Conjunctival-Limbal Autografting Surgical Outcome for Challenging Pterygium Cases: A Prospective Study
Zeena Adnan Abd*

1. Surgery department, ophthalmology unit/College of Medicine, Al-Nahrain University, Baghdad, IRAQ

*Corresponding author: Email: zeenaadnan@yahoo.com

Abstract

Introduction: Pterygium is a common degenerative conjunctival disease, for which several surgical techniques were adopted, but none proved to be ideal because of the relatively high recurrence rate after removal.

Objective: the primary outcome measure was to assess the recurrence rate of pterygia after surgical removal with conjunctival-limbal transplantation; secondary outcome measure was to assess safety of the procedure.

Method: study design: a prospective interventional study

Selection of 20 cases of advanced fleshy pterygia with at least 3.5 mm horizontal extension on the cornea, some primary and some with multiple recurrences, surgical removal with conjunctival-limbal autografting was done

Then postoperative fellow up for 3-6 years checking:

1-evidence of recurrence.

2-evidence of limbal stem cell deficiency.

Results: mean age was 53.45+- 15.78 year

After surgery, the minimum fellow up period was 3 years for primary pterygia, and 6 years for recurrent pterygia

NO recurrence was observed during that period; in addition no signs of limbal stem cell deficiency were seen.

Conclusion: Surgical removal with conjunctival-limbal transplantation proved to be safe and effective for both primary and recurrent pterygia, with NO recurrence rate.

Key words: pterygium, recurrence, conjunctival-limbal transplantation.


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**Introduction**

**Definition**

Pterygium is a triangular in growth of degenerative bulber conjunctival tissue extending over the limbus onto the cornea, composed of fibrovascular tissue (1).

**Prevalence**

The prevalence of pterygia increases gradually as we get closer to the equator (2). A meta-analysis study estimated the overall pooled prevalence to be 10.2% (3). On the other hand, some studies showed a prevalence of 30.8% among adult males aged 40 years and older (4).

**Pathogenesis**

Development of pterygium is strongly correlated with UV light exposure in addition to dryness and exposure to wind and dust (1,2), UV-B radiation is mutagenic to P-53 tumor suppresser gene in limbal basal stem cells (2).

**Pathological changes**

There is elastoid degeneration of collagen fibrills with development of subepithelial fibrovascular tissue in addition to degradation of bowman layer (1,2). The epithelium may show dysplasia (2).

**Symptoms**

Pterygium causes broad range of symptoms and may have a significant impact on patient's life quality (5). Indications for surgery are different from patient to another, but the most common one is reduced vision which is either caused by astigmatism or direct obstruction of the visual axis. Other indications include chronic redness, grittiness and irritation due to chronic or recurrent inflammation (1, 2). Subconjunctival fibrosis may occur in extensive lesions causing restricted ocular motility (1).

**Surgical Treatment**

When pterygium affects vision the mainstay treatment is surgical removal, but the primary complication is recurrence. There is no ideal surgical excision procedure agreed upon to be associated with the lowest recurrence rate. However, the old, fast and easy procedure of bare sclera technique, which was widely used previously, is associated with high recurrence rate (6). Some studies reported this to be up to 40-70% (2). Adjunctive therapies with this technique have been developed to significantly reduce the recurrence rate to 2-15% (7). This may include application of several agents for example: Strontium 90, Beta irradiation, also cytotoxic agents such as Mitomycin-C and 5-Fluorouracil impregnated sponges applied on the scleral bed for several minutes during surgery, were tried to reduce recurrence rate, however sight threatening complications like: scleritis, scleromalacia and phthiasis were reported (8).
Several other surgical techniques for pterygium removal have been described such as conjunctival flap, graft or amniotic membrane transplantation (5). The later technique was associated with a recurrence rate of 4% to more than 60% according to different studies (9, 10). The most commonly used surgical procedure nowadays is excision of pterygium with conjunctival autografting (11). A free conjunctival graft which is usually taken from the superior bulbar conjunctiva, the healthiest part of the conjunctiva due to reduced exposure to UV light, is transplanted to area of sclera from which the pterygium was excised and fixated by sutures or by using tissue adhesives. This reduces the risk of recurrence to approximately 3 -5% (2).

The existence of healthy limbal corneal stem cells creates a natural barrier which prevents the growth of conjunctival epithelium over the cornea. This is the idea behind the use of conjunctival-limbal autograft to fill the gap created by pterygium excision (2).

**Objectives**

To assess recurrence rate of pterygium after surgical excision with limbal-conjunctival autografting and to assess safety of the procedure.

**Patients and methods**

**Study design**

A prospective interventional study.

**Methodology:**

Data collection started from January 2013 to February 2019, during that period hundreds of cases of pterygium were treated, those below 2 mm horizontal length extension on the cornea treated conservatively, cases with larger pterygium treated surgically.

