"A COMPARATIVE STUDY OF MITOMYCIN-C VERSUS CONJUNCTIVAL AUTOGRAFT FOLLOWING PTERYGIUM EXCISION"

By

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In partial fulfillment
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MASTER OF SURGERY
IN
OPHTHALMOLOGY

Under the Guidance of
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Date: **Signature of the Candidate**

LIST OF ABBREVIATIONS USED

S.NO	Abbreviation	Full form
1.	U.V	Ultra violet radiation
2.	DNA	Deoxyribonucleic acid
3.	EPC	Endothelial progenitor cells
4.	D	Diopter
5	No.	Number
6.	CAG	Conjunctival autograft
7.	LCAG	Limbal Conjunctival autograft
8.	RNA	Ribonucleic acid
9.	MMC	Mitomycin-C
10	RE	Right Eye
11	LE	Left Eye
13	SPK	Superficial Punctate Keratitis
14	CVS	Cardio vascular System
15.	CNS	Central Nervous System
16.	RS	Respiratory system

ABSTRACT

BACKGROUND:

Progressive pterygium which is associated with visual impairment requires surgery. Surgical excision is the only treatment modality but it is associated with high recurrence rate of 50-80%. Many studies conducted have shown that post operative use of mitomycin-C and conjunctival autograft had less recurrence rate and fewer complications. We are undertaking this study to compare mitomycin-C versus conjunctival autograft following pterygium excision.

OBJECTIVES

1)To compare the recurrence rate of pterygium after simple excision with mitomycin-C versus conjunctival autograft

2) To study the complications of the two techniques

METHODS:

80 eyes with progressive pterygium were selected .All the patients were randomly divided into 2 groups of 40 each to undergo pterygium excision followed by MMC 0.02% application for 3 minutes and conjunctival autografting respectively. Recurrence rate between the two groups were compared and the intra and postoperative complications in both the groups were noted.

RESULTS

The average age of patients in the study was 48.5 years with a female predominance with more incidence of bilateral than unilateral involvement. Postoperative complications like superficial punctuate keratitis was noted in MMC group and Graft oedema, Granuloma and Distortion of the graft were noted in Conjunctival autograft group. Recurrence rate in Mitomycin group (15%) was more compared to conjunctival autograft group(5%) without any statistical difference between the two groups(p=0.13).

INTERPRETATION & CONCLUSION

Hence, as minimal complications were noted in both the groups but recurrence rate is less in Conjunctival autograft group, pterygium excision with conjunctival autografting is an efficient procedure.

KEYWORDS

Pterygium, Mitomycin-C, Conjunctival autograft, Recurrence.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF CHARTS

LIST OF FIGURES

LIST OF PHOTOGRAPHS

INTRODUCTION

Pterygium is derived from greek word 'pterygion'means wing. Pterygium is a degenerative condition of the subconjunctival tissues which proliferates as vascularized granulation tissue to invade the cornea, destroying the superficial layers of the stroma and Bowmans membrane the whole being covered by conjunctival epithelium[1].

Prevalence of pterygium is 5.2% worldwide but, more common in warm and dry climates with prevalence of 22% in equatorial areas and less than 2% in latitudes above 40 degrees[2].

The causative factors are not defined but it is known to occur in those who are exposed to sunlight or wind for prolonged periods and in areas where there is higher exposure to U.V. radiation especially UV-A and UV-B (290-400nm)[3].

Higher incidence in males in the age group of 20-40 years. The pterygium can vary from small atrophic quiescent lesion to a large fibrovascular lesion commonly involving nasal limbus but can occur on either side of the cornea. It consists of a Head which rests over cornea, Neck and Body[4].Pterygium is associated with decreased visual acuity due to involvement of visual axis, irregular astigmatism, extra ocular motility restriction and cosmetic intolerance[5].

Progressive pterygium which is associated with visual impairment requires surgery but simple excision is associated with high recurrence rate of 24-89%[6]. These recurrences are distressing as they grow at a rapid pace and soon become larger than the original growth. The recurrence may be due to the incomplete excision associated with fibroblastic proliferation and production of matrix metalloproteinases under the

influence of inflammatory cytokines[7]. Other reason for the angiogenesis factor to occur is the surgical insult which acts as stimulus for neovascularisation. After excision there is chemotaxis and influx of polymorphonuclear leukocytes, which then release the angiogenic factor which is the stimulus for neovascularisation and recurrence.

Various methods have been adopted to reduce the recurrence rate of pterygium after its excision which includes antimitotic drugs application like Mitomycin-C and thiotepa, conjunctival autografting, limbal stem cell transplantation, β-irradiation and amniotic membrane transplantation[8].Among these, many studies conducted have shown that intraoperative use of Mitomycin-C and conjunctival autograft had less recurrence rate and fewer complications compared to other techniques.

We are conducting this study in our hospital, to compare Mitomycin-C versus conjunctival autograft following pterygium excision.

OBJECTIVES OF THE STUDY:

1) To compare the recurrence rate of pterygium after excision with intraoperative mitomycin-C versus conjunctival autografting.

2) To study the complications (intra and post operative) of the two techniques

REVIEW OF LITERATURE

Pterygium was first described by Susrutha (India), the world's first surgeon ophthalmologist before 1000A.D.[9]

Jaros P A et al described that pterygium causes decreased vision due to growth over the pupillary axis, induced astigmatism and caused disruption of the precorneal tear film.[10,11]

Coroneo et al observed strong relationship between UV radiation and development of pterygium. Further evidence was from the systemic association of pterygium which includes Basal cell carcinoma, Porphyria cutanea tarda, Xerodermapigmentosum.[12,13]

Taylor H R et al had suggested that prolonged exposure to UV radiation causes biological changes in Bowman's membrane resulting in formation of altered proteins which act as angiogenic factors producing vessel ingrowth and pterygium formation.[14]

Saw S M et al had shown the epidemiological evidence implicating UV radiation as an intiating environmental factor in the pathogenesis of pterygium.[15]

Di Girolamo N et al have stated that p53 and human papilloma virus may also be implicated in pterygium pathogenesis. UV radiation can cause mutations in genes such as the p53 tumor suppressor gene, resulting in its abnormal expression in pterygial epithelium.[16,17]

Fernandes M et al had observed a recurrence which was significantly higher in males (23.3%) and in patients below 40 years of age(25.2%).[18]

Hirst LW postulated the rate of ocular surface squamous neoplasia is as high as 9.8% in patients with pterygium.[19]

Hercules LA et al had shown that Cyclosporin 0.05% is effective to inhibit the proliferation of pterygium and normal tenon's capsule fibroblasts but associated with complications of graft scarring, tenon's granuloma.[20, 21]

Study conducted has shown that recurrence rate of pterygium with intra-operative Mitomycin-C is as low as 1.5% to 7%[22]. Prospective studies have reported that single intra-operative scleral application of 0.1mg/ml to 0.2mg/ml mitomycin-C for 3 to 5minutes reduced the recurrence rate to 3.3% to 12%[23]. Post operative use of Mitomycin-C may have complications like photophobia, irritation, superficial punctate keratitis and scleromalacia.[24]

Kenyon et al. were the first who described the conjunctival autograft in 1985. They reported a recurrence rate of 5.3% and relatively minor complications[25].

Study conducted has shown that free conjunctival autograft technique was found superior to bare sclera technique as the recurrence rate was statistically low (6.6% Versus 36.6%).[26]Conjunctival autograft placement following pterygium excision offers the theoretical advantage of reconstructing the architecture of corneo- scleral limbus and transplanting limbal stem cells which facilitate corneal epithelial

healing.[27]Conjunctivalautografting may have complications like graft edema, graft failure, distortion of the graft and tenon's granuloma.[28]

Sharma R et al has shown that pterygium excision with conjunctival autograft has gained worldwide acceptance as the most favourable technique because it has proven to be safe and effective in reducing pterygium recurrence.[29]

Kheirkhah A et al postulated that, one of the factors that play a role in outcome of pterygium surgery is the postoperative conjunctival inflammation. It has been shown that persistent conjunctival inflammation around the surgical site is present in approximately 31% to 40% of cases after pterygium surgery with amniotic membrane transplantation. There is a higher incidence of such inflammation with suture use compared with fibrin glue (61.5% vs 21.4%, respectively).[30,31]

Nazari R et al found an higher incidence of pyogenic granuloma after amniotic membrane transplantation compared with conjunctival autograft (15.8% vs 5%, respectively).[32]

Koranyi G et al compared the use of tissue adhesives with sutures to attach conjunctival grafts and found that the use of tissue glue was associated with shorter surgery time, reduced postoperative discomfort, and lower recurrence rate compared with sutures.[33, 34]

ANATOMY OF CONJUNCTIVA:[35, 36, 37, 38, 39]

The conjunctiva is a thin, transulucent mucous membrane which derived 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 forward 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 parts.

The Palpebral part is sub-dived 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 eye lid.

At this point, the tarsal glands and the lacrimal punctum arise. This region is covered with tissue which can withstand much wear. 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 being transparent so that the 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. This fold 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.

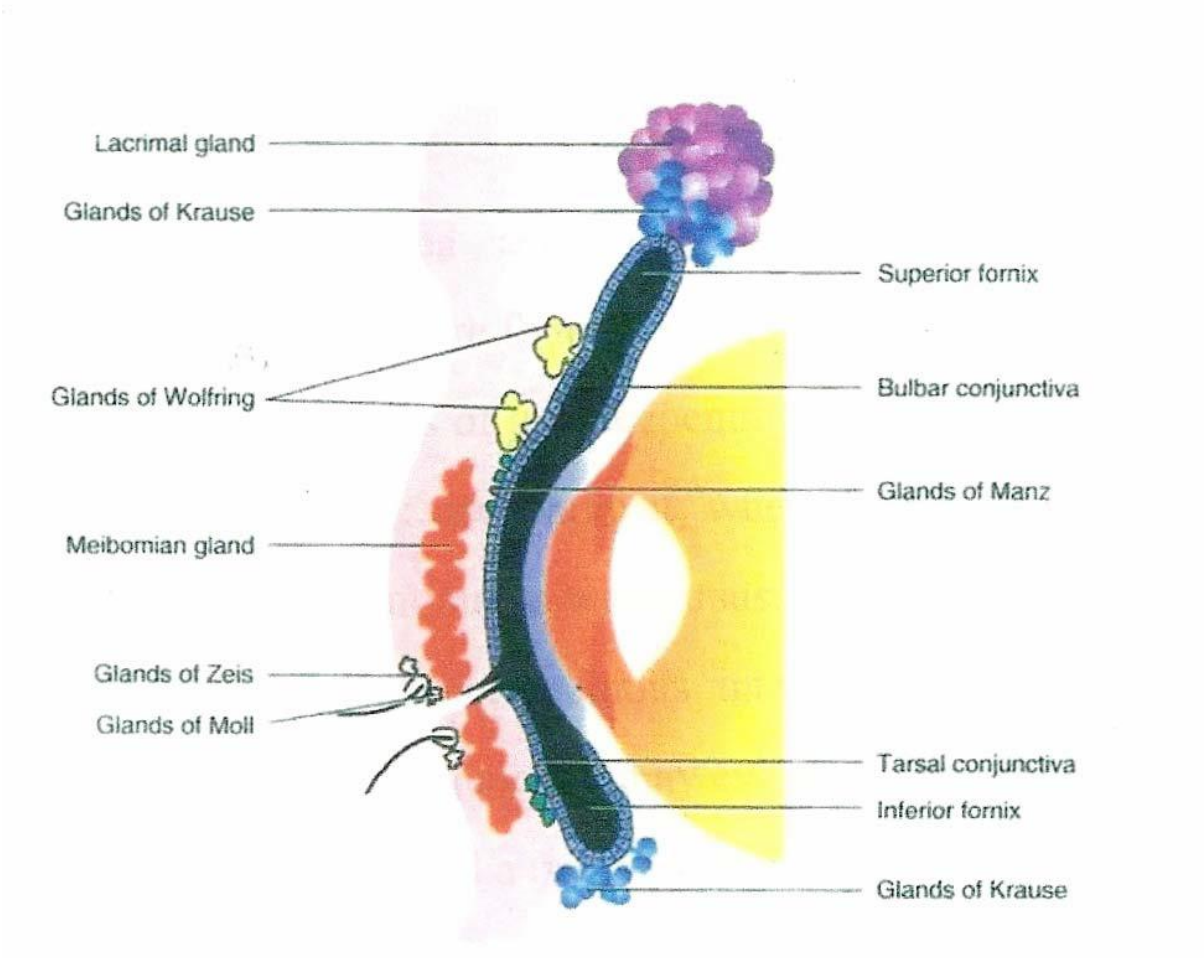


FIGURE-1:ANATOMY OF CONJUNCTIVA

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 Inter tendinous interval, that is in the diagonal regions of the fornix, the conjunctiva may extend to the cornea. The fornix is well supplied with vessels and a

rich venous network can be especially well seen in the inferior fornix, where also the whitish aponeurotic expansion from the inferior rectus and inferior oblique seen through the conjunctiva.

