A ONE-YEAR PROSPECTIVE STUDY TO EVALUATE THE EFFICACY OF INTRAOPERATIVE APPLICATION OF 20% ETHANOL AS AN ADJUVANT IN PTERYGIUM EXCISION WITH CONJUNCTIVAL AUTOGRAFT

By

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Dissertation submitted to the

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In partial fulfillment of the requirements for the award of the degree of

MASTER OF SURGERY

In

OPHTHALMOLOGY

Under the guidance of

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ABSTRACT

BACKGROUND

Pterygium is a common ocular surface disorder. It is a slow growing, wing shaped proliferation of fibrovascular tissue, araising from the subconjunctival tissue and encroaching over the cornea.[1] It is more common on the nasal side. It causes foreign body sensation, redness, visual impairment, and diplopia.

Surgical excision is the treatment of choice for pterygium. Conjunctival autografting has been used frequently following pterygium excision. Recurrence is one of the most common complication of pterygium. Several methods like amniotic membrane implantation, use of adjuvants such as beta- irradiation, thiotepa, 5-Fluorouracil, mitomycin C were used for the treatment of pterygium surgery. Ethanol is an alternate adjuvant which can be used in the pterygium excision. Ethanol causes rapid denaturation of proteins, including cytokines, enzymes, and growth factors involved in pterygium formation and recurrence after excision. Application of ethanol at a concentration 20% less than the 60s on the cornea appears to be safe. It helps to identify the plane between the pterygium and underlying cornea during surgery. Only a few studies have been conducted regarding the use of ethanol in pterygium excision.

AIM AND OBJECTIVE OF THE STUDY

To study the efficacy and safety of 20% ethanol as an adjuvant in pterygium excision with conjunctival autograft implantation and to evaluate the surgical outcomes of using 20% ethanol as an adjuvant in pterygium surgery.

METHODS

This is a prospective interventional study conducted among 30 patients with primary pterygium August 2022 to December 2023. Patient were evaluated preoperatively for anterior segment, posterior segment, visual acuity and corneal astigmatism Pterygium is excised using 20% ethanol as an adjuvant and conjunctival autograft was placed over bare sclera without

suture. Patients were evaluated postoperatively on day 1, day 8, day 30 and day 90 for condition of graft, visual acuity, corneal astigmatism, and associated complications.

RESULT

After 3 months of follow up, the mean visual acuity improved to Logmar 0.46 ±0.35 (p=0.001) which was statistically significant and corneal astigmatism improved from 3.36 ± 2.87 to 0.87±0.57 (p=0.001). No recurrence noted within 3 months of follow up.

CONCLUSION

This study has shown that using 20% ethanol as an adjuvant for pterygium excision helps in easy and clean dissection of pterygium head from underlying cornea and the pterygium induced corneal astigmatism has significantly reduced which was associated with improvement in visual acuity.

LIST OF ABBREVIATIONS

Na^+ - sodium ion

K^+ - potassium ion

Cl^- - Chloride ion

HCO_3^- - Bicarbonate ion

UTP – Uridine 5'-triphosphate

ATP – Adenosine triphosphate

UVA – Ultraviolet A

UVB – Ultraviolet B

TGF β – Transforming growth factor

FGF – Fibroblast dependent growth factor

MMP – Matrix metalloproteinase

HPV – Human Papilloma Virus

EBV – Ebstein Bar Virus

CMV – Cytomegalovirus

CD4 – Cluster of differentiation 4

CD8 – Cluster of differentiation 8

ICAM – Intracellular Adhesion Molecule

HLA-DR – Human Leucocyte Antigen DR isotypes

VEGF – Vascular endothelial growth factor

MMC – Mitomycin C

DNA – Deoxyribonucleic acid

RNA – ribonucleic acid

OPD – Out patient Department

PERFECT - Pterygium Extended Resection Followed by Extended Conjunctival Transplantation

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INTRODUCTION

"Pterygium, a 'wing-like' growth, symbolically reflects how our eyes, if unprotected, can develop unwelcome wings of damage."

- Dr. Karen Mitchell

Pterygium is a common ocular surface disorder. It is a slow growing, wing shaped proliferation of fibrovascular tissue, araising from the subconjunctival tissue and encroaching over the cornea.[1]

Pterygium is more prevalent in the pterygium belt, which is located between the equator and 30 degrees north and south.[2] These areas has high UV radiation exposure. India comes under this pterygium belt thus has high prevalence of pterygium. The prevalence of pterygium in India in people $\geq$ 40 years was 13.2% according to ICMR EYE SEE study [3]

UV radiation, chronic inflammation are thought to be etiological factors for the development of pterygium. It is more commonly seen in dry and dusty climate. People who do more outdoor work are more prone for development of pterygium. Thus it is more prevalent in male gender compared to females.

Pterygium causes cosmetic problems. It causes redness, foreign body sensation, watering, photophobia, and decreased visual acuity. It causes induced astigmatism by horizontal traction of pterygium apex and pooling of tear film.

Pterygium is managed by topical lubricants in case of asymptomatic patients or topical steroids in case of inflammation.

Surgery is indicated in case of pterygium affecting vision. Commonly used technique are pterygium excision with bare sclera technique, pterygium excision with rotational conjunctival autograft with or without suture, fibrin glue, autologous serum, PERFECT, conjunctival limbal autograft, amniotic membrane transplantation.

Recurrence is the most common complications seen following pterygium excision. Many techniques have been developed to prevent recurrence such as use of 5- Fluorouracil, Mitomycin C, anti- VEGF and Interferon alpha. Some of these techniques have serious side effect and very expensive. Thus, ethanol which is available easily can in the pterygium.

Pterygium excision with 20% ethanol is a novel technique which helps yin easy dissection of pterygium head from underlying cornea followed by implantation of

conjunctival autograft without any suture or glue. Ethanol has been used in photorefractive keratectomy. Ethanol causes rapid denaturation of proteins, including cytokines, enzymes, and growth factors involved in pterygium formation and recurrence after excision. Application of ethanol at a concentration of 20% less than the 60s on the cornea helps in easy dissection of pterygium.

There are very few studies conducted regarding the role of ethanol in pterygium excision. The present study aims to investigate the efficacy and safety of using 20% ethanol as an adjuvant in pterygium excision with conjunctival autograft and also evaluates the surgical outcomes of using 20 % ethanol as an adjuvant in pterygium excision with conjunctival autograft.

REVIEW OF LITERATURE

ANATOMY OF CONJUNCTIVA [4,5]

Conjunctiva is a mucous membrane that extends from the edges of the upper and lower lids to the corneal limbus, covering the surface of the eye. It promotes proper eyelid function and permits unhindered eye movement. It helps in production of aqueous and mucous part of tear film and also in involved in ocular immunology.

EMBRYOLOGY

It is derived from surface ectoderm. There is activation of PAX6 gene from surface ectodermal cells when there is apposition of neural ectodermal derived optic vesical to surface ectoderm. It causes elongation of surface ectodermal cell in the apposition are and form lens placode followed lens vesicle. The non elongated ectodermal cells differentiate into conjunctival limbal and corneal epithelium.

ANATOMY

The conjunctiva is extended from the mucocutaneous junction at the edge of the eyelids to the corneoscleral limbus. Palpebral conjunctiva is the term for the conjunctiva that covers the back of the eyelid. Bulbar conjunctiva is the term for the conjunctiva that covers the globe's surface up to the limbus.

In palpebral conjunctiva branches of the palpebral (tarsal) arches are seen as subepithelial vascular network with large vessels running at right angles to the lid margin. Yellowish duct of meibomian glands are also seen through palpebral conjunctiva.

Bulbar conjunctiva is loosely attached to the underlying bulbar fascia (tenon’s capsule) and the sclera. It is tightly attached at the corneal limbus. Between conjunctiva and sclera, there is loose episcleral tissue. In this region there are anterior ciliary artery and tendons of recti muscle.

The bulbar conjunctiva is separated from the lacrimal caruncle at the medial canthus by a vertical fold of conjunctiva known as plica semilunaris.

The palpebral conjunctiva joins with bulbar conjunctiva to form the fornices superiorly, inferiorly, and temporally, and an extendible plica medially. It is a continuous annular cul de- sac. Superior fornix reaches orbital margin 8- 10 mm from the limbus, inferior fornix reaches inferior orbital margin, 8 mm away from limbus. Medial fornix is most shallow and made of medial end of superior and inferior fornix. Lateral fornix is 5 mm away from the limbus.

STRUCTURE

EPITHELIUM

Palpebral margin is covered by stratified keratinized epithelium. Posterior to the margin has non keratinized stratified squamous cells with five strata. The deepest layer is made of cylindrical cells, intermediate layer is made of polyhedral cell and the most superficial layer is made of flat cell. Basal epithelium has papillae. Squamous cells are replaced by cuboidal or columnar cell near the conjunctival sac.

The epithelium is bilaminar in the superior tarsal conjunctiva with deep layer of cuboidal cell and superficial layer of cylindrical cell. Goblet cells are numerous beyond subtarsal fold. From fornix to limbus epithelium becomes less glandular and more epidermal.

Goblet cell

These are present throughout conjunctiva especially in plica semilunaris. They are more commonly seen nasally, least commonly in upper temporal fornix and absent in palpebral mucocutaneous junction and limbus. These are main source of tear mucin which are involved in the moistening the ocular surface. goblet cell araise from basal layer of epithelium.

Melanocyte

These are seen at the limbus, fornix, plica and carcuncle and sites of perforation of anterior ciliary artery.

Langerhans cells

The highest density of Langerhans cell was found in the tarsal conjunctiva followed by fornix and the bulbar conjunctiva. The number decreases with age

THE ACCESSORY LACRIMAL GLAND

Two types of accessory lacrimal gland are situated in conjunctiva

Gland of Krause

The glands of Krause lie mainly in the deep subconjunctival tissue of upper fornix between palpebral part of lacrimal gland and the tarsal plate and in the lower fornix. The ductules of the gland unite to form single duct which opens into fornix.

Gland of Wolfring

These are two to five above superior tarsus and two within lower edge of inferior tarsus.

SUBMUCOSA

It is made up of superficial lymphoid layer and deep fibrous layer. The lymphoid layer, which is thickest at the fornix and ends at the subtarsal fold, is a fine connective tissue reticulum containing many lymphocytes. Fibrous layer is thicker than lymphoid layer except over the tarsal plate. The conjunctival vessels, nerves and gland of Krause are seen in the lymphoid layer. The average conjunctival thickness is 33 microns.[6]

CONJUCTIVAL PAPILLAE

True papillae are seen at the limbus and in the marginal conjunctiva. The upper and lower palisades of Vogt are formed by the limbal papillae where finger like columns of epithelium interdigitate with long extension of surface mucosa.

VASCULAR SUPPLY

The arterial supply of conjunctiva is from

- Peripheral tarsal arcade

  At the upper border of the tarsus, between the two sections of the levator palpebral muscle, is the peripheral tarsal arcade, which is located in the tarsal plate, fornix, and proximal bulbar conjunctiva. The palpebral muscle is perforated by the peripheral perforating branches of this arcade, which further divides into ascending and descending branches. The descending branch anastomoses with the shorter branches of the marginal artery and supplies the proximal two-thirds of the tarsal conjunctiva. At 4 mm from the limbus, the descending branches ascend over the

fornix to produce posterior conjunctival arteries, which anastomose with anterior conjunctival arteries. They supply bulbar conjunctiva.

The peripheral arcade of lower lid, anterior to inferior palpebral muscle of muller muscles. It araises from the lacrimal, the transverse facial or superficial temporal arteries. The peripheral arcade of lower lid is rarely seen. Marginal arcade or muscular arteries to the inferior rectus supplies the inferior tarsal plate, fornix and bulbar conjunctiva.

- Marginal tarsal arcades

The marginal arcade has perforating branches through tarsus to the conjunctiva at the subtarsal folds. These perforating branches divide into marginal and tarsal twigs to supply lid margin or to anastomose with corresponding branches of peripheral arcade. The tarsal conjunctiva is well supplied by with blood, which explains why it is red in colour. The colour of the conjunctiva decreases towards fornix. The bulbar conjunctiva is colourless and appears red when it is congested.

- Anterior and deep ciliary artery

Each muscular artery of the recti gives two anterior ciliary arteries except lateral rectus which gives 1 anterior ciliary artery. In the bulbar conjunctiva, branches from the anterior ciliary arteries are involved in the formation of a superficial marginal plexus at the limbus. It divides into to the terminal vessels of the peripheral arcades and the palisades of Vogt. In the fornices, the branches of the bulbar anterior ciliary arterial system anastomose with vessels from the palpebral conjunctiva.

Episcleral branches of anterior ciliary which are given as anterior ciliary artery pierce sclera, anastomose to form deep episcleral capillary network of peri corneal plexus. At the limbus the episcleral arteries make bend and enter the bulbar conjunctiva as the anterior conjunctival arteries. The anterior conjunctival arteries anastomose with branches of posterior conjunctival artery about 4mm from the limbus. Its perilimbal branches in the conjunctiva form the conjunctival part of pericorneal plexus. At limbus, the episcleral arteries give rise to marginal arcades and give off fine loops of palisades of Vogt at the upper and lower limbus.

Conjunctival veins

The fornix, posterior bulbar conjunctiva, and tarsal conjunctiva are drained by the palpebral conjunctival veins. A perilimbal venous circle, consisting of three parallel veins that communicate with each other, is situated anterior to the episcleral arterial circle and behind the limbal arcades. These draw blood from the anterior conjunctival veins, the limbus, and the marginal corneal arcades. They also empty into the veins of the rectus muscle after draining into the radial episcleral collecting veins.

LYMPHATICS

The conjunctiva contains a rich anastomotic network of lymphatic channels. It has two plexuses of lymphatics. Superficial plexus of small vessels lies inferior to the capillaries and deep plexus of large vessel seen in the fibrous layer of the conjunctiva which receives the lymph from the superficial plexus. It drains towards canthi and joins the lymphatics of the eyelids. It drains medially to the submandibular lymph node and laterally to the preauricular (intraparotid) lymph node system.

NERVES

The conjunctiva is supplied by the lacrimal, supraorbital, supratrochlear, and infraorbital branches of the ophthalmic branch of the trigeminal nerve (V1). Conjunctiva has free nerve endings and specialised ends such as end bulbs of Krause. The myelin sheath are absent in the free nerve endings and are involved in the formation of subepithelial plexus in the superficial substania propria. The end bulbs of Krause are round and 20-100 μm long. These are surrounded by a capsule continuous with nerve sheath and lined endothelial cells containing twisted mass of fibrils.

CONJUCTIVAL FLORA

Organisms found in the conjunctival sac are almost like those found in the eyelids. The common organisms seen in ocular surface are coagulase negative staphylococci, with Staphylococcus epidermidis most common.

PHYSIOLOGY OF CONJUNCTIVA

Conjunctiva has numerous functions in maintaining the health of the ocular surface. It acts as a barrier to exogenous infectious agents and foreign bodies and helps in free

movements of the globe. It helps in maintaining osmolarity, volume and electrolyte concentration of tear film. Conjunctival epithelium is water permeable and there is active transport of chloride ion, which contribute to the secretion of fluid into the space. Physiological fluid secretion across the conjunctival epithelium is regulated by nerves, growth factors, and other small molecules such as the P2Y2 agonists UTP and ATP.

Conjunctival epithelium is an important source of tear mucin. The conjunctival epithelium actively absorbs Na+ from the tear film and also expresses transport elements for glucose, K+, Cl−, and HCO3. It helps in absorption of ophthalmic drugs applied to the ocular surface.

The limbal epithelium prevent the migration of conjunctival epithelial cells onto cornea. Loss of limbal cells leads of conjunctivalization of cornea in turn causing scarring and vascularisation of cornea. It also causes persistent epithelial defect.

