CHANGES IN IOP

AFTER CATARACT SURGERY

By

DR. ADITYA DESAI

Dissertation is submitted to,

Sumandeep Vidyapeeth, Piparia, Vadodara

In partial fulfillment

Of the requirements for the degree of

M.S.

in

OPHTHALMOLOGY

Under the Guidance of

Dr. RAJNI SETHIA

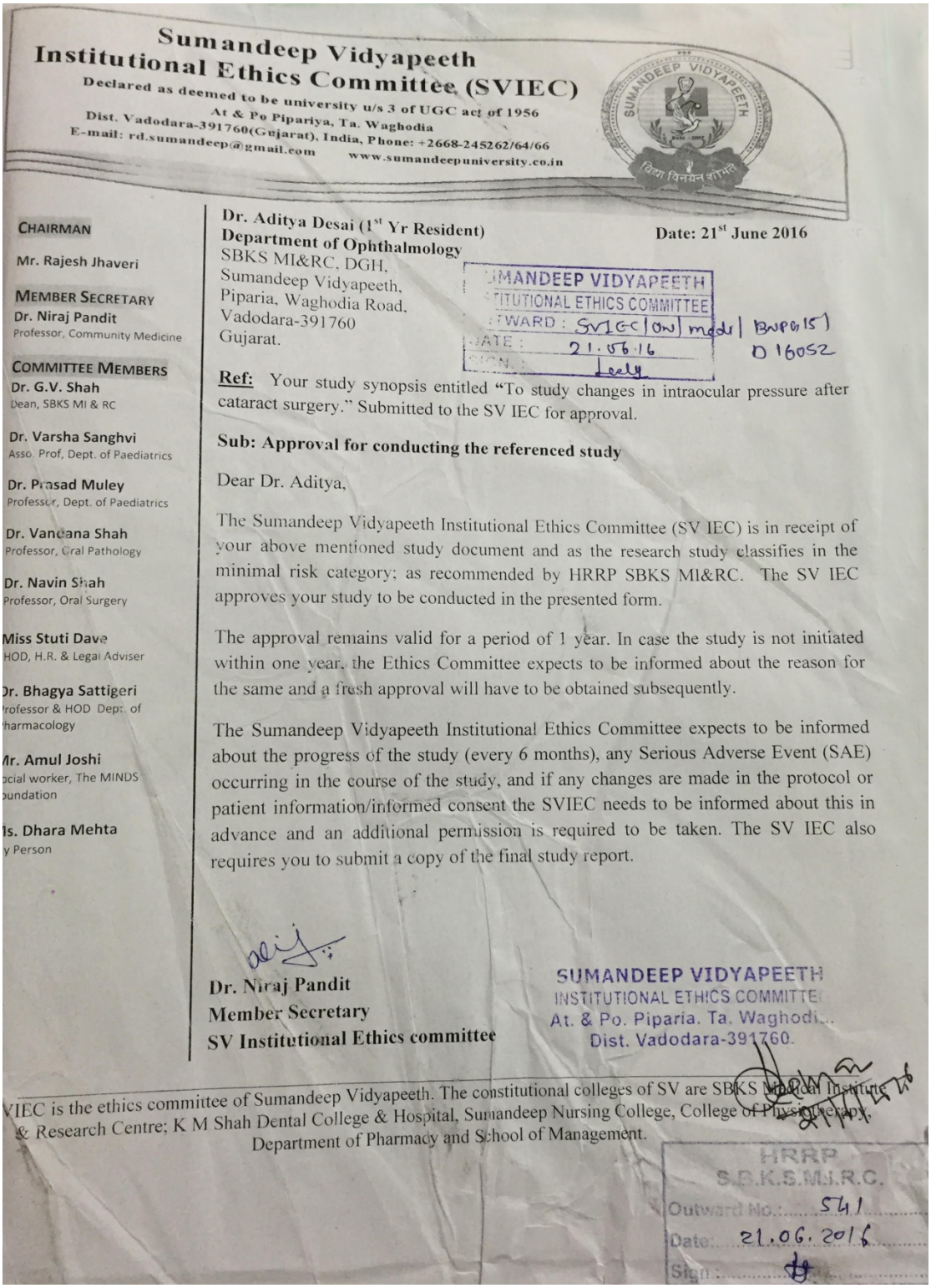
(Associate Professor)

DEPARTMENT OF OPHTHALMOLOGY

SBKS MEDICAL INSTITUTE & RESEARCH CENTRE,

PIPARIA, VADODARA

2015-2018



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Institutional Ethics Committee (SVIEC)
Declared as deemed to be university u/s 3 of UGC act of 1956
At & Po Pipariya, Ta. Waghodia
Dist. Vadodara-391760(Gujarat), India, Phone: +2668-245262/64/66
E-mail: rd.sumandeep@gmail.com www.sumandeepuniversity.co.in

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Department of Ophthalmology
SBKS MI&RC, DGH,
Sumandeep Vidyapeeth,
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Gujarat.

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Date: 21.06.2016
Sign :

Sumandeep Vidyapeeth
Institutional Ethics Committee (SVIEC)
Declared as deemed to be university u/s 3 of UGC act of 1956
At & Po Piparia, Ta. Waghodia
Dist. Vadodara-391760(Gujarat), India, Phone: +2668-245262/64/66
E-mail: rd.sumandeep@gmail.com www.sumandeepuniversity.co.in

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I hereby declare that this dissertation/thesis entitled **"CHANGES IN IOP AFTER CATARACT SURGERY"** is a bonafide and genuine research work carried out by me under the guidance of Dr. Rajni Sethia M.S. (Ophthalmology)

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Date:

Place: Piparia, Vadodara

Signature of the Guide

Dr. Rajni Sethia
M.S.(Ophthal)
Associate Professor.
Dept. of Ophthalmology
Sumandeep Vidyapeeth
Pipariya, Vadodara

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Seal & Signature of the HOD
Dr. R.N. Kothari
M.S. (Ophthal)
Professor & Head of Dept.
Dept. of Ophthalmology
Sumandeep Vidyapeeth
Piparia, Vadodara

Date:

Place: Piparia, Vadodara

Seal & Signature of the Dean
Dr. G.V. Shah
M.S. (Anatomy) – Dean
Sumandeep Vidyapeeth
Piparia, Vadodara

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ACKNOWLEDGEMENT

So finally its done! an end to a small chapter of my story, of my life. You know Life is a constant journey of growing and refining who we are. It's from the little things in life we learn the most vital and important lesson. Learning is a constant process. I have always believed that there is no such thing as the right way or the wrong way. It's a matter of perception!!. Its all about choices and consequences which paves our life. Imagine yourself walking on a road and well at the end of the road there is a pitch fork i.e there are two roads you have to decide you want to go on path number one or path number two. Path number 1 is the path traveled by most of us and path number 2 is the road less travelled. You are wondering which one is the right one? . THEE SECRET is both are! Of course the path 1 is the safe bet and out of peoples experiences it was carefully sorted out, but the road less travelled has endless possibilities, it is less travelled less explored, and we as humans are always afraid of the unknown. But if your heart tells you to go just take it … seize it … own it!!! You might fall, you might fail, but you will find a way, you find people you never thought existed you will gain experience, you will know what you really are capable of and rise above things. Don't be afraid to be different, think different. Don't be afraid to take chances! In the end, its all the paths I choose, at the end of the road and the people I encountered at every step of my life , every experience I perceived are the elements that defines me, moulded me and made me what I am today. It gives me great pleasure in preparing this dissertation and I take this opportunity to thank everyone who have made this possible.

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La clave de la vida no es vivir para siempre, sino vivir contigo para siempre

ABSTRACT

Introduction

Cataract and glaucoma are the leading causes of blindness, with glaucoma, mainly due to rise in intraocular pressure in developing countries. Long term raised intraocular pressure leads to visual field defect. Certain interventions for e.g. anti glaucoma drugs, laser iridotomy, filtration surgery have been attempted throughout the years. Relation between cataract surgery like phacoemulsification with posterior chamber intraocular lens implantation and intraocular pressure has prompted early visual recovery and control of intraocular pressure. This study was conducted to evaluate the effect of an uncomplicated phacoemulsification on intraocular pressure by comparing it to preoperative values and subsequent post-operative values along with preop and postop changes in anterior chamber depth. It was also aimed at finding out whether phacoemulsification can be an alternative for IOP control which, alone, can prevent future complications associated with rise in IOP leading to visual field loss.

Materials and methods:

Ethics committee approval was obtained and the study was then conducted with 150 eyes of patients enrolled through ophthalmology department of Dhiraj Hospital. These candidates confined to the inclusion criteria of the study.

We studied pre op and post op intraocular pressure at day 1, week 1, 4, 12.

IOP fluctuation was observed in follow ups along with changes in anterior chamber depth.

The data obtained was statistically analyzed and compiled.

Results:

Out of 150 eyes, the mean IOP decrease was found to be 1.69±2.313 (11.5%) at post op week 12 from baseline which was statistically significant. We also found that there was a transient rise of IOP on post op day 1. The mean rise on post op day 1 was 0.21 (0.70%). We also compared pre op and post op anterior chamber depth. The mean change was 1.23 ± 0.33 at 12 weeks post operatively

Conclusion:

Our study confirms Cataract surgery (phaco) with PCIOL causes reduction in IOP which remains sustained for months. This could prove to be promising in treatment of cataract with coexisting glaucoma.

Keywords:

Cataract

Intraocular pressure

Phacoemulsification

Anterior chamber depth

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INTRODUCTION

Cataract is one of the leading causes of preventable blindness in the world. While in India its prevalence has been reported to be responsible for 50-80% of bilateral blindness. [1] Blindness due to cataract presents an enormous problem in India not only in terms of human morbidity but also in terms of economic loss and social burden. [2]

Glaucoma is the second leading cause of blindness worldwide. 12 million persons worldwide are estimated to be blind because of the disease. Primary open angle glaucoma (POAG) is far more common than primary angle closure (PACG). [3] While in Asia population based studies from China and India have reported that a significant percentage of population suffer from angle closure. In development and progression of glaucoma, elevated IOP is the major influence. [4]

IOP elevations and fluctuations, small or large, may be due to various physiological conditions or sporadic or due to routine day to day activities which contribute to glaucomatous pathology. [5-7] Major aspects in order to prevent glaucoma progression include

1. To minimize or prevent large fluctuations in diurnal variation of IOP

2. Proper setting of target IOP [8]

Anterior chamber depth (ACD) measurement has been implicated in differentiating diagnosis of types of glaucoma. However, ACD is also gradually compromised with age due to increase in size of the natural crystalline lens resulting from senile changes.

Thus, a thorough ocular examination for cataract should also include ACD measurement.

Central corneal thickness also plays direct role in underestimating or overestimating IOP. Central corneal thickness (CCT) is known to affect the accuracy of intraocular pressure (IOP) measurement when combined with applanation tonometry. [9-10] A thicker cornea requires greater force to applanate and, conversely, a thinner cornea is more easily flattened. A thin cornea is a significant risk factor for the development of glaucoma. Above-average thickness tends to cause overestimation of IOP, but the relationship between corneal thickness and applanation tonometry measurements is probably not linear. [10]

Several studies suggest that there is significant IOP reduction in normal population after cataract extraction with or without posterior chamber intraocular lens implantation. It attributes for long term control of IOP, widening of anterior chamber angle causing its deepening after removal of cataract. [11-12]

The advent and refinement of modern phacoemulsification techniques have revolutionized the ability to rehabilitate patients with vision loss secondary to cataract. Cataract surgery is, far and away, the most commonly performed ophthalmic surgical procedure of any kind, and the use of phacoemulsification to remove cataract is increasing at a rapid pace worldwide [13]. Recent data from WHO show a 25% decrease in blindness prevalence which could have been due to the increased rates of clinical research and surgical interventions in India. [13]

Cataract surgery is considered as one of the most cost-effective interventions. Although the postoperative visual and refractive outcomes of cataract extraction have been well studied, the concomitant changes in anterior chamber anatomy and

physiology remains to be seen. Intraocular pressure changes after cataract surgery is one of the main postoperative effects. Modern cataract surgery is minimally invasive, producing a mild inflammatory reaction and rapid visual recovery.

Several studies on changes in IOP following phacoemulsification with intraocular lens (IOL) implantation have been published in literature.[14,15] Reported changes in IOP range from +1.3 to -2.5 mmHg.[16] Some papers conclude that IOP reductions after phacoemulsification are mild and transient, but more recent studies suggest they are sharper and more sustained than previously reported.[16,17]

In this investigation typical populace having cataract who are fit for phacoemulsification surgery and not having any indications of glaucoma will be taken and the change in IOP will be noted, and we will evaluate if phaco surgery alone can help in decline of IOP hence by swapping the requirement for other medical or surgical interventions in individuals having mild or moderate glaucoma.

AIM AND OBJECTIVES

AIM

1) To study the changes in intraocular pressure after cataract surgery.

OBJECTIVES

1) To study the changes in the configuration of angle of the anterior segment after implantation of the IOL.
2) To find out whether control of intraocular pressure through cataract surgery is adequate enough and could become an optimal solution for patients with coexisting cataract and glaucoma.

REVIEW OF LITERATURE

HUMAN LENS

The eye lens is unique structure that grows throughout life by the addition of new cells inside the surrounding capsule. The old cells are not discarded or dismantled but, instead, are packed into the centre of the organ. This is necessary to maintain the metabolic viability of the outer cortex (and hence, that of the whole organ) and for generation of the refractive properties needed to focus images on the retina and reduce spherical aberration, but has untoward effects with advancing age, namely the development of presbyopia and cataracts.

In order to understand the processes leading to these conditions, and possibly develop strategies for their amelioration, a thorough understanding of the growth of the lens and the effects of age-related changes in its properties is required. [18, 19]. In particular, information is needed on the formation and properties of the lens nucleus to help understand its role in accommodation and in the development of presbyopia and some forms of cataract.

FORMATION OF HUMAN LENS

Human lens induction occurs at around 28 days' gestation (Carnegie stage 13) with the thickening of surface ectoderm, near the optic vesicle, to generate the lens placode. This is followed by formation of a lens vesicle which, except for an anterior monolayer of epithelial cells, is filled with the linear primary fibre cells, aligned parallel to the optic axis. The vesicle is complete by around day 56 (Carnegie Stage 22) and measures 400 μm. With the establishment of lens polarity, further growth takes place ubiquitously (everywhere) and unique mechanism in which epithelial cells

in the lens germinative zone (just anterior to the equator) undergo mitosis and the daughter cells migrate to the transitional zone (posterior to the equator) where they differentiate and elongate into the secondary fibre cells. The new crescent shaped fibre cells, produced in the outer cortex (100 µm wide), are laid down in concentric shells over older cells while synthesizing large quantities of the crystalline proteins in the bow region of the lens, so called because of the arrangement of the cell nuclei. They then move into a 25 µm wide remodelling Zone [(20)] where they become disorganized and develop numerous membrane undulations. From here, they move into a region also called the Transitional Zone lose their cellular organelles and are immediately compacted to become, essentially, inert bags of concentrated protein solution. These processes continue throughout life with the older cells being packed in the centre of the organ. Since there is no loss of cells or their contents, the lens retains a record of its growth, a 3D equivalent of tree rings. This can be very useful when assessing age-related changes in the lens.

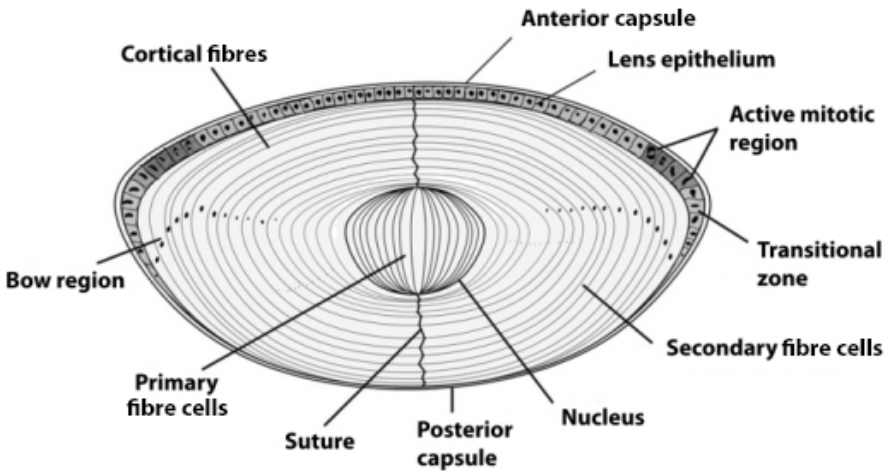


Figure 1: lens fibre distribution

MATURATION OF LENS WITH AGE

The mature secondary fibre cells span half the circumference of the lens, meeting in the centre of the anterior and posterior surfaces where their ends overlap to form the sutures. At birth, the suture pattern consists of 3 branches in a simple Y shape. [(21)]. The regions in the lens containing the different suture patterns have different light scattering properties and are visible in the slit lamp as the Optical Zones of Discontinuity Suture patterns have been used in several studies to identify regions in the lens.

WEIGHT AND DIMENSIONS OF HUMAN LENS

At birth, the in vitro lens measures around 6 mm in diameter and 4 mm in thickness and has a dry weight of 23-25 mg [(22, 23)]. It grows, i.e. its weight increases, through the continuous addition of new fibre cells, both diameter and thickness increase with age. However, the increases are not simple. During childhood, the lens is remodelled and compacted to generate the more elliptical adult shape and the refractive index gradient. In-vitro measurements indicate thickness gradually decreases from the 4 mm at birth to a minimum of around 3.3 mm in the mid to late teens, while the equatorial diameter increases. Primary fibre cell shortening is responsible for some of this decrease. When newly formed, the primary fibres are close to 400 µm long. By age 15 years, the length is 172 µm [(24).] Similar changes are seen with the in vivo thickness. The thinning may be in response to zonular forces generated by growth in the axial diameter of the eye which increases from about 16 to 24 mm between birth and age 20. The in vivo thickness has been reported to increase at linear rates varying from 0.013 to .025 mm/year in adults [(25-31)]

CATARACT

A cataract is a clouding of the lens in the eye leading to a decrease in vision. It can affect one or both eyes. Often it develops slowly. Symptoms may include faded colours, blurry vision, halos around light, trouble with bright lights, and trouble seeing at night. [32] This may lead trouble in driving, reading, or recognizing faces. Cataracts are most commonly due to aging, but may also occur due to trauma, radiation exposure, be present from birth, or occur following eye surgery for other problems.[32]

Lens hardening

Lens stiffening/hardening has long been considered to be a major contributor to the development of presbyopia although there are dissenting views [33]. The increase in stiffness is due to modification of the crystallins. It is well known that lens proteins become progressively modified with age through polypeptide shortening, racemization, deamidation, crosslinking and a variety of other processes [34]. Some of these modifications may be required to promote protein-protein interactions, reducing bound water and allowing the compaction of cells through elimination of the excess water. Continued modification, beyond that required for compaction, could be responsible for the increasingly larger amounts of insoluble proteins, such as a-crystallins, most from the nucleus, which is obtained when transparent lenses of increasing age are disrupted [35, 36].

PREVALENCE OF CATARACT

Globally, cataract has remained the major cause of blindness over the years. Approximately 45 million people are blind worldwide, out of which cataract accounts

for 17.6 million (39%) cases. [37] South East Asian region contributes to 50-80% of all blindness. [37]

Data from the rapid assessment during the national blindness survey (2006-2007) put the prevalence of blindness as 8% in individuals above 50 years of age in India. [38] Cataract accounts for 62.6% of all blindness affecting 9-12 million bilaterally blind persons. [39] In India, an estimated 20 lakhs new cases of cataract is being added to the burden every year. [39]

In Tamil Nadu, the estimated prevalence of cataract per 1000 population was 7.3 and 127,514 new cases of cataract are added to the burden each year. [40] The prevalence of cataract clearly shows a steep rise ranging from 0.5% above 30 years to 94.5% above 70 years of age. [41] In a study to estimate the prevalence of blindness and its causes among those aged 50 years and above, bilateral cataract was found to be the principal cause (78.7%) in 2007. [42] As per the National Program for Prevention and Control of Blindness (NPCB) survey (2001-02) the prevalence of cataract in Tamil Nadu above 50 years of age was found to be 48%. [43]

The major barriers for accessing health services revealed a changing trend from attitudinal to service delivery based reasons in a comparative study with a decade gap. [44] Attitudinal barriers like "could manage daily work," "cataract not mature enough," "fear of surgery," "fear of surgery causing blindness," "female gender," "old age," "no one to accompany" were reported than accessibility or cost. [45] Lack of access to personal funds delayed the utilization of cataract services besides stigma, mortality and ageing. Hear-say reports of surgical outcome and quality of services had a strong influence on service uptake. [46] Higher income, higher education, motivation for

getting operated from relatives and peer group plays an important role as facilitating factors. [47].

