Original Article

DOI: 10.7860/JCDR/2022/52070.15967

Comparative Analysis of Tear Film Parameters in Patients Undergoing Pterygium Excision by Conjunctival Autograft or Bare Sclera Technique Augmented by Intraoperative Mitomycin C Application

Ophthalmology Section

NEERAJ SHARMA[1], SONAKSHI SEHRAWAT[2], SAUMYA SHARMA[3]

ABSTRACT

Introduction: Excision of the pterygium has been shown to enhance tear film stability. The study was designed to assess the effects of pterygium removal utilising two different surgical procedures on tear film parameters: bare sclera with Mitomycin C (MMC) and conjunctival autograft. The bare sclera with MMC application and conjunctival autograft techniques are the two most common treatments for pterygium. Conjunctival autograft is a procedure in which the superior conjunctiva of the patient's eye is removed in one piece and the excised tissue is used to cover the area where the pterygium was removed. The bare sclera with MMC application procedure involves removing the pterygium and intraoperatively applying 0.02% MMC to the scleral bed, leaving it to re-epithelialise.

Aim: To analyse the improvement in tear film parameters of patients undergoing pterygium excision by conjunctival autograft or bare sclera technique augmented by intraoperative MMC application.

Materials and Methods: The prospective interventional study was conducted in Department of Ophthalmology, SGT University affiliated hospital, Gurugram, Haryana, India, from January 2019 to January 2020. A total of 54 patients were divided into two groups: Group 1 has 26 patients undergoing pterygium excision with bare sclera technique (with MMC 0.02%), and Group 2 has 28 patients undergoing pterygium excision with conjunctival autograft technique (with MMC). Tear Break-up Time (TBUT) and Schirmer's I were measured in 54 eyes with pterygium before and after surgery. Data analysis was done using two tail (inequality) test on Statistical Package for the Social Sciences (SPSS) software version 28.0. Patients were randomly divided into two groups by using RAND between software.

Results: The mean preoperative Schirmer's I was 9.333 mm which improved to 12.203 mm after pterygium excision, which was a statistically significant change irrespective of the technique used. The mean preoperative Tear Break-up Time (TBUT) was 7.212 seconds which improved to 13.059 seconds after pterygium excision, which was a statistically significant change irrespective of the technique used. In the autograft group, TBUT improved from preoperative mean value of 7.253 seconds to 14.0 seconds and Schirmer's I mean values improved from 9.178 mm to 12.678 mm, respectively. In the bare sclera group, TBUT improved from preoperative mean value of 7.169 second to 12.046 second and Schirmer's I mean values improved from 9.500 mm to 11.692 mm, respectively. The mean postoperative Schirmer's I in autograft technique was 12.678 mm and postoperative Schirmer's I in bare sclera technique was 11.692 mm. The postoperative improvement in both groups was statistically similar. The mean postoperative TBUT in autograft technique was 14 seconds and postoperative TBUT in bare sclera technique was 12.046 seconds. Postoperative results in the autograft group were statistically better than the bare sclera group.

Conclusion: The tear film stability parameters in pterygium patients improved after surgery in both the groups. Statistical analysis of postoperative Schirmer's I data was similar in both the techniques. Although postoperative TBUT values were statistically better in the autograft group, the mean value in both the techniques were more than ten seconds. The analysis of data indicates that bare sclera technique with MMC can be used as an alternative surgical procedure in patients with scarred conjunctiva or in situations where superior conjunctiva has to be preserved for future use.

Keywords: Conjunctiva, Ocular surface, Pterygium, Schirmer's I, Tear break-up time

INTRODUCTION

Pterygium is a benign fibrovascular growth of the conjunctiva that spreads onto the corneal surface and is raised and wedge-shape [1-3]. The name pterygium originates from the Greek word 'pterygos' which means a small wing [4]. The prevalence rate of pterygium around the world varies from 0.7 to 31%. In rural central India, its prevalence is about 13%. It is commonly seen in tropical and sub-tropical countries with male preponderance [5-7].