Conjunctival epithelium differs from corneal epithelium. The cornea is clear, transparent, avascular, regular, reflecting and refracting whereas conjunctiva is translucent, irregular, and vascularised. In contrast to conjunctiva, cornea is devoid of goblet cells. The corneal epithelial cells has large stores of glycogen which helps them in healing of any epithelial wounds. Conjunctival epithelium has greater dependence on glycolytic and tricarboxyacetic acid cycle activity while corneal epithelium depends on hexose monophosphate shunt activity. Cornea gets nutrition from the tear film and aqueous humour, needs diffusion through the corneal epithelium, stroma, and endothelium whereas conjunctiva gets nutrition from nearby blood vessels and the overlying tear film.

PTERYGIUM

HISTORY

The name pterygium derived from the Greek word pterygos meaning wing. It is a wing shaped encroachment over cornea. The term pterygium was introduced to English language in 1875 by Walton.[7]

Pterygium was described as an ophthalmic enigma by Australian ophthalmologist D Coster as the pathogenesis of pterygium was unknown.[7]

INCIDENCE AND PREVALENCE

Pterygium is prevalent in all parts of India as it lies in the pterygium belt. Cameron described pterygium belt as 37 degrees north and 37 degrees south. Prevalence increases with age. According to Central India Eye and Medical study prevalence of pterygium increases as the age increases. The study concluded the prevalence of pterygium in the age group from 30-39 years was 6.7%, in the age group 50-59 years was 13.5% and in the age group from 70-79 years was 25.3% [8]. Tandon R, Vashist P et al. observed the prevalence of unilateral pterygium was 13.2% and bilateral pterygium was 6.5% in people ≥ 40 years. The prevalence of pterygium increased with age irrespective of sex and the age group 60-69 years (15.8%) had more prevalence. The prevalence was highest in coastal regions (20.3%) followed by plains (11.2%) and hilly regions (9.1%).[3]

ETIOLOGICAL FACTORS

Most common risk factor is environmental, but also hereditary is also a contributing factor for formation of pterygium.

- Ultraviolet radiation

  Both UVA and UVB are involved in the formation of pterygium. UVA causes indirect damage to DNA by inducing reactive oxygen species. Through mechanisms dependent on transforming growth factor β (TGF β) and fibroblast growth factor (b FGF), UV light can harm limbal stem cells, change the function of stromal fibroblast, or trigger an inflammatory response. UV rays also affect morphology and function of conjunctival endothelial cells. Due to this the metabolism of stromal fibroblasts is altered which causes the alteration of collagen and elastin fibre expression. Limbal stem cells which are damaged by UV rays induce the production of many inflammatory factors and MMPs, contributing to the inflammation, angiogenesis, and invasion of pterygium. These altered pterygium fibroblasts produce high levels of growth factors and extracellular enzymes, which facilitate invasion of pterygium through ECM remodeling and dissolution of Bowman's layer.[9] In a meta-analysis by Liu L et al. prevalence of pterygium is higher in rural population than urban population as the people in rural areas are more involved in outdoor works. There was also strong correlation between UV radiation and prevalence of pterygium was seen.[10] Gazzard G et al. noticed a history of more than 5 hours per of

outdoor activity for 10 years earlier was associated with almost twice the rate of prevalence of pterygium than those without such a history.[11]

- Genetic factors

  Genes associated with DNA repair, cell proliferation, migration and angiogenesis are associated with pterygium. MicroRNAs, polymorphism of MMPs, and vascular endothelial factors (VEGF) are involved in familial pterygium. MicroRNAs are also involved in recurrent pterygium.

- Chronic irritation or inflammation

  There is infiltration of T-lymphocytes (CD4 and CD8) in the pterygium tissue. The CD4/CD8 ratio for pterygium epithelium was 0.33 and CD4/CD8 ratio for pterygium substansia was 1.34.[12] ICAM-1 and HLA-DR expression in pterygium epithelium supports the role of cellular immunity in pterygium formation.[9] There is also increase in goblet cells in the pterygium tissue. Dushku N et al. there is increased nuclear p53 gene product in the limbal epithelium of pterygia with little no apoptosis.[13] higher levels of inflammatory cytokines, growth factors and matrix metalloprotease are seen in pterygium

- Virus

  In a meta-analaysis, prevalence of 18.6% was reported for HPV infection in HPV infection in pterygia[9]. E6 and E7 factor produced by HPV affect the normal function of p53. Presence of HSV, EBV, and CMV in pterygia are found in various studies.

HISTOPATHOLOGY

Histopathological examination shows subepithelial tissue which is characterised by elastotic degeneration and breakdown of collagen fibres along with destruction of Bowman's layer. It is a chronic inflammatory condition. There is lymphocytic infiltrate along with new blood vessels, abnormal elastic fibers, and degenerated collagen fibres. The subepithelial material stains for elastin but is not sensitive to elastase.[5]

The apex of the pterygium has a punctate, brownish, subepithelial line passing vertically in front of known as Stocker's line. It believed to be due to deposition of iron which is originating from the lactoferrin in the tear film. There will be active growth of subconjunctival tissue on the cornea known as Fuchs' flecks, which are subepithelial greyish calcification nodules around the head of the pterygium.[14]

PARTS OF PTERYGIUM

- Cap – it is the leading edge with an avascular zone
- Head – it lies peripheral to cap
- Body-it is the main bulk of the pterygium over the sclera and extends the canthal zone.

CLINICAL GRADING OF PTERYGIUM

Tan et al. developed clinical grading scale based on relative translucency of the body of the pterygium[15]

1. T1(Atrophic) – episcleral vessels underlying the pterygium are unobscured and seen clearly.
2. T2 (Intermediate) - episcleral vessels underlying the pterygium are partially seen.
3. T3(Fleshy) - episcleral vessels underlying the pterygium are totally obscured due to fibrovascular tissue.

Another clinical grading system by Maheshwari [16]

1. Grade 1 – pterygium head is located between limbus and a point midway limbus and pupil.
2. Grade 2 – pterygium head is located between limbus and a point midway limbus and pupil and pupillary margin
3. Grade 3- pterygium head crosses pupillary margin

Grading for recurrent pterygium

1. Grade 1 – it consists of normal operative site
2. Grade 2 -fine episcleral vessels are present without fibrous tissue.
3. Grade 3 – fine episcleral vessels are present with fibrous tissue not encroaching cornea.
4. Grade 4 – true recurrent pterygia with a fibrovascular tissue invading cornea.

CLINICAL FEATURES

Patients are usually asymptomatic. But some people have intermittent episodes of inflammation. The common presentations include

- Foreign body sensation
- Redness
- Watering
- Photophobia
- Decreased visual acuity
- Diplopia

It is commonly seen on the nasal side of the eye compared to the temporal side. Various explanations have been told about predominance of pterygium over nasal side.

- Excessive subconjunctival tissue nasally
- Longer temporal eyelashes and greater bowing of lateral 2/3rd of the upper eyelid filter the light falling over the temporal conjunctiva.
- The nasal fibres of orbicularis oculi has greater curvature than temporal fibres which causes greater compression over nasal subconjunctival tissue.
- The natural flow of tears is from temporal side to nasal side towards the punctum carrying the dust particles of conjunctival sac which causes more irritation of nasal conjunctiva.
- There is also increased hyperemia of nasal side as there are two anterior ciliary arteries in the nasal and one ciliary artery at the temporal side.

PSUEDOPTERYGIUM

Pseudopterygium is a fibrovascular scarred tissue araising in the bulbar conjunctiva and extending into the cornea. It is due to previous external ocular inflammation such as chemical burns, trauma or infection.[17] It can be differentiated from pterygium as follows

- There is no recognisable parts as in pterygium.
- It is seen outside the interpalpebral area
- There is no adhesion to the limbus.

COMPLICATIONS OF PTERYGIUM

- Corneal astigmatism

  Pterygium causes corneal surface irregularities and induces astigmatism. It causes with the rule astigmatism due to flattening of the horizontal meridian of the cornea caused by the traction of pterygium head. The formation of tear meniscus between corneal centre and pterygium apex can cause horizontal flattening of cornea. Pterygium causes with the rule astigmatism. The topographical changes induced by pterygium are almost always reversible following pterygium removal.

  The residual postoperative astigmatism can be estimated using preoperative refractive error;

  Postoperative refractive cylinder = 0.283 + 0.266 × preoperative refractive cylinder[9]

  The pterygium encroachment over the cornea is positively correlated to the induced astigmatism. Tomidokoro and colleagues observed that the extension of pterygium on the cornea can predict the degree of corneal irregularity which is explained by this equation

  Induced corneal changes by pterygium (D) = 0.097 × pterygium extension − 1.028.[18]

  Some studies have put forward that vascularity and horizontal length of pterygium can influence astigmatism induced by pterygium which is explained by the following equation

  Pterygium-induced astigmatism = 0.080 × RL (%) + 0.039 × VI – 0.823,

  where RL is the length of pterygium divided by the corneal horizontal diameter and VI stands for vascularity index which is determined through an anterior segment photograph using computerized algorithms.[19]

- Ocular surface squamous neoplasia

  OSSN and pterygium has same risk factors such as chronic irritation, UV radiation, oncogenic virus infection like HPV infection. older age and inferiorly located pterygia are associated with high prevalence of OSSN.

MANAGEMENT

MEDICAL MANAGEMENT

- Avoid dust and dry climate
- Topical preservative free lubricants
- Mild steroids to reduce hyperemia and inflammation
- Use of ultraviolet blocking spectacles

SURGICAL MANAGEMENT

INDICATIONS

- Visual impairment
- Cosmesis
- Patients who are unable to tolerate the symptoms
- Recurrent pterygium

SURGICAL TECHNIQUE

The first reported surgical excision of pterygium was dated from before 1000 B.C. "Susruta performed his operative procedure by placing the patient in recumbent position, pterygium is loosened and disturbed by sprinkling powdered salt into the eye. The pterygium is then fomented with the palm, heated by rubbing with the finger. a sharp hook is used to secure the growth at its loosened part and is held up with a toothed forceps, or a threaded needle which was passed from below the part and held up with the thread. The pterygium is then gotten rid of by scratching with a sharp round-topped instrument. The root of the pterygium pushed from cornea to the medial canthus and then excised and removed. Any remnant of the pterygium after excision removed with a scarifying ointment."[7]

One of the ancient procedure was Celsus's procedure (Rome—50 A.D.), in which the pterygium was separated from the ocular tissues by a thread by moving in a sawing motion towards the pupil. Paulus Aegineta , an ophthalmologist from Greece in 7th century used a small hook to seize the pterygium which is known as Paul's operation.[20]

1.BARE SCLERA EXCISION

Pterygium head and body are excised, leaving a bare sclera to re-epithelize. It was first described by D'Ombrain in 1948. He suggested that leaving an area of bare sclera allowed cornea time to heal before the conjunctiva grows across the limbus. Bare sclera excision has high recurrence rate ranging 24% to 89%[21]

2.PTERYGIUM EXCISION WITH CONJUCTIVAL CLOSURE/TRANSPOSITION

Pterygium is excised and wound closure is done by approximation of undermined conjunctival margins with or without creating relaxing incisions. Bare sclera can be covered by rotational conjunctival pedicle flap from above and below. The recurrence rate for primary closure was around 5% or 69% and for sliding conjunctival autograft was around 3.2% or 10.7%[22]

Stocker described "a method of conjunctival Z -plasty for primary closure." Wilson and Bourne described "an alternate type of z-plasty consists of placing a flap of normal tissue between the body of the pterygium and the corneal limbus."[23]

3.CONJUCTIVAL AUTOGRAFT

Conjunctival autograft has been the most popular method of pterygium surgery. It was reintroduced in the 1980s[24]. It involves removing of limbal tissue and adjacent conjunctiva in one piece and placing this tissue to cover the area from the pterygium is excised. The orientation of the autograft is such that the limbal side of the transplant is placed over the limbal area from where the pterygium was excised.[7] Conjunctival autograft is taken from the superotemporal conjunctiva of the same eye because it has been covered by the upper eyelid, thus it has less UV light exposure during the lifetime and has less histological modifications. The advantage of preservation of limbal stem cells that are responsible for good corneal, limbal and conjunctival healing. This procedure is also known as "Minimally invasive pterygium surgery" or PERFECT surgery (Pterygium Extended Resection Followed by Extended Conjunctival Transplantation).[25] Sutures, autologous blood serum, fibrin glue are used to attachment of conjunctival autograft.

Fernandes M, Sangwan VS et al. in a retrospective study conducted between January 1988 and December 2001 among various surgical technique for pterygium excision, the recurrence rate was 19.4% eyes after bare sclera technique, 16.7% after primary closure, 26.7% with amniotic membrane graft, 12.2% with conjunctival autograft and 17.3% with conjunctival limbal graft. conjunctival autograft was effective for the treatment of primary pterygium. Bare sclera has high recurrence.[26]

Multiple interrupted sutures were used initially for the attachment of the conjunctival graft to the adjacent conjunctival tissue. Cohen RA et al. in 1993 first described using an organic tissue adhesive for the fixation of conjunctival autograft. He used Tisseel (Immuno AG, Vienna, Austria), a biological adhesive in which human fibrinogen and thrombin are combined to form a fibrin glue.[27] Fibrin glue has two parts. One part is fibrinogen mixed with factor XIII, and aprotinin and another part is thrombin-CaCl2 solution. On mixing two parts, and, fibrinogen is converted to fibrin monomers which aided by the action of thrombin. Fibrin monomer by cross-linking, leads to formation of fibrin clot. The concentration of thrombin decides coagulation time.[28, 29] The advantages of fibrin glue over sutures are shorter surgical time, lesser pain, lesser inflammation. In a study conducted in Navi Mumbai on comparing fixation of conjunctival graft using fibrin glue, autologous in situ blood coagulum and suture, all had equal recurrence rate. there is reduced surgical time, less post-operative discomfort and suture related complications with tissue glue and autologous in situ blood coagulum. But these two techniques had graft retraction in early post operative period.[30]

In a study by Kumar S and Singh R on 60 patients, they concluded that fibrin glue and autologous blood are better alternatives for sutures in pterygium surgery. Using fibrin glue and autologous blood can ease surgical procedures, shorten operating time and produce fewer post-operative complications.[31]

4.AMNIOTIC MEMBRANE GRAFTING

Amniotic membrane transplantations are shown to reduce pterygium recurrence. It has anti-inflammatory properties, promotes apoptosis of activated inflammatory cells, promote phagocytosis, and increase the expression of anti-inflammatory cytokines such as IL-10. It also prevents proliferation and myofibroblast differentiation thus reducing scarring and

fibrosis in ocular surgery. It suppresses TGF-β signaling in conjunctival and pterygium fibroblast.[32]

5.LIMBAL STEM CELLS TRANSPLANTATION

Pterygium is caused by the changes and deficiency of limbal epithelial stem cells which lead to encroachment of conjunctiva over cornea. The limbal tissue with stem cells cut into three to four pieces. These pieces are implanted over the bare sclera and secured with fibrin glue. It is either covered by secondary graft or bandage contact lens. This limbal stem cells maintain epithelium throughout life by providing a constant supply of daughter cells.[33]

6.ADJUVANT TREATMENTS

The use of chemicals or chemical cautery to treat pterygium were seen since the time of Susruta. Powered alum, copper sulphate, silver nitrate and carbolic acid are the chemicals used with or without surgical excision over centuries as a treatment for pterygium.[7]

a. Beta Irradiation

Ionizing radiation inhibits the mitosis of actively dividing cells. Strontium 90emits beta radiation without gamma emission. Thus it is safest and effective mode of applying radiation. Total doses used range from 2000 rads or 6000 rads. The duration of treatment vary from single post operative dose to weekly doses for six weeks after surgery.

The adverse events associated with beta irradiation include sectoral cataract formation, iris atrophy, scleral necrosis, conjunctival cicatrization, keratitis, photophobia, and ptosis.

b. Mitomycin C (MMC)

Mitomycin C is an antibiotic anticancer drug which inhibit DNA, RNA, and protein synthesis. In pterygium surgery, it induces prolonged localized inhibition of Tenon's fibroblast and thus reduces pterygium recurrence. It is used either as perioperative, postoperative drops or applied intraoperatively.

