Comparison of Two Methods for the Treatment of Primary Pterygium: Amniotic Membrane Transplantation plus Intraoperative Mitomycin C, versus Conjunctival Rotational Autograft plus Intraoperative Mitomycin C

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Abstract

**Purpose:** To compare outcomes and recurrence rates of amniotic membrane transplantation (AMT) plus intraoperative mitomycin C (MMC) and conjunctival rotational autograft (CRA) plus intraoperative MMC in pterygium surgery

**Methods:** Ninety-two eyes of 92 patients with primary nasal pterygium were enrolled. All patients were randomized to undergo either AMT or CRA. Forty-three patients underwent AMT plus intraoperative MMC (AMT group), and 49 patients CRA plus intraoperative MMC (CRA group). Patients were followed-up at 1 day, 1 week, 2 week, 1, 3, 6, and 12 months postoperatively. The main outcome measurement was a recurrence rate after surgery.

**Results:** A total of 92 eyes of 92 patients were included in the study. In AMT group 22 patients were male and 21 patients were female. In CRA group 25 patients were male and 24 patients were female (p=0.923). Mean age in AMT group was 46.4 and in CRA group was 47.7 years (p=0.634). Mean pterygium size in AMT group was 3.4 mm and in CRA group was 3.3 mm (p=0.320). Mean follow-up time in AMT group was 10.5 months and in CRA group was 10.8 months (p=0.535). Nine of 43 eyes (20.93%) in the AMT group developed recurrence compared with four of 49 eyes (8.16%) in the CRA group (p=0.145).

**Conclusion:** Although no statistically significant difference was present between the two groups, however the recurrence rate seems to be clinically less in the CRA group.

**Keywords:** Pterygium, Amniotic Membrane Transplantation, Conjunctival Rotational Autograft, Mitomycin C
Introduction

Pterygium is a wing-shaped interpalpebral fibrovascular tissue that extends across the bulbar conjunctiva and limbus onto the cornea, most commonly in nasal side. Suprachoroidal fibrovascular tissue present in the body of pterygium, obscuring underlying episcleral vessels, acts as promoters of epithelization and act as promoters of epithelization.

Amniotic membrane has a thick collagen layer and an overlying basement membrane with a single layer of epithelium. It has been exploited as a new ophthalmic tool for the management of many ocular surface diseases including reconstruction of conjunctival defects after pterygium surgery. The effects of the amniotic membrane make this procedure an attractive therapy after pterygium excision. Another established approach is the addition of mitomycin C (MMC), an alkylating agent that reduces recurrence by inhibiting fibrovascular growth in the subconjunctival space. The best method for the use of MMC is intraoperative application of this drug.

Methods

In this randomized clinical trial study, patients with primary pterygium that came to ophthalmology clinic for treatment and had indication of surgery, were enrolled. Patients were excluded if they had more than one head of pterygium, recurrent pterygium, ocular infection and inflammation, glaucoma, previous ocular surgery in the study eye, pregnant and breastmilk women, or systemic diseases such as rheumatoid arthritis or other collagen vascular diseases. After informed consent, the patients underwent detailed examination including visual acuity with and without correction, intraocular pressure measurement with Goldman tonometer, slit-lamp biomicroscopy, documentation of pterygial size and morphological classification (ie, atrophic, fleshy, or intermediate), and dilated fundoscopy. Morphology was graded according to the relative degree of fibrovascular tissue present in the body of pterygium, obscuring underlying episcleral vasculature under slit-lamp biomicroscopic examination (atrophic-translucent tissue with clear visualization of underlying episcleral vessels; fleshy-the least translucent with...
complete obscuration of episcleral vessels; and intermediate-partial episcleral vessel obscuration).

The patients were randomized with block randomization in two groups: 1) AMT+MMC (amniotic membrane transplantation plus intraoperative mitomycin C) 2) CRA+MMC (conjunctival rotational autograft plus intraoperative mitomycin C).