Although, the exact aetiology of pterygium is not clear, but factors like Ultraviolet (UV) light exposure, hot and dusty environment, age, chronic inflammation and genetics play a role in development of pterygium [8,9]. Small pterygium may be asymptomatic, but it can also cause chronic ocular irritation, induced astigmatism, foreign body sensation, decreased vision and tear film disturbances [10]. Few studies have found that pterygium patients had poor tear quality and quantity, as well as a decrease in the number of conjunctival goblet cells [11,12].

Precorneal tear film is composed of three layers; lipid layer being the outermost is secreted by the meibomian glands. It prevents rapid evaporation of tears. Middle aqueous layer is secreted by the lacrimal gland and supplies oxygen to the corneal epithelium. Inner mucous layer is secreted by the goblet cells and functions to make the corneal epithelium hydrophilic [13].

Tear film dysfunction has been found in patients with pterygium and other degenerative lesions of the bulbar conjunctiva [14,15]. Although the role of tear volume in the abnormal tear film function of pterygium patients is a matter of debate, many studies have reported no change in tear volume, while decreased tear production has been reported in some studies [16-19]. Wanzeler ACV et al., stated that pterygium has a substantial impact on the ocular surface because it causes direct changes in the pattern of meibomian glands, as well as corneal abnormalities, conjunctival hyperemia, and lacrimal film alterations, all of which cause considerable discomfort and potential signals of dysfunction [20]. Safarzadeh M et al., showed that the quantity and quality of tear film, as well as the number of goblet cells, decreased, but the tear osmolarity increased in eyes with pterygium [21].

Patkar P and Sune P, evaluated from their study that there was an increase in the TBUT and Schirmer's I test in the case eye after pterygium excision. Hence, they concluded that stability of tear film increased in pterygium patients after pterygium excision [22]. Various clinical tests are available to evaluate tear film and ocular surface. Schirmer's test and the Tear Meniscus Height (TMH) measure the quantity of the tear film. The TBUT test measures the quality of the tear film [23-25]. By detecting damaged epithelial cells, Rose Bengal staining indirectly determines the presence of diminished tear volume. The severity of the aqueous shortage is often associated with the extent of staining. Conjunctival Impression Cytology (CIC) is used to study conjunctival viability [26].

Several studies have investigated the association between pterygium and tear film stability using tear function tests such as the Schirmer's test or Tear Break-up Time (TBUT), with mixed results [27-29]. Schirmer's and tear film BUT are reported to be lower in eyes with pterygium, demonstrating a relationship between tear instability and ocular surface abnormalities [14,15]. TBUT speculates about the qualitative assessment of tear production, hence a shorter TBUT is associated with tear film instability [29]. The TBUT is relatively an easy and less time consuming measure of tear film stability. The definitive treatment of pterygium is surgical excision. Various surgical techniques available are bare sclera technique, conjunctival autografting, and adjunctive treatment with MMC or amniotic membrane patch grafting [30,31].

Few researches have been carried out on the effect of pterygium excision surgery on tear film. The study was designed to evaluate tear film stability in pterygium patients who have their pterygium removed using either a conjunctival autograft approach or a bare sclera treatment with MMC. The aim was to compare improvements in postoperative tear film characteristics.

MATERIALS AND METHODS

This prospective interventional study was conducted in the Department of Ophthalmology, SGT University affiliated Hospital in Gurugram, Haryana, India, from January 2019 to January 2020 after obtaining ethical clearance from the Institutional Ethics Committee (EC approval number: SEC/FMHS/F/30/10/21-03). Informed consent of 54 participating patients was obtained. Patients were randomly divided into two groups by using RAND between software.

Group 1- 26 patients undergoing pterygium excision with bare sclera technique (with MMC 0.02%),

Group 2- 28 patients undergoing pterygium excision with conjunctival autograft technique (with MMC).

Schirmer's I test and TBUT was measured in all patients before and after surgery. All surgeries were performed by same surgeon (NS).

