Precorneal Tear Film in Pterygium Eye

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Background: *Symptoms of pterygium are similar to dry eye symptoms such as dryness and irritation. Precorneal tear film may be changed in pterygium eye.*

Objective: *To evaluate tear breakup time and Schirmer's test results in patients with unilateral pterygium, and to find whether tear breakup time and Schirmer's test results were related to the size of pterygium.*

Material and Method: *Ninety-two patients, aged between 29 and 78 years, were enrolled in this study. The size of pterygium was measured from limbus to apex of pterygium on a horizontal axis. Tear breakup time and Schirmer's test results were compared in pterygium eye and contralateral normal eye of the same patient. The paired t-test was used for calculating the difference. The Pearson correlation was used to assess the correlations of tear breakup time and Schirmer's test with pterygium size.*

Results: *The mean horizontal size of pterygium ± standard deviation was 2.1±0.7 millimeters. The mean ± standard deviation of tear breakup time in pterygium eyes was 5.5±1.9 seconds compared with 11.3±2.7 seconds in contralateral normal eyes ($t = 23.28$, $p<0.001$). The mean ± standard deviations of Schirmer's test results in pterygium eyes and the opposite normal eyes were 9.8±3.9 and 10.0±3.9 millimeters, respectively ($t = 1.43$, $p = 0.16$). Both tear breakup time and Schirmer's test results had no correlation with pterygium size. The correlation coefficients between the size of pterygium and tear breakup time, and pterygium size and Schirmer's test results were 0.11 ($p = 0.30$) and 0.03 ($p = 0.77$), respectively.*

Conclusion: *The size of pterygium does not correlate with tear breakup time and Schirmer's test results. A decrease in tear breakup time, but normal Schirmer's test results, could be found in pterygium eyes.*

Keywords: Pterygium, Tear, Tear breakup time, Schirmer's test, Size of pterygium

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The pterygium is fibrovascular tissue that extends to the cornea. It is known that the most common cause of pterygium is ultraviolet light exposure[1]. Symptoms of pterygium are similar to dry eye symptoms such as dryness and irritation. Many studies reveal the relationship between the pterygium and the precorneal tear film[2-12]. There were conflicting results in most studies of pterygium cases; some studies did not show any differences in tear breakup time and Schirmer's test results[3-6]. However, other studies showed a decrease in tear quality through evaporation rate (tear breakup time test)[7-11]. Yet others demonstrated a reduction in tear quantity (Schirmer's test)[8-10,12]. Furthermore, no reports were discovered during the literature review on the correlation between pterygium size and tear film function test.

The objectives of the present study were to measure tear breakup time and Schirmer's test in unilateral pterygium patients by comparing one eye to the other eye in same patient, and to find whether tear breakup time and Schirmer's test results were related to the size of pterygium.

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Material and Method

This was a prospective study of 92 unilateral pterygium patients, at Thammasat Hospital, from November 2012 to July 2013. Tear breakup time and Schirmer's test were measured in pterygium eye and contralateral normal eye in the same patient. Patients previously diagnosed with dry eye, contact lens users, and patients who used drugs that caused dry eye were excluded from the present study.

Measurement

The present study was conducted in three parts. First, measurement size of the pterygium, tear breakup time, and finally Schirmer's test. Size in millimeters of pterygium was measured from limbus to apex of pterygium on a horizontal axis.

Tear breakup time is a convenient and useful indicator of tear film stability. After staining with

fluorescein on the inferior fornix, patients were asked to blink several times, then stop blinking and look forward. The tear breakup time was measured from the last blink to when the first dry spot appeared on the corneal surface. The value was recorded in seconds.

Schirmer's test with anesthesia is correlated with basic tear secretion. After administration of topical anesthesia, a standard Schirmer's test filter strip was inserted at the lateral one-third of the lower fornix. Five minutes later, the length of the tear moisture on the test paper, in millimeters, gave the value of Schirmer's test.

Statistics

At a 95% confidence interval, the results of tear breakup time and Schirmer's test were analyzed by paired t-test comparing the pterygium eyes and the normal eyes. Pearson correlation was used to assess the correlations of tear breakup time and Schirmer's test with pterygium size.

Ethics

This research has been approved by the Ethics Committee at Thammasat University, Thailand. Informed written consent was obtained from all participants. The authors verified that all applicable institutional and governmental regulations concerning the ethical use of human volunteers were followed during this research, adhering to the tenets of the Declaration of Helsinki.

