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Research Article

# A CLINICAL STUDY OF TEAR FUNCTIONS IN PATIENTS WITH PINGUECULA BEFORE AND AFTER MEDICAL MANAGEMENT

**BIMALESH OJHA, PANKAJ KATARIA, PANKAJ CHOUDHARY, POOJA SINGH***

**Department of Ophthalmology, Shyam Shah Medical College, Rewa, Madhya Pradesh, India. Email: drsinghpooja88@rediffmail.com**

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**ABSTRACT**

**Objective:** The purpose of the study was to determine the changes in tear functions after medical management of pinguecula.

**Methods:** This interventional prospective study included 70 patients with pinguecula random eyes; 39 males and 31 females, 17–70 years of age (mean±SD: 46.52±16.31 years) for medical management. They were categorized as grade P (0), P (1), and P (2) by slit lamp biomicroscopy.

**Results:** On the basis of statistical analysis applying unpaired t-test, for both the test parameters in P (0) grade of pinguecula patients, the p-values for mean Schirmer-1 test and Tear film break-up time (TFBUT) were 0.93, 0.46, 0.03, and 0.22, 0.002, and <0.0001 for BMM versus AMM at 1 m, 3 m, and 6 m, respectively. These p-values show that there were no significant changes in ST-1 at 1 m and 3 m follow-up after medical management. For TFBUT, p-values show that there were no significant changes at 1 m of follow-up but extremely significant at 3 m and 6 m of follow-up. For P (1) grade of pinguecula patients, the p-values for mean Schirmer-1 test and TFBUT were 0.81, 0.08, 0.0002, and 0.31, <0.0001 and <0.0001 for BMM versus AMM at 1 m, 3 m, and 6 m, respectively. These p-values show that there were no significant changes in ST-1 and TFBUT at 1m follow-up after medical management. While, extremely significant changes at 3 m and 6 m of follow-up in ST-1 as well as TFBUT both.

**Conclusion:** The alteration in schirmer-1 test and TFBUT after medical management with e/d carboxyl methyl cellulose 0.5% and/or e/d fluorometholone 0.1% shows improvement in tear film production and tear film stability after 6 months of follow-up.

**Keywords:** .

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## INTRODUCTION

Pinguecula is a common degeneration of the conjunctiva. Pinguecula has originated from the Latin word "pinguis," which means fat or grease. It is a yellowish, round, protruded fleshy tissue growth located in the interpalpebral fissure at the limbus (usually at 3 o' clock or 9 o'clock position). Usually bilateral presentation, more often situated at the nasal rather than the temporal limbus.

The prevalence of pinguecula in published reports varies widely from 22.5 to 70% [1,2-4] across different geographical locations [1-4]. The few population-based studies on the prevalence of pinguecula that has been conducted to date show estimate rates >50% in the adult population [1,5,6]. Pinguecula is the common ocular surface disorder, often contains deposits of protein, fat or calcium [7].

The nodular elastotic degeneration of pinguecula consists of material that stains for elastin but it is not destroyed by elastase. Sometimes, it is associated with calcification or fat globules. Histologically pinguecula and pterygium are analogous to each other, except for the lack of corneal involvement and vascularization [8].

A study was conducted on localized advanced glycation end products in the subepithelial amorphous which was deposited in the pinguecula, may denote the severity of exposure to sun light or the decreased levels of anti-oxidants [9].

Pinguecula is associated with corneal and conjunctival microtrauma from exposure to ultraviolet and/or dust. The development of pinguecula may be influenced by various factors, including aging, ultraviolet radiation, contact lens, and systemic disease, such as diabetes or metabolic syndrome (Gaucher's disease) and exposure to dust. The reason for nasal predominance could be the actinic damage which occurs in this region because of reflection from the side of the nose [10]. Early onset of pinguecula present in contact lens wearer, which may be occurs due to constant friction and inflammation of the conjunctiva.

Few studies that graded the pinguecula have reported that the severity of dry eye is correlated with the grade of pinguecula. Reid and Dushku [11] and Duskhu and Reid [12] have proposed a new grading system for pinguecula. This grading system is considered useful for investigating the clinical significance of pinguecula.