Mitomycin C is used in the pterygium surgery in three different ways

- Subconjunctival injection of mitomycin C (0.1mL of 0.15 mg/mL) given directly into pterygium tissue at the limbus, one month before the bare sclera excision of the pterygium. The recurrence rate was 6% seen after 2 years of follow up.[34]
- Intraoperative application of surgical sponges soaked in MMC solution has been used in pterygium surgery. It can be applied directly over the scleral bed after the pterygium excision. MMC in different concentration and duration of application were used.(0.002% to 0.4% for 3 to 5 min). Most used dosage was 0.02% MMC for 30 seconds to 5 minutes.[35] The recurrence rate for intraoperative use of MMC in primary pterygium varies from 6.7% to 22.5%.[35][36] Korenyi et al. noted 38% recurrence on using 0.04% MMC intraoperatively for 3 minutes. The most common complication observed was delayed epithelial healing (40%) and mild scleral thinning (20%).[37] With the use of 0.02 % for 2min, there were no severe complications reported.[35]
- Postoperative use of topical MMC eye drops. MMC has been used in varying concentration between 0.005% and 0.04%, but more 0.02% MMC eye drops are administered four times daily for 1-2 weeks. Recurrence rate with postoperative use of MMC eyedrops was noted around 20.51%.[38] various complications were reported on using eyedrops includes iritis, limbal avascularity, scleral melting or calcific plague, corneal decompensation, scleral perforation [39]

c. 5-Fluorouracil

5-Fluorouracil is an antimetabolite, is a pyrimidine analogue that causes apoptosis of fibroblasts by inhibiting the thymidylate synthetase enzyme, which is involved in the conversion of ribonucleotides to deoxyribonucleotides, thus preventing DNA synthesis.[24] Sobia u shah et al. used 0.1ML of 5-FU (5mg) in a 1 ml syringe and injected intralesionally.[41] Topical use of 5-FU causes epitheliopathy, ocular surface inflammation, pain, and dry eye symptoms which are mild and are reversible with lubricants.[24]

Bekibele C et al. conducted a randomised controlled study to compare the efficacy of 50mg/ml 5-Fluorouracil versus 0.01% Mitomycin C in preventing pterygium

recurrences amomg 80 eyes. The recurrence rate in 5-FU group was 8.7% and MMC group was11.8%. One patient from the MMC group had cornescleral melt.[41]

d. Thiotepa

The nitrogen mustard analog thiotepa, was used as an adjuvant to reduce the postoperative recurrence of pterygium since 1962. Thiotepa is an alkylating agent which interferes with normal mitosis and cell division in rapidly proliferating tissues. It reduces the recurrence of pterygium by inhibiting vascular endothelial proliferation at the operative site.[42] The most common strength used is 1:2000, given topically three hourly from two days postoperatively to a total duration of 6 – 8 weeks. The recurrence rate was 0 – 16% when excision is followed by thiotepa therapy. [43] Topical thiotepa therapy was associated with complications which included early and late-onset poliosis and periorbital skin depigmentation that can be permanent, prolonged conjunctival injection, irritation, conjunctival deposition of black pigment, allergic reactions, and scleral perforation.[42]

e. Monoclonal antibodies against vascular endothelial growth

Recently anti – VEGF are used as adjunctive therapy in pterygium surgery as eye drops or subconjunctival injections. VEGF levels found to be very high in pterygium. Bevacizumab is a recombinant, humanized anti VEGF agent, active against all the isoforms of VEGF. It prevents angiogenesis and thus reduces recurrence. In a study in which 1.25mg of subconjunctival injection of bevacizumab was given preoperatively 1 week, observed recurrence rate of 6.67%.[44] Kasetzuwan et al. showed that 8.33% recurrence rate after using 0.05% topical bevacizumab four times daily for 3 months following bare sclera technique. No adverse events were noted.[45]

f. Interferon alpha

Interferons are glycoproteins that have antiproliferative, antiviral, immunomodulatory, and antiangiogenic properties. It has been used in ocular surface squamous neoplasia, viral keratitis, and refractory vernal keratoconjunctivitis. Esquenazi first reported that topical IFN alpha-2b could regress neovascularization significantly in the early stage of recurrent pterygium [46]. It inhibits mitogen-activated protein kinases pathway in cultivated pterygium epithelial cells to downregulate the secretion of VEGF and

inflammatory cytokines. In a study one recurrence was observed among 20 eyes, on treatment with IFN alpha-2b 4 times daily for 3 months with no complications.[47]

g. Cyclosporine A

It is a cyclic non-ribosomal peptide which is composed of 11 amino acids and is produced by the fungus. It is an immunosuppressant drug, used in post-allogenic organ transplants to reduce the risk of organ rejection.[24] Pterygium is caused by secretion of proinflammatory cytokines (interleukins) IL -6, IL-1, IL -8 and tumor necrosis factor alpha secondary to chronic ultraviolet radiation exposure. VEGF can also be stimulated by tumor necrosis factor alpha through ultra violet radiation B. Cyclosporine A (CsA) active againt T-helper cells and prevents the synthesis and secretion of ILs. It also blocks angiogenic factors induced by VEGF. 22.2% recurrence rate was noted on using 0.05% topical Cyclosporine postoperatively at 6-hour intervals for 6 months after bare sclera technique.[48]

Hwang S and Choi S conducted a randomised, single-centre study in Seoul, Korea, in which excision of pterygium was done using bare sclera technique. All the patients were administered antibiotic drops and steroid eye drops. Then patients were randomly separated into four adjuvant therapy groups as artificial eye drops, topical 0.02% mitomycin C, topical 0.05% cyclosporine and topical 2.5% Bevacizumab. All were instilled four times a day for three months after sugery. 45.5% in the control group, 10.3% in the mitomycin c group, 20.6% in the cyclosporine group and 41.7% in the bevacizumab group had recurrence.[49]

h. Ethanol

Ethanol has been used in the widely due to its anti-bacterial properties. In photorefractive keratectomy and laser subepithelial keratomileusis, ethanol has been used for the debridement of the corneal epithelium. Alcohol assisted removal is easier, fast and complete.[50] Application of diluted ethanol (mostly 20% ethanol for 30 seconds) delaminates the corneal epithelium at the level of the hemidesmosomal attachments and creates a smooth stromal surface. [51] When ethanol is applied on the cornea and pterygium head before excision it creates a smoother separation plane, and the pterygium head can be easily scrapped off from the underlying cornea. It causes

rapid denaturation of proteins/peptides including cytokines, enzymes, and growth factors that are involved in pterygium formation and recurrence after excision.

Chen K et al. conducted a prospective randomized study in 2006 between ethanol group where 20% ethanol was applied over the pterygium head for 60 seconds and mitomycin C group in which mitomycin C 0.25 mg/ml was applied for 60 seconds to the bare sclera after pterygium excision. After one year of follow up pterygium recurrence was observed in 2 (5.3%) of 38 eyes in ethanol group and 4 (10.0%) of 40 eyes in mitomycin C group.[52]

Nowacka B, Lubinski W studied forty-five patients with primary pterygium underwent the sliding flap technique with adjunctive intraoperative 0.05% mitomycin C (27 eyes) or 20% ethanol (23 eyes) for pterygium surgery in 2019. No post-operative complications were noted. Only two recurrences were noted at the end of the 3rd and 6th months of follow-up. There was a visible reduction in mean corneal astigmatism at 1 year follow up. But this decrease was statistically insignificant.[53]

In a study conducted in China in 2021 on 85 patients, Xiao-Nian Wu and Li Jiang et al., 20% ethanol (the study group) was used for 44 eyes with bare sclera excision and no adjuvant was used for 41 eyes leaving behind bare sclera. In all eyes of the study group, the 20% ethanol for separating the pterygium head was successful. No intraoperative and post-operative complications were noted in any eyes. During follow-up periods of 3 months, only 1 case had a recurrence in the study group, and 2 cases had a recurrence in the control group.[54]

In a European study by Gancedo ML et al., in 2022, 96% ethanol is used to dissect the pterygium from the underlying cornea. All patients had completed epithelialisation within one week, and no one had a limbal deficiency. The recurrence rate after pterygium excision is low.[55]

The above studies used ethanol in 20% or 96% concentration were effective in pterygium surgery and none of the studies reported any complications due to ethanol intraoperative or postoperative. The present study is to evaluate efficacy, safety and surgical outcomes of using 20% ethanol in pterygium surgery.

COMPLICATION OF PTERYGIUM SURGERY

The most common complication encountered during the surgery is bleeding from the conjunctival vessels. It can be controlled by pressure hemostasis and thermal cautery. Immediate post operative complications are graft edema, hematoma under the graft, and corneal epithelial defect.

The vision-threatening complication are seen with use of intraoperative beta irradiation or intraoperative and postoperative MMC which includes thinning and ulceration of sclera. There is an increased risk of complications seen with increased concentration and duration of exposure of MMC. Delayed epithelialization is also noted with the use of MMC in pterygium surgery.[39]

Recurrence of pterygium is one of the most common complications following pterygium surgery. It occurs first 3-6 months after surgery. Dry eye disease, young age are risk factor for development of recurrence. Various molecular and genetic factors involved are increased expression of MMP-1, MMP-3, p53, VEGF. The recurrence of pterygium is caused by formation of pre-inflammatory cytokines, growth factors, and different molecular biomarkers like increased levels of stromal cell-derived factor 1, angiogenin, transcription factor specificity protein 1, and collagen I. these all are associated with higher recurrence rate. Surgical techniques which can risk factor for recurrence are excessive suturing, inadequate peripheral dissection, insufficient conjunctival graft size, thick conjunctival graft with remained Tenon tissue, and postoperative graft retraction due to inadequate fixation. Highest rate of recurrences is seen with bare sclera technique.[56]

MATERIALS AND METHODS

A prospective, hospital based interventional study was done to evaluate the efficacy and surgical outcomes of intraoperative application of 20% ethanol as an adjuvant in pterygium excision with conjunctival autograft. This study was conducted on 30 eyes of 30 patients with primary pterygium who had come to ophthalmology OPD, B.L.D.E's Shri B.M.Patil Medical College, Hospital and Research Centre, Vijayapura.

INCLUSION CRITERIA

- All the patients with primary pterygium
- Aged > 18 years
- Patients who had followed up upto 3 months

EXCLUSION CRITERIA

- Age < 18 years
- Patient with recurrent pterygium and pseudopterygium
- Patient with previous history of ocular surgery
- Patient with meibomitis, atopic keratoconjunctivitis, sjogren's syndrome or herpetic keratitis and other ocular infections

Patient's details were recorded as follows:

1. Demographic details:

Patient's demographic details like name, age, gender, occupation, residence were noted.

2. Chief complaints and relevant history

Chief complaints like abnormal growth over eye, diminision of vision, foreign body sensation, redness, burning sensation or diplopia were noted. The onset of the symptoms, duration and progression of the symptoms were noted. Any previous history of trauma, any medical or surgical history, any use of alcohol or smoking were also enquired.

3. Ocular assessment

All the patients were examined thorough as follows

- Snellen's chart was used to measure the visual acuity
- Slit lamp biomicroscopy was used to examine the anterior segment and grade of the pterygium is determined. Size of the pterygium and encroachment over the cornea is measured using slit lamp examination.
- Dilated fundus examination was done using indirect ophthalmoscope to rule out any fundus pathology.
- Auto refractometer was used to determine vertical meridian (K1) and horizontal meridian (K2). The difference between the K1 and K2 values gives the corneal astigmatism.
- Pterygium was graded based on the extent over the cornea.
    - Grade 1 – pterygium involving the limbus
    - Grade 2 – pterygium encroaching between limbus and pupillary margin
    - Grade 3 – pterygium encroaching the pupillary margin
    - Grade 4 – pterygium crossing the pupilary margin

4. Investigation

Relevant investigation were done before the pterygium surgery which included random blood sugar, HIV and HBsAg viral makers.

5. Operative procedure

Pterygium excision was performed under peribulbar anaesthesia. 20% ethanol was applied for 60 seconds over the pterygium head. Pterygium head is lifted and dissected. The time taken for the pterygium head dissection was noted. The pterygium body is dissected from underlying sclera and excised. The graft was taken from the superotemporal part of the conjunctiva from the same eye, 1-2 mm larger than the size of the bare sclera. The size of the graft was measured using callipers. Bleeding is allowed, and a graft is placed over the bare sclera. Autogenous fibrin-rich serum act as a glue between graft and sclera. Pressure was applied over the graft using cotton bud for 5 minutes to make sure that graft was adherent to bare sclera. 2 drops of Moxifloxacin eye drops was put at the end of the surgery.

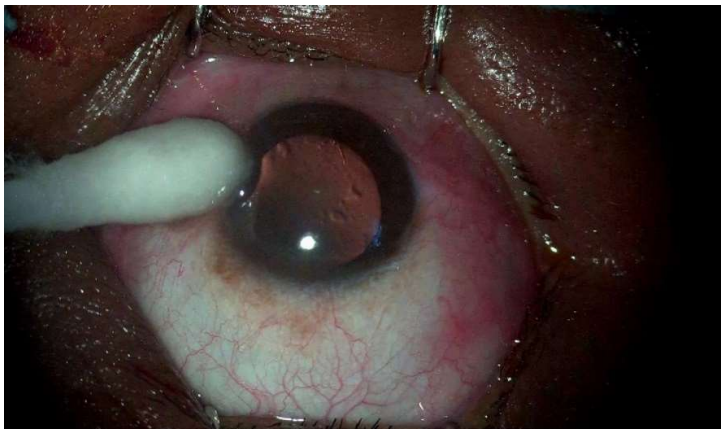
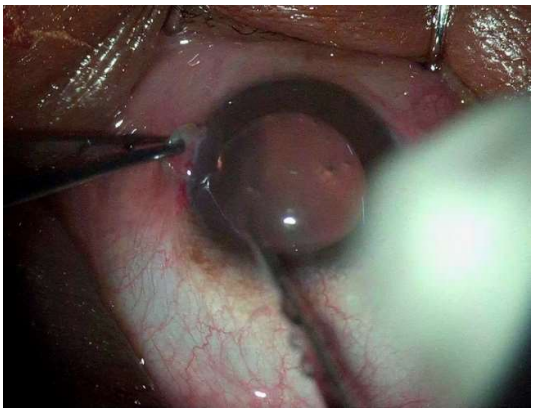


Figure 1: Application of 20% ethanol using a cotton bud to the pterygium head



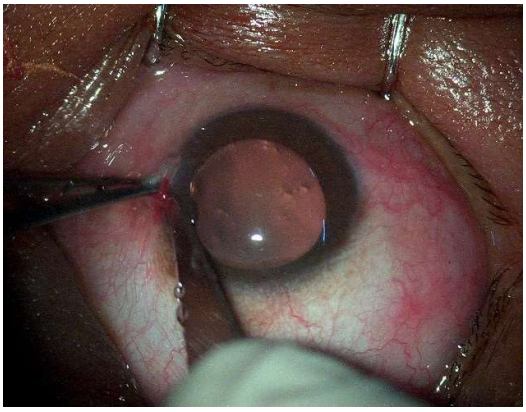


Figure 2 and 3 : Dissection of pterygium head using a scalpel

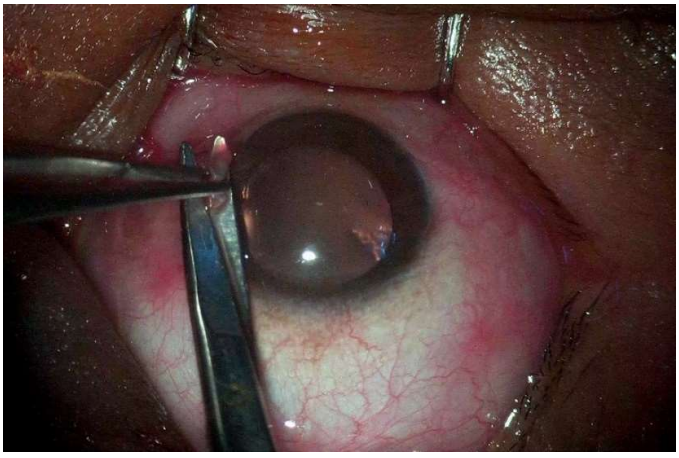
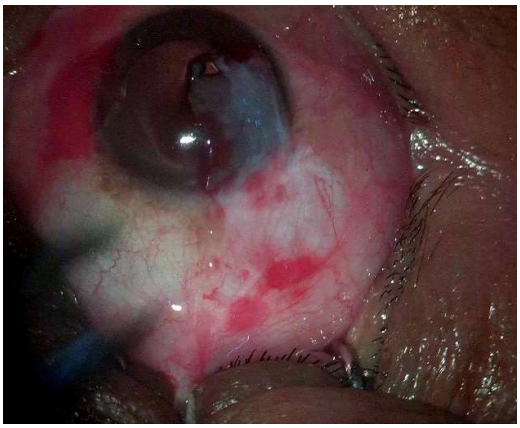


