there is borderline IOP control, advanced damage, or history of postoperative IOP rise in the fellow eye.

Guarded Filtration Procedure- TRABECULECTOMY

Trabeculectomy, with its many modifications, is the most commonly used guarded filtration procedure. Cairns introduced the modern-day trabeculectomy in the 1960s. It was initially believed that aqueous escaped through the cut ends of Schlemm's canal, but it subsequently became obvious that the major effect of the surgery occurred via filtration of aqueous into the subconjunctival space. The reduced incidence of hypotony and flat anterior chambers made trabeculectomy attractive to glaucoma surgeons.



Indications

- Trabeculectomy has become the standard glaucoma procedure, with excellent results for most forms of open-angle and chronic angle-closure glaucoma.
- Aphakic, inflammatory, traumatic, and other secondary forms of uncontrolled glaucoma also are treated by trabeculectomy; success rates are good when wound-healing retardants are used, although success rates tend to be lower than in uncomplicated cases.

So as long as mobile conjunctiva is available superiorly, despite a history of prior surgeries, the predictability of the trabeculectomy and its long-term efficacy at maximally lowering IOP make it the procedure of choice for the majority of uncontrolled glaucoma eyes.

Trabeculectomy can be successfully combined with cataract extraction under a variety of circumstances. The most important advance allowing combined surgeries at one sitting has been the advent of the small-incision cataract/intraocular lens procedure.

Thus modern techniques have broadened the indications for combining these procedures, and many surgeons report excellent results.

MECHANISM

- Aims at excising the trabecular meshwork and creating a fistula through which aqueous humour drains from anterior chamber and accumulates in the subconjunctival and subtenon space forming a filtering bleb

INDICATIONS

- **ABSOLUTE :**

1. Glaucoma not controlled on Maximal medical therapy
2. Primary therapy – in advanced disease requiring a very low target pressure, particularly in younger patients.
3. Progressive deterioration despite adequate IOP control – fluctuation in IOP
4. Refractory glaucoma : Developmental, uveitic and angle recession glaucoma
5. Poor compliance

RELATIVE :

1. Economic considerations
2. Ocular or systemic side effects of anti glaucoma medications

Pre op considerations

- Stop anticoagulants & antiplatelet agents
- Medications which affect the ocular surface and disrupt the blood aqueous barrier should be stopped 1 to 2 weeks prior to surgery

- Prophylactic peripheral iridotomy in angle closure disease.
- Conjunctival mobility should be checked pre operatively to plan the site of surgery.
- Preoperative topical sympathetic agonists (e.g. apraclonidine 1%, adrenaline 0.01% or 0.1%) cause anterior segment vasoconstriction and hence reduce intraoperative bleeding
- In uveitic glaucoma, the use of preoperative topical and/or systemic steroids may be required to ensure optimal control of ocular inflammation prior to surgery

ANESTHESIA

- PERIBULBAR – don't inject more than 5ml /never repeat
- Adrenaline can compromise ONH circulation byvasoconstictive effect in advanced glaucoma
- Topical anesthesia with intracameral anesthesia avoids conjunctival damage, chemosis, SCH but no akinesia achieved
- Subconjunctival anesthesia is less preferred
- General anaesthesia - in pediatric age group, highly anxious patients

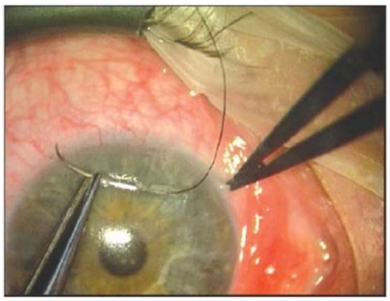
PROCEDURE

• TRACTION SUTURE

1. Clear corneal suture

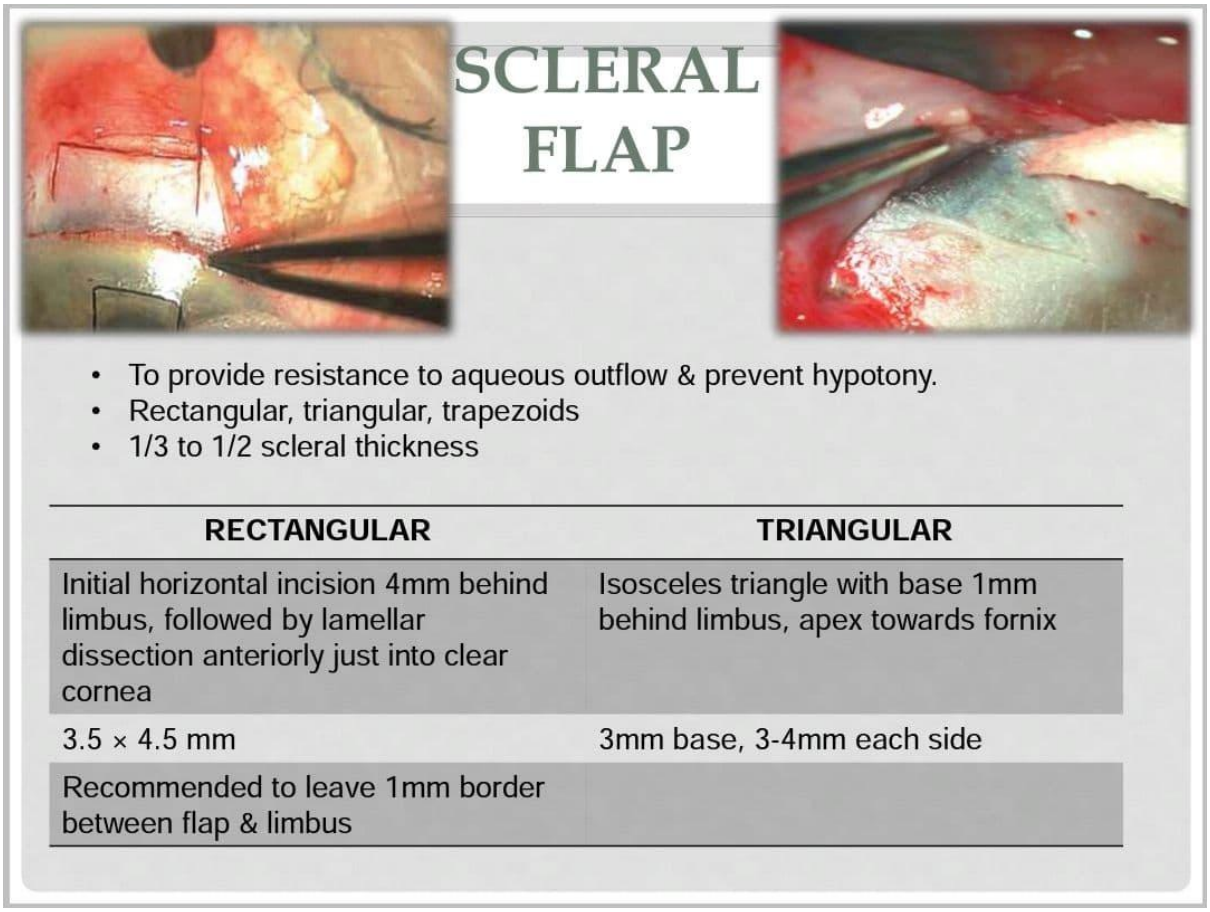
   ✓ Better exposure, less complications

   ✓ 7-0 spatulated vicryl/silk at half thickness, 2mm anterior to limbus



2. SR bridle suture

   • Associated with many complications



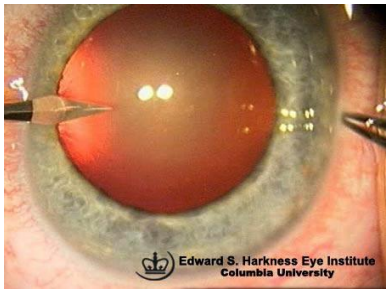
Paracentesis

It helps in controlled decompression which inturn prevents 'snuffout' phenomenon in advanced glaucoma

• Infusion for continuous IOP maintainence by AC maintainer

• To test for patency of filtration site by injecing fluid into AC

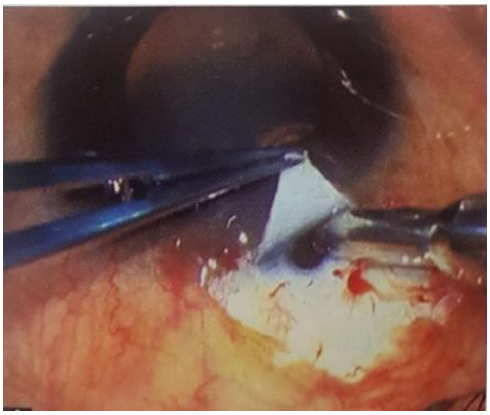
• To prevent intra-op flat AC and postop AC reformation

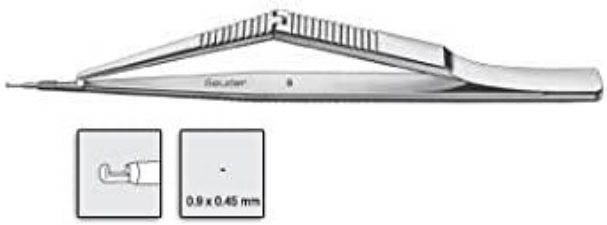


Sclerostomy

Fistula created by hand cut or KELLY DESCEMETS PUNCH

- **Internal block excision** – The block excision can be made with two radial incisoins with a sharp blade.the tissue between the radial incisions is excised with vannas scissors.
- **Sclerostomy punch** – preferred. An anterior corneoscleral incision is made. The punch is then inserted to engage the full-thickness of the limbus. It should be aligned perpendicular to the eye to ensure a clean and nonshelved sclerostomy .Adequate ostium size0.5 -1mm

