Comparison of trichiasis recurrence after primary bilamellar tarsal rotation or anterior lamellar repositioning surgery performed for trachoma

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ABSTRACT

Background: To compare the trichiasis recurrence rate following bilamellar tarsal rotation or anterior lamellar repositioning, performed as primary surgery for trachomatous trichiasis.

Design: Retrospective consecutive case series.

Participants: All cases of trachomatous trichiasis undergoing primary surgical correction at Alice Springs Hospital, Alice Springs, Northern Territory, Australia, between 1 June 2001 and 11 June 2011 were included.

Methods: Retrospective chart review. Key baseline, operative and outcome details were collected from the notes.

Main Outcome Measure: Recurrent trichiasis was defined as one or more lashes touching the cornea, resulting in recurrent symptoms of trichiasis and warranting further surgery in the opinion of the treating ophthalmologist.

Results: Sixty-seven BTR and eighteen ALR procedures were performed, with BTR being performed from 2001 to 2008, and ALR from 2008 to 2011. The mean follow-up times were significantly different for the BTR group (1654 days) and for the ALR group (673 days) (P < 0.001). Kaplan–Meier survival analysis did not reveal any significant differences in recurrence rate between the two procedures overall (P = 0.935). Analysis of the 2008 calendar year (the only year where both procedures were performed and therefore had equal follow-up times) suggested that ALR might have a lower recurrence rate (1/10 ALR recurrences vs. 4/6 BTR recurrences, P = 0.181).

Conclusions: The results do not demonstrate a difference in the recurrence rate between the two techniques. Inconsistent follow times however leave uncertainty in this result, and a larger prospective randomised study is warranted to address this question.

Key words: anterior lamellar repositioning, bilamellar tarsal rotation, cictriciaentropion, trachoma, trichiasis.

INTRODUCTION

Trachoma is responsible for approximately 3% of blindness worldwide.1 There are some 40.6 million people suffering from active trachoma and 8.2 million people suffering from trachomatous trichiasis (TT).2

Trachoma is initiated by chronic Chlamydia trachomatis conjunctivitis.3 Risk factors for infection...
include poor facial hygiene and poor living conditions. Conjunctivitis encompasses the first two of five steps in the World Health Organization’s (WHO) simplified assessment of trachoma criteria: trachomatous inflammation, follicular (TF); trachomatous inflammation, intense (TI); trachomatous scarring (TS); trachomatous trichiasis (TT); and corneal opacity (CO). Repeated infection is critical to the disease process, causing tissue damage and fibrosis that leads to contraction band formation and the rolling inward of the superior tarsus and palpebral margin (entropion). When severe enough, entropion results in trichiasis (TT), causing eyelashes to rub on the conjunctiva and/or cornea of the eye. Untreated, the rubbing from eye movement is a constant irritant and causes scarring and opacification of the cornea, resulting in blindness (CO). With early intervention this condition is fully treatable with surgery – TT is an entirely preventable cause of blindness.

In Australia’s general population, the prevalence of trachoma is negligible, as with all other developed countries. However, amongst the Indigenous population of Australia, trachomatous inflammation (TF, TI) and scarring (TS) remains hyper-endemic in some areas. Australia is the only developed country to have trachoma as a public health issue. Although decreasing, the prevalence is still above the threshold set by the WHO to represent a serious public health problem. The rates of trichiasis (TT) and corneal opacity in adults in some Indigenous communities have been shown to be between 6% and 14%, and between 2% and 3%, respectively.

In 1996, the WHO developed the ‘SAFE’ strategy to tackle trachoma, comprising surgery, antibiotics, facial cleanliness, and environmental health improvements. This study reviews the surgery used to halt progression of trichiasis to corneal opacity, which may also permit improved visual acuity. Currently, the WHO recommends the bilateral tarsal rotation (BTR) procedure to correct all severities of entropion-induced trichiasis. This same BTR procedure was used at the Alice Springs Hospital (ASH) in the Northern Territory up until and including 2008. Beginning 2008 also, following personal communication with J.R.O. Collin at a National Conference in Australia regarding the proneness of BTR to recurrence, the anterior lamellar repositioning (ALR) technique was introduced, as it was suggested as a potentially effective long-term alternative. ALR has been used exclusively since 2009 also for all severities of trichiasis.

The aim of this study was to compare the success rate of BTR with ALR in the primary management of trachomatous trichiasis.