The bulbar conjunctiva is thin and transparent so that white sclera is seen through it giving rise to the white of the eye. 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's 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's 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, all though 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 sub tarsal 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 an trap for materials which would fall on the cornea and assist small specks of mucous membrane which move

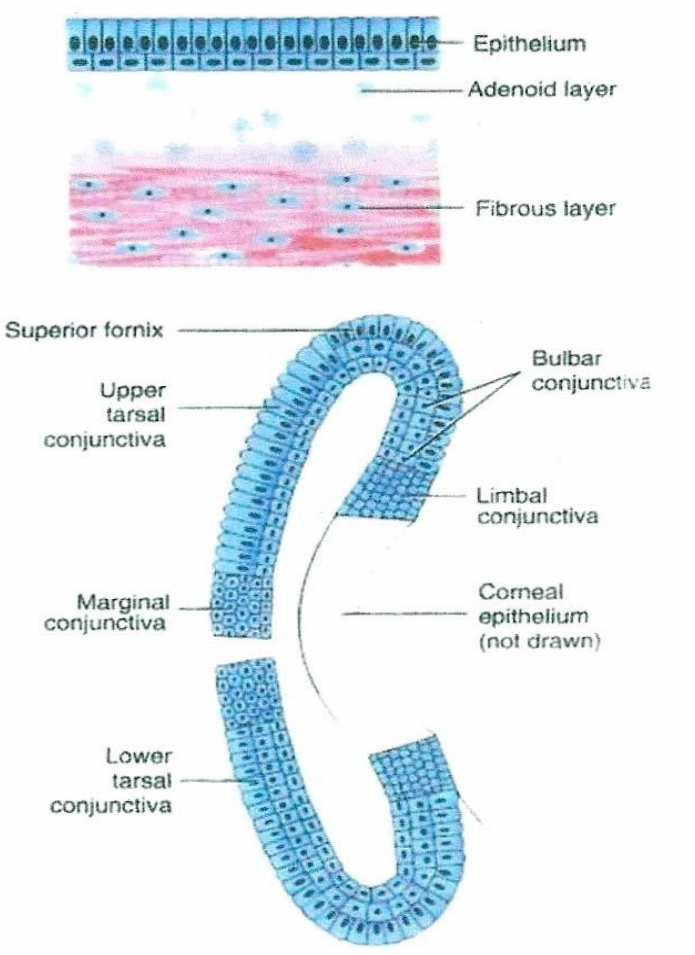


FIGURE-2:CONJUNCTIVAL EPITHELIUM

nasally with each blink.

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 three or four layers of cubical cells, increasing in number from bulbar conjunctiva. Around the limbus a stratified layer appears between eight and ten cells thick, with additional squamous epithelium which is very robust. 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 if 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 50-70 µm 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 non existent 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, which were encapsulated by it.

CONJUNCTIVAL BLOOD VESSELS

The palpebral conjunctiva receives its blood supply from the palpebral arcades. Branches from the arcades anastomose on both sides of the tarsal plate, vessels from the posterior network supply the palpebral conjunctiva in both upper and lower lids. The fornices are supplied by branches from the peripheral arcades, which then branch again and enter the bulbar conjunctiva, forming a plexus of vessels, the posterior conjunctival arteries. These anastomose with the plexus of anterior conjunctival arteries formed by branches from the anterior ciliary arteries. Conjunctival veins parallel the arteries but are more numerous. They drain into the palpebral and ophthalmic veins.

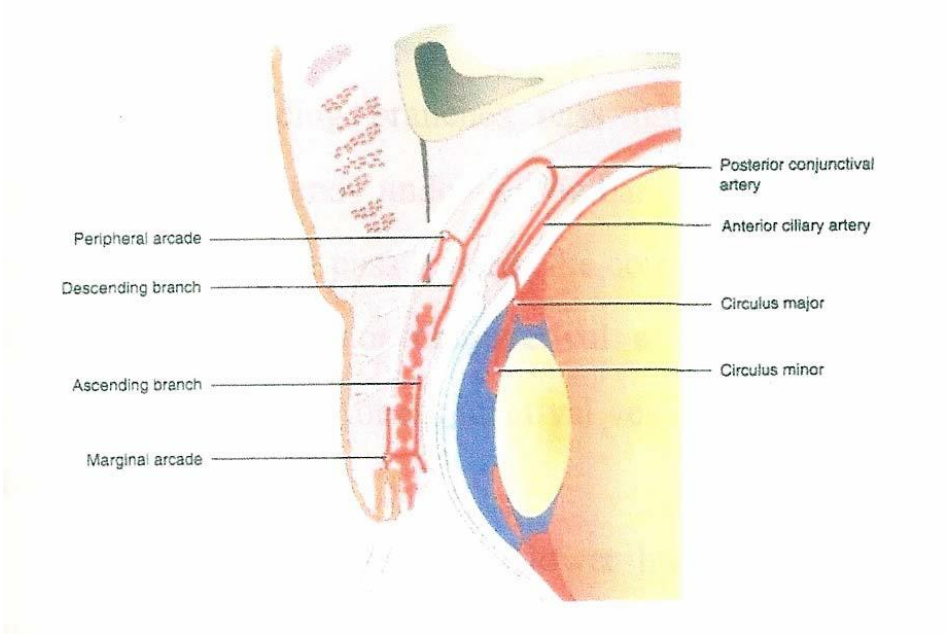


FIGURE-3: BLOOD SUPPLY OF CONJUNCTIVA

CONJUNCTIVAL LYMPHATICS

The conjunctival lymphatic vessels are arranged in superficial and deep networks within the submucosa. These vessels drain into the lymphatics of the eyelids, those from the lateral aspect empty into the parotid lymph node, and those from the medial aspect empty into the sub mandibular lymph node.

CONJUNCTIVAL INNERVATION

Sensory innervations of the bulbar conjunctiva are through the long ciliary nerves. Sensory innervations of the superior palpebral conjunctiva are provided by the frontal and lacrimal branches of the ophthalmic nerve. Innervations of the inferior palpebral conjunctiva are provided by the lacrimal nerve and the infraorbital branch of the maxillary nerve. All the sensory information is carried in the trigeminal nerve.

ANATOMY OF PTERYGIUM:[40, 41, 42, 43]

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 extents 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.

The Cap:

This is the apex of the pterygium anterior to the head. Unlike the head, which is opaque, the cornea of the cap can be viewed 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 a vascular. 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.

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.

II) MICROSCOPIC:

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.

PTERYGIA 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.

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 pingeucula 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 refractile in nature.

Pseudoelastic nature of Pterygium:

Elastic degeneration in cases of pterygium as in pinguecula 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.

INCIDENCE OF PTERYGIUM:

Forsius and Erikson(1962) have said that pterygium is rare in countries like England and Northern Europe and its incidence is exclusively confined to rural workers and fisherman. It is prevalent in those countries where heat, winds and dusty conditions are common as the eastern part of Mediterrian, northern, western and central part of Australia and in Texas.

Parthasarthy and Gupta (1967) during their study of prevalence of pterygium in rural India found that, it increases with age, males suffering more than females. They found that nearly 5.3 million people were suffering from pterygium.

Rasanayagam (1983) found that it was common among Chinese followed by Malaya and Indians and suggested that there might be racial bias in the prevalence of pterygium.

Karukonda SR et al (1995) described that pterygium is a worldwide condition with a "pterygium belt" between the latitudes 30° north and south of the equator. Pterygium is prevalent in Hong Kong, situated 22° north of the equator[44].

Detorakis ET et al (2005) found that pterygium incidence is high in areas with more ultraviolet radiation, especially UVR-A and UVR-B(290-400nm)[45]

Threlfall TJ et al (1999) found incidence of pterygium was 50% among farmers followed by 35% in labourers who have to work outside for long periods of time and are exposed to the hazardous effects of the infrared and ultraviolet radiation present in sunlight[46].

Ooldenburg JB (1990) reported that patients aged 20-40 years have the highest incidence of pterygium[47].

Taylor HR (1992) reported prevalence rate of pterygium ranging from 0.3-29% [48].

Prevalence of Pterygium in different states in India:

(Derived from Trachoma control pilot project, 1956)

Maharashtra: 3.07%

Assam: 2.36%

Andhra Pradesh: 2.22%

West Bengal: 1.99%

Gujarat: 1.94%

Madhya Pradesh: 1.77%

Tamil Nadu: 1.54%

Bihar: 1.44%

Karnataka: 1.29%

Punjab: 1.23%

Rajasthan: 1.19%

Orissa: 0.98%

Uttar Pradesh: 0.55%

Kerela: 0.49%

AETIOLOGY:

As early as 3000 BC great ancient surgeon of India, Sushrutha described "Armans" (Pterygium) as a disease of Shuki-Mandal (sclerotic Region) of the eye and classified it into 5 types. He thought that disease occurred due to a deficient nutritional status of the individuals and that it could be prevented by improving the general health of the patients.

1)Ultraviolet Radiation:

Burlett and Mumma (1951) supported the view that UV rays were the most significant factor in the etiology of pterygium.

Liu L (1993) suggested that ultraviolet radiation causes oxidative DNA damage and has been considered to be a major factor responsible in pathogenesis of pterygium.

Elliot (1961) thought that pterygium is caused by drying of the tear film and damage caused to the epithelium by UV radiations.

Fletcher (1988) postulated the evidence for the involvement of ultraviolet light in the etiology of pterygium from its systemic associations

2) Environmental factors:

McReynolds (1914) attributed environmental factors like heat, a dry atmosphere, high speed wind and abundance of dust for the occurance of pterygium

According to **May and Worth's** manual of disease of eye (IIIrd edition) pterygium occurs particularly in hot and dry climates and in places there is much wind and dust. It must be regarded as degenerative condition which is the result of prolonged irritation.

Doherty (1941) says that exact etiology of pterygium is unknown, but it may occur as a protective membrane, analogous to nictitating membrane of amphibians, in order to protect cornea from constant external irritants like heat and dust

3)Degenerative conditions:

According to **Fuchs** (1913), it originates from pinguecula as degenerative process. Then it makes its way into the limbus and finally upon the cornea gradually and in doing so it draws the conjunctiva over it.

According to the book on ocular pathology of **David J. Apple and Maurice F. Rabb** (5thedition) pinguecula and pterygium occurs in persons exposed to extreme environmental influences.

4)Others:

Wong (1978) suggested that a pterygium angiogenesis factor may exist which develops following repeated irritation at the limbus.

Detorakis (2001) postulated that infection with Human papilloma virus and herpes virus as risk factors for pterygium.

Beden (2003) postulated that pterygium specimens stain for T-lymphocytes which show CD4/CD8 ratio of 0.33 for pterygium epithelium and 1.34 for substantia propria.

Song YS(2005) postulated that adult stem cells from bone marrow are involved in the pathogenesis of pterygium which was proven by immune histochemical staining with various stem cell markers.

Tekelioglu (2006) found deposition of immunoglobulins in a granular pattern around the basement membrane of epithelial layer with mast cell reaction and basement membrane destruction in the area of cap of pterygium.

Lee JK (2007) postulated Endothelial Progenitor cells(EPC) in the development of pterygium and ocular hypoxia triggers the neovascularisation by recruiting this cells.

Lin W (2008) found that chronic exposure to arsenic in drinking water will predispose to development of pterygium.

AETIOPATHOLOGY:

Various theories include:

1)Primary degeneration of the cornea(Elliot,1966; Duke Elder,1965):

UV radiation acts directly on the dried cornea producing small areas of patchy epithelial damage which if severe leads to necrosis and be demonstrable with fluorescein. Oedema of corneal epithelium causes it to separate from the Bowman's membrane allowing sub conjunctival granulation tissue to grow in from the limbus, penetrate the damaged superficial layers of substrantia propria. Fibrosis and contraction of this tissue pulls the loose conjunctiva onto the cornea.

2)Primary chronic inflammation of the conjunctiva and sub conjunctiva(Cameron,1965):

UV rays penetrate the conjunctiva to act directly on the subconjunctival tissue. The resulting damage brings about an inflammation. The fibroblasts penetrate the space between Basement membrane and Bowman's layer where, they induce a fibrotic reaction and brings about the growth of connective tissue from the subconjunctiva. As

a result of UV radiation this conjunctiva is already thickened and hyperplastic. It grows in at the level of Bowman's membrane destroying it and invading the superficial corneal lamellae.

3) Chronic irritative exposure conjunctivitis(Kamel, 1954):

Repeated attacks of exposure conjunctivitis lead to damage of the subconjunctival tissue .the resulting fibroblastic response causes horizontal fibrous bands to be laid down but, fibrous tissue shrinkage produce little or no effect. However this process occurs concurrently in cornea, the resulting simultaneous shrinkage of fibrous tissue bands will exert a mechanical pull between the cornea and the conjunctiva. As the cornea is fixed, conjunctiva is pulled onto it forming the pterygium.

4)Triple response theory (Saif et al):

Great importance is placed on the small conjunctival and corneal blood vessels. Saif suggested that capillaries have a unique power of active dilatation. Hilger's suggested that solar radiation denatured the proteins forming antigens which induce an allergic reaction. The end result of which was pterygium formation.

SIGNS AND SYMPTOMS:

A pterygium appears as a triangular fleshy growth which is almost invariably found on the nasal side slightly below the horizontal meridian, when double headed temporal lesion develops later. Usually both eyes are affected on the nasal side, although unequally. A temporal lesion without nasal pterygium is a rare, but a bilateral instances has been recorded.

Pterygium as long as it is small does not cause any symptoms except from slight irritation. Some patients will complain of cosmetic blemish as it looks like a growth in the white portion of visible eyes. Some patients complain of slight heaviness in the eye along with redness. In later stages it may cause impairment of vision due to growth onto the pupillary area of cornea or by producing astigmatism due to traction over cornea by the fibrosis in the growth. Flattening of the corneal curvature in its horizontal meridian may occur producing an against the rule astigmatism of upto 1.5D. Large pterygium may cause diplopia owing to limitation of ocular movements from traction on the conjunctiva.

As far as signs are concerned pterygium appears to be a triangular encroachment of the conjunctiva upon the cornea with vessels running over it with infront of its blue apex numerous small opacities lying deeply in the neighbouring part of cornea. The thick vascularised conjunctiva appears to be drawn on the cornea from canthus and is loosely adherent in its whole length to the sclera, area of adherence being always smaller than its breadth so that there are conjunctival folds at the upper and lower borders(Parson's diseases of eye). Parson further states that when single it is usually on the nasal side of the cornea and when double in one eye, the temporal lesion develops later.

In the early stages pterygium is rich in blood vessels and hence reddish in colour, later it changes to a white tenacious membrane. Its basal portion is firmly attached to sclera, but below and above its margin is represented by a fold of conjunctiva. Development of pterygium over unusual sites has been reported by various authors.