Inclusion criteria: Patients of all the age groups with primary pterygium, consenting for surgery were included in the study.

Exclusion criteria: Recurrent pterygium, patients on anticoagulants, history of prolonged use of topical eye drops e.g., antiglaucoma drugs, eyelid or ocular surface diseases; e.g., blepharitis, Sjogren syndrome, dry eye and history of previous ocular surgery or trauma.

Surgical Technique

Peribulbar anesthesia was used in both the groups. The body of pterygium was separated from underlying bare sclera at the limbus. Head of the pterygium was avulsed from the corneal surface using a tooth forceps. Subconjunctival fibrovascular tissue was dissected and removed. Overlying conjunctival tissue was preserved during this step. Ideally conjunctiva should fall flat over the scleral bed after removal of subconjunctival fibrovascular tissue. MMC 0.02% soaked cotton ball was applied over the scleral bed for two minutes (both techniques). After two minutes MMC soaked cotton was removed and thorough irrigation of the scleral bed was completed using ringer lactate or balanced salt solution. Conjunctival tissue was trimmed till approximately 10 mm×5 mm of bare sclera was available. In conjunctival autograft technique, appropriately sized superior conjunctival free graft was harvested and sutured over bare sclera, whereas in bare sclera technique, sclera was left bare. Subconjunctival steroid injection was given before pad and bandage. Topical steroid and antibiotic eye drops were prescribed for one month [32].

Preoperative and postoperative readings of TBUT and Schirmer's I were recorded. In this study one-month postoperative TBUT and Schirmer's I reading were used and compared with preoperative readings, while analysing the results of two different surgical techniques.

Schirmer's I Test

Patient was seated in a room with dim illumination. Rounded ends of the strips were folded so they will be creased at the notch. Strips (Ophtechnics Test Blu Schirmer Tear Test Ophthalmic Strips) were removed from the cellophane wrapper, taking care not to touch the rounded ends. Patient was instructed to look up. Lower lid of the eye was pulled down. Notched end of the Schirmer strip was placed over the lateral one third of lower lid margin. Schirmer strip was removed from the eye after five minutes, unless the entire strip wets before the end of the time period. Wet portion of the strip was marked. The amount of wetting was measured from the notch in millimeters [27-29].

Expected result: Wetting less than 10 mm in 5 minutes on the Schirmer's I test denotes moderate dry eye [23]. Wetting less than 5 mm in 5 minutes was considered diagnostic of lacrimal insufficiency.

Tear Break-up Time (TBUT)

The end of the fluorescein strip was moistened with one drop of sterile saline. Patient was instructed to look to the left or to the right. The lower lid was pulled down and the moistened end of the strip was touched to the patient's temporal bulbar conjunctiva. Patient was positioned at the slit lamp. Tear film appeared green due to the fluorescein. Patient was instructed to blink several times to spread the dye over the corneal and conjunctival surfaces and then to keep his eyes open looking straight without blinking. Cornea was scanned for dry areas, which will appear as dark spots or streaks. The number of seconds between the blink and the first appearance of the first dry spot was counted. Average of the three readings (in seconds) was recorded for analysis [27-29].

Expected result: A TBUT less than 10 seconds is indicative of unstable tear film.

STATISTICAL ANALYSIS

Schirmer's I test and TBUT was measured in all patients before and after surgery. The data was analysed using two-tail (inequality) statistical test using Statistical Package for the Social Sciences (SPSS) software version 28.0.

RESULTS

Total 34 female patients with mean age of 53.32 years and 20 male patients with mean age of 48.4 years were included in this study.

Schirmer's I Test

Analysis of preoperative and postoperative Schirmer's I data irrespective of the technique used [Table/Fig-1]:

The mean preoperative Schirmer's I was 9.333 mm which improved to 12.203 mm after pterygium excision. The observed difference between the sample means (9.333 mm to 12.203 mm) (p-value=$5.33e^{-6}$) suggests that the average Schirmer's I improved significantly irrespective of the technique used.

