"COMPARATIVE STUDY OF CONJUNCTIVAL AUTOGRAFT USING AUTOLOGOUS BLOOD WITH FIBRIN GLUE IN TREATMENT OF PTERYGIUM."

By

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In partial fulfillment of the requirements for the degree of

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Under the guidance of

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LIST OF ABREVIATIONS

MMPs	-	Matrix metalloproteinases.
TIMP	-	Tissue inhibitors of matrix metalloproteinases.
Ig G	-	Immunoglobulin G
Ig E	-	Immunoglobulin E
UV	-	Ultraviolet
LSCD	-	Limbal Stem Cell Defiency
$Cacl_2$	-	Calcium chloride
MMC	-	Mitomycin C
DNA	-	Deoxyribonucleic acid
RNA	-	Ribonucleic acid
VEGF	-	Vascular endothelial growth factor.

ABSTRACT

BACKGROUND:

Pterygium is a common ocular surface disorder. It is a hyperplastic and elastotic degeneration which proliferates as vascularized granulation tissue under the conjunctival epithelium and encroaches as wing shaped fold upon cornea.

There are a wide variety of surgical methods to prevent its recurrence and each method has its own merits and demerits. Amongst all the surgical options available, conjunctival autograft is the most frequently practiced method. With the availability of newer techniques, the cost effectiveness and success rates of the surgery have improved with minimal complications. Conjunctival autograft trials have included graft with fibrin glue /sutures which can be compared with the equally successful but cost effective method of suture less and glue free conjunctival autograft. If the latter method is found to have same result as the former method, then not only it will help to prevent recurrence but also prove to be cost effective, for the patients especially in developing countries.

AIM AND OBJECTIVE OF THE STUDY:

To compare the effectiveness, outcome and complications with use of Autologous blood and Fibrin Glue in attaching the conjunctival autograft after pterygium excision.

MATERIALS AND METHODS:

It is a prospective randomized controlled hospital based study of patients who will be operated for pterygium in which 50% patients will undergo pterygium excision with attachment of conjunctival autograft using autologous blood and 50%

patients will undergo pterygium excision with attachment of conjunctival autograft using fibrin glue. All patients will be inpatients of Department of Ophthalmology at B.L.D.E.U's Shri.B.M.Patil Medical College Hospital and Research Centre, Vijayapur. Duration of this study was from October 2013 to March 2015.

RESULTS:

A total of 50 eyes were included in the study. Each group had 25 eyes. All cases of primary progressive pterygium were included in the study. Mean age in Group I was 44.60 years and 44.64 years in Group II. In this study we observed that 24% belonged to grade I, 56% to grade II and 20% to grade III pterygium. Maximum incidence of pterygium was seen in the age group of 31– 50 years. Majority of them were females (56%). Incidence of pterygium was higher in outdoor workers (60%). At the first week follow up, graft oedema, subconjunctival haemorrhage and retraction were seen in 4%, 0% and 4% respectively in patients of group I. In group II, graft oedema, subconjunctival haemorrhage and retraction were seen in 16%, 36% and 12% respectively. These findings in both groups, eventually resolved. At Subsequent follow ups, no recurrence was seen in either of the study groups.

CONCLUSION:

Sutureless glue free limbal conjunctival autografting following pterygium excision may prevent potential adverse reactions encountered by foreign materials like suture and fibrin glue, equally effective in preventing recurrence, safe and economical alternative for autograft fixation in pterygium surgery for developing countries.

Key Words: Pterygium, limbal conjunctival autograft, fibrin glue, autologous blood, recurrence.

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INTRODUCTION

Pterygium is a degenerative condition of the subconjunctival tissue which proliferate as vascularised granulation tissue to invade the cornea destroying superficial layers of stroma and Bowman's membrane.[1]

The term pterygium comes from the ancient Greek words "pterygos" meaning wing and "pterygion" meaning fin. Pterygium is characterized by a triangular portion of the bulbar conjunctiva encroaching into the cornea, usually within the interpalpebral fissure and most often from the nasal side.

It is a hyperplastic and elastotic degeneration which proliferates as vascularized granulation tissue encroaching as wing shaped fold upon cornea. If not treated it may encroach the entire pupillary axis and thus cause a significant disturbance in the visual acuity(astigmatism).[2]

Multiple factors like Ultraviolet radiation, tear film abnormalities, hot and dry climate, wind and outdoor work, play an important role in development of pterygium. The UV type B light in solar radiation has been found to be the most significant environmental factor in pterygium pathogenesis[3,4] Recent studies[5-8] have suggested that p53 and human papillomavirus may also be implicated in pterygium pathogenesis. Matrix metalloproteinases (MMPs) and tissue inhibitors of MMPs (TIMPs) at the advancing pterygium edge may be responsible for the inflammation, tissue remodeling, and angiogenesis that characterize pterygia, as well as the destruction of Bowman's layer and pterygium invasion into the cornea[5-8]

The difficulty in treating this deceptively benign disease stems from our lack of understanding of this condition, and its propensity for recurrence after surgical excision. There is a plethora of surgical and medical measures currently available for pterygium, with no consensus regarding the ideal treatment[9]

In 1985, Kenyon and collaborators introduced conjunctival autograft as a technique for the treatment of recurrent or advanced pterygium.[10]

Conjunctival autografting after pterygium excision is associated with very low rates of recurrence and complications when compared with other techniques. Nevertheless graft suturing has the disadvantage of longer surgery time and complications such as granuloma formation, giant papillary conjunctivitis and significant patient discomfort after surgery.[11]

Lately fibrin based glues for conjunctival autografting have been used to minimize operating time and discomfort associated with sutures[12].

Conjunctival autografting with patients' own blood acting as a bioadhesive in treating pterygium after surgical excision have been used[13].

There are many surgical techniques available but none of them is universally accepted due to the variability in the rate of recurrence. Amongst all the surgical options available, conjunctival autograft is the most frequently practised method. With newer techniques available, cost effectivity, success rate and least complications are very important.

Since it will be advantageous to adopt the better of the techniques available in attaching the conjunctival autograft, the following study has been undertaken to compare the effectiveness, outcome and complications with use of Autologous blood and Fibrin Glue in attaching the conjunctival autograft after Pterygium excision.

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REVIEW OF LITERATURE

HISTORY

Sushruta, world's first surgeon ophthalmologist who lived in 1000 BC, gave an accurate description of a pterygium and its treatment with pulverized salt and stimulation with a palm branch. When the pterygium was inflamed and swollen, he tore it out with forceps and removed any remaining tissue with a flesh-stripping ointment. He also described the ease with which the lesion reappeared.[14]

Hippocrates (469 BC) suggested the use of eye drops containing lead, zinc, copper, iron, bile juices, urine, and maternal milk.[14]

Celso (50 AC) and Galeno (131 AC) also suggested a topical treatment with solutions of white wine, vinegar, euphrasy water, candied sugar, nitrated fennel water and, in the more serious forms, the physical removal. This was done by passing a thread underneath the growth and allowing it to slide over the scleral surface with a to and fro movement as far as the medial canthus: then when the pterygium was detached from the underlying sclera, it was cut with scissors. [14,15,16]

Paolo Egineta (660 AC) and Arab Asicenna (1037 AC) who suggested cutting the pterygium with scissors. [17,18]

Amurose Pare (XVI Century) wrote about a pterygium: "You have learned that a pterygium is an illness that always recurs, even when you have done everything in your power to cure it": this concept has remained true to the present day. [14,17,18,19]

Scarpa (1802): Removal of the head from the cornea using forceps, section of a portion of the body (3-4 mm) and subsequent concentric excision of the detached tissue as far as the limbus.[20]

Arlt (1850): Excision of the head from the cornea and a diamond shaped portion of the body with conjunctival cross-over plastic surgery.[21,22]

Desmarres (1855): Introduced the technique of deviating the head in an attempt to change the direction of growth and induce it to atrophy. The technique was modified by Terrien who deviated the growth towards the superior fornix as opposed to the inferior fornix suggested by Desmarres.[23]

Knapp (1869): Suggested the technique of transposition. The pterygium is cut longitudinally into two halves that are fixed below the superior and inferior conjuctiva.[21]

In The Twentieth Century

Mc Reynolds (1902): Who presented a modified Desmarres technique which placed the head of the pterygium in a conjunctival pouch.[24]

Gifford (1909): Used a thin epidermal graft to cover the sclera that was exposed following the complete removal of the pterygium.[25]

Morax and Magitot (1911): Used first artificially- preserved homologous corneal grafts.[21]

Terson (1911): Was the first to use radiation therapy with X-rays.[26]

Magitot (1916): Suggested lamellar autokeratoplasty using a technique which is similar to Terson's but which used lamellar discs removed from the same eye.[21]

Elsching (1926): In order to repair serious conjunctival defects, he performed conjunctival plastic surgery with transposition of a bridge created from the contra-lateral limbus. So Elschnig was the first person to introduce Conjunctival graft for pterygium surgery.[27]

Amorin (1936): Suggested treatment with a diathermy coagulator.[28]

Burnam and Neil (1941): Used a radioactive applicator (Radon).[29]

Kamel (1946): Performed sub-conjunctival cauterization of the pterygium with carbolic acid.[30]

D'Ombrain (1948): Suggested the technique of scleral baring for the first time.[31]

Paufique (1950): Developed a lamellar keratoplasty for the optic and therapeutic treatment of the corneal pathologies; this also included the pterygium which until then considered to be a minor pathology.[32]

Haik (1957): Used topical beta-therapy with strontium 90 (Sr 90).[33]

Meacham (1962): Was the first to use antibiotics to prevent the recurrences.[34]

Panzardi (1964): Used amniotic membrane to repair the conjunctival tissue loss following excision of the pterygium.[35]

Thoft (1977) described conjunctival autografting for several ocular surface disorders such as unilateral chemical or thermal burns, radiational injury, neoplasms, persistent epithelial defects, fornix reconstruction and degenerative diseases including pterygium.[36]

Kenyon (1985): Reported excellent results in the prevention of recurrences by grafting autologous conjunctiva to the limbus.[10]

Maldonado MJ (1995) was first to use intraoperative 5-Fluorouracil as a chemo-adjuvant in the treatment of pterygium.[38]

ANATOMICAL ASPECTS[37]

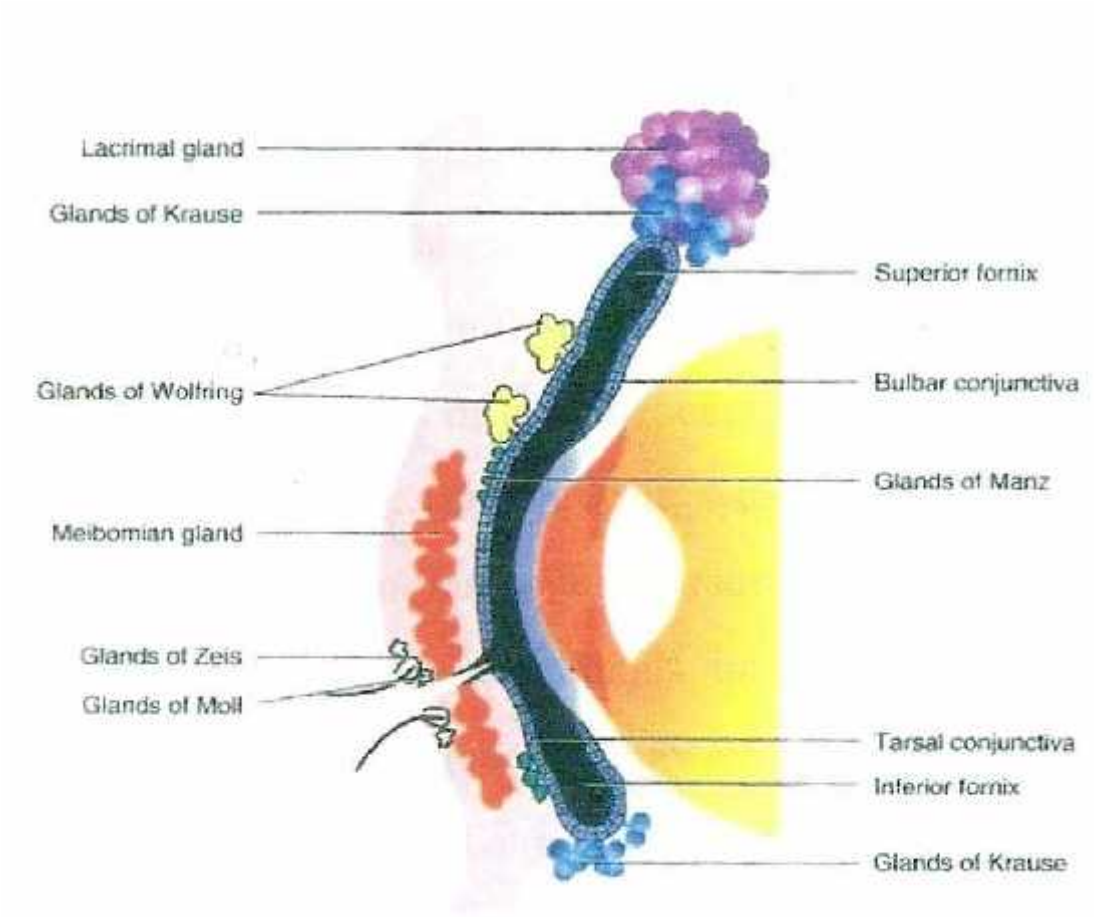


Figure no. 1 Anatomy of Conjunctiva

The conjunctiva is a thin, translucent mucous membrane which derives its name from the fact that it attaches the eye ball to the lids. It lines the posterior surface of the lids and is then reflected forwards on to the globe of the eye. The epithelium becomes continuous anteriorly with the epithelium of the cornea. Thus it forms a barrier which prevents ingress to the orbit from outside.

Conjunctiva is divided for purpose of description into three parts

- Palpebral,
- Fornix, and
- Bulbar.

The palpebral part is sub-divided into two zones. The marginal zone extends from the opening of the glands at the lid margin, across the border of the lid as far as the sub-tarsal furrow, which is about 2mm up on the back of the eyelid.

At this point, the tarsal glands and the lacrimal punctum emerge. The tissues are not smooth and they have minor ridges or elevations. These provide slight depression over the cornea and the tears can run across the depression between the ridges. At the sub-tarsal furrow, perforating vessels pass through the tarsus to reach the conjunctiva.

The tarsal zone is thin, vascular and is light red in colour. It has a good attachment to the underlying tissues and it being transparent, Meibomian glands can be seen from the rear as yellow streaks unlike the upper tarsal conjunctiva which is closely adherent to the tarsus. The orbital zone is loosely attached to the tissues below, lying in a horizontal fold.

The conjunctival fornix is a linear sac folded above, below and laterally and extending along the margin of the orbit. These folds prevents stretching when the eye moves medially. The plica semilunaris has a corresponding function. In order to avoid collapse of the fornix as the globe rotates, there are appropriate connections of the tissues with the superior, inferior and lateral recti. Thus the fornix follows movements of these muscles. The plica semilunaris has corresponding connections with the medial rectus. In it are found the glands of Krause and the unstriped muscle of muller.

By means of this deepening fibrous tissue the levator and recti can act on the fornix deepening it, when they contract. Centrally the fibrous tissue becomes continuous with tarsus.

In the intertendinous interval that is in the diagonal regions of the fornix the conjunctiva may extend to the cornea. The whitish aponeurotic expansion in the fornix from the inferior rectus and inferior oblique is seen through the conjunctiva.

The bulbar conjunctiva is thin and transparent so that white sclera is seen through it. It is attached loosely to the tissues beneath, except around the limbus which is a 3mm wide zone, where it is fastened firmly. The bulbar conjunctiva is at first in contact with the tendons of the recti muscles covered by the tenon's capsule. Thus in exposing these tendons, for instance in tenotomy we must divide the conjunctiva, then the capsule of tenon before they are reached.

In front of the insertion of recti tendons the bulbar conjunctiva lies on the anterior portion of the tenon's capsule, up to a point 3mm from the cornea.

The conjunctiva is separated from the capsule of tenon by loose areolar tissue, in which we find the sub- conjunctival vessels. In between conjunctiva and the sclera, there is the loose episcleral tissue in the anterior portion of the tenon's space. In this space, we find the anterior ciliary arteries which form the pericorneal plexus and the tendons of the insertion of the recti muscles.

At about 3mm from the cornea, the conjunctiva, tenon's capsule and the sclera become much closely united. For this reason, although it is difficult to raise a fold of conjunctiva close to the cornea, a much firmer hold of conjunctiva and episcleral tissues can be obtained here with the forceps than elsewhere.

The palisades of Vogt are found in the limbal conjunctiva as little raised ridges, about 0.55 mm wide and 1 or 2 mm long. They are light elevations, often with

pigment in the furrows and are more distant at the lower limbal area.

The main structures are surface epithelium and underlying connective tissue. At the marginal region, there is many layered non-keratinized squamous epithelium resistant to wear and tear. The epithelium extends from its origin near the meibomian gland outlets around the posterior edge of the lid margin up to the subtarsal furrow which lies some 2mm up on the back of the lid.

This furrow is a narrow depression, or fold in the conjunctiva, its length matching the spread of the eye lashes, less than 1 mm deep. It is a trap for materials which would fall on the cornea and assist small specks of debris in the mucus to move nasally with each blink.

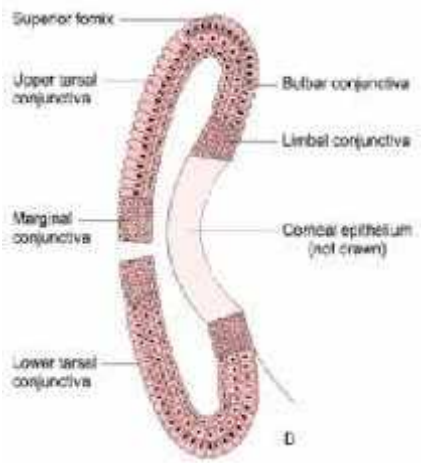


Figure no. 2: **Conjunctival epithelium**

The epithelium of the tarsal region consists of two or three layers of columnar cells. Because it forms a very thin, uneven layer, with ridges and grooves, it reduces friction, but simultaneously ensures a useful collection area of debris and bacteria.

The epithelium of the fornix consists of 3 or 4 layers of cubical cells, increasing in number from bulbar conjunctiva. Around the limbus a stratified layer appears between 8 and 10 cells thick, with additional squamous epithelium. The surface layer cells of conjunctiva have microvilli similar to those of the cornea.

The stroma consists of the two portions a superficial adenoid layer and a deeper fibrous layer. At the limbus, neither layer passes over the cornea.

The adenoid layer is not present at birth, but is formed first in the region of the fornix 3-4 months after birth. The adenoid layer is thin but most developed in the fornix, being here 50-70µ in thickness. It consists of a fine connective tissue reticulum in the meshes of which the lymphatics lie, it is absent at marginal and tarsal zones.

The fibrous layer is generally thicker than the adenoid, but is almost nonexistent over the tarsus with which it is continuous. In it are found the vessels and nerves to the conjunctiva, the unstriped muscle of muller, and Krauses gland.

CONJUNCTIVAL BACTERIA

From the first week of life the conjunctiva carries bacteria. The amount is usually equal within both eyes, although this is subject to individual variations.

THE CONJUNCTIVAL BLOOD VESSELS

The arterial supply of conjunctiva comes from three sources:

1. The peripheral arterial arcades
2. Marginal arterial arcades
3. The anterior ciliary arcades

Blood supply of conjunctiva

Of these as far as upper lid is concerned, the peripheral arcade supplies by far the greatest area that is almost the whole of the conjunctival tarsi, the fornix and the bulbar conjunctiva up to 4mm from the cornea.

The peripheral arcade in the upper lid is situated at the upper border of the tarsus between the two portions of the levator. It gives off peripheral perforating branches which pass above the tarsal plate and pierce the palpebral muscle to reach

the conjunctiva under which it sends branches upwards and downwards. The descending branches supply nearly the whole of the tarsal conjunctiva. They run perpendicularly to the lid margin and anastomose with the much shorter branches of the marginal artery which have pierced the tarsus at the sub-tarsal fold.

The ascending branches pass upwards to the fornix, then bending round this descends under the bulbar conjunctiva as the posterior conjunctival arteries. They pass towards the cornea at 4mm from which they anastomose with the anterior conjunctival arteries and branches of the anterior ciliary arteries. The posterior conjunctival vessels are mobile, moving with the bulbar conjunctiva.

The peripheral arcade of lower lid is in front of the inferior palpebral muscle of Muller and generally behaves similar to that of upper lid.

The marginal arcade sends its perforating branches through the tarsus to reach the deep surface of the conjunctiva at the subtarsal fold. These divide into marginal and tarsal twigs. The tarsal conjunctiva is well supplied with blood, hence it is red in colour. The colour diminishes as we pass towards the fornix and the bulbar conjunctiva is colourless except when the vessels are dilated. The anterior ciliary arteries come from the muscular arteries to the recti. Each muscular artery gives off two anterior ciliary arteries except the lateral rectus, which is supplied anteriorly by the ciliary artery which passes forwards at a deeper level than the posterior conjunctival vessels. They do not move with the conjunctiva. They pass forwards and anastomose with each other and form a series of arcades parallel to ·the corneal margin, anteriorly they form pericorneal plexus, while posteriorly they send twigs which anastomoses with the posterior conjunctival arteries. The pericorneal plexus is arranged in two layers, a superficial conjunctival and a deep episcleral.

The conjunctival veins accompany and are much more numerous than the corresponding arteries. For the most part i.e. from the conjunctival tarsi, from the fornix and the major portion of the bulbar conjunctiva, they drain into the palpebral veins.

Corresponding to the peripheral arcade of the upper lid, there is an important and well marked venous plexus, which drain into veins of the levator and superior rectus which again drain into the ophthalmic vein.

In the circumcorneal zone supplied by the anterior ciliary arteries, veins are less conspicuous than the arteries. They form a network some 5-6 mm wide, which drain in to the muscular veins.

LYMPHATICS

The conjunctival lymphatics are arranged in two plexus:

A superficial, composed of small vessels, placed just beneath the vascular capillaries and a deep, consisting of larger vessels situated in the fibrous layer of the conjunctiva and receiving the lymph from the superficial plexus. They drain towards commossures, where they join the lymphatics of the lid, to lymph gland, pre-auricular and submandibular.

NERVE SUPPLY OF THE CONJUNCTIVA

Sensory innervation for the bulbar conjunctiva is from the long ciliary nerves which are branches of the nasociliary nerves. The upper fornix and the palpebral conjunctiva are served by the frontal and trochlear divisions of the ophthalmic nerve, while the lacrimal nerve covers the region of the outer canthus. The conjunctiva of the lower eyelid is innervated by the infraorbital nerve. Short ciliary nerves supply the cornea and the circumcorneal zone of conjunctiva.

