DISSERTATION ON

STUDY ON VISUAL OUTCOME AFTER SIMULTANEOUS PTERYGIUM AND CATARACT SURGERY AMONG PATIENTS ATTENDING TERTIARY CARE HOSPITAL, KANCHEEPURAM DISTRICT, TAMIL NADU

Dissertation submitted to

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CERTIFICATE

Certified that this dissertation entitled **"STUDY ON VISUAL OUTCOME AFTER SIMULTANEOUS PTERYGIUM AND CATARACT SURGERY AMONG PATIENTS ATTENDING TERTIARY CARE HOSPITAL, KANCHEEPURAM DISTRICT, TAMIL NADU"** is a bonafide work done by Dr. Z. MOHAMED ABDULLAH, Post graduate student, Karpaga Vinayaga Institute of Medical Sciences, Madhuranthagam, during the academic year 2017 – 2020.

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DECLARATION BY THE CANDIDATE

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CERTIFICATE – II

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CERTIFICATE FOR APPROVAL

The Institutional Ethical Committee of Karpaga Vinayaga Institute of Medical Sciences & Research Centre, Maduranthagam reviewed and discussed the application for approval **"Study on visual outcome after simultaneous pterygium and cataract surgery among patients attending tertiary care hospital in Kancheepuram district, Tamil nadu."** by **Dr. Z.Mohamed Abdullah, I PG,** Guided by **Dr.G.S.Srinivasan**, Professor and Head, Department of Ophthalmology, Karpaga Vinayaga Institute of Medical Sciences & Research Centre, Maduranthagam.

The proposal is **APPROVED**

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

04/12/17

Chairperson, Ethics Committee

Date:04 /12/17

CHAIRMAN * Member Secretary Institutional Ethical Committee * KIMS

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CONTENTS

ABBREVIATIONS

MAR	-	MINIMUM ANGLE OF RESOLUTION
LOGMAR	-	LOGARITHM OF THE MINIMUM ANGLE OF RESOLUTION
VEP	-	VISUAL EVOKED POTENTIAL
ICCE	-	INTRACAPSULAR CATARACT EXTRACTION
ECCE	-	EXTRACAPSULAR CATARACT EXTRACTION
SICS	-	SMALL INCISION CATARACT SURGERY
PCIOL	-	POSTERIOR CHAMBER INTRAOCULAR LENS
IOL	-	INTRAOCULAR LENS
HIV	-	HUMAN IMMUNODEFICIENCY VIRUS
DNA	-	DEOXYRIBONUCLEIC ACID
RNA	-	RIBONUCLEIC ACID
5-FU	-	5- FLUORO URACIL
LCAT	-	LIMBAL CONJUNCTIVAL AUTOGRAFT
K1	-	KERATOMETRIC DIOPTERIC POWER OF CENTRAL HORIZONTAL CORNEAL MERIDIAN.
K2	-	KERATOMETRIC DIOPTERIC POWER OF CENTRAL VERTICAL CORNEAL MERIDIAN.

CCC	-	CONTINUOUS CURVILINEAR CAPSULORRHEXIS
PMMA	-	POLY METHYL METHACRYLATE
WHO	-	WORLD HEALTH ORGANISATION
SPSS	-	STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES.
UCVA	-	UNCORRECTED VISUAL ACUITY
BCVA	-	BEST CORRECTED VISUAL ACUITY.

INTRODUCTION

INTRODUCTION

Pterygium is a common ocular surface disorder. It is a degenerative growth in the subconjunctival tissue which proliferates as a fibrovascular granulation tissue enc roaching over cornea replacing bowman's membrane and corneal epithelium.[1-3] Pterygium is more common in tropical country like India, and has been found to have positive correlation with excessive exposure to sunlight which is common in South India.[4,5] This has been directly attributed to the higher exposure levels to outdoor ultraviolet radiation. Among several studies carried out in India, the prevalence of pterygium ranges between 8-15%[5,6]. Although the prevalence is lower, the disease condition involving conjunctival growth may commonly progress towards the cornea, resulting in corneal aberration, scarring and impairment of vision. Apart from exposure to ultraviolet radiation, there are not many risk factors identified to be attributed to pterygium. A few studies have shown that old age could be a potential risk factor.[7]

One of the most common, yet another ocular manifestation in old age is senile cataract. Senile cataract is opacification of formed clear

lens fibres, have high incidence and early onset in Indian subcontinent.[8] The prevalence of senile cataract in South Indian population was approximately 56% in comparative studies.[9]Being a country of diverse climatic and lifestyle patterns, the risk factors of senile cataract in India are often unpredictable. However, evidences point out to strong association between ultraviolet radiation and incidence of cataracts, especially in the tropical countries like India. This directly incriminates to the fact that pterygium and senile cataract presents as a concurrent problem more common in tropical region.[10]

The predominant and definitive treatment of choice for both these conditions is surgery. The choice and time of surgical intervention has been considered in some studies. Simultaneous excision of pterygium combined with cataract surgery has been proposed as a relatively better option, with increased efficacy and safety, according to Kamiya et al.[11] A study of simultaneous pterygium and cataract surgery, resulted in improved visual acuity of 6/12 (snellen meter scale) in around 63.3% of the patients at 6 week follow up and in upto 80% of recurrent pterygium cases improved to 6/24 visual acuity after 6 month

follow up.[12] However, this study used older cataract surgery procedure and pterygium surgery with bare sclera with 500 rads of beta radiation, resulting is certain disadvantages. This had resulted in high rates of recurrence (40%).

In contrast, when phacoemulsification was the procedure of choice, combined with the use of mitomycin-C for pterygium excision, the recurrence rates were as low as 10%, with 57% of the patients improving to 20/40 visual acuity (snellen foot scale) which is snellen equivalent of 6/12 in meter scale , and 42% of the patients improved to 20/200 visual acuity (snellen foot scale) which is equivalent to 6/60 (snellen meter scale) in first month of follow up. At longer follow up periods upto 6 months, approximately 30% had improved visual acuity.[13]As mitomycin-c usage has been associated with scleral and corneal melting it has some disadvantages. In addition, phacoemulsification was not cost effective and the success depended on the skills of the surgeon. Another study showed use of inferior limbal conjunctival autograft transplant after pterygium excision had better

result in terms of recurrence (4%)compared to superior conjunctival autograft (4.2%) with definite advantages over other.[14]

Identifying the ideal procedure to combine the therapeutic options for both pterygium and cataract continues to be a challenge to many surgeons. With cost effectiveness and practical applications on one dimension and considerable improvements in the visual acuity and low recurrence rates form essential components determining successful surgeries. While small incision cataract surgery may be an ideal option, combining it with inferior limbal conjunctival autograft transplantation may prove to be successful protocol of choice for the management.[15]

There are very few studies done to evaluate the ideal protocol for simultaneous surgeries for cataract and pterygium. Adequate research in determining the standard protocol will go a long way in effective management of both these conditions, and also provide better compliance among patients, in terms of cost effectiveness, physical disabilities and socioeconomic constraints including longer duration of hospital stay, increased rates of dependency for daily activities, loss of

wages, and many more. This will also further reduce the recurrent strains on the eye for repeated surgery, considering that atleast 6 weeks of gap between surgeries is advocated, if performed separately. [16]

AIMS AND OBJECTIVES

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Aim

This study was carried out to compare the visual acuity before and after simultaneous small incision cataract surgery and pterygium excision with inferior limbal-conjunctival autograft transplantation.

Objectives

1. To evaluate the visual acuity of patients with senile cataract and pterygium after simultaneous small incision cataract surgery following pterygium excision with inferior limbal conjunctival autograft transplantation.

2. To serially assess the visual acuity on postoperative day 1, week 1 and week 6 following simultaneous small incision cataract surgery and pterygium excision with inferior limbal-conjunctival autograft transplantation.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Visual Acuity [17]

Visual acuity refers to the ability to identify the shapes and details of images that are seen by the naked eye. It is one of the aspects of the overall vision. The other aspects include colour vision, peripheral vision and depth perception. Visual acuity is defined as the measurement of central vision. It is the assessment of the total visual system from the cornea to occipital cortex. Visual acuity can be tested for both distant vision and near vision. Distance visual acuity is most commonly used measure. In other words, visual acuity is measure of the spatial resolution of the eye. If two objects are close, then two adjacent cones are stimulated, the patient would appreciate them as a single target. Therefore, there must be an unstimulated target between stimulated cones to allow for the resolution of two targets to adjust. In real sense visual acuity is a measure to assess the retinal function which is concerned with the appreciation of form sense.

The measurement of visual acuity is carried out using Snellen chart for distant vision. It is done to monitor the change in the vision

with the progression of a disease in the presence or absence of a particular problem in the visual path way. Visual acuity is dependent on various factors including the refractive error of the eye, health and integration of the eye, test targets used and the test conditions. The principle behind Snellen chart is that the fact that two distance points can be visible as a separate, only when they subtend at an angle of one minute at the nodal point of the eye.

Snellen test is carried out by placing chart consisting of series of capital letters on white board arranged in each line progressively diminishing in size. The lines representing the letters have the ideal breadth that will be subtended at an angle of one minute at the nodal point. Each letter of the chart is so designed that it fits in a square and the sides of which are five times the breadth of the constituent lines. Therefore, at a given distance each letter subtends an angle of 5 minutes at the nodal point of the eye. The letters on the top of the lines of the Snellen chart should be clearly seen at a distance of 60 meters. Progressively coming down the chart, the letters would be read from a distance of 36, 24, 18, 12,9,6,5 and 4 meters respectively. However the

patient whose visual acuity is to be tested is placed at 6 meter distance from the chart and his/her ability to read each line is assessed by reading from one eye at a time. It is important to illuminate the chart in order to facilitate easy readability and the patient is asked to read the chart with each eye separately and visual acuity is recorded as 6/6 if normal which means that at 6 meters, the patient is able to read all the letters in a line which is to be read at 6 meters normally. At whatever line the patient stops reading, that is the measure of the visual acuity which may be 6/ 60 or 6/ 36 etc. If the patient is unable to read the top line even at 6 meters he is asked to move further towards the chart by 1 meter and inspite of these if he is unable to read counting fingers is the next alternative test for visual acuity.

Other tools to measure visual acuity

One of the most important tools for measuring visual acuity is the distance vision chart or Snellen chart. While Snellen chart compares the visual acuity in terms of the distance at which the person is able to read in proportion to the distance at which it is ideally read, the visual acuity in Snellen chart is expressed as a proportion. The denominator in

Snellen grading is an indirect measure of the size of the letters at the angle they subtend. Therefore the classic Snellen fraction is the reciprocal of the minimum angle of resolution (MAR).

Another measure of a visual acuity is LOGMAR scale. [17] According to this a notation of the visual acuity that has the same clinically significant difference between each line allows easy recording of every letter read and is log of minimum angle of resolution.

MAR is arrived by dividing the denominator by the distance at which the letters were read. Therefore, the Snellen acuity of 6/12 or 20/40 corresponded to MAR of 2 minutes of the arc. LOGMAR scale allows for constant geometric progression over each step. Derivation has been used in the construction of chart such as Bailey Lovie chart. If the vision is subnormal, the visual acuity is determined by asking the patient to read the letters through a pin hole.

Best Corrected Visual Acuity:

To determine the function of macula, the refraction of eye must be determined and visual activity should be adjusted in the same by correcting glasses by both subjectively and objectively.

The laser interferometer forms a diffraction pattern of the parallel lines on retina through moderate cataract. The patient is asked to identify the orientation of progressively fine lines to establish the visual acuity which can be regained after surgery.

Potential acuity-meter projects a tiny Snellen chart on to the retina through the window in lens opacity and the patient is asked to read the alphabets.

In younger children infant visual function is assessed using visual evoked potential (VEP) and preferential looking behaviour. Other test including Keener Elliot and Kay picture test, Cardiff Acuity Cards, and teller's Acuity test.

Conditions affecting the visual acuity in old age

Old age is characterised with several changes in the physical and mental functioning of the body of which vision is one of the major changes. Many older adults have deficits in visual processing of visual information and this can affect their day today activities. The factors which result in this visual impairment may be physical, physiological or neurological. Among the several physical causes the most important structural causes which result in blindness include senile Cataract, pterygium, retinal detachment, etc. Among the physiological causes the most often encountered cause of visual impairment includes issues related to dark adaptation, spatial contrast sensitivity and scotopic contrast sensitivity. Some of the neurological problems involving visual impairment include macular degeneration, retinopathy following diabetic, and hypertensive states etc. While most of these conditions require greater amount of evaluation one of the common conditions include senile Cataract and pterygium.

Senile cataract:

Cataract is defined as loss of lens transparency because of opacification of the lens. Cataract is often age related and sometimes it can also occur in the paediatric age group. Age related cataract, also known as senile cataract occurs in the adults beyond 45 years of age and is often associated with low to medium socioeconomic background and is therefore common in developing countries.[17] According to World Health Organisation around 95 million people are set to be visually impaired because of cataracts in a survey done in 2014. The incidence of cataract increases with age from the 3.9% at the age of 55 years to 92.6% at the age of 80 years.[18] The number of cataract surgeries has been constantly on the rise in the past few decades and several studies have demonstrated newer advanced techniques for effective cataract surgeries.

