WORLD VIEW

Characteristics of trichiasis patients presenting for surgery in rural Ethiopia

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Aims: To determine the characteristics of trichiasis patients presenting for surgery in Wolayta Zone of Ethiopia.

Methods: Patients referred for trichiasis surgery by community health agents were evaluated by trained integrated eye care workers (IECWs) for the presence of trichiasis, locations of inturned lashes, severity of trichiasis, corneal opacity, and visual acuity.

Results: 1635 individuals with trichiasis presented for surgery. 82% had bilateral trichiasis; 91% of patients reported trichiasis duration of >2 years. Epilation was practised by over three fourths of the study subjects. A high proportion of patients tested positive for ocular *Chlamydia trachomatis* at presentation. 17% had monocular blindness and 8% were binocularly blind. Corneal opacity was highly associated with the trichiasis duration and severity and visual loss was associated with corneal opacity.

Conclusion: Severe trichiasis reflects the magnitude of the trachoma problem in Ethiopia. Visual impairment due to trichiasis is highly associated with disease severity and duration. Early intervention to correct trichiasis before it become severe is recommended to prevent visual impairment.

Trachoma is a chronic, recurrent follicular conjunctivitis caused by *Chlamydia trachomatis*. It is the second most common preventable cause of blindness worldwide, accounting for 15.5% of total blindness.[1] The World Health Organization estimates over six million people are blind from trachoma and another 150 million people have active trachoma.[1] Approximately 2.2 million people are blind in Africa from trachoma[2] and over 10 million people require eyelid surgery for trichiasis in order to prevent or halt the progression of vision loss.[1]

In Ethiopia, the magnitude and prevalence of active trachoma and the potentially blinding complication, trichiasis, are among the highest in the world. Estimates of active trachoma in children range between 36%–57%, and trichiasis is seen in young children.[3 4] In the same population trichiasis prevalence in all ages ranged from 3.2%–3.8%.[3 4] Bilamellar tarsal rotation has been shown to be effective in treating trichiasis, but recurrence of trichiasis following surgery can be high, ranging from 17% to more than 60%.[5–9] Recurrence is related to the number of previous surgeries, and severity of trichiasis/entropion before surgery.[5 10] Other hypothesised reasons for recurrence include repeated or continual infection with *C trachomatis*, ocular infection with other organisms, and continuous conjunctival inflammation. It is possible that chlamydial or other ocular infections may continue to drive the scarring process which leads to more scarring and contraction of the tarsal plate, leading to repeated trichiasis.

Characterising trichiasis patients presenting for surgery will assist in planning staffing for surgery, anticipating the complexity of the surgery and the likely rate of recurrence. In the context of a large clinical trial on post-surgical trachoma treatment in Ethiopia (the STAR trial, a 2 year clinical trial of trichiasis surgery patients), we had the opportunity to assess the characteristics of trichiasis patients presenting for surgery.

METHODS

Study area

The STAR trial is being conducted in Wolayta Zone, the Southern Nations Nationalities and People's Region (SNNPR) of Ethiopia. Four districts out of the seven were included in the study, selected because patients could be followed up by vehicle if necessary. The population in these districts was estimated to be over 700 000. More than 90% of the residents of the study area are subsistence farmers, and trachoma is hyperendemic, as it is in many parts of Ethiopia. The smallest government administrative unit in Ethiopia is called a ''kebele,'' with a population ranging from 2500 to 5000. Each kebele has a community health agent (CHA) who can provide primary healthcare service. CHAs were trained in trichiasis identification and asked to screen all individuals living in each kebele for trichiasis. A programme for training of nurses as integrated eye care workers (IECWs) in primary eye care (including trichiasis surgery) was designed and carried out by an international non-governmental organisation (NGO), and surgery was provided for the first time in this region by our project team. Previous research has demonstrated that the quality of trichiasis surgery of the IECWs is comparable to that of ophthalmologists.[10] The methods for the clinical trial have been described in detail elsewhere.[11] Here, we provide details on the methods specifically related to the baseline assessment.

Study population

Each CHA informed their population of the availability of trichiasis surgery, and screened patients who presented for trichiasis evaluation. To be enrolled in the trial, patients with trichiasis had to be above age 18 and have no history of previous trichiasis surgery in at least one eye with trichiasis. Patients were then asked to come to the health centre for surgery, and transport home was arranged free of charge. In this paper we describe the characteristics of all who presented for surgery, with more detail on the patients enrolled in the trial.