Figure 4: Excision of pterygium



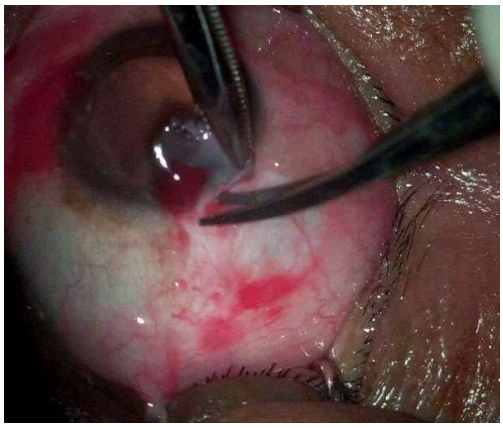


Figure 5 and 6 : Graft is taken from superotemporal conjunctiva

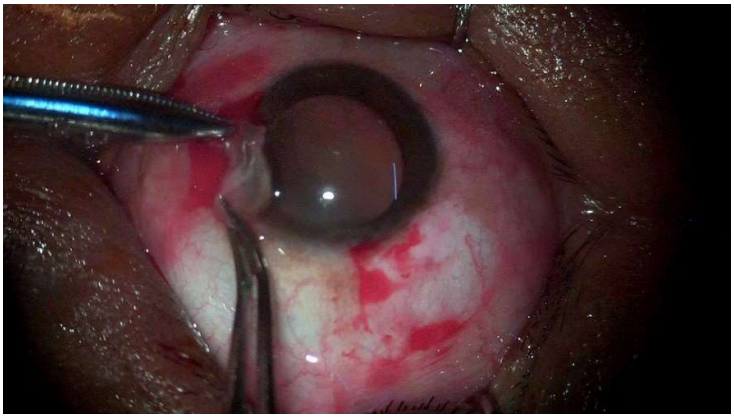


Figure 7 : Graft was placed over bare sclera

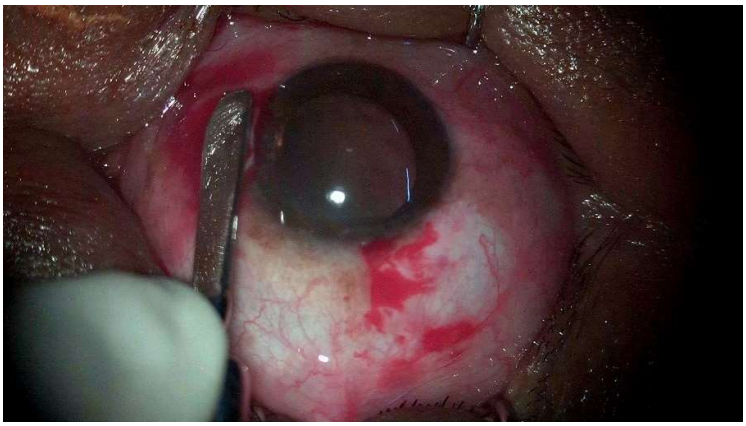


Figure 8: Pressure was applied over the bare sclera

The initial examination was done on the 1st post-operative day, and subsequent follow-up visits were done on the 1st week, 4th week and 3rd month.

The following parameters were noted during initial 1st post-operative day, and subsequent astigmatism and any complications.

The patients were explained about the study, institutional ethical clearance and patients wilful consent were taken.

6.Sampling

With the anticipated proportion of recurrence of pterygium at 2.3%[52], the study had a sample size of 30 patients, with a 95% level of confidence and 5% absolute precision, using Statulator software (http://statulator.com/SampleSize/ss1P.html)

Formula used

- $n=\frac{z^2\ p*q}{d^2}$

Where Z= Z statistic at α level of significance
d^2= Absolute error
P= Proportion rate
q= 100-p

THE SAMPLE SIZE IS 30.

7. Statistical analysis

The data obtained were entered into a Microsoft Excel sheet, and statistical analysis was performed using a statistical package for the social sciences (Version 20).

Results were presented as Mean ±SD, or Median and Interquartile range, frequency, percentages, and diagrams.

Pre-operative and post-operative variables were compared using repeated measures of Friedman test

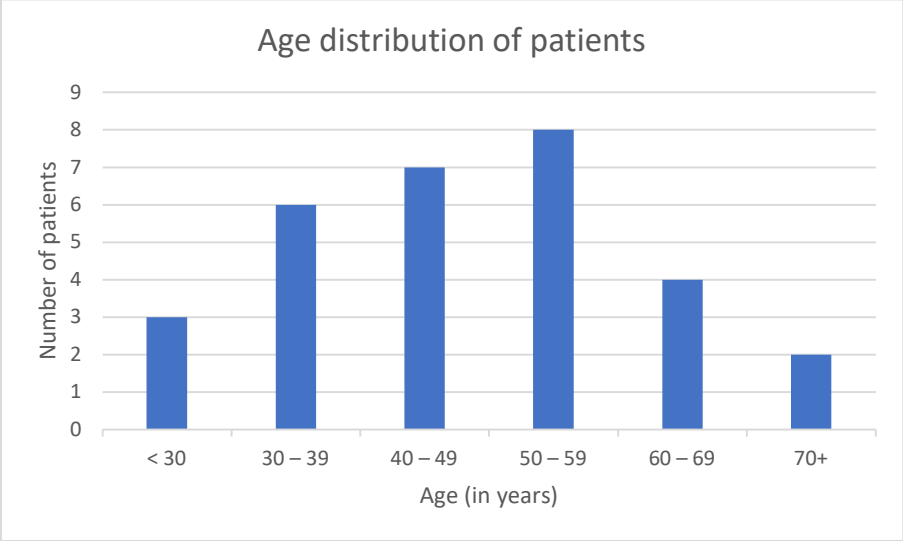
$p<0.05$ was considered statistically significant. All statistical tests were perform two-tailed.

RESULTS

This was a prospective interventional study conducted in the Department of Ophthalmology, B.L.D.E. Shri B.M. Patil Medical College, Vijayapura. 30 eyes of 30 patients with primary pterygium were included in this study for a period of 18 months.

Table1: Age wise distribution of patients with primary pterygium who have enrolled in the study

Age(Years)	No. of patients	Percentage
< 30	3	10.0
30 – 39	6	20.0
40 – 49	7	23.3
50 – 59	8	26.7
60 – 69	4	13.3
70+	2	6.7
Total	30	100.0

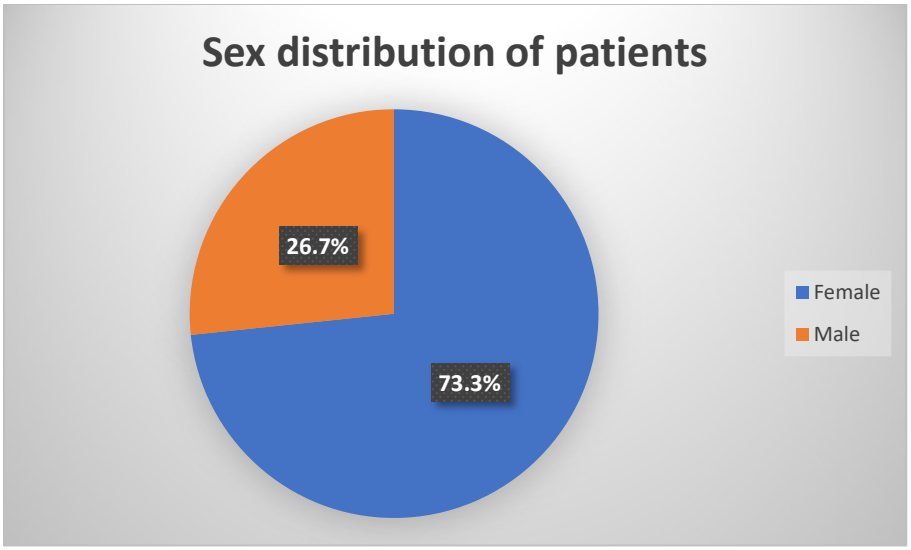


Graph 1: Graph showing age wise distribution of patients

The mean age of the patients was 47.06 ±13.20 years whose age ranged from 26-72 years. Maximum number of people (8) were seen in the age group of 50 – 59 years.

Table 2: Sex distribution of patients with primary pterygium

Gender	No. of patients	Percentage
Female	22	73.3
Male	8	26.7
Total	30	100.0

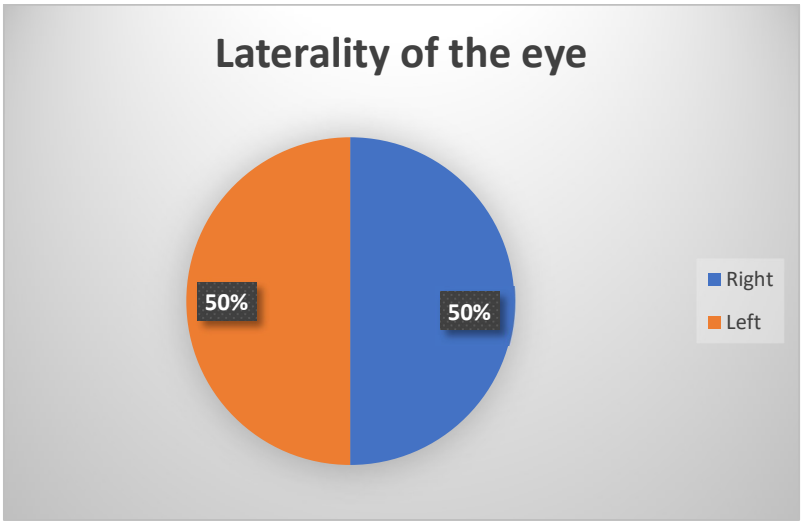


Graph 2: Pie diagram showing sex distribution of the patients

In this study female preponderance was noted. Among the 30 patients 22 were females (73.3%) and 8 were male (26.7%).

Table 3: Laterality of eye of patients with primary pterygium

Eye	No. of patients	Percentage
Right	15	50.0
Left	15	50.0
Total	30	100.0

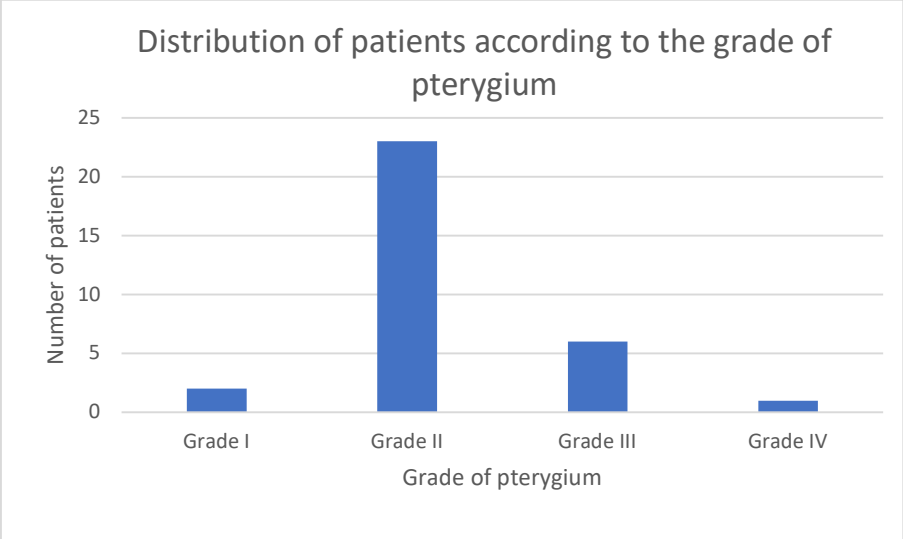


Graph 3: Pie diagram showing distribution of people according to the laterality of the eye

There were 15 (50%) patients with primary pterygium in the right eye and 15 (50%) patients with primary pterygium in the left eye.

Table 4: Distribution of patient according to the grades of pterygium

Grade of the pterygium	No. of patients	Percentage
Grade I	2	6.7
Grade II	21	70.0
Grade III	6	20.0
Grade IV	1	3.3
Total	30	100.0



Graph 4: Bar diagram showing distribution of patients according to the grade of pterygium

There were 21(70%) patients with grade II pterygium, 6 (20.0%) with grade III, 2 (6.7%) patients with grade I and 1 (3.3%) patient with grade IV pterygium. Out of the 30 patients, 26 (86.6 %) had nasal pterygium, 1 (3.3%) patient had temporal pterygium and 3 (10%) patients had biheaded pterygium

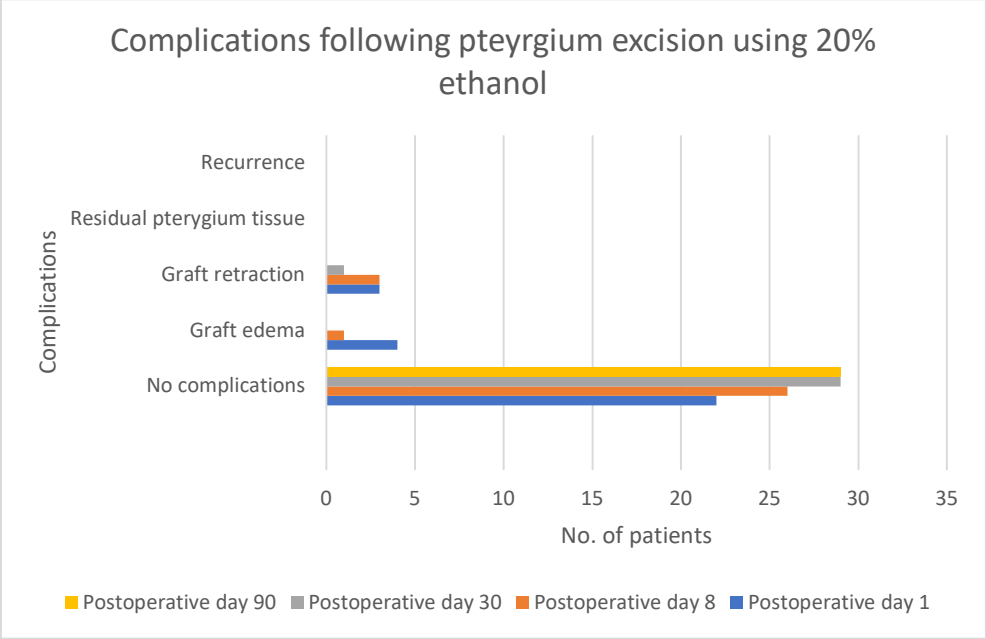
Table 5: Average time taken for the dissection of pterygium head and time taken for the application of pressure over the graft.

	Time taken for the dissection of pterygium head from the underlying cornea (sec)	Duration of application of pressure over graft (sec)
Mean	82.83	321.33
Std. Deviation	39.777	55.069

The average time taken for the dissection of pterygium head from the underlying cornea was 82.83±39.777 sec and the average duration of pressure applied over the graft by the cotton bud is 321.33±55.069 sec.