Analysis of preoperative and postoperative Schirmer's I data in conjunctival autograft group: The mean preoperative and postoperative values were 9.178 mm and 12.678 mm respectively. The analysis of postoperative Schirmer's I results between the sample means (9.178 mm to 12.678 mm) (p-value=$5.39e^{-4}$) indicates that the average Schirmer's I improved in autograft group.

Analysis of preoperative and postoperative Schirmer's I data in bare sclera group: The mean preoperative and postoperative values were 9.500 mm and 11.692 mm, respectively. The analysis of postoperative Schirmer's I results between the sample means (9.500 mm to 11.692 mm) (p-value=$3.30e^{-3}$) indicates that the average Schirmer's I improved in bare sclera group.

Analysis of postoperative Schirmer's I data in autograft group and bare sclera group [Table/Fig-2]: The mean postoperative Schirmer's I in autograft technique was 12.678 mm and postoperative Schirmer's I in bare sclera technique was 11.692 mm. The observed difference between the mean values (12.678 mm to 11.692 mm) which was not statistically significant (p-value=0.64). Therefore, the postoperative improvement in Schirmer's I results was similar in both techniques.

TBUT Data

Analysis of preoperative and postoperative TBUT data irrespective of the technique used [Table/Fig-3]: The mean preoperative and postoperative TBUT values were 7.212 seconds and 13.059 seconds respectively. The analysis of the observed difference between the sample means (7.212 seconds to 13.059 seconds) (p-value=$1.08e^{-18}$) reflects that postoperative TBUT improved significantly irrespective of the technique used.

Analysis of preoperatively and postoperative TBUT data in the auto graft group: The mean preoperative and postoperative TBUT values were 7.253 seconds and 14.0 seconds, respectively. The analysis of the observed difference between the sample means (7.253 seconds to 14.0 seconds) (p-value=$4.25e^{-10}$) reflects that the postoperative TBUT improved in the autograft group.

Analysis of preoperative and postoperative TBUT data in bare sclera group: The mean preoperative and postoperative TBUT values were 7.169 seconds and 12.046 seconds, respectively. The analysis of the observed difference between the sample means (7.169 seconds to 12.046 seconds) (p-value=$1.33e^{-11}$) indicates that the postoperative TBUT improved in the bare sclera group.

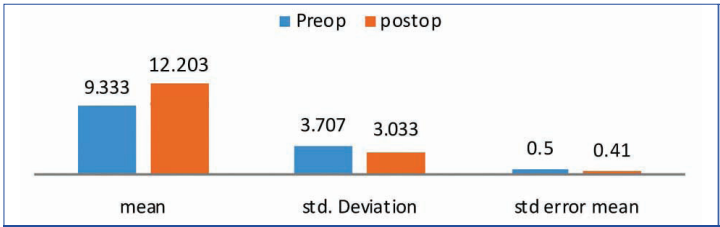
Analysis of postoperative TBUT data in autograft group and bare sclera group [Table/Fig-4]: The mean postoperative TBUT in autograft technique was 14 seconds and postoperative TBUT in bare sclera technique was 12.046 seconds which was statistically significant (p-value=0.002). Statistical analysis of postoperative TBUT values indicates better results in the autograft group as compared to bare sclera group. However, the mean TBUT score in both the techniques used was more than ten seconds, which is universally accepted cut-off for a normal TBUT.