Pathophysiology of senile cataract:

The lens is a transparent biconvex object which causes refraction and focuses light on to the retina. The lens is composed of fibres enclosed in a thin capsule and has many thin zonules on both the

sides. The lens fibres are derived from lens epithelium and as they are generated, the older fibres migrate towards the centre. The nucleus of the lens in the centre consists of older lens fibres and the newly formed lens fibres are present in the peripheries, which are known as the cortex. In senile cataract, the lens fibres become opacified due to ageing fibres. The opacity of the lens fibres is direct outcome of oxidative stress. Based on the presence of the opacification within the lens, the senile cataracts are classified as cortical, nuclear and posterior subcapsular cataract. The lens fibres are metabolically active when they undergo oxidation, cross linking and because of insolubilization these cells migrate to the centre of the lens and progressively get compressed resulting in sclerosis and opacity. The cortical cataract starts at the periphery. The nuclear cataract begins from the centre and proceeds towards the periphery, while posterior subcapsular cataract is present in the posterior region of the lens fibres below the encapsulated sheath.

[Lens Opacities Classification System-III]

Burden of cataract in India

Cataract has been identified as the most important cause of bilateral blindness in India. It has been responsible for 50% to 80% of the bilateral blindness in this country. [19] According to the reports of World Health Organisation, there has been a considerable drop in the incidence of blindness to 25% recently and much has been done in continued effort by the National and International agencies to control and prevent cataract associated blindness. [20] With the proportional increase in the population of elderly, the incidence of cataract continues to rise and this has put forward challenges involving providing treatment options which are both affordable and effective. The population of 50 years and above adults has increased from 13% in 1991 to 13.7% in

2001 and as a result of this the percentage of people with blindness has also increased in this age group. Hence, the figures point out to the fact that there has been increase of 2.38 lakhs surgeries per year in the last 16-year period and is projected to increase by 4500 per 10 lakhs population in the years to come. [20]

Management of senile cataract:

Cataract involves opacity in the lens which has to be replaced surgically. Before decision on the surgical technique is being made, it is essential to evaluate the eyes for various aspects of vision. One of the key aspects is the visual acuity testing followed by contrast sensitivity evaluation. This may be done using Pelli Robson contrast sensitivity chart and in addition visual field testing is done to evaluate the peripheral vision. An external examination of extra ocular motility, pupils and cover test are also routinely done. In addition, pupillary reaction test is done by swinging flash light and also by consensual light reflex test. Other special test include testing for macular function using light discrimination test, maddox rod test, colour perception, entoptic visualisation, blue light entoptoscopy and Purkinje's entoptic

phenomenon. Retinal function is also evaluated through electroretinogram and visual evoked potentials. A slit lamp examination is carried out to examine the eyelids, lacrimal apparatus, sclera, conjunctiva, anterior chamber, cornea, iris and crystalline lens. Fundus evaluation is carried out using ophthalmoscopy and optic nerve is also examined. Measurement of intraocular pressure is done and conjunctival swab is usually sent for culture and sensitivity. Sac patency test is done to exclude dacryocystitis. Oral and dental check up is also carried out to evaluate other focus of sepsis. Pre-operative biometry is done in the form of karatometory, A scan ultrasonography and in addition to these scans, corneal topography, corneal pachymetry and spectral microscopy are also carried out, whenever necessary.

Surgical management of cataract:

Cataract surgery is one of the most cost-effective management interventions for senile cataract. It is performed very often and commonly in all countries including developing countries like India. It is usually quick, risk free and has limited hospital stay and therefore does not impact the quality of life of the patients. There are several

techniques of performing a cataract surgery and the evaluation of cataract surgery over the past three decades has been effectively possible due to improvisations of a cataract extraction. In early days, Sir Stewart Duke carried out intra capsular cataract extraction (ICCE) as a surgery of choice in 1967. However the intraocular lens implant study demonstrated the superiority of extra capsular cataract extraction with the posterior chamber intraocular lens implantation (ECCE with PCIOL) over ICCE.[21] Although both had similar results with respect to correction of visual acuity, extra capsular cataract extraction (ECCE) with PCIOL had a lesser complications and resulted in better vision. However further study done in the United Kingdom placed phacoemulsification as a most superior form of cataract surgery compared to the ECCE. Manual small incision cataract surgery (SICS) in which the nucleus is prolapsed through the self -sealing scleral tunnel was developed in the United States and Israel and later popularised in India. SICS was found to be more effective and cost effective compared to both ICCE and ECCE and it became one of the most popular manual surgeries as a replacement when phacoemulsification (phaco) was found to be expensive.

On comparing the advantages between phaco and SICS there is a difference of 0.3 to 0.5 dioptre of astigmatism between SICS and phaco, And the cost difference between these two surgeries was substantial.[21] While it may be possible to have small incision with SICS some cataracts such as grossly subluxated lenses or very hard cataracts require larger incision thereby affecting the cosmetics and aesthetics of the surgery.

Phacoemulsificition has been established as the gold standard technique for cataract extraction. Phaco with foldable IOL's are easy and available with the assistance of phaco machines and wherever the trained surgeons are present, in addition at regions where the services were affordable phaco is undoubtedly the treatment of choice. As far as the financials are concerned the cost of the technology as such is high; in addition, the consumables and training expenditure for given resources are equally higher. This places phaco as significantly higher priced procedure and cataract being a widespread problem in all the socio-economic section, only 10% of the population in developing country like India can afford phaco. As far as SICS is concerned, it does

not require expensive machines. Hence it is cost effective. A minimal incision of 6 mm is created and superior frown shaped sclero-corneal tunnel is constructed. Thereafter a trypan blue capsulorhexis is created. After hydrodissection, the nucleus is prolapsed from the capsular bag with sinskey hook. This is followed by extraction using an irrigating vectis. This is followed by implantation of single piece intraocular lens made of poly methyl methacrylate into the capsular bag and the anterior chamber is reformed and the tunnel is self-sealing and the wound does not need suturing. [21]

Several studies have been done to compare the effectiveness between various surgical techniques like ECCE, SICS and phaco. A study done by Zia et al in 2010 compared the SICS with ECCE on 100 cataract patients. It was observed that there was significant difference, with a post operative improvement in the visual acuity of 6/9 and above in 83% of the subjects who underwent SICS with PCIOL compared to 6/18who underwent ECCE with PCIOL. The study showed that both SICS and ECCE were safe techniques for treatment of cataract surgery. Although SICS procedure gave better uncorrected vision.[22]

Minassian et al compared ECCE with phaco surgery and it was found that surgical complications within one year after surgery was significantly lesser with phaco and higher proportion of patients with phaco achieved unaided visual acuity of 6/9 or better in 67% of the participants ($p<0.001$).[23]

Thomas et al in 2003 evaluated the differences between SICS and phaco in achieving post operative target intraocular pressure. At 6 months period the targeted intraocular pressure was achieved to be 75.6% in the phaco, whereas in SICS it was 73%. It is definitively proved that SICS is equally effective in achieving the intraocular pressure reduction as much as phaco.[24]

Venkatesh et al in 2010 evaluated the outcome and the chance of complication like infectious endophthalmitis between phaco and SICS. It was observed that the mean time of surgery was shorter for SICS compared to phaco however both had excellent visual outcome and lower complication rates.[25]He also compared the astigmatism between SICS and phaco and this study proved that the difference in astigmatism between phaco and SICS was negligible and the difference

was statistically not significant. Thereby SICS is equally effective in controlling astigmatism. Studies done by Singh et al noted that good visual outcomes were equally present in both the groups. Poor visual outcome was present in 6% of phaco patients compare to 1% of SICS patients.[26] Therefore concluded that SICS was significantly superior than phaco and in addition considering the affordability SICS was any day a preferred treatment of choice.

Pterygium:

Pterygium is structural deformity of the eye that occurs in old age. It is a degenerative growth in the subconjunctival tissue which proliferates as a fibrovascular granulation tissue encroaching over cornea. It is often shaped like a wedge. Pterygium crossing more than 2mm over cornea can induce astigmatism [27] and high grade pterygium can cause impairment to the vision, it requires surgical correction for visual improvement, sometimes cosmetic and for those symptomatic patients as well.[28]

The prevalence of pterygium varies from 0.7% to 31% all over the world. In tropical countries it can be as high as 15 to 20%.

Pterygium can impact the vision by inducing excessive astigmatism. The reported rates of incidence of pterygium recurrence is around 25 to 45% after a simple excision.[29]

Pterygium is graded depending on the extent of corneal involvement[30]

Grade I- Head of the pterygium present between limbus and a point midway between limbus and pupillary margin.

Grade II- Head of the pterygium present between a point midway between limbus and pupillary margin, and a point which is on pupillary margin.

Grade III- Crossing pupillary margin.

Pterygium is classified depending on the extent to which the sclera and other contents are obscured as follows[31][Tan's classification]

S. No	Grade	Description
1	T1 (atrophic)	Episcleral vessels underlying the body of pterygium were unobscured and clearly distinguished.
2	T2(Intermediate)	Episcleral vessels not indistinctly seen or partially obscured
3	T3(fleshy)	Episcleral vessels underlying the body of pterygium were totally obscured

Surgical Management of Pterygium:

The first ever reported surgical approach towards management of pterygium was using a thread and needle which were passed underneath the pterygium and was removed using a sawing machine. [32] Although this successfully resulted in removal of the pterygium, it was associated with dreadful complications including blindness and pain. Further to this, in order to alleviate the dangers, various techniques were employed involving removal with simple conjunctival forceps which was successful but resulted in increased rates of recurrences.

Later on transplantation of the pterygium head away from the cornea was often carried out and this was simple procedure resulting in few complications. [32] Recent techniques of pterygium management include bare sclera excision where there was a complete excision of the pterygium head and the removal of the adjacent normal conjunctiva with the removal of underlying tenon's capsule tissue resulting in a bare sclera. This was followed by the suturing of the bulbar conjunctiva. Although the technique was successful, it resulted in increased rate of recurrences and infections. The surgeons had to improvise on this technique. [15]

Instead of leaving this sclera bare, the improvisation of the technique was involved with grafting [33]. The mucous membrane grafting was the first procedure to be carried out where conjunctival auto grafting as well as limbal conjunctival autografting were introduced later. This resulted in lower recurrence rates and was successful. Another approach to replacing the bare sclera was amniotic membrane grafting. Amniotic membrane which was taken from the placenta's inner lining composed of three layers- single epithelial layer, a thick basement

membrane and an avascular stroma. Amniotic membrane had all characteristics suitable for replacing pterygium tissue and because of anti-inflammatory, anti-scarring and anti-angiogenic properties it was considered to be effective. However, there was an increased need of using fresh or cryopreserved amniotic membrane which increased the demand of the membrane availability. More over there had to be mandatory mechanisms for screening for HIV and hepatitis B which could increase the risk of severe infections and life-threatening complications.

In place of amniotic membrane, fibrin tissue glue was also used. Fibrin glue consists of sealer protein concentrate containing fibrinogen, fibrinolysis inhibitor, thrombin and calcium chloride solution. When this was mixed and applied the two solutions interact and mimic clotting cascade thereby creating adhesion. This clotting adhesion dissolves after 2 weeks and gives adequate time for the conjunctiva to heal. Although the chances of infection are lower there are minimal chances that HIV and hepatitis infection could occur in the pooled donor thrombin cells. This could be replaced in the future by

recombinant technology for developing harvested fibrin instead of human sources of fibrin glue.

Various adjuvant therapies have been tried for replacing the tissue of which mitomycin C and fluorouracil (5FU) are being commonly used. Mitomycin C is a potential alkylating agent which interferes in DNA replication and RNA protein synthesis. Topical application of mitomycin C inhibits the growth of fibroblasts and conjunctival grafting reduces the recurrence of both primary and recurrent pterygium. It was associated with minimal rates of recurrence and minimal risk of infections. Use of 5-FU a fluorinated pyrimidine inhibits the proliferation of fibroblasts involving inhibition of thymidylate synthetase and other enzyme related to nucleic acid biosynthesis. It has been associated with use for glaucoma management leading to severe epitheliopathy and corneal infections. Mitomycin C had better response rates to therapy compared to 5 FU.