Grading of Cataract

Several cataract classification systems have been developed and used to measure the presence and extent of cataracts including the Lens Opacities Classification System (LOCS), Wisconsin Cataract Grading System (Wisconsin system), Wilmer, Age-Related Eye Disease Study Grading System (AREDS), World Health Organization Simplified Cataract Grading System (WHOSCGS), and Oxford Clinical Cataract Classification System (OCCGS)[48,49]

The LOCS III is an improved LOCS system for grading slit-lamp and retro illumination images of age-related cataract. The LOCS III contains an expanded set of standards that were selected from the Longitudinal Study of Cataract slide library at the Center for Clinical Cataract Research, Boston, Mass. It consists of six slit-lamp images for grading nuclear colour (NC) and nuclear opalescence (NO), five retroillumination images for grading cortical cataract (C), and five retroillumination images for grading posterior subcapsular (P) cataract. Cataract severity is graded on a decimal scale, and the standards have regularly spaced intervals on a decimal scale. [50]

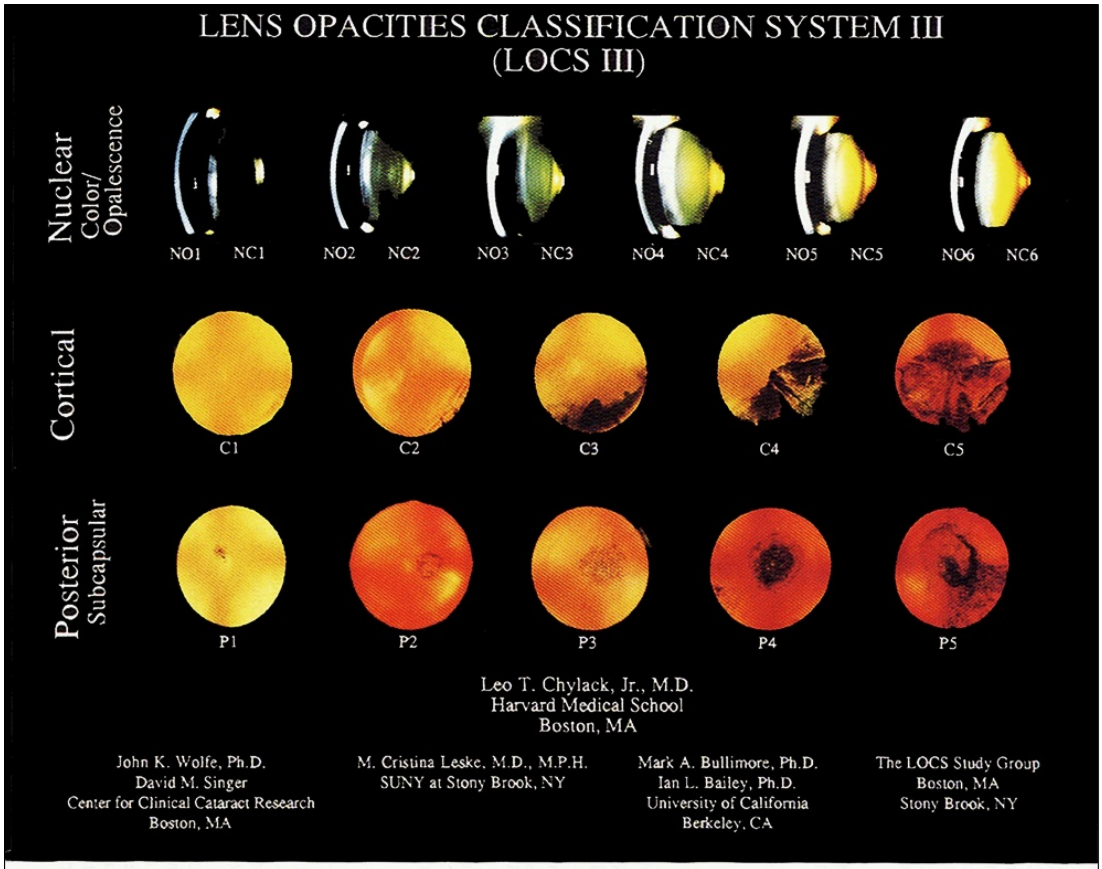


Figure 1–5. Lens Opacities Classification System, Version III (LOCS III). This set of standards consists of six standards to grade NO and NC, five to grade C, and five to grade P. C = cortical cataract; NC = nuclear color; NO = nuclear opalescence; P = posterior subcapsular cataract. (Copyright 1992 Leo T. Chylack, Jr. MD. Reprinted with permission from Archives of Ophthalmology.)

CATARACT SURGERY

Each year, cataract surgery permits millions of people to improve and recover their vision. The procedure has been carried out for centuries, however the last fifty years have demonstrated a noteworthy advancement in techniques, thus making it a common procedure to be done in any clinical setup.

The first surgical procedure for cataract was couching, or displacement of the lens into the vitreous cavity [51]. This technique was introduced by Sushruta, the sclera was pierced with a sharp instrument and a blunt instrument was inserted into the anterior chamber to depress the lens.

Intracapsular Cataract Extraction (ICCE)

The ICCE technique involves taking out the cataractous lens, along with the capsule thus requiring a larger incision and hence more intrusive. It is sparingly today because the incision is quite large, and there is high risk for retinal detachment and inflammation.

Extracapsular Cataract Extraction (ECCE)

In Extracapsular Cataract Extraction, the cataractous lens is taken out, but the posterior capsule that stabilizes the lens in its place remains intact. The incision is significantly less intrusive than the intracapsular procedure. Harold Ridley modernised this technique in 1949 by implanting an intraocular lens after extracting the cataractous one. [52]

Phacoemulsification

Phacoemulsification is a refinement of extracapsular cataract extraction. The procedure was initially created in the 1960s by Charles Kelman. Using an ultrasound tip, a cataract could be fragmented before removal (instead of removing it in one singular piece). Phacoemulsification can be a complicated process for doctors to learn, but because of its remarkable success rates, surgeons have gradually acquired the technique. The sophisticated instrument used in this surgery allows the cataractous lens to be removed through a very small (3.2mm), beveled incision. A foldable intraocular lens is then inserted through the incision. By extending the tunnel to a width of 5mm, a routine single-piece lens may also be implanted. In most cases this incision does not require sutures, and the post-operative rehabilitation period is short.[53]

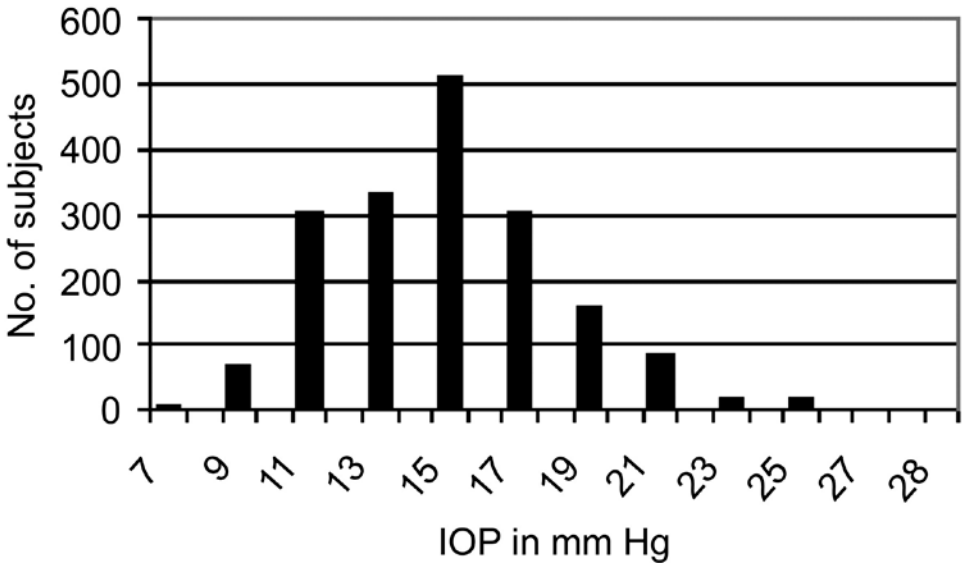
Small Incision Cataract Surgery (SICS)

This "sutureless non-phaco cataract surgery" has three essential parts to it. The procedure creates a small, self-sealing incision that provides low risk for developing astigmatism. This procedure is more beneficial in developing countries and in far reach areas where mobile services are available. [54]

INTRAOCULAR PRESSURE (IOP)

Intraocular pressure is chiefly determined by the pairing of the production of aqueous humor and the drainage of aqueous humor mainly through the trabecular meshwork placed in the anterior chamber angle. Therefore the IOP is a plain and simple balance of the inflow and outflow of aqueous humor through the anterior segment of the eye. Elevation of IOP has been associated with vision loss over years of research. In the 19th century, William Bowman (English ophthalmologist) developed a method of estimating the tension, or hardness, of the eye by palpating it with his fingers through the closed eyelid. They found there was an unambiguous relationship between the level of IOP and the probability that the eye would lose sight. [55, 56, 57]

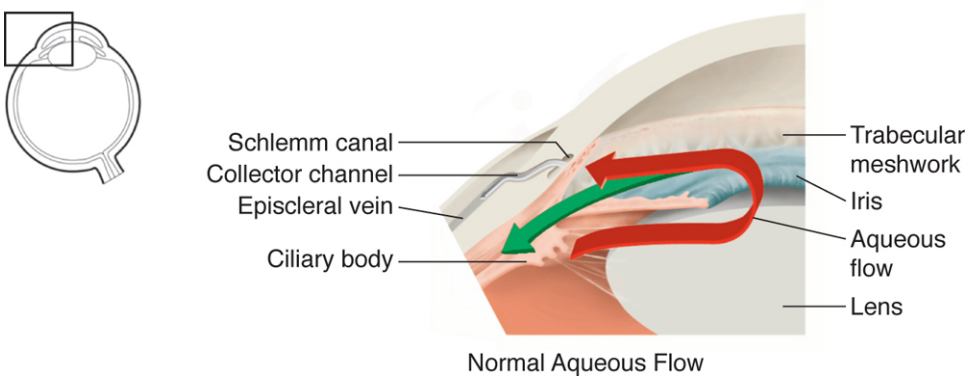
Current nomogram of IOP is considered to be 10mmHg to 21mmHg. According to Framingham study (fig below), The average is around 15.5 with a standard deviation of 2.6mmHg.



Frequency distribution of intraocular pressure: 5220 eyes in the Framingham Eye Study [58]

Intraocular Pressure and Aqueous Humor Dynamics

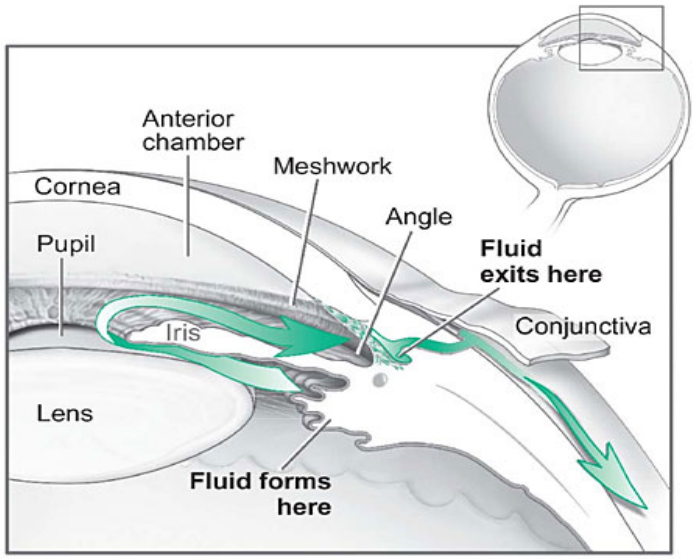
An understanding of aqueous humor dynamics is important to understand intraocular pressure. As shown in Figure



Diagrammatic cross section of the anterior segment of the normal eye, showing the site of aqueous production (ciliary body), sites of conventional aqueous outflow (trabecular meshwork–Schlemm canal system and episcleral venous plexus; red

arrow), and the uveoscleral outflow pathway (green arrow). (Illustration by Cyndie C. H. Wooley.)

Aqueous humor is produced in the posterior chamber and flows through the pupil into the anterior chamber. Aqueous humor exits the eye by passing through the trabecular meshwork and into the Schlemm canal before draining into the venous system through a plexus of collector channels, as well as through the uveoscleral pathway, which is proposed to exit through the root of the iris and the ciliary muscle, into the suprachoroidal spaces and through the sclera.



The modified Goldmann equation summarizes the relationship between many of these factors and the intraocular pressure (IOP) in the undisturbed eye:

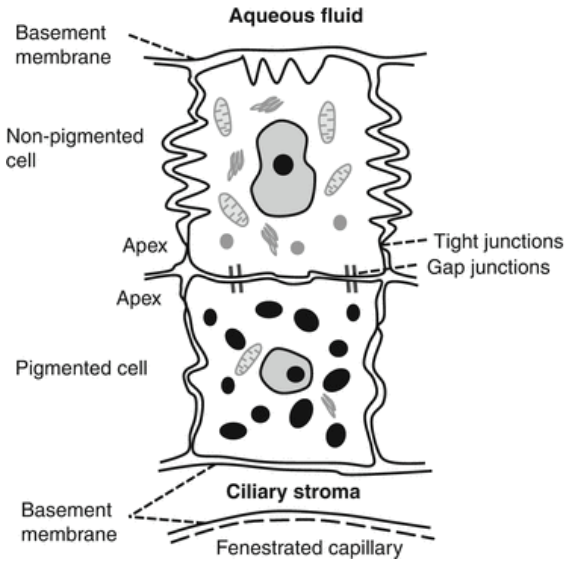
$$P0 = (F - U)/C + Pv$$

where P0 is the IOP in millimetres of mercury (mm Hg), F is the rate of aqueous formation and U is the rate of uveoscleral outflow in microliters per minute (μL/min), C is the facility of outflow in microliters per minute per millimetre of mercury

(μL/min/mm Hg), and Pv is the episcleral venous pressure in millimetres of mercury. Resistance to outflow (R) is the inverse of facility (C). [59]

Aqueous Humor Formation

Aqueous humor is formed by the *ciliary processes,* each of which is composed of a double layer of epithelium over a core of stroma and a rich supply of fenestrated capillaries.



Each of the 80 or so processes contains a large number of capillaries, which are supplied mainly by branches of the major arterial circle of the iris. The apical surfaces of both the outer pigmented and the inner nonpigmented layers of epithelium face each other and are joined by tight junctions, which are an important component of the blood–aqueous barrier. The inner nonpigmented epithelial cells, which protrude into the posterior chamber, contain numerous mitochondria and microvilli; these cells are thought to be the actual site of aqueous production. The ciliary processes provide a large surface area for secretion.

Aqueous humor formation and secretion into the posterior chamber result from the following:

- **Active secretion**, (which takes place in the double-layered ciliary epithelium)
- **Ultrafiltration**
- **Simple diffusion**

Active secretion,

Transport expects energy to move substances against an electrochemical inclination, and it is free of pressure. The character of the exact particle or particles transported is not known, but sodium, chloride, and bicarbonate are involved. Active secretion accounts for the majority of aqueous production and involves, at least in part, activity of the enzyme carbonic anhydrase II.

Ultrafiltration

It refers to a pressure-dependent movement along a pressure gradient. In the ciliary processes, the hydrostatic pressure difference between capillary pressure and IOP favours fluid movement into the eye, whereas the oncotic gradient between the two resists fluid movement.

Simple Diffusion

It involves the passive movement of ions, based on charge and concentration, across a membrane.

In humans, aqueous humor has an excess of hydrogen and chloride ions, an excess of ascorbate, and a deficit of bicarbonate relative to plasma. Aqueous humor is essentially protein free (1/200– 1/500 of the protein found in plasma), allowing for

optical clarity and reflecting the integrity of the blood–aqueous barrier of the normal eye. Albumin accounts for approximately half of the total protein. Other components of aqueous humor include growth factors; several enzymes, such as carbonic anhydrase, lysozyme, diamine oxidase, plasminogen activator, dopamine β-hydroxylase, and phospholipase A2; and prostaglandins, cyclic adenosine monophosphate (cAMP), catecholamines, steroid hormones, and hyaluronic acid.

Aqueous humor is produced at an average rate of 2.5–3.0μL/min, and its composition is altered as it flows from the posterior chamber, through the pupil, and into the anterior chamber. This alteration occurs across the hyaloid face of the vitreous, the surface of the lens, the blood vessels of the iris, and the corneal endothelium; and it is secondary to other dilutional exchanges and active processes.

Rate of Aqueous Formation

The most common method used to measure the rate of aqueous formation is fluorophotometry.

Fluorescein is administered systemically or topically; the subsequent weakening of its concentration in the anterior chamber is measured optically, and this measurement is then used to calculate aqueous flow. As previously noted, the normal flow is approximately 2.5–3.0 μL/min, and the aqueous volume is turned over at a rate of 1.0%–1.5% per minute.

The rate of aqueous humor formation varies diurnally and decreases during sleep. It also decreases with age, as does outflow facility. The rate of aqueous formation is affected by a variety of factors, including the following:

- Integrity of the blood–aqueous barrier

- Blood flow to the ciliary body
- Neurohumoral regulation of vascular tissue and the ciliary epithelium

Aqueous humor production may decrease following trauma or intraocular inflammation and following the administration of certain drugs (eg, general anesthetics and some systemic hypotensiveagents). Carotid occlusive disease may also decrease aqueous humor production.[60]

Aqueous Humor Outflow

Aqueous humor outflow occurs by 2 major mechanisms: pressure-dependent outflow and pressure independent outflow.

The mean value reported ranges from 0.22 to 0.30 μL/min/mmHg.

Outflow is divided into

- Trabecular outflow
- Uveoscleral outflow

FACTORS AFFECTING INTRAOCULAR PRESSURE [61]

Factors	Association	Comments
Demographic		
Age	Mean IOP increases with increasing age	May be mediated partially through cardiovascular factors
Sex	Higher IOP in women	Effect more marked after the age of 40
Race	Higher IOP among blacks	
Heredity	IOP inherited	Polygenic effect
SYSTEMIC		
Diurnal variation	Most people have diurnal pattern of IOP	Variable in individuals
Seasonal	Higher IOP in winter months	-
Obesity	Higher IOP in obese people	-
Blood pressure	IOP increases with increasing blood pressure	-
Posture	IOP increase from sitting to inverted position	Greater effect below horizontal
Exercise	Strenuous exercise lowers IOP transiently	Long-term training has a lesser effect
Neural	Cholinergic and adrenergic input alters IOP	
Hormones	Corticosteroids raise IOP	-
Drugs	Multiple drugs alter IOP	-
OCULAR		
Refractive error	Myopic individuals have higher IOP	IOP correlates with axial length
Eye movements	IOP increases if eye moves against resistance	-
Eyelid closure	IOP increases with forcible closure	-
Inflammation	IOP decrease unless aqueous humor outflow affected more than inflow	-
Surgery	IOP generally decrease unless aqueous humor outflow affected more than inflow	-

Factors that may increase intraocular pressure include [62]

- Elevated episcleral venous pressure
    - Valsalva maneuver
    - Breath holding
    - Playing a wind instrument
    - Bending over or supine position
    - Elevated central venous pressure
    - Orbital venous outflow obstruction
    - Intubation
- Pressure on the eye
    - Blepharospasm
    - Squeezing and crying, especially in young children
- Elevated body temperature : associated with increased aqueous humor production
- Hormonal influences
    - Hypothyroidism
    - Thyroid eye disease
- Drugs unrelated to glaucoma therapy
    - Lysergic acid diethylamide (LSD)

- Topiramate
- Corticosteroids
- Anticholinergics: may precipitate angle closure
- Ketamine

Factors that may decrease intraocular pressure [62]

- Aerobic exercise
- Anesthetic drugs
  - Depolarizing muscle relaxants such as succinylcholine
- Metabolic or respiratory acidosis
- Hormonal influence
  - Pregnancy
- Drugs unrelated to glaucoma therapy
  - Alcohol consumption
  - Heroin
  - Marijuana (cannabis)

DIURNAL VARIATION

Over the course of the day, IOP is variable with an average of 3–6 mmHg in normal individuals. [63, 64, 65]

In many people the diurnal variation of IOP follows a reproducible pattern, with the maximum pressure in the midmorning hours and the minimum pressure late at night or early in the morning. However, some individuals peak in the afternoon or evening, and others follow no consistent pattern. [66]

One study suggests that any male with a borderline IOP measured midday should have a repeat measurement early in the morning, because the male population in particular, may have wider diurnal swings. In general, the two eyes show similar diurnal curves but there is a significant difference in how the right and left eye vary in their IOP. Many patients have a nocturnal surge in IOP. This increase in IOP is only partly explained by postural changes.[67]

TONOMETRY

Tonometry is the measurement of IOP which is an integral part of a comprehensive ophthalmological examination. IOP measurement can be done by various techniques which are indirectly based on the response of the eye to an applied force. Palpation techniques however are inaccurate, though are very useful in certain extraordinary circumstances by proper expertise.

Instruments used for IOP measurement are divided into two groups based on

1) Indentation

2) Applanation.

INDENTATION TONOMETRY

Indentation means assessing the amount of deformation of cornea due to the weights applied. The best example is Schiotz tonometer. [68]

Schiotz tonometry determines IOP by measuring the indentation of the cornea produced by a known weight. The Schiotz tonometer comprises of a bended footplate which is set on the cornea of a recumbent subject. A weighted plunger joined to the footplate sinks into the cornea in a sum that is in a roundabout way relative to the weight in the eye. The plunger will sink into the cornea of a delicate eye more remote than it will in a harder eye. A scale at the highest point of the plunger gives a reading relying upon how much the plunger sinks into the cornea, and a conversion table converts the scale reading into IOP measured in mmHg. Because of a number of practical and theoretical problems, however, Schiotz tonometry is now rarely used.

APPLANATION TONOMETRY

Applanation tonometry works on the basis of the force required to flatten the cornea. Goldmann applanation tonometer is the gold standard of measurement of IOP in current clinical settings. It is based on the principle of Imbert-Fick which is the pressure inside an ideal dry, thin-walled sphere equals the force necessary to flatten its surface divided by the area of the flattening:

$P = F/A$

Where P = pressure, F = force, and A = area. [69, 70]

This is the technique of constant area applanation measuring over an area of 3.06 mm diameter of cornea. At this diameter, the resistance of the cornea to flattening is

counterbalanced by the capillary attraction of the tear-film meniscus for the tonometer head. [70]

TECHNIQUE:

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 cobalt blue filter is used with the slit beam opened maximally. The angle between the illumination and the microscope should be approximately 60°. The clinician observes the applanation through the biprism at low power. A monocular view is obtained of the central applanated zone and the surrounding fluorescein-stained tear film. Using the control stick, the observer raises, lowers, and centres the assembly until two equal semicircles are seen in the centre of the field of view. The tension knob is rotated until the inner borders of the fluorescein rings touch each other at the midpoint of their pulsations. The reading obtained in grams is multiplied by 10 to give the IOP in millimetres of mercury. This value is recorded along with the date, time of day, list of ocular medications, and time of last instillation of ocular medication.[71,72]

Figure 1. Applanation tonometry semi-circles viewed through the Goldmann prism

High intraocular pressure will result in this image. Turn the calibrated dial on the tonometer backwards to reach the accurate end point.

Low intraocular pressure will result in this image. Turn the calibrated dial on the tonometer forwards to reach the accurate end point.

This is the correct end point – the inner edges of the semi-circles are just touching. This will give an accurate reading of intraocular pressure.

OTHER TYPES OF TONOMETRY

NON CONTACT TONOMETRY (NCT)

Noncontact (air-puff) tonometers determine IOP, without touching the eye, by measuring the time necessary for a given force of air to flatten a given area of the cornea. Readings obtained with these instruments vary widely, and IOP is often overestimated. Noncontact tonometers are often used in large-scale glaucoma-screening programs or by nonmedical health care providers.