### Methods

#### Participants

Patients undergoing primary surgery for upper lid TT at the ASH between 1 June 2001 and 11 June 2011 were eligible for inclusion. Cases were identified through a search of the electronic records kept both at ASH, and also through a search of an electronic database maintained by one of the authors (TH). The ophthalmologist specialist present made the diagnoses. Patients who had primary surgery using a lid architecture-altering technique other than BTR or ALR were not included. Techniques involving only lashes such as epilation were also not included in the present study. Patients with follow-up times of less than 6 months were excluded, and patients noted with recurrence within 6 months were documented but not included in the main analysis. This was done to reduce the chance of primary surgical failure confounding comparison of long-term recurrence rates between the two techniques and leading to bias towards early recurrence. All patients were of Aboriginal or Torres Strait Islander descent.

#### Methods

Both paper and computer database medical records were searched for evidence of operations performed to correct upper lid TT. Where possible, paper records were cross-matched with computer records for waiting list admission dates, procedure details (consent forms, anaesthetic records and surgical records), and day-one post-operative follow-up notes. Only operations with completed procedure details in the form of paper notes were included in the study. De-identified personal information concerning date of birth, date of death (if applicable), gender, current location of postal address, history of prior trachoma surgery, date of waiting list admission, date of surgery, lid operated on, knowledge of subsequent waiting list admission, date of subsequent surgery and date of last ophthalmic review were collected into a Microsoft Excel spreadsheet.

A patient’s current postal address was used as the most accurate indicator of current place of residence. For those with recurrence, the time to recurrence (their follow-up time) was calculated as the time from the date of surgery to the first known date of recurrence or in lieu the date of revision surgery. For those with no recurrence, the follow-up time was calculated as the time between the date of surgery and the date of last ophthalmic review.

The study was granted ethics approval by the Central Australian Human Research Ethics Committee (CAHREC) (APP# 2011.10.01) and also the

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Australian National University Human Ethics Committee (APP# 2011/559).

Procedures
All procedures were performed by TH, visiting specialists, or training specialists. TH directly supervised the majority of cases not performed by himself to minimize the known effect of surgeon on recurrence.

Anterior lamellar repositioning:

The technique used is similar to that described by Ross et al. but without specific levator recession or buccal mucosal grafts. Following local anaesthetic infiltration, the mucocutaneous junction of the eyelid margin is incised at the grey line to separate the anterior and posterior lamella. The initial incision is superficial (<2 mm), to prevent losing the tissue plane and inadvertently cutting through the tarsal plate. A low skin crease incision is made at 4 mm from the upper eyelid margin and the tarsal plate is exposed. Blunt dissection is carried out over the tarsus to join the grey line incision. The operation may be commenced from the grey line incision or from the skin crease incision, but they are dissected to meet and separate the anterior and posterior lamellar along the length of the eyelid. Double-armed 5/0 vicryl sutures are placed partial thickness through the tarsal plate and emerge through the anterior lamella close to the upper eyelid margin. The bare eyelid margin is allowed to epithelialize.

Bilamellar tarsal rotation:

A full thickness lid incision is made through the anterior and posterior lamellae followed by three or occasionally four, 5/0 double-ended absorbable evertting sutures, which are placed in the lower end of the proximal posterior lamellar (tarsal plate). They pass forward and distally to emerge just above the lash line in the anterior lamellar. When tightened, they evert the lower section of the lid by rotating the terminal tarsus and overlying anterior lamellar including the lashes (thus bilamellar).

Statistical analysis
All analyses were performed using IBM SPSS software version 21.0 (Armonk, NY, USA). Associations between the categorical variables of procedure, recurrence, gender, lid and place of residence were evaluated using the Pearson chi-squared test where appropriate. The continuous variables age, time to recurrence and follow-up times were evaluated using two-sided $t$-tests. Kaplan–Meier plots were constructed and used to illustrate time to recurrence for each technique. Differences in recurrence were also assessed using the log rank test. $P$-values less than 0.05 were considered to be statistically significant.

RESULTS
Of the 150 procedures for TT during the study period, 39 were excluded as they were not primary operations to correct trichiasis (see Fig. 1). Of the 111 primary operations, 1 was excluded because follow-up time was not calculable, and 20 were excluded because follow-up times were less than 183 days and no recurrence was noted. Five procedures (four BTR and one ALR) with recurrence inside 183 days were not included in the analysis. Overall, 85 procedures were performed on 63 patients, with 48 BTR patients (18 bilateral, 29 unilateral and 1 mixed) and 16 ALR patients (2 bilateral, 13 unilateral, and 1 mixed). The one mixed case had a BTR procedure done on one eye and an ALR procedure done on the other eye and

Figure 1. Flow diagram of patients and procedures.
therefore counted as a patient for both procedures. There were five procedures (three BTR and two ALR), all with no recurrence, that had follow-up times in the period of 183–365 days.