**Grading system for pinguecula**

| Grade | Pinguecula |
|---|---|
| P (0) | No pinguecula |
| P (1) | Mild or moderate pinguecula, yellowish white, and Flate or slightly elevated lesion with a maximum Diameter < 5 mm |
| P (2) | Sever pinguecula, highly vascularized and elevated Lesion or large pinguecula with a diameter≥5 mm |

Pinguecula is asymptomatic, it does not affect visual acuity. It causes cosmetic problems. When pinguecula is inflamed, it is known as pingueculitis. Symptoms of pingueculitis are present because dilated blood vessels release serotonin, bradykinin, histamine, and prostaglandins. Normal spreading of the tear film will be interfered by the surface of the conjunctiva overlying the pinguecula. Thus, dry eye symptoms such as itching, burning sensation, and foreign body sensation occur. Tear break up time (BUT) may diminish in patients with pinguecula.

Since no study on the changes in tear functions in patients of pinguecula after medical or surgical management has been reported from the Indian subcontinent, hence the need for the present study.

## METHODS

An interventional and prospective study titled "A clinical study of tear functions in patients with pinguecula before and after medical management." Was carried out in the Department of Ophthalmology, Shyam Shah Medical College and associated Gandhi Memorial Hospital, Rewa (M.P.). This study was performed in the interval between December 2019 and December 2020.

### Study design
This was a interventional prospective study.

### Case selection
All patients of pinguecula attending ophthalmology outpatient department, who fulfilled the following study criteria were enrolled-

### Inclusion criteria
The following criteria were included in the study:
- Patients with Pinguecula.
- Those who are willing to sign informed consent form.

### Exclusion criteria
The following criteria were excluded from the study:

Patients with
- Disorders of lid, other ocular surface disorder.
- Systemic and topical drugs associated with dry eye.
- History of using contact lens and any ocular surgery

### Data collection and method
After enrollment, a well-informed written consent was taken from all study participants. The purpose of study was explained to the subjects and confidentiality was also assured.

A thorough history was taken which included demographic profile and ophthalmic complaints with special reference to duration of pinguecula and associated patients of tear film dysfunction.

### Evaluation
A comprehensive ophthalmic examination was conducted in all the study subjects which included:

1. Best corrected visual acuity:

It was recorded utilizing self-illuminated Snellen chart at 6-m distance.

2. Anterior segment examination:-

### Slit lamp biomicroscopy
Grading of pinguecula according to their size was done as P (0), P (1), and P (2).

Grading system for pinguecula reported by Reid and Dushku [11] and Dushku and Reid [12].

**Grading system for pinguecula**

| Grade | Pinguecula |
|---|---|
| P (0) | No pinguecula |
| P (1) | Mild or moderate pinguecula, yellowish white, and Flat or slightly elevated lesion with a maximum Diameter <5 mm |
| P (2) | Sever pinguecula, highly vascularized and elevated Lesion or large pinguecula with a diameter ≥5mm |

3. Intraocular pressure (IOP)-

IOP was recorded in millimeters of mercury (mm of Hg) using non-contact tonometer.

4. Special tests:

The following tests and procedures were successively performed on each patient to investigate the tear film production and tear film stability in patients with pinguecula.