The NCT uses a puff of air directed at the cornea with an applanation area, for the Canon TX-10, similar to that of the GAT. The force produced by the air puff is linearly increased over 8 ms and progressively flattens the cornea. When flat, the cornea acts as a mirror reflecting a light beam onto a sensor that triggers a reading**.** [73]

Pneumotonometer

The pneumotonometer is an applanation tonometer with a few parts of indentation tonometry. It comprises of a 5mm measurement, marginally raised, silicone tip at the end of a cylinder that rides on a surge of air. The cornea is indented by the silicone tip. At the point when the cornea and the tip are levelled flat, the pressure pushing forward on the tip is equivalent to the IOP. The gadget measures the weight inside the framework and the weight in mmHg is shown. The readings relate well with Goldmann applanation tonometry within IOP ranges. [74]

Pneumotonometer, measures the pressure in a flowing column of gas (tonometer chamber) directed towards a thin membrane (diameter about 2.5 mm) in contact with the surface of the cornea. The probe tip has an outer diameter of about 5 mm. A portion of the gas flow pushes the outer part of the tonometer tip against the cornea,

depressing its surface, and a portion maintains the pressure required to balance the pressure on the other side of the tip membrane (that is, the IOP) in the central part of the probe tip. The probe tip applanates the cornea for about 5–10 seconds while a continuous IOP trace is recorded

TONO-PEN

The Tono-Pen involves both applanation and indentation processes. It is a small, handheld, battery-powered device. The tonometer has an applanating surface with a tiny plunger protruding microscopically from the centre. As the tonometer makes contact with the eye, the plunger gets resistance from the cornea and IOP producing a rising record of force by a strain gauge. At the moment of applanation, the force is shared by the foot plate and the plunger resulting in a momentary small decrease from the steadily increasing force. This is the point of applanation which is read electronically. Multiple readings are averaged. Because the area of applanation is known, the IOP can be calculated. The readings correlate well with Goldmann tonometry within normal IOP ranges. [74,75]

Many of the portable electronic applanating devices (eg, Tono-Pen) contain a strain gauge and produce an electrical signal as the tip of the instrument applanates a very small area of the cornea. This device is particularly useful for patients with corneal scars or edema.[76]. Tono-Pen has an applanation area smaller (2.36 mm2) than that of the GAT (7.35 mm2)

OCULAR RESPONSE ANALYZER

The ocular response analyzer is a newer type of non-contact tonometer. This device also uses a column of air of increasing intensity as the applanating force. The ocular

response analyzer notes the moment of applanation, but the air column continues to emit with increasing intensity until the cornea is indented. The force of the air column then decreases until the cornea is once again at a point of applanation. The difference in the pressures at the two applanation points is a measure of the corneal elasticity (hysteresis). Mathematical equations can be used to "correct" the applanation point for high or low elasticity. This "corrected" IOP is thought to be less dependent on corneal thickness than other forms of applanated pressures.[77]

REBOUND TONOMETRY

The most up to date form of the rebound tonometer is the ICare gadget (Helsinki, Finland). A 1.8mm plastic ball on a stainless steel wire is held set up by an electromagnetic field in a handheld battery-controlled gadget. At the point when a catch is pushed, a spring drives the wire and ball forward quickly. At the point when the ball hits the cornea, the ball and wire decelerate; the deceleration is faster if the IOP is high and slower if the IOP is low. The speed of deceleration is measured and is changed over by the gadget into IOP. No anesthetic is vital. It demonstrates great concurrence with Goldmann and Tono-pen readings. IOP estimations got with this tonometer have additionally appeared to be impacted by focal corneal thickness, with higher IOP readings with thicker corneas.(78,79,80) This tonometer has been appeared to be influenced by other biomechanical properties of the cornea, including corneal hysteresis and corneal resistance factor.

PASCAL DYNAMIC CONTOUR TONOMETER

The Pascal Dynamic Tonometer (Zeimer Ophthalmic systems AG, Port, Switzerland) utilizes a piezoelectric sensor embedded in the tip of the tonometer to measure the dynamic pulsatile fluctuations in IOP. In contrast to the Goldmann tonometer,

measurements with the DCT are reported to be influenced less by corneal thickness, and perhaps corneal curvature and rigidity. These claims are supported by in vitro and in vivo manometric studies. DCT can also be used to measure the ocular pulse amplitude. Disposable covers are used for each measurement and the digital display provides a Q-value which assesses the quality of the measurements. *Dynamic contour tonometer (DCT),* a nonapplanation contact tonometer that may be more independent of corneal biomechanical properties and thickness than are older tonometers.[81,82]

Central corneal thickness in association with IOP.

Intraocular pressure measurement is also influenced by corneal thickness recently, the importance of CCT and its effect on the accuracy of IOP measurement has become better understood. Increased CCT may give an artificially high IOP measurement and an decreased CCT artificially low reading. IOP measured after photorefractive keratectomy (PRK) and laser in situ keratomileusis (LASIK) may be reduced because of changes in the corneal thickness induced by these and other refractive procedures.

The connection between measured IOP and CCT is not linear so it is important to remember that any rectification factors are just gauges. The biomechanical properties of an individual cornea may differ, with the end goal that adjustments in the relative firmness or unbending nature of the cornea modify IOP estimation.

Most published studies concerning the effect of CCT on measured IOP relate to the Goldmann applanation tonometer (GAT). However, there is increasing evidence that other tonometers share this problem.[83,84,85] The GAT, Tono-Pen, ocular blood flow tonograph (OBF), and non-contact tonometer (NCT) all use an applanation principle. Thin shell theory was used by Orssengo and Pye to demonstrate that corneal radius, thickness and material stiffness affect the applanation pressure for a given IOP.

Reducing the applanation area reduces the difference between the applanation pressure and IOP, because of the reduced resistance offered by the cornea for a smaller contact area.[86] There may also be some reduced effects from surface tension.

The GAT is based on the Imbert-Fick law, which assumes that the cornea has a dry surface, is infinitely thin, and behaves as a "membrane" where the applanating pressure will equal the IOP. In practice, a resistance force, because of the thickness of the cornea, and a surface tension force, the result of the tear film, act upon the applanator causing this membrane assumption to be incorrect. These forces balance each other for the GAT (applanation diameter of 3.06 mm) when the CCT is 520 μm, providing a "reference" value where the applanating pressure does equal the IOP. [87, 88]

Measurements obtained with other most common types of tonometers (Perkins, pneumotonometer, noncontact tonometer, and Tono-Pen) are affected by CCT. The Ocular Hypertension Treatment Study (OHTS) found that low corneal thickness was a strong predictive factor for the development of glaucoma in subjects with ocular hypertension. Subjects with a corneal thickness of 555 μm or less had a threefold greater risk of developing POAG compared with participants who had a corneal thickness of more than 588 μm. Whether this increased risk of glaucoma is due to underestimating actual IOP in patients with low corneal thickness or whether low corneal thickness is a risk factor independent of IOP measurement has not been completely determined; but OHTS found CCT to be a risk factor for progression independent of IOP level.

CATARACT AND IOP

Several studies have shown that cataract extraction with posterior chamber intraocular lens (IOL) implantation lowers IOP in eyes with or without glaucoma as well as in normal eyes,[89] although transient IOP elevation also has been reported.[90]

Steuhl et al attributed this IOP-reducing effect to widening of the anterior chamber angle. The anterior chamber angle was, in fact, wider and that the chamber was substantially deeper after cataract surgery. These changes did not regress throughout the postoperative follow-up. Such prominent angle widening and chamber deepening may well improve the inflow and outflow facility of the aqueous humor. [11]

Pre-operative angle configuration is pointed out as one of the main factors contributing to this variability, as higher IOP reductions are observed with partially or completely closed angles. Besides angle anatomy, many other factors were independently related to IOP reduction of cataract surgery including aqueous humour dynamics, ocular comorbidities and, most importantly, preoperative IOP.

After lens removal, even eyes without glaucoma experience anatomical changes in the anterior chamber, and many biometrical factors are modified. For instance, an increase in anterior chamber depth (ACD), angle opening distance and anterior chamber area are major changes observed.[91,92,93] .

IOP Reduction in Anterior Chambers with an Open Angle

IOP decrease may not only depend on anatomical factors relating to narrow angles. Poley et al. [16] suggest that lens removal allows the posterior capsule to move posteriorly, dislodging the zonula over the ciliary body with a consequent widening of Schlemm's canal and aqueous humour drainage improvement. Another proposed

mechanism states that the ultrasounds used in the phacoemulsification procedure are responsible for an abrupt rise in the anterior chamber pressure, producing inflammatory cytokines (mostly IL-1) that stimulate metalloproteinase production and trabecular meshwork remodelling, facilitating humour drainage.[94,95] As such, and also as stated by Poley et al. [17] , pre-operative IOP is the best predictor of post-operative IOP, as the IOP variation in open angle patients are proportional to the magnitude of the pre-operative IOP.

In a study done by Ken Hayashi et al [93] they examined the changes in anterior chamber angle width and depth induced by intraocular lens (IOL) implantation in eyes with angle-closure glaucoma (ACG), in eyes with open-angle glaucoma (OAG), and in eyes with no evidence of glaucoma or ocular hypertension, it was a comparative, nonrandomized, interventional study where he studies seventy-seven eyes with ACG, 73 eyes with OAG, and 74 control eyes underwent phacoemulsification and soft acrylic IOL implantation. He also measured the angle width and depth of the anterior chamber were measured using a Scheimpflug videophotography system before surgery, and at 1 week and at 1, 3, 6, 9, and 12 months after surgery. They concluded that the width and depth of the anterior chamber angle in eyes with ACG increased significantly after cataract extraction and IOL implantation and became similar to that in eyes with OAG and that in normal eyes, which may lead to the decrease in IOP seen in the postoperative period. No significant changes were observed in angle width and depth in any of the three groups after surgery.

In a another study done by ken hayashi et al in 2001[96] Where he examined the effect of cataract surgery on intraocular pressure (IOP) control in eyes with angle-closure glaucoma (ACG) and open-angle glaucoma (OAG). The study included 74 eyes with

ACG and 68 eyes with OAG having cataract surgery. The IOP was measured and the number of glaucoma medications recorded preoperatively, 1 month postoperatively, and then every 3 months. The IOP control in the 2 groups was compared using survival analysis, with failure criteria being an IOP greater than 21 mm Hg, addition of medications, or the need for additional glaucoma surgery. Where he concluded cataract surgery substantially reduced IOP and the number of medications required for IOP control in glaucomatous eyes. Specifically, cataract extraction normalized the IOP in most eyes with ACG.

Ken Hayashi, MD, Hideyuki Hayashi, MD, Fuminori Nakao, MD, Fumihiko Hayashi, MD : Effect of cataract surgery on intraocular pressure control in glaucoma patients:J Cataract Refract Surg 2001; 27:1779–1786.

Guofu Huang et al [92] in his study:-Association of biometric factors with anterior chamber angle widening and intraocular pressure reduction after uneventful phacoemulsification for cataract and concluded that Surgically induced AOD widening was significantly correlated with anterior chamber biometric factors. Preoperative Lens Vault appears to be a significant factor in angle widening and IOP reduction after phacoemulsification.

Poley et al in her study in 2008,[16] studied the long-term effects of phacoemulsification with intraocular lens (IOL) implantation in nonglaucomatous and glaucomatous eyes. Intraocular pressure (IOP) after phacoemulsification with IOL implantation was retrospectively reviewed. Eyes were divided into 5 groups by preoperative IOP. Data were recorded preoperatively, 1 year postoperatively, and at the final check. Analysis included preoperative IOP versus IOP at 1 year and final IOP, percentage of eyes with elevated or reduced IOP postoperatively, patient age at

surgery, and years of postoperative follow-up, concluded that Intraocular pressure reduction was proportional to preoperative IOP; the highest preoperative IOPs decreased the most and the lowest increased slightly. One-year IOP reductions were sustained for 10 years and were similar in patients of all ages. The IOP reductions were similar to previously reported reductions in nonglaucomatous eyes, indicating that the aging crystalline lens may be a major cause of ocular hypertension and glaucoma and that phacoemulsification with IOL implantation may help prevent and treat adult glaucoma.

Shingleton et al 2006 [14] evaluated the change in intraocular pressure (IOP) and glaucoma medication requirements after clear corneal phacoemulsification in open angle glaucoma patients, glaucoma suspects, and normal patients at 3 years and last follow-up (mean 5 y) where he represents a retrospective analysis of patients who had clear corneal phacoemulsification and at least 3 years of follow-up. The patients were classified into 3 groups: glaucoma (G), glaucoma suspects (GS), and no glaucoma (NG). No patient had a history of previous intraocular surgery. In it demonstrates that cataract removal by clear cornea phacoemulsification in glaucoma patients, glaucoma suspects, and normal patients' results in a small but significant decrease in IOP that is sustained at 3 years and a mean of 5 years in all groups. This study does not imply that cataract removal by phacoemulsification is a substitute for a combined procedure but may be an appropriate procedure for certain patients based on medication requirements and extent of optic nerve damage.

Methalone et al[97] evaluated long-term IOP control after sutureless clear corneal phacoemulsification in eyes with preoperatively controlled glaucoma. The charts of 345 patients who had uneventful sutureless clear corneal phacoemulsification with

acrylic foldable lens (IOL) implantation were retrospectively reviewed. Included were 58 patients with medically controlled open-angle glaucoma and 287 normal controls. Follow-up was 1 to 2 years. Outcome measures were postoperative IOP and number of glaucoma medications. Concluded that these findings suggest that sutureless clear corneal phacoemulsification with foldable acrylic IOL implantation is a relatively simple and efficient surgical option in patients with cataract and well-controlled glaucoma. The approach combines long-term IOP control with fewer medications and leads to rapid visual rehabilitation.

Tham et al 2008 [98] compared phacoemulsification alone versus combined phacotrabeculectomy in medically controlled chronic angle closure glaucoma (CACG) with coexisting cataract. There were Seventy-two medically controlled CACG eyes with coexisting cataract. Recruited patients were randomized into group 1 (phacoemulsification alone) or group 2(combined phacotrabeculectomy with adjunctive mitomycin C). Postoperatively, patients were reviewed every 3 months for 2 years. Concluded that Combined phacotrabeculectomy with adjunctive mitomycin C may be marginally more effective than phacoemulsification alone in controlling IOP in medically controlled CACG eyes with coexisting cataract. Combined surgery may be associated with more complications and additional surgery in the postoperative period.

Jimmy et al 2006 [99] evaluated the clinical outcomes of minimally invasive cataract extraction by phacoemulsification, with primary intraocular lens implantation, in eyes with primary angle-closure glaucoma (PACG) and co-existing cataract. Consecutive primary angle-closure glaucoma patients with co-existing visually significant cataract were invited to participate in this prospective study. These patients were then

followed up for a minimum of 1 year. Outcome measures included intraocular pressure (IOP), requirement for glaucoma drugs, and visual acuity. He concluded in primary angle-closure glaucoma patients with co-existing cataract, cataract extraction alone (by phacoemulsification) can significantly reduce both intraocular pressure and the requirement for glaucoma drugs.

MATERIALS AND METHOD

The design of the study was observational, prospective, cohort study.

A total of 150 eyes were enrolled for this study. The source of the data for the study were the patients who come to the ophthalmology out-patient Department Dhiraj general hospital pipariya from June 2016 to June 2017

STUDY DESIGN

I. It is an observational and prospective cohort study.

II. The study site will be Dhiraj hospital

III. Study of 150 eyes undergoing cataract surgery. Sample selection is random

INCLUSION CRITERIA

I. Patients in need of cataract surgery.

II. More than 40 years of age.

III. Patients with a grade 3 or 4 angle using the Shaffer grading criteria will be included.

EXCLUSION CRITERIA

I. Known cases of glaucoma.

II. Medications like steroids, intraocular pressure lowering drugs

III. Have a history of trabeculectomy surgery before/after enrolment.

IV. Functional damage on perimetry.

V. Structural damage of optic disc.

VI. PAS(peripheral anterior synechia) on gonioscopy.

150 eyes of patients coming to Dhiraj general hospital who fall into the above inclusion-exclusion criteria were taken in the study.

A detailed ocular and medical history followed by complete ocular examination of the patients was done. Patients were made aware of the study and consent was taken for the procedure and for involving them in the study.

Various visual parameters in accordance to study proforma was recorded. The uncorrected visual acuity (UCVA) and best corrected visual acuity (BCVA) was checked by Snellen's chart. Detailed examination of anterior segment of all patients with slit lamp biomicroscopy. For the measurement of intraocular pressure Goldmann applanation tonometry (AATM-5001) was used as shown below. IOP measurements during an examination were taken between 9am to 10am, and using the mean of 3 IOP measurements was taken by 2 assigned doctors only. Eyes will be divided into 3 groups (Gs) based on preoperative IOP: ≤15 mmHg (G1); from 16 to 19 mmHg (G2), and from 20 to 23 mmHg (G3)

Central corneal thickness (CCT) is measured by ultrasound pachymetry (Pacscan 200). The corrected IOP taking CCT in account was calculated and considered in the study.

Gonioscopy with Zeiss four mirror lens was considered to know the anterior chamber angle.

The eyes were dilated with mydriatic drops. Lens grading was determined on the basis of LOCSIII grading on slit lamp biomicroscope.

Complete posterior segment examination was done to exclude any pathologies meeting the exclusion criteria of the study.

Keratometry of both eyes was measured by auto refractometer for calculation of intraocular lens to be chosen for surgery.

Axial length and anterior chamber depth was measured of the chosen eye for surgery by A scan and appropriate intraocular lens was calculated using the formulas according to the corresponding axial lengths.

The subjects will be undergoing cataract surgery with phacoemulsification with PCIOL implantation (posterior capsule intraocular lens) for e.g. RYCF foldable lens, Acrysof IQ lens by a single surgeon.

Follow up examination was done on post-operative day 1, week 1, week 4 and week 12.

STATISTICAL ANALYSIS

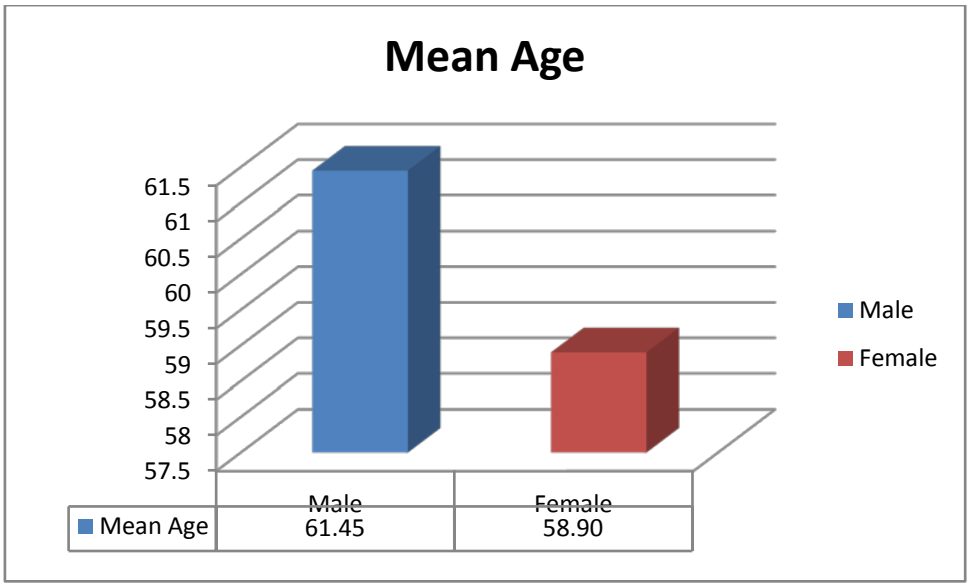
In this study the categorical variables were analysed with frequencies and percentages. For continuous variables, mean and standard deviation were calculated and the student's unpaired't' test was used to for comparison between two group whereas repeated measured ANOVA was applied for comparison between more than two groups. When ANOVA was applied, Bonferroni Post Hoc multiple comparison has been done to know the one to one relation.

RESULTS

TABLE 1: Mean age among male and female patients taken in the study

Age	N	%
Male	80	61.45
Female	70	58.90
Total	**150**	**100.00%**

CHART 1: MEAN AGE OF PATIENTS ENROLLED IN THE STUDY



In this study, we have enrolled a total of 150 patients who are fit for cataract surgery

total mean age is 60.26±10.86

Out of which,

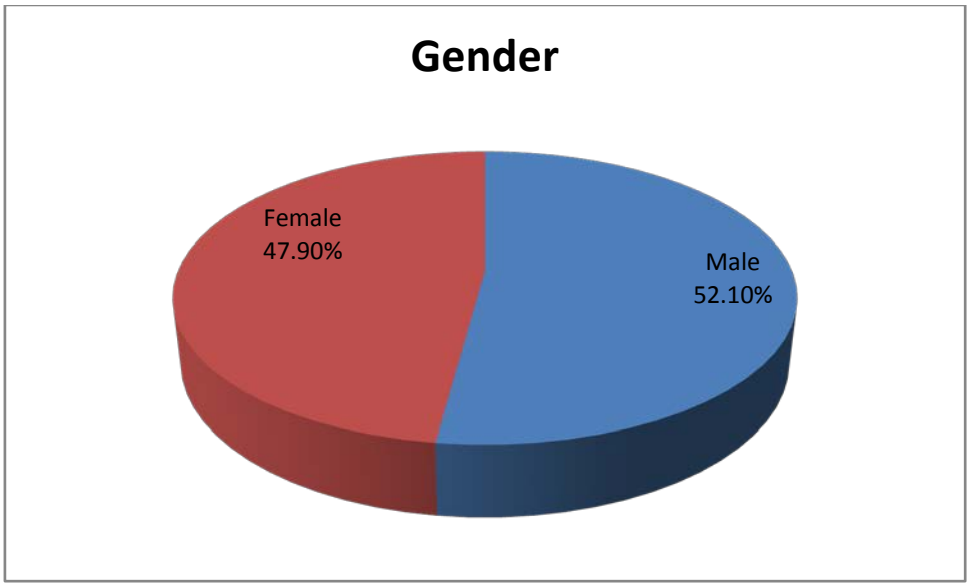
Mean age of male patients enrolled is 61.45±11.79

Mean age of female patients enrolled is 58.90±9.51

TABLE 2: GENDER DISTRIBUTION

Gender	N	%
Male	80	52.10%
Female	70	47.90%
Total	**150**	**100.00%**

CHART 2: GENDER DISTRIBUTION

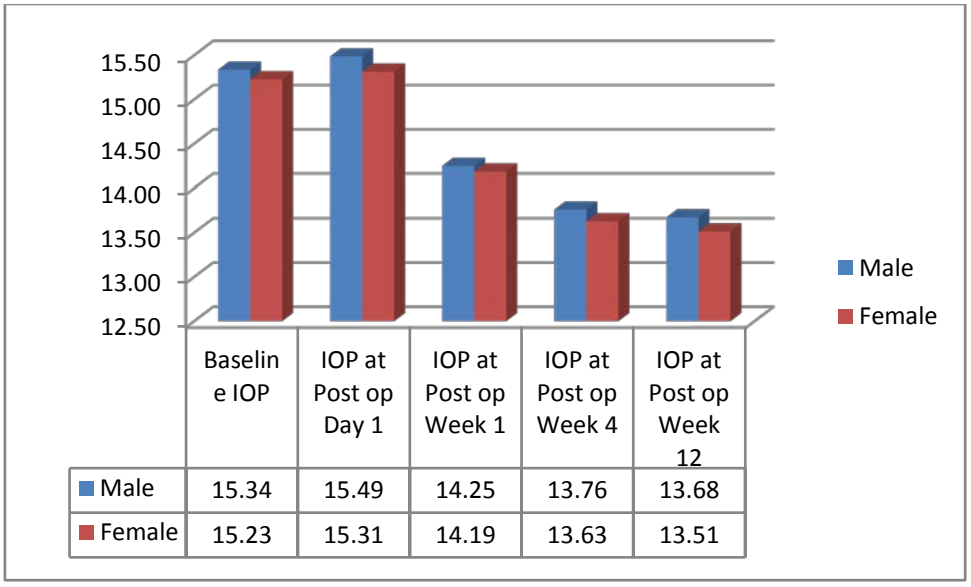


The total number of patients enrolled were 150 out of which 80 (52.10%) were males and 70 (47.90%) was females.

