Trichiasis Surgery in The Gambia: A 4-Year Prospective Study

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Purpose. Trachoma is the leading infectious cause of blindness. Conjunctival *Chlamydia trachomatis* infection causes scarring, entropion, trichiasis, and blinding corneal opacification. Worldwide, there are 8 million people with trichiasis. Although trichiasis surgery can reduce the risk of blindness, retrospective data suggest that long-term recurrence rates may be high. A 4-year prospective investigation of recurrent trichiasis was conducted in The Gambia.

Methods. Patients with trichiasis were examined at baseline, 6 months, 1 year, and 4 years after posterior lamellar tarsal rotation surgery. Conjunctival swabs for bacteriology and PCR for *C. trachomatis* were collected at baseline, 6 months, and 1 year.

Results. Three hundred fifty-six Gambian patients were enrolled at baseline and 266 were reassessed at 4 years (94% of surviving patients). The recurrence rates were 32%, 40%, and 41% at 6 months, 1 year, and 4 years, respectively. At 4 years, 30% of patients had bilateral trichiasis and 21% had bilateral corneal opacity. Recurrence was associated with severe conjunctival inflammation and severe trichiasis (>10 lashes) at baseline.

Conclusions. Trichiasis recurrence rates were high, and most cases recurred within 6 months of surgery. The results suggest that there are important aspects of surgical technique and quality that should to be addressed. Persistent inflammation is strongly associated with recurrence at 4 years. (*Invest Ophthalmol Vis Sci.* 2010;51:4996–5001) DOI:10.1167/iovs.10-5169

Trachoma is the leading infectious cause of blindness worldwide. Repeated conjunctival infection by *Chlamydia trachomatis* provokes a chronic inflammatory process that leads to scarring, cicatricial entropion, and trichiasis. Direct eyelash trauma, secondary bacterial infection, and a dry ocular surface may cause blinding corneal opacification (CO).[1–7] The World Health Organization (WHO) estimates that there are currently 40 million people with active trachoma and 8.2 million people with trachomatous trichiasis (TT) that has not been treated surgically.[8] The Gambia is a small country (population, ~1.5 million) and the prevalences of TT and trachoma have decreased markedly in recent years. However, recent estimates suggest that more than 10,000 people still have TT.[8] National prevention of blindness programs in trachoma-endemic countries are seeking to control the disease through the implementation of the SAFE Strategy: Surgery for trichiasis, Antibiotic distribution, Facial cleanliness, and Environmental improvements to reduce transmission.[9]

Trichiasis is the main risk factor for corneal opacification and should be treated. Successful surgery is likely to halt the progression of corneal opacity. Conversely, postsurgical recurrence confers a significantly increased risk of progressive corneal opacity.[1] In addition, alleviation of trichiasis reduces photophobia and epiphora and allows the corneal scar to fade in some patients.[1,10] Accordingly, visual acuity was shown to improve significantly (0.12 logMAR units; $P < 0.001$; odds ratio [OR], 1.68; 95% confidence interval [95% CI], 1.04–2.70) 6 months after surgery in one study and by 0.14 units at 12 months in another ($P < 0.001$).[10,11]

A wide variety of treatments are used for TT. Nonsurgical options include cryotherapy or thermal ablation of lash follicles by electroepilation or laser photocoagulation. Numerous surgical procedures have been described, and several of these are in routine use in trachoma control programs in endemic countries, including the bilamellar tarsal rotation (BLTR), the Trabut procedure, and other variants of posterior lamellar tarsal rotation (PLTR).[12]

Recurrent trichiasis, developing months to years after surgery, is a frequent problem. Recurrence rates have been reported to range from 7% at 1 year to 62% at 3 years.[1,13–19] There are two distinct forms of recurrence: early "surgical failure" and late "disease progression." Early recurrence may be related to the operation type, the surgeon's technical ability, or the choice of needles or sutures.[10,14,16,17] Factors associated with later recurrence include infection (*Chlamydia* or other bacteria), older age, severe conjunctival inflammation, and preoperative disease severity.[1,10,13,16,17] Much of the data on recurrence are not from prospective cohorts, but rather from retrospective tracing of cases in surgical records. In 2001 to 2002, we recruited people with TT into a randomized controlled trial of postoperative azithromycin after trichiasis surgery. This cohort of patients offers an opportunity to prospectively examine long-term outcome after trichiasis surgery. The 6- and 12-month outcomes were reported.[10]

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METHODS

Ethical Approval

The study was approved by the Gambian Government/Medical Research Council Joint Ethics Committee (SCC Number 858). Informed consent for the study was obtained at enrollment. The research adhered to the tenets of the Declaration of Helsinki.