NERVE ENDINGS: The nerve may end in

1. Free endings
2. End bulbs of Krause
3. Tufts or
4. Ribbons.

1. **Free endings:** the nerves having lost their myelin sheath, from a subepithelial plexus in the superficial part of substantia propria. From this fibres pass to form an intraepithelial plexus and send free nerve fibrils between these cells.
2. **The end bulbs of Krause -** are round bodies from 0.02 mm to 0.1 mm in length. Each is surrounded by a connective tissue enveloped, continuously with nerve sheath and lines by endothelial cells. It has twisted mass of fibrils one or two nerves enter the envelope, lose their myelin sheath and join the central mass. Nerve endings are numerous in area supplied by the lacrimal nerve but are also numerous around the cornea and the marginal portion of the lids.

PTERYGIUM [39,40,41,42,43]

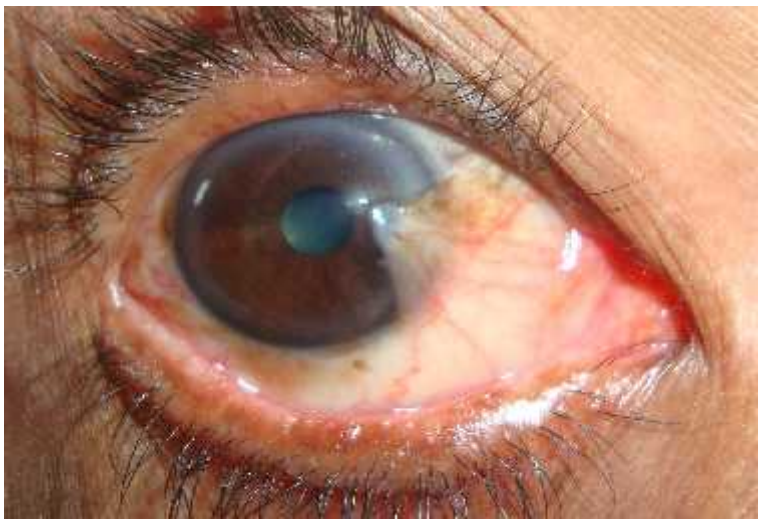


Fig no. 3 Primary pterygium

a) ANATOMY OF THE PTERYGIUM

i) Macroscopic

A pterygium consists of a head, a cap towards the advancing edge and the body lying limbal to the head.

The head

It is the active part of the pterygium which brings about changes in the cornea anterior to it, forming the cap and activates the subconjunctival connective tissue behind it forming the body. It consists of fibrovascular tissue into which the blood vessels of the body end. It is always raised from the corneal surface to varying extent presenting appearances ranging from fibrous, flat, and a vascular to the fleshy gelatinous type. Owing to its large fibrous tissue content, the head is always firmly adherent to the underlying cornea.

The body

The body is the part limbal to the head which assumes the characteristic wing shape. It lies mainly over the sclera. As the head pushes on into the cornea the adherent conjunctiva is dragged along and stretched so the folds appear above and below it, sometimes with overhanging edges.

The blood vessels also assume the classical orientation towards the head. There is always some degree of subconjunctival connective tissue hyperplasia.[40,41,42,]

The cap

This is the apex of the pterygium anterior to the head. Unlike the head, which is opaque, the cornea of the cap is viewable upto the Descemet's membrane. The transparency is altered possibly due to the biochemical changes induced by the invasion of fibroblasts. It usually extends much anterior to the head of the pterygium and is usually avascular. The apex of the cap is bounded by a line either smooth or

dentate, while beyond the margin may be seen peripheral extensions of the cap in the form of greywhite dots, the 'ilots de Fuchs.[43]

The pigment line

This is seen about a millimeter ahead of the cap. It roughly follows the contour of the cap. Its formation is roughly considered to be similar to the formation of the Hudson Stahli line. The thickened layer of tears at the pterygium head and the lacrimal river are thought to be causes. Tears contain lactoferrin, an iron binding protein known to inhibit free radical formation.

This causes iron to be deposited at the advancing edge of the pterygium as the 'Stocker's line. [14,21,22,40,41,42]

ii) Microscopic [37,44]

Histopathologic analysis of the leading edge of the pterygia by Cameron disclosed the following findings:

1. Fibroblastic tissue separating the corneal basal epithelial cells from the Bowman's membrane.
2. Altered orientation of the basal epithelial cells overlying the fibroblastic tissue.
3. Destruction of the Bowman's and superficial stroma beneath the fibroblastic tissue.
4. Normal corneal tissue proximal to the leading edge of the pterygium.

Ocular pterygia and pinguecula have characteristic histologic features:

1. Hyalinization of sub-epithelial connective tissue of the substantia propria which are seen as diffuse or lobular collections of eosinophilic granular material with an associated increase in the number of fibroblasts and other cells.

2. An increased number of thickened and tortuous fibres that stain strongly with elastic stains, immediately adjacent to and beneath the hyalinized region.
3. Connections within the hyalinised and granular areas that may show either eosinophilia or basophilia.[39]

Sub-epithelial hyalinized region:

The hyalinized zone observed by light microscopy immediately beneath the epithelium has an amorphous, slightly eosinophilic or lightly basophilic appearance. It is comparatively acellular. In this region, there are no elastic fibres. Concretions, when present, are frequently seen in this region. Electron micrographs reveal evidence of collagen degeneration with diminished contrast and attendant loss of cross striations and periodicity, with splitting microfilaments at their end. The microfilaments do not show the hollow centers typical of elastic microfibrils. Subsequent clumping of the abnormal collagen fibres results in collection of coarsely granular substances.

There is no evidence of elastogenesis in this area.

Eosinophilic granular material:

Electron microscopic examination demonstrates that the eosinophilic granular material seen by light microscopy represents the earliest phases of elastogenesis, located in the deeper regions of substantia propria and is separated from the epithelium either by the zone of hyalinized material or normal stroma. Elastic staining fibres are sometimes seen within the collections of granular material.

Elastic staining fibres:

Both pinguecula and pterygia, show a large number of elastic staining fibres beneath the hyalinized zone and adjacent to the granular zone. These fibres usually stain intensely with elastic tissue stains, and are eosinophilic in the hematoxylin-eosin

stain. These fibres are of refractile nature.

Pseudoelastic nature of Pterygium:

Elastic degeneration in cases of pterygium, as in pingeucula, is characterized by the appearance of vermiform, coiled and knotty fibres, which take up elastic stain, but these so-called elastic fibres, appear to differ from natural elastic tissue because they can only mimic the staining character of the true elastic tissue. They remain unaffected or only partially affected by pancreatic elastase. Various terms have been used to describe them including 'elastotically degenerated,' 'pseudo elastic type,' 'hyperelastosis' and 'elastotic degeneration.'

The most important changes occur in the conjunctival stroma. Most show a hyperplasia of collagen, subconjunctival hyperemia, and neovascularization. The hyperplastic collagen fibres show fragmentation and a little coiling, which is regarded as a pre-degenerative stage. This development of degeneration is an important feature distinguishing pterygia from pinguecula, in which the degenerative lesion is present from the beginning.

As the collagen ages, or degenerates in pathologic conditions, it loses its natural staining character so that it can take up an elastic tissue stain. Since the staining depends mainly upon the surface chemicals, a degenerative product simulating one of the normal constituents of elastic tissue may perhaps be deposited in the area of degeneration, thus taking up the stain. [37,43,44]

b) DEFINITION AND CLASSIFICATIONS

Definition of pterygium has been advocated in various manners by various authors.

Sir Stewart Duke Elder: True pterygium is a degenerative and hyperplastic process in which the conjunctiva actively invades the cornea. It is essentially a

triangular encroachment of the bulbar conjunctiva onto the cornea.[15]

William M. Townsend: Pterygium is a triangular sheet of fibrovascular tissue that appears on the epibulbar conjunctiva.[22]

True pterygium: A true pterygium develops from the bulbar conjunctiva in the interpalpebral area of the eye. It is a degenerative and hyperplastic process, in which conjunctiva actively invades the cornea. [41,42]

Pseudo pterygium: This is a condition in which the conjunctiva becomes attached to a corneal ulcer or an ulcer near the margin. This is the result of an inflammatory process.

True Pterygium[39,40,41,42]: The true pterygium arises from the bulbar conjunctiva. It gradually grows towards the limbus in a wedge shaped pattern or triangular pattern. In cases of nasal pterygium it starts from the caruncle, and in cases of temporal pterygium it starts from the outer canthus. [41,42]

There is visible change seen in the normal conjunctiva. The translucency of the conjunctiva is decreased and the conjunctiva is thickened. If the growth is checked then the lesion restricts itself to the conjunctiva without involving the cornea. This true pterygium thus runs backwards from the cornea over the sclera in the form of tightly drawn triangular wing shaped mass. A fully developed pterygium consists of head, neck, and body.

The head directs towards the centre of the cornea and lies over cornea, the neck lies at the limbus, from where extending backwards is the body.The body generally lies over the bulbar conjunctiva and is firmly adherent to the sclera. It has an upper and lower border which shows folds, and a probe cannot be passed for a considerable distance underneath it. The area of adhesion is always smaller than its total breadth, the body of the pterygium ends in a base where these folds merge into

the bulbar conjunctiva.

There is considerable amount of tension produced by the pterygium, which can be made out by the straight course of the vessels and the displacement of the plica semilunaris. Sometimes the plica is displaced in such a way that its upper end is pulled out and lies horizontally.

As a result of deep inflammation, fibrous tissue in the form of horizontal bands is laid down in the affected bulbar conjunctiva in cases of pterygium. These fibrous growths attack the cornea and the certain amount of pull exerted either pulls the cornea towards the conjunctiva or the conjunctiva which is more or less mobile. the conjunctiva is dragged towards the cornea, in a triangular pattern.

Different authors have classified pterygium in different ways:

1. William M. Townsend[22] Classified as:

A. Actively growing pterygium.

B. Fleshy or malignant pterygium.

C. Slow growing pterygium.

D. Stationary pterygium.

E. Atrophic pterygium.

2. Doherty Classified[14] pterygia as:

A. Progressive type.

B. Regressive type

3. Fuch's[43] Classified on the basis of vascularity, color, thickness and clinical aggressiveness:

A. Pterygium Crassum.

B. Pterygium Vasculosum.

C. Pterygium Camosum.

D. Pterygium Sarcomatosum.

E. Pterygium Membranosum.

4. Winther[14] (1856) Classified as:

A. True pterygium.

B. Pseudo pterygium.

Pseudo pterygium: When conjunctiva gets adherent to any corneal ulcer, it results in Pseudopterygium.

Mechanism of formation of pseudopterygium: in the presence of an inflammation, when a fold of inflamed conjunctiva becomes adherent to a progressive ulcer, near the corneal margin and is passively drawn across the cornea, a pseudopterygium results. Usually pseudopterygium formation may be seen in conditions like marginal keratitis, burns, membranous conjunctivitis, after excision of new growth, after iris prolapse[111,40,41,42,]

Staging of Pterygium[45]

Pterygium formation usually begins at the medial aspect as the tear film tends to be thinnest in this area and there is greater exposure here due to the shape of the eye. In addition, there are more goblet cells in this location, hence more mucin produced and less aqueous available.

Staging of Pterygium

Stage 0: Pinguecula, posterior to the limbus

Stage I: Tissue involvement upto the limbus

Stage II: Tissue just on to the limbus

Stage III: Tissue between the limbus and papillary margin

Stage IV: Tissue central to the papillary zone.

Lucio Burrato's Clinical Classification of Pterygium: [21]

It is based on morphological features of pterygia and involvement of the cornea. There are 3 main clinical types of pterygia according to this classification. They are:

Type I: Small Primary Pterygium:

a. Classical.

b. Fibrous.

c. Pinguecular.

Type II: Advanced primary or recurrent pterygium with no optical zone involvement.

Type III: Advanced primary or recurrent pterygium with optical zone.

GRADES OF PTERYGIUM:

Tan D.T[46]. has graded it depending on extent of pterygium onto cornea:

Grade I: < 2mm from limbus

Grade II: 2-4mm from limbus

Grade III: >4mm from limbus

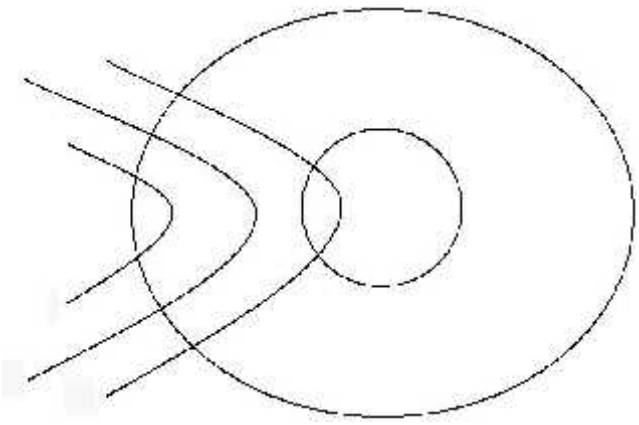


Fig no. 4 Grades of Pterygium

c) Prevalence:

The pterygium is one of the commonest ocular surface disorders mostly found in tropical regions with a predisposition to the equatorial belt. Prevalence of pterygium ranges from 0.3% to 37.46% worldwide[3,39]. A true Pterygium is a condition found chiefly in the sunny hot dusty regions of the world, mostly between the Latitude of 37^{o} North and South of the Equator (Poncet, 1881; deTreigny and Coirre, 1933; Anderson, 1954; Cameron, 1962). High prevalence is seen in "pterygium zone"-i.e. geographical latitude of 37 degree south and north to equator. In India, the prevalence of pterygium is higher in Maharashtra, Andhra Pradesh, Gujarat and Assam. Most of the data available in India is based on the hospital statistics and fragmentary studied done by different workers.

Risk factors for pterygium site [14]

The nasal part of the bulbar conjunctiva is more affected than the temporal part. Various explanations are given for its predilection for nasal side It is more exposed to direct irritation than the temporal conjunctiva.

1. Light is reflected from the skin of the nose back on to the nasal limbus.
2. Transcameral light focusing on the nasal limbus may expose limbal basal stem cells to increased amounts of UVR and be associated with molecular genetic alterations to these cells, eventually leading to pterygium formation.
3. Longer temporal eyelashes of the upper eyelid and the greater downward bowing of the outer two thirds of the upper eyelid, shades and filter light falling on the temporal (compared with the nasal) conjunctiva and cornea.
4. The normal flow of the tears is from temporal to nasal side towards the punctum and carries with it any dust particles entering the conjunctival sac and accumulates in lacus lacrimalis. This probably leads to more irritation of the

nasal conjunctiva.

5. Greater curvature of nasal fibres of orbicularis oculi causing a greater squeezing effect upon nasal subconjunctival tissue.
6. Presence of two anterior ciliary arteries on the nasal side and only one on the temporal side. It is considered due to this fact that any irritant shall lead to greater hyperemia on nasal side and may play a role in production of pterygia commonly on nasal side.
7. Excess of sub conjunctival tissue.

AETIOLOGY AND PATHOGENESIS OF PTERYGIUM

Pterygium is a condition which affects millions of people living in periequatorial regions, causing much discomfort and disablement and in neglected cases blindness. It is a condition rarely seen in European ophthalmological centres and is only seen in England in immigrants or in native English who have spent at least three years in periequatorial regions (Cameron, 1965, Youngson, 1970).

Many theories have been developed to explain the etiology of pterygium.

1- The degenerative theory:

The degenerative theory of the etiology of pterygium was claimed by Fuchs[18] (1892). Duke–Elder[14] (1938) mentioned that pinguecula is a precursor for pterygium based on the early signs of hyaline and elastic tissue degeneration in the deeper parts of the tissues in all cases of pingueculae and pterygia and frequent occurrence of pterygium in cases in which a pinguecula is present.

However, Norn[51] (1979) mentioned that pterygium and pinguccula are totally independent degenerations.

Khalil et al.[52] (1982) concluded from his study that degenerative as well as inflammatory changes occurred in cases of pterygium but, it was difficult to confirm

which process started before the other or it might be true that both changes started at the same time.

Karai and Hariguchi[53] (1984) claimed that a pinguecula is not necessary for a pterygium.

2- The inflammatory theory:

According to the inflammatory theory, Gerundo[19] (1951) isolated Morax-Axenfeld bacillus from 3 cases out of 25 cases of pterygium. Kamel[54](1953) suggested that the formation of pterygium is the result of chronic irritative exposure conjunctivitis in the area exposed in the palpebral fissure, mostly nasal and sometimes temporally. He also added that the degenerative changes that occur in the pterygium are a post-inflammatory degeneration and not a primary degeneration. He based his concept on:-

a. Constant presence of round cell infiltration in the superficial strata of the cornea and conjunctiva of young and progressive pterygia.
b. Marked increase of the Goblet cell of the conjunctiva in cases of pterygia.
c. Deposition of dense fibrous and connective tissue in the submucosa of the conjunctiva and between Bowman`s membrane and epithelium of the cornea.
d. There was no known degenerative condition that starts in a vascular and well nourished area as the limbus, which tends to be self limiting when it progresses towards the non vascular center of the cornea.
e. The vascularity of the pterygium.
f. The periods of more acute inflammatory engorgement that occurred.
g. The occurrence of pterygia in a fixed position which is the most exposed part of the bulbar conjunctiva.

Saif et al.[55] (1967) mentioned that exposure to various extrinsic irritants

causes a triple response (congestion duo to capillary dilatation and oedema caused by exudation of fluid from the dilated capillaries and arterioles) that when repeated lead to an inflammatory reaction.

Mortada et al.[56] (1968) claimed that a true pterygium is a chronic non-specific inflammation with subsequent fibrosis of the subepithelial connective tissue of the nasal (rarely temporal) limbus due to the effect of the environmental factors as dust or ultra-violet rays.

3- The neoplastic theory:

Redslob[57] (1933) mentioned that pterygium is a neoplastic polypoid growth of conjunctiva based on the high rate of recurrence.

Kamel[54] (1953) mentioned that the neoplastic theory is not true as there is nothing in the pathology of pterygia that indicates a neoplastic origin.

Khalil et al.[52] (1982) supported the non-neoplastic nature of pterygium as the changes in the epithelium were mainly in the form of alternating regions of thinning and hyperplasia and the layers of the epithelium were always orderly arranged and the basement membrane of the epithelium was always normal with no signs of break or downward invasion of the epithelium.

4- The tear film abnormality (dry eye) theory:

Elliot[16] (1966) and Goldberg and David (1976) claimed that tear film abnormalities would cause local drying of the cornea and conjunctiva predisposing them to these new growths.

Paton[58] (1975) postulated that exposure to dryness, hot weather, ultra-violet rays, glare and reflections of strong light cause the primary thickening of a limbal mass leading to limbal elevation, which in turn create an exposure problem to the cornea due to poor lid apposition on it.

Taylor[4] (1980) stated that dryness of the cornea and conjunctiva that occurs due to disruption of the tear film, as a result of either evaporation or micro-trauma from micro-patches of dust, to be a primary factor in pterygium development. He also mentioned that drying of the inter-palpebral tear film occurs most readily in the medial third of the inter-palpebral fissure as this part of the conjunctiva is farthest from the lacrimal gland and nearest to puncta, also, as the eyes when partially closed against glare or wind, the medial third of the conjunctiva remains relatively more exposed than the lateral third.

Caldwell[59] (1985) stated that drying and exposure may produce an anoxic condition of the cornea, similar to that occurring in the periphery of the retina in case of diabetes. This anoxia probably produces an angiogenic factor which in turn would lead to neovascularization of the dellen area leading to fibro-vascular ingrowths onto the cornea.

Coroneo[60] (1999) mentioned that drying of the tear film by wind devitalizes tissues of the medial third of the palpebral aperture and this allows actinic radiation to damage the conjunctival and corneal epithelium and Bowman`s membrane.

5- The immunological theory:

Pinkerton et al.[61] (1984) mentioned that the presence of lymphocytes and plasma cells in the stroma of the pterygial tissues indicates that an immunological process may be involved in the pathogenesis of pterygium. He also added that the localization of Ig G and Ig E indicates an immunological mechanism and the presence of Ig E suggests a possible involvement of type (1) hypersensitivity.

Ibrahim et al.[62] (1991) mentioned four points in support of immunological theory:

1) The demonstration, in the pterygial tissue of immunoglobulins and complement suggests that an immune complex mediated type (III)

hypersensitivity.

2) The presence of immunoglobulins along the walls of the epithelium may be suggestive of a type (II) hypersensitivity.
3) Deposition of fibrinogen may be attributed to vascular injury mediated by immune complexes.
4) The fibrinogen detected in the inflammatory cells may represent phagocytosed fibrinoid material derived from the necrosis resulting from local antigen antibody interaction.

Nakagami et al.[63] (1999) showed that the mean number of most cells in the pterygia specimens was twice as high as that in the normal conjunctival tissues.

6- The mechanical theory:

Wong[64] (1978) suggested that a pterygium angiogenesis factor may exist which develops following repeated irritation at the limbus. This factor produces vessel ingrowth and the formation of pterygium.

Barraquer et al.[65] (1980) postulated that chronic irritation may result in repeated attacks of conjunctival inflammation and punctate conjunctival ulcerations, leading to a cicatricial reaction in the subconjunctival tissue which undergoes a retraction process, moving towards the limbus, forming a tiny roundlet that is higher than the limbus. Once the limbic elevation has been formed, the lids no longer touch the cornea in front of the elevation, leading to discontinuity of the precorneal tear film, desiccation, dellen formation and then ulceration of the limbic elevation. Healing of the ulceration attracts the conjunctiva forming a pterygium. Repetition of these corneal ulcerations result in migration of the ptergium towards the center of the cornea.

Aziz[66](1986) claimed that environmental factors as excessive dust, fumes, draughts of air might act as irritating agents which would lead to congestion of the eye and help in pterygium formation.

Coroneo[60] (1999) mechanical irritation by dust particles enhanced by the tear flow from lateral to nasal side of conjunctiva has been proposed as a mechanism. However, pterygia accour in dust- free areas for example at sea, in sailors.

7-- The hereditary theory:

Duck-Elder[14](1965) stated that heredity has undoubted influence on the occurrence of pterygia.

Hilgers[67] (1960) mentioned that some pedigrees have showed an apparent transmission through several generations suggesting an autosomal dominant mode of inheritance.

Mortada et al.[56] (1968) and Coroneo (1993) did not believe in the hereditary theory because they thought that this might simply reflect common environmental factors or occupations or an inherited anterior segment shape factor.