Doherty has described that pterygium has 4 parts:[49]

a) The cap: Flat greyish part which proceeds the head as it encroaches
b) Head: It is a triangular apex which is firmly adherent to the cornea
c) Neck: It is the part of pterygium which lies at limbus
d) Body: It is a fan shaped extension from the neck consisting of epithelium, connective tissue and blood vessels merging with the sub conjunctival tissue.

When examined carefully by oblique illumination and slit lamp the first change is the appearance of grey circumscribed opacities in the cornea near the limbus while in the opposite conjunctiva there occurs shrinkage of mucosa apparent by its tenseness and a displacement of semi lunar folds. As the conjunctiva encroaches upon the cornea it is preceded by the appearance of the same grey infiltrates in this tissue in the form of small islands which gradually fuse. When it is fully formed the triangular apex is blunt with small irregular opacities in the cornea in front of it, at the level of Bowman's membrane.

Immediately in front of the area of superficial opacification a pigmented line may be seen at the level of Bowman's membrane called stocker's line (Stocker,1939) determined by the ruptures in the membrane or due to deposition of hemosiderin

Behind the neck, the conjunctival folds run backwards to the sclera in a tightly drawn triangular wing. At the base of pterygium these conjunctival folds merge into the bulbar conjunctiva causing considerable tension on it which is shown by the straight course of vessels the numerous folds and the gross displacement of plica semilunaris.

Different authors have classified pterygium in different ways:

1)William M. Townsend classified as:[50]

A. Actively growing pterygium

B. Fleshy / Malignant pterygium

C. Slow growing pterygium

D. Stationary pterygium

E. Atrophic pterygium.

2)Doherty classified as:[51]

A. Progressive pterygium

B. Regressive pterygium

3)Fuch's classified based on vascularity, colour, thickness and clinical aggressiveness:[52]

A. Pterygium crassum

B. Pterygium Vasculosum

C.Pterygium Camosum

D. Pterygium Sarcomatosum

E. Pterygium Membranosum

4) Winther classified as:[53]

A.True Pterygium

B. Pseudo pterygium

5)V.Jose.I. Barraquer classified as:[54]

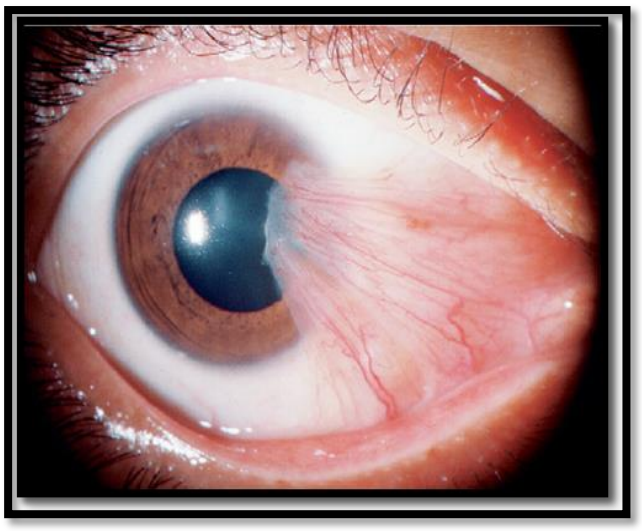
A. Conjunctival stage

B. Corneal stage/ True pterygium stage

On the gross examination, pterygium has been classified into two main types.

1)PROGRESSIVE PTERYGIUM: [FIGURE-4]

Also known as pterygium crassum, pterygium carnosum, pterygium vasculosum and malignant pterygium. It is the early stage of the pterygium and it is thick, fleshy and vascular which continues to grow slowly and occasionally may get violently hyperaemic. At this head there is always a succulent avascular grey area elevated above the neighbouring cornea and preceded by irregular islands of opacities

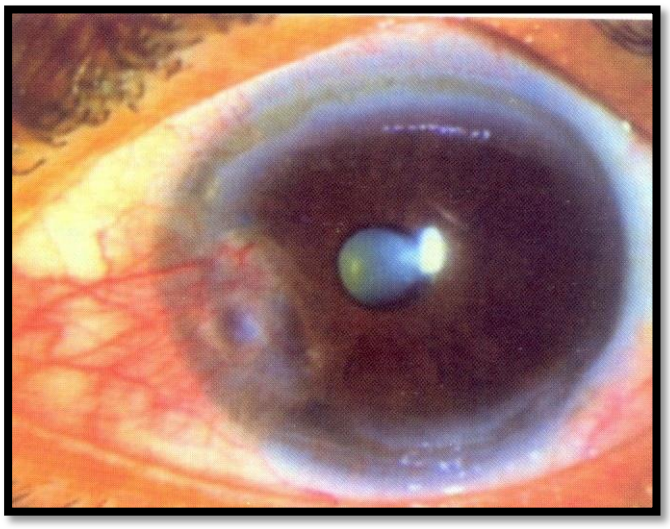


.**FIGURE-4: Progressive pterygium**

2) ATROPHIC PTERYGIUM:[FIGURE-5]

Also known as pterygium tenue when pterygium ceases to grow, the vascularity disappears and it appears thin, grey, anaemic and membranous, but never disappears

FIGURE-5: Atrophic pterygium



Based on the severity, pterygium has been classified as:[48][FIG6,7,8,9,10]

1) STAGE-0: Posterior to limbus

2) STAGE-1: Pterygium is restricted to limbus

3) STAGE-2: Marginally invade the cornea

4) STAGE-3: Between the limbus and pupillary margin

5) STAGE-4: Central to pupillary margin.

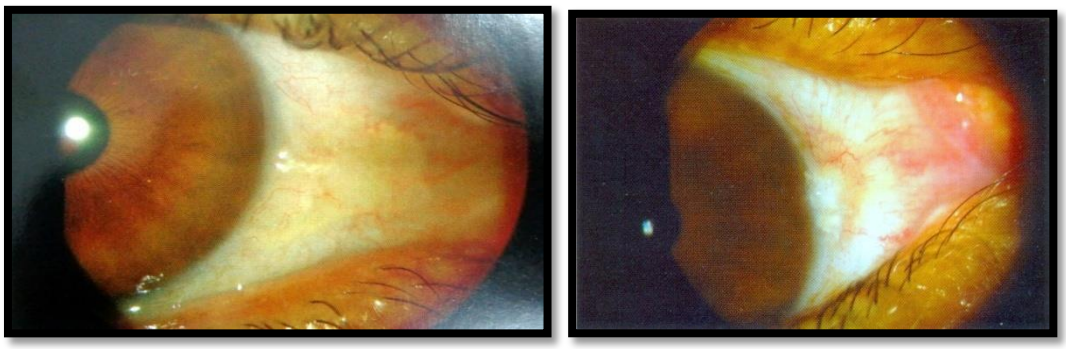


FIGURE-6[STAGE 0]

FIGURE-7[STAGE-1]

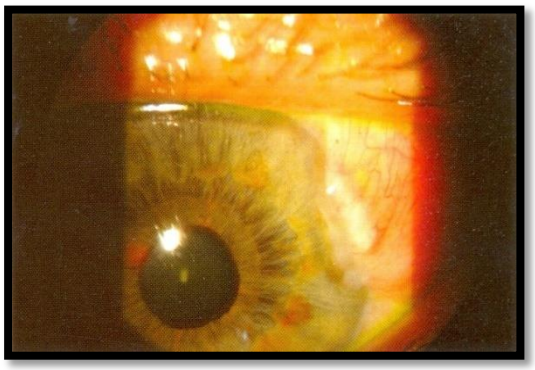


FIGURE-8 [STAGE-2]

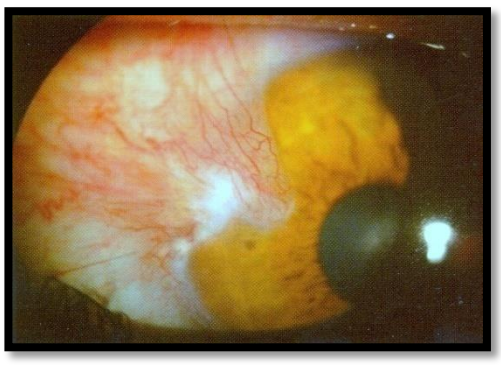


FIGURE-9[STAGE-3]

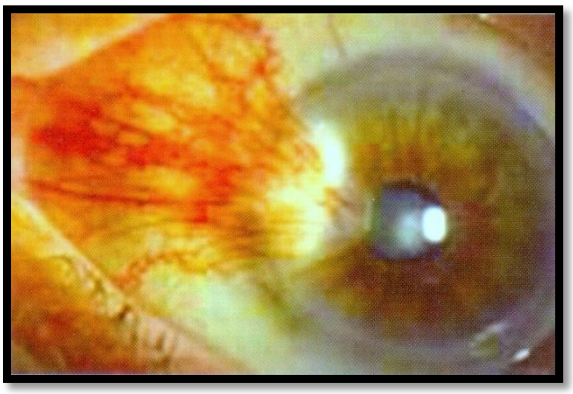


FIGURE-10[STAGE-4]

DIFFERENTIAL DIAGNOSIS:[41, 55]

1)Pseudo pterygium: A pterygium is to be differentiated from pseudo pterygium which is a fold of the conjunctiva adhered to the cornea. A pseudo pterygium results from the adhesion of chemosed conjunctiva, to the marginal corneal ulcer, when inflammation and chemosis has subsided. This could occur after a marginal keratitis, membranous conjunctivitis, after a burn or after excision of new growths. A pseudo pterygium can be differentiated from a true pterygium, by passing a probe through and through at the limbus underneath the growth which is not possible in true pterygium

This may be situated anywhere on the limbus in contrast to true pterygium. A history of corneal trauma like marginal ulcer, fascicular ulcer, lime burns, etc always precede. A probe can be easily passed underneath the neck of pseudo pterygium.

2)Pinguecula: Pingueculae are areas of bulbar conjunctival thickening that adjoin the limbus in the palpebral fissure area. They are elevated, white to yellow in colour, and horizontally oriented. They are less transparent than normal conjunctiva often have a fatty appearance, usually bilateral, and are located nasally much more often than temporally. A pinguecula seldom encroaches on the cornea except when it is very large.

3)Epithelioma: This sometimes grows in the limbal area and resembles pterygium. The difference lies in the greater irregularity of the surface, lack of thickening of sub conjunctival tissue at the caruncle and lack of orientation of blood vessels into characteristic pterygium shape.

4) **Bowen's tumour:** This is a rare tumour that can be mistaken for pterygium. It has the features similar to epithelioma

5)Conjunctival papilloma: It is highly vascular bleeds easily. Compared to pterygium it is easily diagnosed but based on histology. It is vital in origin.

6)Limbal dermoid: It is a rare congenital pathology which appears as a round yellow to red neo formation between the limbus and the edge of cornea. There is no abnormal visualization. The preferred site for dermoid is the inferotemporal sector.

7)Phlyctenular keratoconjunctivitis: This condition is commonly associated with tuberculosis and chronic staphylococcal blepharoconjunctivitis. Other possible sources include Candida albicans, Coccidioides immitis, Chlamydia, parasites, and lympho granuloma venereum. It presents as slightly raised, small, pinkish white or yellow nodules surrounded by dilated vessels located on conjunctiva near the limbus or on peripheral cornea. After a few days, the superficial part of the raised nodule becomes gray and soft, the centre of the lesion then ulcerates, sloughs, and clears without scarring. Classically, there is no clear zone between the limbus and the lesion. Involvement is usually bilateral and seasonal (occurring more in spring and summer) and the condition occurs most frequently in children and young adults.

8)Nodular episcleritis: It is the inflammation of the episclera and overlying conjunctiva. In the nodular form it is localised. Females are more commonly affected and the pathology is observed as a bright red nodule. It consists of twisted and injected conjunctival and episcleral capillary vessels.

9)Epithelial hyperplasia: This cases show increase in the subconjunctival tissue and formation of grey or white plaques surrounded by erythema giving the appearance of pterygium.

10)Lymphoma of the conjunctiva: This is a rare condition which involves the inferior and nasal bulbar conjunctiva. This is a salmon pink subconjunctival lesion which is poorly vascularised and almost flat.

11) Squamous cell carcinoma of the limbus: It is a rare condition but it is difficult to differentiate compared to other pathologies. Diagnosis is mainly done by histopathology.

TREATMENT:

Progressive pterygium causing visual impairment and cosmetic disfigurement requires treatment. Various methods are tried, medical and surgical to prevent progression or recurrence of pterygium.

Treatment modalities are grouped in two varieties:

1) Medical

2) Surgical

MEDICAL TREATMENT:

From the earliest times medical treatment has been tried and found unsatisfactory and the recent attempts at local medication such as by the application of solid choline chloride (Beard and Dimitry-1945) the topical use of steroids(Vadala-1953) or subconjunctival injection of hyaluronidase (Anastasi-1953).

General recommendations for the prevention of pterygium formation should include the avoidance of exposure to ultra-violet radiation. A survey of patients in Australia disclosed that there was a doubling of risk for pterygium formation associated with never wearing a hat outdoors between the age of 20 and 29 years. Additionally, there was a nine-fold increased risk of pterygium formation if glasses were never worn in the decade before the pterygium developed.

Since the development of pterygium is strongly associated with ultra-violet exposure within the first 5 years of life, parents should be advised to protect their children from ultra-violet exposure, especially if the latitude of residence is within 30 degrees of the equator, and a great deal of time is spent outdoors. Hence, in areas

where exposure is high, the use of ultra-violet absorbing protective spectacles, sunglasses and hats is advisable.

Lateral ocular exposure to incident light can be avoided with the newer wrap around sunglass designs.

Mild irritative symptoms from pterygium may be managed with topical lubricants or a mild topical antihistamine, vasoconstrictor. A mild topical corticosteroid (e.g.Fluorornetholone 0.1 % QID) may be useful for moderate to severe vascular injection and irritative symptomatology.

Secondary dellen may be managed with preservative-free lubricating ointments and temporary patching for 24hours.