Study Participants

The detailed methodology has been published.[10] Briefly, subjects who had not had surgery for trichiasis were identified from the Gambian National Eye Care Programme (NECP) database, community ophthalmic nursing records, and village screening. Subjects were recruited at surgical campaigns. All subjects who attended a surgical campaign and had trichiasis were offered TT surgery. There was no bias toward offering surgery to more severe TT cases, although presentation bias is possible, as more severe cases are more likely to present. Individuals who had undergone surgery for trichiasis were not recruited into the study at baseline, and pregnant women (self-reported) were excluded.

Clinical Assessment

Patients were assessed at baseline, 6 months, 1 year, and 4 years. Study subjects were examined with 2.5× loupes and a flashlight, according to the detailed WHO trachoma-grading system (FPC).[20] One ophthalmologist performed the baseline and 1-year examinations and a second performed the 4-year examinations. The 6-month examination was performed by a community ophthalmic nurse. The baseline examination was performed at the surgical campaign. All subsequent examinations were conducted in the patient's village. The death of a participant was ascertained by information from a close relative. Examinations were standardized to those conducted by the first ophthalmologist through a joint examination exercise at the beginning of the 4-year follow-up. The level of agreement between the two observers who conducted the 1- and 4-year examinations for the presence of trichiasis (binary outcome) was $\kappa = 1.00$ and 0.87 and 0.77 for corneal opacity and papillary inflammation, respectively.[20] Visual acuity was measured by using a reduced logMAR tumbling-E chart on all three occasions, except 6 months.[21] Conjunctival swabs for bacteriology and *C. trachomatis* PCR were collected at baseline, 6 months, and 1 year. In the light of the high recurrence rates at 1 year, we added the additional 4-year follow-up, which was not prespecified in the original study plan, to assess whether recurrence continued.[10]

Treatment

TT was corrected surgically with the PLTR technique. In patients with bilateral trichiasis, one eye was randomly selected as the study eye, but both eyes were surgically treated. All surgery was performed by trained community ophthalmic nurses. The patients were randomized to either the azithromycin treatment or control arms of the trial. Treatment allocations were concealed in opaque sequentially numbered envelopes. Separate randomization sequences were generated for each surgeon from random number tables and blocked in groups of four. Those in the azithromycin arm received a single oral dose after surgery and at 6 months. All patients were given tetracycline eye ointment to take twice daily for 2 weeks after surgery, according to Gambian National Eye Care Program guidelines. Recurrent trichiasis was managed according to Gambian guidelines: epilation for a few peripheral lashes or referral for repeat surgery for multiple/central lashes.

Data Analysis

The primary outcome was recurrent trichiasis, defined as one or more lashes touching any part of the globe in primary position. Secondary outcomes were visual acuity and corneal opacification. For visual acuities of counting fingers or less, logMAR values were applied: counting fingers, 2.0; hand movements, 2.5; and perception of light, 3.0. The Wilcoxon signed rank test was used to compare the medians of the number of trichiatic lashes, as this variable has a skewed distribution (Stata 9; Stata Corp., College Station, TX).

RESULTS

Study Subjects

At baseline, 356 Gambians with TT were recruited. Four years after surgery, 266 (75%) were re-examined, 68 (19%) had died, and 22 (6%) were untraceable. Overall, 94% of the surviving patients were seen. The median age at baseline of those re-examined, expired, and untraceable at 4 years was 60 (interquartile range [IQR], 47–70), 70 (IQR, 60–76), and 48 (IQR, 35–60) years, respectively. Of those seen at 4 years, 203 (76%) were women. Demographic and clinical characteristics are shown in Table 1.