8- The ultra-violet rays theory:

Blum[14](1959) stated that UV rays at least in the skin are the most important nuclear damaging agent, as he observed by his experimental study the occurrence of epithelial hyperplasia, degeneration of the Bowman`s membrane and vascularization of the corneal stroma in a mice by the action of large doses of UV rays.

Moran and Hollow[3] (1984) mentioned that the ultra-violet theory of pterygium causation is supported by studies on rural Australian and Japanese Welders. In the Australian study, a strong positive correlation between climatic ultra-violet radiation and pterygium prevalence was demonstrated. Also, there was a comparable prevalence in male and female aborigines and the rates were higher than for non-

aborigines. This was thought to be due to the fact that non-aboriginal women in rural

Australia generally spend less time out of door than men and are well housed and able to escape from solar radiation, either direct or scattered.

Taylor et al.[4] (1989 & 1992) mentioned that the ultra-violet radiation is divided into three bands : UV-A (400- 320nm), UV-B (320-290nm), and UV-C (290-100nm) , based on its biologic activity. The ultra-violet C does not naturally penetrate to the earth`s surface, but the cornea would absorb almost 100% of this radiation below 290nm.

Coroneo (1993) has explained the occurrence of the pterygium most commonly at the side of conjunctiva. He proposed that the anterior eye acts as side on lens, focusing light from the side of the cornea, then light proceeds across the anterior eye via transcorneal pathways to the other side. The degree of limbal focusing is determined by corneal shape and anterior chamber depth, and this may explain why particular individuals in a common environment are affected by these conditions. As these factors are quantifiable, it may be possible to identify at risk individuals by using puter assisted optical ray tracing techniques, Coroneo (1993) stated that the peak light intensity at the nasal limbus is approximately 20 time that of the incident light intensity. This irradiation may be particularly injurious as the corneal epithelial stem cells are struck from behind and are not protected by the more superficial layers of the epithelium.

9- The limbal stem cell dysfunction theory:

Recently, it has been proposed that pterygium may be due to limbal stem cell dysfunction. Chen and Tseng[68] (1990) stated that the corneal epithelial stem cells which are located in the basal limbal epithelium, play a role in maintaining the junction between cornea and conjunctival epithelia.

It has been reported that the primary abnormality in the pathogenesis of pterygium is the abnormal stem cells. This is evidenced, recently, by the immuno-chemical techniques that showed altered limbal epithelial stem cells at the leading edge of pterygia along the normal corneal epithelial membrane.

Based on these data, Dushku & Reid[69] (1994) proposed that the pathogenesis of pterygia is due to altered limbal epithelial basal cells giving rise to a zone of motile daughter cells, the pterygium cells, which leave the limbal region and migrate centripetally along the corneal basement membrane dissolving Bowman`s layer. Since these altered limbal basal cells are found at the microscopic advancing edge over Bowman`s layer with no fibroblast mass under them, the pterygium cell apparently precedes the rapid growth of the fibroblasts from the stroma.

Grimmett and Holland[70] (1997) stated that a healthy limbal stem cell population provides a stable junctional barrier that prevents conjunctivalization of the cornea. So, pterygium formation may ultimately represent a focal limbal stem cell dysfunction state.

A. **Based on the underlying etiology, corneal diseases manifesting LSCD can be subdivided into two major categories[71]**

In the first category, limbal epithelial stem cells are destroyed by known or recognizable offenders such as chemical or thermal burn, Stevens- Johnson syndrome/ toxic epidermal necrolysis, multiple surgeries or cryotherapies or medications (iatrogenic), contact lens, severe microbial infection, radiation, and anti-metabolites including 5-fluorouracil and mitomycin C.[72]

A second category is characterized by a gradual loss of the stem cell population without known or identifiable precipitating factors. In this situation, the limbal stromal niche is presumably affected and progressively deteriorates by a

variety of etiologies that include aniridia and coloboma, neoplasia, multiple hormonal deficiencies, peripheral ulcerative corneal diseases, neurotrophic keratopathy, pterygium and idiopathic limbal deficiency[73,74]

B. Depending on the extent of deficiency they can also be classified as-

1. **Partial / Focal LSCD**- is characterized by partial/ focal loss of stem cell function with rest of the limbus being normal, e.g.- multiple surgeries at limbus, cryotherapy, pterygium, cryotherapy, less severe chemical/ thermal burns, etc.
2. **Total LSCD**- When it is more severe there is total loss of limbal stem cells without any normal area spared and it is called as total stem cell deficiency e.g.- Steven Johnson syndrome, advanced cicatricial pemphigoid, contact lens wear.

C. Limbal stem cell dysfunction versus destruction-

Dysfunction is usually primary or hereditary and can be a part of other ocular or systemic anomalies. Due to abnormal microenvironment of the limbal tissues, the stem cells never achieve their normal function. The condition is usually bilateral and less severe as the rest of ocular surface may be normal e.g. Aniridia, keratitis associated with multiple endocrine deficiencies.

Destruction is an acquired loss of functioning stem cells. The condition can be unilateral or bilateral and associated with severe ocular surface damage Eg.- chemical/ thermal burns steven Johnson syndrome, multiple surgeries pemphigoid, cryotherapy to limbus, contact lens wear etc.

D. DIFFERENTIAL DIAGNOSIS: [41,42]

1. **Pseudo-pterygium:** This may be situated anywhere on the limbus in contrast to the true pterygium. A history of some corneal trauma like a marginal ulcer,

fascicular ulcer, lime burns always precede. A probe can easily be passed under the neck of a pseudo-pterygium.

2. **Pinguecula:** A pinguecula seldom encroaches on the cornea except when it is very large, when the distinction from pterygium becomes difficult.
3. **Epithelioma:** This sometimes grows in the limbal area and resembles a pterygium. The difference lies in the greater irregularity of its surface, lack of thickening of subconjunctival connective tissue at the caruncle and absence of orientation of the blood vessels into the characteristic pterygial shape.
4. **Bowen's tumor:** This is a rare tumor that can be mistaken for the much commoner pterygium. Its features are much the same as for epithelioma.
5. **Epithelial hyperplasia:** These cases show increase in the subconjunctival connective tissue and the development of white or gray plaques surrounded by erythema giving the appearance of a pterygium.
6. **Squamous cell carcinoma of the limbus:** It is a very rare pathology but its differential diagnosis may be difficult with respect to other pathologies of the limbus. Like a pterygium, it would also appear to be the result of chronic exposure to UV radiation. The most common site is the infero-temporal zone of the limbus. The definitive diagnosis is by histological examination.
7. **Conjunctival papilloma:** It is a small active neo-formation in small cauliflower. It is highly vascular and bleeds easily. Compared to a pterygium differential diagnosis is easy but a certain diagnosis is histological. It is of vital origin.
8. **The limbal dermoid:** It is a rare congenital pathology which appears as a round yellow-red neo-formation between the limbus and the edge of the cornea. There is no abnormal visualization. The preferred site for the dermoid

is the infero-temporal sector.

9. **Phlyctenular keratoconjunctivitis:** It is a small circumscribed conjunctival neo-formation with a gel-like appearance and surrounded by twisted capillaries and is associated with conjunctival hyperaemia. The pathogenesis is linked to delayed hypersensitivity to foreign bacterial or food proteins. This pathology is generally localized, but in some cases can lead to new vessel formation in the cornea and successive surface opacity. It is common in infancy or childhood.
10. **Lymphoma of the conjunctiva:** It is a very rare lesion that involves the inferior and nasal bulbar conjunctiva. This is a salmon-pink subconjunctival lesion which is poorly vascularized and almost flat. The definitive diagnosis is obtained histologically.
11. **Nodular episcleritis:** it is an inflammation of the episclera and the over-lying conjunctiva; in the nodular forms, it is localized. Young adult females are most affected and the pathology is observed as a bright red, almost flat nodule. 1t consists of twisted and injected conjunctival and episcleral capillary vessels. When it first appears, episcleritis is associated with pain but it disappears following several weeks' treatment with anti-inflammatory drugs.

Signs and symptoms[14,75]

- Discomfort
- Foreign body sensation
- Congestion
- Irritation
- Dryness
- Tearing (Lacrimation)

- Occlusion of the visual axis (Decreased visual acuity).
- Diplopia on lateral gaze.
- Acquired irregular astigmatism.
- Painless area of elevated vascularized white tissue on the inner and out edge of the cornea.
- Impaired vision when growth extends into the papillary area of the cornea.

MANAGEMENT OF PTERYGIUM

MEDICAL MANAGEMENT[76]

Mild symptoms of photophobia and injection from a small pterygium can often be managed by avoiding smoke and dust-filled environments. Topical, preservative-free lubricants, vasoconstrictors, and a mild nonpenetrating corticosteroid, can safely relieve symptoms when used judiciously. To prevent progression, some authors have advocated the use of ultraviolet-blocking spectacles. Both UV-A and UV-B protection have been recommended by Taylor and associates based on the results of their epidemiologic study.

SURGICAL MANAGEMENT[77,78,79] :

Indications for surgical treatment of pterygium include[77]:

- Proximity to the visual axis resulting in diminution of vision
- Encroachment of visual axis
- Significant astigmatism leading to visual debility
- Restriction of ocular movements causing diplopia
- Atypical appearance such as possible dysplasia
- Symptomatic growth
- Cosmetic concerns

Recurrence is the most problematic outcome and its prevention forms the motivation for evolving different surgical techniques.

Anaesthesia : Subconjunctival or regional anesthesia is sufficient in most instances. If additional surgery such as a conjunctival autograft is planned, retrobulbar or peribulbar anesthesia would be suitable options. General anesthesia may be indicated in exceptional cases of recurrent pterygium with marked muscle restriction and scarring.

Modern pterygium surgery can be divided into four main groups, in order of increasing complexity:

1 Bare sclera excision

2 Excision with conjunctival closure/transposition

3 Excision with antimitotic adjunctive therapies

4 Ocular surface transplantation techniques.

The principles of pterygium excision are:

1 Complete removal of all pterygium tissue at Bowman's plane and the sclera

2 Minimizing scarring and irregular astigmatism at the cornea

3 Minimizing scleral damage.

Surgical excision techniques

Excision (Bare Sclera):-

One of the most popular methods for the removal of primary pterygium is excision of all remnants of the pterygium, leaving the underlying bare sclera exposed. This method was described by D’Ombrain in 1948.Bare sclera excision can be started from the corneal apex or by incising around the conjunctival body of the pterygium .The cornea is left as smooth as possible, and all of Tenon's capsule from beneath the pterygium is excised.

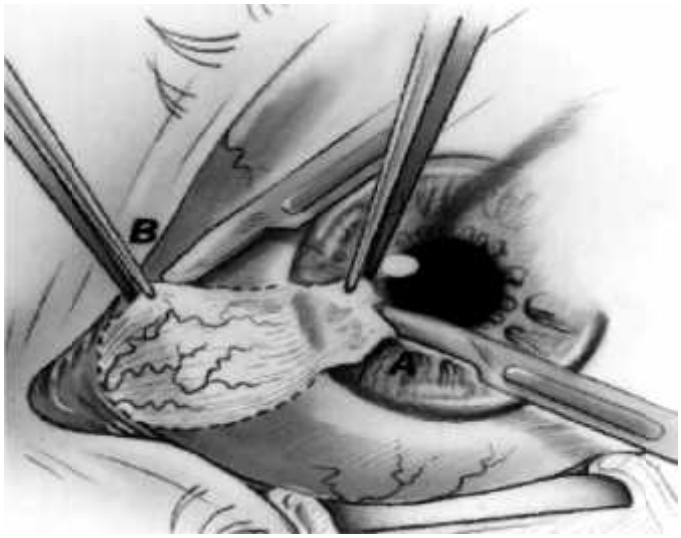


Figure no. 5 : Bare Sclera Excision

The excision of a superficial layer of corneal tissue at the time of pterygium removal was recommended by Castroviejo.Along with a superficial keratectomy, his procedure of choice for recurrent pterygia included removal of all corneal and scleral vascularization in the area of the excision. While emphasizing the importance of not weakening or perforating the cornea, he described a shallow, smooth dissection of the fibrovascular tissue comprising the pterygium and any opacification of the cornea.

It is common to pursue meticulous excision of all abnormal tissue, including cleaning the limbal site with a sharp surgical blade and polishing the area with a diamond burr. The goal is smoothness of the surface of the excision, not the complete removal of all opacity. There is a significant body of literature supporting the bare sclera technique. One of the pilot studies reported the outcome of 100 bare sclera operations and noted a recurrence rate above one third[80].

Avulsion Technique:

In the seventh century, Paluus and Aegeneta described the avulsion technique. With a small hook the pterygium is seized; a needle with a horse hair and a strong thread in its eye is transfixed trough the middle. With the thread, the growth is raised,

and with the horse hair, it is sawed off the globe centrally. At the medial canthus it is cut off with a scalpel.

Simple conjunctival closure

It generally involves the removal of the pterygium with minimal conjunctival excision and then closure of the conjunctiva with sutures leaving very little or no bare sclera. This is the simplest method and consists of extirpation of all the fibrovascular proliferation and suturing the upper and lower cut edges of the conjunctiva. Czemark recommends passing suture through the superficial layers of cornea.

Excision With Primary Closure

The concept of undermining the adjacent normal conjunctiva, with presumably less ultraviolet light exposure, and reapproximating the wound margins is finding renewed interest. To prepare a sliding conjunctival flap, the superior horizontal edge of the conjunctiva is lifted with a fine-toothed forceps and separated from the underlying Tenon's capsule with Westcott scissors. The conjunctiva is incised parallel to the limbus; the length of the incision is approximately the length of the horizontal conjunctival defect . The incision is extended peripherally to the approximate length of the vertical conjunctival defect left by the pterygium excision. The flap is then brought inferiorly to cover the conjunctival defect.A technique of sliding conjunctival flaps from both superior and inferior limbus to close the wound has been reported to have a 1-year recurrence rate of only 5%.

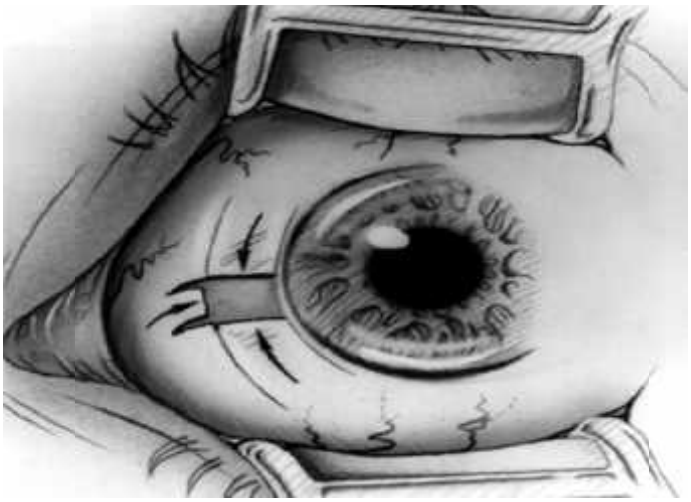


Figure no. 6: Sliding Conjunctival Flap

With the “Merest sclera" technique[78] , the head and mid body of the pterygium are excised and a tenonectomy is extended beneath the conjunctiva to the adjacent rectus muscle, particularly in young patients or large lesions. Relaxing conjunctival incisions are made both superiorly and inferiorly along the limbus, and the conjunctiva is closed primarily and meticulously. The rare recurrences (2.1%), occurred only in 2 cases with wound infection and in 15 cases with wound dehiscence from this large series.

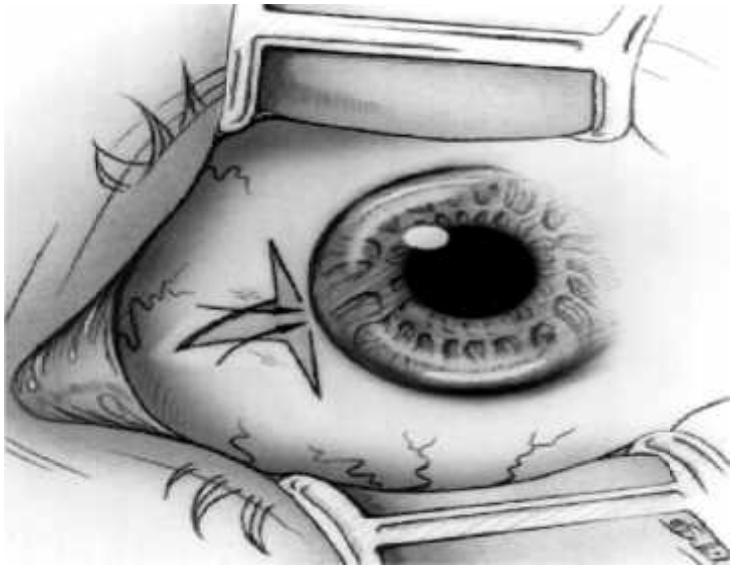


Figure no. 7 : Merest Sclera Technique

Transplantation of the head of the pterygium

Desmarres first suggested that a pterygium would atrophy if the pterygium head was dissected and transposed to a new position away from the cornea. Many variations of this technique have been described:Knapp favored dissecting the pterygium, splitting it in half, and suturing the halves to the conjunctiva; McReynolds buried the head of the pterygium under the conjunctiva; Blaskovics folded the head under the body. Stocker described a method of conjunctival z-plasty for primary closure. An alternate type of z-plasty was described by Wilson and Bourne [79] and consists of placing a flap of normal tissue between the body of the pterygium and the corneal limbus. No data on recurrence using this method are available, but the authors argue that the normal tissue acts as a barrier to the regrowth of the pterygium and preserves the superior bulbar conjunctiva for use in a conjunctival autograft procedure in the event of a recurrence.

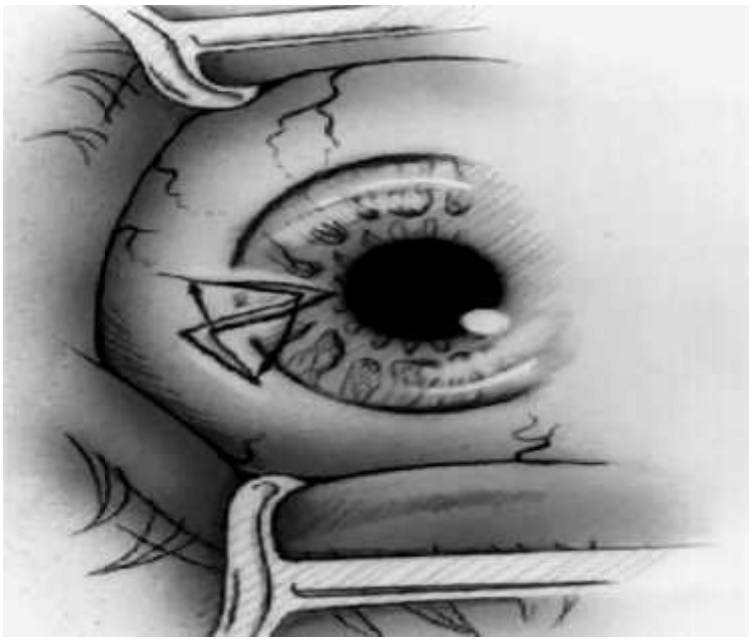


Figure no. 8 : Conjunctival Z-Plasty

Mc Reynold conceived the idea of passing the head of the pterygium beneath the conjunctiva without cutting it and fastening it with suture near the insertion of the

inferior rectus, beneath lower bulbar conjunctiva.

Figure no. 9 Mc Reynold's technique

Unfortunately recurrence rates of 30 to 75% were reported with these techniques. Such transplantation procedures thus have been largely abandoned secondary to high recurrence rate and unsatisfactory post operative cosmetic results.[81]

Conjunctival autograft

Conjunctival autografting prevents recurrence by acting as a barrier adjacent to the limbus and preventing migration of nasal conjunctiva following bare sclera excision of pterygium.

- Kenyon and associates[10] described the transplantation of free autografts of superotemporal bulbar conjunctiva from the same eye to close wounds after the excision of advanced or recurrent pterygium.
- They used this method on 57 eyes of 54 patients, nearly 80% of which were recurrent. Mean follow-up of 2 years detected only three (5.3%) recurrences after autograft transplantation. The authors emphasize taking minimal subconjunctival tissue, to prevent scarring and retraction of the graft.

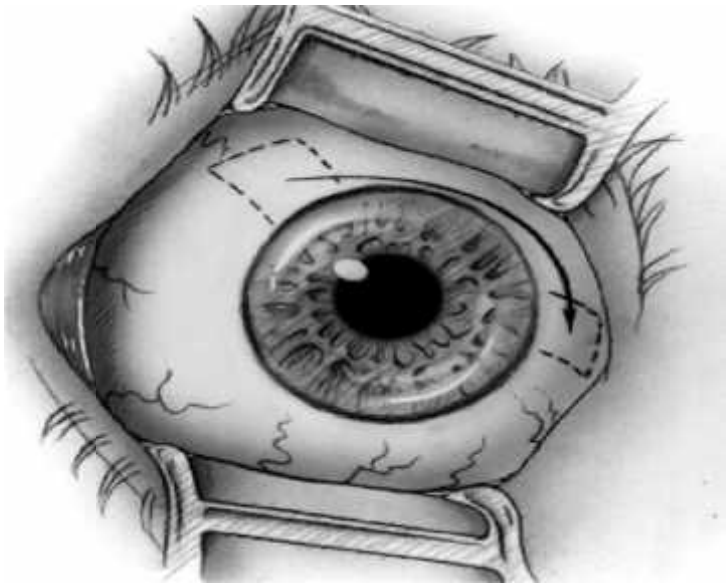


Figure 10 : Conjunctival Autograft Transplantation

- The graft is slightly larger than the pterygium site. Cautery spots are used to delineate the involved area of conjunctiva to be excised.
- Sharp, superficial excision of the head of the pterygium from the involved cornea to the limbus is done. The conjunctiva and Tenon's capsule are bluntly and meticulously dissected from the horizontal rectus muscle, leaving behind the bare sclera and exposed rectus muscle. Conjunctiva is secured to the sclera with absorbable suture (e.g., 8-0 Vicryl) on a spatulated needle.
- Callipers are used to determine the size of conjunctival graft required to resurface exposed sclera and horizontal rectus muscle.
- Free grafts are dissected as thinly as possible, taking minimal subconjunctival tissue. If the graft is excised such that cautery marks remain with the graft tissue margins, then the epithelial surface can be readily identified when the graft is repositioned. The donor site does not require suturing, but the conjunctival margins can be advanced to the limbus with two interrupted sutures.

- The free graft is transferred into the recipient bed and secured to adjacent conjunctiva and episclera with interrupted sutures of 8-0 Vicryl; 10-0 nylon is used for the limbal edge of the graft.
- Younger patients were much more likely to have a recurrence, and all recurrences were noted by the patient within 6 to 8 weeks of surgery.