Table 6: Distribution of patients with complications after pterygium excision using 20% ethanol as an adjuvant with conjunctival autograft

COMPLICATIONS	DAY 1	DAY 8	DAY 30	DAY 90
	No. of patients (Percentage)	No. of patients (Percentage)	No. of patients (Percentage)	No. of patients (Percentage)
No complications	23 (76.6%)	26 (86.7%)	29 (96.7%)	30(100%)
Graft edema	4 (13.3%)	1 (3.3%)	0	0
Graft retraction	3 (10%)	3 (10.0%)	1 (3.3 %)	0
Residual pterygium tissue	0	0	0	0
Recurrence	0	0	0	0
Total	30 (100%)	30 (100 %)	30 (100 %)	30 (100%)



Graph 5: Graph showing complications following pterygium excision with conjunctival autograft implantation

On postoperative day 1 out of 30 patients, 22(73.3%) patients had graft well adherent to sclera 4(13.3%) patients had graft edema, and 3(10.0%) patients had graft retraction.

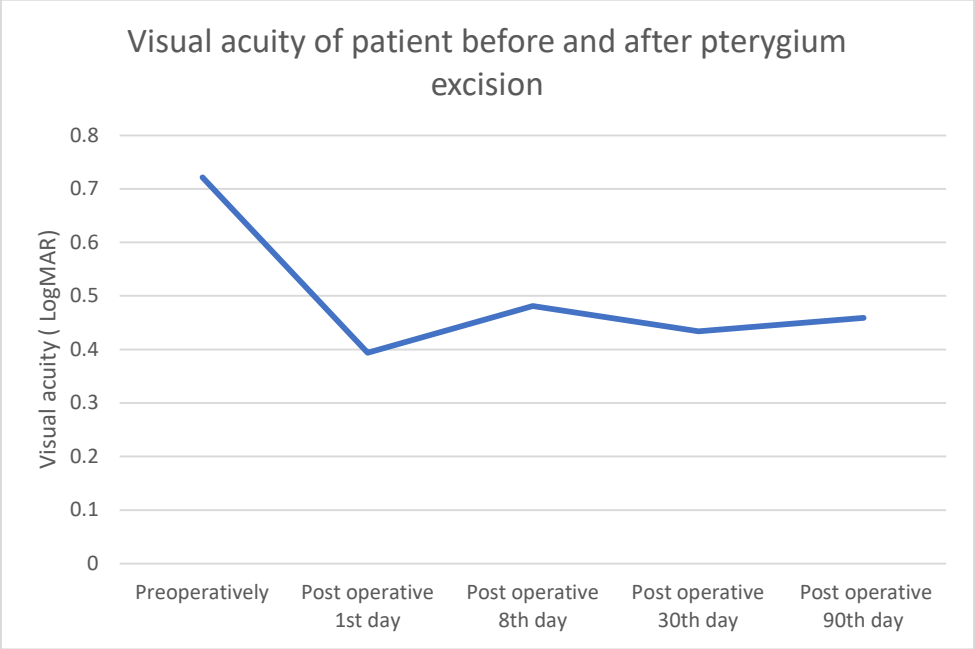
On postoperative day 8, 26 (86.7%) patients had graft well adherent to sclera and no other complicated were noted. 1(3.3%) patient had graft edema and 3(10.0%) had graft retraction.

On post operative day 30 (96.7%) patients had no complications and 1(3.3%) patient had graft retraction.

No recurrence was noted on post operative day 90. No other complications noted among 30 patients on day 90.

Table 7: Visual acuity in LogMAR before and after pterygium excision using 20% ethanol as adjuvant with conjunctival autograft

	Visual acuity (LogMAR)		Friedman Test	Significant value
	Mean	Std. Deviation		
Preoperatively	0.7217	0.47092	25.350	P=0.001*
Post operative 1st day	0.3940	0.33930		
Post operative 8th day	0.4813	0.37217		
Post operative 30th day	0.4340	0.34903		
Post operative 90th day	0.4593	0.35208		



Graph 6: Graph showing visual acuity in LogMAR before and after pterygium excision using 20% ethanol as an adjuvant with conjunctival autograft

The average visual acuity preoperatively was 0.7217±0.471 Log MAR. Post operatively there was improvement in the vision. The average visual acuity in the post operative day 1, day 8, day 30, day 90 were 0.394 ± 0.339 Log MAR, 0.481± 0.372 Log MAR, 0.434 ± 0.349 Log MAR, and 0.459±0.352 Log MAR respectively (p =0.001).

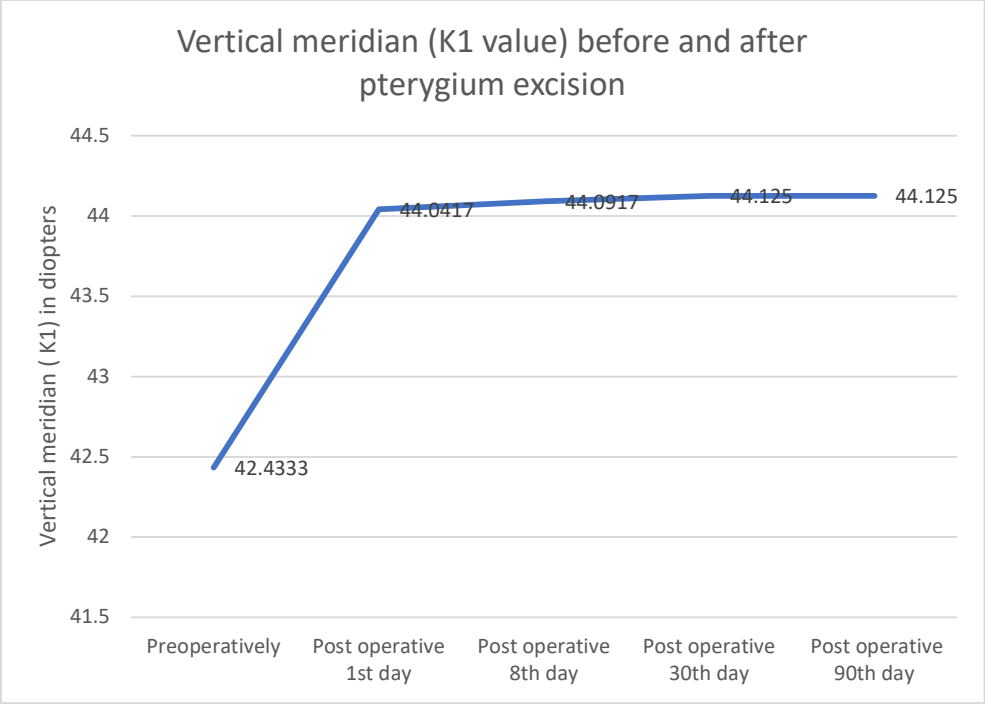
Table 8: Pairwise Comparisons among the visual acuity (Post hoc test)

	Significant value	**Remark**
Comparison of visual acuity on post operative day 1 and visual acuity preoperatively	0.001	Statistically significant
Comparison of visual acuity on post operative day 30 and visual acuity preoperatively	0.019	Statistically significant

There was significant increase in visual acuity post-surgery on day 1 and the increase was statistically significant (p=0.001). there was also statistically significant increase in visual acuity from preoperative day to post operative day 30 (p =0.019)

Table 9: Vertical meridian (K1) in diopters before and after pterygium excision using 20% ethanol as adjuvant with conjunctival autograft

	K1 value		Friedman Test	Significant value
	Mean	Std. Deviation		
Preoperatively	42.4333	2.83599	13.898	0.008
Post operative 1st day	44.0417	1.55929		
Post operative 8th day	44.0917	1.39346		
Post operative 30th day	44.1250	1.32247		
Post operative 90th day	44.1250	1.35308		



Graph 7: Graph showing vertical meridian (K1 value) before and after pterygium excision using 20% ethanol as an adjuvant with conjunctival autograft

The average vertical meridian (K1 value) before pterygium excision was 42.43±2.836 D and after pterygium excision were 44.04 ± 1.56 D, 44.09±1.39D, 44.125 ± 1.32 D and 44.125 ± 1.353 D on post operative day 1, 8, 30 and 90 respectively. These values were statistically significant (p=0.008)

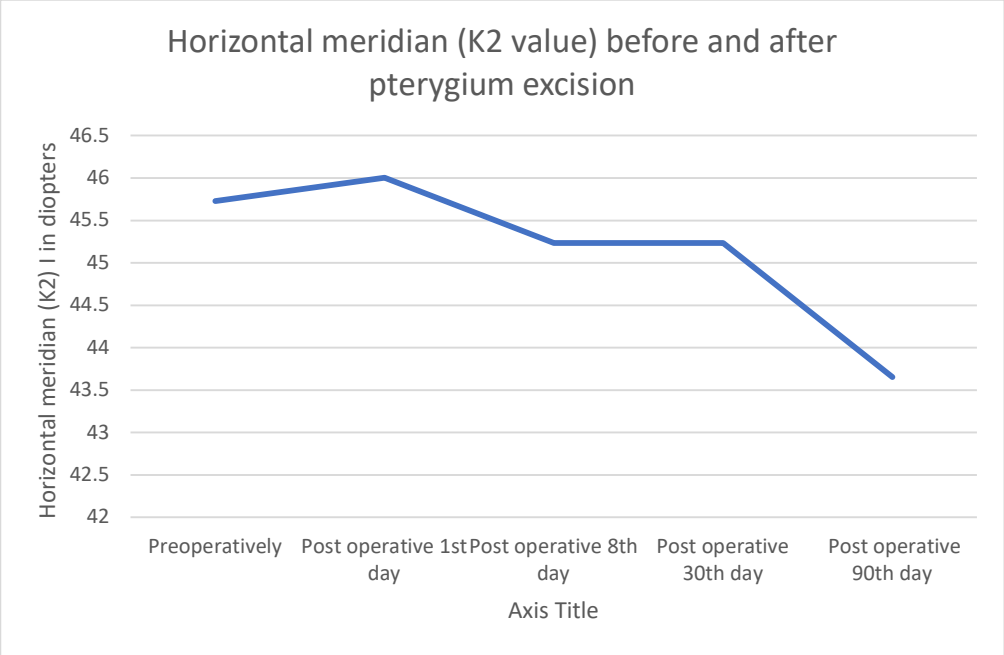
Table 10: Pairwise Comparisons among vertical meridian (K1 value) (Post hoc test)

	Significant value	Remark
Comparison of K1 value preoperatively and postoperatively day 30	0.05	Statistically significant
Comparison of K1 value preoperatively and post operatively day 90	0.019	Statistically significant

On comparing the average vertical meridian (K1 values) preoperative with each postoperative follow up using post hoc test, there was significant change in noted in preoperative day and post operative day 30 (p=0.05) and preoperative day and postoperative day 90(p=0.019).

Table 11: Horizontal meridian (K2) in diopters before and after pterygium excision using 20% ethanol as adjuvant with conjunctival autograft

	K2 Value		Friedman Test	Significant value
	Mean	Std. Deviation		
Preoperatively	45.7250	1.88157	35.347	0.001
Post operative 1st day	46.0000	2.34888		
Post operative 8th day	45.2333	1.57285		
Post operative 30th day	45.2333	1.58105		
Post operative 90th day	43.6533	7.55743		



Graph 8: Graph showing horizontal meridian (K2 value) before and after pterygium excision using 20% ethanol as an adjuvant with conjunctival autograft

The average horizontal meridian (K2 value) preoperatively was 45.725 ± 1.881 which reduced following excision of pterygium. The average horizontal meridian (K2 value) on post operative day 1, 8, 30, 90 were 46±2.349D, 45.233± 1.573 D, 45.23± 1.581 D and 43.653 ± 7.557D respectively. These values are statistically significant (p=0.001)

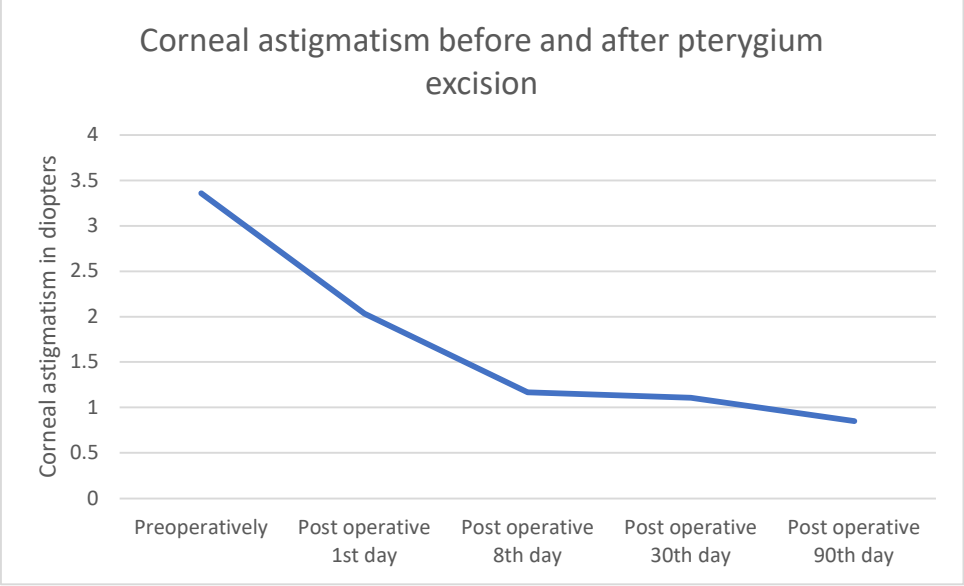
Table12: Pairwise Comparisons among the horizontal meridian (K2 value) (Post hoc test)

	Significant value	**Remark**
Comparison of K2 value post operative day 90 and postoperative day 1	0.004	Statistically significant
Comparison of K2 value post operative day 90 and preoperatively	0.001	Statistically significant
Comparison of K2 value post operative day 8 and preoperatively	0.003	Statistically significant
Comparison of K2 value post operative day 30 and preoperatively	0.005	Statistically significant

On pairwise comparison among the average horizontal meridian (K2 value) using post hoc test, there was statistically significant decrease in K2 value from post operative day 1 to postoperative day 90 (p=0.004), from preoperative day to post operative day 90 (p=0.001), preoperative day to post operative day 8 (p=0.003) and preoperative day to post operative day 30 (p=0.005).