Recurrent Trichiasis

Trichiasis was present in 110 (41%) of 266 study eyes 4 years after surgery. This result compares with 32% at 6 months and 40% at 1 year.[10] Lashes were touching the cornea in 101 (92%) of 110 of these eyes, and only the medial and/or lateral conjunctiva in the remaining 9. At 4 years, the median number of lashes touching the eye (lash burden) in patients with recurrent TT was two (total range, 0 [epilating] to 56; IQR, 1–8). This count was significantly less than the lash burden at baseline in the same eyes (median 8; total range, 0[epilating] to 74; IQR, 5–19; Wilcoxon matched-pairs signed rank test: $z = 5.87$, $P < 0.001$).

A comparison of trichiasis status at years 1 and 4 is shown in Table 2. Trichiasis status was unchanged in 224 (84%) study eyes; 140 had no TT and 84 had TT at both time points. Between year 1 and year 4, 26 (10%) eyes developed recurrent TT, and TT resolved in 16 (6%) eyes. Five of these 16 eyes had undergone reoperation. The proportion of people successfully epilating (i.e., trichiasis controlled by epilation) increased from 10% at baseline to 25% at year 4. Bilateral TT was present in 80 (30%) of 266 people. The TT recurrence rate at year 1 among those who were not traced or had died by year 4 was 48%, compared with 37% at year 1 in those who were seen at 4 years.

Univariate associations and multivariate logistic regression models between potential risk factors and any recurrent TT and major TT (greater than five trichiatic lashes) are shown in Table 3. Severe TT (10+ lashes) at baseline was strongly associated with major TT at 4 years. Recurrent TT at 4 years was associated with increasing conjunctival inflammation at 4 years. The association was stronger for major TT than for any TT. There was a nonsignificant association between the presence of trichiasis at 4 years and being male. No significant associations were found between recurrent TT and age, *C trachomatis* infection status at 1 year, ethnicity, literacy, or education.

Univariate associations for developing incident recurrent TT between years 1 and 4 are presented in Table 4. In multivariate logistic regression models, none of these associations were significant.

Corneal Opacification

At 4 years, 98 (36%) study eyes had visually significant CO (CC2/CC3 or phthisis). Among the people who were seen at the 1-year but not the 4-year follow-up, the proportion with CO was similar (26/65; 40%). Bilateral visually significant CO was found in 56 (21%) people at 4 years. When compared with that at the 1 year time point, the corneal scar grade at 4 years remained unchanged in 195 (73%) study eyes, deteriorated in 58 (22%), and improved in 13 (5%). Thirty-one patients devel-

TABLE 1. The Demographic and Clinical Characteristics of Subjects at Each Time Point

	Baseline (n = 356)	1 Year (n = 332)	4 Years (n = 266)
Demographics			
Sex, female	253 (71)	241 (73)	203 (76)
Median age, y (IQR)*	60 (50–70)	61 (51–71)	64 (51–74)
Visual acuity (logMAR)			
0–0.3	23 (9)	46 (14)	45 (17)
0.4–0.7	86 (25)	84 (25)	61 (23)
0.8–2.0	158 (46)	117 (35)	24 (9)
Mean VA (95% CI)†	0.81 (0.20–1.60)	0.66 (0.10–1.47)	0.51 (0.10–1.10)
Count fingers	18 (5)	23 (7)	27 (10)
Hand movements	25 (7)	23 (7)	71 (27)
Perception of light	13 (4)	23 (7)	25 (9)
No perception of light	23 (7)	13 (4)	12 (5)
Measurement not possible	10 (3)	3 (1)	1 (0)
Corneal opacity			
CC 0	181 (51)	157 (47)	97 (36)
CC 1	71 (20)	67 (20)	72 (27)
CC 2	46 (13)	68 (21)	68 (25)
CC 3	57 (16)	36 (11)	28 (10)
Phthisis	1 (0)	3 (1)	2 (1)
Trichiasis			
Any trichiasis (including epilators)	356 (100)	131 (40)	110 (41)
Any lashes touching cornea	350 (98)	106 (32)	74 (28)
Mean lashes, n	12.6	4.5	3.0
Median of lashes, n (in patients with TT)	8	5	2
Number of lashes touching eye			
0	35 (10)‡	263 (62)	182 (68)
1–4	39 (11)	79 (18)	43 (16)
5–9	128 (36)	45 (11)	19 (7)
10–19	81 (23)	20 (5)	11 (4)
20+	73 (21)	19 (5)	11 (4)
Conjunctival inflammation			
P0	55 (15)	107 (32)	66 (25)
P1	87 (24)	91 (27)	117 (44)
P2	120 (34)	75 (23)	58 (22)
P3	94 (26)	47 (14)	24 (9)
Not everted/examined	0 (0)	11 (3)	2 (1)
Infection			
C. trachomatis present	6 (2)	3 (1)	— —
Pathogenic bacteria present	108 (31)	50 (16)	— —