Factors essential to successful conjunctival autografting include:

- Obtaining a large autograft (oversized by 1 mm compared to the bare scleral defect)
- Adequate removal of all surrounding fibrovascular tissue
- Obtaining a thin, Tenon free graft (by superficial dissection techniques) to ensure minimal graft retraction and better cosmesis
- Avoidance of buttonholing of the autograft
- Achieving a stable, tension-free graft by the use of anchoring sutures with episcleral bites at the superior, inferior and limbal margins of the graft.

Limbal autograft transplantation is based on the concept that the limbal epithelium contains the stem cell population for corneal epithelial cellular proliferation and differentiation and has been advocated for a variety of unilateral ocular surface disorders with suspected limbal stem cell disease (Tan et al., 1996).

Lamellar keratoplasty

If significant corneal thinning is present as a consequence of previous pterygium surgery, a lamellar keratoplasty may be indicated to restore the normal ocular surface integrity. Additionally, various authors have recommended a lamellar keratoplasty as a barrier to pterygium regrowth.

While the reported series are small, recurrence rates after lamellar keratoplasties using lyophilized donor tissue have been reported between 0% and

60%. In severe cases where the visual axis is affected by thinning and scarring, a penetrating keratoplasty may be indicated to visually rehabitate the eye (Castroviejo 1950, Friede 1953).[82]

Amniotic membrane transplantation: Human amniotic membrane reduces inflammation and formation of fibrovascular tissues. This has been used with success to cover the bare sclera after pterygium excision.[83] It serves as a useful alternative to conjunctival tissue in situations where there is a large conjunctival defect and shortage of healthy conjunctival tissue to cover the bare sclera as seen in recurrent pterygium.[54] However preparation of a fresh transplantable amniotic membrane is a tedious process.

Cut and Paste technique using fibrin glue:

Procedure as described by Koranyi et al[84] -

It is a novel, no suture ,small incision approach to pterygium surgery, with the use of an improvised biologically compatible glue.

- Tisseel Duo Quick is a two component tissue adhesive which mimics natural fibrin formation. This glue has two components. One consists of fibrinogen mixed with factor XIII and Aprotinin. The other component is thrombin-$CaCl_2$. All components were prepared from banked and well controlled human blood. Equal amount of components are mixed together. Through action of thrombin, the fibrinopeptides are split to fibrin monomers. These monomers aggregate by cross linking resulting in fibrin clot.
- Pterygium excision was done. Wound bed scraped to clean cornea and sclera, bleeding vessels cauterized.

- A free conjunctival graft of same size as nasal conjunctival defect was prepared at superotemporal limbus of same eye. Limbal edge of the graft was cut to contain a thin rim of corneal epithelium.
- The graft was moved to the nasal area and attached to the sclera with glue. Proper orientation maintained with epithelial side up and limbal edge towards the limbus.
- One drop of thrombin was placed on scleral bed and one drop of protein solution placed on the graft. Thereafter graft is flipped over the sclera and smoothened out while the fibrinogen was activated by the thrombin forming the fibrin glue. After the graft is positioned there was 30 seconds to smoothen out graft and press it gently to the scleral bed attaching the graft firmly.
- Use of fibrin glue for graft fixation in pterygium surgery is a safe, fast method and does not have any side effects. This new technique of pterygium surgery decreases post-operative pain and surgery time.

Fibrin glue: A tissue adhesive

Tissue adhesives can be divided into synthetic adhesives (*e.g.*, cyanoacrylate derivatives) and biologic adhesives (*e.g.*, fibrin-based adhesives)[85] .

- Fibrin glue is a blood derived product that is absorbable, relatively easy to use, and can be kept at room temperature or in a refrigerator[86].
- Although the use of fibrin glue as a biologic adhesive was first introduced in 1909, it was not until 1944 that Tidrick et al. used fibrin for skin graft fixation.
- Also it was in early forties that fibrin glue was introduced to ophthalmology to fixate penetrating corneal grafts in rabbits[87].

- Fibrin glue is a biological tissue adhesive which imitates the final stages of the coagulation cascade when a solution of human fibrinogen is activated by thrombin(the two components of fibrin glue)[88.89].
- Fibrin glue includes a fibrinogen component and a thrombin component, prepared at a blood transfusion center or from patients own blood[50] or obtained as a commercially available preparation.
- When it is derived from individual volunteer donations, it may have a low concentration of fibrinogen. The commercially available products are produced from pools of plasma, usually contain yields of fibrinogen and consequently, produce firm coagulams.

Mechanism of action

- When human tissue is injured , bleeding ensues and then ceases due to formation of a blood clot. This is the initial mechanism of natural wound closure.
- Clot is formed as a product of the final common pathway of blood coagulation. Fibrin glue mimics this coagulation cascade resulting in its adhesive capability.
- Once the coagulation cascade is triggered, activated factor X selectively hydrolyses prothrombin to thrombin, fibrinogen is converted to fibrin. Thrombin also activates factor XIII (present in the fibrinogen component of the glue), which stabilizes the clot, by promoting polymerization and cross linking of the fibrin chains to form long fibrin strands in the presence of calcium ions.

- This is the final common pathway for both extrinsic and intrinsic pathways of coagulation in vivo, which is mimicked by fibrin glue to induce tissue adhesion.
- There is subsequent proliferation of fibroblasts and formation of granulation tissue within hours of clot polymerization. Clot organization is complete two weeks after application. The resultant fibrin clot degrades physiologically.

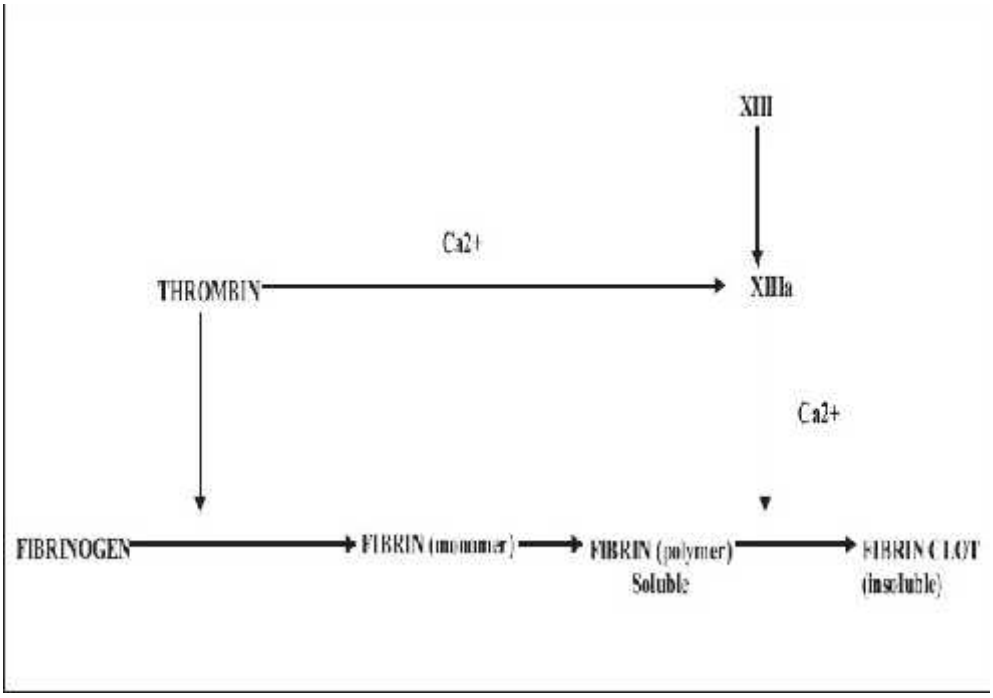


Figure no. 11 Fibrin Activation Pathway

The commercially available fibrin sealant kit contains the following in separate vials:

1. Freeze Dried Human Fibrinogen (40 mg/ml)
2. Freeze Dried Human Thrombin in (500 IU/ml)
3. No antimicrobial preservative is added in any of the components
4. Aprotinin solution (Bovine) as a sterile solution in a composition of 3000 kiu/ml
5. 1 x 4 ml ampoule of sterile water for injection
6. Applicator with two mixing chambers and one plunger guide

Storage

The lyophilised powder is to be stored between +2°C and +8°C (35°F and 46°F)

In India, it is available as Tisseel Fibrin Sealant (Baxter Vienna, Austria), and as reliseal (from Reliance life-sciences)[49] .

Reliseal is a two component tissue adhesive which mimics the natural fibrin formation. This glue has two components. One consists of fibrinogen mixed with factor XIII and aprotinin. The other component is a thrombin-CaCl2 solution. All components are prepared from banked and well controlled human blood. Equal amounts of the components are mixed together. Through the action of thrombin, the fibrinopeptides are split to fibrin monomers. These monomers aggregate by cross linking, resulting in a fibrin clot.

Thrombin concentration can be varied to regulate the speed of coagulation. Low thrombin concentrations (4 IU/ml) with slow clotting are used, for example, in skin grafting while high thrombin concentrations (500 IU/ml) are beneficial where almost instantaneous clotting is desired. The double syringe applicator (Duploject) is usually advocated for mixing, in order to obtain precise amounts of the components. However, the sealant can be applied sequentially or premixed through needles, spraying heads, or catheters. The glue does not stick to intact corneal or conjunctival epithelium.

Figure no. 12 Reliseal Fibrin glue

Methods of preparation

- Numerous techniques have been used to prepare fibrin glue, either from homologous or autologous plasma. The autologous source avoids any possible risk of viral transmission.
- Homologous fibrin glue is prepared from donors screened like other blood products, followed by inactivation of viruses by solvent/detergent treatment.
- The plasma is centrifuged to produce a precipitate containing fibrinogen and a supernatant containing the thrombin. The precipitate is re suspended in a small volume of a supernatant and used as the fibrinogen component.
- The supernatant is further treated by clotting to convert residual fibrinogen to fibrin followed by filtration to isolate the fibrin. The resulting serum is used as the thrombin component.

Advantages

Fibrin glue reduces the total surgical time because time required to place sutures is saved. The use of glue has been found to lower the risk of post-operative wound infection, contrary to conventional suturing. This can be attributed to accumulation of mucous and debris in sutures which may act as a nidus for infection.[86]

It is well tolerated, non-toxic to the tissue wherever it is applied and has some antimicrobial activity. The smooth seal along the entire length of the wound edge results in a higher tensile strength, with the bond being resistant to greater shearing stress. Fibrin glue is also a useful adjunct to control bleeding in selected surgical patients. It has a low incidence of allergic reactions. However, anaphylactic reactions following its application have been reported. This reaction has been attributed to the presence of aprotinin in fibrin glue.[86]

Disadvantages

The major drawback to its use is the risk of transmitted disease from pooled and single-donor blood donors. The same can be minimized to a great extent by obtaining the blood from screened healthy donors. The safest preparation is by using the patient's own blood to prepare fibrin glue but it is expensive and autologous donation requires at least 24 hours for processing. The resultant product often has variable concentrations thereby resulting in an unpredictable performance.[86]

The commonly used method of viral inactivation is the solvent/detergent method which inactivates lipid coated viruses. Additional means of reducing viral transmission risk are a combination of γ-radiation, cryoprecipitation, adsorption, vapor heating, pasteurization and nanofiltration. Further insurance can be attained by testing viral markers from donors for 6 months to ensure sources are virus free.

Fibrin glue in pterygium surgery

Fibrin glue has been used as an alternative to sutures for securing conjunctival grafts. The use of fibrin glue shortens operating times significantly and is associated with less postoperative discomfort. Fibrin glue also provides a more even attachment of the graft to the scleral bed. Most cases performed with fibrin adhesive healed with minimal inflammation and there were only sporadic cases of graft dislodgment or

loss. In a retrospective study,[84] authors demonstrated a pterygium recurrence rate of 5.3% with glue versus 13.5% with sutures. Another study in 2008 evaluated the efficacy and safety of fibrin glue in conjunctival autograft fixation in primary pterygium compared with that of suturing.[90] They found that fibrin glue application takes significantly shorter operating time and associated with fewer post operative symptoms than a sutured graft, indicating the safety of the procedure.

CONJUNCTIVAL AUTOGRAFTING WITH THE USE OF AUTOLOGOUS BLOOD[13,47,48]

PROCEDURE

Pterygium and associated conjunctiva are excised, a thin film of blood clot is allowed to form over bare scleral area by bleeding adjacent conjunctival blood vessels. Any active bleeding is stopped by direct tamponade. Next, a thin, Tenon-free conjunctival autograft, is fashioned at supero- temporal bulbar conjunctiva. After graft is aligned, it is placed over the blood film in the bare sclera, and the edges are held with forceps, usually three to five minutes, to give adequate time for graft fixation.

Mechanism of action

- When human tissue is injured, bleeding ensues and then ceases due to formation of a blood clot. This is the initial mechanism of natural wound closure.
- Clot is formed as a product of the final common pathway of blood coagulation.
- Once the coagulation cascade is triggered, activated factor X selectively hydrolyses prothrombin to thrombin, fibrinogen is converted to fibrin. Thrombin also activates factor XIII, which stabilizes the clot, by promoting

polymerization and cross linking of the fibrin chains to form long fibrin strands in the presence of calcium ions.

- This is the final common pathway for both extrinsic and intrinsic pathways of coagulation in vivo. This mechanism is used to induce tissue adhesion of conjunctival autograft to bare sclera.
- There is subsequent proliferation of fibroblasts and formation of granulation tissue within hours of clot polymerization. Clot organization is complete after two weeks. The resultant fibrin clot degrades physiologically.

ADVANTAGES[13,47,48]:

Suture materials used in ocular surface surgery has chances of local complications such as discomfort, scarring or infection. Fibrin glue has possibility of hypersensitivity reactions and the risk of viral transmission. Suture less and glue free conjunctival autograft in pterygium surgery may prevent potential adverse reactions encountered with foreign materials like suture and fibrin.. No glue no suture method is of less cost , so highly economical.

DISADVANTAGES[13,47,48]:

Complications regarding graft displacement and graft retraction were more common in those grafting with autologous blood (suture less and glue free) than in those with grafting with the glue

Intraoperative Complications in Pterygium Surgery:-

Three major complications that can occur while performing pterygium excision are- Perforation of cornea ,perforation of the sclera,injury to the horizontal rectus muscle.

Perforation of cornea and sclera may occur while excising recurrent lesions because trhe remaining tissue can be iatrogenically left very thin. If corneal thickness

is suspected to be extremely reduced, surgeon should perform a peripheral lamellar keratoplasty. Small scleral perforation can be closed with 7-0 vicryl sutures. If larger defect occurs the area is repaired by using a graft of corneal tissue and covering it up with a conjunctival sliding flap. Button holing of the graft. Injury to extraocular muscles can occur on aggressively recurrent pterygium with prominent scar tissue formation in tenon's layer.

Complications of conjunctival autograft

Early postoperative complications include graft edema, graft hemorrhage, graft retraction/suture breakage, graft inversion and necrosis and corneoscleral dellen. Conjunctival granulomas can also form shortly after surgery. Owing to excessive inflammation and localized irritation occurring at the site of exposed Tenon's tissue, granulomas may occur at the graft harvest site, in the recipient bed adjacent to the autograft , or as a stitch granuloma.

Late postoperative complications include epithelial inclusion cysts, conjunctival scarring or fibrosis at the donor site, and steroid-induced ocular hypertension.

Adjunctive Therapy

A number of adjunctive therapies have been described to decrease the risk of recurrence after the surgical removal of a pterygium. Each has its attractive features, but none is without drawbacks.

Cautery With the knowledge that blood vessel growth at the operative site contributes to the recurrence of a pterygium, several workers have advocated the extensive use of intraoperative cautery, particularly at the limbus, to augment the surgical removal of the pterygium.

Laser Therapy

The use of the Argon laser in selected postoperative cases has been described. The technique of applying 50-µm spots to early neovascular fronds and limiting power settings to minimize conjunctival epithelial damage has been reported. Complications such as scleral necrosis, scleromalacia, secondary iritis and cataract have been reported.

Corticosteroids

New vessels often herald the recurrence of a pterygium. Postoperative use of topical corticosteroids inhibits the inflammatory reaction and may reduce neovascularization of the operative site. Several authors have advocated their use four times daily for 2 weeks after the healing of the corneal epithelial defect.

Thiotepa

Thiotepa is a nitrogen mustard alkylating agent with antimitotic properties. It is a radiomimetic agent that presumably obliterates proliferating vascular endothelial cells.

Reported complications with thiotepa include prolonged conjunctival hyperemia, irritation, allergic reactions, sclerokeratitis, and permanent eyelid depigmentation, especially in darkly pigmented patients. No systemic toxicity has been reported, but these side effects have deterred many ophthalmic surgeons from adjunctive use of thiotepa after pterygium surgery.

Beta Radiation:

Irradiating the rapidly dividing vascular endothelial cells of a pterygium with beta radiation dramatically slows their proliferation, while sparing the adjacent mitotically inactive cell populations.

Beta radiation does not appear to be effective as a sole treatment for established pterygia. The introduction of strontium applicators for ophthalmologic use in 1950 brought strontium-90 into use as the standard pure beta (no gamma) radiation source. In most subsequent studies, recurrence of pterygium after surgery and beta radiation ranges from 0% to 16%.Standard dose is in the range of 1000 to 3000rads. Application of beta radiation is probably best done in the immediate postoperative period.

Cataract formation after beta radiation is well known. Other complications after beta radiation treatment are less common like conjunctival hyperemia, scleral ulceration, symblepharon formation, ptosis, iris atrophy, corneal ulceration, bacterial corneoscleritis and panophthalmitis.

Mitomycin C

Mitomycin C (MMC) is an antibiotic–anticancer agent that inhibits DNA, RNA, and protein synthesis, and has a long-term effect on cell proliferation. MMC has been used as an adjunct to pterygium surgery, and induces prolonged localized inhibition of Tenon's fibroblasts, thus reducing pterygium recurrence.

As postoperative eyedrops, MMC has been used at concentrations between 0.005% and 0.04%, administered four times daily for 1–2 weeks. Recurrence rates with postoperative MMC drops are between 0% and 38%. Iritis, limbal avascularity, scleral melting or calcific plaque, corneal decompensation, scleral or corneal perforations, secondary glaucoma and cataract are the complications that have been reported.

Intraoperative application of MMC to the scleral bed, is an alternative modality. MMC may be used intraoperatively soaked in surgical sponges, at concentrations ranging from 0.01% to 0.04% for 3–5 minutes. Recurrence rates

reported with this application range from 3% to 43%. Intraoperative MMC application can result in early punctate keratitis, chemosis, delayed conjunctival wound healing, conjunctival granulomas, scleral thinning.

More recently, subconjunctival injection of MMC preoperatively directly into the pterygium tissue was described. This was performed 1 month before surgical excision of the pterygium, with 0.1 mL of 0.15 mg/mL MMC in balanced salt solution being injected directly into the pterygium at the limbus. The recurrence rate reported was 6% during a 2-year follow-up period.

Growth factor inhibitors.

Anti-vascular endothelial growth factor monoclonal antibodies have become widely available in ophthalmic practice mainly because of their success in suppressing various forms of intraocular neovascular growth, such as exudative age-related macular degeneration and sub-retinal neovascular membranes, proliferative diabetic retinopathy, or neovascular glaucoma.[75]

Such factors include Pegaptanib, an oligonucleotide aptamer that binds exclusively to the 165 amino acid isoform of VEGF, and recombinant monoclonal antibody Bevacizumab as well as its fragment Ranibizumab, both directed against VEGF.[75]

Bevacizumab is also associated with potential serious side effects, including significant cardiovascular toxicity. The study of VEGF expression in individual lesions may therefore allow for selective Bevacizumab or other anti-VEGF administration, potentially reducing the risk of recurrence or aggressive clinical behaviour without taking unnecessary systemic risks.[75]

MATERIALS AND METHODOLOGY

SOURCE OF DATA:

It was a hospital based study of patients who were operated for Pterygium in which 50% patients underwent pterygium excision with attachment of conjunctival autograft using autologous blood(group I) and 50% patients underwent pterygium excision with attachment of conjunctival autograft using fibrin glue(group II).

All patients were inpatients of Department of Ophthalmology at B.L.D.E.U's Shri.B.M.Patil Medical College Hospital and Research Centre, Bijapur.

STUDY DURATION: October 2013 to March 2015.

STUDY DESIGN: It was a hospital based, prospective, randomized, comparative study.

SAMPLE SIZE:

With 3% prevalence rate of pterygium[8], 95% confidence level and $\pm$5% margin of error, sample size for this study is 46, using the following statistical formula:-

$n = 4pq/ d^2$

p- prevalence,

q- 100 – p,

d- margin of error

STATISTICAL ANALYSIS:

All characteristics were summarized descriptively. For continuous variables, the summary statistics of N, arithmetic mean (referred to as mean), standard deviation about the arithmetic mean (SD) were used. For categorical data, the number and percentage were used in the data summaries.

A Chi-square (χ^2) test was employed to determine the significance of differences between groups for categorical data. If the p-value is > 0.05, then the results will be considered to be not significant and if p-value is < 0.05 then results would be considered to be statistically significant. Data were analyzed using SPSS software version 16. Descriptive statistics were used to describe the sample and scale characteristics.

INCLUSION CRITERIA:

Patients with Primary pterygium type 1, 2, and 3 were included.

EXCLUSION CRITERIA:

1. Those with predisposing conditions to corneal ulceration or poor wound healing such as immunocompromised patients, Sjogren's syndrome, atopic keratoconjuctivitis or herpetic keratitis.
2. Patients with scleritis, rheumatoidarthritis and glaucoma.
3. Recurrent Pterygium
4. Those with history of previous intraocular surgery.
5. Those with known hypersensitivity to fibrin glue.
6. Patients with Pseudopterygium.
7. Those without written informed consent.

SAMPLING

All the patients were assigned to the particular group by simple random sampling. In the conjunctival autograft with fibrin glue group , around 3-5 patients were pooled up for performing surgery on the same day as the 0.5ml Reliseal(fibrin glue) could be used in 3-4 patients. This ensures a cost effective way of use.

PREOPERATIVE EVALUATION:

Patients were admitted a day before for pterygium surgery during the study period and antibiotic eye drops was instilled 4 times a day.

Detailed history was taken regarding the duration of symptoms and treatment history. Ocular examination including visual acuity, sac syringing, intra ocular pressure, slit lamp examination, anterior segment photography and direct ophthalmoscopy was done.

At the slit lamp examination the pterygium was graded as:

Grade1: <2mm across the limbus onto the cornea

Grade2: 2-4mm onto the cornea across the limbus

Grade3: >4mm onto the cornea across the limbus

Investigations like blood and urine examination, random blood sugar, HIV, HBsAg was done. Medical fitness was taken as and when required.

SURGICAL STEPS:

Group I:

Pterygium excision with conjunctival autografting using autologous blood.