TABLE 3: GENDER DISTRIBUTION OF IOP

Gender		N	Mean	SD
Baseline IOP	M	80	15.34	2.23
	F	70	15.23	2.63
IOP at Post op Day 1	M	80	15.49	2.76
	F	70	15.31	2.92
IOP at Post op Week 1	M	80	14.25	2.22
	F	70	14.19	2.50
IOP at Post op Week 4	M	80	13.76	2.12
	F	70	13.63	2.27
IOP at Post op Week 12	M	80	13.68	2.20
	F	70	13.51	2.24

CHART 3: GENDER DISTRUTION OF IOP

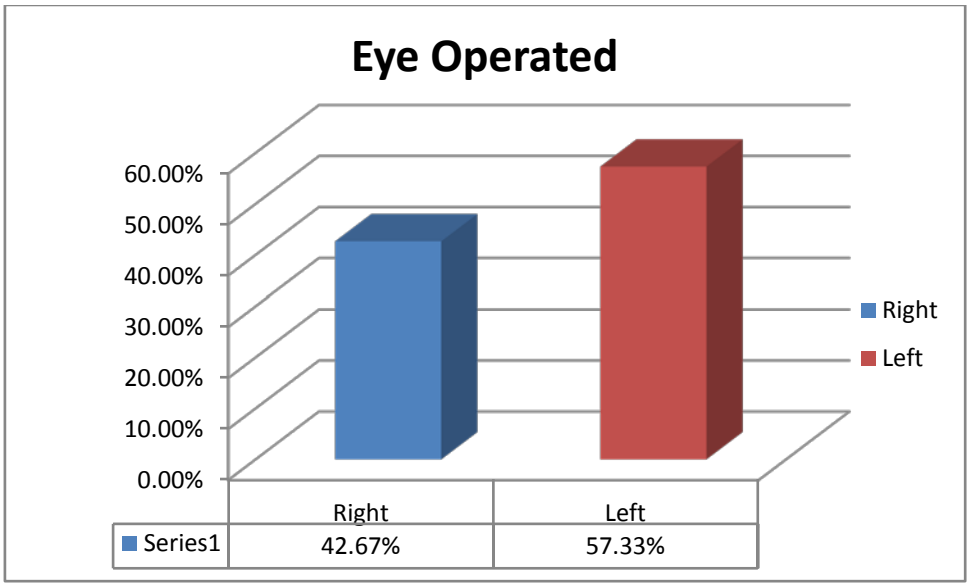


We compared the IOP in both genders at baseline and post op day 1, week 1, week 4 and week 12. The comparison was not found to be statistically significant as shown above.

TABLE 4: FREQUENCY DATA OF EYES OPERATED

Eye Operated	N	%
Right	64	42.67%
Left	86	57.33%
Total	**150**	**100.00%**

CHART 4: FREQUENCY DATA OF EYES OPERATED

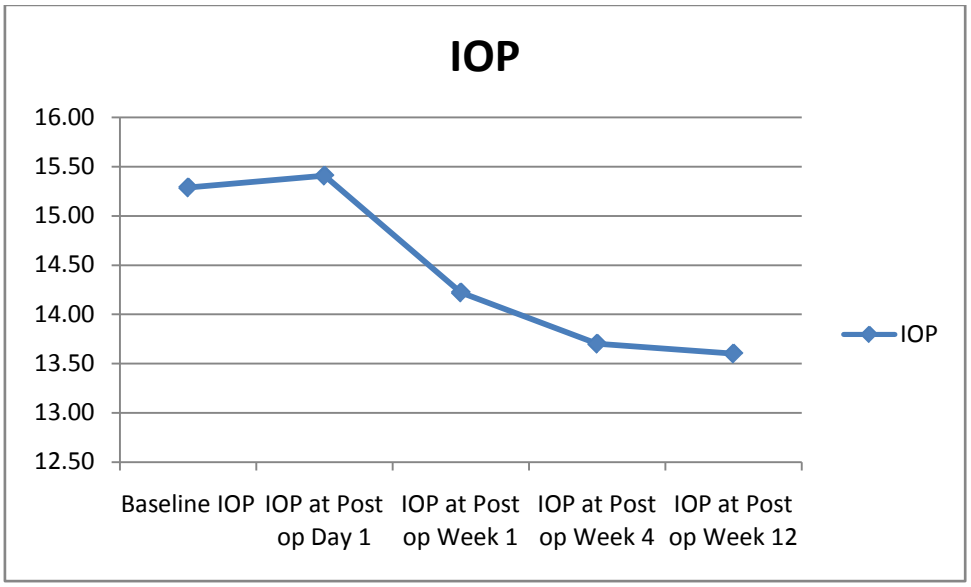


Out of 150 eyes operated in this study, 64 (42.67%) were right eyes and 86 (57.33%) were left eyes.

TABLE 5: MEAN INTRAOCULAR PRESSURE OF 150 OPERATED EYES

IOP	N	Mean	SD	p value
Baseline IOP	150	15.29	2.417	
IOP at Post op Day 1	150	15.41	2.824	
IOP at Post op Week 1	150	14.22	2.346	0.000
IOP at Post op Week 4	150	13.70	2.185	
IOP at Post op Week 12	150	13.60	2.210	

CHART 5: LINE CHART MEAN INTRAOCULAR PRESSURE OF 150 OPERATED EYES



In present study we have compared change in intraocular pressure in 150 eyes that are undergoing cataract surgery (phaco).

The mean intraocular pressure was calculated at baseline (i.e. pre-operative), post op day 1, post op week 1 , post op week 4 & post of week 12.

Mean Baseline IOP of 150 patients is 15.29 ± 2.417

Mean IOP at post op day 1 of 150 patients is 15.41 ± 2.824

Mean IOP at post op week 1 of 150 patients is 14.22 ± 2.346

Mean IOP at post op week 4 of 150 patients is 13.70 ± 2.185

Mean IOP at post op week 12 of 150 patients is 13.60 ± 2.210

TABLE 6: AN INTERGROUP COMPARISION OF MEAN IOP FROM BASELINE TO POST OP WEEK 12

IOP		SE	p value	95% Confidence Interval for Difference	
				Lower Bound	Upper Bound
Baseline	Post op Day 1	0.170	1.000	-0.604	0.364
	Post op Week 1	0.143	0.000	0.660	1.473
	Post op Week 4	0.165	0.000	1.117	2.057
	Post Week 12	0.173	0.000	1.195	2.179
Post op Day 1	Baseline	0.170	1.000	-0.364	0.604
	Post op Week 1	0.126	0.000	0.829	1.545
	Post op Week 4	0.154	0.000	1.268	2.145
	Post op Week 12	0.175	0.000	1.308	2.305
Post op Week 1	Baseline	0.143	0.000	-1.473	-0.660
	Post op Day 1	0.126	0.000	-1.545	-0.829
	Post op Week 4	0.103	0.000	0.226	0.814
	Post op Week 12	0.112	0.000	0.300	0.940
Post op Week 4	Baseline	0.165	0.000	-2.057	-1.117
	Post op Day 1	0.154	0.000	-2.145	-1.268
	Post op Week 1	0.103	0.000	-0.814	-0.226
	Post op Week 12	0.073	1.000	-0.108	0.308
Post op Week 12	Baseline	0.173	0.000	-2.179	-1.195
	Post op Day 1	0.175	0.000	-2.305	-1.308
	Post op Week 1	0.112	0.000	-0.940	-0.300
	Post op Week 4	0.073	1.000	-0.308	0.108

We have performed repeated measure ANOVA to find significance level between Baseline IOP & Post-operative IOP after Cataract surgery (PHACO) (at day-1, 1 week, 4 weeks & 12 weeks) for all operated eyes.

We have found that there was statistical significant change in IOP levels in Baseline and Post operatively (i.e. p value = 0.000).

After that, we have run Bonferroni post hoc test to check intergroup significant change for IOP from baseline to post-operative groups.

In that we found that there was no significant change in IOP levels between Baseline IOP & and Post op day 1.

Similarly there was no significant change in Post op -Week 4 & Week 12, whereas we found significant change in IOP from Baseline to Post op Week 1, Week 4, Week 12.

On comparing IOP levels at Post op Day 1 with other groups, we found that there was significant change in IOP at Week 1, Week 4, and Week 12.

On comparing IOP levels at Post Week 1 with other groups, we found that there was significant change in IOP at Baseline, post op day 1, Week 4 & week 12. (p=0.000 in all groups).

On comparing IOP levels at Post Week 4 with other groups , we found that there was significant change in IOP at Baseline, post op day 1 , Week 1. (p=0.000 in all groups)

On comparing IOP levels at Post Week 12 with other groups , we found that there was significant change in IOP at Baseline, post op day 1 & Week 1 (p=0.000 in all groups)

TABLE 7: Comparing different lens grading with change in intraocular pressure from baseline to post-operative Day 12 (An inter-group comparison.)

Lens		**N**	**Mean**	**SD**	**p value**
PSC	Baseline IOP	7	15.86	2.19	0.051
	IOP at Post op Day 1	7	14.43	2.51	
	IOP at Post op Week 1	7	13.86	2.41	
	IOP at Post op Week 4	7	14.14	2.41	
	IOP at Post op Week 12	7	14.29	2.75	
NS I	Baseline IOP	1	14.00	NA	NA
	IOP at Post op Day 1	1	14.00	NA	
	IOP at Post op Week 1	1	14.00	NA	
	IOP at Post op Week 4	1	14.00	NA	
	IOP at Post op Week 12	1	14.00	NA	
NS I + Cortical	Baseline IOP	2	15.50	0.71	0.200
	IOP at Post op Day 1	2	16.00	1.41	
	IOP at Post op Week 1	2	14.00	1.41	
	IOP at Post op Week 4	2	13.50	0.71	
	IOP at Post op Week 12	2	13.00	1.41	
NS I + PSC	Baseline IOP	9	15.67	1.00	0.000
	IOP at Post op Day 1	9	15.33	2.06	
	IOP at Post op Week 1	9	13.89	0.93	
	IOP at Post op Week 4	9	12.89	0.60	
	IOP at Post op Week 12	9	12.56	0.53	
NS I + PSC + Cortical	Baseline IOP	3	14.00	2.00	0.363
	IOP at Post op Day 1	3	14.67	3.06	
	IOP at Post op Week 1	3	13.67	2.89	
	IOP at Post op Week 4	3	13.33	1.53	
	IOP at Post op Week 12	3	13.00	1.00	
NS II	Baseline IOP	15	13.80	2.51	0.000
	IOP at Post op Day 1	15	14.13	3.11	
	IOP at Post op Week 1	15	12.40	2.23	
	IOP at Post op Week 4	15	12.40	2.20	
	IOP at Post op Week 12	15	12.33	2.06	
NS II + Cortical	Baseline IOP	10	16.00	3.20	0.007
	IOP at Post op Day 1	10	16.00	3.06	
	IOP at Post op Week 1	10	15.00	2.49	
	IOP at Post op Week 4	10	14.30	1.70	
	IOP at Post op Week 12	10	14.00	1.83	
NS II + PSC	Baseline IOP	28	14.75	2.27	0.000

	IOP at Post op Day 1	28	14.75	2.32	
	IOP at Post op Week 1	28	13.79	1.69	
	IOP at Post op Week 4	28	13.68	2.04	
	IOP at Post op Week 12	28	13.86	2.09	
NS II + PSC + Cortical	Baseline IOP	5	15.40	1.34	0.090
	IOP at Post op Day 1	5	17.80	2.59	
	IOP at Post op Week 1	5	14.40	2.07	
	IOP at Post op Week 4	5	14.20	2.86	
	IOP at Post op Week 12	5	14.20	3.83	
NS III	Baseline IOP	16	15.69	2.85	0.000
	IOP at Post op Day 1	16	15.75	3.11	
	IOP at Post op Week 1	16	15.13	2.83	
	IOP at Post op Week 4	16	14.13	2.63	
	IOP at Post op Week 12	16	13.75	2.52	
NS III + Cortical	Baseline IOP	10	14.80	2.39	0.002
	IOP at Post op Day 1	10	14.80	3.58	
	IOP at Post op Week 1	10	13.60	2.84	
	IOP at Post op Week 4	10	13.20	2.39	
	IOP at Post op Week 12	10	13.60	2.84	
NS III + PSC	Baseline IOP	10	15.70	2.45	0.000
	IOP at Post op Day 1	10	15.80	3.52	
	IOP at Post op Week 1	10	14.50	3.31	
	IOP at Post op Week 4	10	14.10	3.07	
	IOP at Post op Week 12	10	13.70	2.67	
NS III + PSC + Cortical	Baseline IOP	9	17.00	2.38	0.000
	IOP at Post op Day 1	9	16.11	1.91	
	IOP at Post op Week 1	9	15.67	0.82	
	IOP at Post op Week 4	9	13.33	2.71	
	IOP at Post op Week 12	9	13.66	2.87	
NS IV	Baseline IOP	20	15.20	2.57	0.000
	IOP at Post op Day 1	20	16.25	3.08	
	IOP at Post op Week 1	20	14.90	2.40	
	IOP at Post op Week 4	20	14.45	2.14	
	IOP at Post op Week 12	20	14.00	1.97	
NS IV + Cortical	Baseline IOP	3	16.67	1.15	0.011
	IOP at Post op Day 1	3	15.33	1.15	
	IOP at Post op Week 1	3	14.67	1.15	
	IOP at Post op Week 4	3	14.00	2.00	
	IOP at Post op Week 12	3	13.33	2.31	
NS IV + PSC	Baseline IOP	1	17.00	NA	NA
	IOP at Post op Day 1	1	19.00	NA	
	IOP at Post op Week 1	1	15.00	NA	

	IOP at Post op Week 4	1	13.00	NA	
	IOP at Post op Week 12	1	15.00	NA	
PSC + Cortical	Baseline IOP	1	17.00	NA	NA
	IOP at Post op Day 1	1	15.00	NA	
	IOP at Post op Week 1	1	13.00	NA	
	IOP at Post op Week 4	1	13.00	NA	
	IOP at Post op Week 12	1	13.00	NA	

150 patients enrolled had different Lens grading such as

PSC

We have performed repeated measure ANOVA to find significance level between Baseline IOP & Post-operative IOP after Cataract surgery (PHACO) (at day-1, 1 week, 4 weeks & 12 weeks) in PSC lens grading for 7 operated eyes.

We have found that there was statistical significant change in IOP levels in Baseline and Post operatively (i.e. p value = 0.000).

NS I + Cortical

We have performed repeated measure ANOVA to find significance level between Baseline IOP & Post operative IOP after Cataract surgery (PHACO) (at day-1, 1 week , 4 weeks & 12 weeks) in NS I + cortical lens grading for 2 operated eyes.

We have found that there was no statistical significant change in IOP levels in Baseline and Post operatively (i.e. p value = 0.200), because there were only two patients in a group

NS I + PSC

We have performed repeated measure ANOVA to find significance level between Baseline IOP & Post operative IOP after Cataract surgery (PHACO) (at day-1, 1 week, 4 weeks & 12 weeks) in NS I + PSC lens grading for 9 operated eyes.

We have found that there was statistical significant change in IOP levels in Baseline and Post operatively (i.e. p value = 0.000).

NS I + PSC + Cortical

We have performed repeated measure ANOVA to find significance level between Baseline IOP & Post operative IOP after Cataract surgery (PHACO) (at day-1, 1 week, 4 weeks & 12 weeks) in NS I + PSC+ cortical lens grading for 3 operated eyes.

We have found that there was no statistical significant change in IOP levels in Baseline and Post operatively (i.e. p value = 0.363), because there were only 3 patients in a group

NS II

We have performed repeated measure ANOVA to find significance level between Baseline IOP & Post operative IOP after Cataract surgery (PHACO) (at day-1, 1 week, 4 weeks & 12 weeks) in NS II lens grading for 15 operated eyes.

We have found that there was statistical significant change in IOP levels in Baseline and Post operatively (i.e. p value = 0.000).

NS II + Cortical

We have performed repeated measure ANOVA to find significance level between Baseline IOP & Post-operative IOP after Cataract surgery (PHACO) (at day-1, 1 week, 4 weeks & 12 weeks) in NS II + cortical lens grading for 10 operated eyes.

We have found that there was statistical significant change in IOP levels in Baseline and Post operatively (i.e. p value = 0.007).

NS II + PSC

We have performed repeated measure ANOVA to find significance level between Baseline IOP & Post operative IOP after Cataract surgery (PHACO) (at day-1, 1 week, 4 weeks & 12 weeks) in NS II + PSC lens grading for 28 operated eyes.

We have found that there was statistical significant change in IOP levels in Baseline and Post operatively (i.e. p value = 0.000).

NS II + PSC + Cortical

We have performed repeated measure ANOVA to find significance level between Baseline IOP & Post operative IOP after Cataract surgery (PHACO) (at day-1, 1 week, 4 weeks & 12 weeks) in NS II + PSC+ Cortical lens grading for 5 operated eyes.

We have found that there was no statistical significant change in IOP levels in Baseline and Post operatively (i.e. p value = 0.090), because there were only 5 patients in a group

NS III

We have performed repeated measure ANOVA to find significance level between Baseline IOP & Post-operative IOP after Cataract surgery (PHACO) (at day-1, 1 week, 4 weeks & 12 weeks) in NS III lens grading for 16 operated eyes.

We have found that there was statistical significant change in IOP levels in Baseline and Post operatively (i.e. p value = 0.000).

NS III + Cortical

We have performed repeated measure ANOVA to find significance level between Baseline IOP & Post operative IOP after Cataract surgery (PHACO) (at day-1, 1 week, 4 weeks & 12 weeks) in NS III + Cortical lens grading for 10 operated eyes.

We have found that there was statistical significant change in IOP levels in Baseline and Post operatively (i.e. p value = 0.002).

NS III + PSC

We have performed repeated measure ANOVA to find significance level between Baseline IOP & Post operative IOP after Cataract surgery (PHACO) (at day-1, 1 week, 4 weeks & 12 weeks) in NS III + PSC lens grading for 10 operated eyes.

We have found that there was statistical significant change in IOP levels in Baseline and Post operatively (i.e. p value = 0.000).

NS III + PSC + Cortical

We have performed repeated measure ANOVA to find significance level between Baseline IOP & Post operative IOP after Cataract surgery (PHACO) (at day-1, 1 week, 4 weeks & 12 weeks) in NS III +PSC Cortical lens grading for 9 operated eyes.

We have found that there was statistical significant change in IOP levels in Baseline and Post operatively (i.e. p value = 0.000).

NS IV

We have performed repeated measure ANOVA to find significance level between Baseline IOP & Post operative IOP after Cataract surgery (PHACO) (at day-1, 1 week, 4 weeks & 12 weeks) in NS IV lens grading for 20 operated eyes.

We have found that there was statistical significant change in IOP levels in Baseline and Post operatively (i.e. p value = 0.000).

NS IV + Cortical

We have performed repeated measure ANOVA to find significance level between Baseline IOP & Post operative IOP after Cataract surgery (PHACO) (at day-1, 1 week, 4 weeks & 12 weeks) in NS IV + Cortical lens grading for 3 operated eyes.

We have found that there was statistical significant change in IOP levels in Baseline and Post operatively (i.e. p value = 0.000).