SURGICAL TREATMENT:

Various modalities of surgical treatment:

1) Pterygium avulsion

2) Pterygium Evulsion

3) Simple excision with closure of wound

4) Bare sclera Method

5) Mc Reynold's technique

6) Carbolization

7) Pediculate Conjunctival autotransplantation

8) Free conjunctival autografting

9) Limbal conjunctival autograft transplantation

10) Amniotic membrane transplantation

11) Anti mitotic drugs like Mitomycin-C and Thiotepa

12) β-irradiation

Surgery for pterygium is warranted under the following circumstances:[56]

- Loss of visual acuity due to induced astigmatism or encroachment onto the visual axis
- Marked cosmetic deformity
- Marked discomfort and irritation unrelieved by medical treatment
- Limitation of ocular motility secondary to restriction

Various workers have tried various operative techniques from time to time with minute difference to treat pterygium as:

A) EVULSIONS:

A horse hair or flax thread was used as early as seventh century.[57]other methods includes use of squint hooks and corrugated silver wires.[58,59]The suture was passed underneath the body of pterygium and with the sawing motion towards the cornea, the head was dissected from underlying corneal tissue.

B)PTERYGIUM AVULSION:

Avulsing the thin primary pterygium by mechanically shearing off the pterygium head from the underlying cornea with forceps was recommended by Rich to avoid deep lamellar dissections. Advantages with this method are a resultant smooth corneal surface, rapid epithelialization and minimal scarring postoperatiely.[60]

C)EXCISION WITH SIMPLE CLOSURE OF THE WOUND:

Von Arit (1874) used to remove whole of the pterygium shaving away the head of the pterygium from the cornea and the bare sclera is covered by suturing the conjunctival margins.

D)THE BARE SCLERA METHOD:

This technique was introduced by Bookmann (1897) and was perfected later by D'Ombrain (1948). The pterygium head was taken off the cornea by blunt dissection with a No. 15 Bard-Parker blade or a crescent knife. The pterygium was then resected from the underlying sclera. Fibrous adhesions, if any, between the underlying muscle and the pterygium were carefully dissected before the pterygium was excised. Minimal wet field cautery was applied to maintain hemostasis. The corneal and limbal surfaces were smoothed by scraping with a Bard Parker blade. Following excision of the pterygium, the sclera was left bare. D'Ombrain reported no recurrence in seven years, after leaving 4mm zone of perilimbal sclera bare removing the pterygium.

E)TRANSFIXATION(MC REYNOLDS TECHNIQUE):

In these operation, the apex or head of the pterygium after shaving away from the cornea is transplanted into conjunctival fornices sub conjunctivally. Desmarres (1851) transplanted the head into lower fornix, a technique which was perfected by Mc Reynolds and is known after his name.

F) CARBOLIZATION:

Sabri kamel (1946) in Egypt favoured separation of head and neck of pterygium from the cornea and limbus respectively, undermining the body of pterygium and the application of pure carbolic acid to its under surface. The head and neck are than excised and the body of pterygium allowed to fall back on the sclera.

POST OPERATIVE MEASURES TO PREVENT PTERYGIUM RECURRENCE:

In all the above surgical techniques, there are chances of recurrence and as the stallard's book of eye surgery- recurrence follows about 20-30% of the various operations and the surgery of recurrent pterygium in some times both a difficult and serious surgical problem, necessitating the utmost care in dissection in order to avoid penetrating the sclera. It is therefore, utmost important to achieve success with one operation.

To prevent the recurrence rate certain post operative measures have been suggested by different workers:

1) PEDICULATE CONJUNCTIVAL AUTOTRANSPLANTATION:

Czermack (1907) sutured the upper free edge of the limitant conjunctiva to the lower one. Campodonico, after removing the pterygium, covered the bare area with a flap of inferior conjunctiva which was sutured to the upper denuded sclera. Arruga dissected the conjunctiva between the superolateral limbus and the insertion of the superior rectus muscle and dragged it over the bare sclera. There are many variants of this technique.

2)FREE CONJUNCTIVAL AUTOGRAFTING:

Some surgeons have transplanted free autologous conjunctiva taken from the operated eye or from the contralateral one. According to Prabhasawat et al the addition of free autologous conjunctiva had the recurrence of 4.8%

MECHANISM OF ACTION:

Conjunctival autograft taken from the superotemporal bulbar conjunctiva provides less actinically exposed conjunctiva with intact basement membrane, goblet cells and epithelium adjacent to the limbus which acts as a barrier and prevents migration of actinically injured bulbar conjunctiva of nasal aspect of palpebral aperture.

ADVANTAGES OF CONJUNCTIVAL AUTOGRAFT TRANSPLANTATION:

1) Offers anatomical and physiological restoration of ocular surface

2) Reduces recurrence rate

3) Useful in both the advanced and recurrent pterygium

4) Does not require additional surgical skills/instrumentation

5) Technically straight forward

6) Simple procedure within the grasp of anterior segment surgeon

7) Avoids serious complications of antimitotic agents or beta irradiation

8) In view of structural stability of conjunctival aytografts and absence of progressive shrinkage and scarring, it is excellent for restoration of ocular motility and reconstruction fornix

9) It doesnot require any special post operative care.

COMPLICATIONS:

OPERATIVE:

a) Thick graft

b) Incorrect graft placement

c) Graft orientation

d) Inadequate graft size

e) Poor quality of graft

f) Excessive surgical manipulation

POST OPERATIVE:

a) Graft oedema

b) Graft necrosis

c) Graft retraction

d) Granuloma formation

f) Corneo sclera dellen

g) Haematoma

h) Symblepharon

i) Epithelial cysts

j) Recurrence

3) LIMBAL CONJUNCTIVAL AUTOGRAFT(LCAG) TRANSPLANTATION:

Recent understanding of the role of limbal stem cells has led to the development of concept for the pathogenesis of pterygium. Based on these concept limbal transplants are harvested from superotemporal quadrant. The understanding of their relative good results began when Davanger et al (1979) suggested that limbal structure is the bed of the corneal epithelial stem cells. Shimazaki et al(1996) had shown 90.9% success rate.

Harvesting of the LCAG was similar to the CAG in all respects except that on reaching the limbus, the tissue was reflected onto the cornea and the dissection was continued 0.5mm beyond the limbus. The donor tissue was excised and slid onto the recipient bed ensuring accurate orientation of the limbal edge of the graft with the limbus

4)MUCOUS MEMBRANE GRAFTS AND SKIN GRAFTS:

Other grafting substances included buccal mucous membrane, skin taken from the flexor surface of the forearm, behind the ear, or from the redundant skin of the upper lid.

In cases in which sufficient conjunctiva is not available for a pedicle graft, Trivedi et al recommended the use of a mucous membrane graft from the lower lip after a pterygium excision.

Wrong reported that a split thickness skin graft decreases the incidence of recurrences in cases of secondary recurrent pterygium and presents an acceptable "white" eye post operatively. Post-operative appearances show a "white" patch in the area of the previously excised pterygium.

The cosmetic appearance of skin grafting does not approach the excellent results achieved by conjunctival rotational flaps or autograft. Based on the paucity of reports using skin grafts, the technique has not gained widespread acceptance in the treatment of pterygium

CHEMOTHERAPY:

1)EXCISION FOLLOWED BY MITOMYCIN-C APPLICATION:

Kurritoma N and Moris (1963) studied the role of mitomycin-C in the treatment of pterygium.

MECHANISM OF ACTION:

Mitomycin-C is an antibiotic-anti neoplatic agent which was isolated from the fermentation filtrate of streptomyces caespitosus. It selectively inhibits the synthesis of DNA, cellular RNA and protein and prevents cellular division and duplication. It has been used intraoperatively to prevent fibroblast proliferation and recurrence after pterygium surgery.

Although postoperative topical mitomycin-C therapy has proved to be a simple and effective method to prevent recurrence, it causes a variety of complications.

COMPLICATIONS:

1) Sclera Ulceration, Necrosis And Calcification

2) Secondary Glaucoma,

3) Corneal Perforation

4) Cataract

5) Iritis

6) Infection

7) Irreversible Damage To Limbal Stem Cells Have Been Reported.

8) Photophobia And Pain

2)THIOTEPA:

The nitrogen mustard analog thiotepa, N, N', N''triethylene thiophosphoramide, has been advocated as an adjunctive measure to reduce the post-operative recurrence of pterygium since 1962.

Thiotepa is an alkylating agent that interferes with normal mitosis and cell division in all rapidly proliferating tissues. It was postulated that thiotepa reduced the recurrence of pterygium by inhibiting vascular endothelial proliferation at the operative site.

Common recommended form is to mix 15 mg of thiotepa in 30 ml of Ringer's solution for a final dilution of 1:2000 strength. The patient uses the medication topically every 3 hours during the day starting 2 days postoperatively for a total of 6 – 8 weeks time.

While no systemic toxicity of topical thiotepa therapy has been reported, complications reported include early and late onset poliosis and periorbital skin depigmentation that can be permanent (especially in darkly pigmented patients), prolonged conjunctival injection, irritation, epithelial toxicity leading to delayed epithelialization of the cornea,conjunctival deposition of black pigment, allergic reactions and scleral perforation.

Sun exposure during therapy was suggested as a contributing factor in the skin and lash depigmentation. The periorbital skin depigmentation has been cited, as the major

reason thiotepa has not gained widespread acceptance in the post-operative treatment of pterygium.

RADIATION THERAPY:

1)BETA IRRADIATION:

Recurrence rates after pterygium excision with beta irradiation have varied widely with a low of 0.8% to a high of 80% reported in literature.

The mechanism of action of beta irradiation in reducing recurrences is thought to be through the inhibition of mitosis in rapidly dividing cells such as vascular endothelial cells.

The optimal dose is between 1000 and 3000 rad given at the time of surgery or within a few days after surgery. Applying the beta irradiation at the time of surgery may also help in better control and localization of the treatment and may save the patient additional time and expense.

Complications following beta irradiation include:

- Scleral necrosis/scleromalacia
- Pseudomonas endophthalmitis secondary to scleral necrosis
- Radiation-induced cataract
- Epithelial defects/corneal thinning/corneal ulcers/pseudomonas keratitis
- Symblepharon

RECENT ADVANCES IN PTERYGIUM SURGERY:

1)CONJUNCTIVAL AUTOGRAFT WITH FIBRIN GLUE:

Tissue adhesives such as Tisseel fibrin glue are alternative means for attaching conjunctival grafts. Several recent studies compared the use of tissue adhesives with

sutures to attach conjunctival grafts and found that the use of tissue glue was associated with shorter surgery time, reduced postoperative discomfort, and lower recurrence rate compared with sutures

Shehadeh-Mashor R et al found a recurrence rate of 3.5% that compares very favorably with recurrence rates reported in the literature in cases where the recurrent pterygium was treated with a sutured conjunctival graft .

In a retrospective study, Koranyi et al. demonstrated a pterygium recurrence rate of 5.3% with glue versus 13.5% with sutures. The authors suggested that immediate adherence of the graft and the lack of postoperative inflammation may inhibit fibroblast in growth and reduce recurrence. Bahar et al. showed that the use of fibrin glue was associated with a significantly shorter operative time and greater patient acceptance compared with using sutures. The major concerns that need to be addressed include the cost of Tisseel and the potential risk of transmitted infection.

2)CONJUNCTIVAL AUTOGRAFTING WITHOUT FIBRIN GLUE OR SUTURES :

In this technique patients own blood is used to adhere the graft which acts as a bio adhesive in treating pterygium after surgical excision. There was no difference between the recurrence rates with and without the glue and their was higher rates of graft displacement and retraction with the use of autologous blood

MATERIALS AND METHODS

1)SOURCE OF DATA:

This prospective study included 80 eyes fulfilling the inclusion criteria selected from the outpatient department at R.L.J. HOSPITAL AND RESEARCH CENTRE, attached to SRI DEVARAJ URS MEDICAL COLLEGE, TAMAKA, KOLAR between December 2011 and July 2013.

Inclusion criteria:

a) Progressive pterygium

Exclusion criteria:

a) Recurrent pterygium
b) Pterygium associated with ocular inflammatory disorders
c) Atrophic pterygium

2) METHOD OF COLLECTION OF DATA:

80 eyes fulfilling the inclusion criteria were included in this study. After taking brief clinical history and general physical examination, patients underwent detailed ophthalmic examination including snellen's chart visual acuity, slit lamp biomicroscopic examination, extra ocular movements, intra ocular tension using applanation tonometry, retinoscopy and dilated fundoscopy.

Preoperatively, the detailed study of pterygium was done in terms of pterygium vascularity, extension, dimensions, depth of invasion, tear film integrity and distortion of corneal mires in keratometry. The condition of superotemporal

conjunctiva in patients undergoing excision with conjunctival autograft was also looked for.

Topical Ciprofloxacin0.3% eye drops is advised to be instilled 6 times a day on the day before surgery and 1 hourly on the day of surgery. Oral Ciprofloxacin 500mg is prescribed 2 times a day starting from a day prior to surgery which was continued for 4days post operatively.

All the patients were divided randomly into two groups:

GROUP-A: Included 40 eyes, pterygium excision was done followed by intra operative application of 0.02% mitomycin-C for 3 minutes.

GROUP-B: Included 40 eyes, pterygium excision followed by conjunctival autografting.

Informed consent was obtained from all the cases. All the surgeries were done under peribulbar block.

Xylocaine test dose was given.

OPERATION TECHNIQUE:

PTERYGIUM EXCISION:

All procedures were performed under Peribulbar anaesthesia with 2% lignocaine (Xylocaine) containing 1:1,00,000 adrenaline (epinephrine) with all aseptic precautions. The head of the pterygium was first separated at the apex and dissected towards the limbus with spring scissors. After excising the head and most of the body, Tenon's and subconjunctival fibrovascular tissue were separated from the overlying conjunctiva, undermined and excised extensively upward and downward towards the fornices and medially towards, but not reaching the caruncle, caution was taken not to

damage the medial rectus. Cautery was gently applied to bleeding vessels. Residual fibrovascular tissue over the cornea was detached using toothed forceps or by gentle scraping with a No.15 surgical blade.