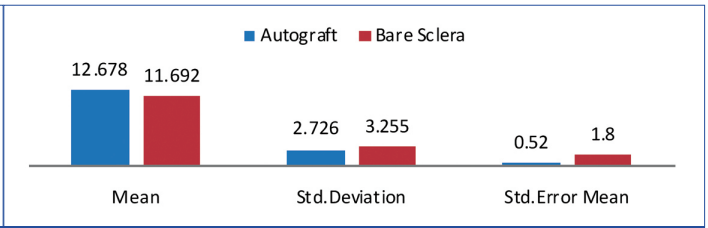
DISCUSSION

Pterygium is a degenerative disorder of the sub conjunctival tissue that invades the cornea as vascularised granulation tissue, eroding the superficial layers of stroma and Bowman's membrane and covering the entire invaded area with conjunctival epithelium [4,5]. Many hypothesis have been proposed regarding the pathogenesis of pterygium and its effect on tear film stability like alteration in the expression of Interleukin-6 (IL-6) and IL-8 due to UV exposure [1]. Cytokines like IL-6 and IL-8 bring about the production of Matrix Metalloproteinase (MMP) that pools at the head of pterygium [33]. IL-6, IL-8 and MMPs damage the ocular surface and result in an unstable tear film.

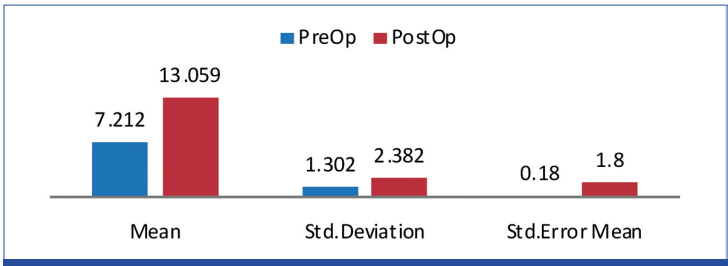
It has been stated that pterygium leads to tear film dysfunction [14,15]. According to some studies, pterygium can cause localised elevation of the conjunctiva and unequal tear distribution, resulting in dry eye and irregular tear dynamics [34]. Pterygium has also been linked to wave front aberrations [35]. Few authors have suggested the reverse sequence, pathological conjunctival and corneal changes in pterygium lead to a disturbed tear film [18]. Based on the possibility of co-occurrence of dry eye and pterygium, artificial tear therapy was introduced as an effort to prevent the development of pterygium [19]. However, there is no evidence on the impact of artificial tears on the establishment or advancement of pterygium.

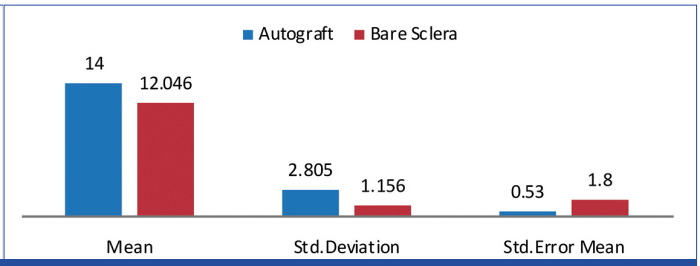
A single, specific and sensitive test for the diagnosis of dry eye is not available. However, several techniques are used to analyse tear film stability such as TBUT, tear clearance tests, tear film lipid layer interferometry, tear evaporation test, and BUT assessment by using a grid xeroscope [36].





[Table/Fig-1]: Preoperative and postoperative Schirmer's I data irrespective of the technique used; **[Table/Fig-2]:** Postoperative Schirmer's I data in autograft group and bare sclera group. (Images from left to right)





[Table/Fig-3]: Preoperative and postoperative TBUT data irrespective of the technique used; **[Table/Fig-4]:** Postoperative TBUT data in autograft group and bare sclera group. (Images from left to right)

The qualitative assessment of tear production can be done by TBUT, which is relatively an easy and safe technique to analyse tear film dysfunction due to pterygium [23,24]. Hence, authors have used Tear Film Break-Up Time in the present study. Schirmer's I test is used for the quantitative analysis of tear film. Studies have been conducted regarding tear film changes after pterygium excision with conflicting results. Some studies reported improved tear film function whereas others did not find any difference in tear film after pterygium excision [2,9,10].