In AMT group 43 eyes from 43 patients and in CRA group 49 eyes from 49 patients were enrolled. All surgeries were performed in Khalili Hospital under topical and subconjunctival anesthesia.

For surgery; in AMT group the head and body of pterygium first were removed by a similar technique in all patients, with resection of the body in front of plica semilunaris. This was followed by removal of subconjunctival fibrovascular tissue beyond the conjunctival edges and polishing of the cornea with a crescent knife. After minimal cauteryization of bleeding vessels, 0.02% MMC was applied both on the bare sclera and under the conjunctival edges by using pieces of Weck-Cel surgical sponge soaked in 0.02% MMC solution. Duration of MMC application was one minute for all cases. After the eye surface was washed with 30 mL balanced salt solution, an amniotic membrane was used as a single layer with the stromal side down, attached with 10-0 nylon interrupted sutures with minimal tension to the conjunctival edges to cover the bare sclera.

In CRA group the head and body of pterygium first were removed by a similar technique in all patients, with resection of the body in front of plica semilunaris. This was followed by removal of subconjunctival fibrovascular tissue beyond the conjunctival edges and polishing of the cornea with a crescent knife. After minimal cauteryization of bleeding vessels, 0.02% MMC was applied both on the bare sclera and under the conjunctival edges by using pieces of Weck-Cel surgical sponge soaked in 0.02% MMC solution. Duration of MMC application was one minute for all cases. After the eye surface was washed with 30 mL balanced salt solution, an amniotic membrane was used as a single layer with the stromal side down, attached with 10-0 nylon interrupted sutures with minimal tension to the conjunctival edges to cover the bare sclera.

For surgery, in AMT group the head and body of pterygium first were removed by a similar technique in all patients, with resection of the body in front of plica semilunaris. This was followed by removal of subconjunctival fibrovascular tissue beyond the conjunctival edges and polishing of the cornea with a crescent knife. After minimal cauteryization of bleeding vessels, 0.02% MMC was applied both on the bare sclera and under the conjunctival edges by using pieces of Weck-Cel surgical sponge soaked in 0.02% MMC solution. Duration of MMC application was one minute for all cases. After the eye surface was washed with 30 mL balanced salt solution, an amniotic membrane was used as a single layer with the stromal side down, attached with 10-0 nylon interrupted sutures with minimal tension to the conjunctival edges to cover the bare sclera.

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Mean pterygium size in AMT group was 3.4 mm and in CRA group was 3.3 mm (p=0.320). In AMT group 25.6%, 46.5% and 27.9% of all pterygia were atrophic type, intermediate type and fleshy type, respectively and in CRA group 24.5%, 46.9% and 28.6% of all pterygia were atrophic type, intermediate type and fleshy type, respectively.

Mean follow-up time in AMT group was 10.5 months and in CRA group was 10.8 months (p=0.535). Nine of 43 eyes (20.93%) in the AMT group developed recurrence compared with 4 of 49 eyes (8.16%) in the CRA group (p=0.145).

Table 1. Patients’ demographic data and recurrence rate

<table>
<thead>
<tr>
<th></th>
<th>AMT group</th>
<th>CRA group</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patients (eyes)</td>
<td>43</td>
<td>49</td>
<td>-</td>
</tr>
<tr>
<td>Sex (M:F)</td>
<td>(22:21)</td>
<td>(25:24)</td>
<td>0.923</td>
</tr>
<tr>
<td>Mean age (SD)</td>
<td>46.4 (13.5)</td>
<td>47.7 (11.5)</td>
<td>0.634</td>
</tr>
<tr>
<td>Range</td>
<td>21-78</td>
<td>22-75</td>
<td>-</td>
</tr>
<tr>
<td>Pterygium size (mm)</td>
<td>Mean (SD)</td>
<td>3.4 mm</td>
<td>3.3 mm</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>2-5.2</td>
<td>2-5</td>
</tr>
<tr>
<td>Pterygium type</td>
<td>Atrophic</td>
<td>11 (25.6%)</td>
<td>12 (24.5%)</td>
</tr>
<tr>
<td></td>
<td>Intermediate</td>
<td>20 (46.5%)</td>
<td>23 (46.9%)</td>
</tr>
<tr>
<td></td>
<td>Fleshy</td>
<td>12 (27.9%)</td>
<td>14 (28.6%)</td>
</tr>
<tr>
<td></td>
<td>F/U time (month)</td>
<td>10.5</td>
<td>10.8</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>(6-12)</td>
<td>(6-12)</td>
</tr>
<tr>
<td>Overall recurrence</td>
<td>9 (20.93%)</td>
<td>4 (8.16%)</td>
<td>0.145</td>
</tr>
</tbody>
</table>