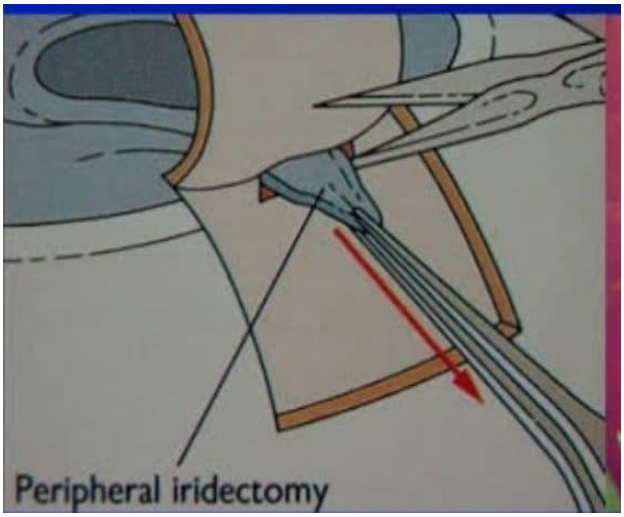




PERIPHERAL IRIDECTOMY

To prevent iris incarceration & ostium blockage

- Performed through the sclerostomy using Vannas scissors
- Base of the iridectomy should be little wider than sclerostomy opening
- Complications: Hyphaema, inflammation, iridodialysis



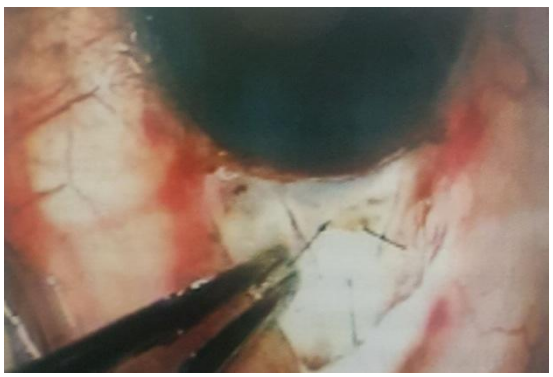
SCLERAL FLAP CLOSURE

Flap construction

- Suture position determines control of
- Tension of resistance to outflow

10-0 Nylon suture

- Suture knots rotated to scleral side



• Types of sutures

  • Fixed, interrupted sutures

  • Adjustable sutures

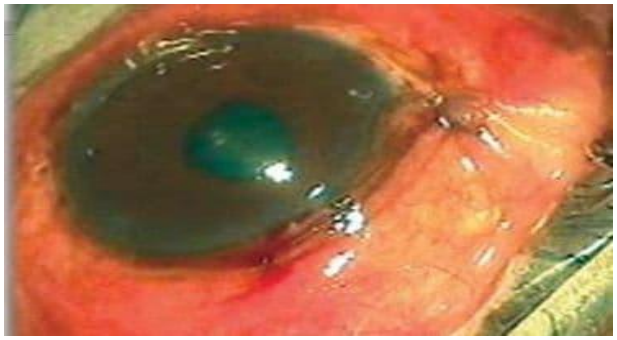
  • Releasable sutures

CONJUNCTIVAL CLOSURE

Closure must be water-tight

• 10-0 nylon or 10-0/9-0 vicryl can be used to close the conjunctiva in a running, locking fashion incorporating tenon's in alternate bites

• Creation of corneal grooves for conjunctival closure of fornix-based flap to minimize wound leakage and suture discomfort



• Anterior chamber is reformed with BSS through the paracentesis

• Test leakage with Seidel technique

• At the end of surgrey, cycloplegics/mydriatics can be used

• ATROPINE 1%

  • Relaxation of ciliary muscle & pain relief

  • Prevention of central posterior synechae

  • Less AC shallowing

  • Dilated pupil – lens cornea touch if AC shallows

POSTOP MANAGEMENT

• Follow-up closely – Success = 50% surgery + 50% postop care

• Topical steroids: suppression of wound healing

• Prednisolone acetate (1%) 2 hourly for 2 weeks and tapered over 8 weeks

• Topical antibiotics: 4 weeks post operatively

• Topical mydriatic/cycloplegic agent : Atropine 1% prevents AC shallowing and risk of malignant glaucoma

• Oral or IV steroids: not routinely used , in severe uveitic glaucoma

POST-OP ASSESSMENT

- Vascularity similar to surrounding conjunctiva
- Numerous microcysts
- Diffuse bleb
- Moderate elevation

REVIEW OF LITERATURE

1. Changes in glaucoma medication numbers after cataract and glaucoma surgery

A nationwide population-based study Hsin-Yi Chen, MD,[a,b,*] Cheng-Li Lin, MSc,[a,c] and Chia-Hung Kao, MD[d,e,]AM

To enhance our understanding of this crucial problem, we designed a study to determine whether cataract surgeryalone (CS) or glaucoma surgery alone (GS) and combined cataract and glaucoma surgery (CGS) affects glaucoma medication usage in Taiwanese patients by using data from the National Health Insurance Research Database (NHIRD).

METHODS

We recruited patients who received new diagnoses of glaucoma (International Classification of Disease, Ninth Revision, Clinical Modification [ICD-9-CM] code 365) between 1998 and 2011 and had undergone either CS, GS, or CGS. To our knowledge, this study is among the few studies worldwide that have investigated this crucial topic by using a large claims database.

In this study, patient records were obtained from the NHIRD, which is released and maintained by the National Health Research Institutes. The NHIRD covers approximately 99% of Taiwan's population and provides registration files and inpatient, outpatient, and pharmacy claims data for all insured individuals .Longitudinal data of medical

history records are linked to an encrypted personal identification number of each patient. The diagnostic codes in the NHIRD follow the format of the ICD-9-CM.

RESULTS

Changes in the number of glaucoma medications before and after surgery

The mean numbers of glaucoma medications in each prescription significantly reduced within 6 months, between 6 months and 2 years, and during 2 to 3 years in all the groups . At the end of the 3-year period, the reduction effect was most clearly visible in the CS group (RR=0.19, 95% CI=0.18–0.20). Significant reductions were also observed in the other 2 groups (RR=0.31 with 95% CI=0.27–0.35 and RR=0.23 with 95% CI=0.20–0.27 in the CGS and GS groups, respectively). Similar trends were also observed in the POAG or PACG groups.

Changes in number of glaucoma medication stratified by age and sex

We stratified the patients in the 3 groups by age and sex to evaluate differences attributable to differences in surgery different age groups and sex groups. We observed significant reductions in all strata among all the groups.

Discussion:

Our results showed that CS, GS, or CGS significantly reduced glaucoma medication usage in the Taiwanese patients, which indirectly indicated the IOP-lowering effect of these surgical procedures.

In actual clinical practice, the decision of timing surgical intervention for glaucoma patients depends not only on the level of IOP but also on the number of glaucoma medications used.

In the GS group, the number of glaucoma medications used was 3.04, which indicated that the patients simultaneously required 3 types of glaucoma medication to control IOP.

Hence, GS was the best choice for this group. However, in the CS group, the number of glaucoma medications was only 1.22, which indicated that patients needed less than 2 types of glaucoma medications for IOP control. For this group, CS would be sufficient for IOP control.

2.EFFECTIVENESS OF TRABECULECTOMY IN PRIMARY OPEN ANGLE GLAUCOMA

Fazle Hanan Mir Ali Shah Muhammad Javaid Shad Muhammad

Abstract

Objective: To analyze the change of intraocular pressure (IOP) brought about by trabeculectomy and to analyze any further changes in intraocular pressure after trabeculectomy during three months follow-up.

Material and Methods:

Patients who presented to eye department of Khyber Teaching Hospital , Peshawar and were diagnosed as primary open angle glaucoma (POAG) and selected for trabeculectomy were included in the study, from 1998 to 2001. History, examination and relevant investigations were performed. All cases of trabeculectomy were analyzed and the follow up period was three months.

Results:

The total number of patients included for trabeculectomy was 44 and the total trabeculectomies performed were 50 as in six cases, bilateral operations were done. Out of 44 patients, 34 (77.2%) were male and 10 (22.8%) were female. The age of the patients ranged from 43 to 80 years. The pre-operative intra ocular pressure ranged from 12 to 60 mm of mercury. The lower ranged intra ocular pressure was those cases of primary open angle glaucoma that were on maximum medical treatment. The post-operative intra ocular pressure was recorded on 1st and 15th post-operative days, one month after surgery and three months after trabeculectomy. The mean intra ocular pressure on 1st and 15th post-operative days, one month and 3 months after surgery was 10.2, 9.8, 12.55 and 10.7 mm of mercury respectively. Overall 92% cases were declared as complete success.

Conclusion:

Trabeculctomy is a safe and effective procedure for primary open angle glaucoma

3.Efficacy and Safety of Low Target Pressure Trabeculectomy: 2-Year Clinical Results

Seung Joo Ha Department of Ophthalmology, Soonchunhyang University College of Medicine, Soonchunhyang University Seoul Hospital, Seoul, Republic of Korea.

Purpose:

To compare the success and complication rates of low target pressure trabeculectomy (LTT) and conventional trabeculectomy (CT).

Methods:

A retrospective study was conducted with consecutive patients undergoing trabeculectomy. Twelve eyes of 12 patients underwent LTT, and 17 eyes of 17 patients underwent CT. Surgical success was defined as meeting each target intraocular pressure (IOP) without additional medication or further glaucoma surgery. A Kaplan-Meier survival analysis was used to estimate survival rate. Incidences of surgical complications were also assessed.