CHART 6: Lens grading and IOP

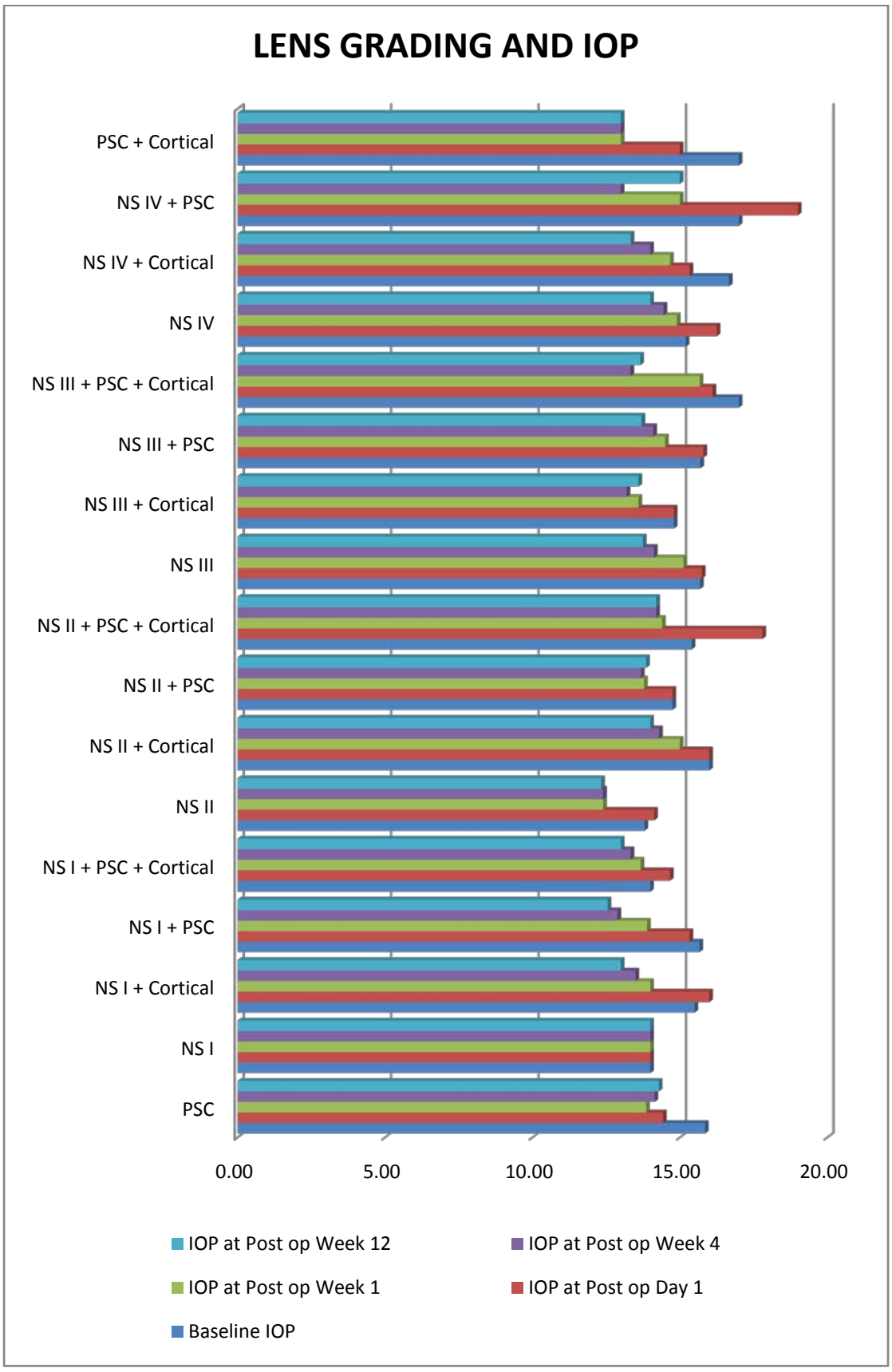
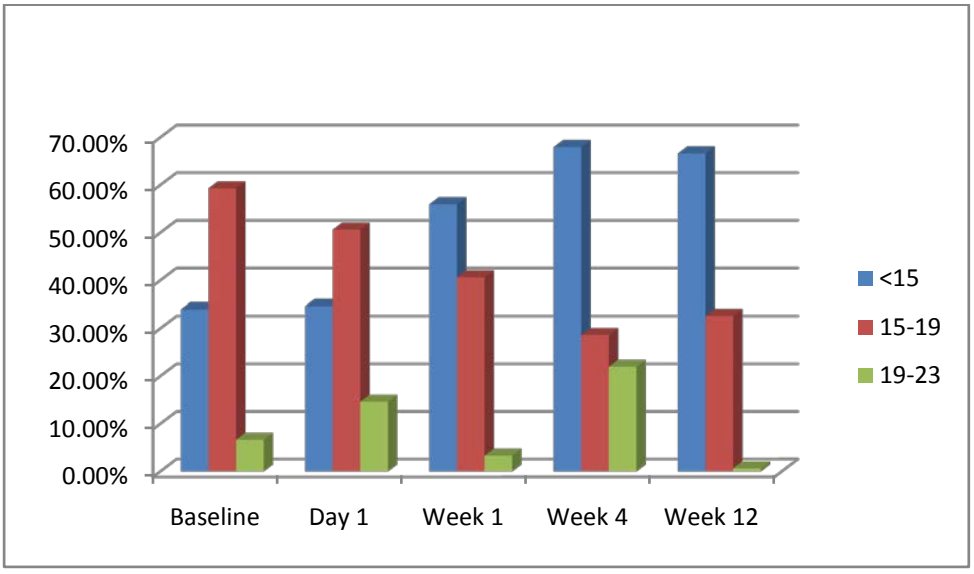


TABLE 8: COMPARISION OF FREQUENCY DISTRIBUTION OF PATIENTS (N) AMONG 3 IOP GROUPS FROM BASELINE TO POST OP WEEK 12

IOP Range(mmHg)	Frequency	Baseline	Day 1	Week 1	Week 4	Week 12
<15	N	51	52	84	102	100
	%	34.00%	34.67%	56.00%	68.00%	66.67%
15-19	N	89	76	61	43	49
	%	59.33%	50.67%	40.67%	28.67%	32.67%
19-23	N	10	22	5	33	1
	%	6.67%	14.67%	3.33%	22.00%	0.67%

CHART 7: COMPARISION OF FREQUENCY DISTRIBUTION OF PATIENTS (N) AMONG 3 IOP GROUPS FROM BASELINE TO POST OP WEEK 12



In present study we have divided IOP in three groups i.e.

<15, 15-19, and 19-23 mmHg of IOP

We have found that with the inclinement of post-operative days

Number of patient increases in <15mmhg of IOP compared to other two groups of IOP.

At post op week 12, 66.67% patient had less than 15mmHG of IOP compared to 34.00% at baseline.

At Baseline, 59.33% patient had less than 15-19mmHG of IOP compared to 32.67% at post op week 12.

At Baseline, 6.67% patient had less than 19-23mmHG of IOP compared to 0.67% at post op week 12

TABLE 9: MEAN OF PRE-OP & POST OP ANTERIOR CHAMBER DEPTH OF 150 PATIENTS

ACD	**Mean**	**SD**	**p value**
Pre OP	2.80	0.449	**0.000**
Post OP	4.03	0.180	

In this study mean PRE-OP Anterior chamber depth of eye selected for cataract surgery is 2.80± 0.449 whereas POST-OP after cataract surgery was 4.03±0.180 Which was statistically significant (p=0.00)

TABLE 10: PRE & POST ACD AMONG DIFFERENT LENS GRADING

Lens		**N**	**Mean**	**SD**
PSC	ACD PRE OP	7	2.79	0.42
	ACD POST	7	4.26	0.34
NS I	ACD PRE OP	1	3.18	NA
	ACD POST	1	4.09	NA
NS I + Cortical	ACD PRE OP	2	3.14	0.58
	ACD POST	2	4.35	0.25
NS I + PSC	ACD PRE OP	9	2.79	0.30
	ACD POST	9	4.19	0.29
NS I + PSC + Cortical	ACD PRE OP	3	2.90	0.48
	ACD POST	3	4.15	0.22
NS II	ACD PRE OP	15	2.86	0.32
	ACD POST	15	4.19	0.18
NS II + Cortical	ACD PRE OP	10	2.74	0.39
	ACD POST	10	4.23	0.15
NS II + PSC	ACD PRE OP	28	2.79	0.27
	ACD POST	28	4.21	0.22
NS II + PSC + Cortical	ACD PRE OP	5	2.96	0.18
	ACD POST	5	4.00	0.21
NS III	ACD PRE OP	16	2.79	0.30
	ACD POST	16	4.15	0.23
NS III + Cortical	ACD PRE OP	10	2.59	0.22
	ACD POST	10	4.22	0.18
NS III + PSC	ACD PRE OP	10	2.71	0.36
	ACD POST	10	4.19	0.20
NS III + PSC + Cortical	ACD PRE OP	9	2.86	0.29
	ACD POST	9	4.16	0.19
NS IV	ACD PRE OP	20	2.84	0.33
	ACD POST	20	4.28	0.20
NS IV + Cortical	ACD PRE OP	3	2.59	0.19
	ACD POST	3	4.29	0.11
NS IV + PSC	ACD PRE OP	1	3.13	NA
	ACD POST	1	3.91	NA
PSC + Cortical	ACD PRE OP	1	3.16	NA
	ACD POST	1	4.08	NA

In this study, we have found that mean post operative anterior chamber depth (ACD) gets deeper after cataract extraction.

We also compared pre op and post op ACD with regard to all groups of cataract grading to find out mean difference and changes observed between the pre op and post op ACD among different cataract grading.

PSC

Mean Pre OP ACD of 7 patients having PSC is 2.79±0.42mm

Mean post OP ACD after cataract surgery (phaco) is 4.26±0.34mm

NS I + Cortical

Mean Pre OP ACD of 2 patients having NS I + Cortical is 3.14±0.58

Mean post OP ACD after cataract surgery (phaco) is 4.35±0.25

NS I + PSC

Mean Pre OP ACD of 9 patients having PSC is 2.79±0.30

Mean post OP ACD after cataract surgery (phaco) is 4.19±0.29

NS I + PSC + Cortical

Mean Pre OP ACD of 3 patients having NSI + PSC + Cortical is 2.90±0.48

Mean post OP ACD after cataract surgery (phaco) is 4.15±0.22

NS II

Mean Pre OP ACD of 15 patients having NS II is 2.86±0.32

Mean post OP ACD after cataract surgery (phaco) is 4.19±0.34

NS II + Cortical

Mean Pre OP ACD of 10 patients having NS II + Cortical is 2.74±0.39

Mean post OP ACD after cataract surgery (phaco) is 4.23±0.15

NS II + PSC

Mean Pre OP ACD of 28 patients having NS II + PSC is 2.79±0.27

Mean post OP ACD after cataract surgery (phaco) is 4.21±0.22

NS II + PSC + Cortical

Mean Pre OP ACD of 5 patients having NS II + PSC + Cortical is 2.96±0.18

Mean post OP ACD after cataract surgery (phaco) is 4.00±0.21

NS III

Mean Pre OP ACD of 16 patients having NS III is 2.79±0.30

Mean post OP ACD after cataract surgery (phaco) is 4.15±0.23

NS III + Cortical

Mean Pre OP ACD of 7 patients having NSIII + Cortical is 2.59±0.30

Mean post OP ACD after cataract surgery (phaco) is 4.22±0.22

NS III + PSC

Mean Pre OP ACD of 10 patients having NS III + PSC is 2.71±0.36

Mean post OP ACD after cataract surgery (phaco) is 4.16±0.20

NS III + PSC + Cortical

Mean Pre OP ACD of 9 patients having NS III + PSC + Cortical is 2.86±0.29

Mean post OP ACD after cataract surgery (phaco) is 4.16±0.19

NS IV

Mean Pre OP ACD of 20 patients having NS IV is 2.84±0.33

Mean post OP ACD after cataract surgery (phaco) is 4.28±0.20

NS IV + Cortical

Mean Pre OP ACD of 3 patients having NS IV + Cortical is 2.59±0.20

Mean post OP ACD after cataract surgery (phaco) is 4.29±0.11

CHART 8: Pre & Post ACD among different lans grading

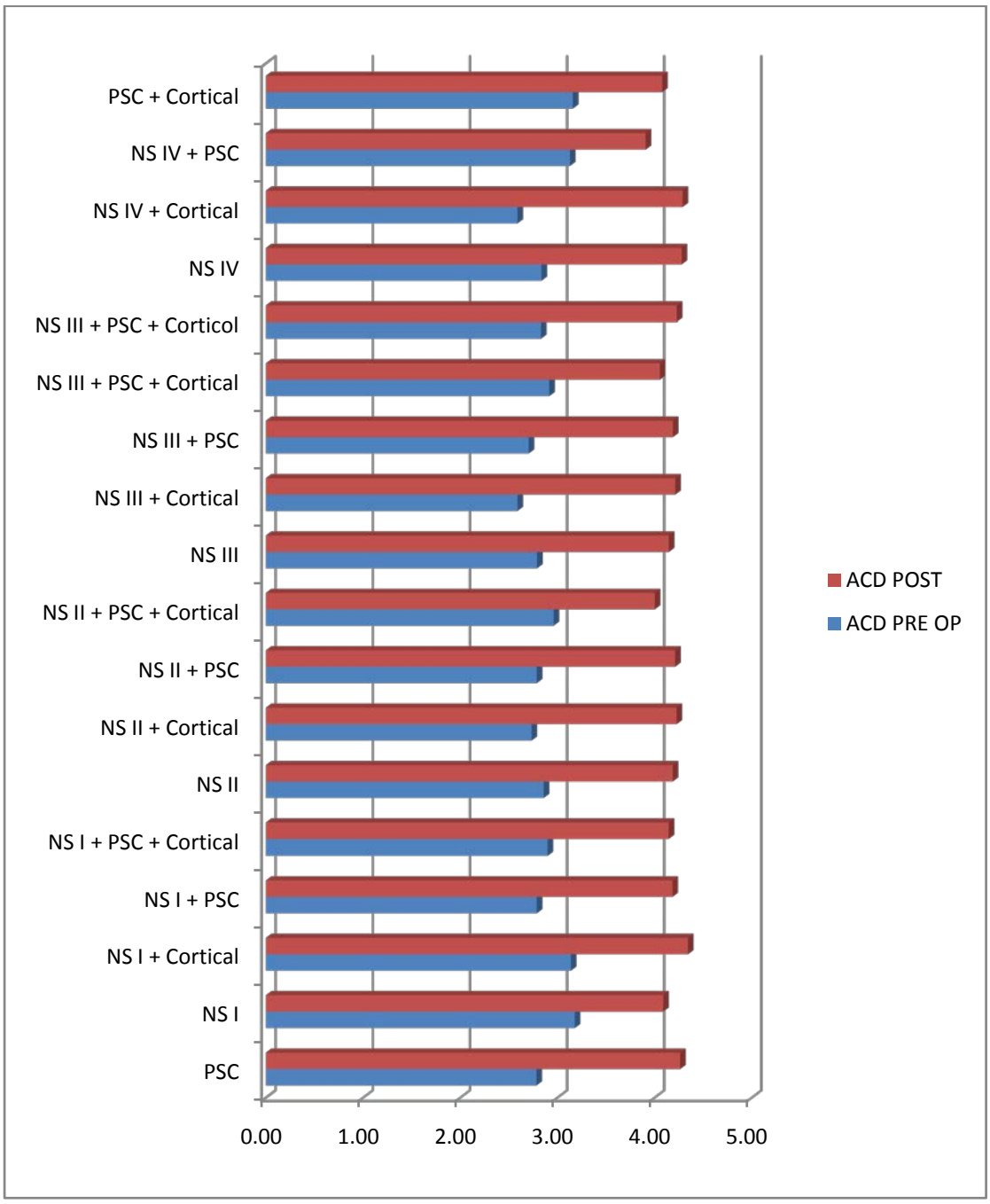
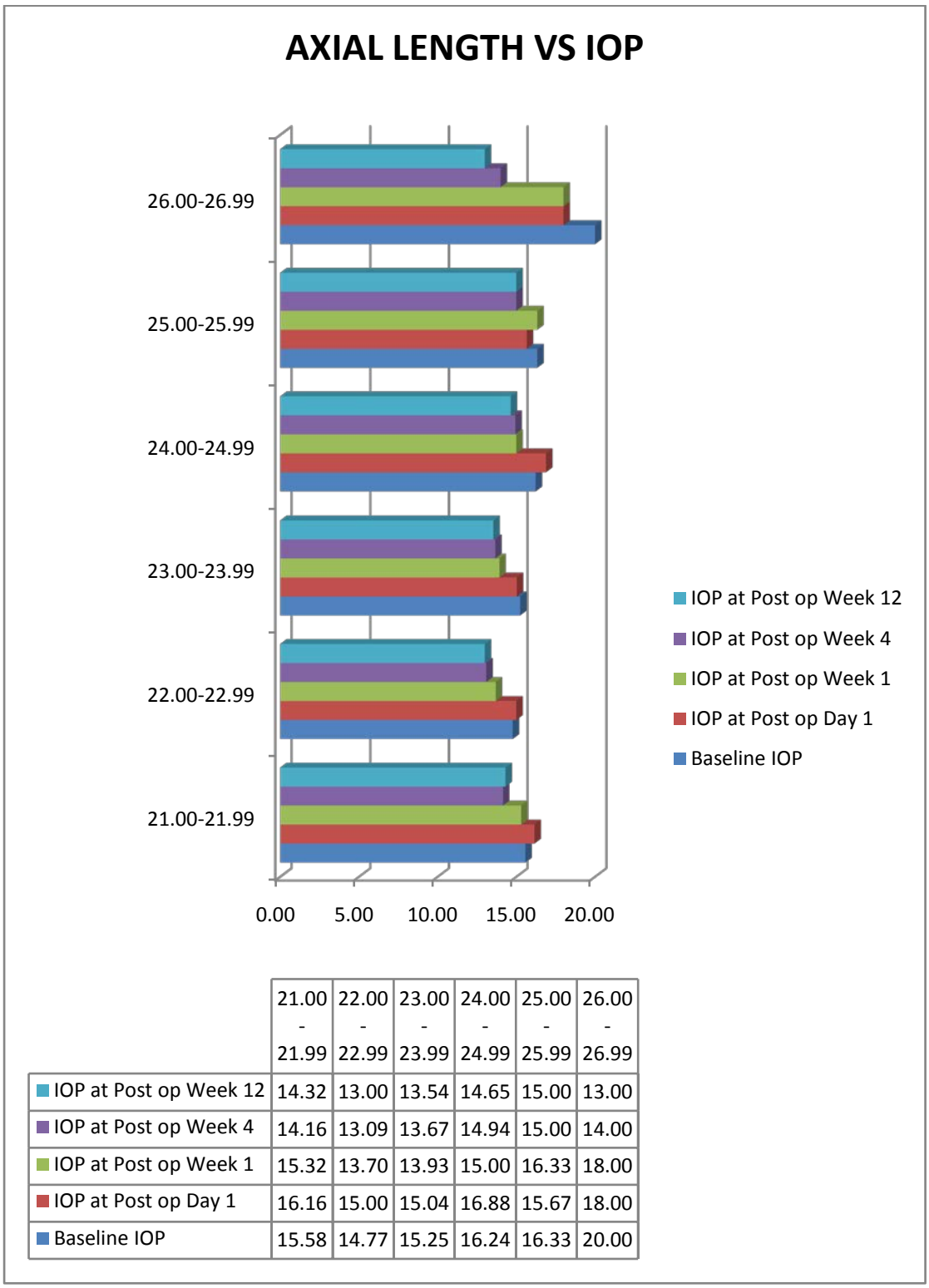


TABLE 11: CHANGE IN IOP IN RELATION TO AXIAL LENGTH

AL		N	Mean	SD	p value
21.00-21.99	Baseline IOP	19	15.58	2.04	0.000
	IOP at Post op Day 1	19	16.16	2.19	
	IOP at Post op Week 1	19	15.32	1.97	
	IOP at Post op Week 4	19	14.16	1.86	
	IOP at Post op Week 12	19	14.32	2.16	
22.00-22.99	Baseline IOP	53	14.77	2.34	0.000
	IOP at Post op Day 1	53	15.00	3.11	
	IOP at Post op Week 1	53	13.70	2.36	
	IOP at Post op Week 4	53	13.09	1.92	
	IOP at Post op Week 12	53	13.00	1.84	
23.00-23.99	Baseline IOP	57	15.25	2.62	0.000
	IOP at Post op Day 1	57	15.04	2.73	
	IOP at Post op Week 1	57	13.93	2.38	
	IOP at Post op Week 4	57	13.67	2.39	
	IOP at Post op Week 12	57	13.54	2.49	
24.00-24.99	Baseline IOP	17	16.24	2.08	0.000
	IOP at Post op Day 1	17	16.88	2.60	
	IOP at Post op Week 1	17	15.00	1.97	
	IOP at Post op Week 4	17	14.94	2.16	
	IOP at Post op Week 12	17	14.65	1.97	
25.00-25.99	Baseline IOP	3	16.33	0.58	0.619
	IOP at Post op Day 1	3	15.67	1.15	
	IOP at Post op Week 1	3	16.33	0.58	
	IOP at Post op Week 4	3	15.00	1.73	
	IOP at Post op Week 12	3	15.00	1.73	
26.00-26.99	Baseline IOP	1	20.00	NA	NA
	IOP at Post op Day 1	1	18.00	NA	
	IOP at Post op Week 1	1	18.00	NA	
	IOP at Post op Week 4	1	14.00	NA	
	IOP at Post op Week 12	1	13.00	NA	

CHART 9: CHANGE IN IOP IN RELATION TO AXIAL LENGTH



	21.00 - 21.99	22.00 - 22.99	23.00 - 23.99	24.00 - 24.99	25.00 - 25.99	26.00 - 26.99
IOP at Post op Week 12	14.32	13.00	13.54	14.65	15.00	13.00
IOP at Post op Week 4	14.16	13.09	13.67	14.94	15.00	14.00
IOP at Post op Week 1	15.32	13.70	13.93	15.00	16.33	18.00
IOP at Post op Day 1	16.16	15.00	15.04	16.88	15.67	18.00
Baseline IOP	15.58	14.77	15.25	16.24	16.33	20.00

In this study, we have measured AXIAL LENGTH (AL) of the chosen 150 eyes and have find out whether there is change of IOP among patients with different AL at baseline, post op day 1, post op week 1, post op week 4, post op week 12.

We divide AL into 6 groups i.e. ranging from 21.00-26.99 with number of patients are as follows:

Group 1 - 21.00-21.99 number of patients: 19

Group 2 - 22.00-22.99, number of patients: 53

Group 3 - 23.00-23.99, number of patients: 57

Group 4 - 24.00-24.99, number of patients: 17

Group 5 - 25.00-25.99, number of patients: 3

Group 6 - 26.00-26.99, number of patients: 1

Group 1 (21.00-21.99, number of patients: 19)

We have performed repeated measure ANOVA to find significance level between Baseline IOP & Post-operative IOP after Cataract in axial lengths.

We have found that there was statistical significant change in IOP levels in Baseline and Post operatively (i.e. p value = 0.000).

Group 2 (22.00-22.99, number of patients: 53)

We have performed repeated measure ANOVA to find significance level between Baseline IOP & Post-operative IOP after Cataract in axial lengths.

We have found that there was statistical significant change in IOP levels in Baseline and Post operatively (i.e. p value = 0.000).

Group 3 (23.00-23.99, number of patients: 57)

We have performed repeated measure ANOVA to find significance level between Baseline IOP & Post-operative IOP after Cataract in axial lengths.

We have found that there was statistical significant change in IOP levels in Baseline and Post operatively (i.e. p value = 0.000).

Group 4 (24.00-24.99, number of patients: 17)

We have performed repeated measure ANOVA to find significance level between Baseline IOP & Post-operative IOP after Cataract in axial lengths.

We have found that there was statistical significant change in IOP levels in Baseline and Post operatively (i.e. p value = 0.000).

Group 5 (25.00-25.99, number of patients: 3)

We have performed repeated measure ANOVA to find significance level between Baseline IOP & Post-operative IOP after Cataract in axial lengths.

We have found that there was no statistical significant change in IOP levels in Baseline and Post operatively (i.e. p value = 0.619) as there were only 3 patients in this group.

Group 6 (26.00-26.99, number of patients: 1)

We have performed repeated measure ANOVA to find significance level between Baseline IOP & Post-operative IOP after Cataract in axial lengths.

We have found that there was no statistical significant change in IOP levels in Baseline and Post operatively (i.e. p value = NA) as only 1 patient was included in this group.