A study conducted in 2019 evaluated the effects of excision on dry eye and Meibomian Gland Dysfunction (MGD) in individuals with pterygium, before and after surgery. A total of 63 patients with primary nasal pterygium were examined. They found that the Ocular Surface Disease Index (OSDI), NIBUTav, lid margin abnormality, meiboscore, and lipid layer grading values differed significantly in the pterygium patients in comparison with the controls (p-value <0.01 for all scores). However, the Schirmer I Test (SIT) and TMH values were unchanged between the two groups (all p-value> 0.05). Hence, they concluded that abnormal tear film and meibomian gland (MG) function improved following pterygium excision in the patients with primary pterygium [37].

Studies have shown that pterygium excision with conjunctival autograft combined with intraoperative low-dose MMC (0.05%) is a safe and effective technique as it can prevent vascular regeneration, fibroblast proliferation, scar formation, and reduce the recurrence rate after pterygium surgery [38,39]. Pterygium excision combined with MMC has no effect on the stability of tear film and the secretion of basic tears. There is no difference in the postoperative recurrence rates of pterygium excision combined with MMC or pterygium excision combined with autologous limbal stem cell transplantation [32]. According to a recent study, using MMC following pterygium removal is both safe and effective [40]. Adjuvant therapies have reduced the recurrence rate in pterygium patients [41].

This study tries to analyse the postoperative changes in tear film of two different surgical techniques. The tear film stability parameters (TBUT and Schirmer's I) after pterygium excision have been examined. Statistical analysis of data, validated postoperative improvement in Schirmer's I data between autograft and bare sclera are equivalent. The comparative analysis of postoperative TBUT values indicates better results in the autograft group. However, the improvement in the mean TBUT scores of the two surgical procedures used was more than ten seconds, which is universally accepted value for a normal TBUT.

Limitation(s)

The limitations of the study include a short time duration and a small sample size. Confirming the findings would require a multi-centric investigation with a larger sample size.

CONCLUSION(S)

Patients with pterygium should be encouraged to have pterygium excision surgery because of the associated dry eye problems. Pterygium excision with conjunctival autograft is the favoured surgical technique in present times. In this study, authors have compared the improvement in tear film parameters using two different surgical techniques. This suggests that, regardless of the surgical method utilised, the tear film stability of pterygium patients improves in the postoperative period. The postoperative improvement in Schirmer's I parameters was statistically similar in both the groups. The postoperative improvement in the TBUT scores was statistically better in the autograft group. However, the improvement in the mean TBUT scores of the two surgical procedures used was more than ten seconds, which is universally accepted value for a normal TBUT. Mitomycin C associated complications during the study period and the recurrence rate of pteygium was nil in both groups. Therefore, the study suggests that bare sclera with MMC can be used as a safe and viable alternative in patients where conjunctival autograft is not possible because of scarred conjunctiva, previous conjunctival surgeries or in conditions where superior conjunctiva might be required in future e.g., trabeculectomy for glaucoma patients.

Acknowledgement

Authors acknowledge the help provided by Mr. Abhishek Joshi, bio-medical statistician in analysing the results.