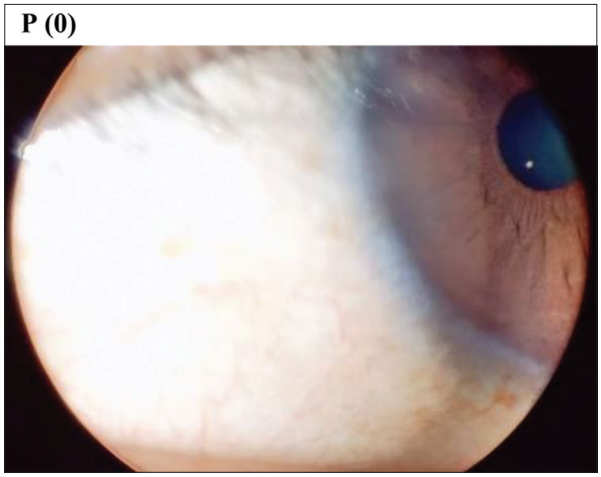



**Fig. 1: No pinguecula**

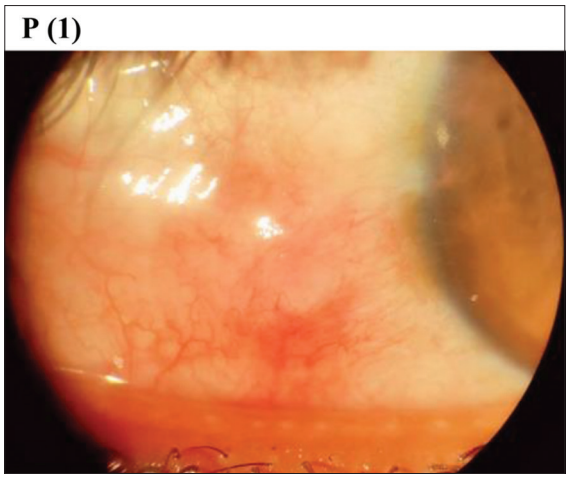



**Fig. 2: Yellowish white, flat and slightly elevated lesion with a diameter of <5 mm**

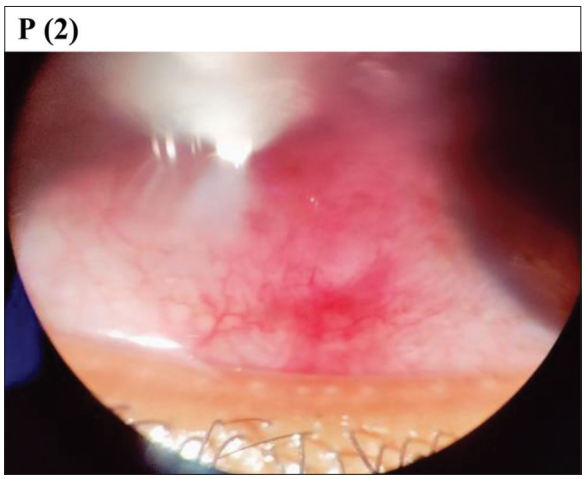



**Fig. 3: Highly vascularized and elevated lesion with a diameter of ≥5 mm**

- Schirmer -I test
- Tear film break-up time (TFBUT)

### Schirmer-I test
This test was performed on random eyes of the patients without using any topical anesthetic agents and standardized test strip

**Table 1: Tear function assessment in grade-P (0) (58 eyes)**

| TFT | BMM | At 1 month | At 3 month | at 6 month | p-value | | |
|---|---|---|---|---|---|---|---|
| | | | | | BMM versus 1 month | BMM versus 3 month | BMM versus 6 month |
| ST-1 (mm) | 23.67±4.86 | 23.60±4.65 | 24.32±4.79 | 25.63±4.86 | 0.93 | 0.46 | 0.03 |
| TFBUT (s) | 11.29±1.41 | 11.60±1.33 | 12.05±1.16 | 13.06±1.04 | 0.22 | 0.002 | <0.0001 |

TFBUT: Tear film break-up time

**Table 2: Tear function assessment in grade- *P* (1) [75 eyes]**

| TFT | BMM | At 1 month | At 3 month | At 6 month | p-value | | |
|---|---|---|---|---|---|---|---|
| | | | | | BMM versus 1 month | BMM versus 3 month | BMM versus 6 month |
| ST-1 (mm) | 14.97±3.16 | 14.85±3.12 | 15.85±3.12 | 17.12±3.09 | 0.81 | 0.08 | 0.0002 |
| TFBUT (s) | 9.21±1.92 | 9.53±1.93 | 10.65±1.72 | 11.68±1.64 | 0.31 | <0.0001 | <0.0001 |