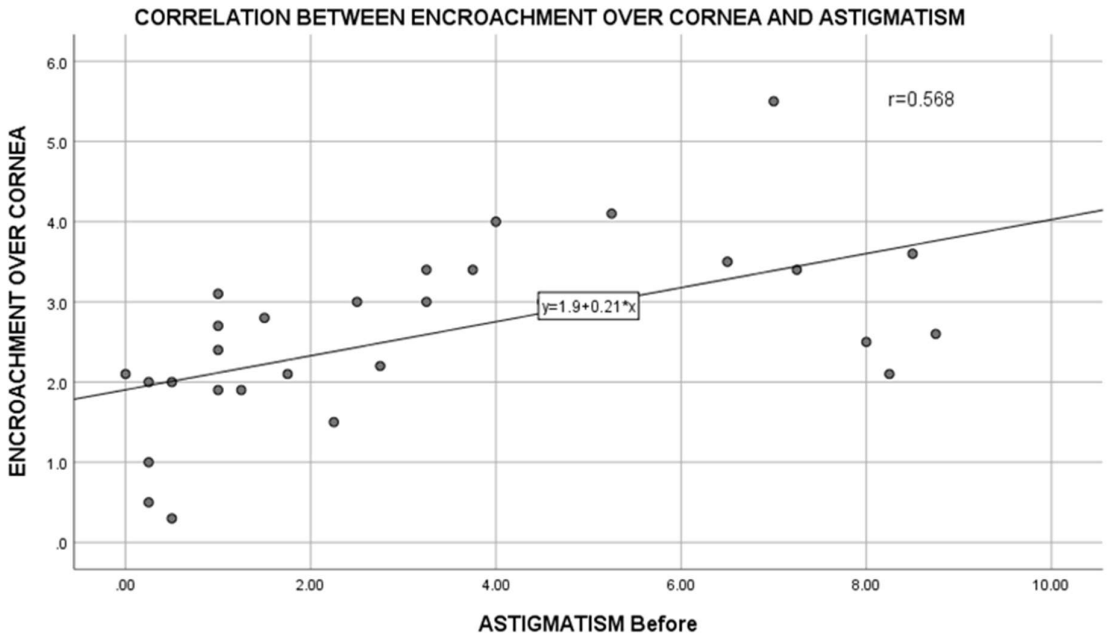
Table 13: Corneal astigmatism in diopters before and after pterygium excision using 20% ethanol as adjuvant with conjunctival autograft

	Corneal Astigmatism		Friedman Test	Significant value
	Mean	Std. Deviation		
Preoperatively	3.3583	2.86679	37.804	0.001
Post operative 1st day	2.0333	1.36257		
Post operative 8th day	1.1667	1.02624		
Post operative 30th day	1.1083	1.02277		
Post operative 90th day	0.8500	0.57084		



Graph 9: Graph showing corneal astigmatism in diopters before and after pterygium excision using 20% ethanol as adjuvant with conjunctival autograft

There is significant reduction in the corneal astigmatism from the preoperative day to post operative day 90. The mean corneal astigmatism preoperatively was 3.3583±2.865 D which was reduced to 2.0333±1.3362 D, 1.1667±1.026 D, 1.1083 ±1.023 D, 0.85±0.57D on post operative day 1, day 8, day 30 and day 90 respectively. The p value is statistically significant (p=0.001)



Graph 10: Graph showing the correlation between the encroachment over the cornea and corneal astigmatism

There was a moderately positive correlation between encroachment of pterygium over cornea and corneal astigmatism preoperatively (r = 0.568) which is statistically significant (p = 0.001).

Table 14: Pairwise Comparisons among the corneal astigmatism (Post hoc test)

	Significant value	Remark
Comparison of corneal astigmatism post operative day 90 and postoperative day 1	0.0001	Statistically significant
Comparison of corneal astigmatism post operatively day 90 and preoperative	0.0001	Statistically significant
Comparison of corneal astigmatism post operative day 30 and postoperative day 1	0.015	Statistically significant
Comparison of corneal astigmatism post operative day 30 and preoperative	0.003	Statistically significant
Comparison of corneal astigmatism post operative day 8 and postoperatively day 1	0.022	Statistically significant
Comparison of corneal astigmatism post operative day 8 and preoperative	0.004	Statistically significant

On pairwise comparison of average corneal astigmatism using post hoc test, there was significant decrease in corneal astigmatism noted among different follow up periods. There were statistically significant decrease in corneal astigmatism from post operative day 1 and post operative day 90(p=0.0001), preoperative day and post operative day 90 (p=0.0001), post operative day 1 and post operative day 30 (p=0.015), preoperative and post operative 30(p=0.003), post operative day 1 and day 8 (p= 0.022), preoperative and post operative day 8 (p= 0.004)

DISCUSSION

Pterygium commonly affects people of tropical and subtropical areas. Since India comes within the area of "pterygium belts", pterygium is very prevalent among the Indian population.

This was a prospective interventional study conducted at Shri B.M. Patil Medical College Vijayapura. This study assessed the efficacy and safety of using 20% ethanol as an adjuvant with conjunctival autograft implantation and also studied surgical outcomes of using 20% ethanol as an adjuvant in pterygium surgery. Thirty patients with primary pterygium were enrolled in this study. The mean age of the patients was 47.06 $\pm$13.20 years whose age ranged from 26-72 years. Majority of them (8 patients) were in the age group of 50-59 years. It was followed by 7 patients in the age group 40-49 years and 6 patients in the age group 30-39 years. This may be due to more hours of outdoor activity among these people.

Female preponderance was noted in this study. Das AV, Podila S et al. from their study of 1,610,843 pterygium patients majority were female (54.5%). They concluded from their study that female gender, increasing age is a risk factor for developing pterygium.[57] In a study conducted in Mansoura ophthalmic centre had 1.812: 1 male to female ratio.[58]

Most of the patient had grade II pterygium (70%) followed by grade III (20%) , grade I (6.7%) and grade IV (3.3%). In this study, it was observed that 76.7% of the cases had pterygium on the nasal side, 2% had biheaded pterygium and 1 % has temporal pterygium. Higher prevalence of nasal pterygium is due to flow of tears towards the medial carrying dust particles. Lesser prevalence of temporal pterygium may be due to greater bowing of outer 2/3rd of the upper lid causing less exposure of conjunctiva on temporal side.

All the patient underwent pterygium excision using 20% ethanol as an adjuvant with conjunctival autograft. The patients were followed up for post operative day 1, day 8, day 30, and day 90.

Ethanol helps is to create a dissection plane between pterygium head and cornea. Thus the separation of pterygium head from the underlying cornea was easier. The average time taken for the dissection of pterygium head from the underlying cornea was 82.83±39.777 sec. There was no residual tissue was noted after the pterygium excision over the cornea.

The graft was taken from superotemporal conjunctiva as superotemporal conjunctiva is protected from UV exposure by the covering of upper eyelid. There would be less histological changes in the superotemporal conjunctiva. The average duration of pressure applied over the graft by the cotton bud is 321.33±55.069 sec. Using 20 % ethanol was considered as safe. No patients complained of burning sensation. All the patients had redness, watering and photophobia on post operative day 1, watering and photophobia were absent by the time they came for 8th day follow up. 4 patients had graft edema on post operative day 1 which resolved in 3 patients by post operative day 8 and 1 patients by post operative day 30. All the patients were prescribed combination of Gatiquin 0.3% and prednisolone acetate 1% and lubricant 0.5% carboxy methyl cellulose and used these medications 6th hourly for 3 months.Graft retraction was noted in 3 patients in post operative day 1 and 1 patients in post operative day30. 1 patient who had biheaded pterygium developed recurrence on postoperative day 90.

Surgical excision is indicated when there is visual obstruction by pterygium involving the pupillary axis and visual distortion by pterygium induced astigmatism. Thus, after the excision of pterygium, there was improvement in the visual acuity. In this study there was significant improvement in vision from preoperative day Log MAR 0.72±0.47 to Log MAR 0.45±0.35after 3 months of follow up. Similar studies like Garg P, Sahai A et al. observed improvement in vision from 0.56 ± 0.49 preoperatively to 0.32 ± 0.29 LogMAR after 3 months of pterygium excision [59]. Misra et al. observed the preoperative best corrected visual acuity improved from 6/7.25 to 6/6 after 1 month of follow up.[60] In a study conducted in Maharastra, to evaluate the visual outcomes after pterygium surgery found that 23 patients (75.68%) had improved visual acuity on Snellen's chart, while 8 patients (21.62%) had no change in vision after surgery and 1 patient (2.70%) showed decline in vision.[61]

There was increase in vertical meridian (K1 value) from 42.43±2.836 D preoperatively to 44.125 ± 1.353 D at the 3rd month of follow up. There was also decrease in the horizontal meridian (K2 value) from 46±2.349D to 43.653 ± 7.557D at the end of 3rd month. The mean corneal astigmatism reduced significantly from 3.3583±2.865 D preoperatively to 0.85±0.57D at the 3rd month of follow up.

Pterygium causes flattening of the cornea by the mechanical traction exerted by the pterygium thus induces astigmatism. There was moderately positive correlation between length of the pterygium and corneal astigmatism in this study. As the length of the pterygium over cornea increases there was increase in corneal astigmatism. A patient with 1mm length

of pterygium encroached over the cornea, developed 0.25 D corneal astigmatism and patient with 4.1mm length of pterygium had 5.25 D corneal astigmatism. Salih M, A-K Payman et al. studied the relationship between pterygium size and astigmatism. They concluded pterygium extension and area of pterygium had stronger association with corneal astigmatism than width of pterygium.[62]

Lin and Stern studied the correlation and reported that lesions involving > 45 % of the corneal radius or within 3.2 mm of the visual axis produce increasing degrees of induced astigmatism.[63]

Post surgery, there was significant reduction in the average corneal astigmatism and the reduction was significant with each follow up such preoperative and post-surgery day 8, follow day 1 and day 8. Garg P, Sahai A observed that amniotic membrane transplantation, conjunctival autografting was more effective in reducing corneal astigmatism than bare sclera technique. Changes in astigmatism were 1.85 ± 0.88 D by bare sclera technique, 2.55 ± 1.26 D by conjunctival autografting, and 2.67 ± 1.44 D by amniotic membrane implantation.[59] In a study conducted in Poland, 23 eyes were operated using 20% ethanol as an adjuvant in pterygium excision following conjunctival autograft implantation. The corneal astigmatism reduced from 1.3±1.3 Dcyl before surgery to 0.8±0.6 Dcyl at 12th month of follow-up which was statistically insignificant ($p>0.05$).[53]

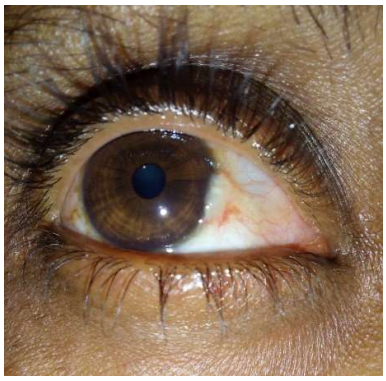


Figure 9: Patient with grade 1 nasal pterygium (Case 17)

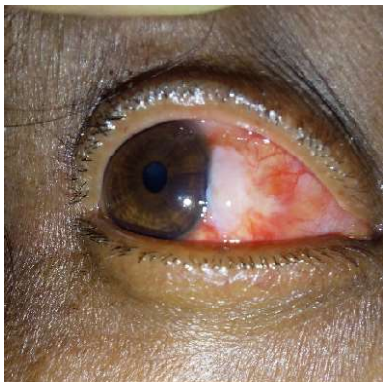


Figure 10: Postoperative day 1 (Case17)

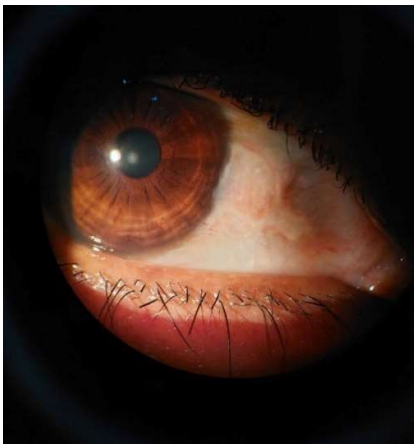


Figure 10 : Post operative day 8 (Case 17)

Figure 11: Postoperative day 30(Case17)

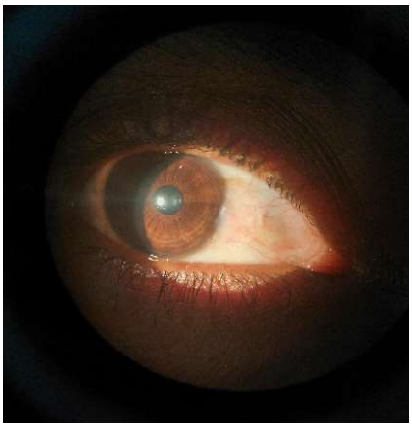


Figure 12: Postoperative day 90(Case 17)

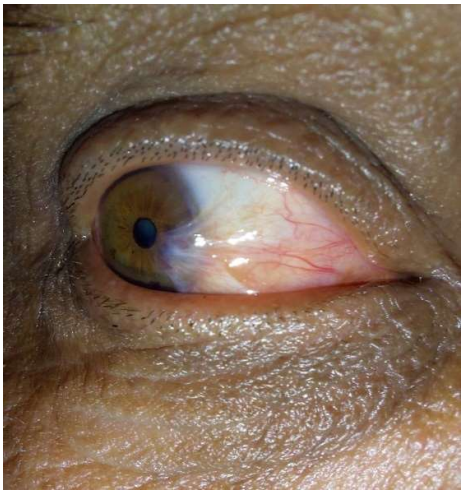


Figure 13: Patient with grade II nasal pterygium (case 7)

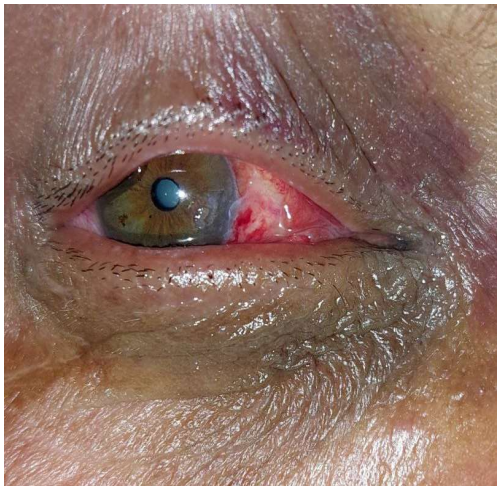


Figure 14: Post operative day1(case 7)

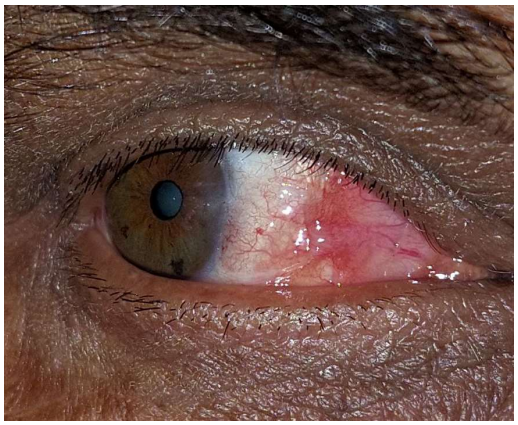


Figure 15: postoperative day 8 (case 7)

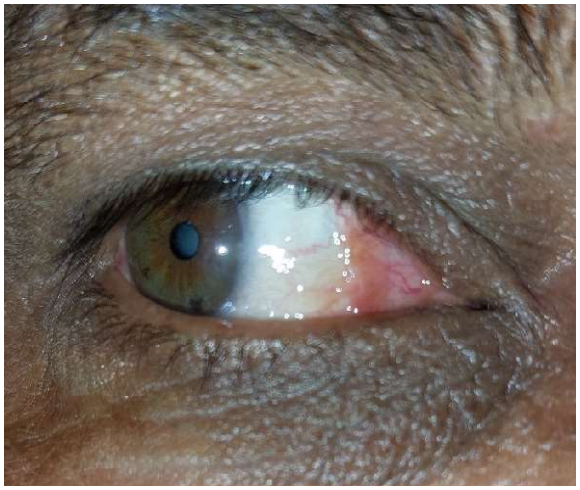


Figure 16: Postoperative day 30(Case 7)

Figure 17: Postoperative day 90(case 7)

SUMMARY

This study was a prospective interventional study conducted among 30 patients with primary pterygium to evaluate the efficacy and safety of using 20% ethanol as an adjuvant in pterygium excision with conjunctival autograft implantation and to evaluate the surgical outcomes of using 20% ethanol as an adjuvant in pterygium surgery.

- The mean age of the patients was 47.06 ± 13.20 years. Maximum number of patients (26.7%) were in the age group of 50-59 years.
- Majority of them were females (73.3 %) and most of them had grade II nasal pterygium (70%).
- The preoperative visual was 0.7217±0.471 Log MAR and corneal astigmatism was 3.3583±2.865 D. There was also moderately positive correlation between encroachment of pterygium over cornea and corneal astigmatism.
- The average time taken for the dissection of the pterygium head using 20% ethanol was 82.83 ± 39.77 sec.
- There was significant improvement in visual acuity (0.459±0.352 Log MAR) and corneal astigmatism (0.85±0.57D) at the 3rd month of follow up.
- There were no patients with burning sensations or any other complications due to ethanol. There was no recurrence noted after 3 months.

