Comparative study of pterygium excision with suture and sutureless conjunctival autograft

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ABSTRACT
Introduction and aim. This is a prospective interventional study to compare corneal astigmatism before and after pterygium excision with conjunctival autograft, to determine the difference in mean corneal curvatures before and after pterygium excision, to evaluate the safety and efficacy of autologous blood technique, and sutured conjunctival autograft for primary pterygium.

Material and methods. Patients were divided into group A – pterygium excision+sutured conjunctival limbal autograft and group B – pterygium excision+autologous conjunctival limbal autograft under local anesthesia. The preoperative and post operative K1 and K2 values and BCVA were noted.

Results. There was statistically significant reduction in mean astigmatism at each post operative follow up in group A at 1 week (p=0.0249), 2 weeks (p=0.004), 1 month (p=0.0031) and at 3 months (p=0.0009) and similarly in group B post operative follow up at 1 week (p=0.0011), 2 weeks (p=0.0021), 1 month (p=0.0009) and at 3 months (p=0.0003).

Conclusion. Pterygium surgery decreases the cylindrical error and reverts corneal curvatures to normal, thus improving subjective visual acuity. Astigmatism produced by the pterygium is reduced after surgery We found autologous conjunctival autograft is superior than sutural conjunctival autograft. Pterygium causes astigmatism depending upon the size of pterygium it should be surgically removed to prevent obstruction in the vision.

Keywords. astigmatism, autologous blood conjunctival autograft, pterygium
1. Loss of corneal transparency in the visual axis,
2. Irregular corneal astigmatism (localized flattening).

Induced astigmatism is due to pooling of tears over the pterygium apex or due to mechanical traction of the pterygium leading to tractional corneal flattening. An advanced pterygium can produce changes in corneal curvature and refractive state before entering the optical zone, which can cause visual impairment.

Grades of pterygium:
- Grade-I: Crossing the limbus but not reaching the pupil margin (<2mm)
- Grade-II: Crossing the limbus and reaching up to the pupil margin (2–4 mm)
- Grade-III: Reaching beyond the pupil margin (involving the visual axis) (>4 mm)

Aim
The aim of the study was to determine the difference in mean corneal astigmatism before and after pterygium excision. Moreover, we evaluated the safety and efficacy of autologous blood technique and sutured conjunctival autograft for primary pterygium.

Material and methods
The prospective interventional study was done in Shri Shankaracharya Institute of Medical Sciences, Bhilai, C.G. The study period was June 2022 to March 2023. In this study total 58 patients with primary pterygium of age more than 30 years who attended the Ophthalmology Out Patient Department who were suffering from primary pterygium were taken after getting permission from ethical committee of college (SSIMS/EC/2022/21).

Inclusion criteria were as follows: primary pterygium and age more than 30 years.

Participants with recurrent pterygium, pseudo- pterygium, surface disorders, cases with serology positive for HIV and hepatitis B were excluded from the study.

All the patients with primary pterygium who attended ophthalmology department were selected. Written informed consent was taken. Thorough examination of the patient in terms of visual acuity, slit - lamp examination of anterior segment, posterior segment examination by direct and indirect ophthalmoscopy was done. Data was collected and patients were ruled out according to exclusion criteria. Before surgery the blood sample for random blood sugar, viral markers were sent.

The patients were randomly divided into two groups. All the surgeries were done by a single surgeon.

Group A – had undergone pterygium excision+sutured conjunctival limbal autograft under local anesthesia.

Group B – had undergone pterygium excision+autologous conjunctival limbal autograft under local anesthesia.

The preoperative and post operative K1 and K2 values and best corrected visual acuity (BCVA) was not-ed. Follow up was done on day 1 (D1), day 7 (D7), day (D14), 1 month, 3 months.

On each visits patients were examined for watering, foreign body sensation (Fb), pain and graft stability.