Results:

The median postoperative IOP 2 years after surgery were 10.0 mmHg (interquartile range [IQR] 8.5 - 12.0 mmHg) in the LTT group and

16.0 mmHg (IQR, 14.0 - 18.5 mmHg) in the CT group (P = 0.000). Estimated survival rates for patients who underwent the two types of trabeculectomy were significantly different with all IOP criteria of 10, 12 and 14 mmHg (P < 0.01 for all), except IOP ≤ 18 mmHg. Vision-threatening complications were not found in either group during the observation period. Late-onset bleb leaks occurred in only two eyes in the LTT group but were well treated with autologous blood injection and amniotic membrane transplantation.

Conclusion:

LTT provided more chances to maintain low postoperative IOP and had no more vision-threatening complication than those of CT.

4.Glaucoma Medications in the Tube Versus Trabeculectomy Study

M. Reza Razeghinejad

One of the issues discussed was the number of glaucoma medications. At the first postoperative year, the number of antiglaucoma medications in the tube group was 1.3 ± 1.3 and in the trabeculectomy group was 0.5 ± 0.9 ($P < .001$). These figures at the end of third year were 1.3 ± 1.3 in the tube group and 1.0 ± 1.5 in the trabeculectomy group ($P < .30$). In the articles discussing this trial, one of the important points was the necessity for more glaucoma medications over the first year in the tube group.

5.Success Rate of Trabeculectomy in Primary Glaucoma at Cicendo Eye Hospital on January–December 2013

Erva Monica Saputro, Maula Rifada, RB. Soeherman Herdiningrat

Background:

Trabeculectomy is a surgical therapy for glaucoma to preserve visual function by lowering intraocular pressure (IOP). In some studies, the success of trabeculectomy in lowering IOP is greater than medication. Success is defined by IOP <21 mmHg, with or without glaucoma medication. Primary glaucoma based on the mechanism of aquous humor outflow is divided into primary open-angle glaucoma (POAG) and primary angle-closure glaucoma (PACG). This study aimed to know the success rate of trabeculectomy in POAG and PACG.

Methods:

This study was a descriptive study conducted at Cicendo Eye Hospital using medical record of POAG and PACG patients who underwent trabeculectomy surgery on January–December 2013 with minimal one month follow-up. Data collection was conducted during September 2014. Data processed in this study were 100 eyes from 76 patients with diagnosis POAG and PACG.

Results:

The success rate for trabeculectomy in POAG was 79% and PACG was 86%, failure (IOP ≥ 21 mmHg) 21% in POAG, and 14% in PACG for period 2013 at Cicendo Eye Hospital.

Conclusions: The success rate of trabeculectomy at Cicendo Eye Hospital is good in one month, with or without glaucoma medication after surgery.

PART - II

OBJECTIVE / AIM :

To determine whether anti-glaucoma surgery modifies glaucoma medication usage postoperatively after anti-glaucoma surgery.

Primary objective :

To analyse the changes in number of anti-glaucoma medications after anti-glaucoma surgery.

Secondary objective:

To determine influence of certain factors which predispose to the need for anti-glaucoma medication following anti-glaucoma surgery.

METHODOLOGY:

Study design: Prospective study

Sample size: 50

Sampling technique:

Convenient Sampling where every consecutive glaucoma patient attending Regional Institute of ophthalmology outpatient department were included in the study.

Study tool:

Health records and medical reports with relevant follow up ophthalmic examination.

Study population:

All patients with primary open angle glaucoma and primary angle closure glaucoma attending glaucoma clinic

Study Setting:

The study was conducted at Regional Institute of Opthalmology, chennai

Study Duration:

1year (October 2020 to Sep 2021)

Subject Selection:

All patients with primary open angle glaucoma and primary angle closure glaucoma who were operated for anti glaucoma surgery were taken up for the study after consent from the patients.

Inclusion criteria:

Patients who were diagnosed to be a case of

1. Primary open angle glaucoma
2. Primary angle closure glaucoma
3. Age group above 30years and below 80years
4. IOP at initial presentation >21mmHg

Exclusion criteria

1. Ocular hypertension- where there is only raise in intraocular pressure without fundus changes
2. Normotensive glaucoma- where the intraocular pressure is within normal limits but with fundus changes
3. Secondary open angle and secondary closed angle glaucomas

METHODS :

Patients who were selected as participants of the study are well informed and after due consent, the following details were obtained.

1.History of presenting complaints

2.Family history

3. Treatment history

4.History of associated systemic comorbidities were obtained.

All patients were subjected to

1.Visual acuity examination

2.Intraocular pressure with Goldmann applanation tonometer

3.Slit lamp examination of anterior segment

4.Gonioscopy with Goldmann 2mirror lens

5.Fundus (posterior segment examination for optic nerve head changes) using +90 D lens

6. Automated Perimetry.

The total number of topical antiglaucoma medication with dosage which the patient had been using was noted.

Indications which were considered for taking up for surgery :

1.Glaucoma not controlled on Maximal medical therapy

2. Primary therapy – in advanced disease requiring a very low target pressure, particularly in younger patients.

3. Progressive deterioration despite adequate IOP control-fluctuation in IOP

4. Poor compliance

5.Economic considerations(patients not affordable for topical anti glaucoma medications)

6. Ocular or systemic side effects of anti glaucoma medications

The patients were advised for Anti-glaucoma surgery.

Note:

- The better eye was operated first with aim to retain the better vision for a long time pertaining to the life expectancy of the patient.
- Based on the vision and cataractous lens changes patients had undergone either **combined surgery(lens removal with intraocular lens implantation with trabeculectomy) or trabeculectomy** alone
- Before taking the patient for surgery for Intraocular pressure control patient may be added on systemic anti glaucoma measures like oral acetazolamide 250mg BD and
- Inj mannitol 100ML IV in case of poor control of IOP with Maximum medical therapy.

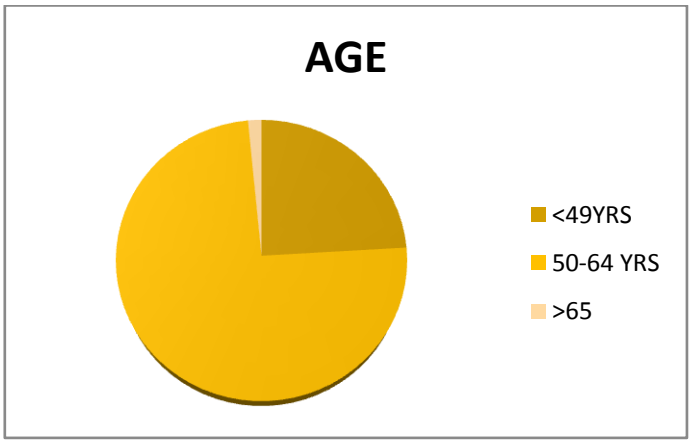
- Patients were followed up postoperatively,. were monitored regularly at every month for the first 3 months and then for every 3 months for 1year of study period.
- At each visit with the consent of the patient all details were recorded and patients were well informed that they were the participants of the study.
- At each visit patients were checked for visual acuity, anterior segment examination by slit lamp bio microscopy and introcular pressure measured by goldmann applanation tonometer . And if IOP was found to be raised concerned patients were started upon topical anti glaucoma medications to achieve the target IOP for that patient and this number of anti glaucoma medications advised postoperatively was been recorded. All the records collected preoperatively and postoperatively are analysed statistically and the results were obtained. **The results were obtained after statistical analysis by SPSS 28 TRIAL VERSION.**

RESULTS:

In the prospective study conducted on patients diagnosed as POAG and PACG, to determine the efficacy of antiglaucoma medications in modifying the number of anti-glaucoma medications postopertively , during a period of 1year the following results were obtained .

AGE DISTRBUTION

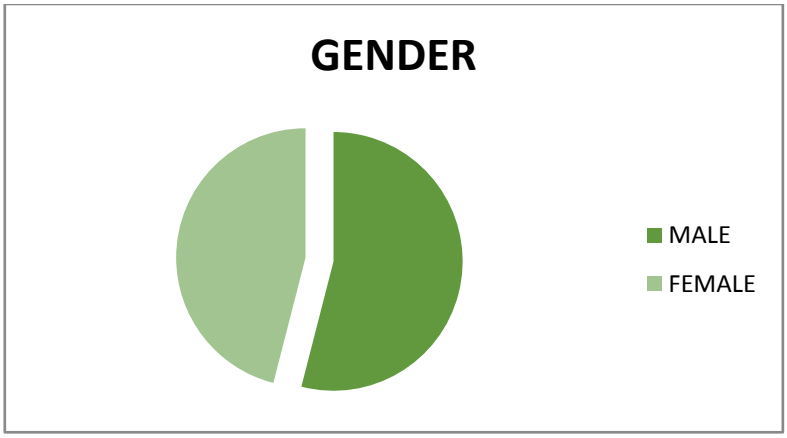
AGE DISTRIBUTION	FREQUENCY	PERCENT
<49 YEARS	11	22.0
50-64 YEARS	34	68.0
>65 YEARS	5	10.0
TOTAL	50	100.0



In this study the age group of patients <49 years was 22.0 and between 50-64years age group is 68.0 and age more than 65years was 10.0 people.

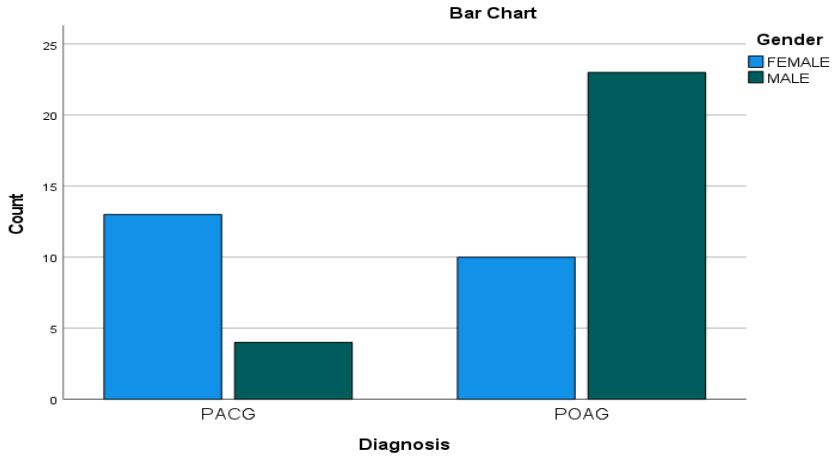
GENDER DISTRIBUTION

SEX	FREQUENCY	PERCENT
FEMALE	23	46.0
MALE	27	54.0
TOTAL	50	100



In this study the total number of males patients were 54% and total number of females patients were 46% .