TFBUT: Tear film break-up time

**Table 3: Final assessment of TFT at 6 months**

| TFT | Management | P (0) | P (1) | P (2) | p-value | | |
|---|---|---|---|---|---|---|---|
| ST-1 (mm) | BMM | 23.67±4.86 | 14.97±3.16 | 9.72±2.43 | P (0) versus P (1) | P (0) versus P (2) | P (1) versus P (2) |
| | AT 6 month | 25.63±4.86 | 17.12±3.09 | 13.86±1.91 | 0.02<0.0002 P (0) <P (1) | 0.02<0.0001 P (0) <P (2) | 0.0002<0.0001 P (1)<P (2) |
| TFBUT (s) | BMM | 11.29±1.41 | 9.21±1.92 | 7.35±2.04 | <0.0001 P (0)=P (1) | <0.0001 P (0)=P (2) | <0.0001 P (1)=P (2) |
| | AT 6 month | 13.06±1.04 | 11.68±1.64 | 9.97±1.93 | | | |

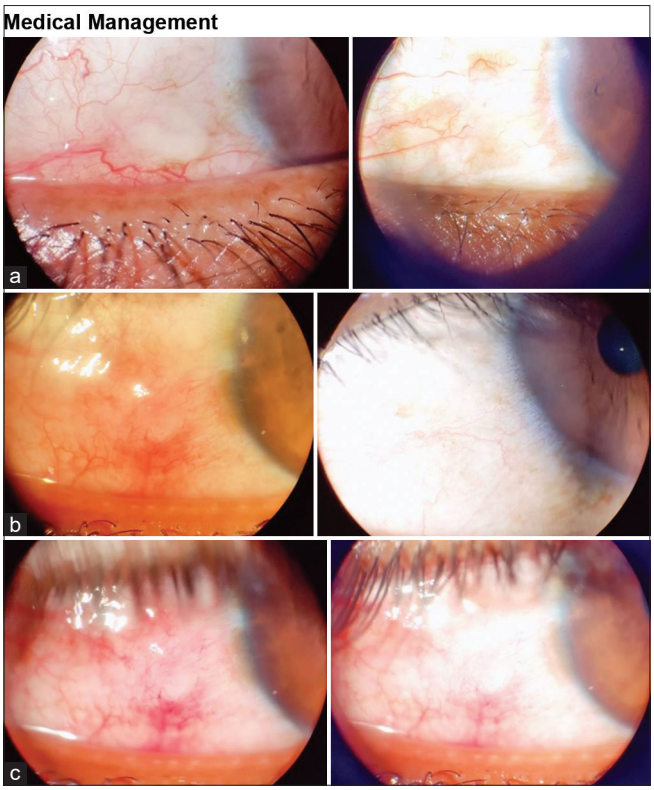



**Fig. 4: Before and after medical management slit-lamp biomicroscopic photographs of three patients. A 30-year-old male with protruded nasal pinguecula: P (1) (a) A 60-year-old male with nasal pinguecula: P (1) (b). A 46-year-old female with nasal pinguecula (c): Pingueculitis P (2)**

maintained between lateral one-third and medial two-third of the lower conjunctival fornix for 5 min. The patient was seated in a dim light room and advised to remain open his/her eyes with minimal blinking and measurement of wetted length of the strip was taken in millimeters.

**BUT**

1 h after the Schirmer I test, BUT was assessed. A fluorescein strip was moistened with eye drop moxifloxacin. To distribute the fluorescein evenly, asked the patient to blink several times and then asked to look ahead without blinking or holding the eyelids. BUT was measured by taking time interval of last blink and the first dry spot on the cornea, using the diffuse and cobalt blue illumination of the slit lamp. The average of result of three measurements was taken.

All patients were managed according to their grade of pinguecula by

**Medical management**

a. P (0)
b. P (1)
c. P (2)

Pinguecula size <5 mm we use eye drop carboxyl methyl cellulose 0.5%. In vascularized pinguecula (Pingueculitis)/Size more than 5 mm we use e/d flurometholone 0.1% in tapering manner for 1 month along with e/d carboxyl methyl cellulose 0.5%.