Simultaneous management of senile cataract and pterygium

In a tropical country like India, the incidence of pterygium and senile cataracts are always high. Although this may be attributed to

visual problems of old age, exposure to pollutants and ultraviolet radiation are important factors. It is an established fact that pterygium affects the visual acuity when it extends into the visual axis. In such situations, the corneal curvature along the long axis of the pterygium body is flattened. Therefore, excision of pterygium can result in reduction in astigmatism due to steepening of the cornea. Therefore due care is to be taken to calculate the IOL power when both pterygium and cataract are simultaneously operated upon. Studies have shown that simultaneous correction of both the conditions is the best therapeutic option as it not only minimizes the cost and other health care adversities, the surgical outcomes are much superior and reduced rates of recurrences are observed. [16]

A study “Simultaneous pterygium excision with Mitomycin C and Phacoemulsification” published in Thammasat Thai Journal of Ophthalmology In the year 2007 done in Had Yai Hospital, Songkla province, Thailand. This study was conducted by Jaratkit Chanpong. In this study simultaneous procedure has been performed in 40 patients having concurrent pterygium and cataract. The result on visual outcome

was found to be as, 8 out of 16 (50%) patients with pterygium larger than 3 mm in size and senile cataract, had visual recovery to 20/40 which is 6/12 of snellen metric equivalent. Among 15 out of 24patients (61 %) who had pterygium less than 3 mm in size and senile cataract, had visual recovery to 20/40 which is 6/12 of snellen metric equivalent. Thus, 23 out of 40 patients had visual recovery to 20/40 snellen equivalent of 6/12 in meter scale. [34]

A study “Simultaneous pterygium and cataract surgery” published in Journal of Postgraduate Medicine in the year 1995. This study was conducted by Gulani A, Dastur YK in Dept. of Ophthalmology, KEM Hospital, Parel, Bombay (Mumbai), India. [16] This study involved simultaneous surgery, pterygium excision (bare sclera technique with beta irradiation)first followed by either extracapsular (ECCE) or intracapsular cataract extraction(ICCE) for correcting concurrent senile cataract and pterygium in 30 patients. This study showed visual outcome of 6/12 (snellen meter scale) in 19 out of 30 patient at 6 week follow up and in 7 out of 12 recurrent cases improved to 6/24 after 6 month follow up.

A study “Simultaneous pterygium and intraocular surgery” published in British Journal of Ophthalmology in the year 1990.[35] This study was conducted by Ibechukwu BI, Department of ophthalmology, jos university teaching hospital, in jos, plateau state, Nigeria. Involving 15 patients out of which 11 undergone simultaneous pterygium excision (Bare sclera technique) with cataract extraction (ECCE and ICCE technique), found that there is no evidence of increased risk of pterygium recurrence and complication of combined procedure per se. He advocates completion of pterygium excision before cataract surgery procedure and found visual prognosis better. And combined procedure is beneficial to hospital and patient as well interms of avoiding multiple hospital visits with multiple procedure in same eye and cost effectiveness, thereby reducing infection and pain.

A study “Predictability of Intraocular Lens Power Calculation after Simultaneous Pterygium Excision and Cataract Surgery” published in the journal “medicine (Baltimore)” in the year 2015. [11] Study was conducted by kamiya et al, department of ophthalmology, University of Kitasato School of medicine, Kitasato, Kanagawa, Japan. Moderate

accuracy in predicting the intraocular lens power calculation after simultaneous pterygium excision and cataract surgery. The combined procedure was safe and effective.

A study “Inferior limbal-conjunctival autograft transplantation for recurrent pterygium” published in “Indian journal of ophthalmology” in the year 2000. This study was conducted by Wong a k et al, department of ophthalmology and visual sciences, Chinese university of Hong Kong, Prince of Wales hospital, Hong Kong.[36] This was done in 11 patients with pterygium and found that the inferior limbal-conjunctival autograft transplantation (LCAT) is effective and safe option. Especially in management of recurrent pterygium after superior limbal conjunctival autografting. It can be procedure of choice in patients with suspected or proven glaucoma, for whom superior conjunctival bleb is vital filtration area for the success of trabeculectomy procedure.

METHODOLOGY

METHODOLOGY

Study design:

This study was carried out as a prospective cohort study.

Study setting:

This study is carried out in the department of Ophthalmology, Karpaga Vinayaga Institute of medical science and research centre.

Study duration:

This study was carried out for the period from January 2018 to June 2019.

Study population:

All the adults who presented to the outpatient department of ophthalmology of our tertiary care centre with the concurrent cataract and pterygium in the same eye formed the study population.

Inclusion criteria:

1. Patients with concurrent grade 2 pterygium with cataract on the same eye. (senile immature cataract or senile mature cataract)
2. Patients with full range of eye movement with clear cornea, normal functioning pupil and normal B scan study, lacrimal duct patency in both the eyes and normal intra ocular pressure were taken up for study.
3. Controlled systemic hypertension and well controlled glycaemic state without retinopathy on either eye.
4. Patient with nasal pterygium.

Exclusion criteria:

1. Patients with central corneal opacity (involving visual axis)
2. Patients with glaucoma
3. Patients with ocular infection.
4. Patients with retinopathy.
5. Double pterygium.

Sample size and sampling techniques:

All the patients who were diagnosed with concurrent pterygium and cataract in the same eye during the study period were included in the study. A total of minimum 30 patients were planned to be studied. They were to be selected by a non-probability sampling method, convenient sampling method.

A total of 54 patients fulfilling the eligible criteria were involved in our study.

Ethical approval and informed consent:

Approval was obtained from the institutional ethical committee prior to the commencement of the study. Each participant was explained and detailed about and the informed consents were obtained prior to the data collection.

Data collection:

Pre-operatively visual acuity was recorded for all the participants. The following investigations were carried out to ensure that

the participants were fit for the surgery. Snellen chart was used for calculating the visual acuity. Direct ophthalmoscope and slit lamp examination were carried out. Fundus examinations were done under slit lamp with Volk aspheric lenses of +78D /+90D and indirect ophthalmoscopy with Volk double aspheric+20D lens. Goldmann Applanation tonometer was used for documenting the intra ocular pressure. Bausch and Lomb keratometer was used for calculating K1 and K2 values. An applanation ultrasound A-scan(Appascan 2000) was used in documenting the axial length of the eye ball. A structured interview schedule was used to document the demographic particulars of the study participants. Following the operative procedure, post operative visual acuity was recorded for three follow up visits on the post operative day 1, after 1st week and after 6 weeks of surgery.

Surgical procedure:

PREOPERATIV PREPARATION:

Preoperative antibiotic eye drop (moxifloxacin 0.5%) is advised for the operating eye for four times a day for 3 days prior to the

surgery. Patient was taken up for the surgery only after ensuring the patency of the lacrimal duct and after eye lash trimming.

On the day of surgery operating eye is dilated with tropicamide (0.8%) with phenylephrine (5%) eye drop. Eye drop flurbiprofen (0.3mg) is applied before surgery to prevent intraoperative miosis.

Pterygium excision with inferior limbal conjunctival autograft followed by manual small incision cataract surgery.

The patient was made to lie in the supine position. Under peribulbar anaesthesia by standard technique, after cleaning periocular area with povidone iodine solution 10% and conjunctival sac with povidone iodine 5% drops, first pterygium excision is planned. Surgical drape is applied and barraquer wire speculum is applied. Firmly adherent fibrovascular pterygium tissue is held by Castroviejo colibri forcep and slowly excised from firm attachment with underlying corneal surface and scleral bed. The thick fibrovascular tissue with conjunctiva over it and abnormal tenon's capsule beneath it is slowly dissected and excised at the line of demarcation of pterygium tissue where it is

continuing with the normal conjunctival tissue using Westcott scissor. Cornea is polished using crescent knife carefully. Using Castroviejo callipers the defect size is measured. Conjunctival autograft donor site in the inferior limbal region is marked with the surgical sterile marker pen using calliper reading (slightly oversized of about 0.5-1 mm). Then 2% lignocaine is injected beneath the conjunctiva separating the tenon's layer at the graft harvesting area. The conjunctival graft is cut using Westcott scissor and the graft is rotated and placed in such a way that limbal side of graft is laid over the limbus of pterygium excision site. The graft is secured with autologous serum in the graft bed as glue and the graft is pressed by a sterile cotton bud against the bed for two to three minutes to ensure graft stability and avoid extra bleeder to accumulate blood in the bed which may result in displacement of graft. The reason for us in choosing inferior limbal autograft is that the nature of cataract surgery where the incision is planned superolaterally, and the superior conjunctiva is available without scarring for future glaucoma surgical procedure if at all planned. The inferior limbal autograft is safe and post operative patient discomfort is less.[37] And the choice of autologous serum in this study was mainly about lowering surgical time

against suturing technique and it is equally effective as fibrin glue with no allergic complication [38], post operative graft inflammation is significantly lower [39] and cost effective.

The second procedure of manual small incision cataract surgery (SICS) is performed. A superior rectus bridle suture is placed. Using Castroviejo calliper 6 to 7 mm for immature cataract and 7 to 8 mm for nuclear mature cataract, incision size is marked on the superotemporal conjunctiva in about 3mm distance from the limbus. The reason for choosing the superotemporal incision is that as the nasal pterygium induces with-the-rule astigmatism, higher astigmatism for increasing grades of pterygium [40,41], performing the manual SICS with superior incision results consistently in against-the-rule astigmatism of about 1.28 D [42], which when combined with pterygium excision has the increased chance of resulting post operative higher dioptre of against-the-rule astigmatism which may decrease post-operative visual acuity. The same study has also shown the superotemporal and temporal incision has induced less astigmatism(with-the-rule astigmatism) compared to superior incision

group. So it is wise to choose superotemporal incision than the superior, as temporal incision has its own limitation as it would make inferior limbal graft harvesting for pterygium surgery a tad difficult.

Using Westcott scissor the fornix based conjunctival flap is created. Using bard-parker knife with #15 blade[43] is used to make straight incision of about 0.3mm depth on sclera is made. Haemostasis is achieved with bipolar diathermy cautery. The scleral tunnel is sculpted using crescent blade at 0.3 mm of depth which is assessed by noting the just visibility of blade through the sclera. Once limbus is reached the tunnel is converted into flap by forward and backward motion of blade cutting the tissue while coming out. Scleral pockets are created on either side of tunnel. The width of trapezoid tunnel was about 4mm. then a side port is created at about 3 clock hour away from incision site temporally using side port stab blade. After injecting small air bubble capsule staining is done using trypan blue. After washing stain with ringer lactate solution the bent 24 gauge needle capsulotome is inserted into anterior chamber for making continuous curvilinear capsulorrhexis(CCC). Anterior chamber is formed with the help of

viscoelastics whenever needed. The nucleus is rotated, tilted and delivered using vectis and lens hook by sandwich lens delivery technique. In case of immature cataract the nucleus is rotated after hydrodissection gently after CCC. After cortical wash with two way aspiration and irrigation cannula, PMMA rigid PCIOL of calculated power is implanted in the bag. Before hydrating the side port, anterior chamber final wash is done thoroughly for clearing left over cortex and viscoelastics. Then the incision integrity is checked for water tight. Sub conjunctival dexamethasone 0.25 ml and gentamycin 0.25ml is injected at the incision site and care is taken not to disturb the graft area.

Post operative management:

All the patients were put on antibiotic steroid combination eye drops six times a day with tapering dose every week on following up. And ointment moxifloxacin(0.5%) at bed time for 2 weeks.

Some people with complication like uveitis was advised hourly antibiotic and steroid eye drops initially and were closely followed up with tapering dose.

Strict advice is given to patient to adhere good personal hygiene and use of clean fomites. And abstain from rubbing eyes at any cost in immediate post op for avoiding graft related complication.

Operational definition:

1. Visual acuity:

Visual acuity is considered as measure of form sense and refers to spatial limit of visual discrimination. That is measure of spatial resolution of the eye making it to discriminate between two points[44]

In this study, post-operative visual acuity was categorised according to WHO suggested levels of visual outcomes for post operative visual outcome measurements as follows:[45]

S.NO	GRADE	VISUAL ACUITY
1	Good	6/6 to 6/18
2	Average	<6/18 to 6/60
3	Poor	<6/60

2. Pterygium grading: TAN'S CLASSIFICATION[31]

S.NO	GRADE	DESCRIPTION
1	T1 (atrophic)	Episcleral vessels underlying the body of pterygium were unobscured and clearly distinguished
2	T2 (Intermediate)	Episcleral vessels were not indistinctly seen or partially obscured
3	T3(fleshy)	Episcleral vessels underlying the body of pterygium were totally obscured

Pterygium is graded depending on the extent of corneal involvement as follows[30]:

Grade I- Between limbus and a point midway between limbus and pupillary margin.

Grade II- Head of the pterygium present between a point midway Between the limbus and pupillary margin, and a point which is on pupillary margin.

Grade III- Crossing pupillary margin.

Data analysis:

Data was entered and analysed using SPSS version 21 software. Mean and the standard deviation of the visual acuity were calculated. Test of significance was carried out by Paired sample T-test and P value < 0.05 was considered statistically significant.