Abbreviations: CHA, community health agent; CO, corneal opacity; GEE, generalised estimating equations; IECWs, integrated eye care workers; NGO, non-governmental organisation; SNNPR, Southern Nations Nationalities and People's Region; TF, follicular trachoma; TI, severe inflammatory trachoma; TS, scarring

Table 1 Trachoma grading scheme

Sign	Description
Follicular trachoma (TF)	Presence of 5+ follicles in the upper tarsal conjunctiva
Trachomatous inflammation—intense (TF)	Pronounced inflammatory thickening of the upper tarsal conjunctiva that obscures more than half of the normal deep tarsal vessels
Trachomatous scarring (TS)	Presence of scarring in the tarsal conjunctiva
Corneal opacity (CO)	(1) Corneal scarring that is so dense that at least part of the pupil margin is blurred when viewed through the opacity. (2) Scarring that covers the entire cornea

Ocular assessment

All ocular assessments were done clinically, by a trained trachoma grader standardised to senior investigators with experience in trachoma assessment (MM, WA). Using a standardised protocol and a tumbling "E" chart equivalent of an ETDRS chart (Lighthouse, New York, NY, USA) an eye nurse assessed monocular distance visual acuity for each eye. Visual acuity was tested at 3 metres with the participant's presenting refractive correction. If the participant could not correctly identify three of the five letters on the first line, testing was conducted at 1 metre. If participants could not read the first line of the chart at 1 metre, ability to count fingers, identify hand motion and light perception were evaluated. Monocular blindness was defined as vision of worse than 3/60 in that eye, or binocular blindness was defined as vision of worse than 3/60 in the better eye. An ocular swab was taken of the study eye, using a standard protocol to avoid any contamination. The swab was kept frozen at −20° until shipped, on dry ice, to the international chlamydia laboratory at Johns Hopkins University, USA. The swab was processed for presence of *Chlamydia trachomatis* using the highly sensitive Amplicor qualitative polymerase chain reaction (PCR) (Roche Molecular Systems, Branchburg, NJ, USA).

Interview

Patients were asked to report their age using an events calendar to assist in determining correct age. The patients were also asked about the duration of their trichiasis and whether they had previously had trichiasis surgery on either lid. Active trachoma and expanded trichiasis grading for each eye separately were conducted using a 2.5 magnification loupe and a hand-held torch. The inter-observer agreement for active trachoma ranged from 0.65 to 0.89, and for presence of trichiasis ranged from 0.66 to 0.88.

The following definitions were used:

Trichiasis: Trichiasis was defined as one or more of the upper eyelid lashes touching the globe or evidence of epilation. For this project, we used an expanded grading of trichiasis, modified from our previous publication.[12] The lid is divided into three segments, nasal, central, and temporal, with cut offs on either side of the corneal limbus. The origin of the trichiatic lashes are classified as follows:

- Nasal trichiasis: if the origin of the lashes touching the globe are medial to the nasal limbus.
- Central trichiasis: if the trichiasis originates from the lid in the zone between the nasal and temporal limbus.
- Temporal trichiasis: if the trichiatic lashes originate from the lid lateral to the temporal limbus.

Entropion: Evidence of in-deviation of the upper lid margin. Entropion was classified into one of three categories:

- None: there is trichiasis but all lash bases are visible.
- Mild entropion: if some lash bases are visible in the region with trichiasis but at least one lash base is not visible.
- Severe entropion: if base of all trichiatic lashes is not visible.

Trachoma: Each eye was evaluated individually for presence of active trachoma and corneal opacity. The WHO simplified grading scheme[13] with expanded grading of corneal opacity was used to assess the presence or absence of each sign, as detailed in table 1.