The people enrolled in this study were examined at 1 month, 3 monthl and 6 months after management, for the assessment of tear function.

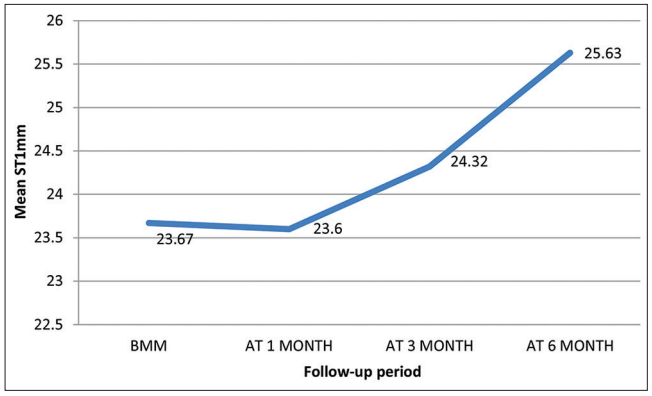
**Statistical analysis plan**

The collected data were fed in computer in MS Excel sheet and an individual master chart was prepared for each group for analysis. GraphPad instant software was employed for the statistical analysis in which unpaired t-test was applied to compare the three groups and thus the probability (p) value was procured. "p" value indicates how likely it is that a result has occurred by chance alone. Smaller the "p" value more is the significance of a test and so a p<0.05 or <5% is taken as statistically significant.

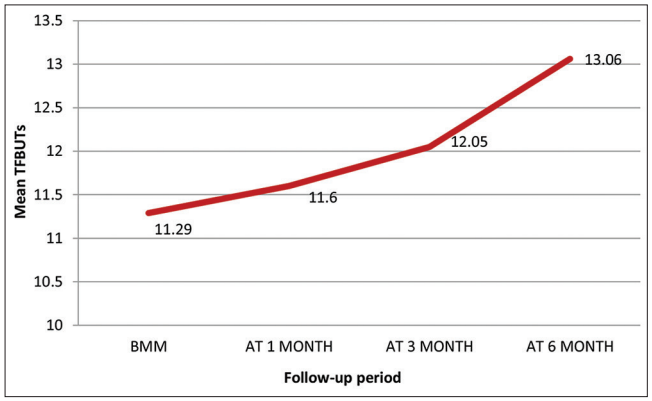
**Observations and results**

Seventy patients with pinguecula [random eyes; 39 males and 31 females, 17–70 years of age (mean±SD:46.52±16.31 years) for medical management were enrolled in this study.

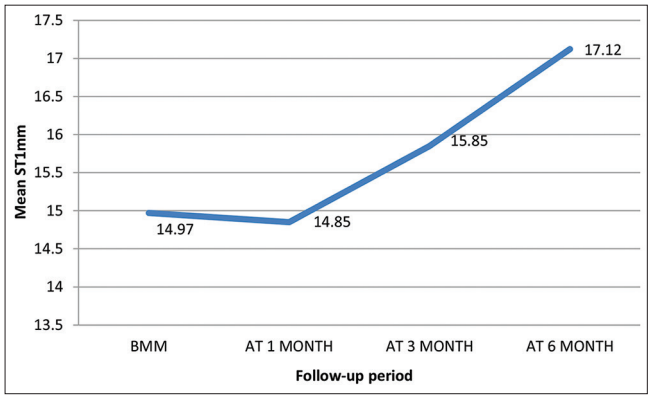
Thereafter they were categorized as grade P (0), P (1), and P (2) by slit lamp biomicroscopy. The forthcoming observations were made from the study.