RESULTS

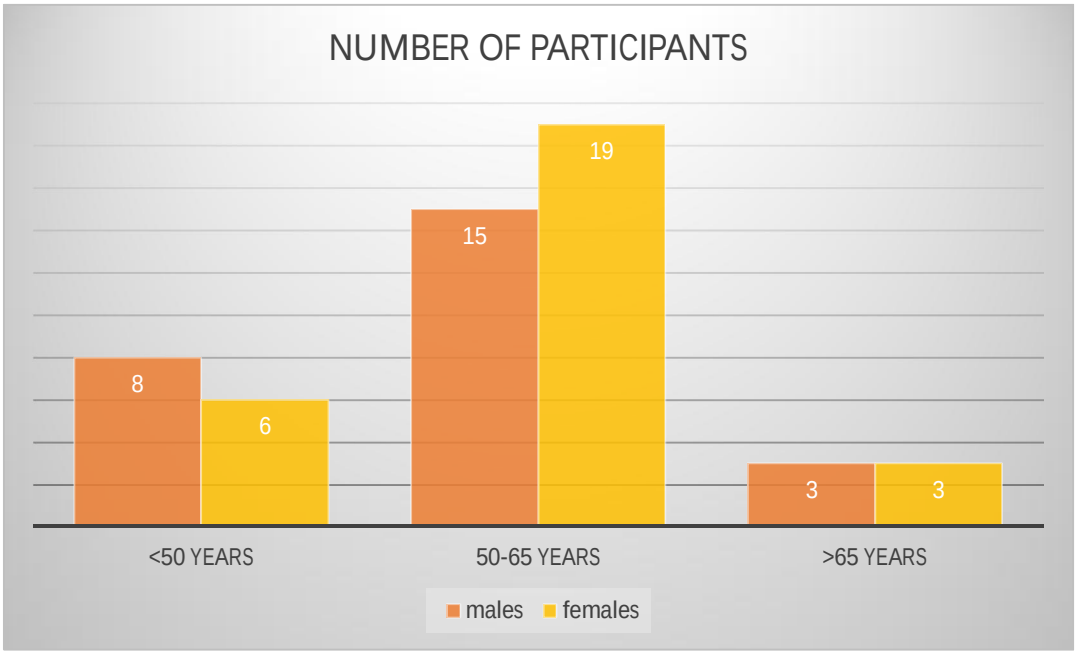
RESULTS

This study was carried out among 54 participants of which majority were females (51.9%). Majority of the participants belonged to the age group of 50 to 65 years (62.9%) (Table 1, Figure 1)

Table-1: age and sex distribution of the study participants:

Age (in years)	**Gender**		**Total(%)**
	Males(%)	**Females(%)**	
<50	8(57.1)	6 (42.9)	14(25.9)
50-65	15(44.1)	19(55.9)	34(62.9)
>65	3(50)	3(50)	6(11.2)
Total	**26(48.1)**	**28(51.9)**	**54(100)**

Figure-1: Age and sex distribution:

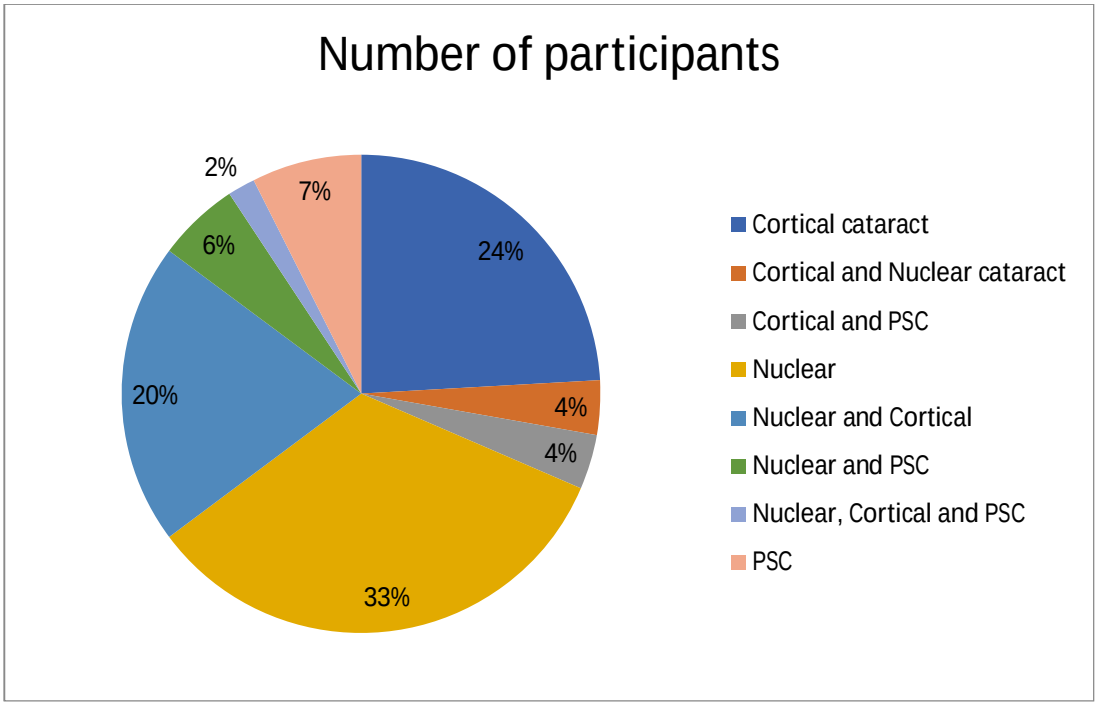


The distribution of participants based on the type of cataract is given in table 2, figure 2. It was observed that nuclear cataract was predominantly present among 18(33.3%) of the participants while cortical cataract was present among 13(24.1%) of the participants. Mixed cataract was present in a majority of 19 (35.2%) of the participants. And posterior subcapsular cataract was seen among 4 (7.4%) participants

Table-2: Distribution of type of cataract among the study participants:

S. No	Type of cataract	Frequency (n=54)	Percentage (%)
1	Cortical cataract	13	24.1
2	Cortical and Nuclear cataract	2	3.7
3	Cortical and PSC	2	3.8
4	Nuclear	18	33.3
5	Nuclear and Cortical	11	20.4
6	Nuclear and PSC	3	5.6
7	Nuclear, Cortical and PSC	1	1.9
8	PSC	4	7.4

Figure-2: Distribution of type of cataract among the study participants:

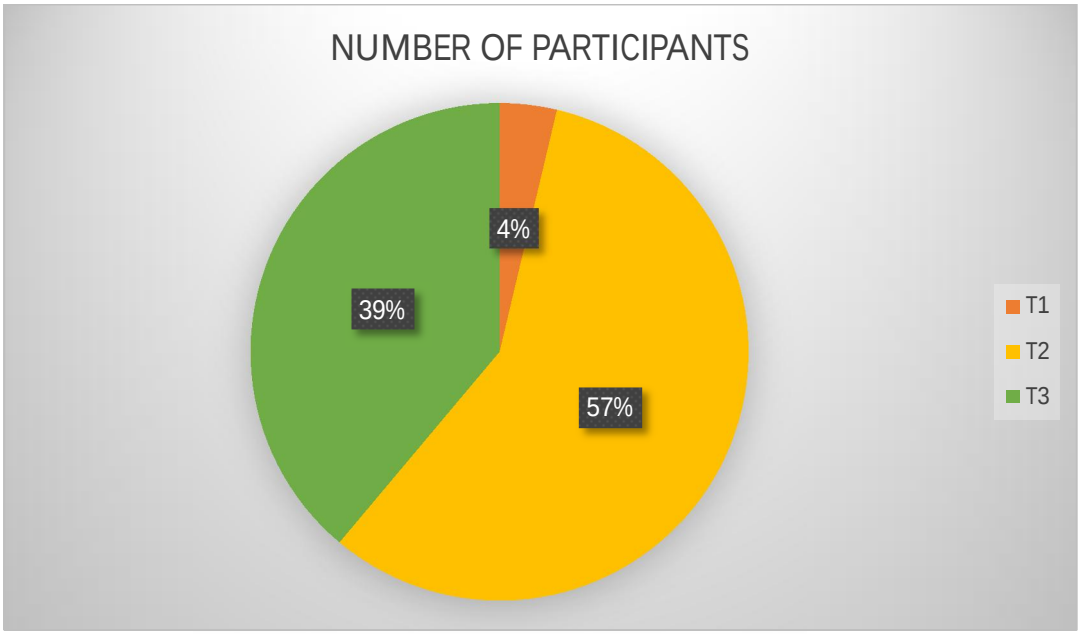


The distribution of type of pterygium among the study participants is given in table 3, figure 3. Majority of the grade 2 pterygium cases belonged to type T2 31(57.4%) pterygium while 21(38.9%) belonged to type T3.

Table-3: Distribution of type of pterygium among the study participants:

S. No	Parameter	Frequency (n=54)	Percentage (%)
1	**Type of pterygium**		
	T1	2	3.7
	T2	31	57.4
	T3	21	38.9

Figure-3: Distribution of type of pterygium among the study participants:



The age and sex wise distribution of type of cataract is given in table 4 and 5. Among the age group of <50 years, mixed cataract was present among 77.8%, while in the age group of 50-65 years, nuclear cataract was prevalent in 94.4%. Among the females, nuclear cataract was seen in 50% of the participants, while the same among males was seen in 50%.

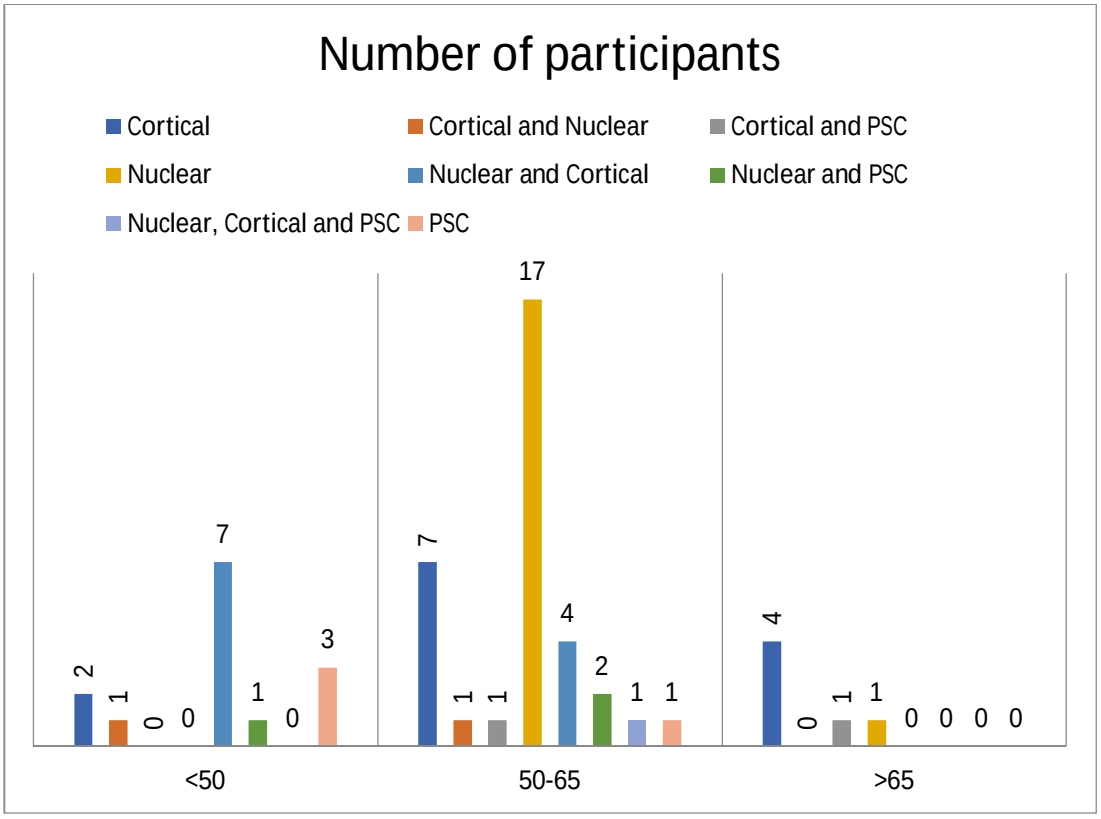
Table-4: Age distribution of type of cataract:

S. No	Type of cataract	Age			Total N=54 n(%)
		<50 n(%)	50-65 n(%)	>65 n(%)	
1	Cortical cataract	2(15.4)	7(53.8)	4(30.8)	13(24.1)
2	Cortical and Nuclear cataract	1(50)	1(50)	0(0)	2(3.7)
3	Cortical and PSC	0(0)	1(50)	1(50)	2(3.8)
4	Nuclear	0(0)	17(94.4)	1(5.6)	18(33.3)
5	Nuclear and Cortical	7(63.6)	4(36.4)	0(0)	11(20.4)
6	Nuclear and PSC	1(33.3)	2(66.7)	0(0)	3(5.6)
7	Nuclear, Cortical and PSC	0(0)	1(100)	0(0)	1(1.9)
8	PSC	3(75)	1(25)	0(0)	4(7.4)

Table-5: Sex distribution of type of cataract:

S. No	Type of cataract	Sex		Total N=54 n(%)
		Female	Male	
1	Cortical cataract	7(53.8)	6(46.2)	13(24.1)
2	Cortical and Nuclear cataract	2(100)	0(0)	2(3.7)
3	Cortical and PSC	2(100)	0(0)	2(3.8)
4	Nuclear	9(50)	9(50)	18(33.3)
5	Nuclear and Cortical	6(54.5)	5(45.5)	11(20.4)
6	Nuclear and PSC	0(0)	3(100)	3(5.6)
7	Nuclear, Cortical and PSC	0(0)	1(100)	1(1.9)
8	PSC	2(50)	2(50)	4(7.4)