The challenge in our study was to only include cases with pterygium larger than 3.5 mm horizontal length extension onto the cornea and to have a long fellow up period of 3-6 years postoperatively, reserving the longest fellow up period: 6 years for cases with the worst expected prognosis which are cases with multiple recurrences. This explains the relatively low number of patients (twenty) who were included in the statistics despite the hundreds of cases who were examined and managed during the period of the study. so cases with recurrent pterygium were followed up to 6 years postoperatively.

**Type of anesthesia**

Local anesthesia in the form of topical and or peribulbar injection was given.
Surgical technique

Excision of pterygium was done from base to apex, making sure to clean the limbus very meticulously using surgical blade no. 11, then a healthy looking bulbar conjunctiva with a size matching the defect, with a good strip of limbus (to include limbal stem cells) is transplanted to cover the bare sclera, after carefully dissecting it from the underlying tenon, so as to ensure transplanting the conjunctiva alone, leaving the sclera at the donor site covered with tenon capsule without the need for suturing.

The transplanted conjunctival-limbal autograft is secured to the limbus using 10.0 nylon suture superiorly and inferiorly (two nodes), and the base of the graft is sutured to the adjacent conjunctiva either using same non-absorbable stitch or by using 8/0 or 6/0 vicryle absorbable suture.

Post operatively the patients were given steroid-antibiotic drops 4x/day and ointment twice daily. Removal of non-absorbable stitches was done after 10 days. Then patients would continue using steroid-AB drops with gradual tapering over 6 weeks, in addition to preservative free artificial tears 4x/day.

All patients were advised to wear sun glasses and avoid unnecessary sun exposure. Then follow up every six months for 3 to 6 years postoperatively checking for any evidence of pterygium recurrence which is our main outcome measure, and also checking for the presence of any corneal erosions as a measure of safety of the procedure.

Results

Mean age was 53.45+- 15.78 year
Youngest patient was 27 years old, and the oldest was 73 years, as shown in table (1):

<table>
<thead>
<tr>
<th>Age (yr)</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>53.45</td>
<td>15.78</td>
<td>27-73</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1 shows females were more than male.

Figure (1): Percentage of females and male
Table (2) shows the raw data which includes type of job of patients, primary or recurrent pterygium with number of recurrences, pre and post-operative visual acuity, and finally the number of years of fellow up postoperatively, paying attention that the maximum fellow up period reserved for cases with multiple recurrences.

**Table (2): Raw data**

<table>
<thead>
<tr>
<th>No.</th>
<th>Type of work</th>
<th>Primary (1°) or recurrent pterygium</th>
<th>Preoperative VA</th>
<th>Postoperative VA</th>
<th>Follow up period in years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Farmer</td>
<td>3 previous recurrences</td>
<td>CF 1/2 m</td>
<td>6/6</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>House-baking</td>
<td>1°</td>
<td>6/36</td>
<td>6/6</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>House-baking</td>
<td>One recurrence</td>
<td>CF 3 m</td>
<td>6/6 p</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>House-baking</td>
<td>One recurrence</td>
<td>CF 6 m</td>
<td>6/9 p</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Driver</td>
<td>1°</td>
<td>CF 3 m</td>
<td>6/6 p*</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Military</td>
<td>1°</td>
<td>6/24</td>
<td>6/6</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Driver</td>
<td>1°</td>
<td>6/60</td>
<td>6/6 p</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>House-baking</td>
<td>1°</td>
<td>6/24</td>
<td>6/6</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>House-baking</td>
<td>Two recurrences</td>
<td>CF 5 m</td>
<td>6/6</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>House-baking</td>
<td>1°</td>
<td>CF 1.5 m</td>
<td>6/9</td>
<td>4</td>
</tr>
<tr>
<td>11</td>
<td>Farmer</td>
<td>1°</td>
<td>6/24</td>
<td>6/6 p</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>Farmer</td>
<td>1°</td>
<td>6/24</td>
<td>6/6</td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>Military</td>
<td>1°</td>
<td>6/36</td>
<td>6/9</td>
<td>3</td>
</tr>
<tr>
<td>14</td>
<td>Police officer</td>
<td>1°</td>
<td>6/18 severely inflamed</td>
<td>6/6</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>Military</td>
<td>1°</td>
<td>6/24</td>
<td>6/6</td>
<td>3</td>
</tr>
<tr>
<td>16</td>
<td>Farmer</td>
<td>1°</td>
<td>6/24</td>
<td>6/6</td>
<td>3</td>
</tr>
<tr>
<td>17</td>
<td>House-baking</td>
<td>1°</td>
<td>CF 3 m</td>
<td>6/6p</td>
<td>5</td>
</tr>
<tr>
<td>18</td>
<td>House-baking</td>
<td>1°</td>
<td>6/60</td>
<td>6/6 p</td>
<td>3</td>
</tr>
<tr>
<td>19</td>
<td>Farmer</td>
<td>1°</td>
<td>6/24 p</td>
<td>6/9 p</td>
<td>3</td>
</tr>
<tr>
<td>20</td>
<td>Farmer</td>
<td>1°</td>
<td>CF 5 m</td>
<td>6/9 p</td>
<td>3</td>
</tr>
</tbody>
</table>

Regarding environmental risk factors, and depending on the type of patients work, exposure to heat with or without direct exposure to UV-light were the most important, as shown in figure (2).