Results

There were 46 males and 46 females in the present study. The mean age ± standard deviation was 55.1±12.0 years, ranged between 29 to 78 years. The mean horizontal size of pterygium ± standard deviation was 2.1±0.7 millimeters. The mean ± standard deviation of tear breakup time in pterygium eyes was 5.5±1.9 seconds compared with 11.3±2.7 seconds in contralateral normal eyes (t = 23.28, p<0.001). The mean ± standard deviations of Schirmer's test results in pterygium eyes and the opposite normal eyes were 9.8±3.9 and 10.0±3.9 millimeters, respectively (t = 1.43, p = 0.16).

Surprisingly, both tear breakup time and Schirmer's test results had no correlation with pterygium size (Fig. 1, 2). The coefficients were 0.11 (p = 0.30) and 0.03 (p = 0.77) for the correlation between the size of pterygium and tear breakup time, and between pterygium size and Schirmer's test results, respectively.

Discussion

The present study showed that tear breakup time in pterygium eyes was statistically less significant than normal contralateral eyes; however, there was no significant difference for Schirmer's test results. The results of the present study were similar to previous studies. Wang found that tear breakup time in pterygium eyes was 9.89±3.93 seconds compared with 13.21±4.18 seconds of the opposite control eyes at a statistical significance of t = 13.28, p = 0.048. Schirmer's test results in pterygium and the opposite eyes were 8.21±2.60 and 9.80±3.66 millimeters, respectively, which was not statistically significant (t = 1.50, p = 0.374)[7].

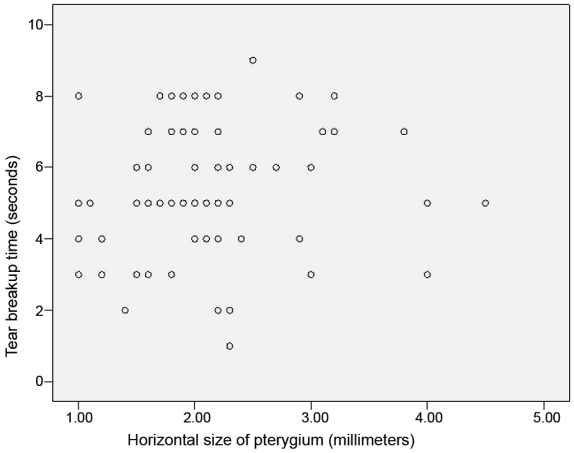

Fig. 1 The correlation between the horizontal size of pterygium (millimeters) and tear breakup time (seconds).

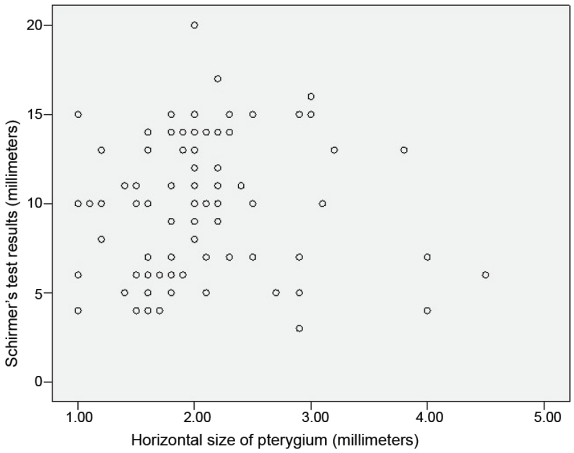

Fig. 2 The correlation between the horizontal size of pterygium (millimeters) and Schirmer's test (millimeters).

Kadayifcilar studied 70 pterygium eyes and 70 normal eyes of age-matched control groups. His study showed that the tear breakup time in eyes with pterygium was 9.84±0.40 seconds; however, in the age-matched control groups, it was 13.41±0.58 seconds, which was statistically significant ($t = 5.31$, $p<0.05$). Schirmer's test results in eyes with pterygium and in control eyes of the age-matched groups was 17.10±1.12 and 19.86±1.01 millimeters, respectively, which was not statistically significant ($t = 1.71$, $p>0.05$)[11]. The study of Marzeta also confirmed that tear breakup time demonstrated a statistically significant reduction in patients with pterygium but no statistically significant difference for Schirmer's test results[13].

Many reports revealed that the tear film mucin layer was abnormal in pterygium. It may be a possible cause of decreasing tear breakup time. In cases of pterygium, the mucus fern test demonstrated a decrease in normal crystallization (mucus fern pattern type I, II), but there was an increase in abnormal crystallization (mucus fern pattern type III, IV)[11,13]. There was a significant increase in normal mucus fern pattern (type I, II) after pterygium excision[14]. The pterygium had lower goblet cell density[15]. Li found that goblet cell density in conjunctival impression increased significantly from 41.82±18.29 per 10 fields to 50.67±18.71 per 10 fields after pterygium excision ($p<0.001$)[14].