Data are expressed as the number of subjects (%), unless stated otherwise.
* Median age at the time of follow-up of patients examined.
† Arithmetic mean of visual acuities where vision sufficiently good to test with a logMAR chart.
‡ Trichiatic lashes epilated.

oped pupil-obscuring opacity between baseline and the 4 year follow-up. Fifteen (48%) of these patients had recurrent TT at 4 years. Univariate and multivariate associations with visually significant CO are shown in Table 5. The incidence of new corneal opacity at 4 years (when compared to baseline) was too small to test for associations.

TABLE 2. Comparison of Trichiasis Status in the Study Eyes at the 1- and 4-Year Follow-ups

	TT at 4 Years		
TT at 1 Year	**Yes**	**No**	**Total**
Yes	84 (31.7)	16 (6)	99
No	26 (9.8)	140 (52.8)	166
Total	110	155	265*

Data are the number of eyes (% of total).
* One individual seen only at 4 years.

Visual Acuity

The comparative visual acuity levels between baseline and 1 year and baseline and 4 years are shown in Table 6. Between baseline and 1 year after surgery, visual acuity improved in 40% of the patients. By 4 years, there was a sustained improvement in 18% when compared with baseline. It is unknown how many patients received cataract surgery or refractive correction during the follow-up period, but it is likely to be few if any, as the threshold for surgery is relatively high, and spectacles are not widely available in rural areas. Poor vision (logMAR $>$ 0.7) is strongly associated with the presence of significant corneal opacity (OR, 10.1; 95% CI, 5.1–20.4; $P < 0.001$). There was a nonsignificant trend toward improving vision in those who did not have recurrent trichiasis (OR, 1.90; 95% CI, 0.96–3.75; $P = 0.065$).

DISCUSSION

Recurrent trichiasis after surgery is a major problem in the prevention of blindness from trachoma. Although in tightly supervised clinical trials recurrence rates as low as 7% at 1 year

TABLE 3. Univariate Associations and Multivariate Logistic Regression Models for Various Factors and any TT and Major TT at 4 Years after Surgery

Variable	Any TT at 4 Years			Major TT at 4 Years		
	OR	95% CI	*P*	OR	95% CI	*P*
Univariate analysis						
Sex, male	1.96	1.11–3.47	0.021	0.93	0.40–2.16	0.87
Age 60+ years at baseline	1.41	0.85–2.35	0.18	2.64	1.29–5.38	0.008
Severe TT (10+ lashes) at baseline	2.15	1.31–3.54	0.003	13.56	4.04–45.49	<0.001
Bacterial infection at baseline	1.15	0.67–1.97	0.62	2.53	1.23–5.20	0.011
Bacterial infection at 1 year	1.86	0.93–3.69	0.078	5.17	2.34–11.45	<0.001
Conjunctival inflammation at 4 years*						
P1	1.41	0.72–2.77	0.32	6.64	0.84–52.66	0.073
P2	4.00	1.87–8.56	<0.001	13.33	1.65–107.73	0.015
P3	10.73	3.47–33.21	<0.001	89.6	10.59–758.06	<0.001
Multivariate logistic regression model						
Sex (male)	1.83	0.98–3.42	0.060	0.51	0.17–1.54	0.23
Severe TT (10+ lashes) at baseline	2.16	1.26–3.71	0.005	14.04	3.90–50.55	<0.001
Conjunctival inflammation at 4 years*						
P1	1.40	0.70–2.78	0.34	7.56	0.93–61.34	0.058
P2	4.08	1.87–8.88	<0.001	16.67	1.99–139.67	0.009
P3	8.77	2.76–27.81	<0.001	108.95	11.61–1022.13	<0.001

Major TT is more than five ingrowing lashes.