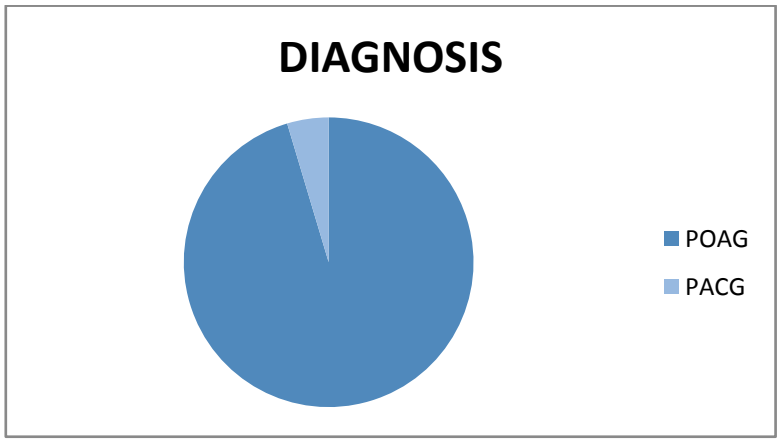
Diagnosis - Gender Cross tabulation				
		Gender		
		FEMALE	MALE	Total
Diagnosis	**PACG**	**13**	4	17
	POAG	10	23	33
Total		23	27	50



In this study the total number of POAG patients were 33 of which 23 were males and 10 were females while in PACG total number of cases were 17 of which 4 were only males and 13 were females which was significant and infers that PACG was more prevalent among females compared to males.

DIAGNOSIS

DIAGNOSIS	FREQUENCY	PERCENT	VALID PERCENT	CUMULATIVE PERCENT
PACG	17	34.0	34.0	34.0
POAG	33	66.0	66.0	136
TOTAL	50	100.0	100.0	



In this study the total number of Primary open angle glaucoma patients were 66.0 and the total number of Primary angle closure glaucoma patients were 34.0.

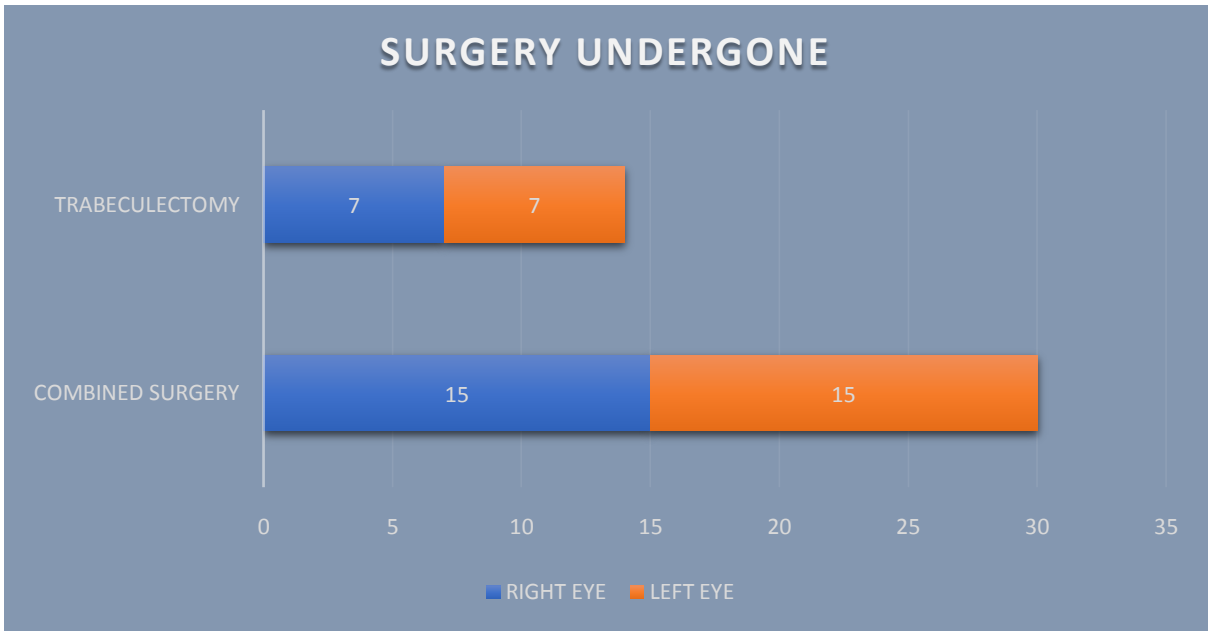
Table 1 details of the patients based on grading

Variable	Frequency (N)	Percentage %
GLAUCOMA TYPE & GRADE		
• PAOG		
Moderate	13	26
Severe	20	40
• PACG		
Moderate	8	17
Severe	7	17

In this study the glaucoma was classified as primary open angle and primary closed angle glaucoma and again each was graded into moderate and severe based on American Academy of Ophthalmology guidelines.

The number of moderate grade open angle patients were 26 and severe grade open angle patients were 20 and the moderate grade closed angle patients were 17 and severe grade angle closure patients were17.

LATERALITY



In this study the total number of patients undergone trabeculectomy were 14 among which right eye was operated in 7 patients and left eye in 7 patients.

The total number of patients undergone combined surgery (cataract +trabeculectomy) was 30 , of which right eye was operated in 15 patients and left eye in 15 patients.

Table 2 Changes in glaucoma medication –1

No. of Glaucoma Medications		
	PreOP	PostOP
Mean	2.50	0.82
Median	2.00	1.00
Mode	2	0
Std. Deviation	0.614	0.774
Range	2	2
Minimum	2	0
Maximum	4	2

The number of glaucoma medications were compared preoperatively and post operatively. Preoperatively the mean was 2.50±0.614, the median was 2.00 , the mode was 2.Preoperatively the maximum number of drugs were 4 and minimum was 2. Post operatively the mean was 0.82±0.774, median was 1.00 and mode was 0 . Post operatively the maximum number of drugs was 2 and minimum was 0.

BOX PLOT COMPARING THE NUMBER OF ANTIGLAUCOMA MEDICATIONS PREOP AND POST OP

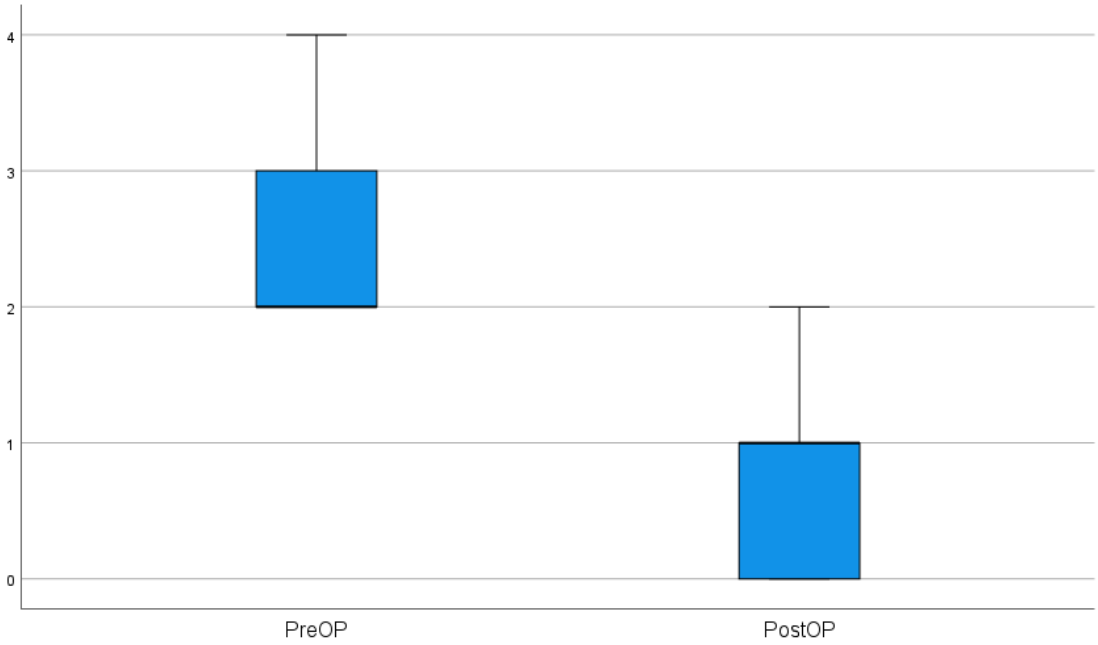


Table 3: Changes in glaucoma medication - II

S. No	Variables	Pre-Op	Post-Op	Pre & Post Change				
		Mean, SD	Mean, SD	Mean difference	SD	95% Confidence Interval of the Difference		P Value
						Lower	Upper	
1.	**Overall**	2.50, 0.614	0.82, 0.774	1.680	0.621	1.504	1.856	<.001

In this study the the overall preop and postop mean difference was 1.68 ± 0.621. And the 95% confidence interval of the mean difference was between 1.504 and 1.856. And the p value obtained was<0.01, which was statistically significant.