C trachomatis infection: Following clinical examination, an ocular swab was taken of the upper conjunctiva of the study eye. Details of the procedures for specimen collection and processing and for avoiding contamination are described

Table 2 Baseline characteristics of trichiasis surgery patients

	Trial participants	Trial ineligible patients	Total trichiasis patients
	No (%)	No (%)	No (%)
Total participants	1452	183	1635
Age:			
<40	358 (24)	61 (34)	419 (26)
40-60	720 (50)	68 (37)	788 (48)
>60	374 (26)	53 (29)	427 (26)
% Female	1121 (77)	138 (75)	1259 (77)
Previous trichiasis surgery in at least one eye	31 (2.1)	118 (64.5)	149 (9.1)
Bilateral trichiasis	1184 (82)		
TI in at least one eye	450 (31)		
Infected with *C trachomatis*	281 (19)		
At least one eye with 5+ lashes touching globe	855 (59)		
At least one eye with 5+ lashes touching cornea	585 (40)		
% Monocular blind*	241 (17)		
% Binocular blind*	116 (8)		

p Value comparing trial participants to non-participants for age categories = 0.005; sex = 0.577; previous surgery = 0.001
*Visual acuity not available for 17 participants.

Table 3 Relation of duration of trichiasis and corneal opacity in 2628 trichiatic eyes of 1452 participants*

	Corneal opacity			
	None	Obscures pupil margin	Covers the cornea	
Duration of trichiasis	No (%)	No (%)	No (%)	Total
⩽1 year	52 (94.6)	2 (3.6)	1 (1.8)	55
>1–2 years	142 (89.9)	9 (5.7)	7 (4.4)	158
>2 years	1895 (78.5)	232 (9.6)	288 (11.9)	2415

Using presence of corneal opacity as the outcome, test for trend for duration of the lashes accounting for correlation between eyes, p = 0.0004
*One eye missing report of duration. p<0.001.

elsewhere.[11] Briefly, standard swab collection procedures were followed in order to limit potential for contamination. Swabs were kept frozen at –20°C until shipped on ice packs to the international chlamydia laboratory at Johns Hopkins. Swabs were processed for presence of *C trachomatis* using the highly sensitive Amplicor qualitative PCR (Roche Molecular Systems, Branchburg, NJ, USA).

Statistical analysis

All data were double entered onsite by two data entry personnel. Data were sent weekly to the data coordinating centre at Johns Hopkins where they were checked for inconsistencies, and feedback was provided to correct problems on a regular basis.

Contingency table analyses were used to examine associations between demographic characteristics and severity of trichiasis, and differences were tested using χ^2 tests. Logistic regression models were used to investigate the relation between blindness and trichiasis severity at eye level; standard errors were corrected to account for the correlation between eye of the same subject using a generalised estimating equations (GEE) approach.

Ethical approval

All study procedures were approved by the Western Institutional Review Board (WIRB) and the Ethiopia Science and Technology Commission.

RESULTS

Overall, 1635 patients with trichiasis presented for surgery over a 7 month period (table 2). Of these, 1452 trichiasis patients were enrolled in the clinical trial, and 183 were ineligible, primarily because they were age <18 or had had previous trichiasis surgery in the only eye with trichiasis. The majority of trichiasis patients were women, and one quarter of them were less than age 40. Only 9% had had previous trichiasis surgery. The remainder of the study characteristics were evaluated for the 89% (1452) who were eligible for the trial.

Bilateral trichiasis was present in 82% of trial participants, and 19% were positive for ocular *C trachomatis* infection (table 2). Of the study eyes, 369 (25%) presented with inflammation graded as TI, and only 15 (1%) had TF. Fully 17% were monocularly blind, and 8% were binocularly blind. Almost all of the trial participants (1326, 91%) reported trichiasis duration of >2 years, with only 96 (7%) between 1–2 years, and 30 (2.5%) for less than 1 year.

Duration of trichiasis was significantly associated with presence of corneal opacity. Compared with eyes that had trichiasis for 1 year or less, eyes that had trichiasis for more than 2 years were significantly more likely to have corneal opacities (age adjusted OR: 4.5 (95% CI 1.3 to 14.8), (table 3).