Schirmer's test results were not different in pterygium and normal eyes in the current study. The cause might be that pterygium did not have any effect on the aqueous tear film. According to Wang's research, he found that tear quantity was unchanged, but tear quality was altered in pterygium[7]. In contrast, some studies reported Schirmer's test results in pterygium eyes were less than in normal eyes[8-10,12]. This conflict in the research needs more samples for further investigation.

Perhaps the elevated ocular surface of pterygium tissue could have disturbed distribution of tear film and caused abnormalities in tear film function[16]. If the elevated surface of the pterygium had a direct effect on the tear film, the larger pterygium should have shown a decrease in the tear film function versus the smaller one. Nevertheless, the present study demonstrated that both tear breakup time and Schirmer's test results did not have any correlation with the pterygium size. Therefore, the elevated surface of the pterygium alone may not explain the cause of dry eye.

Conclusion

In summary, the size of pterygium does not correlate with tear breakup time and Schirmer's test results. Decreased tear breakup time, but normal Schirmer's test results, could be found in pterygium eyes. Pterygium may cause tear instability but does not affect tear secretions.

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Potential conflicts of interest

None.

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สภาพน้ำตาในตาที่เป็นต้อเนื้อ

โกศล คำพิทักษ์, วิชัย ลีละวงค์เทวัญ

ภูมิหลัง: *อาการของผู้ที่เป็นต้อเนื้อจะมีอาการคล้ายตาแห้ง เช่น รู้สึกแห้งและระคายเคืองตา สภาพน้ำตาอาจมีการเปลี่ยนแปลงในต้อเนื้อ*

วัตถุประสงค์: *เพื่อประเมินค่า tear breakup time และค่า Schirmer's test ในผู้ที่มีต้อเนื้อในตาข้างเดียว และเพื่อหาความสัมพันธ์ระหว่างค่า tear breakup time และค่า Schirmer's test กับขนาดของต้อเนื้อ*

วัสดุและวิธีการ: *ผู้ป่วยที่เข้าร่วมการศึกษามี 92 ราย อายุระหว่าง 29 ถึง 78 ปี วัดขนาดของต้อเนื้อในแนวนอนจาก limbus ถึงส่วนปลายของต้อเนื้อ เปรียบเทียบค่า tear breakup time และค่า Schirmer's test ในตาที่เป็นและไม่เป็นต้อเนื้อในผู้ป่วยคนเดียวกัน ด้วยวิธี paired t-test เปรียบเทียบความสัมพันธ์ระหว่างค่า tear breakup time และค่า Schirmer's test กับขนาดต้อเนื้อด้วย Pearson correlation*

ผลการศึกษา: *ขนาดต้อเนื้อในแนวนอนมีค่าเฉลี่ย ± ส่วนเบี่ยงเบนมาตรฐาน 2.1±0.7 มิลลิเมตร ค่า tear breakup time ในตาที่เป็นต้อเนื้อมีค่าเฉลี่ย ± ส่วนเบี่ยงเบนมาตรฐาน เท่ากับ 5.5±1.9 วินาที เปรียบเทียบกับ 11.3±2.7 วินาที ในตาอีกข้างที่ไม่เป็นต้อเนื้อ ($t = 23.28$, $p<0.001$) ค่าเฉลี่ย ± ส่วนเบี่ยงเบนมาตรฐานของค่า Schirmer's test ในตาที่เป็นและไม่เป็นต้อเนื้อเท่ากับ 9.8±3.9 และ 10.0±3.9 มิลลิเมตร ตามลำดับ ($t = 1.43$, $p = 0.16$) ค่า tear breakup time และค่า Schirmer's test ไม่มีความสัมพันธ์กับขนาดของต้อเนื้อ สัมประสิทธิ์ความสัมพันธ์ระหว่างขนาดต้อเนื้อกับค่า tear breakup time และค่า Schirmer's test มีค่าเท่ากับ 0.11 ($p = 0.30$) และ 0.03 ($p = 0.77$) ตามลำดับ*

สรุป: *ขนาดของต้อเนื้อไม่มีความสัมพันธ์กับค่า tear breakup time และค่า Schirmer's test ในตาที่เป็นต้อเนื้อ อาจพบค่า tear breakup time ลดลงแต่ค่า Schirmer's test ปกติได้*