After peribulbar anaesthesia, the involved eye underwent sterile preparation and draping. Universal lid speculum applied for maximal ocular exposure. Superior rectus bridle suture was taken. Head of pterygium dissected from cornea by tenting up pterygium apex with fine forceps and performing delineating keratectomy at the leading edge with rounded sharp blade taking care to follow the surgical plane of the pterygium. Conjunctival extent of pterygium was then excised with wescott scissors. All involved conjunctiva, underlying tenons and episcleral tissue were removed upto bare sclera.

The scleral bed is allowed to bleed for 3 to 5 minutes.

In the mean time, size of scleral defect was measured with Castroviejo calipers. Globe was rotated down to expose the superior bulbar conjunctiva. Dimensions of the intended conjunctival graft was measured using Castroviejo calipers. Balanced salt solution was injected subconjunctivally to elevate the conjunctiva for dissection. Blunt wescott scissors were used to incise the conjunctiva along the posterior border of the graft. Conjunctiva was undermined with blunt dissection, care was taken not to include tenons capsule in the final graft. Lateral edges were incised and limbal conjunctiva was incised last. Care was taken not to include any tenon's capsule in the graft and buttonholing of the graft was avoided. The dissected graft was flipped over cornea and brought near the area of bare sclera formed by excision of pterygium. Proper orientation was maintained, with the epithelial side up and limbal edge towards limbus. The donor site was left to heal on its own. The eye was patched.

Group II :

Pterygium excision with conjunctival autografting using fibrin glue.

After peribulbar anaesthesia, the involved eye underwent sterile preparation and draping. Universal lid speculum applied for maximal ocular exposure. Superior rectus bridle suture was taken. Head of pterygium dissected from cornea by tenting up pterygium apex with fine forceps and performing keratectomy at the leading edge with rounded sharp blade taking care to follow the surgical plane of the pterygium. Conjunctival extent of pterygium was then excised with wescott scissors. All involved conjunctiva, underlying tenon's and scar tissue were removed upto bare sclera.

All the bleeders over the scleral bed were then cauterized. An adequately sized conjunctival autograft was measured using Castroviejo calipers and was harvested

from the superotemporal conjunctiva. Care was taken not to include any tenon's capsule in the graft and buttonholing of the graft was avoided.

Then the freshly constituted fibrin glue was applied using a double syringe system with a common plunger, over the cauterized scleral bed and the graft was placed over the excised area. Swiftly all the air bubbles were taken out beneath the graft. Gentle pressure was applied over the graft for 3 to 5 minutes. The eye was patched.

Post operatively, all the patients were instructed not to remove the eye pad till the next day and not to rub the eyes. On first postoperative day, patients were examined and started on steroid antibiotic eye drops 4 times a day for 15 days, tapered 1 drop each week for 4 weeks and lubricating eye drops 4 times a day for a month. Patients were followed at day 1, 1 week, 1 month, 3months and 6 months postoperatively.

The following details were noted at follow up:

- Visual acuity .
- Patient symptoms like pain, foreign body sensation, irritation, lacrimation were enquired.
- Haemorrhage under graft
- Graft insitu/ any retraction at edges
- Graft displacement, if any
- Details of cornea
- Anterior chamber reaction if any
- Recurrence rate (Recurrence was defined as regrowth of fibro vascular tissue at least 1 mm across the corneo scleral limbus)

GROUP I

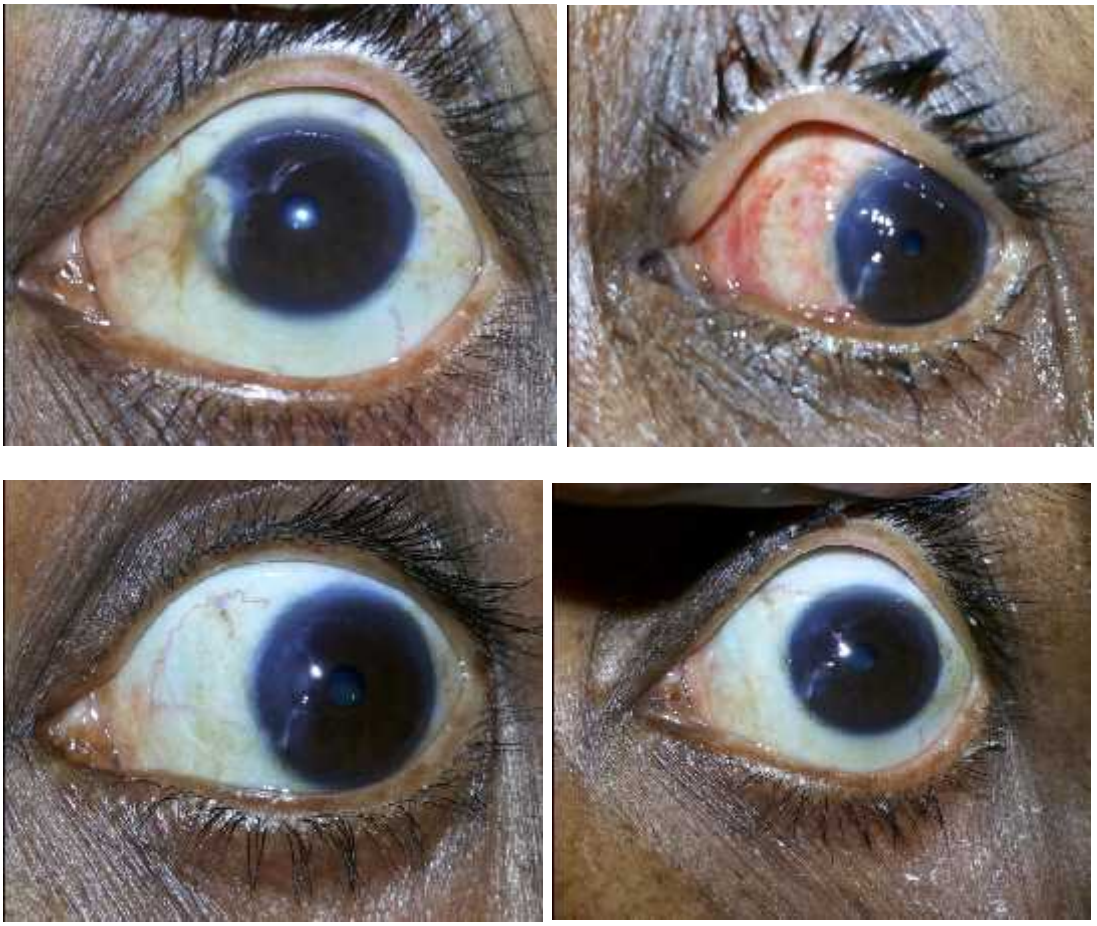


Figure no. 13: Pre operative, intra operative and post operative photograph of case no. 8 in group I

GROUP II

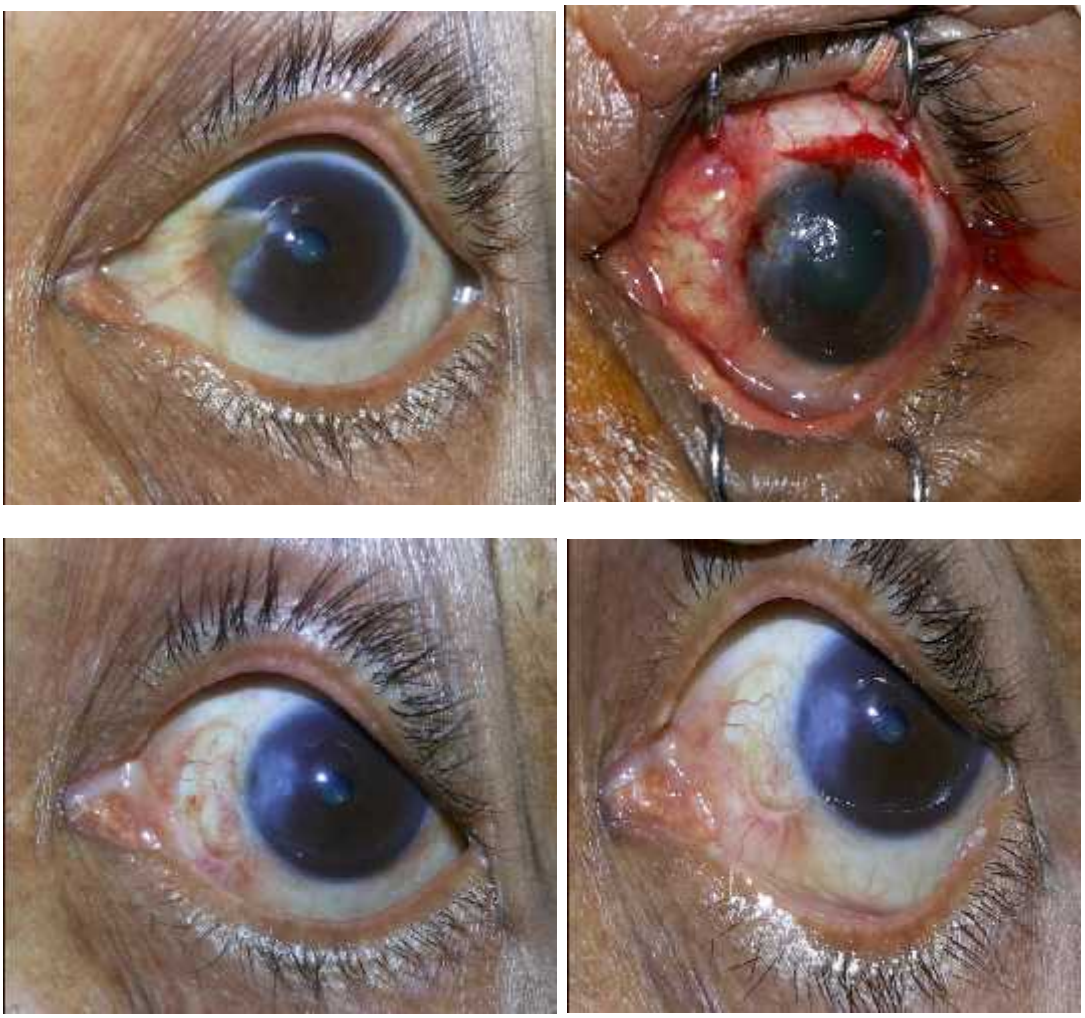


Figure no. 14: Pre operative, intra operative and post operative photograph of case no. 17 in group II

OBSERVATIONS AND RESULTS

Table no. 1: Age wise distribution of the study population:

In the present study, patients were aged between 19 -72 years, with the mean age of 44.6 years.7 (14%) patients were less than 30 years of age, 32 (64%) patients in the age group of 31-50 years. The average age and standard deviation in group A and B were 44.60±12.90 and 44.64±14.00 years respectively.

Age	Group I		Group II		Total		p value
	N	%	N	%	N	%	
<=30	4	16.0	3	12.0	7	14.0	
31-40	5	20.0	11	44.0	16	32.0	
41-55	11	44.0	5	20.0	16	32.0	0.192
>55	5	20.0	6	24.0	11	22.0	
Total	25	100.0	25	100.0	50	100.0	

Graph no. 1: Age wise distribution of the study population:

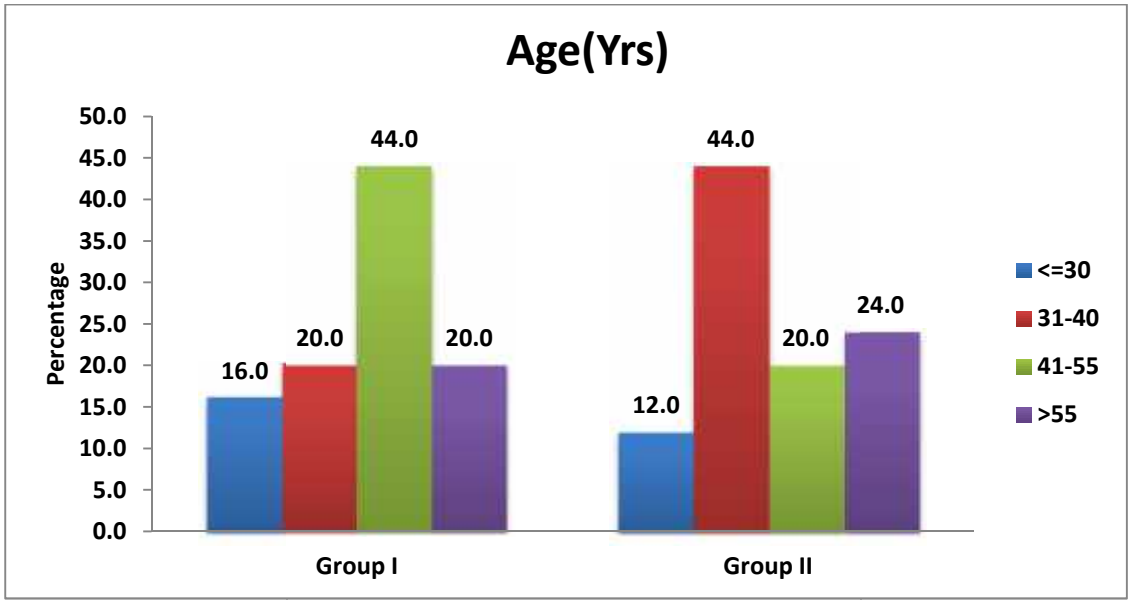


Table no. 2: **Mean and SD of Age (yrs) by study groups**

Age	N	Minimum	Maximum	Mean	SD
Group I	25	21	70	44.60	12.9
Group II	25	19	72	44.64	14.0

Table no. 3: Sex wise distribution of the study population: In the present study 44% were males and 56% were females.

Sex	N	Percent
Male	22	44
Female	28	56
Total	50	100

Graph no. 2: Sex wise distribution of the study population: In the present study 44% were males and 56% were females.

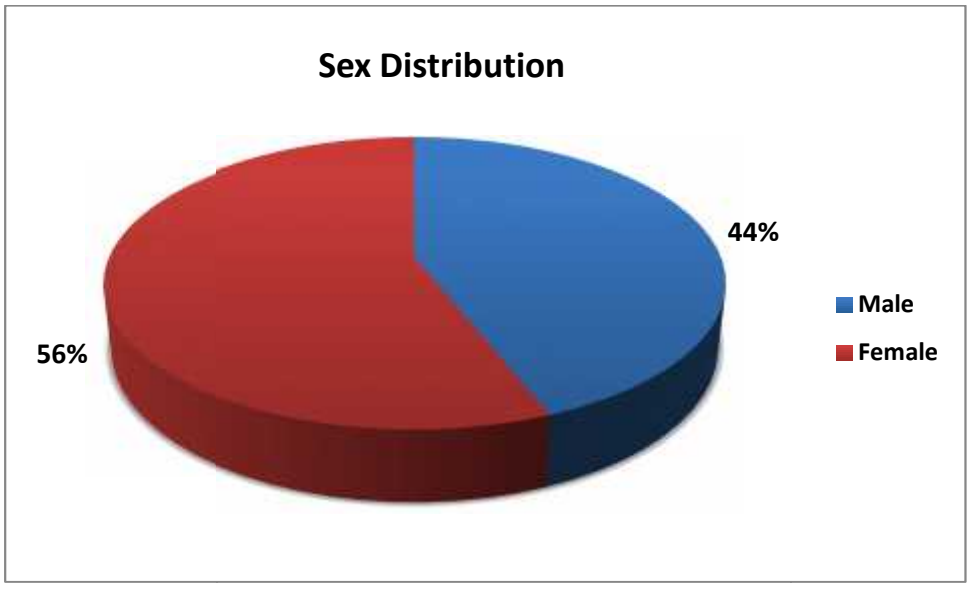


Table no. 4: Distribution of Site among total patients:

In the present study 49 (98%) patients had nasal pterygium and 1(2%) patient from the group 2 had temporal pterygium.

Site	N	Percent
Nasal	49	98
Temporal	1	2
Total	50	100

Graph no. 3: Distribution of Site among total patients:

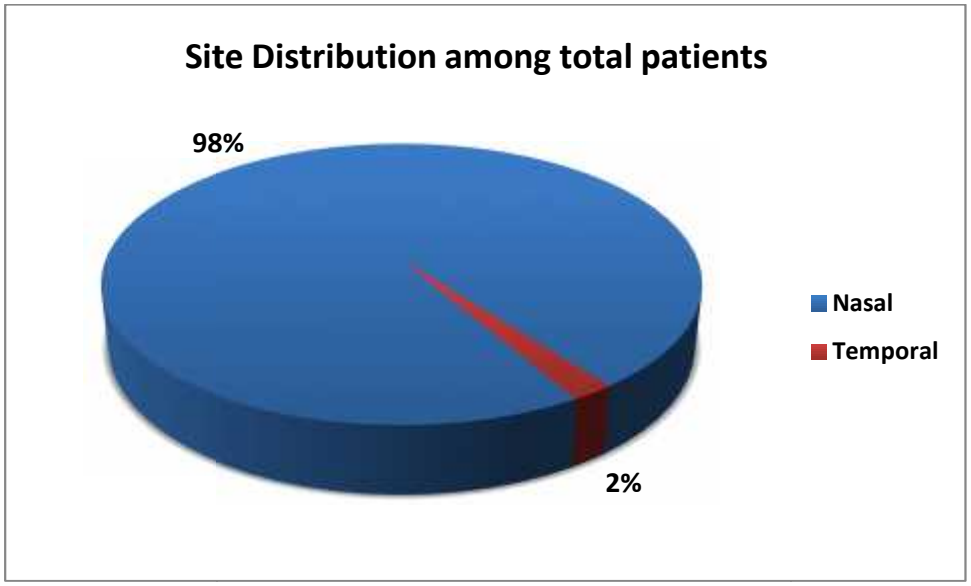


Table no 5 : Distribution of patients as per the Grade of pterygium among study groups:

Majority of patients in this study had grade 2 pterygium(60% of group I and 52% of group II).

Grade	Group I		Group II		Total		p value
	N	%	N	%	N	%	
1	5	20.0	7	28.0	12	24.0	0.788
2	15	60.0	13	52.0	28	56.0	
3	5	20.0	5	20.0	10	20.0	
Total	25	100.0	25	100.0	50	100.0	

Graph no. 4 : Distribution of patients as per the Grade of pterygium among study groups:

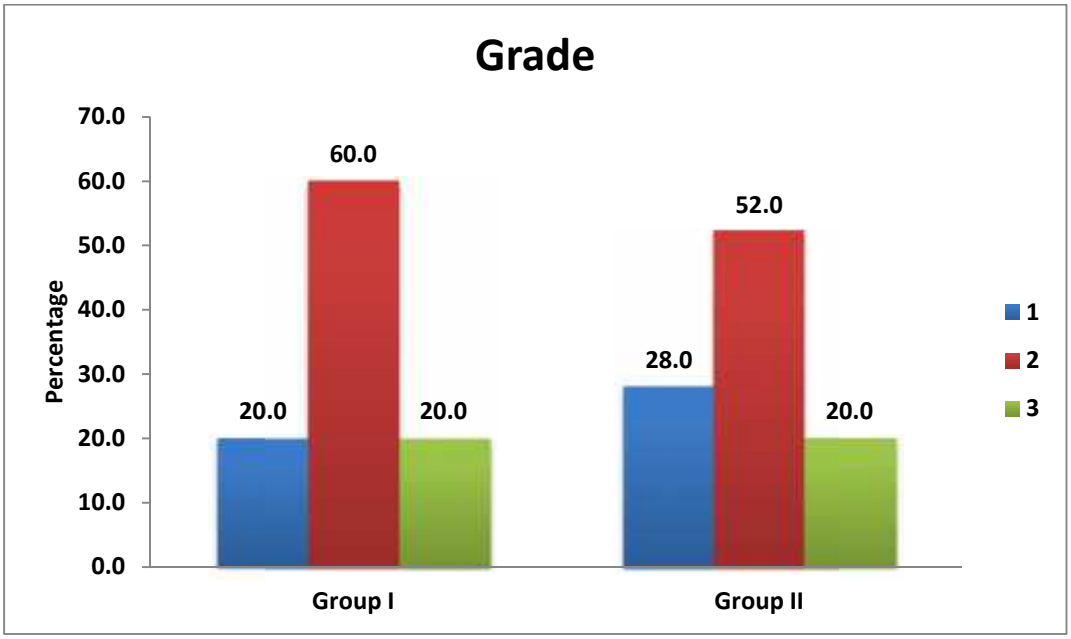


Table no. 6: Distribution of patients as per the nature of work

In this study, 60% were outdoor workers and 40% were indoor workers. Incidence of pterygium was higher in outdoor workers

Occupation	Group I					Group II				
	Male		Female		Total	Male		Female		Total
	N	%	N	%	N	N	%	N	%	N
indoor	0	0.0	10	100.0	10	1	10.0	9	90.0	10
outdoor	10	66.7	5	33.3	15	11	73.3	4	26.7	15
Total	10	40.0	15	60.0	25	12	48.0	13	52.0	25

Graph no. 5: Distribution of patients as per the nature of work

I

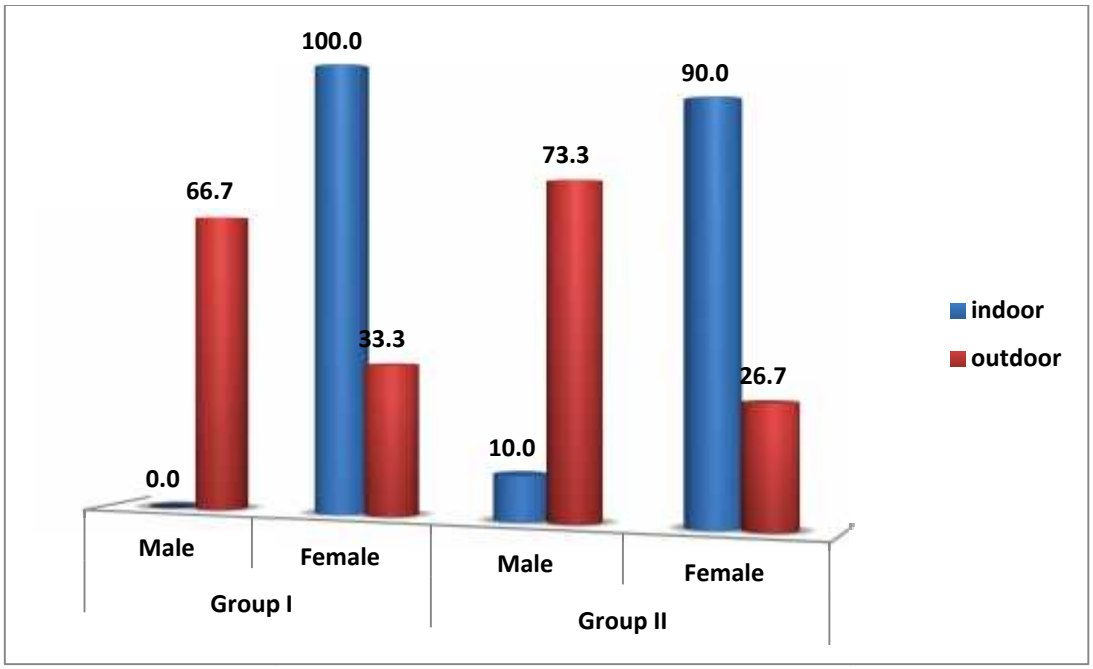


Table no.7: Distribution of patients as per the Symptoms among study groups:

In the present study majority of the patients needed surgery because of foreign body sensation. 24% patients underwent surgery for cosmetic reasons.