IN GROUP-A: Following pterygium excision, 2mg of mitomycin-C is diluted by adding 10ml of distilled water, 1ml of this solution is diluted with 9ml of distilled water to prepare the concentration of 0.02% of mitomycin-C. This mitomycin-C 0.02% is applied on the bare sclera for 3 minutes by using surgical sponge. The site was then thoroughly irrigated with Ringer lactate.

IN GROUP-B: Following pterygium excision, the size of the conjunctival graft required to resurface the exposed scleral surface was determined using Castroviejo calipers in 3 directions - extent across the limbus, maximum circumferential extent of the bed, and the maximum distance from the limbus. The eyeball was rotated down and an area of the superior bulbar conjunctiva adjacent to the limbus was exposed. The measured dimensions were marked onto the superotemporal conjunctiva using marker. Using a Pierse-Hoskins forceps and Westcott scissors, the conjunctiva was dissected without the Tenon's capsule starting at the forniceal end measuring 1 mm greater than the dimensions of bare sclera. The limbal tissue was not included.

Care was taken to obtain as thin a graft as possible without button-holing. Careful hemostasis of the exposed scleral surface was done using bipolar cautery. Once the limbus was reached, the graft was flipped over onto the cornea and the Tenon's attachments at the limbus were meticulously dissected. The flap was then excised using a Vannas scissors.

The autograft was slid into place over the bare sclera in its correct limbus-limbus anatomical orientation. The position of the graft was secured using interrupted 10-0 nylon sutures (The four corners of the graft were anchored with episcleral bites to

maintain position). Extra sutures were applied, depending on the size of the graft and the defect. The medial edge of the graft was sutured with 2-4 additional sutures, preferably including episclera.

Post operatively, patients were put on steroid and antibiotic drops 6 times daily for 1 month with gradual tapering.

Patients were followed upon 1day, 1week, 1month, 3months and 6months post operatively for any recurrence and complications.

We assessed the proportion of recurrences in each group. The difference in proportion of recurrence was tested by using chi-square test.

STATISTICAL ANALYSIS

Demographic data were expressed as Mean±Standard deviation and analysed using descriptive statistics. Proportion of recurrences were assessed in both the groups and difference in proportion of recurrence was compared using Chi square test (Epi info 2.3 version) with a chi square value of 2.22 and P-value of 0.13.

OBSERVATIONS AND RESULTS

A randomized, prospective comparative study of Mitomycin-C versus Conjunctival autografting following pterygium excision was conducted at R.L.Jalappa Hospital attached to Sri Devaraj Urs Medical College. 80 cases were studied, of which 40 cases underwent pterygium excision with intra operative Mitomycin-C 0.02% application and remaining 40 cases underwent pterygium excision with conjunctival autografting.

The following are the observations made in our study:

1)AGE DISTRIBUTION:

Table-1: Showing age distribution

AGE GROUP	GROUP-A		GROUP-B		TOTAL
	NO.(40)	%	NO.(40)	%	
<20	0	0%	02	5%	5%
21-30	04	10%	04	10%	10%
31-40	09	22.5%	09	22.5%	22.5%
41-50	07	17.5%	08	20%	18.75%
51-60	15	37.5%	07	17.5%	27.5%
61-70	05	12.5%	10	25%	18.75%
TOTAL	40	100%	40	100%	100%
MEAN±SD	49.1±12.37		47.9±15.18		

P-VALUE-0.69

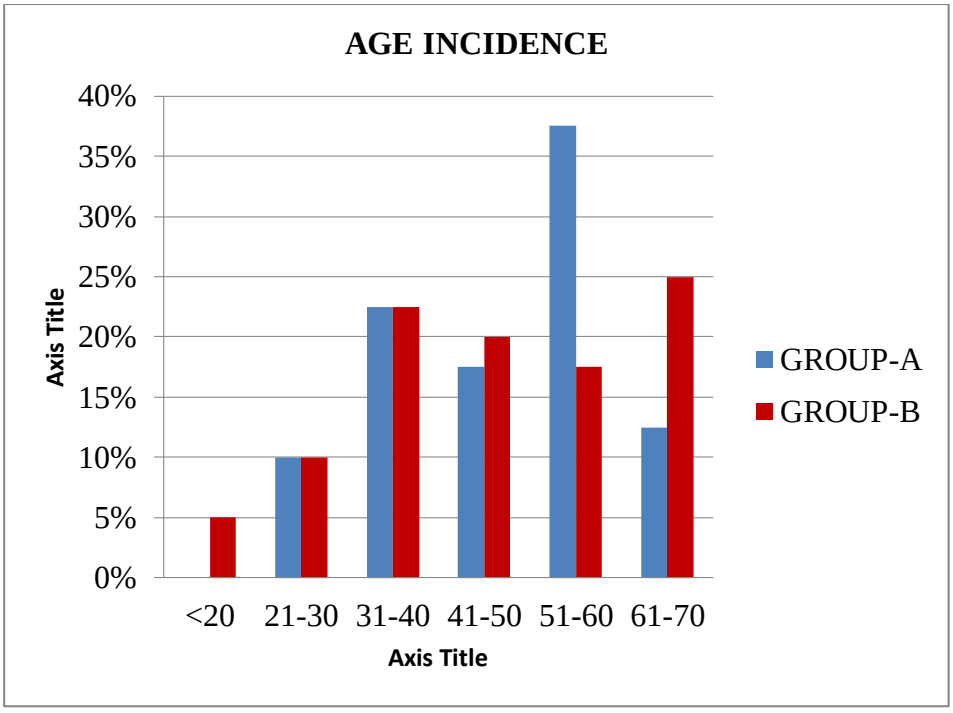


CHART-1: AGE DISTRIBUTION

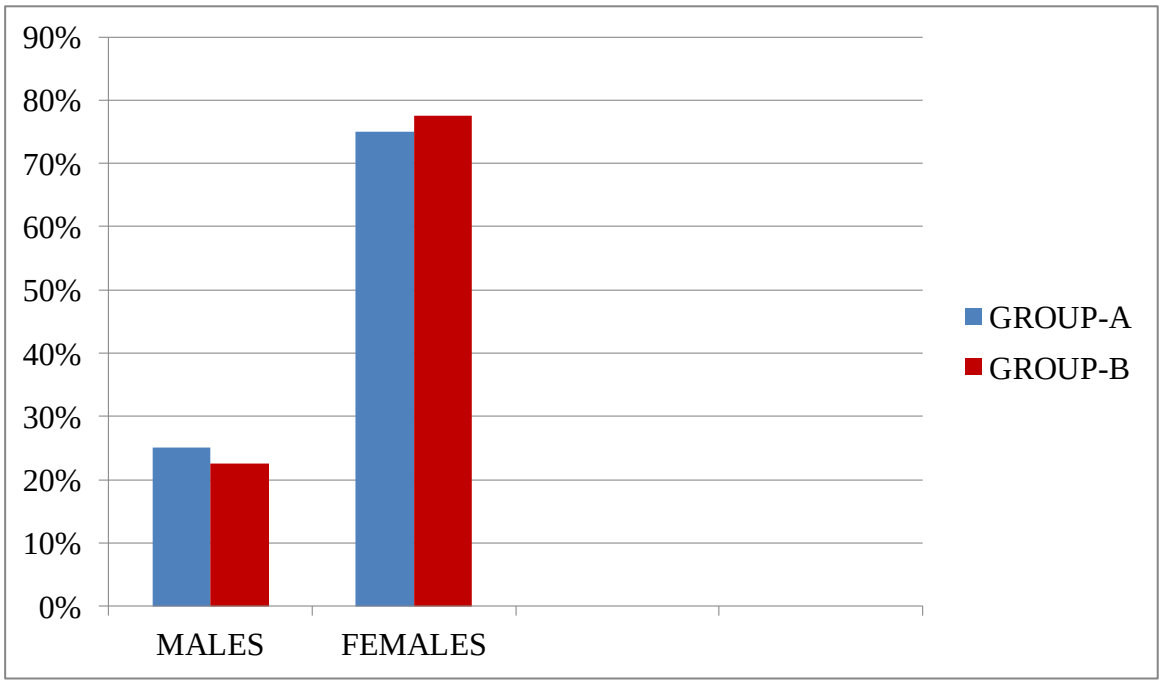
In our study, among 80 patients including both the groups, 22 patients (27.5%) were in the age group of 51-60 years, 18 patients(22.5%) in the age group of 31-40 years, 15 patients(18.75%) were in the age group of 61-70 and 41-50 years, 8 patients (10%) in the age group of 21-30 years and 2 patients(5%) in the age group of less than 20years.

2)SEX DISTRIBUTION:

Table-2: Showing Sex Distribution

SEX	GROUP-A		GROUP-B		TOTAL
	NO.(40)	%	NO.(40)	%	
MALE	10	25%	09	22.5%	23.75%
FEMALE	30	75%	31	77.5%	76.25%
TOTAL	40	100%	40	100%	100%

CHART-2:GENDER DISTRIBUTION



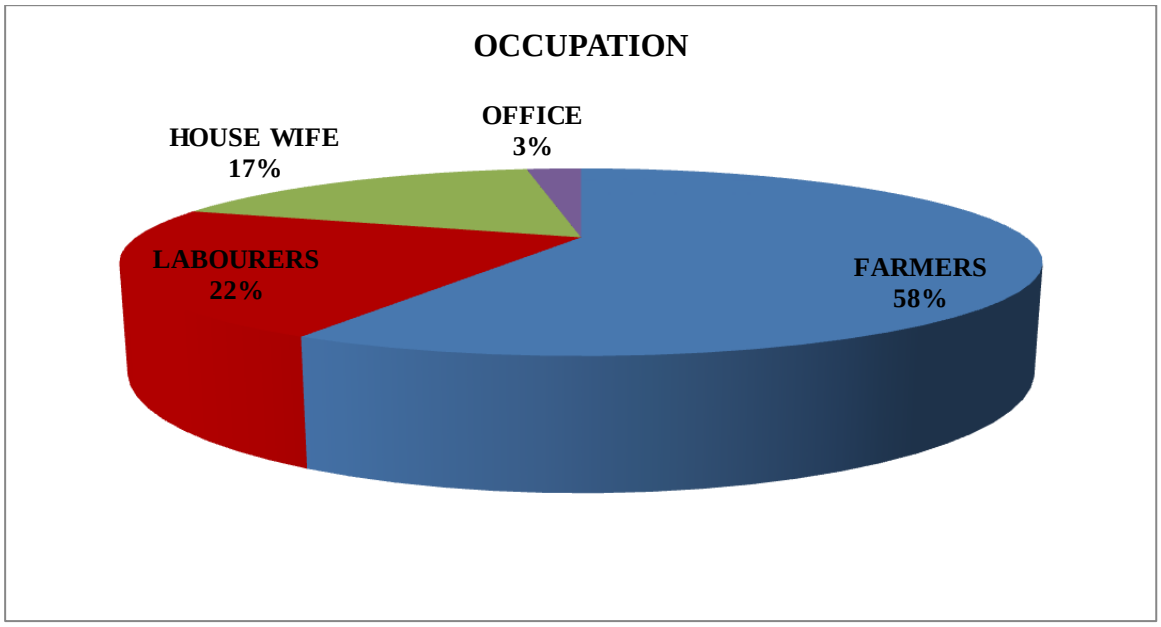
In our study, in group-A among 40 patients, 10 patients (25%) were males and 30 patients (75%) were females. In Group-B among 40 patients, 9 patients (22.5%) were males and 31 patients (77.5%) were females.

3) OCCUPATION:

Table-3: Showing effect of occupation

OCCUPATION	GROUP-A		GROUP-B		TOTAL
	NO.(40)	%	NO.(40)	%	
FARMERS	24	60%	23	57.5%	58.75%
LABOURERS	10	25%	08	20%	22.5%
HOUSEWIVES	06	15%	08	20%	17.5%
OFFICE	00	0	01	2.5%	2.5%
TOTAL	40	100%	40	100%	100%

CHART-3: EFFECT OF OCCUPATION



In our study, among 80 patients including both the groups, 48 patients (58.75%) were farmers, 18 patients (22.5%) were labourers, 14 patients were(17.5%) housewives and 1 patient(2.5%) was office worker

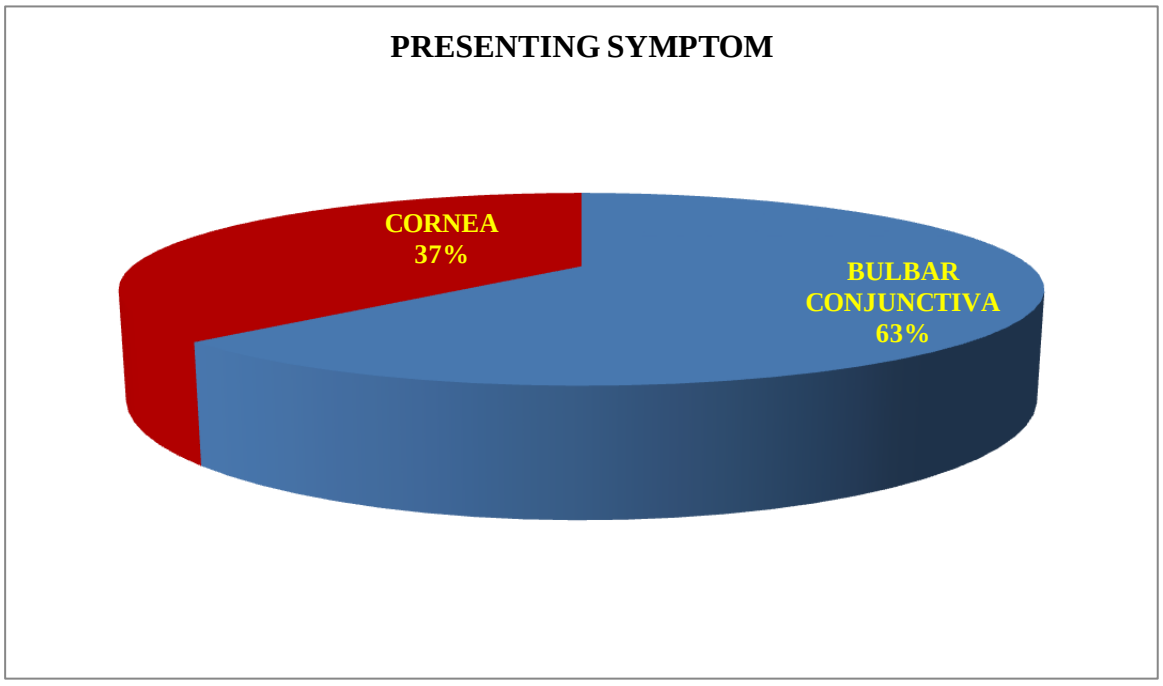
4) PRESENTING SYMPTOM:

The commonest presenting symptom in both the groups is growth over bulbar conjunctiva (62.75%) and remaining with growth over the cornea (37.25%).