Operative procedure
Eye was painted with 5% povidone iodine and draped. Patient was anesthetized by infiltration of 2% xylocaine. Then the small conjunctival incision was made and dissected close to limbus separation was done. The tenon's capsule was dissected. Removal of the pterygium was done. A thin tenon's free conjunctival autograft was then harvested from superiortemporal quadrant. Gentian violet was used to outline the conjunctiva to be harvested measure by Castro Viejo caliper. The donor area should be 2 mm larger than the bare sclera as the larger graft takes care of graft shrinkage in post operative period. The limbal edge of the graft should be denoted with specific marks in order to identify the edge. The conjunctival auto graft was then harvested by undermining and careful dissection with blunt Wescott scissors. The free conjunctival auto graft was positioned over the area of bare sclera. Maintaining the limbus to limbus and epithelial-side-up configuration keeping the distance of 0.5 mm to 1 mm from limbus to include the limbal stem cells. The autograft was then sutured to the underlying sclera at the limbus and to the cut conjunctival edges with 10–0 Vicryl sutures in group A where as in group B the autograft was positioned over the bare sclera and it gets adhered by autologous blood. The graft harvest site does not require closure and will re-epithelialize on its own. Postoperatively, topical steroids and antibiotics were employed at the rate of 4 times a day, and tapering over 4 weeks depending on degree of inflammation and post-operative course.

Results
Total of 58 eyes were included in study among them 28 was in group A and 30 was in group B. Location of pterygium in each group in which majority of location is Nasal (left eye 8 to 10 o’clock and in right eye 2 to 4 o’clock approximately) with 96.4% and 96.7% in group A and group B respectively.

Table 1. Grading of pterygium

<table>
<thead>
<tr>
<th>Grading of pterygium</th>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>II</td>
<td>18</td>
<td>21</td>
</tr>
<tr>
<td>III</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>30</td>
</tr>
</tbody>
</table>

Comparative study of pterygium excision with suture and sutureless conjunctival autograft
Table 1 shows the grading of pterygium in each group. The above table shows that 4 (14.3%) of the 28 eyes in group A and 5 (16.7%) of the 30 eyes in group B have grade I, 18 (64.3%) of the 28 eyes in group A and 21 out of 30 eyes in group B have grade II, and the remaining 6 eyes in group A and 4 eyes in group B have grade III (Fig. 1).

Table 2 shows the mean astigmatism for each group. Between group A and group B, there was no statistically significant difference in the mean values of K1 at various follow-up times (p>0.05). However, in the postoperative follow-up, the mean values of K1 marginally increased over time.

K1 had pre-operative mean values of 42.55±1.78 for group A and 43.45±1.89 for group B, respectively. For groups A and B, the post-operative at 3 months mean of K1 values was 44.51±1.25 and 44.27±1.32, respectively. This indicates that both group A (p=0.0001) and group B (p=0.0475) experienced statistically significant steepening of the vertical meridian after surgery (Fig. 4).
Comparative study of pterygium excision with suture and sutureless conjunctival autograft

Fig. 4. Comparison of values of K1 and K2

Table 4. Change in mean astigmatism in group A

<table>
<thead>
<tr>
<th>Follow Up</th>
<th>Number of patients (n=28)</th>
<th>Mean</th>
<th>SD±</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-operative</td>
<td>28</td>
<td>5.8</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Post-operative 1 week</td>
<td>28</td>
<td>2.1</td>
<td>3.6</td>
<td>0.0249</td>
</tr>
<tr>
<td>Post-operative 2 week</td>
<td>26</td>
<td>1.71</td>
<td>1.5</td>
<td>0.0040</td>
</tr>
<tr>
<td>Post-operative 1 month</td>
<td>27</td>
<td>1.50</td>
<td>2.1</td>
<td>0.0031</td>
</tr>
<tr>
<td>Post-operative 3 month</td>
<td>26</td>
<td>1.18</td>
<td>1.3</td>
<td>0.0009</td>
</tr>
</tbody>
</table>