Symptoms	Group I		Group II		Total		p value
	N	%	N	%	N	%	
burning+ FB	4	16.0	5	20.0	9	18.0	0.968
Cosmetic	7	28.0	5	20.0	12	24.0	
FB	3	12.0	3	12.0	6	12.0	
redness+ FB	7	28.0	7	28.0	14	28.0	
watering+ FB	4	16.0	5	20.0	9	18.0	
Total	25	100.0	25	100.0	50	100.0	

Graph no. 6: Distribution of patients as per the Symptoms among study groups:

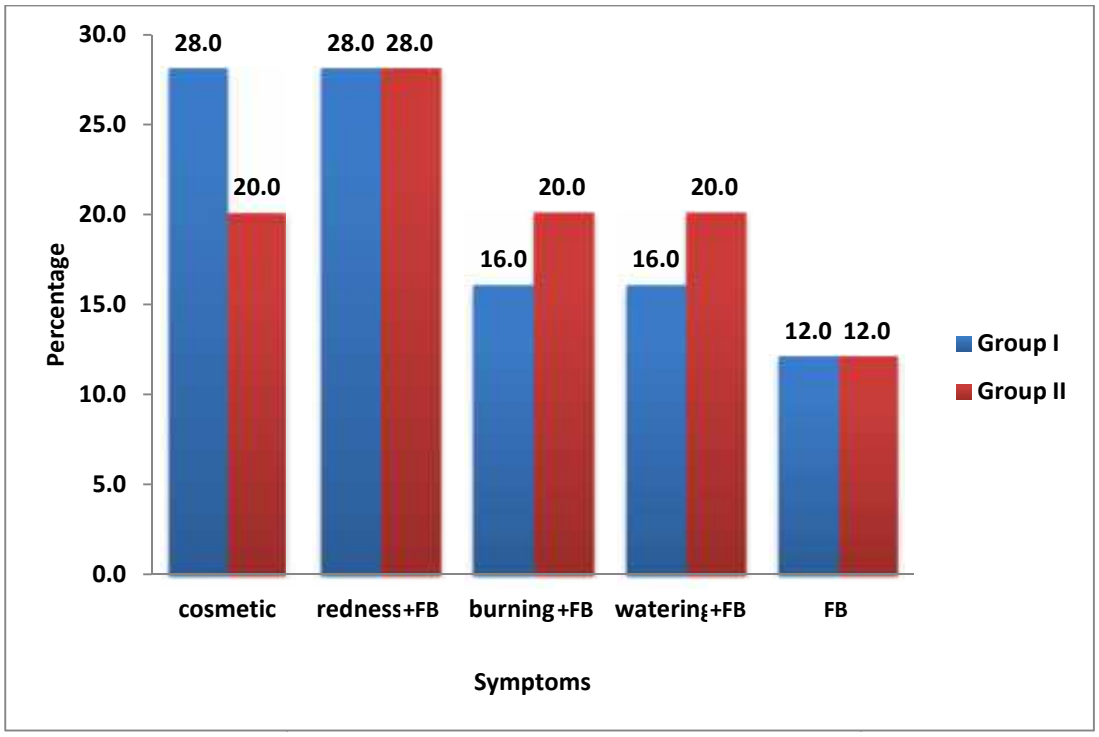


Table no. 8: Distribution of patients as per signs & complications at post operative day 1:

All the patients in the study groups had some amount of pain and congestion on day 1. Retraction of the graft was seen in 1 patient of group I and 3 patients of group II. Sub conjunctival hemorrhage was commonly seen in group II.

Day 1	Group I		Group II		Total		p value
	N	%	N	%	N	%	
pain+FB +cong	2	8.0	8	32.0	10	20.0	0.000
pain+FB +cong+sch	0	0.0	4	16.0	4	8.0	
pain+FB +cong+sch+retraction	0	0.0	1	4.0	1	2.0	
pain+FB +sch+oedema	0	0.0	4	16.0	4	8.0	
pain+FB+W+ retraction+cong	0	0.0	2	8.0	2	4.0	
pain+FB+W+cong	13	52.0	0	0.0	13	26.0	
pain+FB+W+cong+ retraction	1	4.0	0	0.0	1	2.0	
pain+FB+W+cong+oedema	6	24.0	0	0.0	6	12.0	
pain+FB+cong+ oedema	1	4.0	6	24.0	7	14.0	
pain+cong	2	8.0	0	0.0	2	4.0	
Total	25	100.0	25	100.0	50	100.0	

Graph no. 7: Distribution of patients as per signs & complications at post operative day 1:

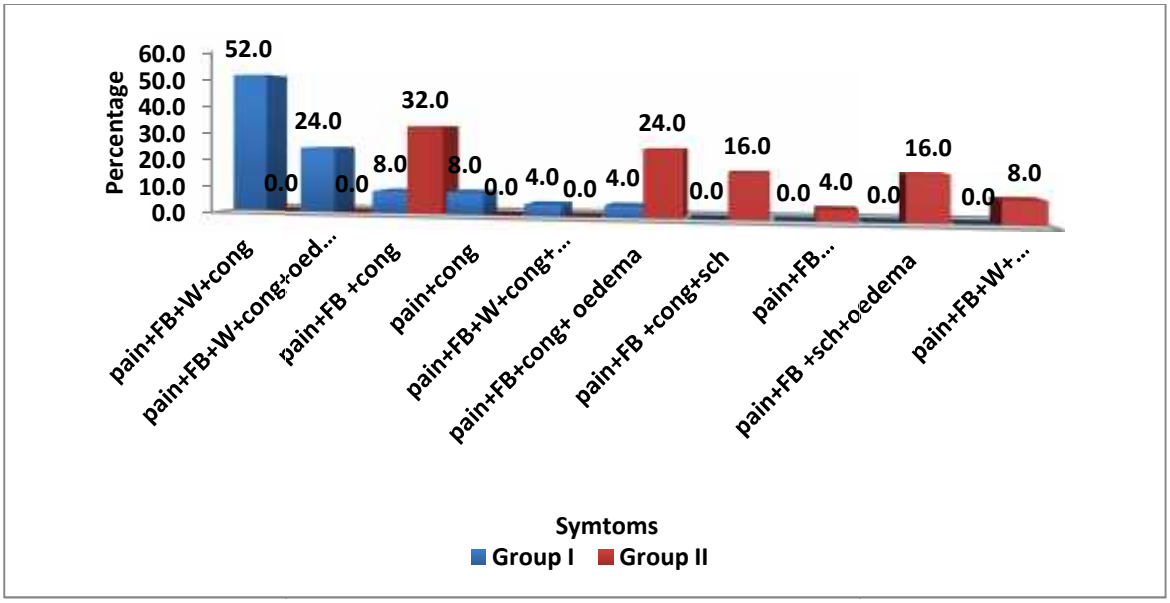


Table no.9: Distribution of patients as per the signs & complications at first week follow up

At the first week follow up foreign body sensation and congestion was commonly seen in group I. In group II foreign body sensation and subconjunctival haemorrhage was common. Retraction of the graft was seen in 1 patient of group I and 3 patients of group II.

1 week	Group I		Group II		Total		p value
	N	%	N	%	N	%	
FB+W+cong	5	20.0	0	0.0	5	10.0	0.000
FB+W+cong+oedema	1	4.0	0	0.0	1	2.0	
FB+cong	12	48.0	0	0.0	12	24.0	
FB+cong+ retraction	1	4.0	0	0.0	1	2.0	
FB+cong+W	1	4.0	0	0.0	1	2.0	
FB+oedema	0	0.0	3	12.0	3	6.0	
FB+retraction	0	0.0	2	8.0	2	4.0	
Cong	5	20.0	3	12.0	8	16.0	
cong+sch	0	0.0	3	12.0	3	6.0	
cong+sch+ retraction	0	0.0	1	4.0	1	2.0	
graft healthy	0	0.0	8	32.0	8	16.0	
pain+FB +sch+oedema	0	0.0	1	4.0	1	2.0	
Sch	0	0.0	1	4.0	1	2.0	
sch+oedema	0	0.0	3	12.0	3	6.0	
Total	25	100.0	25	100.0	50	100.0	

Graph no.8: Distribution of patients as per the signs & complications at first week follow up

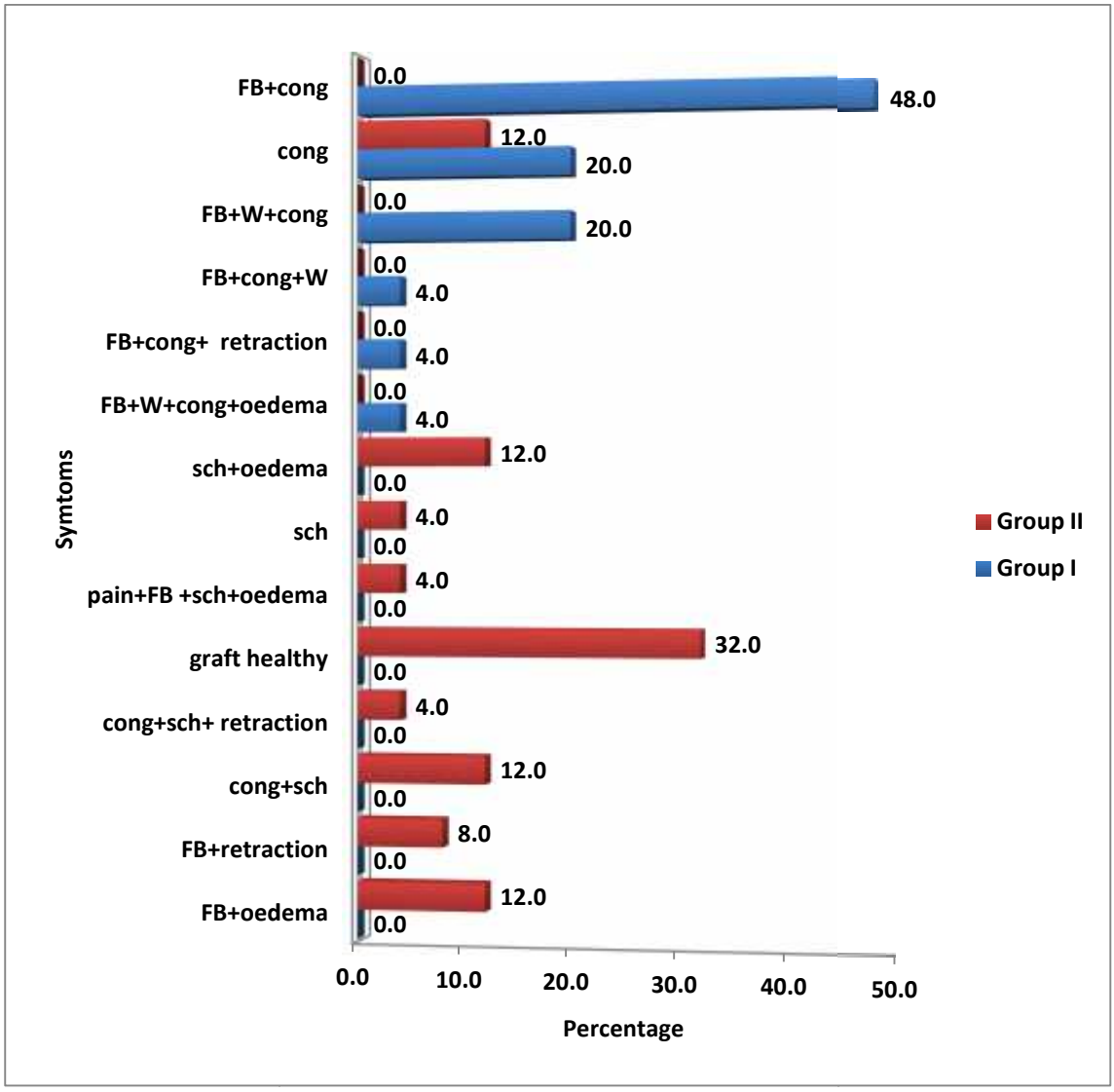


Table no.10: Distribution of patients as per the signs & complications at 1 month follow up:

Most of the previously seen signs had resolved in both the groups. Mild retraction was seen in 3 patients of group II.

1 month	Group I		Group II		Total		p value
	N	%	N	%	N	%	
graft healthy	23	92.0	22	88.0	45	90.0	0.413
graft healthy+ growth excised	1	4.0	0	0.0	1	2.0	
graft healthy+ growth resolved	1	4.0	0	0.0	1	2.0	
retraction	0	0.0	2	8.0	2	4.0	
retration+ cong resolved	0	0.0	1	4.0	1	2.0	
Total	25	100.0	25	100.0	50	100.0	

Graph no. 9: Distribution of patients as per the signs & complications at 1 month follow up:

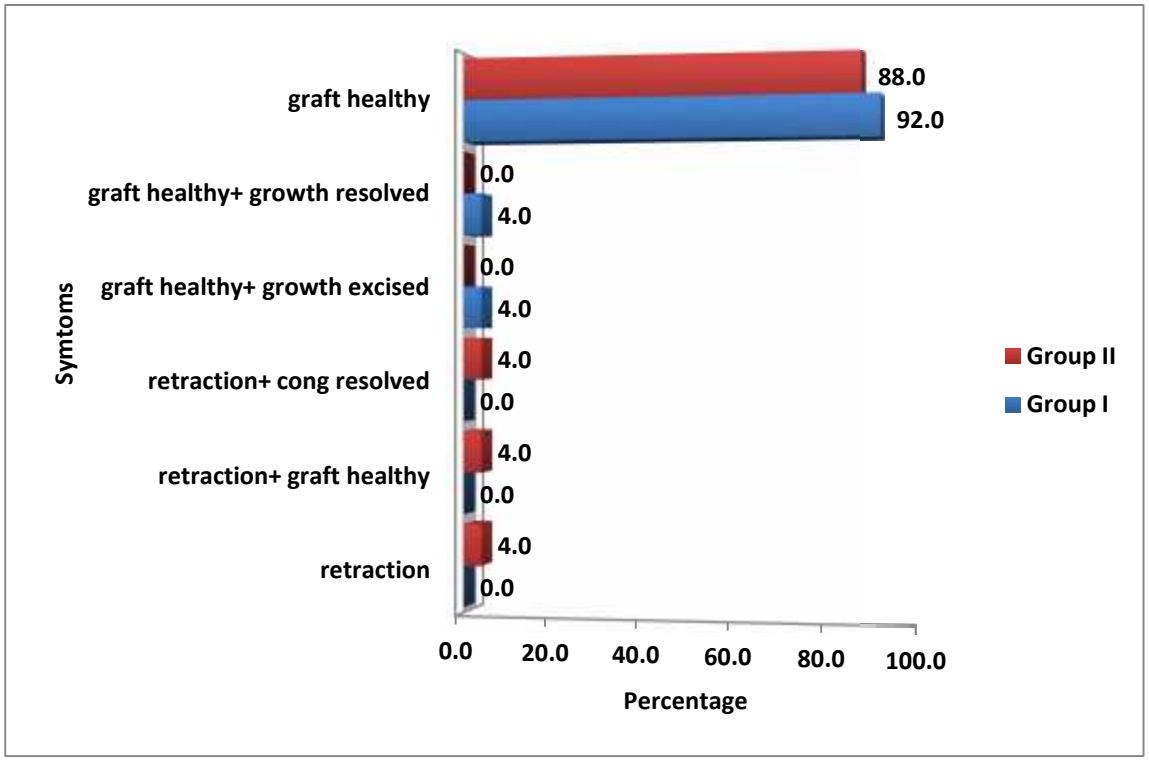


Table no. 11 : Distribution of patients as per the complications at 3 months follow up.

All the grafts in both the groups had healthy grafts and there was no sign of recurrence in any patient from either groups.

3 month	Group I		Group II		Total	
	N	%	N	%	N	%
graft healthy	25	100.0	25	100.0	50	100.0
Total	25	100.0	25	100.0	50	100.0

Graph no. 10 : Distribution of patients as per the complications at 3 months follow up.

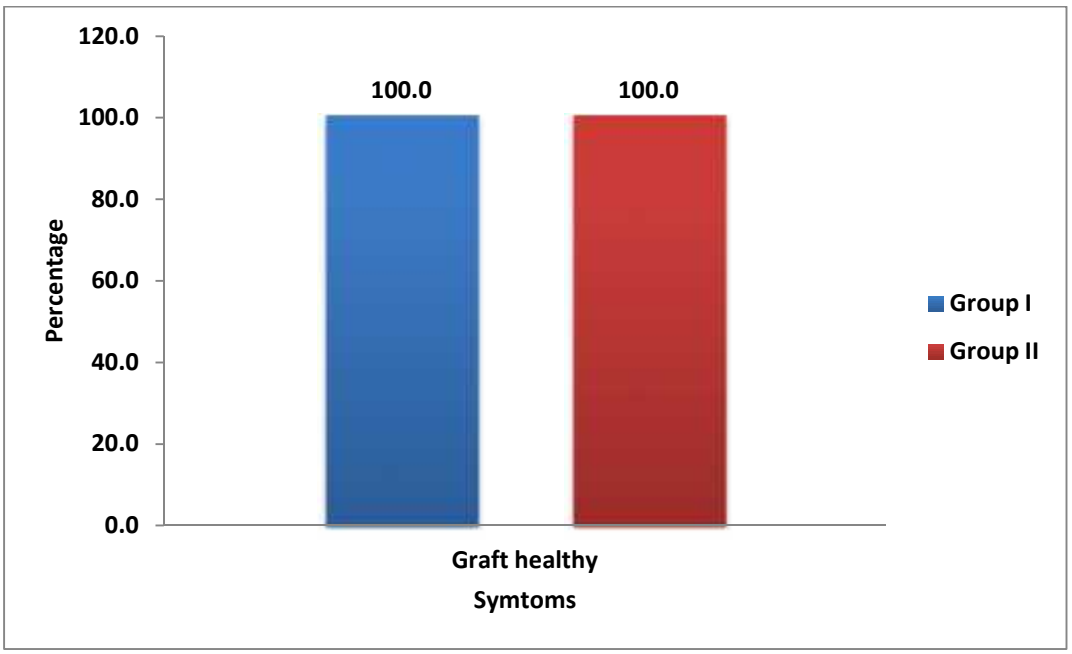


Table no. 12 Comparison of pre and post-operative visual acuity in group I

Out of the 25 patients, majority of the patients had one line improvement of visual acuity in Snellen's chart. Few of them had 2 lines improvement.

Preop V/A	Postop V/A	Group I	
		N	%
6/60	6/36	2	8.0
6/36	6/24	1	4.0
6/24	6/18	2	8.0
6/18	6/9	1	4.0
6/12	6/9	2	8.0
6/9	6/6	5	20.0
6/9	6/6p	2	8.0
6/9	6/9	3	12.0
6/6p	6/6	1	4.0
6/6	6/6	6	24.0

Graph no. 11 Comparison of pre and post-operative visual acuity in group I

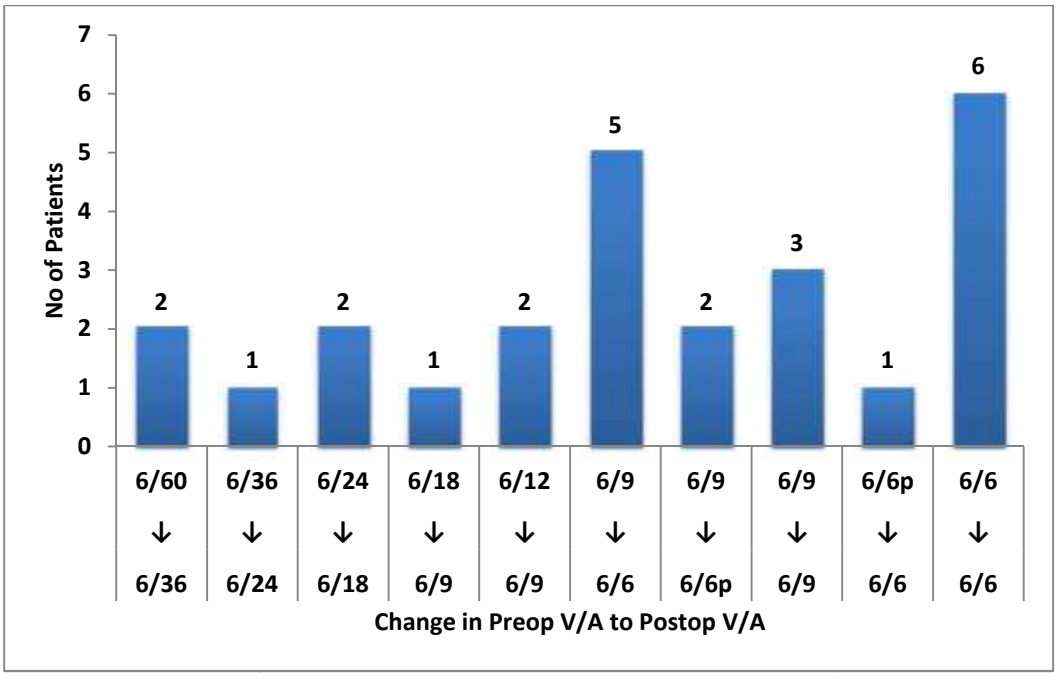


Table no. 13: Comparison of pre and post-operative visual acuity in group II

Out of the 25 patients, majority of the patients had one line improvement of visual acuity in Snellen's chart. Few of them had 2 lines improvement.