Table-4: Showing incidence of presenting symptom

SYMPTOM	GROUP-A		GROUP-B		TOTAL
	NO.(40)	%	NO.(40)	%	
Growth over bulbar conjunctiva	24	60%	31	77.5%	62.75%
Growth over cornea	16	40%	09	22.5%	37.25%
TOTAL	40	100%	40	100%	100%

CHART-4:PRESENTING SYMPTOM



5) DURATION OF SYMPTOM:

Table-5: Showing duration of symptom

DURATION IN YEARS	GROUP-A		GROUP-B		TOTAL
	NO.(40)	%	NO.(40)	%	
0-1	09	22.5%	14	35%	28.75%
1-2	22	55%	18	45%	50%
2-3	06	15%	05	12.5%	13.75%
3-4	03	7.5%	03	7.5%	7.5%
TOTAL	40	100%	40	100%	100%

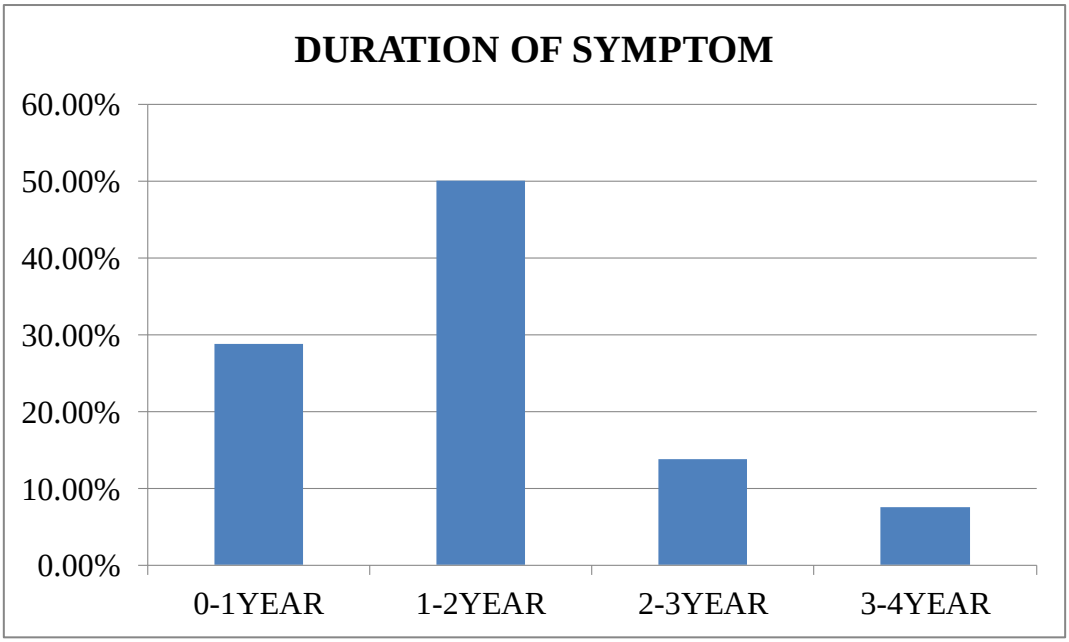


CHART-5:DURATION OF SYMPTOM

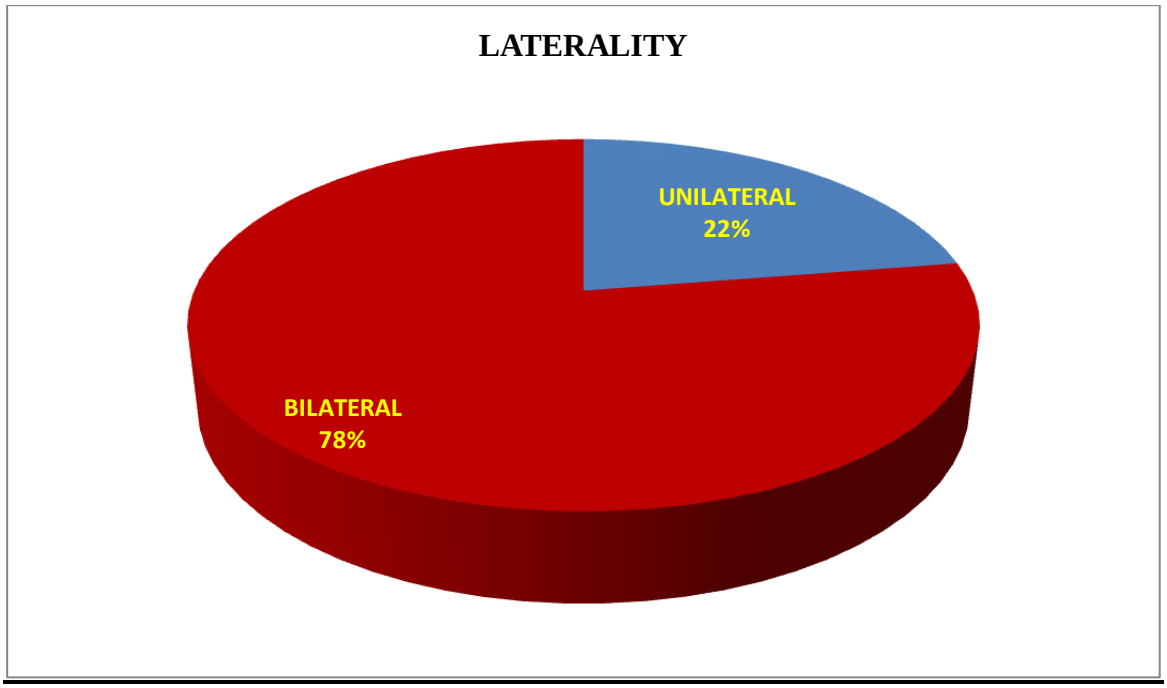
In our study, among 80 patients in both the groups, 40 patients (50%) presented to us within the second year, 23 patients (28.75%) presented within first year, 11 patients (13.75%) presented within third year and 6 patients (7.5%) within fourth year of appearance of growth of pterygium.

6)LATERALITY OF PTERYGIUM:

Table-6:Laterality of pterygium

LATERALITY	GROUP-A		GROUP-B		TOTAL
	NO.(40)	%	NO.(40)	%	
UNILATERAL	11	27.5%	07	17.5%	22.5%
BILATERAL	29	72.5%	33	82.5%	77.5%
TOTAL	40	100%	40	100%	100%

CHART-6:LATERALITY OF PTERYGIUM



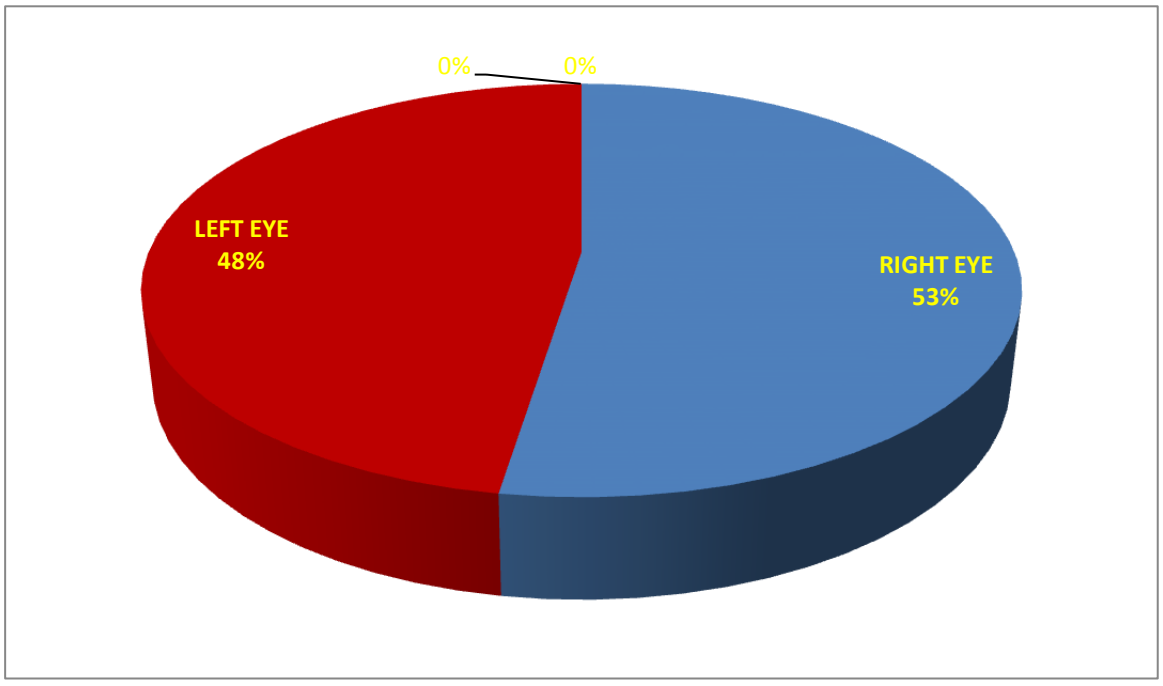
In our study, in group-A among 40 patients, 11 (27.5%) had unilateral pterygium and 29 patients (72.5%) had bilateral pterygium. In Group-B among 40 patients, 7 patients (17.5%) had unilateral pterygium and 33 patients (82.5%) had bilateral pterygium.

7) EYE TO BE OPERATED:

Table-7:EYE TO BE OPERATED

SIDE	GROUP-A		GROUP-B		TOTAL
	NO.(40)	%	NO.(40)	%	
RIGHT EYE	21	52.5%	21	52.5%	52.5%
LEFT EYE	19	47.5%	19	47.5%	47.5%
TOTAL	40	100%	40	100%	100%

CHART-7:EYE TO BE OPERATED



In our study, in Group-A among 40 patients, 21 patients (52.5%) got operated in right eye and 19 patients (47.5%) in left eye. In Group-B among 40 patients, 21(52.5%) got operated in right eye and 19 patients (47.5%) in left eye.

8)RECURRENCE OF PTERYGIUM:

Table-8: Comparison of recurrence between two groups

RECURRENCE RATE NOTED				
	GROUP-A(Excision with MMC)		GROUP-B(Excision with CAG)	
	NO (40)	%	NO (40).	%
1DAY	0	0%	0	0%
1WEEK	0	0%	0	0%
1MONTH	01	2.5%	0	0%
3MONTHS	03	7.5%	0	0%
6MONTHS	02	5%	02	5%
TOTAL	06	15%	2	5%

P VALUE-0.13

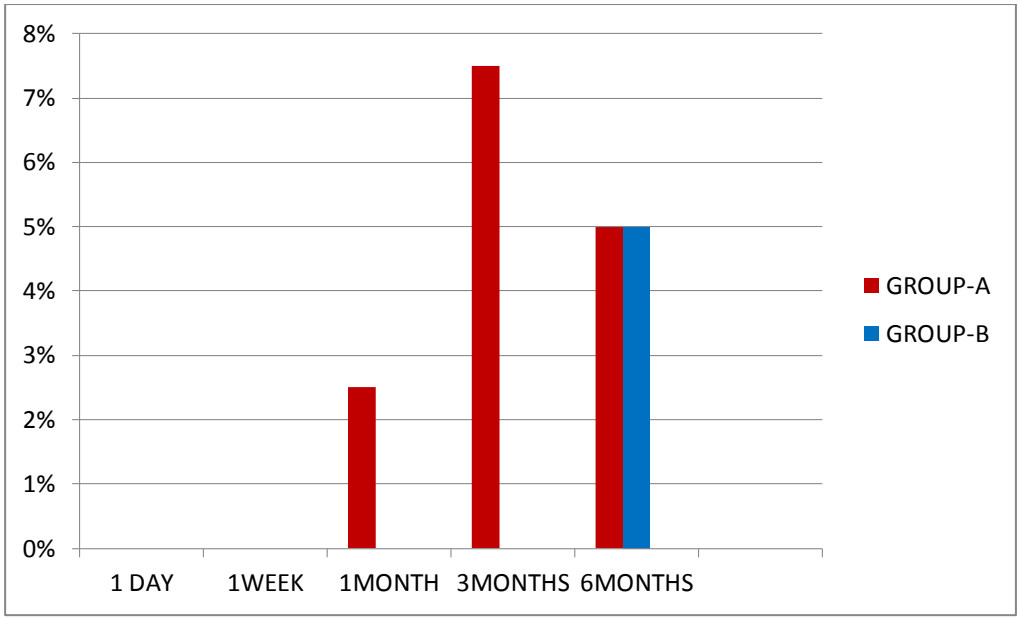


CHART-8: COMPARISON OF RECURRENCE OF PTERYGIUM

In our study, in group-A among 40 patients, 1 patient (2.5%) had recurrence at 1 month, 3 patients (7.5%) had recurrence at 3 months and 2 patients (5%) had recurrence at 6months follow up period. In Group-B among 40 patients, 2 patients (5%) had recurrence at 6 months follow up period.