Fig. 5. Change in mean astigmatism in group A

Table 5. Change in mean astigmatism in group B

<table>
<thead>
<tr>
<th>Follow Up</th>
<th>Number of patients (n=30)</th>
<th>Mean</th>
<th>SD±</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-operative</td>
<td>30</td>
<td>5.11</td>
<td>5.5</td>
<td>-</td>
</tr>
<tr>
<td>Post-operative 1 week</td>
<td>30</td>
<td>2.09</td>
<td>3.2</td>
<td>0.0011</td>
</tr>
<tr>
<td>Post-operative 2 week</td>
<td>30</td>
<td>1.77</td>
<td>1.4</td>
<td>0.0021</td>
</tr>
<tr>
<td>Post-operative 1 month</td>
<td>27</td>
<td>1.33</td>
<td>2</td>
<td>0.0009</td>
</tr>
<tr>
<td>Post-operative 3 month</td>
<td>27</td>
<td>1.12</td>
<td>1.1</td>
<td>0.0003</td>
</tr>
</tbody>
</table>

Table 4 shows the change in mean astigmatism in group A after surgery. The Pre operative and post-operative at 3 months mean astigmatism were 5.00±5.8 and 1.18±1.3, respectively. There was statistically significant reduction in mean astigmatism at each post operative follow up at 1 week (p=0.0249), 2 weeks (p=0.004), 1 month (p=0.0009) and at 3 months (p=0.0009). This indicates that group A experienced statistically significant reduction of the mean astigmatism after surgery (Fig. 5).

Fig. 6. Change in mean astigmatism in group B

Table 5 shows the change in mean astigmatism in group B after surgery. The Pre operative and post-operative at 3 months mean astigmatism were 5.11±5.5 and 1.12±1.1, respectively. There was statistically significant reduction in mean astigmatism at each post operative follow up at 1 week (p=0.0011), 2 weeks (p=0.0021), 1 month (p=0.0009) and at 3 months (p=0.0003). This indicates that group B experienced statistically significant reduction of the mean astigmatism after surgery (Fig. 6).

Table 6. Comparison of symptoms based on surgery

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Group A</th>
<th>Group B</th>
<th>Post-operative percentage overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>25</td>
<td>26</td>
<td>0.35</td>
</tr>
<tr>
<td>Watering</td>
<td>24</td>
<td>19</td>
<td>0.27</td>
</tr>
<tr>
<td>Sensation</td>
<td>23</td>
<td>19</td>
<td>0.32</td>
</tr>
</tbody>
</table>

Table 6 compares symptoms according to the type of surgery. The percentage of eyes that were watering, hurting, or had an FB feeling before surgery was roughly the same in groups A and B. There was a statistically significant difference in the percentage of eyes in groups A and B experiencing pain (p=0.041) and FB (0.034), while the difference in the percentage of eyes in groups A and B experiencing watering was insignificant (p=0.261). There was no graft displacement in group A while it was noticed in one eye of group B.

Figure 7 shows that the comparison of best corrected visual acuity (Log MAR) during follow up. In group A mean BCVA (Log MAR) pre-operatively was 0.24±0.2 while it was 0.18±0.1, 0.14±0.1, 0.11±0.14, and 0.09±0.06 at 1st week, 2nd week, 1st month and 3rd
month. An ANOVA test of significance revealed a statistically significant improvement in mean visual acuity (p=0.034) in group A. In group B mean BCVA (Log MAR) pre-operatively was 0.23±0.18 while it was 0.15±0.14, 0.12±0.11, 0.12±0.09, and 0.08±0.07 at 1st week, 2nd week, 1st month and 3rd month. An ANOVA test of significance revealed a statistically significant improvement in mean visual acuity in group B (p=0.039).