Table : **4** Changes in glaucoma medication (with respect to age and gender)– III

S. No	Variables	Pre-Op	Post-Op	Pre & Post Change				
		Mean, SD	Mean, SD	Mean difference	SD	95% Confidence Interval of the Difference		P Value
						Lower	Upper	
2.	**Age in Years**							
	<49	2.27, 0.467	0.64, 0.674	1.630	0.247	1.145	2.115	<.001
	49 – 64	2.53, 0.662	0.85, 0.821	1.680	0.181	1.325	2.035	<.001
	> 65	2.80, 0.447	1.00, 0.707	1.800	0.374	1.067	2.533	<.001
	Gender							
	Males	2.44, 0.577	0.93, 0.781	1.414	0.187	1.414	1.876	<.001
	Females	2.57, 0.662	0.70, 0.765	1.870	0.211	1.457	2.283	<.001

The changes in glaucoma medication pre operatively and post operatively with respect to each variable like age and gender were given in the above table.

The mean difference in <49 years was 1.630 ± 0.247 , among 49-64 years age group mean difference was 1.680 ±0.181 and >65years age group mean difference was 1.800 ±0.211 and overall the p value in all age groups was <0.01.

Similarly with respect to gender variable the mean difference in MALES was 1.414±0.817 and in FEMALES was 1.870 ±0.211 respectively . The p value was <0.01in both males and females, which was statistically significant..

Table 3 Changes in glaucoma medication with respect to grade of glaucoma

S. No	Variables	Pre-Op	Post-Op	Pre & Post Change				
		Mean, SD	Mean, SD	Mean difference	SD	95% Confidence Interval of the Difference		P Value
						Lower	Upper	
1.	**POAG**							
	Moderate	2.36, 0.633	0.57, 0.646	1.790	0.242	1.316	2.264	<.001
	Severe	2.50, 0.607	0.90, 0.852	1.600	0.234	1.142	2.058	<.001
2.	**PACG**							
	Moderate	2.50, 0.535	0.50, 0.535	2.000	0.268	1.476	2.524	<.001
	Severe	2.75, 0.707	1.38, 0.744	1.370	0.363	0.659	2.081	<.001

- The changes in number of glaucoma medications with respect to the type and grading of glaucoma is given in the above table.
- The mean difference in moderate POAG was1.790±0.242 and severe POAG was 1.600 ± 0.234 respectively
- p value was <0.01in both moderate and severe grades of POAG , which was statistically significant
- For moderate and severe PACG, the mean difference was2.00 ±0.268 and for severe PACG was1.370 ±0.363 .
- The p value for <0.01 was found in both moderate and severe PACG cases .

Table 4: Changes in Glaucoma Medication based on type of anti-glaucoma surgery

S. No	Variables	Pre-Op	Post-Op	Pre & Post Change				
		Mean, SD	Mean, SD	Mean difference	SE	95% Confidence Interval of the Difference		P Value
						Lower	Upper	
1.	POAG							
	Moderate							
	• Trabeculectomy	2.36, 0.633	0.57, 0.646	1.790	0.242	1.316	2.264	<0.001
		2.00, 0.000	0.00, 0.000	-	-	-	-	-
	• Combined Surgery	2.50, 0.674	0.67, 0.651	1.830	0.271	1.300	2.360	<0.001
	Severe	2.50, 0.607	0.90, 0.852	1.600	0.234	1.142	2.058	<0.001
	• Trabeculectomy	2.50, 0.707	1.00, 1.414	1.500	1.118	-0.691	3.691	0.312
	• Combined Surgery	2.50, 0.632	0.94, 0.854	1.560	0.266	1.039	2.081	<0.001
2.	PACG							
	Moderate	2.50, 0.535	0.50, 0.535	2.000	0.268	1.476	2.524	<.001
	• Trabeculectomy	2.43, 0.535	0.57, 0.535	1.860	0.286	1.300	2.420	<.001
	• Combined Surgery	2.67, 0.577	0.67, 0.577	2.000	0.471	1.077	2.923	0.013
	Severe	2.75, 0.707	1.38, 0.744	1.370	0.363	0.659	2.081	<.001
	• Trabeculectomy	2.00, 0.000	0.50, 0.707	1.200	0.374	0.467	1.933	0.012
	• Combined Surgery	3.00, 0.707	1.80, 0.447	-	-	-	-	-

The above table shows the outcome of trabeculectomy and combined surgery for moderate and severe grades of POAG and PACG cases separately.

1. The moderate grade POAG patients undergone trabeculectomydoesnt show significant mean difference where as combined surgery patients show mean difference of 1.830±0271 and the p value was <0.001 in combined surgery group of POAG alone was statistically significant.
2. The severe grade POAG patients undergone trabeculectomyshows mean difference of1.500±1.118 and the p value was 0.312 which is not significant. And the combined surgery cases of severe PACG shows mean difference of1.560±0266 and the p value was <0.001 which was statistically significant.
3. The moderate grade PACG patients undergone trabeculectomy shows mean difference of 1.8600±0.268 and the p value was< 0.001 and combined surgery patients whose mean difference of 2.00±0.471 and the p value was 0.013 which was statistcally significant.
4. The severe cases of PACG undergone trabeculectomy doesnt shows significant mean difference and combined surgery mean difference was1. 200±0.374 and
5. p value was 0.012 which was statistically significant.

DISCUSSION

AGE:

In our study patients were grouped into 3 classes as < 49years and 50-64years and >65years, and it was found that around 68% cases comes under 2nd category of 50-64 age group.

In the reference the study(changes in glaucoma medication numbers after cataract and glaucoma surger- nationwide population –based study –Hsin-Yi Chen,MD, Cheng-Li Lin, Msc, and Chiea-Hung Kao,MD) age of the patients ranged from 43 to 80years.

GENDER:

In our study considering both POAG and PACG, males were affected more than females overall . And inspecific the angle closure type was found to be more prevelant among the females.

In the reference study(changes in glaucoma medication numbers after cataract and glaucoma surger- nationwide population –based study –Hsin-Yi Chen,MD, Cheng-Li Lin, Msc, and Chiea-Hung Kao,MD) the total number of male patients were more than the total number of female patients.

LATERALITY:

In our study almost all patients had bilateral but asymmetrical presentation. And the total number of eyes undergone either

trabeculectomy or combined surgery doesn't have any laterality preference. Both eyes were operated equally based on the severity of presentation.

CHANGES IN NUMBER OF GLAUCOMA MEDICATIONS:

This being the main objective of the study, the number of glaucoma medications preoperatively and post operatively was found to be reduced significantly. The mean number of medications preoperatively was 2.50 and post operatively was 0.82 and SD was 0.62 and the P value <0.01 which was statisctically significant.

In the reference study(changes in glaucoma medication numbers after cataract and glaucoma surger- nationwide population –based study – Hsin-Yi Chen,MD, Cheng-Li Lin, Msc, and Chiea-Hung Kao,MD) the mean number of glaucoma medicationsin each prescription reduced to 0(in the CSgroup) and approximately 0.5 (in the GS and CGS groups).

Further more the mean number of medications in each prescription significantly dereased within 6months , between 6months and 2years in all groups.

In the reference study also the mean number of glaucoma medications in each prescription significantly reduced in 6months. Similar trends were observed in POAG and PACG groups.

CHANGES IN GLAUCOMA MEDICATION NUMBERS WITH RESPECT TO OTHER VARIABLES:

With respect to factors like age , sex there is significant difference in the outcome. Overall there was significant reduction in IOP and the anti-glaucoma medication numbers.

In the reference study also there was significant reduction in all strata among all the groups.

SUMMARY

- The primary open angle Glaucoma and primary angle closure glaucoma distribution based on age and gender doesn't make big difference except for PACG being little more common among females.
- With respect to laterality of presentation , the disease per se had bilateral with asymmetric presentation, we opted to operate the better eye earlier than the worst eye at the time of presentation.
- Both moderate and severe grades of POAG and PACG where the progress was not controlled by medical management were advised for surgical management.
- Surgery was planned based on the associated lens changes .Patients with immature cataract contributing to defective vision were advised for combined surgery(cataract + trabeculectomy) and patients without significant lens changes or pseudophakic patients were advised for trabeculectomy alone.
- The number of glaucoma medications preoperatively and postoperatively had reduced significantly in the follow up period of 6months post operatively .
- The overall change in glaucoma medication pre op and post op mean difference was 1.680 and SD was 0.62 and 95%confidence interval of the difference was 1.540 and 1.856 upper and lower and P value <0.01 , which is statistically significant

CONCLUSION

As known the Intraocular pressure being the only modifiable risk factor in controlling the progress of the glaucoma [POAG and PACG] and considering the grade of glaucoma mild moderate and advanced, initial IOP control was tried with MMT(Maximum medical therapy).

Poor control of IOP with MMT, poor compliance, considering the economic factors and associated lens changes patients were advised for anti-glaucoma surgery(trabeculectomy or combined surgery).

The IOP control by the anti glaucoma surgeries (either alone or combined with cataract surgery) was found to be significant that it alters need for anti-glaucoma medications postoperatively.

Hence trabeculectomy and combined surgery are safe and effective procedures for primary open angle and primary angle closure glaucoma.

PART - III

BIBILIOGRAPHY

1. Becker-Shaffer's Diagnosis and therapy of the Glaucoma
2. Parsons'disease of the eye
3. Schieldls textbook of Glaucoma
4. Kanski's clinical Ophthalmology – A Systematic Approach
5. Diagnosis and Management of Glaucoma – R Ramakrishnan
6. Yanoff and ducker Opthal
7. 41. Larsson LI, Rettig ES, Sheridan PT, et al. Aqueous humor dynamics in low-tension glaucoma. Am J Ophthalmol. 1993; 116(5):590-593.
8. Ray K, Mookherjee S. Molecular complexity of primary open angle glaucoma: current concepts. J Genet 2009;88:451-67
9. Broadway DC, Nicolela M, et al. Optic disc appearances in primary openangle glaucoma. Survey of ophthalmology 1999;43(Suppl 1):S223-43. 7. Burgoyne CF, Downs JC, et al.
10. The optic nerve head as a biomechanical structure: a new paradigm for understanding the role of IOP-related stress and strain in the pathophysiology of glaucomatous optic nerve head damage. Prog Retin Eye Res 2005;24:39-73.
11. Cioffi G. Ischemic model of optic nerve injury. Transactions of the American Ophthalmological Society 2005;103:592-613. 9. Cioffi GA.