Table 1 presents baseline data comparing the BTR and ALR groups, and Table 2 contains the outcome data. The follow-up time was significantly longer for the BTR group ($P < 0.001$), making any difference in recurrence rate impossible to interpret. As a result, Kaplan–Meier survival analysis of non-recurrence for the ‘overall’ group of 67 BTR and 18 ALR procedures was conducted and is presented in Figure 2. This fails to demonstrate a clear trend favouring either procedure (31/67 BTR and 3/18 ALR recurrences, $P = 0.935$, log rank test). In addition, analysis of a separate ‘subgroup’ of 6 BTR and 10 ALR procedures from 2008 did not show a significant difference (4/6 BTR and 1/10 ALR recurrences, $P = 0.181$, log rank test); however, the numbers in this group were very small. This particular subgroup was chosen prior to examining the outcome data in an effort to standardize follow-up time (this was the only overlapping year both procedures were being performed). Follow-up time was similar (965 vs. 733 days, $P = 0.204$). There were no significant differences between demographic characteristics for these subgroups (data not shown).

### Table 1. Baseline features of BTR and ALR patients from 2001–2011

<table>
<thead>
<tr>
<th>Patient features</th>
<th>BTR</th>
<th>ALR</th>
<th>$P$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total lids $n$ (%)</td>
<td>67/85 (79)</td>
<td>18/85 (21)</td>
<td>–</td>
</tr>
<tr>
<td>Total patients $n$ (%)</td>
<td>48/63$^a$ (76)</td>
<td>16/63$^a$ (24)</td>
<td>–</td>
</tr>
<tr>
<td>Gender: Female $n$ (%)</td>
<td>56/67 (84)</td>
<td>13/18 (72)</td>
<td>$P = 0.313^a$</td>
</tr>
<tr>
<td>Lid: Left $n$ (%)</td>
<td>34/67 (51)</td>
<td>9/18 (50)</td>
<td>$P = 0.955^a$</td>
</tr>
<tr>
<td>Residence: Alice Springs $n$ (%)</td>
<td>21/67 (31)</td>
<td>3/18 (17)</td>
<td>$P = 0.256^a$</td>
</tr>
<tr>
<td>Average age in years (min, max) $n = 85$</td>
<td>60.2 (30,86)</td>
<td>62.6 (47,75)</td>
<td>$P = 0.435^a$</td>
</tr>
</tbody>
</table>

$^a$Chi-squared test. $^t$-test. $^\dagger$One patient received one BTR and one ALR procedure. ALR, anterior lamellar repositioning; BTR, bilamellar tarsal rotation.

### Table 2. Surgical details of BTR and ALR patients from 2001–2011

<table>
<thead>
<tr>
<th>Surgical details</th>
<th>BTR</th>
<th>ALR</th>
<th>$P$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recurrence $n$ (%)</td>
<td>31/67 (46)</td>
<td>3/18 (17)</td>
<td>–</td>
</tr>
<tr>
<td>Mean follow-up time in days (min, max) $n = 85$</td>
<td>1654 (190, 3734)</td>
<td>673 (196, 1414)</td>
<td>$P &lt; 0.001^t$</td>
</tr>
<tr>
<td>Mean time to recurrence in days (min, max) $n = 34$</td>
<td>1078 (204, 2927)</td>
<td>681 (588, 768)</td>
<td>$P = 0.290^t$</td>
</tr>
</tbody>
</table>

$^t$-test.
We observed that the majority of patients were women. This has previously been suggested by Congdon et al. to be due to the role of women having more contact with children, and consequently being more vulnerable to facial cleanliness and environmental factors such as fly exposure, leading to chronic trachoma. It could also reflect the ratio of genders in Indigenous communities, especially because the mean age of surgery approaches the age of expectancy, and there is a difference between the expectancies of men and women. Having women access healthcare more would also explain such a result.

Despite the possibility of gender differences in access to healthcare, it is interesting to note that more than half of patients were from remote communities outside of the Alice Springs area (69% and 83% for BTR and ALR, respectively). These statistics highlight the limitation on the services offered by ASH, with the implications for each patient’s post-surgical disease, wound healing ability, immunogenetic factors, older age, and C. trachomatis and other bacterial infections.

All in all, the rate of recurrence is still high, and although this study concentrated on the surgical aspects of the SAFE strategy, it is important to remember the reasons for recurrence in the context of the individual. Antibiotics, facial cleanliness and environmental infrastructure such as clean water and latrine provisions all help prevent the cycle and spread of ocular infection, and are therefore critically important, in addition to surgery, to prevent surgical failure.

We conclude that we could not establish a significant difference in trichiasis recurrence between the ALR technique and the World Health Organization- endorsed BTR technique in this setting. Inconsistent follow times, however, leave uncertainty in this result.

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REFERENCES