TABLE 12: COMPARING DIFFERENCE OF MEAN OF BASELINE IOP TO POST OP WEEK 12 IOP AMONG GROUPS HAVING DIFFERENT AXIAL LENGTH

AL Code		N	Mean	SD	Difference
21.00-21.99	Baseline IOP	19	15.58	2.04	1.263
	IOP at Post op Week 12	19	14.32	2.16	
22.00-22.99	Baseline IOP	53	14.77	2.34	1.774
	IOP at Post op Week 12	53	13.00	1.84	
23.00-23.99	Baseline IOP	57	15.25	2.62	1.702
	IOP at Post op Week 12	57	13.54	2.49	
24.00-24.99	Baseline IOP	17	16.24	2.08	1.588
	IOP at Post op Week 12	17	14.65	1.97	
25.00-25.99	Baseline IOP	3	16.33	0.58	1.333
	IOP at Post op Week 12	3	15.00	1.73	
26.00-26.99	Baseline IOP	1	20.00	NA	7.000
	IOP at Post op Week 12	1	13.00	NA	

We also compared the change in IOP from baseline to post op week 12 in each of the above mentioned groups and found that there is no significant difference in IOP among groups 1-5. Group 6 was excluded as there was 1 patient.

DISCUSSION

Cataract and glaucoma are the leading causes of blindness, with glaucoma, mainly due to rise in intraocular pressure in developing countries. A significant number of people remain unnecessarily visually impaired as a result of inability to have access to clinical and surgical services. So as to control the ascent in intraocular pressure a few interventions, for e.g., anti-glaucoma drugs, laser iridotomy, and filtration surgery have been attempted throughout the years. In the last few decades research work on relation between cataract surgery like phacoemulsification with posterior chamber intraocular lens implantation and intraocular pressure has advanced essentially. Cataract surgery has been refined over the previous century in a colossal way. Recent advances in phacoemulsification have prompted early visual recovery and control of intraocular pressure. Post uneventful cataract surgery ascent in IOP is generally transient, particularly in the quick time frame. However, there is a consistent decrease in demonstrating a biphasic bend of IOP with the advancement in technologies. It has been proved by various studies that cataract surgery alone maybe sufficient enough to control IOP for longer time period.

A very wide variation has been reported in IOP fluctuations after cataract surgery. This study was conducted to evaluate the effect of an uncomplicated phacoemulsification on intraocular pressure by comparing it to preoperative values and subsequent post-operative values along with preop and postop changes in anterior chamber depth. It was also aimed at finding out whether phacoemulsification can be an alternative for IOP control. Adequate IOP control achieved through phacoemulsification alone can prevent future complications associated with rise in IOP leading to visual field loss.

This study was aimed at evaluating intraocular pressure pre and post cataract surgery. This study included 150 eyes of patients who underwent uneventful phacoemulsification surgery by the same surgeon in the ophthalmology department of Dhiraj hospital. The study was strictly confined to the inclusion and exclusion criteria defined above. Mean baseline IOP was measured preoperatively and compared to IOP in the postoperative period on follow ups at day 1, week 1, week 4 and week 12. Furthermore IOP was also compared with the cataract grading of the operated eye, axial length, and anterior chamber depth changes. 3 groups were defined based on preop IOP values.

We have also considered central corneal thickness into account and corrected IOP values were taken according to linear regression for all patients enrolled in the study.

Out of 150 eyes operated in this study, 64 (42.67%) were right eyes and 86 (57.33%) were left eyes.(table no. 4) The total number of patients enrolled were 150 out of which 80 (52.10%) were males and 70 (47.90%) was females. (Table no. 2)

The total mean age of the 150 patients enrolled in this study was 60.26±10.86. Out of which, mean age of male patients enrolled is 61.45±11.79 and mean age of female patients enrolled is 58.90±9.51.(Table no. 1) There was no gender predilection in this study for IOP fluctuations before and after surgery. (Table no. 3)

The mean IOP at baseline calculated preoperatively was 15.29 ± 2.417. Mean IOP at post op day 1 of 150 patients was 15.41 ± 2.824. Mean IOP at post op week 1 was 14.22 ± 2.346. Mean IOP at post op week 4 was 13.70 ± 2.185. Mean IOP at post op week 12 was 13.60 ± 2.210. These values showed a statistically significant decrease in IOP after an initial transient rise on post op day 1. (Table no.6)

Post op day 1 showed a rise in IOP with p = 1.000 which was not statistically significant. However consecutive follow ups showed a steady decline in IOP with p=0.000 for all groups.

Intergroup comparison was also done to determine change in IOP among different post operative follow ups. Significant change was noted in decrease in IOP when baseline was compared with post op week 1, week 4 and week 12 (p = 0.000).

Mansberger et al. in 2012 [(100)] found that in the cataract group, postoperative IOP was significantly lower than the preoperative IOP (19.8±3.2 mmHg vs. 23.9±3.2 mmHg; P=0.001). The postoperative IOP remained lower than the preoperative IOP for at least 36 months. The average decrease in postoperative IOP from preoperative IOP was 16.5%, and 39.7%. A greater reduction in postoperative IOP occurred in the eyes with the highest preoperative IOP. In our study there was 11.4% decrease in IOP when compared post op week 12 with baseline IOP which is in accordance with the above study.

Shingleton et al. in 2006 [(14)] compared the Non glaucomatous group (NG) (59 patients) At 3 years follow-up NG 1.7±3.1mmHg (P=0.0005). At the final follow-up visit (mean near 5 y for all groups) the IOP was significantly decreased in NG 1.5±2.5mmHg (P<0.0001). NG had IOPs less than or equal to their preoperative IOP. In another study by Issa et al. in 2005[(101)] demonstrated IOP dropped by a mean of 2.55±1.78mm Hg following cataract surgery (p=0.0001) on 103 patients who underwent uneventful phacoemulsification and posterior chamber intraocular lens (PCIOL) implantation. Results from our study indicate a reduction of IOP by 1.69±2.313 from pre-operative IOP measurement which is in accordance to above studies.

Tuula et al. in 2001[102] studied intraocular pressure (IOP) after phacoemulsification and intraocular lens (IOL) implantation in nonglaucomatous eyes without exfoliation. In the non-EXF group, mean IOP rose from 16.2±3.4 mm Hg to 20.5±5.7 mm Hg,

A 29.9% increase (*P* = .001). After this, significant IOP decreases occurred in non-EXF group, respectively, as follows: 15.0 ±2.9 mm Hg (5.9%; *P* =.001) 1 week postoperatively; 13.8±2.7mmHg (13.2%; *P*=.001) after 4 months; and 12.7± 2.7 mm Hg (21.2%; *P* =.001) after 1.0 to 2.7 years. Tong et al. in 1998[103] showed that mean preoperative IOP of the eyes operated on was 15.8 mm Hg ± 0.2 (±SE) (range 8 to 28 mm Hg). One week postoperatively, the mean IOP dropped by 6.8% to 14.5 ± 0.2 mm Hg *(P* <.001) Six weeks postoperatively, mean IOP was down by 14.6% to 13.3 ± 0.2 mm Hg *(P* < .001). Six to 8 months after surgery, it was down by 12.2% to 13.6 ±0.2 mm Hg *(P* < .001). Mean IOP drop at post op week 1 was 14.22 ± 2.346 (down by 7%) and at 1 months was13.70 ± 2.185 mm Hg(down by 10.39%) and at 3 months was 13.60±2.210 which is in accordance to our study.

Several mechanisms for the reduction of IOP after uneventful phacoemulsification have been proposed. These may be enhanced outflow facility by stretching of the trabecular meshwork, a direct effect of the IOL on the ciliary body or via- capsular bag contraction in reducing aqueous humor formation, ciliary body traction via the zonules preventing collapse of Schlemm's canal, widening of the anterior chamber angle and biochemical or blood-aqueous barrier permeability alterations. Some postulate increase in prostaglandin F2 levels post operatively leading to increased uveoscleral outflow.

Transient IOP rise on post op day 1 can be attributed to either retained viscoelastic material, cortical matter or pigment dispersion from iris chafing.[14, 103]

We also compared changes in IOP with different cataract grading. (Table no.7)

7 eyes with PSC were operated and showed a decline in IOP compared to baseline mean of 15.86 and postoperatively mean of 14.29 at week 12 with a p=0.000 which is statistically significant.

2 eyes with NS I + cortical also showed a decrease in IOP with a statistically significant p=0.000 ranging from mean 15.50 at baseline to 13.00 at week 12.

9 eyes operated with NS I + PSC grading had a statistically significant decrease in IOP from mean 15.67 at preop and 12.56 at week 12. (p=0.000)

15 eyes operated with NS II showed a decline from mean 13.80 at baseline to mean 12.33 at week 12. (p=0.000)

10 eyes with NS II + cortical were operated and showed a significant decrease in IOP with p=0.007 from preop mean 16.00 to 14.00.

28 eyes with NS II + PSC showed a decrease in IOP p=0.000 ranging from mean baseline of 14.75 to 13.86 at post op week 12.

16 eyes with NS III showed a mean decline from 15.69 to 13.75 with a significant p=0.000.

10 eyes with NS III + cortical were operated which showed a decline from mean 14.80 to 13.60 at post op week 12. P=0.002

10 eyes with NS III + PSC showed a mean decrease from baseline 15.70 to 13.70 at post op week 12 with a p =0.000

9 eyes with grading NS III+ PSC + cortical were operated that showed a decrease from 17.00 to 13.66 with p=0.000.

20 eyes with grade NS IV showing a decline from 15.20 to 14.00 at post op week 12 with p = 0.000.

3 eyes with NS IV + cortical showed a decline in IOP from 16.67 baseline to 13.33 at week 12 with p=0.011.

The above data suggests that there is a steady decline in IOP in with each cataract grading. However, our data propose no correlation between cataract grading and decrease in IOP. But there was higher decline in IOP in eyes with higher preoperative IOP which was in accordance of the above quoted studies.

In this study we wanted to find out the percentage of number of patients who have decline of IOP from pre op baseline to post op week 12 among 150 eyes.

We have divided the eyes based on preoperative IOP in three groups i.e.<15, 15-19, and 19-23 mmHg of IOP (Table no. 8)

We have found that with the increase of post operative days, number of patient increases in <15mmhg of IOP group compared to other two groups of IOP.

At post op week 12, 66.67% patient had less than 15mmHG of IOP compared to 34.00% at baseline.

At Baseline, 59.33% patient had less than 15-19mmHG of IOP compared to 32.67% at post op week 12.

At Baseline, 6.67% patient had less than 19-23mmHG of IOP compared to 0.67% at post op week 12

We have also compared ACD of operated eyes. The mean pre-op Anterior chamber depth of eyes operated were 2.80± 0.449 whereas post-op depth were 4.03±0.180 which was statistically significant (p=0.000). (Table no.9) The mean increase in ACD of 150 eyes was 1.23±0.314

Issa et al. in 2005[101] demonstrated that The ACD increased by a mean (SD) of 1.10 (0.44) mm (p=0.00001).In our study mean ACD increased in relation to baseline was 1.23±0.314 which was significant and is comparable to this study.

Hayashi et al. in 2000[93] studied the changes in anterior chamber depth induced by intraocular lens (IOL) implantation. They took 74 control eyes undergoing cataract extraction and IOL implantation. The mean postoperative depth was approximately 3.9 mm in the ACG group and 4.2 mm in the OAG and control groups. This difference was still significant (P= 0.0001), but this decreased to only approximately 0.3 mm. No significant differences were found between the OAG and control groups before and after surgery. In our study post op ACD was 4.03±0.180 which is in accordance to the above study.

According to SHIN et al [104] in 2010 reported in his study where they compared intraocular pressure, axial length and anterior chamber depth between patients with narrow occludable angles and open angles chosen for cataract surgery.

Mean pre op ACD was 3.08 which increased to 4.06±0.98 at week 4 and 4.07±0.98 at week 12. The mean increase in ACD 12 weeks postoperatively was statistically

significantly greater in the occludable angle group than in the open-angle group ($P<0.05$).

In our study we have excluded patients with occludable angles but the findings of open angle are in accordance with our study. We measured ACD at post op week 12 which was 4.03±0.180.

We also compared pre op and post op ACD with regard to all groups of cataract grading to find out mean difference and changes observed between the pre op and post op ACD among different cataract grading. The increase in the post op ACD does not show any significant relation to any grade of cataract.(Table no. 10)

We compared axial lengths (AL) of operated eyes with baseline and post op IOP changes. (Table no. 11) We found that most of the axial lengths ranging from 21.00 to 24.99 showed significant change in IOP ($p=0.000$).Groups 5 and 6 were excluded due to less number of patients.

Higher AL values could not be compared as there were no patients who were fulfilling our inclusion criterions.Lower ALs were excluded because of narrow angles on gonioscopy as per exclusion criterion.

Tuula et al in 2001[102] compared axial length of operated eyes with changes in IOP and found no statistically significant correlations. Not many studies have been conducted in this aspect.

Shin et al in 2010[104] enrolled eyes with short axial lengths and found that shorter ALs have shallow ACD and were included in occludable angles group. In our study we have excluded these parameters and hence no correlation could be found.

Intergroup comparison which is mean difference of change in IOP of baseline and post op week 12 among all groups [Table 12] i.e.

Group – 1 mean IOP difference between baseline and post of week 12 was 1.263

Group- 2 mean IOP difference between baseline and post of week 12 was 1.774

Group – 3 mean IOP difference between baseline and post of week 12 is 1.702

Group – 4 mean IOP difference between baseline and post of week 12 is 1.588

Group - 5 mean IOP difference between baseline and post of week 12 is1.333

Group- 6 was not considered as it had only one patient.

Looking at this mean difference we concluded that there is no significant lowering of IOP in any one group compared to others.

Thus, our study confirms Cataract surgery (phaco) with PCIOL causes reduction in IOP which remains sustained for months, as the duration of study was short. Though anterior chamber angle anatomy, lens vault, lens thickness which has been the technical limitation of our study are strong predictors expected for the post-operative reduction in IOP; yet, elucidation of such factors has been suboptimal to date. . The mechanism that leads to IOP reduction following cataract surgery in patients with open angles remains poorly understood, further research will likely allow a better understanding of these postoperative changes.

SUMMARY AND CONCLUSION

The research study was a hospital based observational, prospective, cohort study that is “CHANGES IN INTRAOCULAR PRESSURE AFTER CATARACT SURGERY” among normal population which was conducted in tertiary care centre in Western India (Gujarat) from June 2016 – September 2017.

Total of 150 eyes of patients in accordance to the inclusion and exclusion criterions of this study,underwent cataract surgery (phacoemulsification) with posterior chamber intraocular lens implantation (PCIOL) were taken after complete ophthalmic examination. Their intraocular pressure (IOP) was measured using Goldmann applanation tonometry at the following time i.e. preoperatively, and on follow ups at Post op day 1, Post op week 1, week 4 & week 12.

Changes in IOP were measured and noted according to correlation with the central corneal thickness(CCT) which was done with a pachymetry. Axial length (AL) &anterior chamber depth (ACD) were measured using A-scan machine. ACD was measured preoperatively and at post of week 12.

Out of 150 eyes of patients who were operated by a single surgeon in our study, 80 (52.10%) were males and 70 (47.90%) were females, with a total mean age of 60.26±10.86 years.

The baseline mean intraocular pressure of 150 eyes was 15.29 ± 2.417 which was lowered 13.60 ± 2.210 at post op week 12.

Mean decrease in IOP was 1.69 ± 2.313 (11.4%) from the baseline IOP.

However, significant amount of eyes had raised IOP on post op day 1 i.e. mean IOP at post op day 1 was 15.41 ± 2.824 compared to 15.29 ± 2.417 at baseline,followed by a steady decline which suggest that cataract surgery (phaco) with PCIOL lowers IOP and remains sustained.

Our study suggests that higher the IOP preoperatively there is significant lowering of IOP post operatively, whereas low IOP showed lesser reduction of IOP or equivalent to baseline at post op week 12.

We had divided 150 patients into 3 groups according to range of IOP i.e. <15 mm Hg, 16-19 mm Hg, 20-23 mm Hg

At post op week 12, 66.67% patient had less than 15mmHG of IOP compared to 34.00% at baseline. Whereas at Baseline, 59.33% patient had less than 15-19mmHG of IOP compared to 32.67% at post op week 12.Hence, there was significant increase in number of patients having <15mmHg of IOP at post op week 12.

Additionally in our study, we also compared mean IOP of selected eyes in relation to their LOCS III grading, in order to find any correlation between changes in IOP with different cataract gradings. We found there is linear decrease of IOP irrespective of their cataract gradings.

Another parameter we considered in our study is pre & post op ACD. Mean pre-op anterior chamber depth of 150 eyes was 2.80± 0.449 whereas post-op ACD at 3 months was 4.03±0.180. Mean change in ACD from baseline was 1.23 ± 0.33. Significant increase in size of ACD post op suggests better outflow of aqueous leading to decrease in IOP.

We also compared different groups of axial length and its correlation with changes in IOP. We found that there is linear decrease in IOP in all eyes irrespective of group of AL it belongs to.

Thus we concluded that, phacoemulsification surgery with PCIOL implantation of 150 eyes, the mean reduction of IOP is 1.69±2.313(11.4%) considering the difference between baseline to post op week 12 and also there is increase in ACD which is highly significant and may be one of the reasons for lowering intraocular pressure in normal population.

Findings in our study suggests if there is adequate control of intraocular pressure through cataract surgery in normal population than cataract surgery would render glaucoma treatment nonessential in early glaucoma stages and could become an optimal solution for patients with coexisting cataract and glaucoma.

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ANNEXURES

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ANNEXURE 1

LIST OF ABBREVIATIONS

IOP: Intraocular Pressure

AT: Applanation Tonometry

CCT: Central Corneal Thickness

NCT: Non-Contact Tonometer

PCIOL: Posterior Chamber Intraocular Lens

ACD: Anterior Chamber Depth

AL: Axial Length

UCVA: Uncorrected Visual Acuity

BCVA: Best Corrected Visual Acuity

Phaco: Phacoemulsification

Pachy: Pachymetry

ANNEXURE 2

PROFORMA FOR THESIS

TOPIC:-the changes in intraocular pressure after cataract surgery

Date:

Name of the patient:
Age:
Sex:
Contact number:
Date of admission:
Date of examination:
IPD/OPD number

Chief Complains:

Refraction Status:-

- H/O Glasses:
- H/O redness/discharge/pain/photophobia
- H/O ocular surgery/trauma/ocular disease
- H/O any systemic illness:
  (DM/HTN/COPD/Arthritis/Asthma/Allergy)

Parameters	R.E	L.E
Vision (unaided)UCVA		
Vision with spectacles		
Present Spectacle power		
Vision with pinhole		
Auto Refractometer		
Best Corrected Visual Acuity		

IOP:- **OD** **OS**

NCT:-

AT

(undilated/dilated)

(time:)

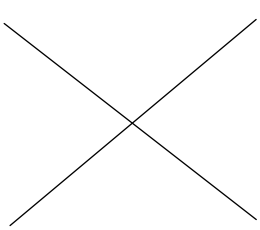
(performed by:

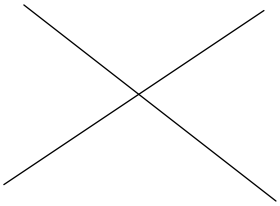
)

CCT

CORRECTED IOP

GONIOSCOPY OD OS





LOCAL EXAMINATION

R.E L.E

Head Posture:-

Eye position:-

Ocular Motility:-

Lids/Lashes:-

Conjunctiva:-

Cornea:-

Corneal Sensitivity:-

Anterior Chamber:-

Iris:-

Pupil:-

Lens:

Slit Lamp Examination:-

Fundus examination:- OD OS

Disc:-

B/G:-

B/V:-

FR:-

OD OS

K_1
K_2
Ax
AL
IOL power calculations

INTRAOPERATIVE NOTES:

IOP:- **OD** **OS**
NCT:-
AT
(undilated/dilated)
(time:)
(performed by:
)

POST OPERATIVE 1 WEEK
POST OP DAY 1:-

UCVA

BCVA

IOP:- **OD** **OS**
NCT:-
AT
(undilated/dilated)
(time:)
(performed by:
)

POST OPERATIVE 4TH WEEK

IOP:-	**OD**	**OS**
NCT:-		
AT		

(undilated/dilated)
(time:)
(performed by:
)

POST OPERATIVE 12TH WEEK

IOP:-	**OD**	**OS**
NCT:-		
AT		

(undilated/dilated)
(time:)
(performed by:
)

ANTERIOR CHAMBER DEPTH:

ANNEXURE 3

PARTICIPANT INFORMARTION SHEET

1 What is the study about?
-The study is to observe intraocular pressure changes after cataract surgery.

2 What is the purpose of this study?
-By this study we will establish This study will give better understanding about anterior chamber changes like anterior chamber depth or angles and IOL implantation reconfigures the anterior segment are a mechanism behind intraocular pressure reduction following cataract surgery.

3 Why have I been chosen?
-You have been chosen as you fit all the inclusion criteria of study.
Which is being a suitable candidate for cataract surgery

4 Do I have to take part?
-Your participation in the study program will be absolutely voluntary.

5 How long will the study last?
-The study will last for 1 year or 150 eyes whichever first.

6 What will happen to me if I take part?
If you take part in study

- Your full evaluation of will be done and screened for cataract and intraocular pressure.
- Your intraocular pressure will be measured day before the surgery and then you have to come for regular routine follow ups after cataract surgery where we will measure your intraocular pressure 1 day after surgery, 1,4 and 12 weeks after surgery.

7. What do I have to do?

-After agreeing to participate in the study, you are expected to extend full support. You should provide real facts when enquired into & follow the medications advised properly.

8.What is the drug being tested?

-Since, no new drug or procedure is being tested, there is no additional risk anticipated, for which you may need any protection or security

9. What are the benefits of the study?

a) Adequate control of intraocular pressure through cataract surgery would render glaucoma treatment nonessential and could become an optimal solution for patients with coexisting cataract and glaucoma

10. What are the alternatives for treatment?

-No treatment or drug regime is allocated in this study

11. What are the side effects of the treatment received during the study?

- No new drug or procedure is being tested

12.What if new information becomes available?

-It will be implemented for the benefit of the study and you are assured no harm will be done to you

13.What if something goes wrong?

-You contact us immediately, and we will be at your service 24/7.

14.Will my taking part be kept confidential?

-Of course it will be kept confidential

15.Who to call with questions?

NAME: DR. ADITYA.P.DESAI

CONTACT NO.: +91-9979902655

ANNEXURE 4

Informed Consent Form (ICF) for Participants

Study Title: - The changes in intraocular pressure after cataract surgery

Please initial box
(Subject)

1. I confirm that I have read and understood the information sheet dated ……....….for the above study and have had the opportunity to ask questions. ☐

(ii) I understand that my participation in the study is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected. ☐

(iii) I understand that the Sponsor of the clinical trial, others ☐

working on the Sponsor's behalf, the Ethics Committee and the regulatory authorities will not need my permission to look at my health records both in respect of the current study and any further research that may be conducted in relation to it,

even if I withdraw from the trial. I agree to this access. However, I understand that my identity will not be revealed in any information released to third parties or published. ☐

(iv) I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s) ☐

(v) I agree to take part in the above study.