* Relative to P0.

have been reported, it is likely that rates are much higher under operational conditions.[13,18] In our study, the recurrence rate at 4 years was 41%. Most recurrences occurred within the first year (32% at 6 months, 40% at 12 months).[10] However, an additional 26 cases of recurrence were recorded between 1 and 4 years after surgery. The uncensored recurrence rate at 4 years (including those who had died or were lost to follow-up) is likely to have been higher than 41%, as the recurrence rate at 12 months in these individuals was 48%, compared with 37% in those who were also seen at 4 years. Despite these high recurrence rates, the lash burden in those eyes with trichiasis was much less than at baseline. The risk of CO increases with increasing lash burden.[10,17] Therefore, even partially successful surgery is likely to be beneficial.

Early recurrence is probably related to surgical factors, whereas late recurrence may reflect an ongoing cicatrizing process. In our study, 75% of recurrent TT had developed by 6 months, and there was significant intersurgeon variation.[10] Therefore, in this low-prevalence setting, there were probably important issues relating to surgical technique and quality that should be addressed. No long-term prospective studies of post-surgical recurrence have been reported from high-prevalence settings, where late recurrence driven by ongoing *C. trachomatis* infection may be more frequent.

BLTR and PLTR are the most commonly used procedures to treat TT in trachoma-endemic settings. PLTR is used in The Gambia. The WHO recommends BLTR, although the only small comparative trial of the two procedures found similar outcomes.[22,23] A larger trial with longer follow-up is needed, to conclusively determine whether these two procedures are comparable. Variations in surgical technique are likely to influence the success of the operation: incision length, degree of eversion, suture material, and tension.[18,24] As with other surgical procedures, it is likely that performing the surgery more frequently leads to improved quality and may in part explain the significant intersurgeon variation in outcomes reported at 1 year, although all surgeons receive the same National Eye Care Programme training.[10] In light of that study, all Gambian trichiasis surgeons underwent refresher training and recertification. High early recurrence rates may result from the lid's reverting to the entropic position soon after the removal of the silk sutures, removed at 7 to 10 days per WHO guidelines.[22] Stable wound healing in heavily scarred tissue may not have occurred by this time. A recent report suggested that better results are attained with the use of absorbable sutures, perhaps because they hold the lid in position for a longer period. However, differences in socioeconomic status between groups receiving different suture materials may have confounded this finding.[14]

TABLE 4. Univariate Associations of Various Factors and New Recurrence between 1 Year and 4 Years after Surgery

Variable	New TT at 4 Years*		
	OR	95% CI	*P*
Sex, male	2.76	1.13–6.78	0.026
Age 60+	0.76	0.30–1.94	0.57
Severe TT (10+ lashes) at baseline	0.89	0.38–2.11	0.80
Bacterial infection at baseline	0.93	0.34–2.51	0.89
Bacterial infection at 1 year	0.60	0.13–2.79	0.52
Conjunctival inflammation at 4 years†	2.35	0.94–5.90	0.068

* Cases of recurrent TT at 1 year were excluded; 166 individuals were included in the analysis, of which 26 had incident trichiasis.

† Binary outcome for conjunctival inflammation (P0/P1 vs. P2/P3).

TABLE 5. Univariate Associations and Multivariate Logistic Regression Model for Various Factors and Central or Pupil-Obscuring CO (CC2, CC3, or Phthisis) at 4 Years after Surgery

	Pupil-Obscuring/Central Corneal Opacity		
Variable	**OR**	**95% CI**	***P***
Univariate analysis			
Sex, male	1.17	0.66–2.09	0.59
Age 60+ years	2.06	1.23–3.46	0.006
Any TT at 4 years	2.00	1.21–3.33	0.007
New TT recurrence at 4 years	1.69	0.71–4.06	1.69
Major TT (more than 5 lashes) at 4 years	4.27	2.03–9.02	<0.001
Severe TT (10+ lashes) at baseline	2.09	1.26–3.49	0.004
Bacterial infection at baseline	3.59	2.05–6.28	<0.001
Bacterial infection at 1 year	2.80	1.39–5.62	0.004
Conjunctival inflammation at baseline	1.44	1.12–1.86	0.005
Conjunctival inflammation at 1 year	1.31	1.05–1.63	0.016
Conjunctival inflammation at 4 years	1.89	1.41–2.52	<0.001
Multivariate logistic regression model			
Age 60+ years	1.78	1.01–3.12	0.046
Major (more than five lashes) TT at 4 years	3.23	1.47–7.09	0.004
Conjunctival pathogen at baseline	3.33	1.86–5.94	<0.001

The association between severe disease and recurrence has been reported.[10,17,18,25–30] The patients in our study tended to have slightly more severe trichiasis than those in other trials, and that difference may have contributed to the less favorable outcome. More severe disease makes the surgery harder, especially when the lids are shortened, more scarred, and inflamed. Similarly, repeat surgery is technically more challenging, as lids are often more scarred and distorted by previous surgery. These cases should be referred to an ophthalmologist or experienced TT surgeon.