Discussion

To prevent pterygium recurrence and other complications, various surgical techniques for pterygium have been developed and are continuously being revised. Pterygium surgery should ideally have a low or no recurrence, minimal adverse events, and be cosmetically acceptable.

Recurrence of pterygium onto the cornea after surgical excision is still the most important and frustrating cause of pterygium surgery failure for both surgeon and patient. Therefore, it is still an ongoing debate regarding the “ideal” pterygium surgery technique.

In this prospective randomized study, we compared two techniques for pterygium surgery.

In one group AMT+MMC and in other group CRA+MMC, and we compared recurrence rate between two groups. The recurrence rate was 20.93% in AMT group and 8.16% in CRA group.

Higher recurrence rate was found clinically in AMT group compared to CRA group but this difference was statistically insignificant (p=0.145).

Luanratanakorn et al compared the recurrence rate after excision of primary pterygium combined with AMT (148 cases) and conjunctival autograft (106 cases). In the conjunctival autograft group, the recurrence rate was 12.3% and in the amniotic membrane group, the recurrence rate was 25.0%. Recurrence rate in amniotic
membrane group was comparable to our study (20.93%).

Tananuvat et al compared primary pterygium excision and amniotic membrane versus conjunctival autograft transplantation. They reported higher recurrence rate (40.9%) in amniotic membrane transplantation technique compared to conjunctival autograft technique (4.76%).

Prabhasawat et al carried out AMT on 46 patients of primary pterygium and reported recurrence rate of 10.9% that is lower recurrence rate compared to our study result.

Huang et al reported very low recurrence rate (0.79%) in combining application of mitomycin and amniotic membrane transplantation after pterygium resection in 127 cases.

Alvin L Young et al carried out combined CRA and intraoperative 0.02% MMC in the treatment of primary pterygium. They reported less recurrences rate (3%) than our study which is 8.16%.

Kim et al compared conjunctival autograft and anchored conjunctival rotation flap techniques and reported recurrence rate 8.0% in the conjunctival autograft group and 8.6% in the anchored conjunctival rotational flap group (p=0.659) which is similar to our CRA group.

The difference is recurrence rate of our study with some of the above studies may originate from different demographic and racial factor of our patients, difference in geographic region and sunlight exposure, different definition for recurrence and grading system, length of follow-up, and also time or concentration of MMC applied.

In our study we applied the MMC for one minute, maybe if we increase the time of MMC to two minutes, we may achieve even lower recurrence rates. This can be the aim of our future studies.

Conclusion

No statistically difference was found in recurrence rate between the two group of CRA and AMT in our study.

Although recurrence rate was higher in the AMT group clinically, however it has superiority to CRA method in special circumstances. For example when preparation of conjunctival flap is difficult due to conjunctival atrophy and shrinkage, or when dealing with dual head pterygium and ipsilateral pterygium. Also in cases which may need a future filtering glaucoma surgery, AMT is the superior technique.

Acknowledgement

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References

14. Chen PP, Ariyasu RG, Kaza V, LaBree LD, McDonnell PJ. A randomized trial comparing mitomycin C and conjunctival autograft after