**Graph 1: Tear function assessment in grade-P (0) (58 eyes)**



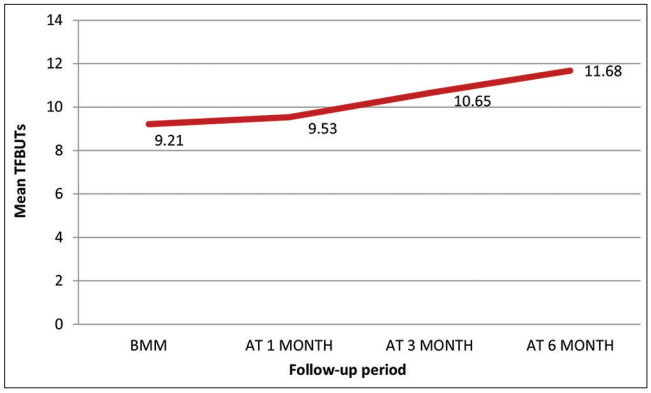

**Graph 2: Tear function assessment in grade-p (0) [58 eyes]**



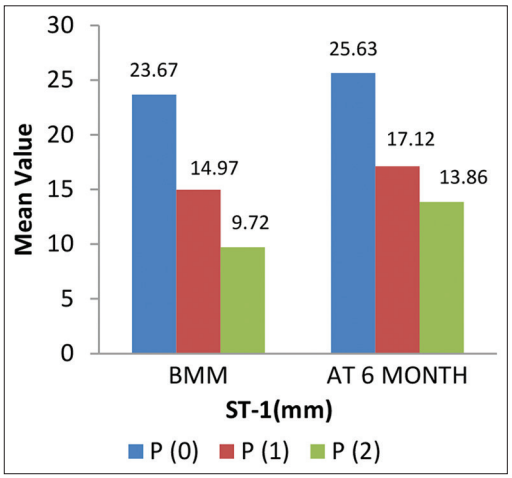

**Graph 3: Tear function assessment in grade-P(1) [75 eyes]**

On the basis of statistical analysis applying unpaired t-test, for both the test parameters in P (0) grade of pinguecula patients, the p-values for mean Schirmer-1 test and TFBUT were 0.93, 0.46, 0.03, and 0.22, 0.002 and <0.0001 for BMM versus AMM at 1 m, 3 m, and 6 m, respectively. These p-values show that there were no significant changes in ST-1 at1 m and 3 m follow-up after medical management. For TFBUT, p-values show that there were no significant changes at 1 m of follow-up but extremely significant at 3 m and 6 m of follow-up.

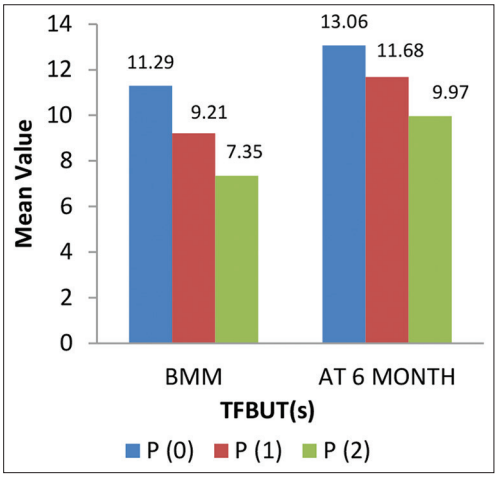
On the basis of statistical analysis applying unpaired t-test, for both the test parameters in P (1) grade of pinguecula patients, the p-values for mean Schirmer-1 test and TFBUT were 0.81, 0.08, 0.0002, and 0.31, <0.0001 and <0.0001 for BMM versus AMM at 1 m, 3 m, and 6 m, respectively. These p-values show that there were no significant changes in ST-1 and TFBUT at 1 m follow-up after medical management. While, extremely significant changes at 3 m and 6 m of follow-up in ST-1 as well as TFBUT both.




**Graph 4: Tear function assessment in grade-P (1) [75 eyes]**




**Graph 5: Final assessment of TFT at 6 months**




**Graph 6: Final assessment of TFT at 6 months**

Final assessment of TFT at 6 month on the basis of statistical analysis, we found that after 6 month of medical management, there were no significant changes in ST-1 of p (0) grade of pinguecula (p=0.02), while extremely significant changes in ST-1 and TFBUT of P (1) and P (2) grade of pinguecula (p<0.0001).