Patients with trichiasis often had persistent tarsal conjunctival inflammation that was strongly associated with the presence of recurrence, particularly major recurrence at 4 years. However, the causality in the relationship between inflammation and recurrence is unclear and may go both ways. We suggest that, although early recurrence primarily results from surgical factors, a chronic inflammatory and cicatrizing process causes the development of recurrence many years later. *C. trachomatis* infection is probably the major driver of active disease in children and perhaps postsurgical recurrence in high-prevalence areas, although this has never been demonstrated. However, chlamydial infection was rare and not associated with recurrence in these Gambian patients, and its role remains uncertain in other populations.[10,19,26] Pathogenic bacteria were strongly associated with recurrence at 1 year in this cohort of patients, suggesting that they may play a role in driving the clinically observed inflammation.[10] In addition, a large prospective sample with repeat bacteriology investigations, and laboratory studies of the inflammatory mediators would be needed to further investigate this process. Other factors, for which there is good evidence of an association with increased recurrence, are a history of previous surgery, older age, female sex, and immunogenetic factors.[1,10,17–19,28,31–33] Recurrent trichiasis has been associated with the use of three or more sutures in surgery, making postoperative adjustments to the sutures, living with children who are infected with *C. trachomatis*, and eye laterality.[1,14,19,24,28]

This group of patients had high levels of visually disabling CO (36%). Many patients had bilateral opacification (21%) and, given the worsening corneal disease and trichiasis recurrence observed over 4 years, many of these individuals are at high risk of blindness. Major TT at baseline is a strong risk factor for CO at 4 years. A greater lash burden probably has a greater abrasive effect. However, the large, dense, deep scars that are seen in patients with TT suggest that secondary microbial keratitis plays a role. This notion is supported by the strong association between the presence of a conjunctival bacterial pathogen at baseline and CO at 4 years. It is likely that eyes with more trichiatic lashes are more susceptible to damaging bacterial infections. Prevention and/or prompt treatment of pathogenic conjunctival and corneal bacterial infection in patients with TT is likely to be beneficial, although studies to assess this possibility have not been conducted. Despite the likely progression of cataract and CO in some patients (22%), the visual acuity was significantly better in 99 patients at 1 year and in 47 patients at 4 years when compared with baseline. There was a nonsignificant trend toward improving vision in patients without recurrence at 4 years. Successful trichiasis

TABLE 6. Change in Visual Acuity between Baseline and 1 Year and Baseline and 4 Years

		Baseline to 4 Years		
Visual Acuity*	**Baseline to 1 Year**	**All**	**Recurrence**	**No Recurrence**
Improved, >2 logMAR lines	99 (40)	47 (18)	14 (13)	33 (22)
Same, within 2 logMAR lines	111 (45)	92 (35)	41 (38)	51 (34)
Deteriorated, >2 logMAR lines	35 (14)	121 (47)	54 (50)	67 (44)
Total	241	260	109	151

Data are expressed as the number (%).

* For visual acuities of counting fingers or less, logMAR values were applied: counting fingers, 2.0; hand movements, 2.5; and perception of light, 3.0.

treatment probably facilitates visual improvement by allowing a normal tear film, which reduces photophobia and possibly enables corneal scars to fade slightly. It is important to treat patients with TT as soon as possible, and it seems likely that well-conducted epilation is a sensible interim measure for reducing lash burden until surgery takes place.

High recurrence rates in TT surgery are a major concern. Patients thought to be successfully treated remain at risk of recurrence. Individuals are likely to share any negative experience with other sufferers, discouraging the uptake of surgery. Both these factors greatly impede the control of blinding trachoma. The findings in this long-term, prospective study suggests that, in this environment, most recurrence occurs within the first few months after surgery and that surgical factors, such as technique and training, are very important determinants of the outcome. We have observed a strong association between increasing conjunctival inflammation and recurrent trichiasis at 4 years, which warrants further investigation.

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