Signature (or Thumb impression) of the Subject/LAR: _____

Date: / / _____

Signatory's Name: _____

Signature of the Investigator:
_____

Date: / /
_____ _____ _____

Study Investigator's Name:
_____

Signature of the Witness
_____

Date: / _/
_____ ____ _____

Name of the Witness:

ANNEXURE 5

પક્ષકાર માહિતી શીટ

અભ્યાસશીર્ષક :- મોતિયાના ઓપરેશન પછી આંખના દબાણમાં ફેરફારોનો અભ્યાસ

૧ .પરિચય

-

મોતિયાનાઓપરેશનપછીઆંખનાદબાણઉપરઆવતીઅસરનુંઅવલોકનકરવાનોઅભ્યાસછે .

૨ .આઅભ્યાસનોહેતુશુંછે?

-

આઅભ્યાસઆંખનાએંટેરીઓરચેમ્બરમાંથતાંફેરફારોજેમકેઊંડાઈઅથવાકોણઅનેમણિમૂકવાથીએંટેરીઓરચેમ્બરનામાપમાંથતાંફેરફારજેથીઆંખનાદબાણઉપરકોઈઅસરથાયછેકનહીતે જાણવાનીકોશિશકરેછે .

૩ .મનેકેમપસંદકરવામાંઆવ્યો?

-

તમનેઆઅભ્યાસમાટેપસંદકરવામાંઆવ્યાકારણકેતમેઆઅભ્યાસનાબધાસમાવેશમાપદંડ નેપૂરાપાડોછો .જેમકેમોતિયાનાઓપરેશનમાટેલાયકછો.

૪ .શુંમારેભાગલેવુંજરૂરીછે?

-તમારીભાગીદારીસંપૂર્ણપણેસ્વૈચ્છીકછે .

૫ .આઅભ્યાસકેટલાસમયમાટેચાલશે?

-આઅભ્યાસ 1 વર્ષઅથવા 150 આંખો,જેપેહલાપાટેતે.

૬ .હુંઆઅભ્યાસમાંભાગલઉંતોશુંથશે?

-મોતિયાઅનેઆંખનાદબાણનીપૂરીતપાસકરવામાંઆવશે .

-મોતિયાનાઓપરેશનનાએકદિવસપેહલાતમારાઆંખનુંદબાણમાપવામાંઆવશે . ત્યારપછીઓપરેશનથયાબાદતમારેનિયમિતઅનુવર્તીમાટેઆવુંપડશેજ્યારેઅમેતમારાઆંખ નુંદબાણ 1 દિવસ,1 ,4,અને 12 અઠવાડીયાપછીમાપીશું .

૭ .મારેશુંકરવાનુંરેહશે?

-

અભ્યાસમાંભાગલેવાનીસંમતિઆપ્યાપછીતમારાસંપૂર્ણસહકારનીઅપેક્ષારાખવામાંઆવશે . જ્યારેપૂછેત્યારેવાસ્તવિકહકીકતોઆપવાનીરહશેઅનેજેમસમઝાવીહોયતેમદવાલેવાનીરહશે .

૮ .શુંડ્રગપરીક્ષણકરવામાંઆવેછે?

-

આએકનિરીક્ષણપ્રકારનુંઅભ્યાસછેએટ્લેકોઈપણદવાઆપવામાંઆવશેનહી .

૯ .આઅભ્યાસનાશુંફાયદાછે?

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મોતિયાનાઓપરેશનદ્વારાઆંખનાદબાણનુંપર્યાપ્તનિયંત્રણથશેજેથીઝામરનીસારવારનીજરૂરપડશેનહીં .

આવસ્તુએવાદર્દીઓજેમનેઝામરઅનેમોતિયોબન્નેહોયતેમનામાટેશ્રેષ્ઠઉકેલહશે .

૧૦ .સારવારમાટેવિકલ્પોશુંછે?

- આઅભ્યાસમાંકોઈદવાનુંપરીક્ષણનથીથઈરહ્યુંએટ્લેકોઈવિકલ્પોનથી.

૧૧. નવીમાહિતીઉપલબ્ધબનેત્યારેશુંકરવામાંઆવશે?

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નવીમાહિતીનેઅભ્યાસમાંઅમલકરવામાંઆવશેઅનેતમનેખાતરીઆપીશુંકેતમનેકોઈહાનિનહીંપહોંચે.

૧૨. જોકોઈખોટુંથાયતો?

- તમેતરતજઅમારોસંપર્કકરોઅનેઅમેતમારીસેવામાં24કલાકઅને 7 દિવસહાજરરહીશું .

૧૩ .મારોભાગલેવાનીબાબતગુપ્તરાખવામાંઆવશે?

- હાતમારીભાગીદારીગુપ્તરાખશે .

૧૪. પ્રશ્નોઉભાથતાકોનેકૉલકરવો?

-નામ :ડો .આદિત્યદેસાઇ

-નંબર+ :૯૧ - ૯૯૭૯૯૦૨૬૫૫

ANNEXURE 6

સહભાગીઓમાટેમાહિતીપૂર્ણસંમતિફોર્મ (ICF)

અભ્યાસશીર્ષક :- મોતિયાના ઓપરેશન પછી આંખના દબાણમાં ફેરફારોનો અભ્યાસ

I. હું ખાતરી કરો કે હું વાંચી અને ક માહિતી શીટ સમજી છે .... ઉપર અભ્યાસ માટે અને પ્રશ્નો પૂછી કરવાની તક મળી છે

II. . હુંસમજુંછુંકેઅભ્યાસમાંમારોસહયોગસ્વૈચ્છિકછેઅનેહુંમા રાતબીબીસંભાળવિના , કોઈપણકારણઆપ્યાવિનાકોઈપણસમયેપાછીખેંચી , અથવાકાનૂનીઅધિકારોઅસરથઈરહીમફતછું

III. હુંસમજુંછુંકેક્લિનિકલટ્રાયલપ્રાયોજક , અન્ય

a. પ્રાયોજકવતીકામ, એથિક્સસમિતિઅનેનિયમનકારીસત્તાવાળાઓ બંનેવર્તમાનઅભ્યાસઅનેઆગળકોઈસંશોધનકે તેસંબંધમાંહાથધરવામાંઆવેછેબાબતમાંમારા આરોગ્યરેકોર્ડજોવામાટેમારાપરવાનગીજરૂરન થી
b. પણજોહુંટ્રાયલમાંથીપાછીખેંચી. હુંઆએક્સેસકરવામાટેસંમતથાયછે. જોકે, હુંસમજુંછુંકેમારીઓળખતૃતીયપક્ષોમાટેપ્રકાશિ તઅથવાપ્રકાશિતકોઈપણમાહિતીજાહેરકરવા માંઆવશેનહીં.

IV. હું કોઇ ડેટા અથવા પરિણામો કે આ અભ્યાસમાંથી પેદા થાય છે , જે મકે એક ઉપયોગ પૂરી પાડવામાં ઉપયોગ પ્રતિબંધિત નથી માત્ર વૈજ્ઞાનિક હેતુ (ઓ) માટે છે સંમત

V. હું ઉપર અભ્યાસમાં ભાગ લેવા માટે સંમત.

હસ્તાક્ષર (અથવા અંગૂઠાની છાપ) વિષય :

તારીખ: / / સહી નામ:

તપાસનીશ સહી: તારીખ: / /

અભ્યાસ તપાસનીશ નામ:

સાક્ષી હસ્તાક્ષર

તારીખ: / _ /

સાક્ષી નામ:

ANNEXURE 7

प्रतिभागी सूचना पत्रक

अध्ययन शीर्षक: - मोतियाबिंद ऑपरेशन के बाद आँख के दबाव में परिवर्तन का अध्ययन

1. परिचय

यह ऑपरेशन के बाद आंख के दबाव पर आंख के प्रभाव के अवलोकन का एक अध्ययन है।

2. इस अध्ययन का उद्देश्य क्या है?

अध्ययन का यह पता करना है कि आँख में पूर्वकाल कक्ष में परिवर्तन, जैसे कि गहराई या कोण और मरियम, पूर्वकाल कक्ष के आकार में परिवर्तन, जो कि आंखों के दबाव पर प्रभाव पड़ता है।

3. मुझे क्यों चुना गया?

-इस अध्ययन के लिए आपको चुना गया है क्योंकि आप इस अध्ययन के सभी प्रासंगिक मानदंड प्रदान करते हैं।

4.क्या मुझे भाग लेने की आवश्यकता है?

आपकी भागीदारी पूरी तरह से स्वैच्छिक है

5. यह अध्ययन कब तक चल जाएगा?

- अध्ययन 1 वर्ष या 150 आंखों के लिए है,

6. यदि मैं इस अध्ययन में भाग लेता हूं तो क्या होगा?

- मोतियाबिंद और आंख का दबाव अच्छी तरह से जांच की जाएगी।

आपकी आंख का दबाव मोतियाबिंद के ऑपरेशन के एक दिन से पहले मापा जाएगा। ऑपरेशन के बाद, आपको नियमित रूप से फ़ॉलो-अप के लिए ऐसा करना होगा जब हम 1 दिन, 1,4 और 12 सप्ताह के बाद आपके आँख के दबाव को माप देंगे।

7. मुझे क्या करना चाहिए?

-अध्ययन में भाग लेने के लिए सहमत होने के बाद, आपके पूर्ण सहयोग की उम्मीद होगी, पूछे जाने पर, वास्तविक तथ्यों दी जानी चाहिए और बताए अनुसार दवा लेनी चाहिए।

8. किस दवा की जांच की जाती है?
यह एक निरीक्षण प्रकार का अध्ययन है तो कोई भी दवाइयां नहीं दी जाएगी।

9. इस अध्ययन के लाभ क्या हैं?
मोतियाबिंद के ऑपरेशन के माध्यम से आंखों के दबाव का पर्याप्त नियंत्रण होगा, जिससे ग्लूकोमा के उपचार की आवश्यकता नहीं होगी। यह बात ग्लूकोमा और मोतियाबिंद दोनों के साथ रोगियों के लिए सबसे अच्छा समाधान होगी।

10. उपचार के लिए क्या विकल्प हैं?
इस अध्ययन में किसी भी दवा की जांचनहीं की गई है, इसलिए और कोई विकल्प नहीं है।

11. अध्ययन के दौरान प्राप्त उपचार के दुष्प्रभाव क्या हैं?
कोई दवा इस अध्ययन में परीक्षण नहीं किया जा रहा है।

12. जब नई जानकारी उपलब्ध हो जाए, तब क्या करें?
-नई जानकारी अध्ययन में लागू की जाएगी और आपको आश्वासन दिया जाएगा कि आपको कोई नुकसान नहीं होगा।

13. अगर कुछ गलत हो जाता है तो क्या होगा?
- तुरंत हमसे संपर्क करें और हम आपकी सेवा में 24 घंटे और 7 दिन उपस्थित होंगे।

14. अध्ययन बंद होने पर क्या होगा?
जब अध्ययन बंद हो जाता है, तो हम डेटा संकलित करेंगे और सांख्यिकीय रूप से संबंधित दवाओं के प्रभाव का विश्लेषण करेंगे।

15. क्या मेरी साझेदारी को गोपनीय रखा जाएगा?
हां, रोगियों की जानकारी गोपनीय रखी जाएगी।

16. मुझे और क्या पता होना चाहिए?

आप सुनिश्चित हैं कि हमारे अध्ययन में भाग लेने से आपके लिए कोई अतिरिक्त जोखिम नहीं है।

17. मैं और क्या जान सकता हूं?
यदि आपके मन में कोई भी सवाल है जो इसके लाभों और नुकसान से संबंधित है तो आप इसके बारे में बिना किसी देरी के पूछ सकते हैं।

18. प्रश्न पूछने के लिए किसे कोल करें?
नाम: डॉ। आदित्य देसाई

नंबर:९९७९९०४६५५

ANNEXURE 8

प्रतिभागियों के लिए सूचित सहमति प्रपत्र

मोतियाबिंद ऑपरेशन के बाद आँख के दबाव में बदलाव का अध्ययन

(i) मैं इस बात की पुष्टि करता हूँ कि मैंनेउपरोक्त अध्ययन के लिए जानकारी शीट पढ़ा है और समझ में आ रहा हैऔरमुझे सवाल पूछने का अवसर मिला है । ☐

(ii) मैं समझता हूँ कि इस अध्ययन में मेरी भागीदारी स्वैच्छिक है, और मैं अपनी चिकित्सीय देखभाल या कानूनी अधिकारप्रभावित किया बिना किसी भी समय, बिना कोई कारण बताए, भागीदारी वापस लेने के लिए स्वतंत्र हूँ | ☐

(iii) मैं समझता हूँ कि चिकित्सीय परीक्षण के प्रायोजक, प्रायोजक की ओर से कर्मी, आचार समिति, और नियामक प्राधिकरणोंकोमेरे स्वास्थ्य के अभिलेखों में दोनों, वर्तमान अध्ययन और किसी भी आगे अनुसंधान के संबंध में देखने के लिए मेरी अनुमति की जरूरत नहीं होगी | यहां तक कि अगर मैं परीक्षण से भागीदारी वापस लेलूंतो मैं इस का उपयोग करने के लिए सहमत हूँ।हालांकि, मैं समझता हूँ कि मेरी पहचान तीसरे पक्ष के लिए जारी या प्रकाशितकी गई किसी भी जानकारी में पता नहीं किया जाएगा। ☐

(iv) मैं इस अध्ययन से उत्पन्न किसी भी डेटा या परिणाम के उपयोग को प्रतिबंधितनहीं करूँगा | ☐

(v) मैं उपरोक्त अध्ययन में भाग लेने के लिए सहमत हूँ।

भागीदारकीहस्ताक्षर (या अंगूठे का निशान)

तारीख

हस्ताक्षरकर्ता का नाम

अन्वेषक के हस्ताक्षर:

तारीख

अन्वेषकका नाम

गवाह का हस्ताक्षर

तारीख

गवाह कानाम

Sr No	Age	Age Group	Gender	UCVA	BCVA	Baseline IOP	Baseline IOP Code	Pachy	Lens	k1	k2	Ax	eye operated	AL	AL Code	IOP at Post op Day 1	IOP at Post op Day 1 Code	IOP at Post op Week 1	IOP at Post op Week 1 Code	IOP at Post op Week 4	IOP at Post op Week 4 Code	IOP at Post op Week 12	IOP at Post op Week 12 Code	ACD PRE OP	ACD POST AT WEEK 12
1	60	2	M	6/60	6/36	20	3	508	NS II + Cortical	42.75	48.25	55.00	Left	26.77	6.00	18	2	18	2	14	1	13	1	2.79	4.01
2	60	2	F	CF 3m	6/60	10	1	540	NS IV	41.75	42.75	42.00	Left	22.50	2.00	12	1	10	1	10	1	10	1	2.38	4.32
3	60	2	F	CF 4M	6/36	17	2	520	NS III + PSC	41.75	42.75	95.00	Left	22.99	2.00	21	3	19	3	19	3	17	2	2.45	4.27
4	55	2	F	6/60	6/36	18	2	511	NS II + PSC	42.25	42.75	153.00	Left	24.23	4.00	18	2	16	2	18	2	18	2	2.53	4.16
5	82	3	M	6/36	6/24	12	1	542	NS III	42.75	45.25	95.00	Left	23.00	3.00	14	1	14	1	14	1	12	1	2.71	4.43
6	75	3	F	6/36	6/24	19	3	501	NS III	39.25	47.25	9.00	Left	23.73	3.00	15	2	17	2	15	2	15	2	2.29	3.95
7	73	3	M	CFCF	CF2M	16	2	575	NS IV	39.25	40.25	70.00	Left	22.29	2.00	16	2	14	1	14	1	12	1	2.83	4.22
8	57	2	M	CF 2m	CF3M	15	2	498	NS III + Cortical	41.50	42.25	145.00	Left	23.44	3.00	17	2	15	2	15	2	17	2	2.77	3.94
9	50	2	F	CF 2m	CF3M	17	2	525	NS III + PSC + Cortical	42.00	44.00	79.00	Left	21.90	1.00	15	2	17	2	13	1	15	2	2.92	4.04
10	55	2	F	HMCF	CFCF	17	2	519	NS IV + PSC	39.25	39.50	135.00	Left	22.69	2.00	19	3	15	2	13	1	15	2	3.13	3.91
11	60	2	M	CF 2m	CF4M	15	2	527	NS III + Cortical	43.75	44.00	20.00	Left	21.66	1.00	15	2	13	1	13	1	13	1	2.67	4.11
12	40	1	F	CF 2M	6/60	18	2	570	NS III + PSC + Cortical	45.25	46.00	20.00	Left	22.93	2.00	17	2	16	2	12	1	11	1	2.55	3.97
13	70	3	M	CF 4m	6/60	13	1	505	NS II + PSC + Cortical	39.75	40.25	107.00	Left	21.27	1.00	19	3	18	2	19	3	21	3	2.69	3.88
14	62	3	F	6/60	6/36	13	1	555	NS III + PSC	44.00	44.50	7.00	Left	23.15	3.00	13	1	11	1	10	1	10	1	2.45	4.15
15	74	3	M	6/36	6/36	14	1	536	NS III + PSC	40.25	40.25	101.00	Left	22.84	2.00	14	1	12	1	12	1	11	1	2.55	3.94
16	50	2	F	6/60	6/36	13	1	544	NS II + Cortical	44.50	46.00	16.00	Left	23.02	3.00	14	1	14	1	14	1	13	1	2.63	4.09
17	54	2	F	6/24	6/24	15	2	550	NS I + PSC	43.50	44.25	4.00	Left	22.50	2.00	17	2	15	2	14	1	13	1	2.34	4.21
18	68	3	M	6/24	6/24	18	2	542	PSC	43.25	44.00	71.00	Left	22.82	2.00	12	1	12	1	12	1	14	1	2.39	4.26
19	62	3	F	6/24	6/24	16	2	575	NS II	43.75	44.25	142.00	Left	23.55	3.00	16	2	12	1	14	1	12	1	2.87	4.03
20	65	3	M	6/36	6/24P	15	2	579	NS II + PSC	43.50	44.00	166.00	Left	21.83	1.00	15	2	13	1	14	1	13	1	2.92	3.98
21	55	2	F	CF 3m	6/60	17	2	518	NS III + Cortical	44.50	45.75	138.00	Left	23.10	3.00	15	2	13	1	13	1	13	1	2.56	4.41
22	60	2	M	6/60	6/60	16	2	526	NS III + PSC	42.75	43.25	139.00	Left	23.38	3.00	15	2	15	2	15	2	15	2	2.74	4.36
23	54	2	M	6/24	6/24	17	2	555	NS II	75.50	46.25	1.00	Left	23.49	3.00	16	2	14	1	13	1	14	1	2.94	4.32
24	38	1	M	6/24	6/12P	14	1	515	NS II	44.00	44.50	80.00	Left	23.99	3.00	16	2	14	1	14	1	13	1	3.12	4.28
25	70	3	F	CF 3M	CF 3M	14	1	545	NS IV	41.25	42.50	105.00	Left	22.12	2.00	14	1	14	1	14	1	14	1	2.69	4.15
26	68	3	M	6/60	6/36	14	1	588	NS II + PSC	42.25	44.00	80.00	Left	23.04	3.00	14	1	15	2	13	1	14	1	3.22	4.50

Sr No	Age	Age Group	Gender	UCVA	BCVA	Baseline IOP	Baseline IOP Code	Pachy	Lens	k1	k2	Ax	eye operated	AL	AL Code	IOP at Post op Day 1	IOP at Post op Day 1 Code	IOP at Post op Week 1	IOP at Post op Week 1 Code	IOP at Post op Week 4	IOP at Post op Week 4 Code	IOP at Post op Week 12	IOP at Post op Week 12 Code	ACD PRE OP	ACD POST AT WEEK 12
27	45	1	F	6/36	6/24	13	1	551	NS III	44.25	45.25	171.00	Left	23.82	3.00	13	1	13	1	13	1	13	1	2.66	3.92
28	68	3	M	CF 4M	CF 4M	15	2	521	NS IV	42.00	42.75	79.00	Left	23.68	3.00	13	1	13	1	15	2	15	2	2.96	4.25
29	75	3	M	6/36	6/24	16	2	600	NS I + Cortical	40.75	41.25	22.00	Left	23.12	3.00	15	2	15	2	14	1	14	1	2.73	4.17
30	50	2	F	6/12	6/12	17	2	585	PSC	42.50	43.00	10.00	Left	22.96	2.00	15	2	13	1	13	1	13	1	3.09	4.44
31	50	2	F	6/24	6/12P	13	1	525	NS II + PSC	42.25	43.00	175.00	Left	22.52	2.00	12	1	12	1	12	1	13	1	3.18	4.57
32	26	1	M	HMCF	HMCF	16	2	515	NS IV	42.00	42.75	82.00	Left	25.23	5.00	15	2	16	2	16	2	16	2	3.65	3.81
33	45	1	M	6/60	6/36	17	2	560	NS II + PSC	42.25	42.75	12.00	Left	23.26	3.00	17	2	16	2	17	2	17	2	3.03	4.32
34	55	2	M	6/24	6/24	10	1	575	NS III	39.50	40.50	82.00	Left	23.57	3.00	10	1	8	1	8	1	8	1	3.24	3.76
35	60	2	F	6/60	6/36	14	1	566	NS I + PSC + Cortical	45.25	47.25	176.00	Left	23.60	3.00	14	1	12	1	13	1	13	1	2.96	3.90
36	73	3	M	6/24	6/24	16	2	545	PSC	41.25	43.00	86.00	Left	23.20	3.00	16	2	16	2	17	2	18	2	2.48	4.35
37	73	3	M	6/36	6/36	18	2	590	NS II + PSC	41.25	43.00	86.00	Left	23.26	3.00	18	2	14	1	14	1	14	1	2.69	4.27
38	59	2	F	6/36	6/24	16	2	591	NS II + PSC + Cortical	43.25	45.75	6.00	Left	22.68	2.00	20	3	14	1	14	1	13	1	2.94	4.16
39	67	3	F	6/60	6/36	13	1	551	NS III + Cortical	44.50	45.50	78.00	Left	22.17	2.00	13	1	13	1	13	1	13	1	2.60	4.34
40	70	3	F	6/24	6/12	15	2	535	NS I + PSC	41.25	42.50	105.00	Left	22.50	2.00	13	1	13	1	13	1	13	1	2.48	4.47
41	63	3	M	6/60	6/24P	15	2	580	NS III	44.00	44.25	180.00	Left	24.40	4.00	15	2	15	2	15	2	15	2	2.54	4.22
42	62	3	F	CF 2M	CF 4M	15	2	552	NS IV	42.50	46.75	75.00	Left	21.00	1.00	15	2	15	2	15	2	15	2	2.35	3.99
43	51	2	M	6/24	6/12P	12	1	540	NS II	41.75	42.00	135.00	Left	22.60	2.00	12	1	13	1	12	1	14	1	3.16	3.82
44	50	2	F	6/36	6/24	10	1	572	NS II + PSC	39.25	40.50	106.00	Left	22.82	2.00	10	1	10	1	11	1	10	1	3.03	4.17
45	65	3	M	6/24	6/12P	14	1	538	NS II + Cortical	43.00	43.75	106.00	Left	23.06	3.00	16	2	15	2	16	2	16	2	2.33	4.09
46	60	2	F	6/60	6/36P	22	3	515	NS III + PSC + Cortical	43.50	44.50	50.00	Left	23.28	3.00	19	3	18	2	18	2	18	2	2.96	3.85
47	72	3	F	6/24	6/24	16	2	625	NS II	43.50	44.75	101.00	Left	23.83	3.00	12	1	11	1	12	1	12	1	3.02	4.12
48	51	2	M	6/12	6/12	16	2	515	PSC	41.00	41.50	159.00	Left	22.66	2.00	16	2	14	1	14	1	14	1	2.74	3.90
49	59	2	M	6/24	6/12	12	1	536	NS I + PSC + Cortical	42.25	43.25	45.00	Left	21.31	1.00	12	1	12	1	12	1	12	1	2.39	4.21
50	65	3	F	6/12	6/12	12	1	562	PSC	45.00	45.25	67.00	Left	22.71	2.00	11	1	11	1	13	1	11	1	3.26	4.28
51	68	3	F	6/36	6/24	15	2	525	NS III	12.25	43.25	82.00	Left	22.75	2.00	18	2	15	2	13	1	13	1	3.17	4.31
52	45	1	M	6/60	6/24	16	2	591	NS II + PSC	41.25	42.75	2.00	Left	23.47	3.00	16	2	16	2	15	2	15	2	2.98	3.98