## DISCUSSION

This prospective and interventional study titled "A clinical study of tear functions in patients with pinguecula before and after medical management" incorporated P (0) No pinguecula, P (1) mild or moderate

pinguecula, yellowish white, and flat or slightly elevated lesion with a maximum diameter <5 mm and P (2) sever pinguecula, highly vascularized and elevated Lesion or large pinguecula with a diameter ≥5 mm, attending the Out Patient Department Of Ophthalmology, Shyam Shah Medical College and associated Gandhi Memorial Hospital, Rewa (M.P.), this study was initiated in the December 2019–December 2020. Grading of pinguecula was done by slit lamp biomicroscopy. After tear function, assessment pinguecula was managed medically. The 70 people enrolled in this study were examined at 1 month, 3 month, and 6 month after management, for the assessment of tear functions.

**Tear function assessment after medical management**

There is a significant amount of research on the association of pterygium and dry eye syndrome [13], but very little on the association between pinguecula and dry eye, even though pinguecula is more prevalent and its pathophysiology may be different [2,14,15]. Pinguecula size <5 mm we use eye drop carboxyl methyl cellulose 0.5%. In vascularized pinguecula/Size more than 5mm we use e/d fluorometholone 0.1% in tapering manner for 1 month along with e/d carboxyl methyl cellulose 0.5%. In this study, we found that before and after management comparison of Schirmer -1 test and TFBUT between the groups [P (0), P (1), and P (2)] revealed a statistically not significant difference at 1m (p=0.93, p=0. 22, p=0. 81, p=0. 31, p=0. 30, and p=0.47) respectively.

At 3 month difference in ST-1was not significant (p=0.46, p=0.11), while changes in TFBUT was statistically significant (p=0.002, p<0.0001) in P (0) and P (1) grade, but in P (2) both the parameters changed significantly (p<0.0001, p=0.03).

At 6 m changes in both the parameters were extremely significant (p<0.0001). There have not been many studies describing medical management of pinguecula, some limited researches on it like Frucht- Pery *et al*.[16] studied that topical indomethacin 0.1% solution is as effective as topical dexamethasone phosphate 0.1% solution for the treatment of inflamed pinguecula and, therefore, is suggested as an effective treatment for these conditions. "Total signs," and "total symptoms," were significantly lower (p=0.001) by day 14.

Halit *et al.* (2001) [17] found that the mean Schirmer test value was 22.72±12 mm in the eyes with pinguecula and 22.7±8.5 mm in the control eyes. There was no statistically significant difference (t=0.01, p=0.99) between the groups. The mean BUTs were 11.42±6.89 s in the eyes with pinguecula and 15.46±5.85 s in the control eyes. Comparison of BUTs between the groups revealed a statistically significant difference (t=3.37, p=0.0010). They concluded that the alteration in the mucin layer is a possible change inducing pinguecula formation. While in our study we found that both parameters (ST-1 and TFBUT) decreased significantly. Mean Schirmer test value and TFBUT were 14.97±3.16, 9.21±1.92, and 9.72±2.43, 7.35±2.04 for P (1) and P (2) grade of pinguecula, respectively.

## CONCLUSION

The following conclusions were drawn from this study:

1. Given the high prevalence of pinguecula, its potential relationship to dry eye syndrome should not be overlooked, especially with significantly larger and raised lesions.
2. The alteration in schirmer-1 test and TFBUT after medical management with e/d carboxyl methyl cellulose 0.5% and/or e/d fluorometholone 0.1% shows improvement in tear film production and tear film stability after 6 months of follow-up.
3. To our knowledge, this study is the first to systematically determine tear film functions after medical management. Our study revealed statistically significant improvement in tear functions at 6 month of follow-up after medical management.

**Limitations**

- study does not include grading of fluorescein staining, an important measure in the study and treatment of dry eye syndrome
- Due to smaller sample size and enrollment from hospital based OPD, generalizability of the results is doubtful as it may not represent the tear function characteristics of the population as a whole.
- In our study, grading of pinguecula was done by size measurement through slit lamp, which may have lesser accuracy as compared with AS-OCT measurement.

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