CONCLUSION

In this study, 30 eyes with primary pterygium underwent pterygium excision using 20% ethanol as an adjuvant with conjunctival autograft. Post surgery no patient had burning sensation. Photophobia, redness, and watering were noted in all patients with subsided within 1 week. No recurrence noted after 3 months. There was significant improvement in visual acuity and corneal astigmatism after surgery.

Using 20% ethanol as an adjuvant was safe and cost-effective technique of pterygium excision compared to other adjuvants such Mitomycin C, anti- VEGF Bevacizumab. 20% ethanol helps in easy dissection of pterygium head from underlying cornea without leaving any residual tissue. There were good surgical outcomes associated with this technique. The recurrence rate was absent. There was significant reduction in pterygium induced corneal astigmatism, thus improving the visual acuity. Thus 20% ethanol can be used as an alternative cost-effective technique in pterygium excision.

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ANNEXURES

ETHICAL CLEARANCE CERTIFICATE

BLDE
(DEEMED TO BE UNIVERSITY)
Declared as Deemed to be University u/s 3 of UGC Act, 1956
Accredited with 'A' Grade by NAAC (Cycle-2)
The Constituent College
SHRI B. M. PATIL MEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE, VIJAYAPURA

BLDE (DU)/IEC/ 688/2022-23 30/8/2022

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Ethical Committee of this University met on **Friday, 26th August, 2022 at 3.30 p.m. in the Department of Pharmacology** scrutinizes the Synopsis of Post Graduate Student of BLDE (DU)'s Shri B.M.Patil Medical College Hospital & Research Centre from ethical clearance point of view. After scrutiny, the following original/ corrected and revised version synopsis of the thesis/ research projects has been accorded ethical clearance.

TITLE: "A ONE-YEAR PROSPECTIVE STUDY TO EVALUATE THE EFFICACY OF INTRAOPERATIVE APPLICATION OF 20% ETHANOL AS AN ADJUVANT IN PTERYGIUM EXCISION WITH CONJUNCTIVAL AUTOGRAFT".

NAME OF THE STUDENT/PRINCIPAL INVESTIGATOR: Dr. Shilpa K

NAME OF THE GUIDE: Dr. Rekha R Mudhol,Professor, Dept. of Ophthalmology

Dr. Santoshkumar Jeevangi
Chairperson
IEC, BLDE (DU),
VIJAYAPURA

Chairman,
Institutional Ethical Committee,
BLDE (Deemed to be University)
Vijayapura

Dr.Akram A. Naikwadi
Member Secretary
IEC, BLDE (DU),
VIJAYAPURA

MEMBER SECRETARY
Institutional Ethics Committee
BLDE (Deemed to be University)
Vijayapura-586103, Karnataka

Following documents were placed before Ethical Committee for Scrutinization

- Copy of Synopsis/Research Projects
- Copy of inform consent form
- Any other relevant document

Smt. Bangaramma Sajjan Campus, B. M. Patil Road (Sholapur Road), Vijayapura - 586103, Karnataka, India.
BLDE (DU): Phone: +918352-262770, Fax: +918352-263303, Website: www.bldedu.ac.in, E-mail:office@bldedu.ac.in
College: Phone: +918352-262770, Fax: +918352-263019, E-mail: bmpmc.principal@bldedu.ac.in

STUDY SUBJECT CONSENT FORM

I confirm that Dr SHILPA K has explained the purpose of the research, the study procedure, the benefits, and the possible discomfort I may experience in the language best understood by me. Therefore, I agree to participate as a subject in this research project and willfully consent for the same.

_____ _____

(Participant) (Date)

_____ _____

(Witness to above signature) (Date)

ಅಧ್ಯಯನವಿಷಯಕಾನ್ಸೆಂಟ್ಫಾರ್ಮ್

ಡಾ.ಶಿಲ್ಪಾ ಕೆ, ನನಗೆ ಸಂಶೋಧನೆಯ ಉದ್ದೇಶ, ಅಧ್ಯಯನದ ವಿಧಾನ ಮತ್ತು ಸಂಭವನೀಯ ಅಸ್ವಸ್ಥತೆಗಳು ಮತ್ತು ನನ್ನ ಸ್ವಂತಭಾಷೆಯಲ್ಲಿ ನಾನು ಅನುಭವಿಸಬಹುದಾದ ಪ್ರಯೋಜನಗಳನ್ನು ವಿವರಿಸಿದ್ದೇನೆ ಎಂದು ನಾನು ಖಚಿತ ಪಡಿಸುತ್ತೇನೆ. ಮೇಲಿನ ಎಲ್ಲಾ ವಿಷಯಗಳನ್ನು ನನ್ನ ಸ್ವಂತ ಭಾಷೆಯಲ್ಲಿ ವಿವರವಾಗಿ ವಿವರಿಸಲಾಗಿದೆ ಮತ್ತು ನಾನು ಅದನ್ನು ಅರ್ಥಮಾಡಿಕೊಂಡಿದ್ದೇನೆ. ಆದ್ದರಿಂದ, ಈ ಸಂಶೋಧನಾಯೋಜನೆಯಲ್ಲಿ ವಿಷಯವಾಗಿ ಭಾಗವಹಿಸಲು ಒಪ್ಪಿಗೆ ನೀಡಲು ನಾನು ಒಪ್ಪುತ್ತೇನ

~~(ಭಾಗವಹಿಸುವವರು)~~ ~~(ದಿನಾಂಕ)~~

RISK AND DISCOMFORTS:

I understand that I may undergo some pain and discomfort during the examination or the treatment. This study's procedures are not expected to amplify these feelings associated with the usual course of treatment.

BENEFITS:

I know that my participation in the study of the pterygium excision with 20% ethanol and conjunctival autograft implantation under local anaesthesia helps to learn about a better method for Pterygium excision and thus able to initiate effective treatment for pterygium.

I understand and accept the benefits, risks, and costs involved. I willingly give consent to take part in the study.

CONFIDENTIALITY*:*

I understand that this study's medical information will be subject to the privacy and will become a part of hospital records. Suppose the data are used for teaching purposes or publication in the medical literature. In that case, no name will be used, and other identifiers such as photographic images will be used only with written permission.

REQUEST FOR MORE INFORMATION:

I understand that I may ask more questions about the study to Dr. Shilpa K in the Department of Ophthalmology, who will answer my queries or worries. I understand that I will be well informed of any significant new findings discovered during the study, which might influence my continued participation. A copy of this consent form is given to me for careful reading.

REFUSAL FOR WITHDRAWAL OF PARTICIPATION:

I understand that I am participating in this study voluntarily and that I may withdraw consent or may refuse to participate and discontinue participation in the study at any time without 0prejudice. I also understand that Dr SHILPA K may terminate my study's participation after explaining the reasons.

INJURY STATEMENT:

I understand that any unlikely event of injury to me resulting directly from my study's participation, if such damage were reported promptly, I will be treated appropriately. But, no further compensation or reimbursement would be provided by the doctor or hospital. I understand my agreement to participate in this study and not waive any of my legal rights.

_____ _____

(participant) (date)

I have explained to the patient name _____the purpose of the research, the procedures required and the possible risks to the best of my ability.

_____ _____

DR. SHILPA K (Investigator) Date

CASE PROFORMA

Case No: .....

Name: .....

Age: ..... years Sex: ..... IP no: .....

Occupation: ……..

Address: .....

Contact no: .....

Date of admission: ..... Date of Discharge: .....

Is the patient eligible for the study? (1-Yes, 2-No): .....

Has informed consent been given? (1-Yes, 2-No): .....

SURGEON'S NAME: PROF. (DR.) REKHA R. MUDHOL

SURGEON'S SIGNATURE:

Chief Complaints:

1. Diminution of vision: Right Eye..... Duration: ..... days/months/years

Left Eye .....Duration: .....days/months/years

2. Foreign body sensation: .....

2. Others (if any): .....

History of Present Illness:

1. Diminution of vision: Insidious or Sudden: .....

Progressive or Non-progressive: .....

2. Foreign body sensation: Present or Absent: .....

3. Pricking sensation: Present or Absent: .....

4. Diplopia: Present or Absent: .....

5. Redness: Present or Absent: .....

6. Watering: Present or Absent: .....

7. Discharge: Present or Absent: .....

8. Pain in eyes: Present or Absent: .....

9. H/O present trauma: Present or Absent: .....

Past history:

1. H/O past trauma to eye: Present or Absent: .....

2. Ocular surgery: Present or Absent: .....

Type of surgery: ..... When performed? : .....

3. Diabetes: Present or Absent: .....

Duration: ..... Medication: .....

4. Hypertension: Present or Absent: .....

Duration: ..... Medication: .....

5. CAD: Present or Absent: .....

Duration: ..... Medication: .....

6. Any other medical disorder: .....

Personal History:

1. Smoking: Present or Absent: .....Duration: .....

2. Alcohol intake: Present or Absent: ..... Duration: .....

3. History of UV rays exposures: ……. Exposure per day: ……..

Duration: ……..

Family History:

Family history of pterygium: Present or Absent: .....

General Physical Examination:

1. Built: .....

2. Pulse: .....

3. Temperature: .....

4. Blood pressure: ...../.....mmHg

5. Respiratory rate: .....

6. Others:…….

Systemic Examination:

1. CVS:

2. CNS:

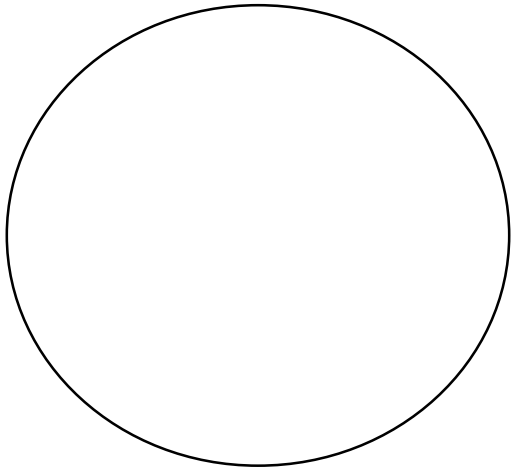
3. Respiratory System

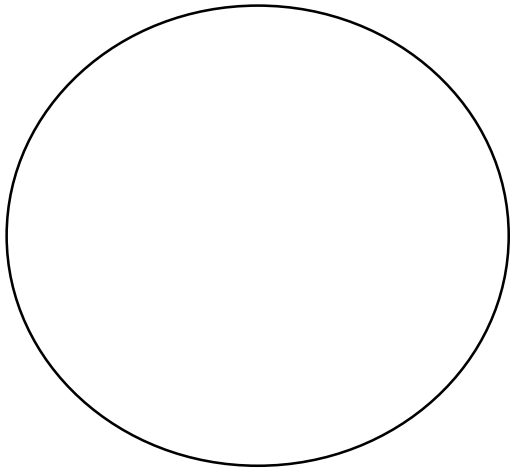
4. Per abdomen:

Ocular Examination

	RIGHT EYE	LEFT EYE
External Appearance		
Ocular motility		
Conjunctiva Location of pterygium Size and shape Grade Inflammation Progressive or non-progressive		
Sclera		
Cornea		
Anterior chamber		
Iris		
Pupil		

Lens		
Visual acuity Distant vision Near vision Best corrected vision Refraction		
Keratometry K1 K2		
Intraocular pressure		
Lacrimal passage (sac syringing)		
Fundus Media Disc Background Blood vessel Macula		





Diagnosis

Investigations

HIV

HBsAg

Random blood sugar: .....mg/dl

Preoperative preparation:

1. Written and informed consent taken
2. Xylocaine sensitivity test done
3. Tab Ciprofloxacin 500mg 1 tab after dinner
4. Do not dilate the eyes

OPERATIVE PROCEDURE:

DATE OF SURGERY: .....

OPERATING EYE: Left / Right.....

ANESTHESIA: Peribulbar block/ Topical Anaesthesia.....

DURATION OF APPLICATION OF 20% ETHANOL OVER THE HEAD OF PTERIGIUM: ……..

TIME TAKEN FOR THE DISSECTION OF PTERYGIUM HEAD FROM UNDERLYING CORNEA: ……..

SITE OF THE CONJUNCTIVAL GRAFT: ……

SIZE OF THE CONJUNCTIVAL GRAFT: …….

DURATION OF APPLICATION OF PRESSURE OVER THE GRAFT AFTER PLACING OVER THE BARE SCLERA: ……..

OPERATIVE COMPLICATION: .....

POSTOPERATIVE COMPLICATION: .....

ADVICE ON DISCHARGE

POSTOPERATIVE FOLLOW-ON DAY 1

External appearance.....

Conjunctiva.....

Graft.....

Cornea.....

Anterior chamber.....

Pupil.....

Lens.....

Visual acuity.....

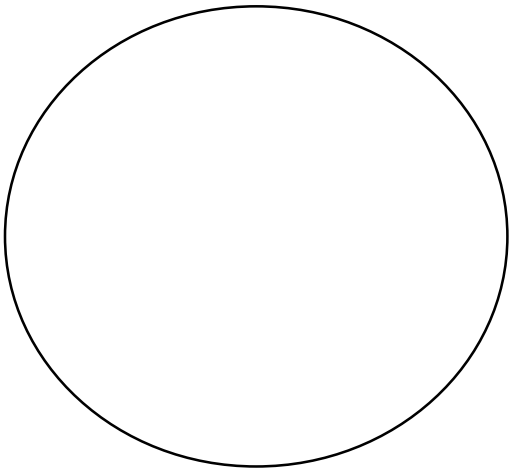
Refraction: …….

Keratometry

K1 :…….

K2 :…….

Complications (if any) .....



POSTOPERATIVE FOLLOW ON DAY 8

External appearance.....

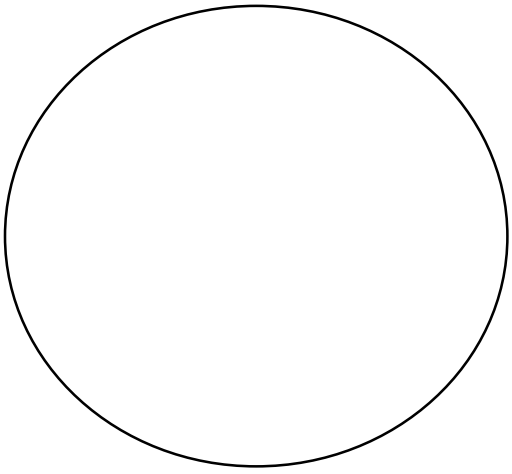
Conjunctiva.....

Graft.....

Cornea.....

Anterior chamber.....

Pupil.....



Lens.....

Visual acuity.....

Refraction: …….

Keratometry

K1 :…….

K2 :…….

Complications (if any) .....

POSTOPERATIVE FOLLOW-ON 4th WEEK

External appearance.....

Conjunctiva.....

Graft.....

Cornea.....

Anterior chamber.....

Pupil.....

Lens.....

Visual acuity.....

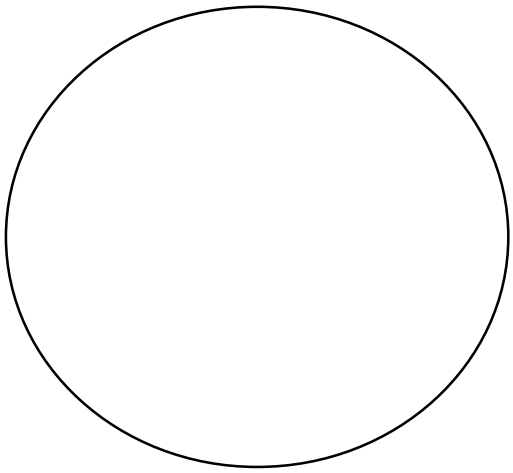
Refraction: …….