Preop V/A	Postop V/A	Group II	
		N	%
6/60	6/36	1	4.0
6/36	6/24	1	4.0
6/24	6/18	3	12.0
6/24	6/9	1	4.0
6/18	6/9	3	12.0
6/12	6/6	1	4.0
6/12	6/9	3	12.0
6/9	6/6	2	8.0
6/9	6/6p	1	4.0
6/9	6/9	3	12.0
6/6	6/6	6	24.0

Graph no. 12: Comparison of pre and post-operative visual acuity in group II

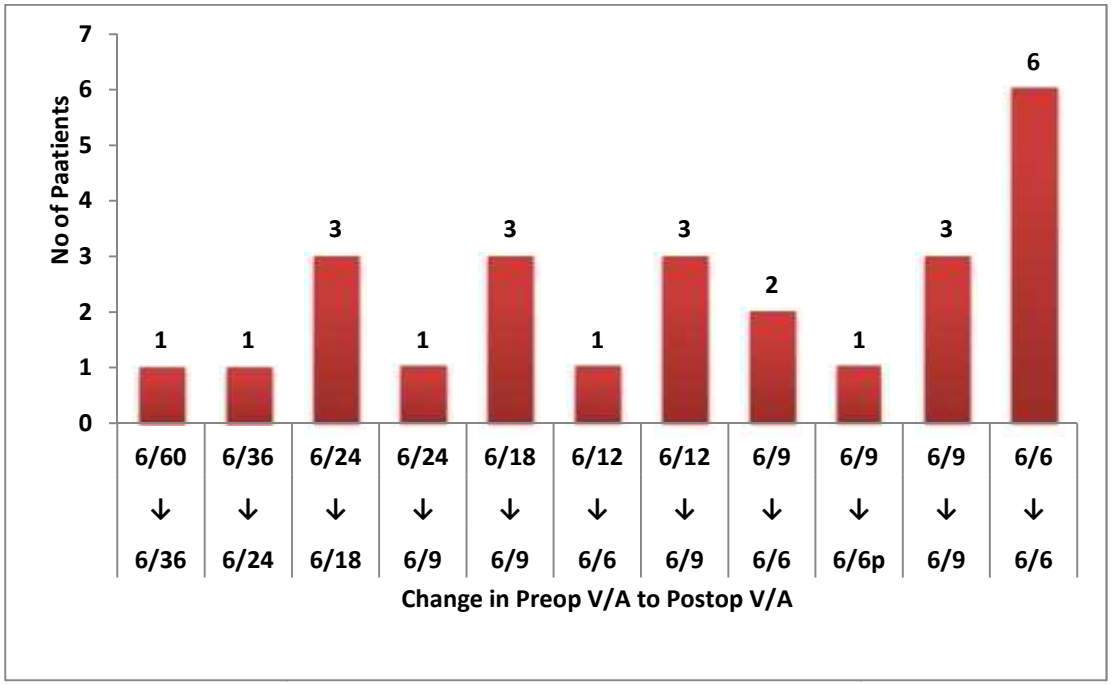
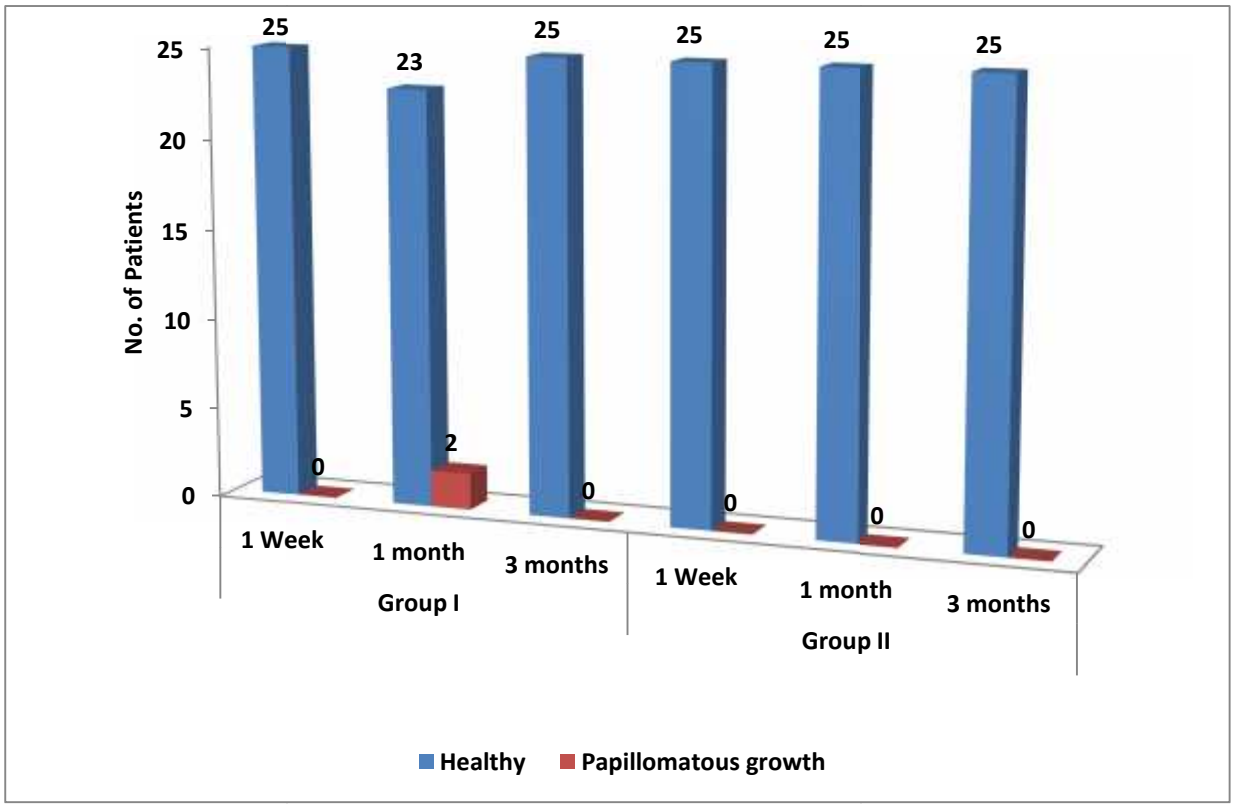


Table no. 14: Distribution of patients as per the state of the host site at follow up visits in both groups.

2 patients from group I showed papillomatous growth at the donor site, 15 days after surgery. The growth subsided in 1 patient with topical use of steroid and antibiotic eye drops. In the other patient the growth was excised under topical anaesthesia 2 months after surgery.

Graft Host site	Group I			Group II		
	1 Week	1 month	3 months	1 Week	1 month	3 months
Healthy	25	23	25	25	25	25
Papillomatous growth	0	2	0	0	0	0
Total	25	25	25	25	25	25

Graph no. 13: Distribution of patients as per the state of the host site at follow up visits in both groups.



GROUP I

CASE NO. 17

Figure no. 15: Pre operative

Figure no. 16: Post op day 1

Figure no. 17: 3 months follow up

CASE NO. 21

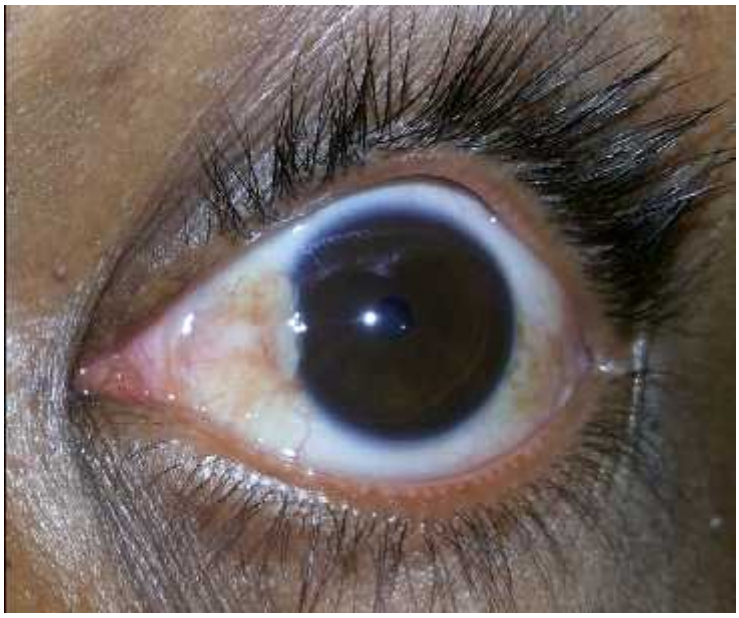


Figure no. 18: Pre operative

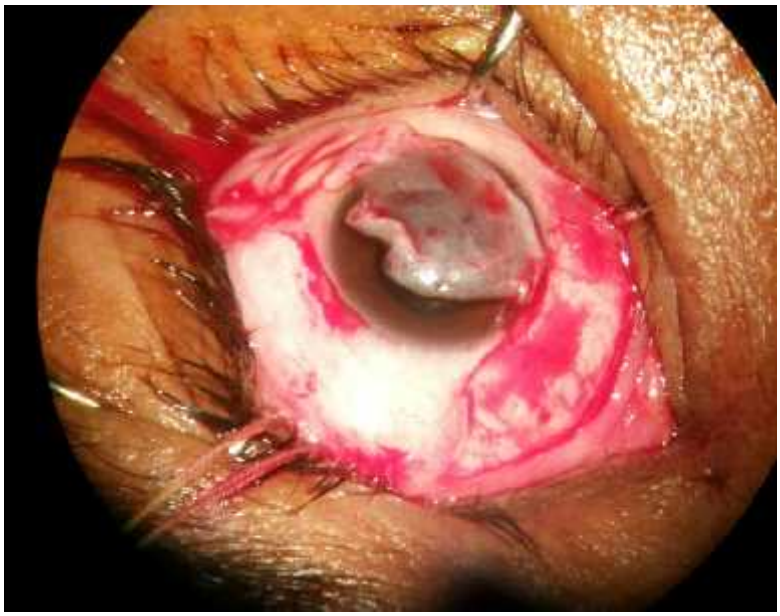


Figure no. 19: Harvested graft

Figure no. 20: Intra operative

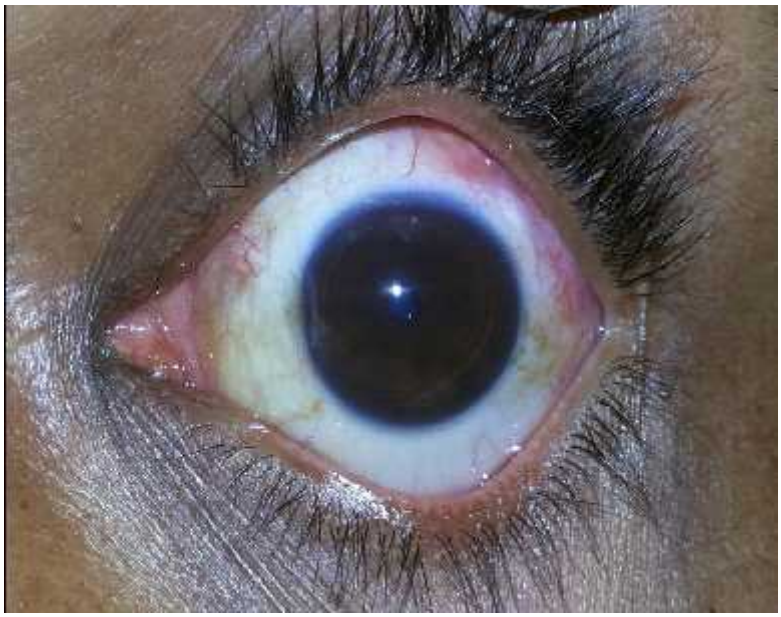


Figure no. 21: 3 Months follow up

Figure no. 22: Papillomatous growth at donor site

GROUP II

CASE NO. 1

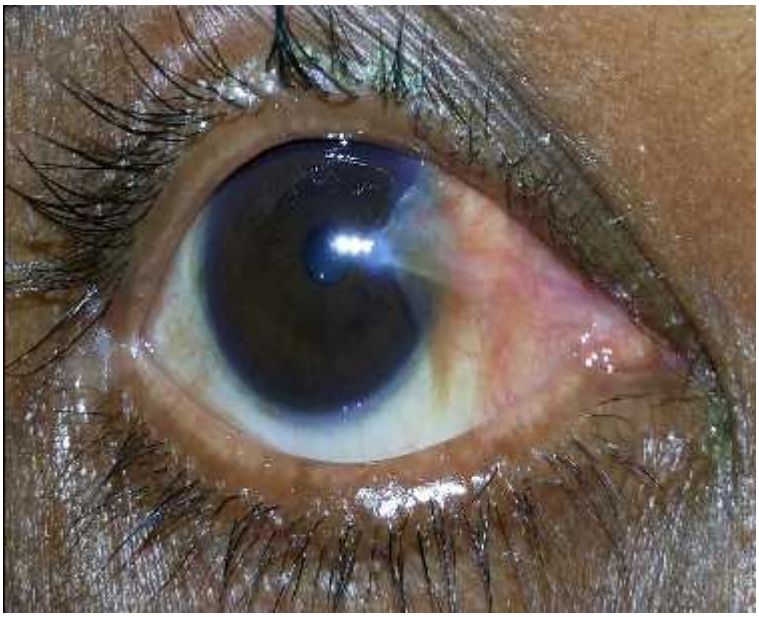


Figure no. 23: Pre operative

Figure no. 24: Day 1 follow up

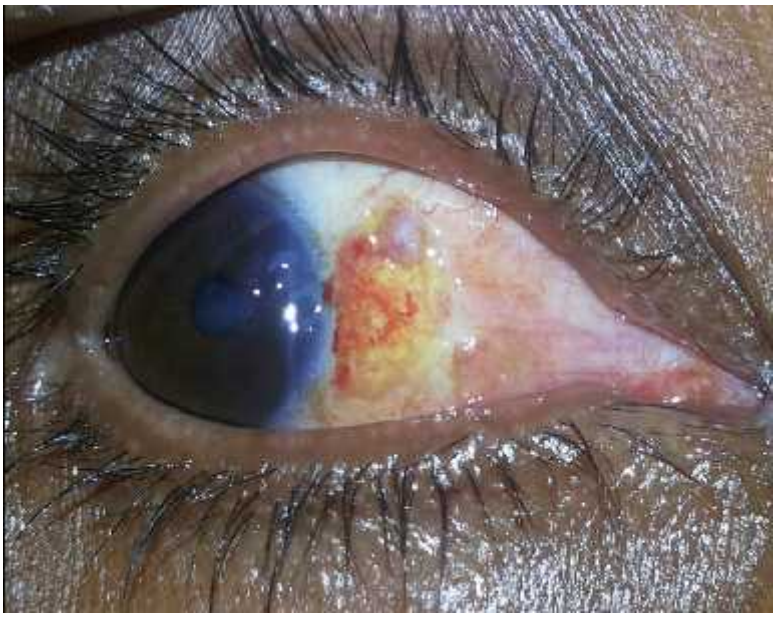


Figure no. 25: 1 week follow up

Figure no. 26: 4 months follow up

CASE NO. 25

Figure no. 27: Pre operative

Figure no. 28: Day 1 follow up

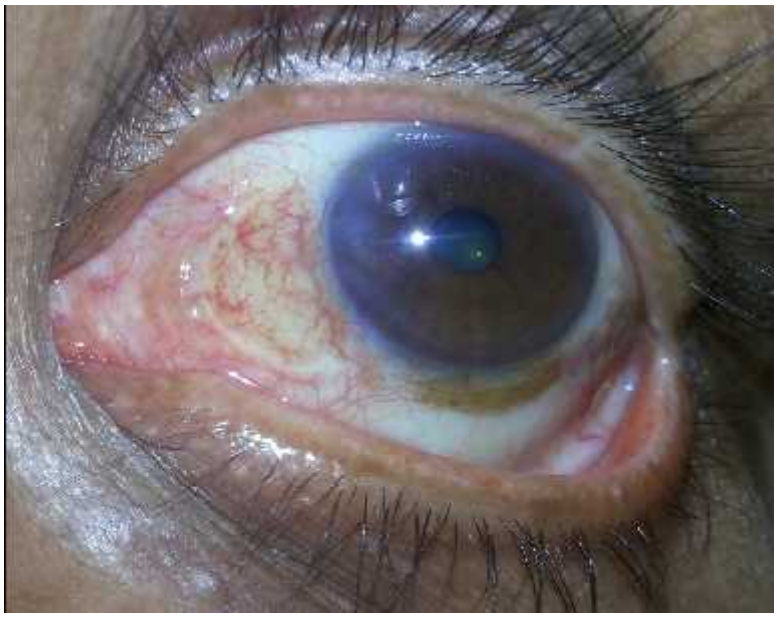


Figure no. 29: 15 days follow up

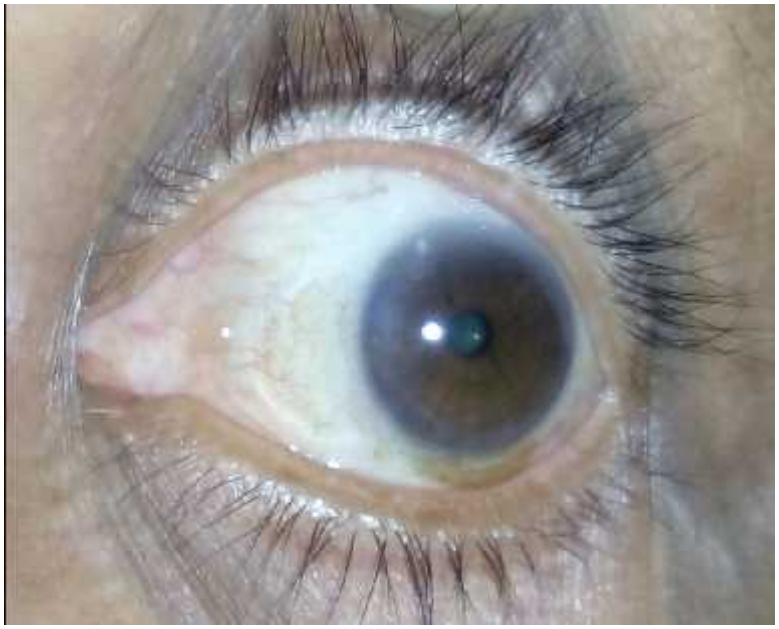


Figure no. 30: 3 months follow up

DISCUSSION

Pterygium commonly affects the population in tropical and subtropical areas such as that of India. According to The Chennai glaucoma study prevalence of pterygium in South India is 9.5% and according to PGMIE, Chandigarh, study prevalence in India is on average 5.2% (0.75 to 10.42%).

This was a prospective, comparative study conducted at Shri B.M.Patil medical college Vijaypur . The study compared the outcome of conjunctival autograft surgery for pterygium using fibrin glue and sutureless glue free(autologous blood). During this period 50 patients with primary pterygium who conferred to inclusion and exclusion criteria underwent surgery and were followed up during day 1, 1 week, 2 weeks, 1 month and 3 months after surgery.

In our study, all patients had primary pterygium. Conjunctivalautograft were secured using fibrin glue in 25 patients and using autologous blood in 25 patients.

Age:

Patients younger than 15 years rarely develop pterygium. Although prevalence of pterygium increases with age, highest incidence occurs between 20 and 49 years (HilghersJHCh)[67]. In this study patients age ranged between 19 to 72 years. In group I (autologous blood), overall age was 21 to 70years with mean age of 44.60 yrs (SD 12.9yrs). In group II (fibrin glue), overall age was 19 to 72years with mean age of 44.64 yrs (SD 14.00yrs). There was no statistically significant difference in terms of age distribution between the 2 groups.

Gender:

Hilgers[21] have demonstrated a higher prevalence of pterygium among males. Sharma[91] et al found female preponderance in their study. In this study 44% were males 56 % were females. In group I (autologous blood) 40 % were males 60% were

females. In group II (fibrin glue) 48% were males 52% were females. There was no statistically significant difference in terms of gender distribution between the 2 groups.

0ccupation:

The incidence of pterygium is higher in patients in outdoor activities. H.Taylor et al, Mc Reynolds et al, and Moran et al have shown strong association between outdoor work related environmental factors like exposure to UV radiation, heat, dust and incidence of pterygium.[3,4] this is well co related in our study which has 60% of outdoor workers. Remaining 40% patients doing indoor activities also showed pterygium, probably indicating multiple etiopathogenetic factors like genetic predisposition/ heredity playing role in the formation of pterygium.

Site of pterygium:

In the present study, 98% of the cases had pterygium on the nasal side and 2% cases had it on the temporal side. Higher evidence of pterygium on nasal side was attributed due to flow of tears towards medial canthus carrying with it sand and dust particles. Possibility of less exposure of conjunctiva due to greater amount of bowing of outer 2/3rd of the upper lid could explain presentation of the pterygium more commonly on nasal side. Srinivas K Rao[92] in a study on 51 patients, found that pterygium was nasal in 46 (86.8%) eyes, temporal in 4 (7.5%) eyes and both nasal and temporal in 3 (5.7%) eyes.

Grade of pterygium:

In this study it was observed that 24% belonged to grade I, 56% to grade II and 20% to grade III. In a study done by Sharma et al[91], 76% patients had grade II pterygium. Patients usually present with grade II and grade III pterygium as it leads to cosmetic blemish and visual disturbance.

Presenting Symptoms:

Majority of the patients in this study had a complaint about growth on the inner side of the eye and they complained about foreign body sensation, redness and watering. Cosmetic disfigurement was the next major issue of concern among the patients in this study. Some patients had either as a single complaint each or associated with the growth. No patients came with diplopia. These findings correlates well with the views of majority of authors, that pterygium does not produce many symptoms especially in the early stage and majority of the patients are either worried about the growth and consulted the doctor for cosmetic reason, but later on when it encroaches the pupillary area, it produces marked diminution of vision. Generally pterygium excision is indicated if the visual axis is threatened or if the pterygium causes extreme irritation.[41] Diminution of vision in early stages can be attributed to astigmatism produced by stretch exerted over the cornea and in the later stages due to covering of pupillary area and corneal opacity at the head of pterygium. Pull of the pterygium over cornea causes flattening of the corneal curvature in the horizontal meridian, demonstrated by Ponico E. Carreras and Bedrossian, Robert M[93] also reported that marked changes in refractive status and corneal curvature may be produced by a pterygium before it enters the optical zone of cornea.

Post operative signs and complications:

On post operative day, all the patients had complaint of pain and congestion was noted. Pain did not increase in any patient and all had a progressive decrease in intensity of pain over next 2 or 3 days. In group I, pain, foreign body sensation, watering was noted in majority of patients and retraction was noted in 1 patient. Graft oedema was seen in 28% of patients. In group II along with foreign body sensation,

watering and pain, graft oedema was noted in 34% of patients. Graft retraction was noted in 3 patients. Sub conjunctival haemorrhage was seen in 9(18%) patients.

At the 1st week follow up, pain had subsided in all the patients. Majority of patients had complaints of mild foreign body sensation and watering at the end of first week. Apart from these minor discomforts majority of patients were comfortable. In group I, graft oedema subsided in all the patients except 1 patient but retraction still persisted in all the patients who had retraction on day 1 after surgery. In group II 4 patients had persistent graft oedema and all the 9 patients had subconjunctival haemorrhage. Uy[95] et al reported subconjunctival hemorrhage under the graft in 1 patient in fibrin glue group, resolving in 3 weeks. Retraction was persistent in 3 patients of group II. Malik[13] et al noticed 7.5% retraction in their study which disappeared once the chemosis subsided.