![Figure (2): Percentage of exposure to UV-light and/or heat](image-url)
In our study, 20% of patients were presented with recurrent pterygium preoperatively, some with single recurrence and some with multiple, up to three recurrences, as shown in figure (3).

Regarding the comparison between pre and postoperative visual acuity and as we involved cases with large pterygium size; 3.5 mm horizontal length extension onto the cornea, 50% of cases have preoperative visual acuity of counting fingers (CF) 1/2 m to 6/60, while 100% of cases have postoperative VA of 6/9 P or better, so there was a highly significant (12) improvement in vision, as shown in table (3).

![Figure (3): Percentage of cases of recurrent pterygium preoperatively](image)

<table>
<thead>
<tr>
<th>Visual acuity</th>
<th>Preoperative</th>
<th>Postoperative</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>6/6</td>
<td>0</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>6/9 P to 6/6 P</td>
<td>0</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>6/36 to 6/18</td>
<td>10</td>
<td>50.0</td>
<td>0</td>
</tr>
<tr>
<td>CF 1/2 M to 6/60</td>
<td>10</td>
<td>50.0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>100</td>
<td>20</td>
</tr>
</tbody>
</table>

### Discussion

A lot of studies have been done to figure out the ideal surgical procedure for pterygium removal, for example a study done by Donald and his colleagues (13) who compared the recurrence rate between conjunctival autografting and bare sclera technique, where they found a lower recurrence rate using the former procedure, they studied also the effect of pterygium morphology & fleshiness on recurrence rates, where they found a positive relationship; the more fleshy the pterygium the higher the recurrence rate. The later conclusion does not agree with our results as we have no recurrence despite the fact that...
all of our cases were fleshy and of large size (3.5 mm or more of horizontal extension on the cornea), which probably could be explained by the effect of the transplanted limbal stem cells (in our cases) which may act as a barrier against growth of conjunctiva onto the cornea.

The only drawback of conjunctival – limbal autografting is the relatively long surgical time and irritation from stitches postoperatively, beside the fear of damaging the limbus, this opens the door for the use of amniotic membrane to cover the gap created by pterygium excision, and again several studies were done for comparison, like the study done by Luanratanakorn and his colleagues (14), who compared the recurrence rate between the conjunctival graft and amniotic membrane groups, and they found that the recurrence rate for the amniotic membrane group was 28.1% which was significantly higher than the conjunctival group 13.1% (p=0.003).

Other comparative study (15) concluded that the recurrence rate of pterygia was significantly higher after amniotic membrane transplantation in comparison with conjunctival-limbal transplantation.

Another comparative study (16) concluded that both techniques of conjunctival and limbal-conjunctival autografting have significantly lower recurrence rate when compared with amniotic membrane grafting.

Li et al (17) did a meta-analysis and showed that although recurrence rate of primary pterygia was significantly lower with conjunctival autograft in comparison with amniotic membrane graft, both techniques have similar recurrence rate when treating recurrent pterygia.

In 2009, Alpay and his colleagues did a comparative study (18), comparing 4 different surgical techniques for pterygium removal which are bare sclera, intraoperative mitomycin c, conjunctival autograft and conjunctival flap techniques, and they found that the highest recurrence rate occurred in the bare sclera group, and the lowest was with the conjunctival autograft and mitomycin groups, beside this, they found that the cosmetic outcome of the autograft group was the superior one, although their follow up period was from 6 months to 2 years, depending upon the opinion that recurrence of pterygium generally occurs within the first 6 months postoperatively (19).

Another prospective study, that is consistent with our study, is the one performed by Al Fayez (20) who compared free conjunctival grafting versus limbal-conjunctival transplantation technique for treating primary and recurrent pterygia, where he get a recurrence rate of 10% for the former technique versus 1% for the later, beside this, there was no side effects from limbal transplantation; i.e. no signs of limbal stem cells deficiency.

Another safety factor in our study is the avoidance of the use of any type of antimetabolite, like mitomycin C, with their well-known complications (21).

In our study, we included cases with recurrent pterygia, one of them have 4 previous recurrences, and after 6 years of postoperative fellow up, no recurrence occurred, so limbal- conjunctival technique is effective for recurrent pterygia, and this is consistent with the finding of Guler and his colleagues (22).
The use of mitomycin C in management of recurrent pterygia was evaluated in several studies (23,24), who concluded the effectiveness of this antimetabolite in preventing or reducing recurrence rate, however there were reasonable concerns about side effects.

Side effects of mitomycin C range from persistent irritation and discomfort, wound dehiscence that lead to recurrence (25), to serious vision threatening complications like secondary glaucoma, corneal edema and perforation, iritis and correctopia, mature cataract, scleral calcification(26) and scleral melting (27).

**Conclusion**

Pterygium excision with conjunctival-limbal autografting proved to be "safe" and "effective" in the management of the most challenging cases of large and fleshy pterygia, even those with multiple recurrences, and after 3 to 6 years of post-operative fellow up no recurrence was observed.

**References**