Keratometry

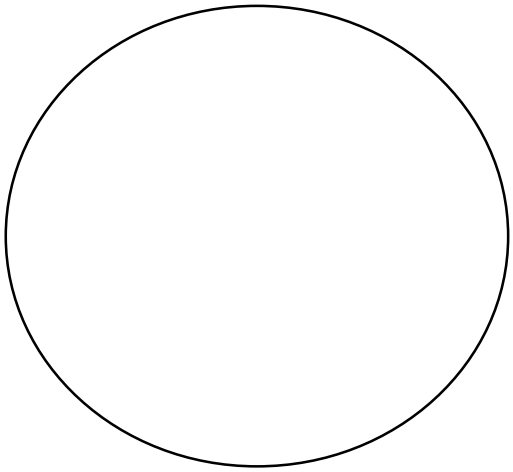
K1 :…….

K2 :…….

Complications (if any) .....



POST OPERATIVE FOLLOW-ON 3rd MONTH



External appearance.....

Conjunctiva.....

Graft.....

Cornea.....

Anterior chamber.....

Pupil.....

Lens.....

Visual acuity.....

Refraction: …….

Keratometry

K1 :…….

K2 :…….

Complications (if any) .....

.....	.....
Dr.Shilpa K	Prof. (Dr.) Rekha R Mudhol
Investigator	Thesis Guide
PG student	Professor & HOD
Department of Ophthalmology	Department of Ophthalmology

KEY TO MASTER CHART

F - Female

M – Male

R – Right eye

L – Left eye

N – Nasal pterygium

T – Temporal Pterygium

B – Biheaded Pterygium

K1 – Vertical Meridian

K2 – Horizontal Meridian

D1 – Post operative day 1

D8 - Post operative day 8

D30 – Post operative day 30

D90 – Post operative 90

MASTER CHART

Sl.no.	NAME	AGE	SEX	EYE	GRADE OF PTERYGIUM	TYPE OF PTERYGIUM	ENCROACHMENT OVER CORNEA	PROGRESSIVE (1) OR NON PROGRESSIVE(2)	PRE-OPERATIVE PERIOD				TIME TAKEN FOR THE DISSECTION OF PTERYGIUM HEAD FROM THE UNDERLYING CORNEA (SEC)	DURATION OF APPLICATION OF PRESSURE OVER GRAFT (SEC)
									VISUAL ACUITY	K1	K2	ASTIGMATISM		
1	SITA CHAVAN	49	F	L	2	N	2.1MM	1	0.48	35.75	44	8.25	60	300
2	ITABAI	70	F	L	3	N	3MM	1	1	38.5	43	4.5	90	300
3	CHANDAMMA	65	F	L	2	N	2.7 MM	2	1	45	46	1	60	300
4	BASANGOUDA	60	M	L	3	N	4MM	1	1.77	45	49	4	120	300
5	SHRISAIL	30	M	L	2	N	2MM	2	0.3	48	48.5	0.5	60	300
6	VIJAYAKUMAR	30	M	R	2	N	1.5MM	1	0	40.5	42.75	2.25	45	300
7	LAXMAN	48	M	R	3	N	3.6MM	1	1.48	38.5	46.5	8.5	90	300
8	YALLAWWA	48	F	R	3	N	4.1MM	1	1.3	41.75	46	5.25	60	300
9	TUTURI	56	F	R	3	N	2.5MM	1	1.48	41.25	49.25	8	120	300
10	MAHIBOOB	37	M	R	2	N	3.4MM	1	0.3	39.25	46.5	7.25	60	300
11	SUMITRA	60	F	R	2	N	2.2MM	2	0.48	43	45.75	2.75	30	300
12	LAXMI KUMBAR	22	F	R	2	N	1.9MM	2	0.3	44.25	45.25	1	60	300
13	VEENA	50	F	R	2	N	2.1MM	1	0.3	42	43.75	1.75	45	300
14	BILKISH	29	F	L	1	N	1MM	2	1	45	45.25	0.25	45	300
15	CHANAMMA	62	F	R	3	N	3.5MM	2	0.6	42.25	48.75	6.5	120	300
16	ASHOK	34	M	L	2	B	1MM NASALLY, 1.9MM TEMPORALLY	1	1	46	47.25	1.25	180	500
17	SUKADEVI	32	F	R	2	N	2MM	1	1	43	43.25	0.25	30	360
18	BASAMMA DHARI	52	F	L	2	N	2.9MM	1	0.78	39	43.75	4.75	120	360
19	KASTURI	52	F	R	2	T	3.4MM TEMPORALLY	2	0.48	41	44.75	3.75	120	300
20	VIMALABAI	45	F	R	2	N	3MM	2	0.48	43	45.5	2.5	150	300
21	BASAMMA SIND	48	F	L	2	N	3.1MM	1	0.48	46.5	47.5	1	120	300
22	AKSHATA	26	F	R	2	N	0.3MM	1	0	45.75	46.25	0.5	45	420
23	KUMAR MUDHOL	40	M	R	2	B	2.8MM NASALLY, 0.5MM TEMPORALLY	1	0.3	43.75	45.25	1.5	105	500
24	PARASHURAM	40	M	L	4	B	5.5MM NASALLY, 2.3MM TEMPORALLY	1	1.48	41	48	7	160	300
25	SHANTABAI	55	F	L	1	N	0.5MM	1	0.3	44	44.25	0.25	60	300
26	MALLAMMA	55	F	L	2	N	3.4MM	2	1	41.75	44.5	3.25	60	300
27	ANASUBAI	52	F	L	2	N	2.6MM	1	1	37.75	46.5	8.75	60	300
28	LAXMI VISHWANATH	38	F	L	2	N	2.4MM	1	0.18	43.5	44.5	1	90	300
29	NIRMALA	55	F	L	2	N	3MM	2	0.78	44	47.25	3.25	60	300
30	REKHA	72	F	R	2	N	2.1MM	2	0.6	43	43	0	60	300

SL.No.	NAME	D1 COMPLICATION	D1					
		NO COMPLICATION (0)GRAFT EDEMA (1),	PHOTOPHOBIA	WATERING	VISUAL ACUITY	K1	K2	ASTIGMATISM
		GRAFT RETRACTION (2), RESIDUAL PTERYGIUM TISSUE(3	RESENT(1),ABSENT((	ABSENT (0) PRESENT (1)				
1	SITA CHAVAN	0	1	1	0.48	41.75	42.25	0.5
2	ITABAI	0	1	1	0.6	41.5	44	3.5
3	CHANDAMMA	0	1	1	0.48	45.25	46.75	1.5
4	BASANGOUDA	2	1	1	1.48	46	48.75	2.75
5	SHRISAIL	0	1	1	0.48	46	46.75	0.75
6	VIJAYAKUMAR	0	1	1	0	41.75	42.75	1
7	LAXMAN	0	1	1	0.6	43.25	46.25	3
8	YALLAWWA	0	1	1	1	44.25	49.5	5.25
9	TUTURI	0	1	1	0.78	46.5	49	3.5
10	MAHIBOOB	1	1	1	0.3	45	50.75	4.25
11	SUMITRA	0	1	1	0.48	45.75	50.25	4.5
12	LAXMI KUMBAR	1	1	1	0.3	45.75	48.25	2.75
13	VEENA	0	1	1	0.3	42.5	43.5	1
14	BILKISH	2	1	1	0	45	46.75	1.75
15	CHANAMMA	0	1	1	0.6	46	48	2
16	ASHOK	1	1	1	0	46	46.75	0.75
17	SUKADEVI	2	1	1	0.18	42.5	43	0.5
18	BASAMMA DHARI	0	1	1	0.3	42.75	43.5	0.75
19	KASTURI	0	1	1	0.48	43.5	44	0.5
20	VIMALABAI	0	1	1	0.18	43.75	44.25	0.5
21	BASAMMA SIND	0	1	1	0.48	45.5	47.75	2.25
22	AKSHATA	0	1	1	0	45.5	46	0.5
23	KUMAR MUDHOL	0	1	1	0.18	43.25	46.25	3
24	PARASHURAM	0	1	1	1	43.25	47	3.75
25	SHANTABAI	0	1	1	0.18	43.5	44.25	0.75
26	MALLAMMA	0	1	1	0.18	42	44	2
27	ANASUBAI	0	1	1	0.3	44	45.25	1.25
28	AXMI VISHWANATI	0	1	1	0	43.5	45	1.5
29	NIRMALA	0	1	1	0.18	44.25	46.5	2.25
30	REKHA	1	1	1	0.3	41.75	43	2.75

Sl.no.	NAME	D8 COMPLICATIONS	D8					
	NO COMPLICATION (0)GRAFT EDEMA (1), GRAFT RETRAC		PHOTOPHOBIA	WATERING	/ISUAL ACUITY (LOGMAR	K1	K2	ASTIGMATISM
	GRAFT RETRACTION(2) RESIDUAL PTERYGIUM TISSU		RESENT(1),ABSENT((	ABSENT (0) PRESENT (1)				
1	SITA CHAVAN	0	0	0	0.48	43	43	0
2	ITABAI	0	0	0	0.6	42	44	2
3	CHANDAMMA	0	0	0	0.48	45.25	46	0.75
4	BASANGOUDA	2	0	0	1.48	46.25	48	2.25
5	SHRISAIL	0	0	0	0.48	45.75	46.75	1
6	VIJAYAKUMAR	0	0	0	0	42.25	43	1
7	LAXMAN	0	0	0	1	44.75	45.75	1
8	YALLAWWA	0	0	0	0.48	45	46	1
9	TUTURI	0	0	0	1	46.25	47.25	1
10	MAHIBOOB	0	0	0	0.3	42.25	46.25	4
11	SUMITRA	0	0	0	0.48	43.5	45.5	2
12	LAXMI KUMBAR	1	0	0	0.3	44.25	45.25	1
13	VEENA	0	0	0	0.3	42.5	43.25	0.75
14	BILKISH	0	0	0	0	44.75	45	0.25
15	CHANAMMA	0	0	0	0.6	46.5	47.5	1
16	ASHOK	0	0	0	0.18	45.25	46.75	1.5
17	SUKADEVI	0	0	0	0	42.5	43	0.5
18	BASAMMA DHARI	0	0	0	0.48	42.75	43.25	0.5
19	KASTURI	0	0	0	0.3	43.75	44.5	0.75
20	VIMALABAI	0	0	0	0.6	43.5	44	0.5
21	BASAMMA SIND	0	0	0	0.48	46.25	46.75	0.5
22	AKSHATA	0	0	0	0	45.5	45.75	0.25
23	KUMAR MUDHOL	0	0	0	0.18	44	45.75	1.75
24	PARASHURAM	0	0	0	1.48	43.5	48.25	4.75
25	SHANTABAI	0	0	0	0.3	43.75	44.25	0.5
26	MALLAMMA	2	0	0	0.78	42.75	43.75	1
27	ANASUBAI	2	0	0	0.6	44.5	45	0.5
28	AXMI VISHWANATI	0	0	0	0.3	43.75	44.5	0.75
29	NIRMALA	0	0	0	0.48	44.75	46	1.25
30	REKHA	0	0	0	0.3	42	43	1

Sl.no.	NAME	D30 COMPLICATION	D30					
		NO COMPLICATION (0)GRAFT EDEMA (1), GRAFT RETRAC	PHOTOPHOBIA	WATERING	/ISUAL ACUITY (LOGMAR	K1	K2	ASTIGMATISM
		RESIDUAL PTERYGIUM TISSUE(3)	RESENT(1),ABSENT((	ABSENT (0) PRESENT (1)				
1	SITA CHAVAN	0	0	0	0.48	43	43.5	0.5
2	ITABAI	0	0	0	0.48	43	43.5	0.5
3	CHANDAMMA	0	0	0	0.6	45	46.25	1.25
4	BASANGOUDA	2	0	0	1.48	45	48	3
5	SHRISAIL	0	0	0	0.48	45.5	46.75	1.25
6	VIJAYAKUMAR	0	0	0	0	41.75	42.5	0.75
7	LAXMAN	0	0	0	1	45.25	46.5	1.25
8	YALLAWWA	0	0	0	0.48	45	46.25	1.25
9	TUTURI	0	0	0	1	46	47.25	1.25
10	MAHIBOOB	0	0	0	0	43	46.25	3.25
11	SUMITRA	0	0	0	0.6	42.5	44.75	2.25
12	LAXMI KUMBAR	0	0	0	0.48	44.25	45	0.75
13	VEENA	0	0	0	0.3	42.5	43.25	0.75
14	BILKISH	0	0	0	0	44.75	45	0.25
15	CHANAMMA	0	0	0	0.6	46.75	47	0.25
16	ASHOK	0	0	0	0	45.25	46.75	1.5
17	SUKADEVI	0	0	0	0	43	43	0
18	BASAMMA DHARI	0	0	0	0.48	42.75	43.5	0.75
19	KASTURI	0	0	0	0.18	43.75	44.25	0.5
20	VIMALABAI	0	0	0	0.6	44	44.5	0.5
21	BASAMMA SIND	0	0	0	0.3	46	46.75	0.75
22	AKSHATA	0	0	0	0	46	46	0
23	KUMAR MUDHOL	0	0	0	0	43.25	46.25	3
24	PARASHURAM	0	0	0	0.6	44	48	4
25	SHANTABAI	0	0	0	0.3	44	44	0
26	MALLAMMA	0	0	0	0.78	42.25	43.75	1.5
27	ANASUBAI	0	0	0	0.6	44.75	45.25	0.5
28	AXMI VISHWANATI	0	0	0	0.3	44	44.5	0.5
29	NIRMALA	0	0	0	0.6	45	45.75	0.75
30	REKHA	0	0	0	0.3	42.5	43	0.5

Sl.no.	NAME	D90 COMPLICATIONS	D90					
		NO COMPLICATION(0)GRAFT EDEMA (1), GRAFT RETRACT	PHOTOPHOBIA	WATERING	VISUAL ACUITY (LOGMAR	K1	K2	ASTIGMATISM
		RESIDUAL PTERYGIUM TISSUE(3) RECURRENCE(4)	RESENT(1),ABSENT((	ABSENT (0) PRESENT (1)				
1	SITA CHAVAN	0	0	0	0.48	43	4.35	0.5
2	ITABAI	0	0	0	0.48	42	42.5	0.5
3	CHANDAMMA	0	0	0	1	44.75	45	0.25
4	BASANGOUDA	0	0	0	1.48	45	47.25	2.25
5	SHRISAIL	0	0	0	0.48	45.5	46.75	1.25
6	VIJAYAKUMAR	0	0	0	0	41.75	42.5	0.75
7	LAXMAN	0	0	0	1	44	45	1
8	YALLAWWA	0	0	0	0.48	45	46.25	1.25
9	TUTURI	0	0	0	1	46.25	47.5	1.25
10	MAHIBOOB	0	0	0	0	43.75	46	2.25
11	SUMITRA	0	0	0	0.6	42.75	44.25	1.5
12	LAXMI KUMBAR	0	0	0	0.6	44.5	45	0.5
13	VEENA	0	0	0	0.3	42.75	43.25	0.5
14	BILKISH	0	0	0	0	44.5	45	0.5
15	CHANAMMA	0	0	0	0.6	46.75	47	0.75
16	ASHOK	0	0	0	0.18	45.5	47	1.5
17	SUKADEVI	0	0	0	0	42.75	43.25	0.5
18	BASAMMA DHARI	0	0	0	0.6	42.25	43.5	1.25
19	KASTURI	0	0	0	0.3	43.25	44	0.75
20	VIMALABAI	0	0	0	0.3	44	44.5	0.5
21	BASAMMA SIND	0	0	0	0.3	46.25	46.75	0.5
22	AKSHATA	0	0	0	0	45.75	46	0.25
23	KUMAR MUDHOL	0	0	0	0	44	45.5	1.5
24	PARASHURAM	0	0	0	0.6	44	45	1
25	SHANTABAI	0	0	0	0.6	44.5	44.5	0
26	MALLAMMA	0	0	0	0.6	42.5	43.75	1.25
27	ANASUBAI	0	0	0	0.6	45	45.25	0.25
28	AXMI VISHWANATI	0	0	0	0.3	44.25	44.5	0.25
29	NIRMALA	0	0	0	0.6	45	45.5	0.5
30	REKHA	0	0	0	0.3	42.5	43	0.5

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