Three common assumptions about ocular blood flow and glaucoma. Survey of ophthalmology 2001;45(Suppl 3):S325-31; discussion S332-4.

12. 72. Sigal IA, Ethier CR, Biomechanics of the optic nerve head. Experimental Eye Research 2009;88:799-807.

13. The Advanced Glaucoma Intervention Study, 6: effect of cataract on visual field and visual acuity. The AGIS Investigators. Arch Ophthalmol 2000;118:1639-52.

14. Gabelt BT,Kaufman PL. Aqueous humor hydrodynamics. In Kaufmann PL,AlmAem Adlers physiology of the eye CVMosby and co, StLouis 2003:237.

15. Ang GS, Eke T. Lifetime visual prognosis for patients with primary openangle glaucoma. Eye 2007;21:604

16. Moses RA. The Goldmann applanation tonometer. Am J Ophthalmol 1958;46:865.

17. van Herick W, Shaffer RN, Schwartz A. Estimation of the width of the angle of anterior chambers: incidence and significance of the narrow angle. Am J Ophthalmol 1969;68: 626-9.

18. mrattan RS, Wolfs RCW, Jonas JB, et al. Determinants of optic disc characteristics in a general population. The Rotterdam Study. Ophthalmol 1999;106:1588-96.

19. Lichter PR, Musch DC, Gillespie BW, Guire KE, Janz NK, Wren PA, et al. Interim clinical outcomes in the collaborative initial glaucoma

treatment study (CIGTS) comparing initial treatment randomized to medications or surgery. Ophthalmology 2001;108:1943-53.

20. Coakes RL, Brubaker RF. The mechanism of timolol in lowering intraocular pressure. In the normal eye. Arch Ophthalmol 1978;96:2045-8.

21. Sears MI. The mechanism of action of adrenergic drugs in glaucoma. Invest Ophthalmol 1966;5:115.

22. Walters TR. Development and use of brimonidine in treating acute and chronic elevations of intraocular pressure: a review of safety, efficacy, dose response and dosing studies. Surv Ophthalmol 1996;41 Suppl 1:S19-26.

23. Cole man RA, Smith WL, Narumiya S. International Union of pharmacology classification of prostanoid receptors and their subtypes. Pharmacol Rev 1994;46:205.

24. Addicks EM, et al. Histologic characteristics of filtering blebs in glaucomatous eyes, Arch Ophthalmol 1983;101: 795. 2. Ainsworth JR, Jay JL. Cost analysis of early trabeculectomy versus conventional management in primary open angle glaucoma. Eye 1991;5:322.

25. Chandrasekaran S, Cumming RG, Rochtchina E, Mitchell P. Associations between elevated intraocular pressure and glaucoma, use of glaucoma medications, and 5-year incident cataract: the Blue Mountains Eye Study. Ophthalmology 2006;113:417-24

PROFORMA

NAME

AGE

SEX

OP NUMBER

DATE OF VISIT

PRESENTING COMPLAINTS

HISTORY OF ANY SYSTEMIC ILLNESS

FAMLY HSTORY

TREATMENT HSTORY

VITALS

EXAMINATION

1. **VISUAL ACCUITY(BCVA)**

2. **ANTERIOR SEGMENT** **RE** **LE**

   LIDS

   CONJUNCTIVA

   CORNEA

   ANTERIOR CHAMBER

   IRIS

   PUPIL

   LENS

3. **INTRAOCULAR PRESSURE**

4. **FUNDS EXAMINATION**

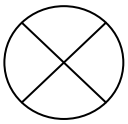
Media

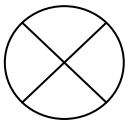
Disc changes

Vessel changes

macula

5. **GONIOSCOPY** **RE** **LE**





TREATMENT

MEDICAL

SURGICAL

FOLLOW UP

DATE

VISUAL ACUTY

IOP

ANTERIOR SEGMENT **RE** **LE**

LIDS

CONJUNCTIVA

CORNEA

ANTERIOR CHAMBER

IRIS

PUPIL

LENS

FUNDUS

ADVICE

KEY TO MASTER CHART

S.NO	-	SERIAL NO
POAG	-	PRMARY OPEN ANGLE GLAUCOMA
PACG	-	PRMARY ANGLE CLOSURE GLAUCOMA
RE	-	RIGHT EYE
LE	-	LEFT EYE
BE	-	BOTH EYE
M	-	MALE
F	-	FEMALE
IOP	-	INTRAOCULAR PRESSURE
IMC	-	IMMATURE CATARACT
CDR	-	CUP DISC RATIO
CCT	-	CENTRAL CORNEAL THICKNESS
DZ	-	DORZOLAMIDE
T	-	TIMOLOL
TRAV	-	TRAVOPROST
BZ	-	BRINZOLAMIDE
BM	-	BRIMONIDINE
TRAB	-	TRABECULECTOMY
RGN	-	RETINAL GANGLION NEURON
GON	-	GLAUCOMTOUS OPTIC NEUROPATHY
ONH	-	OPTIC NERVE HEAD