REFERENCES

[1] Coroneo MT, Girolamo N, Wakefield D. The pathogenesis of pterygia. Curr Opin Ophthalmol. 1999;10:282-88.
[2] Saleem MI, Channar MS, Saleem MF. Effects of pterygium excision on corneal curvatures. Pak J Med Sci. 2011;27:325-28.
[3] Zare M, Zarei-Ghanavati S, Ansari-Astaneh MR.Baradaran-Rafiee A, Einolahi B. Effects of pterygium on ocular aberrations. Cornea. 2010;29:1232-35.
[4] Mannis M, Holland E, Lee W. (2002) Ocular Surface Disease: Medical and surgical management, ed. New York: Springer.
[5] Detels R, Dhir SP. Pterygium: A geographical study. Arch Ophthalmol. 1967;78:485-91.
[6] Nangia V, Jonas BJ, Nair D, Saini N, Nangia P, Jonas SP, et al. Prevalence and associated factors forPterygiumin Rural Agrarian Central India: The Central India Eye and Medical Study. PLoS One. 2013;8(12):e82439.
[7] Moukoury NE, Epee E, Nsangou JFI, NoaNoa TB. Pterygium in a tropical region. Analysis of 344 cases in Cameroon. Bull de la Societe Belge D'Ophthalmologie. 2009;311:11-15.
[8] Coroneo MT. Pterygium as an early indicator of ultraviolet insolation: A hypothesis. Br J Ophthalmol. 1993;77(11):734-39.
[9] Mackenzie FD, Hirst LW, Battistutta D, Green A. Risk analysis in the development of pterygia. Ophthalmology. 1992;99:1056-61.
[10] Saw SM, Tan D. Pterygium: Prevalence, demography and risk factors. Ophthalmic Epidemiol. 1999;6(3):219-28.
[11] Rajab AY. Evaluation of tear film stability in pterygium and pingueculae. Ann Coll Med Mosul. 2013;39(2):132-35.
[12] Li M, Zhang M, Lin Y, Xiao Q, Zhu X, Song S, et al. Tear function and goblet cell density after pterygium excision. Eye. 2007;21:224-28.
[13] Lemp MA, Holly FJ, Iwata S, Dohlman CH. The precorneal tear film I: Factors in spreading and maintaining continuous tear film over the corneal surface. Arch Ophthalmol. 1970;83:89-94.
[14] Karmer SG.Pingueculae and pterygia. SurvOphthalmol. 1988;32:41-49.
[15] Oguz H, Karadede S, Bitiren M, Gurler B, Cakmak M. Tear functions in patients with pinguecula. Acta Ophthalmol Scand. 2001;79:262-65.
[16] Chaidaroon W, Pongmoragot N.Basic tear secretion measurement in pterygium. J Med Assoc Thai. 2003;86:348-52.
[17] Rajiv, Mithal S, Sood AK. Pterygium and dry eye: A clinical correlation. Indian J Ophthalmol. 1991;39:15-16.
[18] Ergin A, Bozdogan O. Study on tear function abnormality in pterygium. Ophthalmologica. 2001;215:204-08.
[19] Biedner B, Biger Y, Rothkoff L, Sachs U. Pterygium and basic tear secretion. Ann Ophthalmol. 1979;11:1235-36.
[20] Wanzeler ACV, Barbosa IAF, Duarte B, Barbosa EB, Borges DA, Alves M, et al. Impact of pterygium on the ocular surface and meibomian glands. PLoS One. 2019;14(9):e0213956.
[21] Safarzadeh M, Heidari S, Azizzadeh P, Sheibani K, Nassiri N, Heidari L, et al. Comparative assessment of tear function tests, tear osmolarity, and conjunctival impression cytology between patients with pterygium and healthy eyes. J Ophthalmic Vis Res. 2019;14:11-17.
[22] Patkar P, Sune P. Evaluation of tear film functions in cases with pterygium: A case control study. J Clin Diagn Res. 2020;14(1):NC10-13.
[23] Senchyna M, Wax BM. Quantitative assessment of tear production: A review of methods and utility in dry eye drug discovery. J OculBiol Dis Infor. 2008;(1):01-06.
[24] Ganeshpuri AS, Kamble BS, Patil P, Wadgaonkar SP. A comparative study of tear film stability and secretion in pterygium patients-Diabetic vs. Nondiabetic. Int J Health Sci Res. 2014;4:86-97.
[25] Yanoff M, Duker JS. (2013) Ophthalmology (4th ed.) India: Saunders.
[26] Singh R, Joseph A, Umapathy T, Tint NL, Dua HS. Impression cytology of the ocular surface. Br J Ophthalmol. 2005;89:1655-59.
[27] Ishioka M, Shimmura S, Yagi Y, Tsubota K. Ptyerygium and dry eye. Ophthalmologica. 2001;215(3):209-11.
[28] Goldberg L, David R.Pterygium and its relationship to the dry eye in the Bantu. Br J Ophthalmol. 1976;60:720-21.
[29] Kadayifcilar SC, Orhan M, Irkec M. Tear functions in patients with pterygium. Acta Ophthalmol Scand. 1998;76:176-79.
[30] Farjo QA, Sugar A.Pterygium and conjunctival degenerations.In: YanoffM; Duker J S. (2009) Ophthalmology. (3rd ed.) Edinburgh: Elsevier.
[31] Donnenfeld ED, Perry HD, Fromer S, Doshi S, Solomon R, Biser S. Subconjunctival mitomycin C as adjunctive therapy before pterygium excision. Ophthalmology. 2003;110:1012-16.