Figure-4: age-wise distribution of type of cataract:

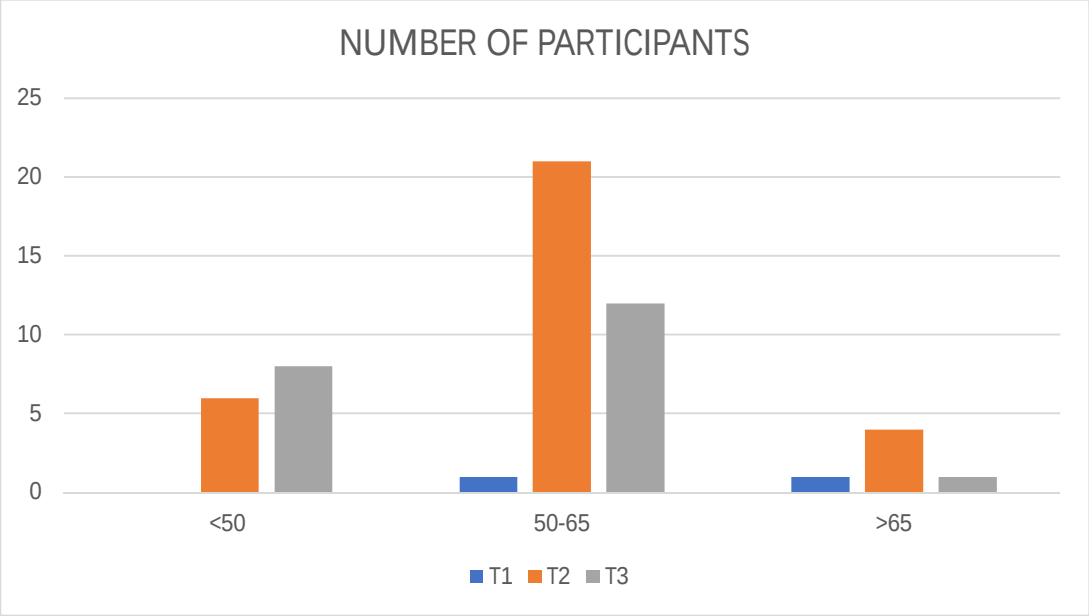


The age and sex distribution of type of pterygium is given in table 6. Among the participants aged <50 years, majority of them had T3 type of pterygium (57.2%) while in the age group of 50-65 years and >65 years, the most common type was T2 (61.8% and 66.6% respectively). Similarly, T2 type of pterygium was more common among both males and females (61.5% and 53.6% respectively).

Table-6: Age and sex distribution of type of pterygium:

S. No	Parameter	Type of pterygium			Total N=54 n(%)
		T1 n(%)	T2 n(%)	T3 n(%)	
1	**Age (in years)**				
	<50	0(0)	6(42.8)	8(57.2)	14(25.9)
	50-65	1(2.9)	21(61.8)	12(35.3)	34(62.9)
	>65	1(16.7)	4(66.6)	1(16.7)	6(11.2)
2	**Sex**				
	Females	1(3.6)	15(53.6)	12(42.8)	28(51.9)
	Males	1(3.8)	16(61.5)	9(34.6)	26(48.1)

Figure-5: Age wise distribution of type of pterygium:

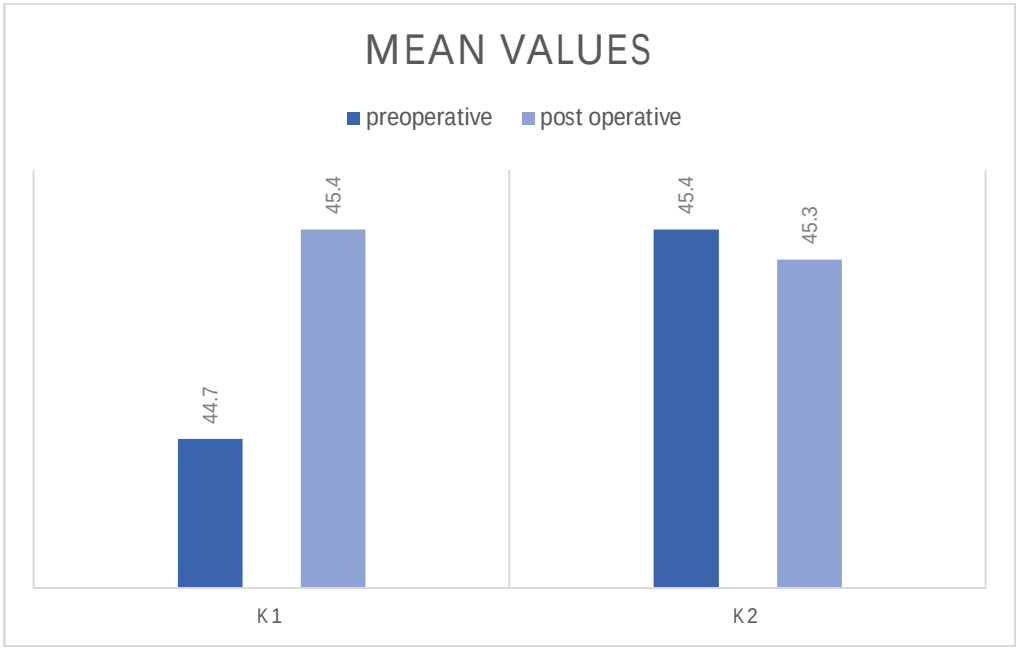


The K value of the pre operative and post operative parameters is given in table 7, figure 6. The mean K1 value was 44.7 D in the pre operative period while in post operative period the mean K1 was 45.4 D. Similarly the mean K2 value in the pre operative period was 45.4 D while the mean K2 in the post operative period was 45.3 D. The difference between post operative mean K1 and K2 is 0.1D. whereas the preoperative difference in mean K1 and K2 was 0.7 D. Difference between mean preoperative K1 and post operative K1 is 0.7D Increase in horizontal meridian. Difference between mean preoperative K2 and post operative K2 is 0.1D decrease in vertical meridian.

Table-7: K value parameters:

Operative status	K value Mean (SD)	
	K1	K2
Preoperative	44.7(± 1.2)	45.4(± 1.1)
Post operative	45.4(± 1.1)	45.3(± 1.2)

Figure-6: K value parameters:

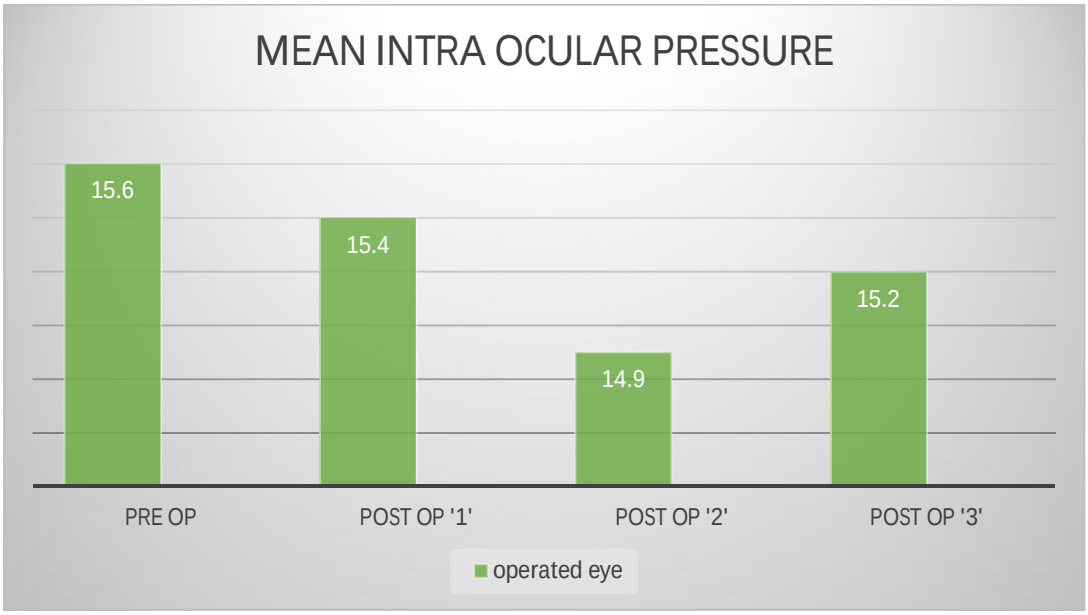


In this study, the mean preoperative intra ocular pressure was 15.6±2.8 and post op intraocular pressure was 15.4±2.4. The difference in the preoperative and post operative intra ocular pressure was however not statistically significant. The intraocular pressure was well within normal range. (Table 8, Figure 7)

Table-8: Intra ocular pressure findings:

S. No	Operative status	Intra ocular pressure Mean (SD)
		Operated eye
1	Preoperative	15.6(±2.8)
2	Post operative visit 1(day 1)	15.4(±2.4)
3	Post operative visit 2(week 1)	14.9(±2.3)
4	Post operative visit 3(week 6)	15.2(±2.1)
Test of significance	Paired t test T value-0.619	P value=0.539

Figure-7: Intra ocular pressure findings



On comparing the pre operative and post operative findings of K values, it was observed that there was a significant difference in the K1 values between pre and post operative periods with the T value of -15.072 and P value < 0.05 which was statistically significant. (Table 9)

Table-9: Comparison of K values between pre operative and post operative period:

S. No	Parameter	Mean difference	S.E mean	T value	P value
1	K1	-0.65	0.043	-15.072	0.0001*
2	K2	0.33	0.042	0.789	0.433

*statistically significant

We correlated the pre and post operative parameters and we observed that there was a statistically significant difference in both K1 and K2 parameters between a pre and post operative visits with the correlation coefficient of 0.965 and 0.964 respectively. The observed difference was statistically significant (P value < 0.001). (Table 10)

Table-10: Correlation between pre op and post operative keratometer:

S. No	Comparison	Correlation coefficient	P value
I	**Keratometer findings**		
1	Pre-op vs. post op (K1)	0.965	0.0001*
2	Pre-op vs. post op (k2)	0.964	0.0001*

*statistically significant

We compared the visual acuity for the pre and post operative period for un-corrected visual acuity and best corrected visual acuity. We observed that throughout the study period there was a statistically significant improvement in the visual acuity between the pre and post operative periods for both un-corrective visual acuity and best corrective visual acuity. While the preoperative UCVA was average (6/18 to 6/60) 11.1% and poor (less than 6/60) in 88.9% and BCVA was average (6/18 to 6/60) in 31.5% of the participants and poor (less than 6/60) in 68.5% of the participants, the postoperative period showed good (>6/18) 100% improvement in both UCVA and BCVA. The observed difference was statistically significant (P value < 0.0001). (Table 11, figure 8&9). However, 5 and 7 patients did not turn up for follow up in 2nd and 3rd

post operative visits respectively accounting for loss of22.2% of the study participants.

Table-11:Comparison of visual acuity between pre-operative and post operative periods:

S. No	Time frame	WHO grade of visual acuity N(%)				P value
		Good	Average	Poor	Patient Drop out	
1	**UCVA**					
	Preoperative	0(0)	6(11.1)	48(88.9)	0(0)	0.000l
	Postoperative visit ‘1’	47(87)	7(13)	0(0)	0(0)	
	Postoperative visit ‘2’	49(90.7)	0(0)	0(0)	5(9.3)	
	Postoperative visit ‘3’	47(87)	0(0)	0(0)	7(13)	
2	**BCVA**					
	Preoperative	0(0)	17(31.5)	37(68.5)	0(0)	0.0001
	Postoperative visit ‘1’	53(98.1)	1(1.9)	0(0)	0(0)	
	Postoperative visit ‘2’	49(90.7)	0(0)	0(0)	5(9.3)	
	Postoperative visit ‘3’	47(87)	0(0)	0(0)	7(13)	

Figure-8: Comparison of UCVA among the study participants during pre and post operative period:

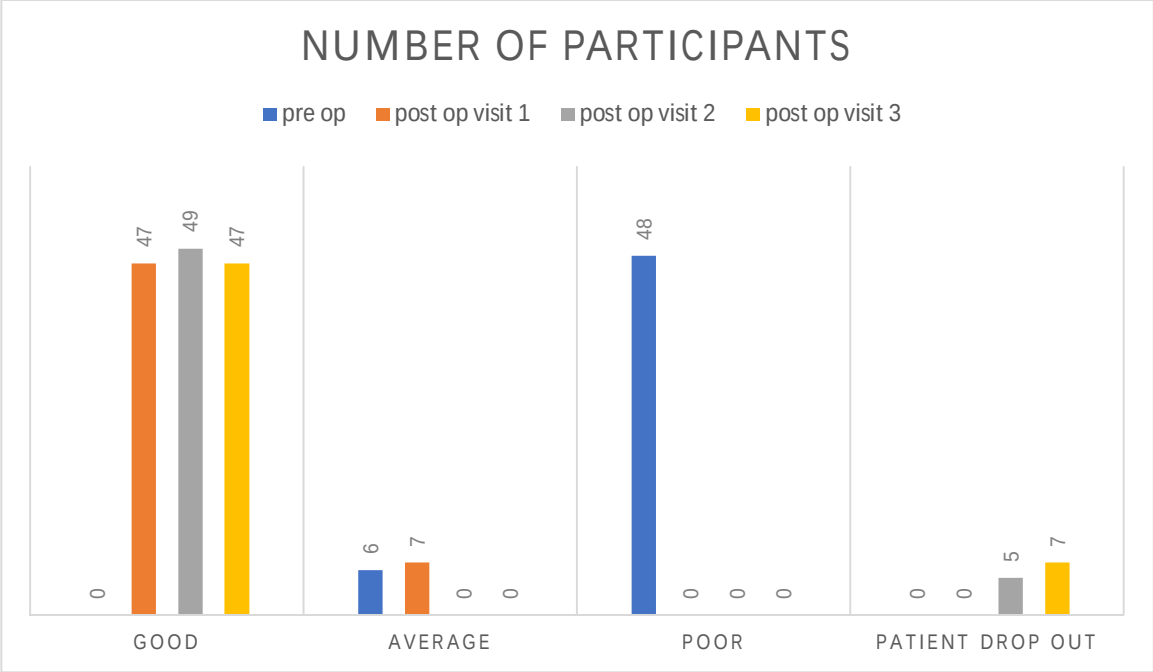
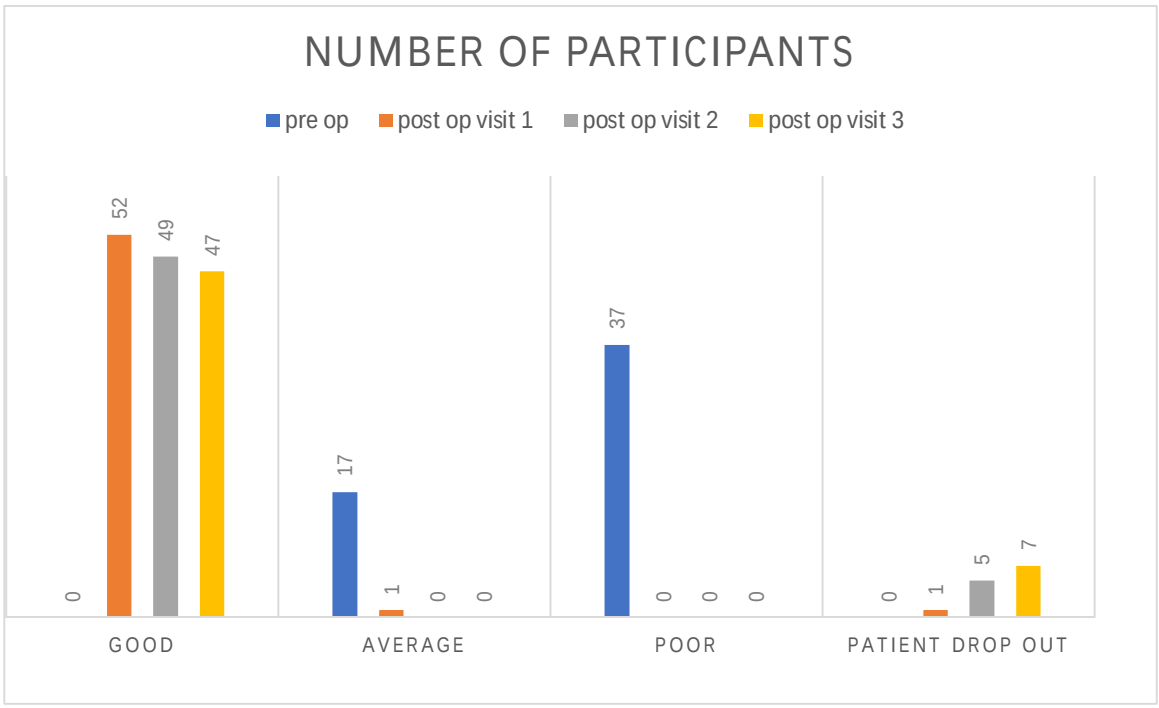


Figure-9: Comparison of BCVA among the study participants in the pre and post operative period:



DISCUSSION

DISCUSSION

Pterygium is a commonly occurring surface disorder of the eye. Pterygium, when it progresses aggressively can cover the visual axis and also results in scarring of the cornea [1]. In certain adults, pterygium co-exists with cataract and can pose an important challenge to the clinicians. Although cataract is a common age related condition seen in most of the adults, when cataract co-exist with pterygium in the same eye the impact on the visual acuity is higher and therefore clinical and surgical management of both the problems need adequate planning and consideration.

This study was carried out among 54 individuals who were diagnosed with pterygium and senile cataract in the same eye for a period of one and half years in 2018. Majority of the participants belong to 50 to 65 years of age (62.9%) and were females (51.9%). In a study done by Tidake P et al on 100 participants, the mean age of participants was 56 years and majority were males, similar to our study.[46] In another study done by Gulani et al majority of the participants (47%)

belong to the age group of 45 to 60 years and were males (77%). The observations were similar to our study.

Our study showed a significant change in the K1 parameter between the pre operative and post operative periods with minimal steepening on horizontal meridian as expected. As evident from pre operative mean K1 being 44.7D and that of post operative K1 was 45.4 D. This results in difference of 0.7 D. The observed difference was statistically significant.

A study done by Gokhale NS et al also showed similar findings with respect to a mean difference of 1.36D and 0.51D with superior and supratemporal incision for SICS. [47] Similarly, in a study done by Maheshwari S et al, the difference in the mean pre operative and post operative astigmatism was statistically significant, correlating with our study. [48] Another study done by Radwan AA et al showed a difference in the mean astigmatism between pre and post operative period following SICS was 0.5D, similar to our study. [49] The study done by Hussain M et al around 84% of the participants following

pterygium surgery did not develop intraocular hypertension, similar to our study. [50]

The main objective of our study was to compare the visual acuity between pre operative and post operative period. In this study, we categorized postoperative visual acuity based on WHO classification as good (6/18 and above), average (between 6/18 and 6/60) and poor (below 6/60). [48] Although majority of the participants had a best corrected visual acuity ranging from 6/36 to 6/60 and even lesser in 10 patients in the pre operative period, the post operative period in the immediate post operative and during the follow-ups periods showed that 100% of the participants had a visual acuity of > 6/18 uncorrected. The observed difference was statistically significant (P value < 0.001). In our study, we encountered drop out of 5 and 7 patients in the follow up during post operative visits 2 and 3 respectively, accounting for loss of follow up in 22.2% of the participants, due to various logistic and socioeconomic reasons. It would have been better if all patients have been followed up, since the study population is small. In a study done by Tidake P et al, the visual recovery was a 63% and fared better during the

post operative period, similar to our study.[46] In a study done by Gulani et al about a 52% of the participant had a good (6/18 and above) visual recovery during the immediate post operative period and the recovery was 100% by the end of 6 weeks, similar to our study.[16]

The management of simultaneous pterygium and cataract pose significant challenges to the health care professional. It is essential to undertake a detailed preoperative evaluation in selecting pterygium capable of altering vision, as pterygium more than 2 mm over limbus only can induce astigmatism [27], and location of pterygium. Proper careful biometry is necessary in order to avoid error in IOL calculation which may alter post operative visual acuity. The size of the pterygium and its location are essential to determine the prognosis and outcomes of the treatment. It is better to avoid temporal pterygium as it may hamper the superotemporal incision integrity and good conjunctival approximation post procedure as new graft might not be efficient in sealing the wound site as good as native conjunctival flap. In our study resulting K value is significant between the pre and post operative keratometric finding, that is less steepening in horizontal corneal

meridian with mean increase of 0.7D in post operative mean K1which is better than resulting against-the-rule astigmatism with superior incision [42] indicates the successful management and outcomes following auto-graft transplantation which is comparable to previous studies. It is better to avoid preoperative high native against-the-rule astigmatism patient, who would have steeper horizontal axis, for this combined procedure as resulting post operative K1 value is slightly in favour of against-the-rule astigmatism shift as evident from our study. In those patients further temporalisation of incision during cataract surgery might be considered as it results in post operative slight with-the-rule astigmatism shift, means flattening of horizontal meridian or steepening of vertical meridian favouring the end visual outcome[42], However, detailed study should be done to validate the outcome for any of the procedures. Although smaller pterygium may not affect the refractive status of cornea, combined cataract and pterygium excision less than 2mm, if at all considered for cosmetic surgery, should yield good visual outcome. Grade3 pterygium sometimes has poor outcomes due to corneal opacification post operatively as it involves pupillary axis, irrespective

of good surgery, hence it is not taken for considering visual outcome post operatively as in our study.

Historically management of pterygium and cataract have been initiated with cataract surgery being performed following pterygium excision. [32] However, doing a simultaneous excision and intraocular lens implantation minimise a lot of complications. Surgical complications are lowered by reducing multiple surgical exposures to the same eye there by reducing pain and infection. And also considering the low cost, unnecessary of multiple hospital visits for multiple surgery, following each surgery and hospital stay, especially for the people in lower and lower middle socioeconomic strata makes this single sitting procedure a favouring option. During post op period we faced graft slippage in one patient and managed with resuturing. Local hematoma beneath the graft in post operative period was noted in 6 cases, but no graft displacement was noted in those events. Graft oedema were noted in 16 patients which were managed conservatively. The complication of cataract surgery as such was minimal with only 11 cases had mild postoperative iritis with grade 2 anterior chamber cells,

which subsided with eye drops in second post op visit, and only 3 patient developed post operative anterior uveitis which took around 3 weeks to subside, who were followed up closely with frequent visit with tailored eye medication. And also we had striate keratopathy in 12 patients who had recovered well with 5% sodium chloride eye drop in first week post op.

As for the cataract surgery, in our study we opted to undertake small incision cataract surgery against phaco was mainly considering cost effectiveness for this targeted population, because we get majority of low socioeconomic population in around our institution. We considered SICS to be a more effective and cost effective compare to ICCE, ECCE and phaco, as observed in various studies. (There is a difference of 0.3 to 0.5 dioptre of astigmatism between the SICS and phaco. Although certain other complications like subluxation of lens are frequent, SICS was a preferred choice of management considering these factors). In our study the outcomes of combined pterygium and cataract surgery have been substantially better with the SICS thereby indicating a feasible and practical solution for managing cataract and pterygium

especially in resource limited settings. Similar vision outcomes were obtained from population-based studies on visual acuity following single procedure of cataract surgery. A study done by Aliyu H et al categorized the visual outcomes following cataract surgery based on WHO classification, similar to our study. This study showed considerable improvement in the visual acuity between day'1' and week '6' postoperative period showing statistically significant correlation in the logMAR visual acuity with a correlation coefficient of 0.46, $p<0.001$. [51] Another population- based cross sectional study done in South India also categorized the visual acuity based on WHO classification, similar to our study. This study also demonstrated that majority of the participants (53.1%) had good outcomes following cataract surgery, similar to our study. [52]

CONCLUSION

CONCLUSION

Our study has elucidated the challenges and management options for simultaneous excision of pterygium and cataract surgery. In our study, surgery for senile cataract was carried out using Small Incision Cataract Surgery. Similarly, we employed inferior limbal autograft transplantation for management of pterygium. Our study observed a positive outcome with respect to Keratometry findings and visual acuity. We also witnessed minimum complications in this combined setting, in terms of duration of hospital stay, postoperative complications, etc. Our postoperative visual acuity falls under good outcome category, similar to that of any other manual small incision cataract surgery and previous combined surgeries. Therefore, it may be considered that superotemporal SICS in combination with inferior limbal autograft transplantation can be implemented as a standard protocol for the simultaneous management of nasal pterygium and senile cataract. We would like this study to be done in large sample size to be

validated with better understanding, modifications, and with standardisation of certain technique to tailor the selection of incision site considering the grade and type of pterygium, pterygium induced astigmatism and native corneal astigmatism.

LIMITATIONS

LIMITATIONS

1. Corneal topography can be utilised interms of measuring the complete corneal astigmatism thereby better understanding of resulting astigmatism can be anticipated precisely.

2. Regression formula for calculating the predictive postoperative keratometry value is not used. This indeed needs to be compared in the future study.

3. Patient with high native against-the-rule astigmatism cannot be considered for this procedure. Because superotemporal incision may further worsen the astigmatism.

4. Study did not involve other comorbid ocular condition, which can be included in future study to correlate the visual outcome with significant results.

5. For biometry, Immersion ultrasound A-scan or non contact IOL measurement equipments like IOL master / Lenstar could be considered for precise calculation of

IOL power, but the cost effectiveness should be a concern here.

6. Large number of studies need to be conducted in this modality of management for such target population.

7. Toric IOL cannot be used which require precise pre operative measurement of astigmatism and lens placement. And predicting IOL with pterygium is difficult.