SERIAL NO	NAME OF THE PATIENT	AGE	SEX	LENS STATUS	DIAGNOSIS	VISUAL ACUITY	INTRAOCULAR PRESSURE	CCT(MICRO METER)	CDR	GRADING OF GLAUCOMA	TOPICAL MEDICATIONS USED	NUMBER OF ANTIGLAUCOM MEDICTIONS	DATE OF SURGERY	SURGERY UNDERGONE	TYPE OF SURGERY	CATERGORY OF SURGERY	EYE UNDER FOLLOWUP	IOP AT 1ST POST OP MONTH	IOP AT 1ST POST OP MONTH IN FOLLOW UP EYE	IOP AT 2ND POST OP MONTH	IOP OF FOLLOWUP EYE AT THE 2ND POST OP MONTH	IOP AT 3RD POST OF MONTH	IOP OF THE FOLLOWUP EYE AT THE 3RD POST OP	IOP AT 6MONTHS POST OPERATIVELY	IOP OF THE FOLLOWUP EYE AT THE END OF 6TH MONT
1	CHANDRAN	55	MALE	BE)IMC	POAG	RE- 6/60 LE-	RE-16MMHC	RE:524 LE:5	RE-0.7-0.8 L	2	BE) DZ, T	2	21.10.20	LE) COMBINED SURGERY	2	1	LE	RE:15 LE:16	16	RE:16 LE: 18	18	RE: 15 LE:22	22	RE: 16 LE: 22	22
2	GIRIJA	64	FEMALE	BE)IMC	POAG	RE-4/60 LE:6	RE:32 LE:20	RE:530 LE:5	RE: 0.8 LE:	2	BE) DZ, T,TRA	2	26.10.20	LE) COMBINED SURGERY	2	1	LE	RE:28 LE: 12	12	RE:26 LE: 15	15	RE: 22 LE:16	16	RE:22 LE:16	16
3	SITHU HABIRA	72	FEMALE	LE)PSEUDOPHAKIA	PACG	RE:6/60 LE6/	RE:20 LE:13	RE:526 LE:5	RE:0.5-0.6 L	4	LE)T,TRAV	2	12.08.20	RE)COMBINED SURGERY	2	3	RE	RE:14 LE:40	14	RE:16 LE:36	16	RE:16 LE:30	16	RE:16 LE:28	16
4	SURESH BABU	66	MALE	BE)IMC	POAG	RE:CFCF LE	RE:20 LE:22	RE:496 LE:5	RE:0.8 LE:0.	2	BE)BM+T	2	21.8.20	LE) COMBINED SURGERY	2	1	LE	RE:19 LE:08	8	RE:19 LE:10	10	RE:20 LE:07	7	RE: 19 LE:08	8
5	PREMA	63	FEMALE	BE)IMC	PACG	RE:HM LE:N	RE:18 LE:40	RE:522 LE:5	RE:0.9 LE:0.	4	BE) BM+T+T	3	17.08.20	LE) COMBINED SURGERY	2	3	LE	RE:08 LE:18	18	RE:10 LE:26	26	RE :09 LE:26	26	RE:09 LE:22	22
6	GOPAL	56	MALE	LE)PSEUDOPHAKIA	POAG	RE:CFCF LE	RE:24 LE:22	RE:507 LE:5	RE:0.7 LE:0.	2	BE) T+DZ	2	03.08.20	RE)COMBINED SURGERY	2	1	RE	RE:06 LE:20	6	RE:12 LE:21	12	RE:14 LE:19	14	RE:22 LE:20	22
7	RASSAMAL	60	FEMALE	BE)IMC	POAG	RE:6/36 LE:(	RE:24 LE:26	RE:516 LE:5	RE:0.7 LE:0.	2	BE)BM+T+BZ	3	12.09.20	LE) COMBINED SURGERY	2	1	LE	RE:18 LE:22	22	RE:17 LE:20	20	RE:18 LE:19	19	RE:18 LE: 16	16
8	KUMAR	52	MALE	BE)LC+	PACG	RE:6/24 LE:(	RE:19 LE:26	RE:492 LE:5	RE:0.5 LE:0.	3	LE)DZ+T	2	16.9.20	LE) TRAB	1	4	LE	RE:18 LE:11	11	RE:16LE:14	14	RE: 16 LE:15	15	RE:15 LE:12	12
9	SOPHIA	65	FEMALE	LE)PSEUDOPHAKIA	POAG	RE: 5/60 LE:	RE:18 LE:16	RE:612 LE:6	RE:0.7 LE:0.	1	RE)DZ ,T,BM	3	25.9.20	RE)COMBINED SURGERY	2	1	RE	RE:07 LE:15	7	RE:12 LE:15	12	RE: 14 LE:16	14	RE:12 LE:14	12
10	KARUPAIYA	67	MALE	BE)IMC	PAOG	RE:2/60 LE:(	RE:18 LE:14	RE:564 LE:5	RE:0.8 LE:0.	2	RE)DZ ,T,BM	3	28.9.20	RE)COMBINED SURGERY	2	1	RE	RE:10 LE:14	10	RE:12 LE:16	10	RE:15 LE:16	15	RE:20 LE: 14	20
11	KAMACHI	62	FEMALE	BE)IMC	PACG	RE:CFCF LE	RE:36 LE:18	RE:534 LE:5	RE:0.5 LE:0.	3	RE)DZ,T,BM	3	5.10.20	RE)COMBINED SURGERY	2	3	RE	RE:22 LE:18	22	RE:18 LE:16	22	RE:14 LE:19	14	RE:14 LE:18	14
12	ESWARAN	49	MALE	BE)LC+	POAG	RE:6/9 LE:6/	RE:16 LE:28	RE:512 LE:5	RE:0.7 LE:0.	2	RE)DZ LE)DZ,T	2	11.10.20	LE)COMBNED SURGERY	2	1	LE	RE:12 LE:10	10	RE:14 LE:12	12	RE:12 LE:10	10	RE:16 LE:12	12
13	GANDHI MADHI	58	FEMALE	BE)PSEUDOPHAKIA	POAG	RE:6/18 LE:(	RE:24 LE:26	RE:504 LE:5	RE:0.8 LE:0.	2	BE)T,TRA,BZ	2	14.10.20	RE)TRAB	1	2	RE	RE:14 LE:18	14	RE:12 LE:18	12	RE:12LE:20	12	RE:10 LE:18	10
14	KARUNAKARAN	64	MALE	BE)IMC	POAG	RE:6/60 LE:2	RE:16 LE:32	RE:516 LE:5	RE:0.4-0.5 L	1	LE)BZ,BM,T	3	25.10.20	LE)COMBNED SURGERY	2	1	LE	RE:15 LE:24	24	RE:16 LE:20	20	RE:16 LE:20	20	RE:14 LE:16	16
15	CHELAMAL	63	FEMALE	BE)IMC	PACG	RE:3/60 ->6/	RE:30 LE:24	RE:492 LE:4	RE:0.6 LE:04	3	RE)BZ,BM,T LE)T	3	25.10.20	RE)COMBINED SURGERY	2	3	RE	RE:24 LE:18	24	RE:20 LE:16	20	RE:18 LE16	18	RE:16 LE:18	16
16	DHANAM	42	FEMALE	BE)LC+	PACG	RE:6/12->6/9	RE:24 LE:18	RE:514 LE:5	RE:0.6-0.7 L	1	RE)BM,T	2	29.10.20	RE)TRAB	1	4	RE	RE:14 LE:16	14	RE:12 LE:16	12	RE:10 LE:16	10	RE:09 LE:16	9
17	SEKAR	60	MALE	LE)PSEUDOPHAKIA	POAG	RE: 5/60->6/	RE:22 LE:20	RE:540 LE:5	RE:0.7 LE:0.	1	BE)DZ, T	2	29.10.20	RE)COMBINED SURGERY	2	1	RE	RE:16 LE:18	16	RE:12 LE:18	12	RE:14 LE:20	14	RE: 12 LE:18	12
18	SURESH BABU	47	MALE	BE)LC+	PACG	RE:6/9 LE:6/	RE:16 LE:28	RE:518 LE:5	RE:0.5-0.6 L	4	LE)DZ,T,BM	2	14.10.20	LE)TRAB	1	4	LE	RE:16 LE:18	18	RE:18 LE:16	16	RE:16 LE:14	14	RE:14 LE:10	10
19	MUNNUSAMY	72	MALE	LE)PSEUDOPHAKIA	POAG	RE:CFCF LE	RE:26 LE:24	RE:530 LE:5	RE:0.8 LE:0.	2	BE)DZ,T,BM	3	2.11.20	RE)COMBINED SURGERY	2	1	RE	RE:12 LE:20	12	RE:14 LE:22	14	RE:12 LE:18	12	RE:12 LE:20	12
20	ANTONY DOSS	55	MALE	LE)IMC	POAG	RE:6/36->6/9	RE:16 LE:28	RE:524 LE:5	RE:0.3-0.4 L	1	LE)DZ,T	2	6.11.20	LE)COMBNED SURGERY	2	1	LE	RE:14 LE:12	12	RE:16 LE:12	12	RE:14 LE:14	14	RE:16 LE:12	12
21	MOHAMED	62	MALE	BE)IMC	POAG	RE:2/60->6/6	RE:28 LE:32	RE:56 LE:548	RE:0.5-0.6 L	2	BE)DZ,T,BM,BZ	4	13.11.20	RE)COMBINED SURGERY	2	1	RE	RE:18 LE:28	18	RE:18 LE:22	18	RE:14 LE:24	14	RE:12 LE:20	12
22	KRISHNAVENI	58	FEMALE	LE)IMC	POAG	RE:6/18 LE:(	RE:42 LE:28	RE:526 LE:5	RE: 0.8 LE:	1	BE)BM,BZ,T,TRA	4	22.11.20	LE)COMBNED SURGERY	2	1	LE	RE:28 LE:16	16	RE:26 LE: 15	15	RE:24 LE:16	15	RE:22 LE:14	14
23	SULOCHANA	57	FEMALE	BE)IMC	PACG	RE:6/18->6/1	RE:36 LE:32	RE:570 LE:5	RE:0.6 LE:0.	4	BE)BM,BZ,T,TRA	4	22.11.20	LE)COMBNED SURGERY	2	3	LE	RE:28 LE:14	14	RE:26 LE:14	14	RE:26 LE:12	12	RE:28 LE:12	12
24	SUDHAKARAN	59	MALE	BE)IMC	POAG	RE:6/36 LE:2	RE:16 LE:30	RE:522 LE:5	RE:0.6 LE:0.	2	LE)TRA , T,BM	3	26.11.20	LE)COMBNED SURGERY	2	1	LE	RE:16 LE:18	18	RE:12 LE:12	12	RE:16 LE:14	14	RE:14 LE:12	12
25	MARIMUTHU	60	MALE	BE)IMC	POAG	RE:1/60 ->5/	RE:22 LE:16	RE:510 LE:5	RE:0.7 LE:0.	2	RE:TRA,T	2	26.11.20	RE)COMBINED SURGERY	2	1	RE	RE:08 LE:18	8	RE:08 LE,16	8	RE:10 LE:16	10	RE:08 LE:16	8
26	GEETHA	45	FEMALE	BE)CLEAR	PACG	RE:6/6 LE:6/	RE:26 LE:42	RE:530 LE:5	RE:0.6 LE:0.	4	RE)TRA LE)TRAV	3	3.12.20	LE)TRAB	1	4	LE	RE:18 LE:12	12	RE:18 LE:12	12	RE:20 LE:12	12	RE:18 LE:10	10
27	VISALATCHI	62	FEMALE	LE)IMC	POAG	RE:6/12 LE:4	RE:18 LE:24	RE:526 LE:5	RE:0.4-0.5 L	1	LE)T , TRAV	2	7.12.20	LE)COMBNED SURGERY	2	1	LE	RE:16 LE:12	12	RE:18 LE:12	12	RE:16 LE:10	10	RE:18 LE:10	10
28	USHA	48	FEMALE	BE)LC+	PACG	RE:6/9 LE:61	RE:28 LE26	RE:495 LE:5	RE:0.6-0.7 L	3	BE :DZ, T	2	15.12.20	RE)TRAB	1	4	RE	RE:12 LE:22	12	RE:12 LE:21	12	RE:12 LE:20	12	RE:10 LE:18	10
29	SANKAR	46	MALE	BE)LC+	POAG	RE6/12->6/9	RE:32 LE:18	RE:517 LE:5	RE:0.7 LE:0.	2	RE:TRA,T,BM	3	15.12.20	RE)TRAB	1	2	RE	RE:14 LE:16	14	RE:12 LE:18	12	RE:20 LE:18	20	RE:18 LE:16	18
30	SAMUEL	50	MALE	BE)IMC	POAG	RE: 6/36->6/	RE:16 LE:24	RE:496 LE:4	RE:0.5-0.6 L	2	LE)BM,BZ	2	18.12.20	LE)COMBNED SURGERY	2	1	LE	RE:16 LE:12	12	RE:16 LE:08	8	RE:14 LE:10	10	RE:14 LE:10	10
31	BABU	56	MALE	LE)IMC	POAG	RE:6/12-> 6/	RE:22 LE:26	RE:544 LE:5	RE:0.6 LE:0.	1	BE)DZ, T	2	18.12.20	LE)COMBNED SURGERY	2	1	LE	RE:20 LE:16	16	RE:18 LE:12	12	RE:18 LE:12	12	RE:20 LE: 14	14
32	DHINAKAR	52	MALE	BE)IMC	POAG	RE:6/24->6/1	RE:28 LE:18	RE:536 LE:5	RE:0.8 LE:0.	2	RE:BZ,BM,T	3	23.12.20	RE)COMBINED SURGERY	2	1	RE	RE:20 LE16	20	RE:16 LE:18	16	RE:18 LE:16	18	RE:14 LE:18	14
33	FRANCIS	63	MALE	BE)IMC	PACG	RE:6/60 LE:2	RE:34 LE:32	RE:530 LE:5	RE:0.7 LE:0.	4	BE)BM,BZ,T	3	28.12.20	RE)COMBINED SURGERY	2	3	RE	RE:20 LE:28	20	RE:18 LE:26	18	RE:16 LE:28	16	RE:14 LE:24	14
34	SARADHA	57	FEMALE	BE)IMC	POAG	RE:6/24 LE:6	RE:22 LE:18	RE:526 LE:5	RE:0.7 LE0.4	1	RE)BM,T	2	4.01.21	RE)COMBINED SURGERY	2	1	RE	RE:10 LE:14	10	RE:12 LE:18	12	RE:08 LE:16	8	RE:10 LE:18	10
35	MANIMEGALAI	53	FEMALE	BE)LC+	PACG	RE:6/24->6/6	RE:36 LE:28	RE:570 LE:5	RE:0.6 LE:0.	3	BE)DZ,T,BM	3	15.01.21	RE) TRAB	1	4	RE	RE:15 LE:24	15	RE:12 LE:20	12	RE:14 LE:20	14	RE:12 LE:22	12
36	KANAGASABAI	60	MALE	BE)IMC	POAG	RE:1/60 LE:6	RE:16 LE:26	RE:530 LE:5	RE:0.9 LE:0.	2	BE:BZ, BM	2	15.01.21	LE)COMBNED SURGERY	2	1	LE	RE:14 LE:11	11	RE:18 LE:10	10	RE:18 LE12	12	RE 16 LE:08	8
37	SULTHANA	48	FEMALE	BE)LC+	PACG	RE:6/9 LE:6/	RE:24 LE:14	RE:528 LE:5	RE:0.4-0.5 L	1	BE)TRA , T	2	18.01.21	LE)TRAB	1	4	LE	RE:18 LE:14	14	R:18 LE:12	12	RE:14 LE:10	10	RE:16 LE:10	10
38	SIVASANKAR	55	MALE	LE)PSEUDOPHAKIA	PACG	RE:6/36->6/1	RE:44 LE:28	RE:554 LE:5	RE0.7 LE0.8	4	BE)DZ,T,BM	3	26.1.21	RE)COMBINED SURGERY	2	3	RE	RE:16 LE:24	16	RE:18 LE:26	18	RE:16 LE:22	16	RE:14 LE:20	14
39	MURUGESAN	59	MALE	BE)IMC	POAG	RE:6/60->6/2	RE:22 LE:18	RE:516 LE:5	RE:0.9 LE:0.	2	BE:BZ, BM	2	26.01.21	RE)COMBINED SURGERY	2	1	RE	RE:08 LE:18	8	RE:10 LE:18	10	RE:12 LE:22	12	RE:10 LE:18	10
40	NARAYANAN	65	MALE	BE)IMC	POAG	RE:3/60->6/6	RE:28 LE:30	RE:542 LE:5	RE:0.5-0.6 L	2	BE)DZ,T,TRA	3	30.01.21	RE)COMBINED SURGERY	2	1	RE	RE:18 LE:28	18	RE:16 LE:26	16	RE:14 LE:26	14	RE:12 LE:26	12
41	GOVINDAN	49	MALE	BE)LC+	POAG	RE:6/12 LE:6	RE:22 LE:28	RE:562 LE:5	RE:0.4-0.5 L	1	LE)TRA , T	2	6.2.21	LE)TRAB	1	2	LE	RE:20 LE:14	14	RE:20 LE:12	12	RE:20 LE:14	14	RE:20 LE:10	10
42	CHINNAKARUPAN	60	MALE	BE)IMC	POAG	RE:6/60->6/3	RE:14 LE:18	RE:545 LE:5	RE:0.7 LE:0.	2	BE)BM,T	2	6.2.21	RE)COMBINED SURGERY	2	1	RE	RE:10 LE:14	10	RE:12 LE:16	12	RE:10 LE:14	10	RE:08 LE:18	8
43	SELVARANI	53	FEMALE	BE)IMC	PACG	RE:6/24 LE:6	RE:18 LE:16	RE:524 LE:5	RE:0.6-0.7 L	3	RE)DZ,T	2	11.2.21	RE)COMBINED SURGERY	2	3	RE	RE:12 LE:16	12	RE:14 LE:16	14	RE:10 LE:18	12	RE:12 LE:16	12
44	SARAVANAN	57	MALE	LE)PSEUDOPHAKIA	POAG	RE:6/60->6/1	RE:30 LE:22	RE:532 LE:5	RE:0.5-0.6 L	1	RE)BM,BZ	2	14.2.21	RE)COMBINED SURGERY	2	1	RE	RE:18 LE:20	18	RE:14 LE:20	14	RE:16 LE:19	16	RE:12 LE:20	12
45	FATHIMA	50	FEMALE	BE)LC+	POAG	RE:6/12->6/6	RE:28 LE:26	RE:498 LE:5	RE:0.6 LE:0.	1	BE)TRA , T	2	26.2.21	RE)TRAB	1	2	RE	RE:14 LE:19	14	RE:12 LE:20	12	RE:10 LE:18	10	RE:08 LE:18	8
46	PALANYANDI	56	MALE	BE)IMC	POAG	RE:6/24 NIG	RE:24 LE:28	RE:536 LE:5	RE:0.7 LE:0.	2	BE)BZ,BM,T	3	26.2.21	RE)COMBINED SURGERY	2	1	RE	RE:20 LE:22	20	RE:16 LE:20	16	RE:12 LE:18	12	RE:12 LE:16	12
47	SUBHA	51	FEMALE	BE)LC+	PACG	RE:6/9 LE:6/	RE:26 LE:28	RE:520 LE:5	RE-0.7 LE:0.	4	BE)TRA , T	2	29.2.21	LE)TRAB	1	4	LE	RE:22 LE:14	14	RE:20 LE:14	14	RE:22 LE:10	10	RE:18 LE:06	6
48	SASIKALA	46	FEMALE	RE)LC+LE)NAD	PACG	RE:6/18 LE:6	RE:32 LE:16	RE:530 LE:5	RE:0.5 LE:0.	3	RE)DZ,T,TRA	3	2.03.21	RE)TRAB	1	4	RE	RE:22 LE:14	22	RE:18 LE:14	18	RE:14 LE:16	14	RE:12 LE:16	12
49	FAROOKBEGAM	48	FEMALE	BE)LC+	POAG	RE: 6/12->6/	RE:12 LE:18	RE:548 LE:5	RE:0.4-0.5 L	3	LE)T,DZ	2	2.3.21	LE)TRAB	1	2	LE	RE:14 LE:10	10	RE:16 LE:12	12	RE:12 LE:10	10	RE:14 LE:12	12
50	KANCHANAMALA	63	FEMALE	BE)IMC	POAG	RE:5/60->6/1	RE:26 LE:24	RE:522 LE:5	RE:0.6 LE:0.	1	BE)BZ,BM,T	3	2.3.21	RE)COMBINED SURGERY	2	1	RE	RE:18 LE:22	18	RE:18 LE:20	18	RE:16 LE:20	16	RE:12 LE:18	12