![Fig. 7. Comparison of best corrected visual acuity (Log MAR) during follow up](image)

We found that autologous conjunctival autograft has some advantages as compared to sutured conjunctival autograft which are as follows-Availability of patient’s own blood, no extra cost, no risk of transmission of blood related diseases, no suture related complications. In comparison to sutured conjunctival autograft there was less watering, pain. Foreign body sensation in autologous conjunctival autograft. Graft stability was more in sutured conjunctival autograft as we found displacement of 1 graft in autologous conjunctival autograft.

**Discussion**

In our study we found females are more affected than males. Similar findings were found in Asokan et al. and by Tomidokoro et al. in which they stated that pterygium has positive correlation with females.8,9

The amount of astigmatism increases with grading of pterygium; the finding has positive correlation with the studies of Payman et al.10

**Table 7. Amount of astigmatism and grading of pterygium**

<table>
<thead>
<tr>
<th>Grading</th>
<th>Group A</th>
<th>Group B</th>
<th>Muhammad Imran Saleem et al.11</th>
<th>Sulman Jaffar et al.12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 1</td>
<td>2.34±0.22 D</td>
<td>2.45±0.31 D</td>
<td>1.76±0.52 D</td>
<td>1.165±0.849 D</td>
</tr>
<tr>
<td>Grade 2</td>
<td>2.51±1.40 D</td>
<td>2.81±0.55 D</td>
<td>2.46±0.74 D</td>
<td>3.46±1.44 D</td>
</tr>
<tr>
<td>Grade 3</td>
<td>6.42±0.81 D</td>
<td>6.58±1.73 D</td>
<td>3.57±1.48 D</td>
<td>5.9±0.265 D</td>
</tr>
</tbody>
</table>

The number of astigmatic changes from pre-operative to post operative value is significant in both group A and group B. It has positive correlation with the following studies (Table 7 and 8).

This verifies the statement that pterygium flattens the cornea and increases the horizontal corneal curvature.

There was significant steepening of horizontal and vertical curvature post-operatively in both Group A and group B. Similar findings were seen in the following studies (Table 9).

**Table 8. Changes in mean astigmatism pre and post operatively**

<table>
<thead>
<tr>
<th>Mean astigmatism±SD</th>
<th>Group A</th>
<th>Group B</th>
<th>Yadnik et al. study13</th>
<th>Maheshwari study14</th>
<th>Maheshwari study15</th>
<th>Mohd Yusuf study16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-operative</td>
<td>5.0±5.80 D</td>
<td>5.1±5.55 D</td>
<td>4.2±3.40 D</td>
<td>4.6±2.2 D</td>
<td>4.0±3.64 D</td>
<td>4.32±1.88 D</td>
</tr>
<tr>
<td>Post-operative</td>
<td>1.8±1.3 D</td>
<td>1.2±1.1 D</td>
<td>1.0±1 D</td>
<td>2.2±0.6 D</td>
<td>1.5±0.63 D</td>
<td>2.1±1.96 D</td>
</tr>
</tbody>
</table>

A statistically significant improvement in mean visual acuity pre-operatively and post-operatively seen in group A and group B was found. Similar findings were seen in Bhandari et al., Zheleva et al., Amoah Kwadwo et al.17-19 The limitation of this study was its relatively small sample size and short follow up period.

**Conclusion**

Pterygium surgery decreases the cylindrical error and reverts corneal curvatures to normal thus improving subjective visual acuity. These finding were noted in both sutured CAG and autologous CAG. Astigmatism produced by the pterygium is reduced after surgery. We found that autologous CAG is superior than sutural CAG.

**Declarations**

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**Author contributions**

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R.M.; Project Administration, A.D. and T.; Funding Acquisition, R.K.

Conflicts of interest
No potential conflict of interest was reported by the authors.

Data availability
The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethics approval
Written permissions were obtained from the Ethical Committee of Shri Shankaracharya Institute of Medical Sciences (SSIMS/EC/2022/21). The participants were informed about the purpose, method, and plan of the study by the researchers, and their informed consent were obtained.

References