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ANNEXURES

PATIENT CONSENT FORM

ANNEXURE 1

INFORMED CONSENT FORM

Study title: STUDY ON VISUAL OUTCOME AFTER SIMULTANEOUS PTERYGIUM AND CATARACT SURGERY AMONG PATIENTS ATTENDING TERTIARY CARE HOSPITAL, KANCHEEPURAM DISTRICT, TAMIL NADU

Principal Investigator: Dr. Z. Mohamed Abdullah

Details of the study:

This study will be carried out to evaluate the outcome of visual acuity and other parameters among patients who undergo simultaneous excision of cataract and pterygium. This study will not involve any complications due to participation. We assure you that your identity will be kept confidential.

Participation in this study is voluntary. There is no cost involved in participation. We request you to sign in this consent form thereby expressing your willingness to participate in this study.

Signature of the patient with date:

Signature of the investigator with date:

PATIENT CONSENT FORM

(TAMIL)

ANNEXURE 2

சுய ஒப்புதல் படிவம்

ஆராய்ச்சியின் தலைப்பு:

Study On Visual Outcome After Simultaneous Pterygium And Cataract Surgery Among Patients Attending Tertiary Care Hospital, Kancheepuram District, Tamil Nadu

பெயர்: வயது: தேதி: உள்நோயாளி எண்.

இடம்: கற்பக விநாயகா மருத்துவக் கல்லூரி, சின்னக்கோளம்பாக்கம், மதுராந்தகம் தாலுகா, காஞ்சிபுரம் மாவட்டம்.

..... என்பவராகிய நான் இந்த ஆய்வின் விவரங்களும் அதன் நோக்கங்களும் முழுமையாக அறிந்து கொண்டேன். எனது சந்தேகங்கள் அனைத்திற்கும் ஆய்வாளரால் தகுந்த விளக்கம் அளிக்கப்பட்டது. இந்த ஆய்வில் முழு சுதந்திரத்துடன் மற்றும் சுயநினைவுடன் பங்கு கொள்ள சம்மதிக்கிறேன்.

எனக்கு விளக்கப்பட்ட விஷயங்களை நான் புரிந்து கொண்டு நான் எனது சம்மதத்தைத் தெரிவிக்கிறேன். இச்சுய ஒப்புதல் படிவத்தை பற்றி எனக்கு விளக்கப்பட்டது.

இந்த ஆய்வினை பற்றிய அனைத்து தகவல்களும் எனக்கு தெரிவிக்கப்பட்டது. இந்த ஆய்வில் எனது உரிமை மற்றும் பங்கினை பற்றி அறிந்து கொண்டேன்.

இந்த ஆய்வில் பிறரின் நிர்பந்தமின்றி என் சொந்த விருப்பத்தின் பேரில்தான் பங்கு பெறுகிறேன் மற்றும் நான் இந்த ஆராய்ச்சியிலிருந்து எந்நேரமும் பின் வாங்கலாம் என்பதையும் அதனால் எந்த பாதிப்பும் ஏற்படாது என்பதையும் நான் புரிந்து கொண்டேன்.

இந்த ஆய்வில் கலந்து கொள்வதன் மூலம் என்னிடம் பெறப்படும் தகவலை ஆய்வாளர் இன்ஸ்டிட்யூசனல் எத்திக்ஸ் கமிட்டியினரிடமோ, அரசு நிறுவனத்திடமோ தேவைப்பட்டால் பகிர்ந்து கொள்ளலாம் என சம்மதிக்கிறேன்.

இந்த ஆய்வின் முடிவுகளை வெளியிடும்போது எனது பெயரோ, அடையாளமோ வெளியிடப்படாது என அறிந்து கொண்டேன்.

இந்த ஆய்வில் பங்கேற்கும் பொழுது ஏதேனும் சந்தேகம் ஏற்பட்டால், உடனே ஆய்வாளரை தொடர்பு கொள்ள வேண்டும் என அறிந்து கொண்டேன்.

இச்சுய ஒப்புதல் படிவத்தில் கையெழுத்திடுவதன் மூலம் இதிலுள்ள அனைத்து விஷயங்களும் எனக்கு தெளிவாக விளக்கப்பட்டது என்று தெரிவிக்கிறேன் என்று புரிந்து கொண்டேன். இச்சுய ஒப்புதல் படிவத்தில் ஒரு நகல் எனக்கு கொடுக்கப்படும் என்றும் தெரிந்து கொண்டேன்.

பங்கேற்பாளர்/பாதுகாவலர் கையொப்பம் தேதி:

ஆய்வாளர் கையொப்பம் தேதி:

QUESTIONNAIRE

ANNEXURE 3

QUESTIONNAIRE

DEMOGRAPHIC DATA

[*PLEASE "✓" IN APPROPRIATE BOX*
IF NOT APPLICABLE - SKIP TO NEXT]

1) DATE:

2) NAME:

3) OP NO:

4) AGE:

5) SEX: MALE ☐ FEMALE ☐

6) ADDRESS:

REASON TO VISIT OPHTHALMOLOGY DEPARTMENT

[PLEASE "✓" IN APPROPRIATE BOX

IF NOT APPLICABLE - SKIP TO NEXT]

	YES	NO
1)VISUAL IMPAIRMENT	☐	☐

IF YES, continue

	RE	LE
a) EYE AFFECTED	☐	☐
IF BOTH		
b) WHICH IS MORE AFFECTED	☐	☐
c) WHICH WAS AFFECTED EARLY	☐	☐

→ ***FOLLOWING QUESTIONS TO BE ANSWERED ONLY FOR "<u>MOST AFFECTED EYE</u>"***

	YES	NO
d) IS IT SUDDEN	☐	☐
e) IS IT GRADUAL ONSET	☐	☐
f) IS IT ASSOCIATED WITH PAIN	☐	☐
g) IS IT MORE DURING DAYTIME	☐	☐
IF YES, DOES IT IMPROVES	☐	☐
h) IS IT MORE DURING NIGHT	☐	☐
IF YES, DOES IT IMPROVES	☐	☐
i) IS IT DIFFICULT TO READ TEXT (*MAGAZINES, BOOKS, NEWSPAPER, RELIGIOUS BOOK*)	☐	☐

j)DIFFICULT TO RECOGNIZE PEOPLE FACE

	YES	NO
WHEN THEY ARE CLOSE	☐	☐
WHEN THEY ARE FAR	☐	☐
k) DIFFICULT TO DO DAILY WORKS AND PERSONAL NEEDS	☐	☐

2) IF VISUAL IMPAIRMENT ASSOCIATED WITH ANY OF THE FOLLOWING DIFFICULTY:

	YES	NO
a) RINGS/HALOS	☐	☐
b) GLARE ON SEEING BRIGHT SUNLIGHT/HEADLIGHT	☐	☐
c) HAZY/BLURRED	☐	☐

3) DID YOU WEAR SPECTACLES BEFORE: YES ☐ NO ☐

IF YES, HOW LONG _____YEAR/MONTHS

STARTING FROM ___ yrs OF AGE TILL ___ yrs.

4) IS THE MOST AFFECTED EYE HAS FOLLOWING PROBLEM:

	YES	NO
a) GROWTH IN THE WHITE OF THE EYE	☐	☐
IF YES, PROCEED		
b) IS IT SPREADING TO BLACK OF THE EYE	☐	☐
c) WAS IT CAUSING ANY DIFFICULTY	☐	☐
IF YES,		
IRRITATION	☐	☐
REDNESS	☐	☐
FOREIGN BODY SENSATION	☐	☐
COSMETIC	☐	☐

d) HAVE YOU UNDERGONE SURGERY FOR THIS SIMILAR PROBLEM YES ☐ NO ☐

e) DURATION OF THIS PROBLEM IN _____YEARS/MONTHYS (specify).

MASTER CHART

MASTER CHART

S.No	Age	Sex	Eye to be opearted	Cataract		Pterygium		Visual Acity(SNELLEN- METRIC)							
				Type	Grade(LOCS-III)	Type	Grade	Pre OP		Post OP					
								UCVA	BCVA	VISIT 1(POD-1)		VISIT 2(WEEK 1)		VISIT 3(WEEK 6)	
										UCVA	BCVA	UCVA	BCVA	UCVA	BCVA
1	58	F	RE	Nuclear	NO-4 NC-4	T 2	2	6/60	6/60	6/9	6/9	6/9	6/6	6/9	6/6
2	69	M	RE	Nuclear	NO-4 NC-4	T2	2	5/60	5/60	6/12	6/12	6/9	6/9	6/9	6/9
3	50	F	LE	cortical and Nuclear	NO-3 NC-3 C-4	T3	2	HM+	HM+	6/9	6/9	NA	NA	NA	NA
4	65	M	RE	Nuclear	NO-5 NC-5	T2	2	HM+	HM+	6/12	6/9	6/9	6/6	6/9	6/6
5	55	F	RE	Nuclear	NO-3 NC-3	T 2	2	6/36	6/36	6/18	6/12	6/12	6/6	6/12	6/6
6	47	M	LE	Nuclear and PSC	NO-2 NC2 P3	T 3	2	6/60	6/36	6/9	6/9	6/9	6/6	6/6	6/6
7	54	M	RE	Nuclear	NO-6 NC-6	T2	2	4/60	4/60	6/18	6/12	6/12	6/9	6/12	6/9
8	53	M	LE	Nuclear	NO-5 NC-5	T2	2	6/60	6/36	6/12	6/9	6/9	6/6	6/9	6/6
9	58	F	RE	Nuclear and cortical	NO-3 NC-3 C-3	T2	2	5/60	5/60	6/12	6/12	6/9	6/9	6/9	6/6
10	45	M	RE	PSC	P-4	T3	2	6/60	6/60	6/9	6/9	6/6	6/6	NA	NA
11	65	M	LE	Nuclear	NO-5 NC-5	T1	2	HM+	HM+	6/18	6/12	6/12	6/6	6/12	6/6
12	48	F	RE	Nuclear and cortical	NO-3 NC-3 C-4	T2	2	6/36	6/36	6/12	6/12	NA	NA	6/6	6/6
13	53	M	RE	Nuclear	NO-4 NC-4	T2	2	6/60	6/60	6/12	6/9	6/9	6/6	6/9	6/6
14	47	F	RE	Nuclear and cortical	NO-3 NC-3 C-4	T 3	2	6/60	6/36	6/12	6/9	6/12	6/9	6/12	6/6
15	47	F	RE	cortical	C-4	T 3	2	6/60	6/36	6/12	6/9	6/9	6/6	6/9	6/6
16	65	M	LE	Nuclear and cortical	NO-2 NC-2 C-5	T2	2	PL+PR+	PL+PR+	6/9	6/9	6/9	6/9	6/9	6/9
17	65	M	RE	cortical	C-5	T2	2	6/60	6/36	6/9	6/9	6/6	6/6	NA	NA
18	54	M	RE	Nuclear, cortical and PSC	NO-2 NC-2 C-2 P-4	T3	2	1/60	3/60	6/18	6/12	6/12	6/6	6/12	6/6
19	48	M	LE	Nuclear and cortical	NO-2 NC-4	T2	2	6/36	6/36	6/12	6/9	6/9	6/6	6/9	6/6
20	52	F	LE	Nuclear	NO-4 NC-4	T3	2	6/60	6/36	6/9	6/9	NA	NA	6/6	6/6
21	58	F	LE	Nuclear and cortical	NO-4 NC-4 C-5	T2	2	HM+	HM+	6/12	6/9	6/12	6/6	6/12	6/6
22	67	F	LE	cortical and PSC	C-3 P-3	T2	2	5/60	6/60	6/9	6/9	6/9	6/6	6/9	6/6
23	59	F	LE	cortical and Nuclear	NO-2 NC2 C-3	T2	2	6/60	6/36	6/12	6/9	6/12	6/6	6/12	6/6
24	54	M	LE	Nuclear	NO-5 NC-5	T3	2	4/60	6/60	6/18	6/12	6/9	6/6	6/9	6/6
25	65	M	LE	Cortical	C-5	T2	2	6/60	6/60	6/9	6/6	NA	NA	6/6	6/6
26	60	F	LE	Nuclear	NO-4 NC-4	T2	2	6/60	6/36	6/9	6/6	6/9	6/6	6/9	6/6
27	46	M	RE	Nuclear and cortical	NO-5 NC-5 C-2	T2	2	HM+	HM+	6/12	6/9	6/12	6/6	6/12	6/6
28	59	F	LE	PSC	P-4	T3	2	6/36	6/36	6/9	6/9	6/6	6/6	6/6	6/6
29	50	M	RE	Nuclear and cortical	NO-5 NC-5 C-4	T2	2	4/60	6/60	6/9	6/6	6/9	6/6	6/9	6/6
30	52	M	LE	Nuclear	NO-3 NC-3	T3	2	6/36	6/36	6/9	6/6	6/9	6/6	6/9	6/6
31	68	M	RE	Cortical	C-5	T2	2	6/60	6/36	6/9	6/6	6/6	6/6	NA	NA
32	65	F	LE	Nuclear	NO-5 NC-5	T2	2	6/60	6/60	6/6	NA	6/6	6/6	6/6	6/6