IOP AT 9TH MONTH POSTOPERATIVELY	IOP OF THE FOLLOWUP EYE AT THE END OF 9TH MONTH	ANTIGLAUCOMA MEDICATON ADVISED POST OPERATIVELY	NUMBER OF ANTIGLAUOMA DRUGS USED POSTOPERATIVELY
RE: 15 LE: 18	18	LE: DZ,T	2
RE:21 LE: 16	16	NIL	0
RE:16 LE:25	16	LE DZ	1
RE: 18 LE:08	8	NIL	0
RE:08 LE: 20	20	LE) BM+ T	2
RE:12 LE:19	12	LE) BM+T	2
RE:16 LE:12	12	LE) BM+T	2
RE:14 LE:13	13	NIL	0
RE: 08 LE: 14	8	NIL	0
RE:18 LE:16	18	RE) T	1
RE:16 LE:18	16	RE)DT	1
RE:14 LE:08	8	LE)T	1
RE:12 LE:18	12	NIL	0
RE:16 LE:18	18	LE:DT	0
RE:14 LE:16	14	RE)T	1
RE:10 LE:16	10	RE) T	1
RE:10 LE:16	10	RE)T	1
RE:16 LE:12	12	LE)T	1
RE:12 LE:18	12	RE: T	1
RE:14 LE:12	12	LE)T	1
RE:12 LE:22	18	RE) DT,T	2
RE:26 LE:12	12	LE) BM,T	2
RE:30 LE:12	12	LE) TRA, T	2
RE:14 LE:08	8	LE:T	1
RE:08 LE: 20	8	NIL	0
RE:18 LE:10	10	LE: T	1
RE:14 LE:10	10	NIL	0
RE:08 LE: 20	8	NIL	0
RE:16 LE:18	16	RE: DT ,T	2
RE:14 LE:08	8	NIL	0
RE:22 LE:12	12	LE) T	1
RE:12 LE:16	12	RE) T	1
RE:12 LE:26	12	RE) DZ,T	2
RE:08 LE:16	8	NIL	0
RE:12 LE:24	12	RE) T	1
RE:16 LE:08	8	NIL	0
RE:16 LE:06	6	NIL	0
RE:14 LE:22	14	RE) DZ,T	2
RE:10 LE:16	10	NIL	0
RE:12 LE:24	12	RE) DZ,T	2
RE:20 LE:12	12	NIL	0
RE:08 LE:18	8	NIL	0
RE:10 LE:16	10	NIL	0
RE:12 LE:20	12	RE) DZ	1
RE:10 LE:20	10	NIL	0
RE:10 LE:18	10	RE) T	1
RE:18 LE:08	8	NIL	0
RE:14 LE:16	14	RE)T	1
RE:16 LE:10	10	NIL	0
RE:12 LE:18	12	RE)T	1