2 patients from group I(autologous blood) showed papillomatous growth at the donor site, 15 days after surgery. The growth subsided in 1 patient with topical use of steroid and antibiotic eye drops. In the other patient the growth was excised under topical anaesthesia 2 months after surgery.

At 1 month follow up, all 25 patients of group I had healthy grafts. In group II 22 grafts were healthy and 3 patients had persisting retraction on the nasal side. Graft oedema and subconjunctival haemorrhage and congestion had subsided in all the patients.

At the end of 3 months all the grafts on both the groups were healthy and there were no signs of recurrence in any of the patients. Koranyi[84] et al reports 5.3% and 13.5 % recurrence respectively in glue and suture group. Jiang[90] et al have seen twice recurrence rates with sutures (10%) as compared to glue (5%) at 1 year follow up. Farid[94] et al found the recurrence rate even much less in fibrin glue group to be 3.7%

compared with 20% in suture group and found average time of recurrence to be around 3 months. Singh[47] et al have seen the rate of recurrence was equal in grafts with glue (10%) and grafting with no glue no suture is (10%). Malik[13] et al reported recurrence in no glue no suture is 2.5%. Srinivas[92] et al described recurrence of 3.8% at 9 months following surgery, after a conjunctival limbal autograft.

Although generally considered safe, fibrin glues are currently manufactured from human plasma and therefore carry the theoretical risk of transmissible disease.[96] Virus removal and inactivation procedures are included in the manufacturing process although may be of limited value against nonenveloped viruses such as hepatitis A virus and parvovirus B19.[97]

Fibrinogen compounds may also be susceptible to inactivation by iodine preparations such as those used for conjunctival disinfection before pterygium surgery.[48] The apposition of the lids to the bulbar conjunctiva provides a natural biological dressing and confers a unique wound-healing environment. Apart from a physical barrier, the lids provide compression, a smooth frictionless surface, and a vascular bed with immune capability in close proximity to the injured site.

Sutureless glue free limbal conjunctival autografting following pterygium excision may prevent potential adverse reactions encountered by foreign materials like suture and fibrin glue, proved to be equally effective in preventing recurrence, safe, highly economical and better alternative for graft fixation in conjunctival autografting after excision of primary pterygium in developing countries.

CONCLUSION

In our study, all 50 patients had primary pterygium. Conjunctival autograft were secured using autologous blood in 25 patients and using fibrin glue in 25 patients.

Both the surgical methods used to attach the conjunctival autograft after pterygium excision are effective in management of pterygium, since there was no recurrence in either groups at the end of the study.

Fibrin glue is a foreign material associated with certain complications like allergy, theoretical risk of transmission of viral and prion diseases.

Though in our study, we did not encounter any of these complications, they can entirely be avoided by the use of autologous blood, which is free from any foreign material but is efficacious in fulfilling the purpose of attachment of the conjunctival autograft without any additional expenses.

Use of autologous blood in attaching the conjunctival graft is a safe, effective and economical alternative for the management of primary pterygium.

SUMMARY

This study is a prospective randomized controlled hospital based study to compare the effectiveness of autologous blood and fibrin glue in attaching the conjunctival autograft following pterygium excision in management of primary pterygium.

- Fifty eyes were randomized into 2 groups (25 in each group) after a detailed ocular examination.
- All the patients were randomly assigned into the two groups, since we had to pool 3-4 patients in group II for cost effectiveness.
- All cases of primary progressive pterygium were included in the study.
- Mean age in Group I was 44.60 years and 44.64 years in Group II.
- In this study we observed that 24% belonged to grade I, 56% to grade II and 20% to grade III.
- Maximum incidence of pterygium was seen in the age group of 31– 50 years. Majority of them were females (56%).
- Majority of the patients in this study had complaint about growth on the inner side of the eye and they complained about foreign body sensation, redness and watering. Cosmetic disfigurement was the next major issue of concern among the patients in this study.
- In this study, 60% were outdoor workers and 40% were indoor workers. Incidence of pterygium was higher in outdoor workers.
- Among 50 eyes, 49(98%) had nasal pterygium and only 1(2%) had temporal pterygium.
- In majority of patients there was improvement in the visual acuity. Most of them had one snellen line improvement and few had two lines improvement.

- In this study we did not encounter any serious intra operative or post operative complications. At the first week follow up, graft oedema, subconjunctival haemorrhage and retraction were seen in 4%, 0% and 4% respectively in patients of group I which resolved in the subsequent visits. In group II, graft oedema, subconjunctival haemorrhage and retraction were seen in 16%, 36% and 12% respectively. These subsequently resolved in following visits.
- In this study 2 patients of group I had papillomatous growth at the donor site at around 2 weeks following sugery, of which one resolved with topical steroid and antibiotic drops but other had to be excised.
- At Subsequent follow up, no recurrence was seen in any of the groups.
- Serious complications such as pyogenic granuloma, symblepharon formation, scleral melt or scleral avascularity were not encountered in any of the patients eye throughout the follow up period in both the groups.
- After a minimum followup period of 3 months, both the procedures seemed to be relatively free from complications.

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ANNEXURES

ETHICAL CLEARANCE CERTIFICATE

OUTWARD
No. 5213
Date. 14-11-13

B.L.D.E. UNIVERSITY'S
SHRI.B.M.PATIL MEDICAL COLLEGE, BIJAPUR-586 103
INSTITUTIONAL ETHICAL COMMITTEE

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Ethical Committee of this college met on 13-11-2013 at 3-30pm to scrutinize the Synopsis of Postgraduate Students of this college from Ethical Clearance point of view. After scrutiny the following original/corrected & revised version synopsis of the Thesis has been accorded Ethical Clearance.

Title "Comparative study of conjunctival auto-graft using autologous blood with fibrin glue in treatment of pterygium"

Name of P.G. student Dr. Harsha Nadgir.
Department of Ophthalmology

Name of Guide/Co-investigator Dr Sunil. G. Biradar.
Professor of ophthalmology.

DR.TEJASWINI. VALLABHA
CHAIRMAN
INSTITUTIONAL ETHICAL COMMITTEE
BLDEU'S, SHRI.B.M.PATIL
MEDICAL COLLEGE, BIJAPUR.

Following documents were placed before E.C. for Scrutinization
1) Copy of Synopsis/Research project.
2) Copy of informed consent form
3) Any other relevant documents.

RESEARCH SAMPLE INFORMED CONSENT

Consent will be taken from each patient before procedure.

TITLE OF PROJECT: **COMPARATIVE STUDY OF CONJUNCTIVAL AUTOGRAFT USING AUTOLOGOUS BLOOD WITH FIBRIN GLUE IN TREATMENT OF PTERYGIUM.**

GUIDE : **Dr. SUNIL G.BIRADAR**

P.G. STUDENT : **Dr. HARSHA NADGIR**

PURPOSE OF RESEARCH:

I have been explained about the reason for doing this study and selecting patients as subjects of the study. This study is for better understanding of the effectiveness and safety of the two procedures in Pterygium which will help in future for better selection of the procedure for Pterygium surgery.

PROCEDURE:

I understand that I will undergo Pterygium surgery by random selection.

RISKS AND DISCOMFORTS:

I clearly understand the risk involved in the procedure.

BENEFITS:

I understand that my participation in this study will help in selection of safe and effective procedure for Pterygium surgery.

CONFIDENTIALITY:

I understand that the medical information produced by the study will become a part of institutional record and will be subjected to confidentiality and privacy regulations of the said institute. Information of a sensitive personal nature will not be a part of medical record, but will be stored in investigators research file and identified

only by a code number. The code key connecting name two numbers will be kept in a separate secured location.

If the data are used for publication in the medical literature and for teaching purposes no names will be used and other identities such as photographs, audio and video tapes will be used only with my special written permission. I understand I may see the photographs and the video tapes and have the audio tapes before giving this permission.

REQUEST FOR MORE INFORMATION:

I understand that I may ask more questions about the study at any time. **Dr. HARSHA NADGIR** is available to answer my questions or concerns. I understand that I will be informed of any significant new findings discovered during the course of this study, which might influence my continued participation. If during this study or later, I wish to discuss my participation in or concerns regarding this study with a person not directly involved, I am aware that the social worker of the hospital is available to talk with me. And for careful reading a copy of this consent form will be given to me.

REFUSAL OR WITHDRAWAL OF PARTICIPATION:

I understand that my participation is voluntary and that I may refuse to participate or withdraw consent and discontinue participation in the study at any time without prejudice. I also understand that **Dr. HARSHA NADGIR** may terminate my participation in the study after she has explained the reasons for doing so.

INJURY STATEMENT:

I understand in the unlikely event of injury to me resulting directly from my participation in this study, if such injury were reported promptly, then medical treatment will be available to me, but no further compensation would be provided. I

understand that by my agreement to participate in this study I am not waiving any of my legal rights.

I have explained to_____(patient's/relevant guardian) the purpose of the research, the procedure required and the possible risk and benefits to the best of my ability.

_____ _____

Dr. HARSHA.NADGIR. Date

(Investigator)

STUDY SUBJECT CONSENT STATEMENT:

I confirm that I Dr. HARSHA. NADGIR has explained to me the purpose of research, the study procedure, that I will undergo and the possible discomforts as well as benefits that I may experience in my own language and I understand the same. Therefore I agree to give consent to participate as a subject in this research project.

_____ _____

(Participant) Date

_____ _____

(Witness to signature) Date

PROFORMA

Name of the patient :

IP. No:

Age: Sex :

Address:

Date of Admission : Occupation :

Date of surgery :

Date of Discharge :

1. Chief complaints :
2. History of presenting illness : Patient was apparently

   alright _____earlier then

   h/o foreign body sensation Yes/ No

   h/o growing red mass(cosmetic) Yes/ No

   h/o burning sensation Yes/ No

   h/o diminution of vision Yes/ No

   H/o double vision Yes/ No

   H/o trauma/ watering/ pain/ photophobia/ itching/ discharge Yes/ No
3. Past history : H/o Chemical burns/Corneal ulcers/ Trauma/ drug allergies/ Pterygium excision/ treatment history. Any history suggestive of rheumatoid arthritis.
4. Personal history :
5. General physical examination: a) pulse

   b) B.P.

   c) Respiratory rate

6. Preoperative : Right eye Left eye

   a) Visual acuity

   b) Pin hole

   c) Refraction

   d) IOP

   e) Sac syringing

7. Ocular examination :

   a) Head posture

   b) Extra Ocular movements(any restriction)

   c) Adnexa

   d) Conjunctiva

Pterygium

   1) Size

   2) Shape

   3) Circumferential extent on the cornea

   4) Radial extent in relation to cornea

   5) Vascularity

   6) Infiltration

   7) Type of Pterygium type 1/type 2 /type 3

   e) Cornea :

      Size :

      Shape :

      Surface :

      Transparency :

      Sensation :

f) Anterior Chamber :

g) Iris :

h) Pupil :

i) Lens :

j) Direct ophthalmoscopy :

8. Investigations :

a) Hb% :

b) Urine sugar :

c) Random blood sugar :

d) HIV :

e) HBsAg :

9. Treatment :

Pterygium excision with Attachment of Conjunctival autograft using

I) Autologous blood

II)Fibrin glue

Surgeon's name :

Intraoperative complications :

Intervention :

10. Post operative treatment

11. Post operative follow up :

	1st day	1st week	4th week	3rd month	6th month
1. Pain					
2. Foreign body sensation					
3. Photophobia					
4. Watering					
5. Conjunctival congestion					
6. Chemosis					
7. Graft : Vascularity Necrosis Failure Retraction Dehiscence					
8. Cornea Size Shape Surface Transparency Sensation					
9. Limbal avascularity					
10. Sclera Necrosis Inflammation					
11. Post-operative recurrence Yes/No					
12. Visual Acuity					

KEY TO MASTER CHART

M	-	Male
F	-	Female
RE	-	Right eye
LE	-	Left eye
FB	-	Foreign body sensation
W	-	Watering
Cong	-	Congestion
Pap growth	-	Papillomatous growth

MASTER CHART (Group I)

SN.	Name	IP. No.	Age	Sex	Address	Occupation	Symptoms	Site	Preop V/A	Postop V/A	Grade	donor area	day 1	1 week	1 month	3 month	recurrence
1	shivyya	4803	40	M	Bijapur	outdoor	FB	LE nasal	6/9	6/6	1	healthy	pain+FB+W+cong	FB+cong	graft healthy	graft healthy	no
2	Parwati	540	44	F	Athani	indoor	cosmetic	RE nasal	6/9	6/6	2	healthy	pain+FB+W+cong	FB+cong	graft healthy	graft healthy	no
3	Laxmibai	3289	40	F	Bijapur	indoor	redness+FB	LE nasal	6/24	6/18	2	healthy	pain+FB+W+cong+oedema	FB+W+cong	graft healthy	graft healthy	no
4	Nimbavva	6165	70	F	sindagi	indoor	redness+FB	LE nasal	6/60	6/36	3	healthy	pain+FB+W+cong+oedema	FB+cong	graft healthy	graft healthy	no
5	Neelamma	6148	35	F	sindagi	outdoor	cosmetic	LE nasal	6/9	6/6	2	healthy	pain+FB+Wcong	cong	graft healthy	graft healthy	no
6	Ashwini	6902	22	F	Bijapur	indoor	cosmetic	RE nasal	6/6	6/6	1	healthy	pain+FB+W+cong	FB+cong	graft healthy	graft healthy	no
7	Suvarna	7545	32	F	Bijapur	indoor	cosmetic	LE nasal	6/9	6/6	2	healthy	pain+FB+W+cong+oedema	FB+cong	graft healthy	graft healthy	no
8	Ashok	12123	45	M	Bijapur	outdoor	FB	LE nasal	6/6p	6/6	2	healthy	pain+FB+W+cong	FB+cong	graft healthy	graft healthy	no
9	Ashok	12123	45	M	Bijapur	outdoor	FB	LE nasal	6/18	6/9	2	healthy	pain+FB+W+cong	FB+cong+W	graft healthy	graft healthy	no
10	hajilal	25155	45	M	Bijapur	outdoor	redness+FB	RE nasal	6/9	6/6p	2	healthy	pain+FB+W+cong+oedema	FB+W+cong+oedema	graft healthy	graft healthy	no
11	Lakshmibai	14656	65	F	Sangli	indoor	burning + FB	RE nasal	6/24	6/18	3	healthy	pain+FB+W+cong	FB+W+cong	graft healthy	graft healthy	no
12	Tukabai	20510	60	F	sindagi	outdoor	burning +FB	LE nasal	6/36	6/24	2	healthy	pain+FB+W+cong	FB+W+cong	graft healthy	graft healthy	no
13	Mallappa	20828	52	M	Bagewadi	outdoor	redness+FB	RE nasal	6/9	6/6p	3	healthy	pain+FB+W+cong+oedema	FB+W+cong	graft healthy	graft healthy	no
14	Umesh	7	21	M	Jewargi	outdoor	cosmetic	LE nasal	6/6	6/6	2	healthy	pain+FB+W+cong	FB+cong	graft healthy	graft healthy	no
15	Dashrath	31236	38	M	Bijapur	outdoor	redness+FB	LE nasal	6/6	6/6	2	pap growth	pain+FB+W+cong	FB+cong	graft healthy+ growth resolved	graft healthy	no
16	Savita	34002	43	F	Bijapur	indoor	watering +FB	LE nasal	6/9	6/9	2	healthy	pain+cong	cong	graft healthy	graft healthy	no
17	Bouramma	34461	55	F	Bijapur	outdoor	redness+FB	RE nasal	6/12	6/9	2	healthy	pain+FB+W+cong	FB+cong	graft healthy	graft healthy	no
18	krishna	2016	50	M	Bijapur	outdoor	watering+FB	LE nasal	6/12	6/9	3	healthy	pain+FB+W+cong+oedema	FB+cong	graft healthy	graft healthy	no
19	biyamma	3064	60	F	Indi	outdoor	watering+FB	RE nasal	6/9	6/9	2	healthy	pain+FB+cong+oedema	cong	graft healthy	graft healthy	no
20	Basamma	6680	42	F	BIjapur	outdoor	redness+FB	RE nasal	6/6	6/6	1	healthy	pain+cong	cong	graft healthy	graft healthy	no
21	Shivraj	16909	26	M	Bijapur	outdoor	cosmetic	LE nasal	6/6	6/6	1	pap growth	pain+FB+cong	FB+cong	graft healthy+ growth excised	graft healthy	no
22	Parwati	12987	50	F	Bijapur	indoor	watering + FB	RE nasal	6/9	6/9	2	healthy	pain+FB+W+cong+ retraction	FB+cong+ retraction	graft healthy	graft healthy	no
23	Surekha	19496	45	F	Bijapur	indoor	cosmetic	RE nasal	6/9	6/6	2	healthy	pain+FB+cong	cong	graft healthy	graft healthy	no
24	Bouramma kuri	19026	30	F	Bijapur	indoor	burning+FB	LE nasal	6/6	6/6	1	healthy	pain+FB+W+cong	FB+cong	graft healthy	graft healthy	no
25	Yallappa	26706	60	M	Bijapur	outdoor	burning+FB	RE nasal	6/60	6/36	3	healthy	pain+FB+W+cong	FB+W+cong	graft healthy	graft healthy	no

Group II

SN.	Name	IP. No.	Age	Sex	Address	Occupation	Symptoms	Site	Preop V/A	Postop V/A	grade	donor area	day 1	1 week	1 month	3 month	recurrence
1	Channama	9847	37	F	Sindagi	outdoor	burning+ FB	RE nasal	6/6	6/6	2	healthy	pain+FB +cong+sch	cong+sch	graft healthy	graft healthy	no
2	Chandamma	9885	35	F	Sindagi	outdoor	FB	RE nasal	6/6	6/6	1	healthy	pain+FB +cong	graft healthy	graft healthy	graft healthy	no
3	Husbanabi	9788	46	F	Bijapur	indoor	watering+ FB	LE nasal	6/6	6/6	2	healthy	pain+FB +cong+sch+retraction	cong+sch+ retraction	retraction	graft healthy	no
4	sandeep	9922	50	M	Bijapur	outdoor	redness+FB	RE nasal	6/9	6/6	2	healthy	pain+FB +cong	cong	graft healthy	graft healthy	no
5	Madevi	13263	40	F	Sindagi	indoor	redness+ FB	RE nasal	6/9	6/9	1	healthy	pain+FB+cong+ oedema	FB+oedema	graft healthy	graft healthy	no
6	Md sab	13423	58	M	Sindagi	outdoor	watering+ FB	LE nasal	6/36	6/24	3	healthy	pain+FB+W+ retraction+cong	FB+retraction	retrction+ cong resolved	graft healthy	no
7	Basanna	13395	65	M	Bijapur	outdoor	burning+FB	RE temporal	6/24	6/18	3	healthy	pain+FB +cong	cong	graft healthy	graft healthy	no
8	Shakti	13186	35	M	Sindagi	outdoor	FB	RE nasal	6/9	6/6p	3	healthy	pain+FB +cong	cong	graft healthy	graft healthy	no
9	Somaling	13167	40	M	Bijapur	outdoor	FB	RE nasal	6/9	6/9	2	healthy	pain+FB+cong+ oedema	graft healthy	graft healthy	graft healthy	no
10	Shivashankrappa	18344	72	M	Bijapur	outdoor	watering+FB	LE nasal	6/24	6/18	1	healthy	pain+FB +cong+sch	cong+sch	graft healthy	graft healthy	no
11	Godabai	18339	40	F	Bagewadi	outdoor	burning+FB	RE nasal	6/12	6/9	2	healthy	pain+FB +cong	graft healthy	graft healthy	graft healthy	no
12	Kamalabai	18342	67	F	Malla	indoor	burning+ FB	RE nasal	6/24	6/9	2	healthy	pain+FB +cong	graft healthy	graft healthy	graft healthy	no
13	Mallamma	18396	38	F	Indi	outdoor	redness+FB	LE nasal	6/18	6/9	2	healthy	pain+FB+W+ retraction+cong	FB+retraction	retraction+ graft healthy	graft healthy	no
14	Mudalingappa	30416	40	M	Surpur	outdoor	redness+FB	RE nasal	6/18	6/9	3	healthy	pain+FB +cong+sch	cong+sch	graft healthy	graft healthy	no
15	Prabhakar	30401	64	M	Bijapur	outdoor	redness+FB	RE nasal	6/24	6/18	2	healthy	pain+FB +sch+oedema	sch+oedema	graft healthy	graft healthy	no
16	renuka	30404	32	F	Bijapur	indoor	cosmetic	LE nasal	6/6	6/6	1	healthy	pain+FB +cong	graft healthy	graft healthy	graft healthy	no
17	Gowramma	16971	45	F	Surpur	indoor	redness+FB	LE nasal	6/12	6/9	2	healthy	pain+FB+cong+oedema	FB+oedema	graft healthy	graft healthy	no
18	Malkamma	16954	65	F	Indi	indoor	watering+FB	RE nasal	6/60	6/36	3	healthy	pain+FB+cong+oedema	FB+oedema	graft healthy	graft healthy	no
19	Shanta	16853	45	F	Bijapur	indoor	watering+FB	LE nasal	6/9	6/9	1	healthy	pain+FB +sch+oedema	sch+oedema	graft healthy	graft healthy	no
20	Shivanand	16970	38	M	Bijapur	outdoor	redness+FB	RE nasal	6/12	6/9	2	healthy	pain+FB +sch+oedema	pain+FB +sch+oedema	graft healthy	graft healthy	no
21	Vilas	24087	19	M	Bijapur	outdoor	cosmetic	LE nasal	6/6	6/6	1	healthy	pain+FB +cong+sch	sch	graft healthy	graft healthy	no
22	Sommanna	24128	27	M	Sindagi	outdoor	burning+FB	RE nasal	6/9	6/6	2	healthy	pain+FB +cong	graft healthy	graft healthy	graft healthy	no
23	Mahananda	23869	35	F	Bijapur	indoor	cosmetic	RE nasal	6/12	6/6	1	healthy	pain+FB+cong+oedema	graft healthy	graft healthy	graft healthy	no
24	Bouramma biradar	24115	28	F	Bijapur	indoor	cosmetic	LE nasal	6/6	6/6	2	healthy	pain+FB+cong+oedema	graft healthy	graft healthy	graft healthy	no
25	Sharan Reddy	24111	55	M	Bijapur	indoor	cosmetic	LE nasal	6/18	6/9	2	healthy	pain+FB +sch+oedema	sch+oedema	graft healthy	graft healthy	no