33	70	F	LE	Cortical	C-4	T1	2	6/36	6/36	6/9	6/6	6/9	6/6	6/9	6/6
34	55	F	RE	Cortical and PSC	C-2 P-4	T2	2	6/60	6/60	6/9	6/9	6/9	6/6	6/6	6/6
35	68	M	RE	Cortical	C-5	T2	2	2/60	2/60	6/12	6/12	6/9	6/9	6/9	6/6
36	60	F	LE	Nuclear and cortical	NO-3 NC-3 C-4	T3	2	6/60	6/36	6/9	6/9	6/9	6/6	NA	NA
37	58	F	LE	Cortical	C-5	T2	2	4/60	4/60	6/18	6/12	6/12	6/9	6/12	6/6
38	49	M	RE	PSC	P-4	T3	2	6/60	6/60	6/9	6/6	6/6	6/6	6/6	6/6
39	55	F	LE	Nuclear	NO-5 NC-5	T2	2	6/60	6/60	6/12	6/12	6/9	6/9	6/9	6/9
40	58	F	LE	Cortical	C-5	T2	2	1/60	1/60	6/12	6/9	6/9	6/9	6/6	6/6
41	48	F	LE	Nuclear and cortical	NO-2 NC-2 C-4	T3	2	4/60	4/60	6/12	6/12	6/9	6/6	6/6	6/6
42	55	M	RE	Nuclear and PSC	NO-2 NC-1 P-4	T2	2	6/60	6/60	6/9	6/9	6/9	6/6	6/6	6/6
43	52	M	RE	Nuclear	N0-5 NC-5	T3	2	6/60	6/36	6/12	6/9	6/9	6/6	6/9	6/6
44	57	F	LE	Cortical	C-4	T2	2	6/60	6/60	6/9	6/9	NA	NA	6/9	6/6
45	54	M	LE	Cortical	C-5	T3	2	4/60	4/60	6/12	6/9	6/9	6/6	6/9	6/6
46	56	F	RE	Nuclear	NO-5 NC-5	T3	2	6/60	6/36	6/12	6/12	6/9	6/9	6/6	6/6
47	54	M	RE	Nuclear and PSC	NO-4 NC-4 P-3	T2	2	5/60	5/60	6/9	6/9	6/6	6/6	NA	NA
48	60	F	LE	Nuclear	NO-5 NC-5	T3	2	6/60	6/60	6/12	6/12	6/9	6/6	6/9	6/6
49	52	F	RE	Cortical	C-5	T3	2	HM+	HM+	6/12	6/12	6/9	6/9	6/9	6/6
50	49	M	RE	Nuclear and cortical	NO-2 NC-2 C4	T2	2	4/60	5/60	6/12	6/9	6/9	6/6	6/9	6/6
51	61	F	RE	Nuclear	NO-5 NC-5	T3	2	6/60	6/36	6/24	6/18	6/12	6/6	6/12	6/6
52	48	M	LE	Cortical	C4	T3	2	6/60	6/60	6/9	6/9	6/6	6/6	NA	NA
53	46	F	RE	PSC	P-5	T2	2	1/60	1/60	6/12	6/9	6/9	6/6	6/9	6/6
54	66	F	RE	Cortical	C5	T3	2	2/60	2/60	6/12	6/12	6/9	6/9	6/6	6/6

S NO	AGE	SEX	K VALVE(DIOPTRE)				IOP(mmhg)							
			PRE OP		POST OP(WEEK 6)		PRE OP		POST OP					
			K1	K2	K1	K2			VISIT 1(POD 1)		VISIT 2 (WEEK 1)		VISIT 3(WEEK6)	
							RE	LE	RE	LE	RE	LE	RE	LE
1	58	F	43.25	42.75	43.5	42.5	18	12	14	14	18	16	14	16
2	69	M	45	46.25	45.75	46	18	16	14	16	14	14	14	16
3	50	F	42.75	43.25	43.25	43.5	14	16	12	16	14	12	16	14
4	65	M	43.5	44.75	44	44.75	16	16	16	14	14	18	14	14
5	55	F	45.52	43.5	45.5	43.75	14	14	18	14	16	14	14	12
6	47	M	44.75	46	45.5	45.75	12	12	16	20	14	16	18	14
7	54	M	43	43.75	43.75	43.25	14	14	16	18	16	14	18	16
8	53	M	46.5	47.25	46.75	47	16	16	12	16	14	18	16	14
9	58	F	45.75	46.5	46.25	46	18	14	18	22	16	14	18	18
10	45	M	43.75	45	44.5	44.75	16	18	18	12	14	16	16	14
11	65	M	46	45.75	46.75	46	20	18	16	16	16	12	14	16
12	48	F	46.5	47	46.75	47.25	16	12	12	18	18	14	16	18
13	53	M	42.25	43.75	43.25	43.5	16	14	16	18	12	14	16	12
14	47	F	43.75	44.75	44.75	44.75	16	16	12	14	16	14	12	14
15	47	F	43	43.25	43.75	43.5	18	20	16	20	16	14	18	18
16	65	M	46	46.5	47	46.75	22	20	18	20	16	14	18	14
17	65	M	45.25	44.25	45.75	44.5	12	14	16	14	12	10	14	16
18	54	M	45.75	46	46	45.5	16	12	16	14	14	16	16	14
19	48	M	43.5	44.75	44	44.5	18	14	16	14	12	16	14	16
20	52	F	43	43.5	44	43.75	12	16	14	14	18	14	14	16
21	58	F	44.75	46	45.25	45.5	14	16	16	18	16	14	16	16
22	67	F	46.5	47.5	47	47.5	18	12	14	16	12	14	16	14
23	59	F	46	45.25	46.25	44.75	16	14	14	14	16	14	12	16
24	54	M	43.25	44.75	44	44.5	20	22	16	12	18	16	16	18
25	65	M	45.5	46	46.25	46.25	18	22	14	16	18	16	16	16
26	60	F	44.75	45.75	45	45.5	14	18	14	12	16	14	16	16
27	46	M	43.25	44.5	43.75	44.25	12	18	14	14	12	14	16	14
28	59	F	43.5	43.75	44	43.75	14	14	16	14	14	18	12	16
29	50	M	45.75	46.25	46	46	16	14	18	16	16	14	16	18
30	52	M	44.5	45	45.25	44.25	22	18	20	18	20	18	18	18
31	68	M	47	48	47.75	48	18	18	16	14	14	16	16	18
32	65	F	47	46.5	47.25	46.75	12	12	14	16	16	14	14	14
33	70	F	46	45.75	46.5	46.25	10	12	12	14	16	16	12	16
34	55	F	43.25	44.5	44.25	44.5	14	14	14	12	16	14	12	14
35	68	M	44	44.75	45.25	45	16	14	14	14	16	14	14	16
36	60	F	45.5	46	46.25	46.75	18	16	16	18	16	18	18	18
37	58	F	44.75	46.75	45.75	46.5	12	10	10	12	12	10	10	10
38	49	M	43.75	45	44.75	45.25	14	12	12	14	12	12	12	14
39	55	F	44.5	45.25	45	45.5	16	18	18	18	16	18	16	16
40	58	F	45.75	46.5	46.5	46.25	18	20	18	20	20	20	18	20
41	48	F	45	45.75	46	45.5	12	10	12	12	12	12	10	12
42	55	M	46.25	45.75	47	45.75	18	18	18	16	16	16	18	16
43	52	M	43.5	45	44.75	45.2	14	16	16	16	14	14	16	14
44	57	F	44.75	45.25	45.25	45.5	14	14	16	14	16	16	18	16
45	54	M	46	46.5	46.75	46.5	18	18	20	20	22	20	20	18
46	56	F	44.25	44.75	44.75	44.5	10	12	12	12	10	10	12	10
47	54	M	45.25	46.5	45.5	46.25	18	14	16	14	16	16	16	16
48	60	F	44.5	45.25	46.25	45.5	16	16	14	16	16	14	16	14
49	52	F	46.5	45.75	47	46.25	18	18	18	16	14	16	14	16
50	49	M	44.75	45.5	45.75	45.25	14	16	16	16	16	16	14	16
51	61	F	43.75	45.5	44.5	45.25	16	16	16	16	14	16	16	16
52	48	M	45.75	46	46.5	46.25	12	14	12	12	12	12	14	14
53	46	F	44.5	46.25	45	46	16	20	16	22	18	20	18	20
54	66	F	45.25	46	45.75	46.25	12	14	10	12	12	12	10	12

BIOMETRY							
S.NO	AGE	SEX	EYE TO BE OPEARTED	AXIAL LENTH(mm)	K VALUE (DIOPTRE)		IOL POWER(+ D SPH LENSE)
					K1	K2	
1	58	F	RE	21.90	43.25	42.75	25
2	69	M	RE	22.13	45.00	46.25	22
3	50	F	LE	22.46	42.75	43.25	23.5
4	65	M	RE	22.57	43.50	44.75	22
5	55	F	RE	21.82	45.25	43.50	24.5
6	47	M	LE	22.38	44.75	46.00	21.5
7	54	M	RE	23.15	43.00	43.75	21.5
8	53	M	LE	21.96	46.50	47.25	22
9	58	F	RE	23.00	45.75	46.50	19
10	45	M	RE	22.79	43.75	45.00	21.5
11	65	M	LE	21.63	46.00	45.75	24
12	48	F	RE	22.66	46.50	47.00	19.5
13	53	M	RE	22.36	42.25	43.75	23.5
14	47	F	RE	21.51	45.75	44.75	21.5
15	47	F	RE	23.03	43.00	43.25	22
16	65	M	LE	22.00	46.00	46.50	21.5
17	65	M	RE	22.42	45.25	44.25	22
18	54	M	RE	22.18	45.75	46.00	21.5
19	48	M	LE	22.50	43.50	44.75	22
20	52	F	LE	23.24	43.00	43.50	21
21	58	F	LE	22.93	44.75	46.00	20
22	67	F	LE	21.77	46.50	47.50	22.5
23	59	F	LE	21.83	46.00	45.25	23.5
24	54	M	LE	22.31	43.25	44.75	23
25	65	M	LE	22.69	45.50	46.00	20.5
26	60	F	LE	23.12	44.75	45.75	19.5
27	46	M	RE	23.37	43.25	44.50	20.5
28	59	F	LE	22.23	43.50	43.75	23.5
29	50	M	RE	22.28	45.75	46.25	21
30	52	M	LE	22.18	44.50	45.00	22.5
31	68	M	RE	21.53	47.00	48.00	22.5
32	65	F	LE	21.44	47.00	46.50	23.5
33	70	F	LE	21.59	46.00	45.75	24
34	55	F	RE	22.78	43.25	44.5	22
35	68	M	RE	22.12	44	44.75	23
36	60	F	LE	21.96	45.5	46	22.5
37	58	F	LE	22.08	44.75	46.75	22
38	49	M	RE	22.88	43.75	45	21.5
39	55	F	LE	22.21	44.5	45.25	22.5
40	58	F	LE	21.89	45.75	46.5	22
41	48	F	LE	22.08	45	45.75	22.5
42	55	M	RE	21.97	46.25	45.75	22
43	52	M	RE	22.71	43.5	45	22
44	57	F	LE	22.26	44.75	45.25	22.5
45	54	M	LE	21.76	46	46.5	22.5
46	56	F	RE	22.46	44.25	44.75	22
47	54	M	RE	22.12	45.25	46.5	22
48	60	F	LE	22.38	44.5	45.25	22
49	52	F	RE	21.86	46.5	45.75	22.5
50	49	M	RE	22.6	44.75	45.5	22.5
51	61	F	RE	23.12	43.75	45.5	20.5
52	48	M	LE	22.41	45.75	46	21
53	46	F	RE	21.89	44.5	46.25	23
54	66	F	RE	22.08	45.25	46	22

S.NO	PRE -OP IOP	POST -OP IOP IN OPERATED EYE		
	IN OPERATED EYE	VISIT 1(POD 1)	VISIT 2(WEEK 1)	VISIT 3(WEEK6)
1	18	14	18	14
2	18	14	14	14
3	16	16	12	14
4	16	16	14	14
5	14	18	16	14
6	12	20	16	14
7	14	16	16	18
8	16	16	18	14
9	18	18	16	18
10	16	18	14	16
11	18	16	12	16
12	16	12	18	16
13	16	16	12	16
14	16	12	16	12
15	18	16	16	18
16	20	20	14	14
17	12	16	12	14
18	16	16	14	16
19	14	14	16	16
20	16	14	14	16
21	16	18	14	16
22	12	16	14	14
23	14	14	14	16
24	22	12	16	18
25	22	16	16	16
26	18	12	14	16
27	12	14	12	16
28	14	14	18	16
29	16	18	16	16
30	18	18	18	18
31	18	16	14	16
32	12	16	14	14
33	12	14	16	16
34	14	14	16	12
35	16	14	16	14
36	16	18	18	18
37	10	12	10	10
38	14	12	12	12
39	18	18	18	16
40	20	20	20	20
41	10	12	12	12
42	18	18	16	18
43	14	16	14	16
44	14	14	16	16
45	18	20	20	18
46	10	12	10	12
47	18	16	16	16
48	16	16	14	14
49	18	18	14	14
50	14	16	16	14
51	16	16	14	16
52	14	12	12	14
53	16	16	18	18
54	12	10	12	10