[32] Wang J. Recent Advances in the Effects of Various Surgical Methods on Tear Film after Pterygium Surgery In Dorota Kopacz (Ed.) Oculur Surface diseases some current date on tear film problem nad keratoconic Diagnosis. 2021, 45-54, London: Intechopen.
[33] Li DQ, Lee SB, Gunja-Smith Z, Liu Y, Solomon A, Meller D. Overexpression of collagenase (MMP-1) and stromelysin (MMP-3) by pterygium head fibroblasts. Arch Ophthalmol. 2001;119(1):71-80.
[34] Abdelfattah NS, Dastiridou A, Sadda SR, Lee OL. Noninvasive imaging of tear film dynamics in eyes with ocular surface disease. Cornea. 2015; 34:48-52.
[35] Razmjoo H, Vaezi MH, Peyman A, Koosha N, Mohammadi Z, Alavirad M, et al.The effect of pterygium surgery on wavefront analysis. Adv Biomed Res. 2014;3:196.
[36] Mengher LS, Bron AJ, Tonge SR, Gilbert DJ. A non-invasive instrument for clinical assessment of the pre-corneal tear film stability. Curr Eye Res. 1985;4:01-07.
[37] Ning Li, Wang T, Wang R, Duan X. Tear film instability and meibomian gland dysfunction correlate with the pterygium size and thickness pre- and postexcision in patients with pterygium. J Ophthalmol. 2019;(10):01-09.
[38] Frucht-Pery J, Raiskup F, Ilsar M.Conjunctivalautografting combined with low-dose mitomycin C for prevention of primary pterygium recurrence. Am J Ophthalmol. 2006;141(6):1044-50.
[39] Rodriguez JA, Ferrari C, Hernández GA. Intraoperative application of topical mitomycin C 0.05% for pterygium surgery. Boletín de la Asociación Médica de Puerto Rico. 2004;96(2):100-02.
[40] Shukla P, Bhartia S. Complications and recurrence after pterygium excision using Mitomycin C eye drops versus sutureless and glue free conjunctival autograft: A prospective study. J Clin Diagn Res. 2020;14(9):NC01-04.
[41] Todorovic D, Vulovic TS, Sreckovic S, Jovanovic S, Janicijevic K, Todorovic Z, et al. Updates on the treatment of Pterygium. Serb J Expe Clin Res. 2016;17(3):257-62.

PARTICULARS OF CONTRIBUTORS:
1. Professor, Department of Ophthalmology, Faculty of Medicine and Health Sciences, SGT University, Gurugram, Haryana, India.
2. Resident, Department of Ophthalmology, Faculty of Medicine and Health Sciences, SGT University, Gurugram, Haryana, India.
3. Resident, Department of Ophthalmology, Faculty of Medicine and Health Sciences, SGT University, Gurugram, Haryana, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Neeraj Sharma,
House No. 910, Sector-9A, Behind E.S.I. Hospital, Gurugram, Haryana, India.
E-mail: sharmaneeraj75@rediffmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Aug 28, 2021
- Manual Googling: Nov 08, 2021
- iThenticate Software: Dec 22, 2021 (11%)

ETYMOLOGY: Author Origin

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Aug 27, 2021**
Date of Peer Review: **Oct 20, 2021**
Date of Acceptance: **Nov 22, 2021**
Date of Publishing: **Feb 01, 2022**