Sr No	Age	Age Group	Gender	UCVA	BCVA	Baseline IOP	Baseline IOP Code	Pachy	Lens	k1	k2	Ax	eye operated	AL	AL Code	IOP at Post op Day 1	IOP at Post op Day 1 Code	IOP at Post op Week 1	IOP at Post op Week 1 Code	IOP at Post op Week 4	IOP at Post op Week 4 Code	IOP at Post op Week 12	IOP at Post op Week 12 Code	ACD PRE OP	ACD POST AT WEEK 12
53	70	3	M	6/60	6/24	17	2	535	NS III + Cortical	44.00	46.50	93.00	Left	23.36	3.00	15	2	15	2	15	2	15	2	3.05	4.33
54	45	1	M	6/60	6/24	18	2	572	NS II + Cortical	41.25	42.75	5.00	Left	24.40	4.00	14	1	16	2	14	1	14	1	3.54	4.50
55	65	3	F	6/36	6/12P	16	2	569	NS II + PSC	42.25	43.50	90.00	Left	23.90	3.00	16	2	16	2	17	2	16	2	3.01	3.99
56	51	2	F	6/24	6/24	14	1	575	PSC	41.25	41.75	3.00	Left	23.13	3.00	13	1	13	1	12	1	12	1	2.28	4.81
57	56	2	M	6/36	6/36	18	2	610	NS III	41.25	42.00	106.00	Left	21.06	1.00	14	1	13	1	11	1	11	1	2.79	4.29
58	66	3	M	6/24	6/12P	15	2	556	NS II + PSC	42.25	42.75	109.00	Left	22.81	2.00	12	1	13	1	13	1	13	1	2.88	4.16
59	42	1	M	6/24	6/12	17	2	585	PSC + Cortical	41.25	42.25	175.00	Left	22.96	2.00	15	2	13	1	13	1	13	1	3.16	4.08
60	65	3	F	6/36	6/12	13	1	525	NS II + PSC	43.00	43.50	133.00	Left	22.52	2.00	12	1	12	1	12	1	13	1	2.86	3.91
61	53	2	M	CF 3M	CF 3M	16	2	515	NS IV	40.75	42.25	88.00	Left	25.23	5.00	15	2	16	2	16	2	16	2	3.18	4.15
62	53	2	M	6/60	6/36	17	2	560	NS II + PSC	40.75	42.25	88.00	Left	23.26	3.00	17	2	16	2	17	2	17	2	3.07	4.35
63	54	2	F	6/36	6/24	10	1	575	NS II	43.70	44.30	11.00	Left	23.57	3.00	10	1	8	1	8	1	8	1	3.25	4.43
64	74	3	M	CF 2M	CF 2M	16	2	591	NS II + PSC + Cortical	43.70	44.30	11.00	Left	22.68	2.00	20	3	14	1	14	1	13	1	2.94	3.80
65	46	1	M	6/60	6/24	13	1	518	NS III + PSC	45.25	46.00	114.00	Left	23.15	3.00	13	1	13	1	13	1	13	1	3.33	4.42
66	62	3	F	6/24	6/12	15	2	535	NS I + PSC	42.25	43.00	126.00	Left	22.50	2.00	13	1	13	1	13	1	13	1	2.86	4.37
67	54	2	F	6/60	6/36	15	2	580	NS III	44.00	44.75	1.00	Left	24.40	4.00	15	2	15	2	15	2	15	2	2.67	4.26
68	55	2	F	CF 3M	CF 3M	15	2	552	NS IV	44.00	44.50	103.00	Left	21.00	1.00	15	2	15	2	15	2	15	2	2.62	4.31
69	70	3	F	6/24	6/12	12	1	540	NS II	41.25	42.50	105.00	Left	22.60	2.00	12	1	13	1	12	1	14	1	2.46	3.94
70	68	3	M	6/36	6/24	10	1	572	NS II + PSC	42.00	42.75	79.00	Left	22.82	2.00	10	1	10	1	11	1	10	1	2.52	3.85
71	73	3	M	6/36	6/24	14	1	538	NS II + Cortical	41.25	43.00	86.00	Left	23.06	3.00	16	2	15	2	16	2	16	2	2.38	4.26
72	56	2	F	CF 3M	CF 3M	13	1	532	NS IV	42.50	43.00	10.00	Left	22.50	2.00	16	2	13	1	13	1	12	1	3.11	4.52
73	75	3	M	6/24	6/24	17	2	520	NS III	40.75	41.25	22.00	Left	22.99	2.00	21	3	19	3	19	3	17	2	2.52	4.21
74	60	2	F	6/24	6/12	18	2	511	NS II + PSC	45.25	47.50	79.00	Left	24.23	4.00	18	2	16	2	18	2	18	2	2.26	4.36
75	73	3	M	6/24	6/12	15	2	582	NS II + PSC	43.84	45.40	87.00	Left	23.36	3.00	13	1	13	1	13	1	15	2	2.86	4.24
76	54	2	F	6/36	6/24	17	2	532	NS II + Cortical	43.00	44.25	91.00	Left	24.19	4.00	17	2	15	2	15	2	15	2	2.84	4.22
77	47	1	F	6/60	6/24	12	1	542	NS III	41.74	42.50	155.00	Left	23.00	3.00	14	1	14	1	14	1	12	1	2.86	3.77
78	80	3	F	6/60	6/24	19	3	501	NS III	42.00	42.75	103.00	Left	23.73	3.00	15	2	17	2	15	2	15	2	2.93	4.46

Sr No	Age	Age Group	Gender	UCVA	BCVA	Baseline IOP	Baseline IOP Code	Pachy	Lens	k1	k2	Ax	eye operated	AL	AL Code	IOP at Post op Day 1	IOP at Post op Day 1 Code	IOP at Post op Week 1	IOP at Post op Week 1 Code	IOP at Post op Week 4	IOP at Post op Week 4 Code	IOP at Post op Week 12	IOP at Post op Week 12 Code	ACD PRE OP	ACD POST AT WEEK 12
79	64	3	M	HMCF	HMCF	16	2	575	NS IV + Cortical	43.00	43.50	63.00	Left	22.29	2.00	16	2	14	1	14	1	12	1	2.58	4.41
80	65	3	M	6/36	6/24	15	2	498	NS III + Cortical	43.75	44.50	81.00	Left	23.44	3.00	17	2	15	2	15	2	17	2	2.32	3.94
81	38	1	M	CF 2M	CF 4M	17	2	525	NS III + PSC + Cortical	40.75	41.56	173.00	Left	21.90	1.00	15	2	17	2	13	1	15	2	3.24	4.36
82	67	3	M	CF4M	6/60	19	3	546	NS IV	43.25	43.75	94.00	Left	24.23	4.00	22	3	17	2	17	2	16	2	2.64	4.48
83	34	1	M	6/60	6/36	15	2	505	NS I + Cortical	45.00	45.25	111.00	Left	23.15	3.00	17	2	13	1	13	1	12	1	3.55	4.52
84	65	3	F	6/24	6/24	18	2	485	PSC	45.25	46.50	121.00	Left	22.17	2.00	18	2	18	2	18	2	18	2	3.26	3.81
85	66	3	M	6/24	6/12P	14	1	572	NS I	44.50	45.50	138.00	Left	22.50	2.00	14	1	14	1	14	1	14	1	3.18	4.09
86	55	2	M	6/60	6/36	21	3	565	NS IV	44.25	44.75	8.00	Left	24.40	4.00	23	3	20	3	19	3	17	2	3.33	4.46
87	50	2	M	CF 4M	6/60	13	1	532	NS IV	42.75	43.25	93.00	Right	22.60	2.00	15	2	13	1	11	1	12	1	2.61	4.43
88	65	3	M	6/60	6/36	14	1	551	NS II + PSC	43.75	44.50	81.00	Right	22.60	2.00	17	2	15	2	13	1	15	2	2.35	4.29
89	82	3	F	6/60	6/24	18	2	575	NS IV	42.75	43.25	161.00	Right	21.92	1.00	19	3	18	2	16	2	16	2	2.26	4.51
90	55	2	M	6/36	6/24	15	2	535	NS II	41.50	42.50	110.00	Right	23.46	3.00	19	3	15	2	15	2	15	2	2.64	4.29
91	70	3	M	6/36	6/24	15	2	582	NS II + PSC	43.00	45.00	92.00	Right	23.46	3.00	13	1	13	1	11	1	11	1	2.44	4.48
92	65	3	M	6/24	6/12	15	2	532	NS II	42.00	42.25	24.00	Right	24.36	4.00	15	2	13	1	15	2	13	1	2.63	4.31
93	65	3	F	CF3M	CF 3M	17	2	535	NS III + Cortical	45.50	46.00	74.00	Right	21.46	1.00	19	3	17	2	15	2	15	2	2.26	4.41
94	67	3	M	CF 4M	6/60	14	1	592	NS IV	44.08	44.25	62.00	Right	22.80	2.00	17	2	16	2	14	1	13	1	2.87	3.89
95	64	3	M	CF4M	6/60	16	2	545	NS III + PSC + Corticol	43.00	43.50	143.00	Right	21.96	1.00	16	2	14	1	12	1	12	1	2.78	4.29
96	45	1	F	6/60	6/36	19	3	505	NS II + Cortical	46.00	47.75	15.00	Right	23.40	3.00	19	3	17	2	15	2	15	2	3.08	4.35
97	60	2	M	6/24	6/12	17	2	535	NS I + PSC	43.50	43.75	177.00	Right	22.55	2.00	15	2	13	1	13	1	13	1	3.38	4.19
98	60	2	F	6/24	6/12	14	1	499	NS II	46.75	46.50	171.00	Right	22.83	2.00	15	2	15	2	13	1	13	1	2.42	3.98
99	45	1	F	6/60	6/36	17	2	528	NS III	46.50	47.00	136.00	Right	24.33	4.00	19	3	15	2	13	1	13	1	2.48	4.47
100	60	2	M	6/24	6/12	14	1	536	NS I + PSC	42.00	43.00	58.00	Right	22.38	2.00	16	2	14	1	12	1	12	1	2.96	3.56
101	45	1	M	6/24	6/12	17	2	532	NS I + PSC	41.25	42.75	2.00	Right	23.51	3.00	13	1	13	1	13	1	13	1	2.74	4.47
102	70	3	M	CF2M	6/60	18	2	567	NS III + PSC + Corticol	44.00	46.50	93.00	Right	23.22	3.00	15	2	15	2	14	1	14	1	2.95	4.31
103	45	1	M	6/36	6/36	13	1	551	NS II	41.25	42.75	5.00	Right	22.17	2.00	11	1	11	1	11	1	11	1	3.38	4.32
104	65	3	F	6/60	6/36	17	2	530	NS III	42.25	43.50	90.00	Right	25.30	5.00	17	2	17	2	13	1	13	1	3.07	4.27

Sr No	Age	Age Group	Gender	UCVA	BCVA	Baseline IOP	Baseline IOP Code	Pachy	Lens	k1	k2	Ax	eye operated	AL	AL Code	IOP at Post op Day 1	IOP at Post op Day 1 Code	IOP at Post op Week 1	IOP at Post op Week 1 Code	IOP at Post op Week 4	IOP at Post op Week 4 Code	IOP at Post op Week 12	IOP at Post op Week 12 Code	ACD PRE OP	ACD POST AT WEEK 12
105	51	2	F	6/60	6/24	14	1	501	NS III + PSC + Corticol	41.25	41.75	3.00	Right	23.08	3.00	19	3	17	2	15	2	15	2	2.34	4.35
106	56	2	M	CF 4M	6/36	16	2	569	NS IV	41.25	42.00	106.00	Right	23.00	3.00	18	2	15	2	15	2	13	1	2.89	4.21
107	66	3	M	6/60	6/36	14	1	515	NS II + PSC	42.25	42.75	109.00	Right	22.65	2.00	13	1	12	1	12	1	12	1	2.74	4.27
108	42	1	M	6/60	6/24	16	2	545	NS I + PSC + Cortical	41.25	42.25	175.00	Right	21.50	1.00	18	2	17	2	15	2	14	1	3.35	4.33
109	65	3	F	6/60	6/24	14	1	511	NS II + PSC	43.00	43.50	133.00	Right	24.32	4.00	14	1	14	1	13	1	13	1	2.94	4.23
110	53	2	M	CF4M	6/36	16	2	590	NS II + PSC + Cortical	40.75	42.25	88.00	Right	22.81	2.00	15	2	13	1	12	1	12	1	3.18	3.89
111	54	2	F	6/60	6/24	15	2	550	NS II + PSC	44.00	44.75	1.00	Right	24.59	4.00	17	2	14	1	14	1	14	1	2.72	3.96
112	55	2	F	6/60	6/24	12	1	536	NS II + PSC	44.00	44.50	103.00	Right	21.80	1.00	14	1	14	1	14	1	14	1	2.84	4.22
113	70	3	F	6/36	6/24	16	2	565	NS I + PSC	41.25	42.50	105.00	Right	23.93	3.00	18	2	15	2	13	1	12	1	2.68	3.90
114	68	3	M	6/36	6/36	8	1	575	NS II	42.00	42.75	79.00	Right	23.67	3.00	8	1	8	1	8	1	8	1	2.76	4.29
115	73	3	M	6/60	6/12	13	1	525	NS II + PSC	41.25	43.00	86.00	Right	23.50	3.00	15	2	13	1	13	1	13	1	2.45	4.34
116	56	2	F	6/60	6/24	18	2	616	NS II + PSC	42.50	43.00	10.00	Right	22.90	2.00	15	2	13	1	12	1	12	1	3.14	3.77
117	75	3	M	CF3M	6/60	15	2	518	NS III + PSC	40.75	41.25	22.00	Right	23.08	3.00	13	1	12	1	12	1	12	1	2.58	4.46
118	60	2	F	CF4M	6/60	11	1	550	NS III + Cortical	45.25	47.50	79.00	Right	23.22	3.00	9	1	9	1	9	1	9	1	2.46	4.37
119	73	3	M	6/36	6/12	14	1	536	NS II	43.84	45.40	87.00	Right	24.20	4.00	16	2	12	1	12	1	12	1	2.83	4.33
120	54	2	F	HMCF	HMCF	16	2	601	NS IV + Cortical	43.00	44.25	91.00	Right	23.22	3.00	14	1	14	1	12	1	12	1	2.78	4.21
121	47	1	F	CF 5M	6/24	17	2	526	NS III	41.74	42.50	155.00	Right	24.15	4.00	17	2	17	2	17	2	17	2	2.95	3.99
122	80	3	F	6/60	6/24	16	2	586	NS I + PSC	42.00	42.75	103.00	Right	22.80	2.00	15	2	14	1	12	1	12	1	2.90	4.31
123	60	2	F	HMCF	HMCF	18	2	515	NS IV + Cortical	41.75	42.75	95.00	Right	23.22	3.00	16	2	16	2	16	2	16	2	2.41	4.25
124	55	2	F	CF 4M	6/36	15	2	560	NS IV	42.25	42.75	153.00	Right	22.69	2.00	14	1	13	1	13	1	13	1	2.69	4.28
125	82	3	M	CF 3M	6/36	11	1	565	NS IV	42.75	45.25	95.00	Right	22.07	2.00	11	1	11	1	11	1	11	1	2.93	4.41
126	75	3	F	6/60	6/24	10	1	568	NS II + Cortical	43.25	45.25	9.00	Right	22.45	2.00	9	1	9	1	10	1	10	1	2.34	4.25
127	73	3	M	6/60	6/12	15	2	562	NS III + PSC + Corticol	44.25	44.75	70.00	Right	23.25	3.00	13	1	13	1	11	1	11	1	2.82	4.32
128	57	2	M	6/60	6/24	15	2	552	NS III + PSC	41.50	42.25	145.00	Right	22.50	2.00	15	2	13	1	13	1	13	1	2.43	4.27
129	50	2	F	6/36	6/24	14	1	511	NS II + PSC	42.00	44.00	79.00	Right	24.32	4.00	14	1	14	1	13	1	13	1	2.94	4.46
130	55	2	F	CF 4M	6/36	16	2	590	NS II + PSC + Cortical	42.25	43.50	135.00	Right	22.81	2.00	15	2	13	1	12	1	12	1	3.06	4.29

Sr No	Age	Age Group	Gender	UCVA	BCVA	Baseline IOP	Baseline IOP Code	Pachy	Lens	k1	k2	Ax	eye operated	AL	AL Code	IOP at Post op Day 1	IOP at Post op Day 1 Code	IOP at Post op Week 1	IOP at Post op Week 1 Code	IOP at Post op Week 4	IOP at Post op Week 4 Code	IOP at Post op Week 12	IOP at Post op Week 12 Code	ACD PRE OP	ACD POST AT WEEK 12
131	60	2	M	CF 4M	6/24	15	2	550	NS II + PSC	43.75	44.00	20.00	Right	24.59	4.00	17	2	14	1	14	1	14	1	2.94	4.36
132	40	1	F	CF 5M	6/60	12	1	536	NS II + PSC	45.25	46.00	20.00	Right	21.80	1.00	14	1	14	1	14	1	14	1	2.50	4.46
133	70	3	M	6/36	6/24	16	2	565	NS I + PSC	40.75	41.25	107.00	Right	23.93	3.00	18	2	15	2	13	1	12	1	2.76	4.19
134	62	3	F	6/60	6/24	18	2	616	NS II + PSC	44.00	44.50	7.00	Right	22.90	2.00	15	2	13	1	12	1	12	1	2.38	4.41
135	74	3	M	6/60	6/36	15	2	551	NS III	40.25	40.25	101.00	Right	22.42	2.00	13	1	13	1	13	1	13	1	2.51	3.98
136	50	2	F	CF 4M	6/36	11	1	550	NS III + Cortical	44.50	46.00	16.00	Right	23.22	3.00	9	1	9	1	9	1	9	1	2.58	4.15
137	54	2	F	6/36	6/36	14	1	536	NS II	42.00	42.75	79.00	Right	24.20	4.00	16	2	12	1	12	1	12	1	2.34	4.32
138	62	3	F	6/60	6/12	14	1	551	NS II + PSC	41.25	43.00	86.00	Right	22.60	2.00	17	2	15	2	13	1	15	2	2.67	3.91
139	65	3	M	CF 3M	6/60	18	2	575	NS IV	42.50	43.00	10.00	Right	21.92	1.00	19	3	18	2	16	2	16	2	2.96	4.47
140	70	3	F	CF3M	6/36	15	2	535	NS IV	40.75	41.25	22.00	Right	23.46	3.00	19	3	15	2	15	2	15	2	2.84	4.32
141	82	3	M	CF4M	6/36	17	2	535	NS III + Cortical	45.25	47.50	79.00	Right	21.46	1.00	19	3	17	2	15	2	15	2	2.63	4.15
142	75	3	M	CF4M	6/24	14	1	592	NS IV	43.84	45.40	87.00	Right	22.80	2.00	17	2	16	2	14	1	13	1	2.95	4.43
143	73	3	M	CF3M	6/60	16	2	545	NS III + PSC + Corticol	43.00	44.25	91.00	Right	21.96	1.00	16	2	14	1	12	1	12	1	3.27	3.88
144	57	2	M	6/60	6/36	19	3	505	NS II + Cortical	41.74	42.50	155.00	Right	23.40	3.00	19	3	17	2	15	2	15	2	2.96	4.13
145	50	2	M	6/60	6/24	15	2	518	NS III + PSC	42.00	42.75	103.00	Right	23.08	3.00	13	1	12	1	12	1	12	1	3.34	3.94
146	55	2	M	6/60	6/24	20	3	515	NS III	43.00	43.50	63.00	Right	22.60	2.00	22	3	20	3	18	2	18	2	3.28	4.08
147	60	2	M	6/36	6/24	16	2	588	NS II + Cortical	43.75	44.50	78.00	Right	23.02	3.00	18	2	14	1	14	1	13	1	2.47	4.38
148	40	1	F	6/60	6/12P	18	2	492	NS III + PSC	45.25	46.75	110.00	Right	22.60	2.00	22	3	20	3	16	2	16	2	2.81	4.17
149	70	3	F	6/24	6/12	17	2	555	NS II	43.75	44.25	170.00	Right	21.92	1.00	18	2	15	2	15	2	14	1	3.09	4.04
150	62	3	F	CF 4M	6/60	21	3	500	NS III + PSC	42.00	43.50	55.00	Right	23.22	3.00	19	3	18	2	19	3	18	2	2.37	3.92