9) COMPLICATIONS:

Table-9: Complications noted

COMPLICATIONS	GROUP-A		GROUP-B	
	NO(40)	%	NO(40)	%
Superficial Punctate Keratitis	12	30%	-	-
Scleromalacia	-	-	-	-
Symblepharon	-	-	-	-
Conjunctival cyst	-	-	-	-
Granuloma	-	-	02	5%
Graft edema	-	-	05	12.5%
Graft rejection	-	-	-	-
Distortion of the graft	-	-	03	7.5%
Others	-	-	-	-

In our study, in Group-A among 40 patients, 12 patients (30%) developed superficial punctuate keratitis. In Group-B among 40 patients, 2 patients (5%) had developed granuloma and 5 patients(12.5%) had developed graft edema and 3 patients(7.5%) had developed distortion of the graft.

DISCUSSION

There have been many attempts to optimize Pterygium surgery. Today a wide variety of techniques are in use. The aim is to excise the Pterygium and prevent its recurrence. The ideal surgery should have a low recurrence rate, minimal complications and cosmetically acceptable. Free conjunctival autografting and intra operative Mitomycin-C application following pterygium excision were found to have less recurrence rate of 5.3% and 10.5% respectively[60,61] and minimum complications compared to other techniques.

The risk factors for pterygium include geographic location[62], age[63] and morphology of pterygium[64]

According to Cameron (1965), Young Son (1970), Pterygium affects preferentially adults over middle age. The highest incidence is in fourth decade. In a study conducted by Dr. Meenakshi et al Showed that 87.5% were above the age of 40 years. Another study conducted by Dr. Rao SK. et al showed that 56.98%were above the age of 40 years, Chen et al[67] showed that 45.6% ,Lewallen et al[63] 37.4% and Singh et al 36.7%. As shown in **Table-1**, Present study showed that 65%were above the age of 40.

Table-10: comparison of age distribution with other studies

STUDY	AGE INCIDENCE(>40years)
Meenakshi et al	87.5%
Dr.Rao SK et al[68]	56.98%
Chen et al[67]	45.6%
Lewallen et al[63]	37.4%
Singh et al	36.7%

Pterygium is more often seen in men than in women This is attributed to the fact that males are exposed to dust and environmental irritants more than women. As shown in **Table-2**, In the present study compared to males (23.75%) females showed increased incidence (76.25) of occurance of pterygium. It coincides with various studies given below:

Table-11:Comparison of Sex distribution with other studies

STUDY	SEX INCIDENCE	
	MALES	FEMALES
Chen et al[67]	45.3	54.7
Lewallen et al[63]	38.2	61.8
Sing G et al[70]	43.8	56.3
Our study	23.75	76.25

Occupation plays a major role in occurance of pterygium. As shown in **Table-3**, In the present study maximum number of patients were farmers (58.75%) followed by labourers (22.5%), housewives (17.5%) and least in office workers(2.5%). The highest incidence among farmers and labourers can be attributed to the dry, sunny and dusty environmental factors to which they are constantly exposed while working for their livelihood. This is in accordance with the findings of Doherty (1941), Descamps (1951), Tabot (1948), Elliot (1961) and Rasool [4](2010) who claimed that dust, wind , dryness and U.V rays are the most important factors in the causation of pterygium.

In the present study all cases had nasal pterygium (100%). The nasal affinity of the Pterygium was attributed to the following factors. Sparseness of the subconjutival tissue in the temporal region. The temporal region is exposed to lesser extent to UV

radiation due to greater amount of bowing of outer 2/3 of the upper lid. The studies coinciding with our studies include:

Table-12: Comparison of laterality of pterygium with other studies

STUDY	LATERALITY
Dr. Gnana Murthy et al	97%
Rasool et al[4]	76%
Mikaniki et al[24]	100%

Majority of the patients in this study presented with a complaint of growth on the inner side of the eye and many of them complained about the cosmetic problem caused by this growth. These findings correlate well with the view of many authors that pterygium does not produce many symptoms in the early stages and majority of the patients are either worried about the growth and consulted the doctor for cosmetic problem or encroachment over cornea.

As shown in **Table-5**, In our study most of the patients reported the disease within 2years of the onset of the disease (50%) while (13.75%) within 3years of onset of disease. It may differ variably depending from patient to patient but majority is seen to report it early for cosmetic reasons.

There is no definite predilection to which eye is affected most. As shown in **Table-7**, In the present study, right eye (52.5%) is affected more than the left eye (47.5%) and as shown in **Table-6** it was bilateral (77.5%) in majority of the cases than unilateral(22.5%) involvement.

As shown in **Table-9**, In the follow up period, in Mitomycin group, 12 patients came back with superficial punctuate keratitis (30%) Among them 2 patients during 1 week,8 patients during 1month and 2 patients during 3months follow up period and 8

patients with lacrimation and photophobia(20%), 2 during 1 week, 4 during 1 month and 2 during 3 months follow up period. All the complications were resolved by 6 months follow up time. This correlates with the study done by various authors:

Table-13: Comparison of complications in MMC group with other studies

COMPLICATION	STUDY	NO. OF EYES(%)
Superficial punctuate keratitis	Mutlu FM et al[28]	40%
	Our study	30%

In conjunctival autograft group, 5 patients (12.5%) had graft edema, 1 during 1 week, 4 during 1 month follow up period which had resolved with topical anti inflammatory drugs by 3 months. 3 patients (7.5%) had distortion of the graft on 1st day post operative period which had been resutured. 2 patients (5%) had granuloma, 1 during 1week and other during 1 month follow up period which had resolved with topical steroid drops by the end of 3 months.

This correlates with the study done by various authors**:**

Table-14:Comparison of complications in CAG group

COMPLICATION	STUDY	NO. OF EYES(%)
Graft edema	Mutlu FM et al[28]	100%
	Nazullah et al[27]	6.7%
	Our study	12.5%
Granuloma	Nazullah et al[27]	13.3%
	Mutlu FM et al[28]	12.1%
	Wong VA et al[23]	8.9%
	Our study	5%

RECURRENCE RATE:

As shown in **Table-8,** In MMC group, 6 cases (15%) had shown recurrence.1 case at1month, 3 cases at 3months and 2 cases at 6 months follow up. In CAG group, 2 cases (5%) had shown recurrence at 6 months follow up period. In our study there is no statistical significance between the two groups with a p value of 0.13.

Recurrence rate observed by various studies as follows:

1)Recurrence rate with MMC:

Table-15:Comparison of Recurrence rate in MMC group with other studies

STUDY	YEAR	RECURRENCE (%)
Frucht- Pery J et al[65]	1994	3.3%
Chen et al[67]	1995	38%
Manning et al[61]	1997	10.5%
Young AL et al[69]	2004	15.9%
Mikaniki et al[24]	2007	1%
Narsani A K et al[26]	2008	19%

2) Recurrence rate with CAG:

Table-16:Comparison of recurrence rate in CAG group with other studies

STUDY	YEAR	RECURRENCE (%)
Kenyon et al	1985	5.3%
Lewallen et al[63]	1998	21%
De Keizer et al	2001	6.6%
Fahmi et al[66]	2005	13.3%
Fernandes M et al[19]	2005	12.2%
Narsani AK et al[26]	2008	5.7%
Rasool AU et al[4]	2010	10%

CONCLUSION

From the above study, it can be concluded that the recurrence rate of pterygium is more with the application of intra operative Mitomycin-C 0.02% for 3minutes (15%) after pterygium excision compared to pterygium excision with Conjunctival autografting (5%).

Complications like superficial punctuate keratitis were encountered with Mitomycin-C application and Graft oedema, Granuloma formation and distortion of the graft were encountered in conjunctival autograft group. No intraoperative complications are noted

Hence, as minimal complications were noted in both the groups but recurrence rate is less in Conjunctival autograft group, pterygium excision with conjunctival autografting is an efficient procedure.

SUMMARY

The present study titled "A comparative study of Mitomycin-C versus Conjunctival Autograft following pterygium excision" was conducted at R.L.Jalappa Hospital and Research Centre attached to Sri Devaraj Urs Medical College, Kolar from December 2011 to July 2013. This study included 80 cases, 40 of whom were randomly picked for intraoperative Mitomycin-C application and Conjunctival autografting following pterygium excision. The demographic data like age and sex were noted, recurrence rate between the two groups were compared and the complications in the two groups were noted.

From the present study, it is concluded that,

1) Pterygium is less commonly seen in the age group below 20years (5%) and gradually rises to a maximum during fifth decade (27.5%) and then declines after fifth decade. In our study, pterygium was seen more commonly among females (76.25%) than males (23.75).

2) Environmental irritants like dust, heat and UV radiation are the main etiological factors. Most of the pterygium are present on nasal side compared to temporal side may be due to more exposure to environmental irritants.

3) The recurrence of pterygium with intra operative Mitomycin-C 0.02% for 3minutes (15%) is maximum and least with conjunctival autografting (5%).

4) Minor complications superficial punctuate keratitis were encountered with Mitomycin-C application and Graft oedema, Granuloma formation and distortion of the graft were encountered in conjunctival autograft group

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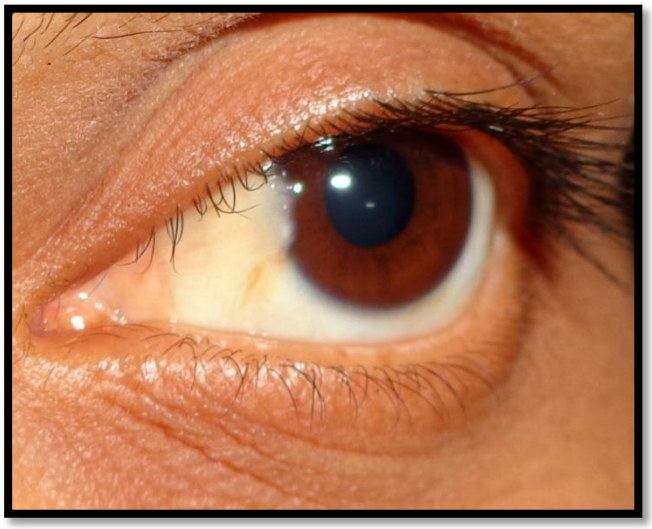
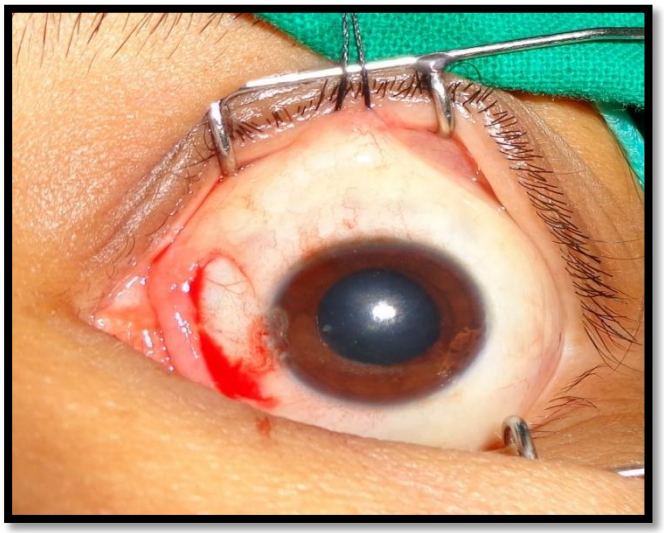
ANNEXURE-I

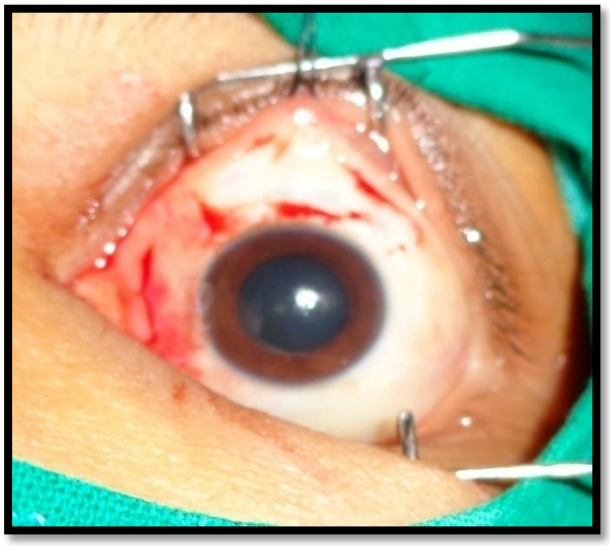
PHOTOGRAPH-1- Preoperative Progressive Pterygium



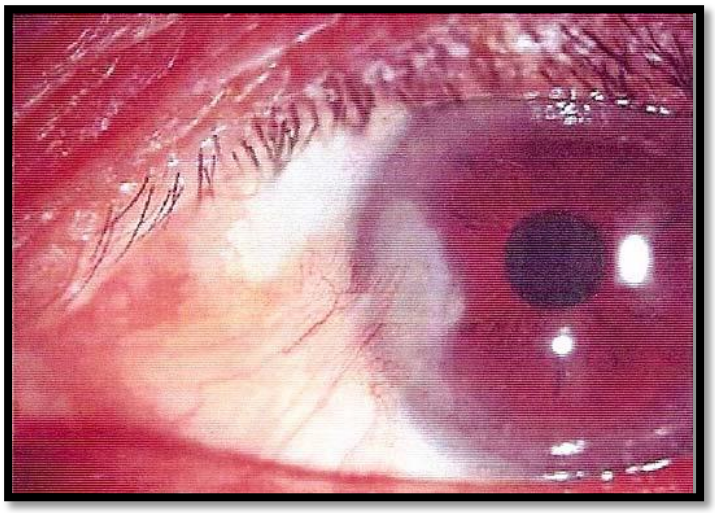
PHOTOGRAPH-2: Intra Operative Photo After Pterygium Excision



PHOTOGRAPH-3: Intraoperative Photo After Graft Placement



PHOTOGRAPH-4: Recurrent Pterygium



ANNEXURE-II

PROFORMA

NAME: OCCUPATION:

AGE: HOSP.NO:

SEX: D.O.A:

ADDRESS: D.O.D:

CHIEF COMPLAINTS:

HOPI:

PAST HISTORY:

FAMILY/PERSONAL HISTORY:

GENERAL PHYSICAL EXAMINATION:

Pulse Rate: Pallor: Cyanosis:

Blood Pressure: Icterus: Edema:

Temperature: Cyanosis:

Respiratory rate: Lymphadenopathy:

SYSTEMIC EXAMINATION:

C.V.S: C.N.S

RS: P/A:

OCULAR EXAMINATION:

HEAD POSTURE:

OCULAR POSTURE:

	RE	LE
PERIORBITAL REGION		
EYELIDS AND EYE LASHES		
ORBITAL RIM		
LACRIMAL APPARATUS		
CONJUNCTIVA		
CORNEA		
ANTERIOR CHAMBER		
IRIS		
PUPIL		
LENS		
VISION		
FUNDUS		
SYRINGING		
I.O.T		

KERATOMETRY:

K1-

K2-

AUTO REFRACTOMETRY:

SPECIFIC EXAMINATION FOR PTERYGIUM:

SIDE	RE/LE	
POSITION	NASAL/TEMPORAL/DOUBLE	
EXTENT FROM CARUNCLE	NEAR LIMBUS/ADVANCED OVER CORNEA	

Type of surgery: MMC/ CAG

POST OPERATIVE:

Subsequent follow up:

RECURRENCE RATE NOTED				
	GROUP-A(Excision with MMC)		GROUP-B(Excision with CAG)	
1DAY				
1WEEK				
1MONTH				
3MONTHS				
6MONTHS				
TOTAL				

COMPLICATIONS NOTED:

MITOMYCIN-C					
	1DAY	1WEEK	1MONTH	3MONTHS	6MONTHS
SPK					
SCLEROMALACIA					
CONJUNCTIVAL CYST					
SYMBLEPHARON					
OTHERS					

CONJUNCTIVAL AUTOGRAFTING					
	1DAY	1WEEK	1MONTH	3MONTHS	6MONTHS
GRANULOMA					
GRAFT FAILURE					
GRAFT EDEMA					
DISTORTION OF GRAFT					
OTHERS					

ANNEXURE III MASTER CHART

S.NO	NAME	AGE	SEX	OCCUPATION	HOS. NO.	DIAGNOSIS	EYE TO BE OPERATED	PROCEDURE	RECURRENCE	COMPLICATIONS
1	ROJA	40	F	LABOURER	776867	PTERYGIUM(BE)	LE	EX WITH MMC	NIL	NIL
2	NARAYANAMMA	55	F	FARMER	775457	PTERYGIUM(BE)	LE	EX WITH MMC	PRESENT	SPK
3	GANGARATHNAMMA	50	F	HOUSE WIFE	784660	PTERYGIUM(LE)	LE	EX WITH MMC	NIL	NIL
4	THIMMAKKA	55	F	FARMER	789589	PTERYGIUM(BE)	LE	EX WITH MMC	NIL	NIL
5	LAXMIDEVAMMA	55	F	FARMER	790264	PTERYGIUM(BE)	LE	EX WITH MMC	PRESENT	SPK
6	RAMAKKA	48	F	LABOURER	880774	PTERYGIUM(BE)	LE	EX WITH MMC	NIL	SPK
7	MUNIYAMMA	60	F	FARMER	815749	PTERYGIUM(BE)	RE	EX WITH MMC	NIL	NIL
8	CHOWDAMMA	68	F	HOUSE WIFE	815002	PTERYGIUM(RE)	RE	EX WITH MMC	NIL	NIL
9	LAXMINARSAMMA	30	F	LABOURER	790263	PTERYGIUM(BE)	LE	EX WITH MMC	NIL	SPK
10	SUBBAKKA	48	F	LABOUERER	880774	PTERYGIUM(LE)	LE	EX WITH MMC	NIL	SPK
11	MAQBOOL	55	F	HOUSE WIFE	793469	PTERYGIUM(RE)	RE	EX WITH MMC	PRESENT	NIL
12	GAYATHRIBAI	40	F	LABOURER	794092	PTERYGIUM(BE)	RE	EX WITH MMC	NIL	NIL
13	SRIRAMAPPA	60	M	FARMER	829899	PTERYGIUM(BE)	LE	EX WITH MMC	NIL	NIL
14	ESHWARAPPA	66	M	FARMER	746382	PTERYGIUM(BE)	RE	EX WITH MMC	NIL	SPK
15	SHARADAMMA	68	F	FARMER	809119	PTERYGIUM(LE)	LE	EX WITH MMC	PRESENT	NIL
16	GANGAMMA	55	F	FARMER	804762	PTERYGIUM(BE)	RE	EX WITH MMC	NIL	NIL
17	BHAGYAMMA	25	F	HOUSEWIFE	794087	PTERYGIUM(BE)	RE	EX WITH MMC	PRESENT	NIL
18	JAYAMMA	40	F	LABOURER	765176	PTERYGIUM(BE)	RE	EX WITH MMC	NIL	NIL
19	SHANTHAMMA	38	F	LABOURER	807590	PTERYGIUM(RE)	RE	EX WITH MMC	NIL	SPK
20	MADAPPA	56	M	FARMER	890857	PTERYGIUM(BE)	RE	EX WITH MMC	NIL	NIL
21	GANGOJAMMA	48	F	FARMER	816935	PTERYGIUM(RE)	RE	EX WITH MMC	NIL	NIL
22	VASUNDHARA	28	F	LABOURER	875609	PTERYGIUM(BE)	RE	EX WITH MMC	NIL	NIL

23	NARAYAN REDDY	35	M	FARMER	875623	PTERYGIUM(RE)	RE	EX WITH MMC	NIL	SPK
24	SUBBARAYAPPA	53	M	FARMER	872468	PTERYGIUM(LE)	LE	EX WITH MMC	NIL	NIL
25	RUKMINI	28	F	HOUSE WIFE	859195	PTERYGIUM(RE)	RE	EX WITH MMC	NIL	SPK
26	KANTHAMMA	60	F	FARMER	799926	PTERYGIUM(BE)	LE	EX WITH MMC	NIL	NIL
27	NARAMMA	60	F	FARMER	844456	PTERYGIUM(BE)	RE	EX WITH MMC	NIL	NIL
28	SHABINA	40	F	LABOURER	856581	PTERYGIUM(BE)	LE	EX WITH MMC	NIL	NIL
29	LAKSHMAMMA	55	F	FARMER	857226	PTERYGIUM(BE)	RE	EX WITH MMC	NIL	NIL
30	KRISHNAPPA	59	M	FARMER	850649	PTERYGIUM(BE)	LE	EX WITH MMC	NIL	NIL
31	BASAVARAJ	65	M	FARMER	854461	PTERYGIUM(BE)	RE	EX WITH MMC	NIL	NIL
32	MUTHULAXMI	58	F	FARMER	887064	PTERYGIUM(BE)	RE	EX WITH MMC	NIL	NIL
33	MANJULA	42	F	FARMER	872867	PTERYGIUM(BE)	LE	EX WITH MMC	NIL	SPK
34	SAVITHA	34	F	HOUSE WIFE	864162	PTERYGIUM(BE)	RE	EX WITH MMC	PRESENT	NIL
35	KAMALAMMA	48	F	FARMER	850340	PTERYGIUM(BE)	LE	EX WITH MMC	NIL	NIL
36	YALASAPPA	54	M	FARMER	871081	PTERYGIUM(BE)	RE	EX WITH MMC	NIL	NIL
37	YASHWANTH	33	M	FARMER	870051	PTERYGIUM(BE)	LE	EX WITH MMC	NIL	NIL
38	BHARGAVI	32	F	LABOURER	851287	PTERYGIUM(BE)	RE	EX WITH MMC	NIL	SPK
39	SANGAPPA	70	M	FARMER	879589	PTERYGIUM(RE)	RE	EX WITH MMC	NIL	SPK
40	NARAYANAMMA	50	F	FARMER	879592	PTERYGIUM(LE)	LE	EX WITH MMC	NIL	NIL
41	ASHWATHNARAYANA	26	M	OFFICE	791403	PTERYGIUM(LE)	LE	EX WITH CAG	NIL	NIL
42	LAKSHMAMMA	70	F	FARMER	798043	PTERYGIUM(BE)	LE	EX WITH CAG	NIL	GRAFT EDEMA
43	HANUMAKKA	65	F	FARMER	807733	PTERYGIUM(BE)	LE	EX WITH CAG	NIL	NIL
44	RATHNAMMA	40	F	FARMER	802873	PTERYGIUM(BE)	LE	EX WITH CAG	NIL	NIL
45	ANJAMMA	50	F	FARMER	813557	PTERYGIUM(BE)	RE	EX WITH CAG	NIL	NIL
46	GOWRAMMA	45	F	LABOURER	822188	PTERYGIUM(LE)	LE	EX WITH CAG	NIL	NIL

47	NANJAPPA	55	M	FARMER	822187	PTERYGIUM(BE)	LE	EX WITH CAG	NIL	NIL
48	RAJAMMA	60	F	FARMER	819972	PTERYGIUM(LE)	LE	EX WITH CAG	NIL	GRANULOMA
49	CHANDRAPPA	45	M	LABOURER	817329	PTERYGIUM(BE)	RE	EX WITH CAG	NIL	NIL
50	GANGAPPA	70	M	LABOURER	824175	PTERYGIUM(BE)	LE	EX WITH CAG	PRESENT	NIL
51	NARAYANAMMA	70	F	FARMER	825581	PTERYGIUM(BE)	RE	EX WITH CAG	NIL	NIL
52	ASHWINI	21	F	HOUSE WIFE	828416	PTERYGIUM(LE)	LE	EX WITH CAG	NIL	NIL
53	GANGAMMA	58	F	LABOURER	816935	PTERYGIUM(BE)	LE	EX WITH CAG	NIL	NIL
54	VENKATAMMA	65	F	FARMER	829902	PTERYGIUM(BE)	RE	EX WITH CAG	NIL	NIL
55	LAKSHMI DEVAMMA	35	F	HOUSE WIFE	835139	PTERYGIUM(BE)	RE	EX WITH CAG	NIL	DISTORTION OF THE GRAFT
56	RAMAIAH	65	M	FARMER	837518	PTERYGIUM(BE)	RE	EX WITH CAG	NIL	NIL
57	PADMAVATHAMMA	50	F	LABOURER	844482	PTERYGIUM(BE)	RE	EX WITH CAG	NIL	GRAFT EDEMA
58	SURAPPA	39	M	LABOURER	853645	PTERYGIUM(BE)	RE	EX WITH CAG	NIL	NIL
59	MANJULA	19	F	HOUSE WIFE	846752	PTERYGIUM(BE)	RE	EX WITH CAG	NIL	NIL
60	BHARGAVI	32	F	HOUSE WIFE	851287	PTERYGIUM(BE)	RE	EX WITH CAG	NIL	NIL
61	RUDRAMMA	45	F	LABOURER	854408	PTERYGIUM(RE)	RE	EX WITH CAG	NIL	NIL
62	MUNIVENKATAMMA	65	F	FARMER	846743	PTERYGIUM(BE)	LE	EX WITH CAG	NIL	GRANULOMA
63	VENKATAMMA	65	F	FARMER	856590	PTERYGIUM(BE)	RE	EX WITH CAG	NIL	GRAFT EDEMA
64	RUKHMANI	60	F	FARMER	791102	PTERYGIUM(BE)	RE	EX WITH CAG	NIL	NIL
65	ADILAXMI	54	F	FARMER	850289	PTERYGIUM(BE)	LE	EX WITH CAG	NIL	NIL
66	NAGAMMA	30	F	HOUSE WIFE	872869	PTERYGIUM(RE)	RE	EX WITH CAG	NIL	DISTORTION OF THE GRAFT
67	RAMANAPPA	52	M	FARMER	866641	PTERYGIUM(BE)	RE	EX WITH CAG	NIL	NIL
68	PALLAVI	30	F	HOUSE WIFE	858415	PTERYGIUM(LE)	LE	EX WITH CAG	NIL	NIL
69	KAMALAMMA	35	F	FARMER	874244	PTERYGIUM(BE)	LE	EX WITH CAG	NIL	DISTORTION OF THE GRAFT
70	VENKATESHAPPA	40	M	FARMER	886397	PTERYGIUM(BE)	LE	EX WITH CAG	NIL	GRAFT EDEMA

71	MUNISWAMY	45	M	LABOURER	735718	PTERYGIUM(BE)	LE	EX WITH CAG	NIL	NIL
72	SULOCHANA	65	F	FARMER	743603	PTERYGIUM(BE)	LE	EX WITH CAG	NIL	NIL
73	MANJULA	20	F	HOUSE WIFE	890504	PTERYGIUM(BE)	LE	EX WITH CAG	NIL	NIL
74	SHANTHAMMA	32	F	FARMER	898927	PTERYGIUM(BE)	RE	EX WITH CAG	PRESENT	NIL
75	VENKATAMMA	55	F	FARMER	903996	PTERYGIUM(BE)	LE	EX WITH CAG	NIL	NIL
76	RAMKIBAI	70	F	FARMER	904657	PTERYGIUM(BE)	RE	EX WITH CAG	NIL	NIL
77	ANITHAMMA	39	F	HOUSE WIFE	909917	PTERYGIUM(BE)	LE	EX WITH CAG	NIL	NIL
78	PARVATHAMMA	38	F	FARMER	909916	PTERYGIUM(BE)	RE	EX WITH CAG	NIL	GRAFT EDEMA
79	SUBHADRAMMA	50	F	FARMER	909915	PTERYGIUM(BE)	RE	EX WITH CAG	NIL	NIL
80	CHOWDAMMA	45	F	FARMER	934712	PTERYGIUM(BE)	RE	EX WITH CAG	NIL	NIL

ANNEXURE-IV

KEY TO MASTER CHART

S.NO: Serial Number

HOS NO: Hospital Number

M:Male

F:Female

BE: Both Eyes

RE: Right Eye

LE: Left Eye

EX WITH MMC: Excision with mitomycin-C

EX WITH CAG: Excision with Conjunctival Autograft