Epilation was a common practice in this group of eyes, as 78% of subjects were epilating in at least one eye, and 23% of eyes being epilated had no lashes touching the globe. In eyes where at least one lash was touching the globe (including

Table 4 Characteristics of trichiatic eyes (n (%))

	Eyes with no evidence of epilation			Eyes with evidence of epilation		
	Right	Left	Total*	Right	Left	Total
Number	398	415	813	912	911	1823
No of lashes touching globe:						
0	—	—	—	312 (34)	304 (33)	616 (34)
1–4	164 (41)	162 (39)	326 (40)	202 (22)	215 (24)	417 (23)
5–9	90 (23)	117 (28)	207 (26)	181 (20)	171 (19)	352 (19)
10+	144 (36)	136 (33)	280 (34)	217 (24)	221 (24)	438 (24)
No of lashes touching cornea:						
0	37 (9)	49 (12)	86 (11)	352 (39)	351 (38)	703 (39)
1–4	187 (47)	206 (50)	393 (48)	329 (36)	325 (36)	654 (36)
5–9	68 (17)	68 (16)	136 (17)	127 (14)	120 (13)	247 (14)
10+	106 (27)	92 (22)	198 (24)	104 (11)	115 (13)	219 (12)
Number with at least one lash touching the globe	398	415	813	600	608	1208*
Location of lashes:						
Nasal	137 (34)	140 (34)	277 (34)	316 (53)	304 (50)	620 (51)
Central	356 (89)	360 (87)	716 (88)	550 (92)	554 (91)	1104 (91)
Temporal	202 (51)	228 (55)	430 (53)	395 (66)	400 (66)	795 (66)
No of locations:						
One	200 (50)	200 (48)	400 (49)	193 (32)	214 (35)	407 (34)
Two	99 (25)	117 (28)	216 (27)	153 (25)	136 (22)	289 (24)
Three	99 (25)	98 (24)	197 (24)	254 (42)	258 (43)	512 (42)

*Eyes without trichiasis are excluded (142 right eyes, 124 left eyes); eyes being epilated with no lashes touching the globe are excluded (312 right eyes, 305 left eyes).

Table 5 Visual acuity status of the 2872* eyes of 1452 trichiasis surgery patients by severity of trichiasis and corneal opacity

Characteristic	No	Visual acuity			
		>6/18 or better	6/18–>6/60	6/60–3/60	<3/60
Corneal opacity†					
None	2320	1308 (56%)	771 (33%)	79 (3%)	162 (7%)
Obscures pupillary margin	242	41 (17%)	74 (31%)	36 (15%)	91 (38%)
Covers cornea	304	16 (5%)	48 (16%)	21 (7%)	219 (72%)
Trichiasis severity‡					
Lashes touching globe/not cornea	170	84 (49%)	61 (36%)	2 (1%)	23 (14%)
1–4 lashes touching cornea	1029	533 (52%)	341 (33%)	44 (4%)	111 (11%)
5+ lashes touching cornea	794	316 (40%)	228 (29%)	53 (7%)	197 (25%)
Epilating no lashes touching	610	279 (46%)	196 (32%)	31 (5%)	104 (17%)

*32 eyes missing visual acuity testing.
†6 eyes missing corneal opacity grade.
‡269 eyes trichiasis absent, severity not graded.

eyes with both epilation and lashes touching the globe), 42% had lashes touching the globe emanating from all three locations (table 4). Because of previous data suggesting a difference in location between right and left eyes of recurrent trichiasis following surgery,[14] we looked at right and left study eyes separately for location of trichiatic eyelashes at baseline before surgery (table 4). Regardless of epilation status, most eyes had lashes emanating from the central location, followed by the temporal location. There was no difference in right or left eyes in the origin of the trichiatic lashes. Epilation was more common in females (age adjusted OR: 1.8 (95% CI: 1.4 to 2.3)).

Visual loss was related to both presence of corneal opacity, and severity of trichiasis (table 5). Since corneal opacity is related to trichiasis severity, any independent contribution of these two factors could not be assessed. Eyes with five or more lashes touching the cornea were more likely to be blind than eyes with four or fewer lashes touching the cornea (25% versus 11%, $p<0.0001$).

DISCUSSION

In a trachoma hyperendemic area within Ethiopia where services were not previously available, 1635 trichiasis patients presented for surgery over a 7 month period. Knowledge regarding several characteristics of these patients will help in planning appropriate services for this and other areas. Firstly, the cases that presented were quite severe; 82% of cases had bilateral trichiasis and 40% of these had five or more lashes touching the cornea. The cases also presented with a high rate of visual loss, 8% were binocularly blind. These indicators point to the lack of previous services in this area, and show a substantial backlog of cases that need to be operated. Most patients who presented for surgery, 92%, reported having trichiasis for more than 2 years. Surgical recurrence has been related to severity of trichiasis at the time of presentation in other studies,[5 10] which suggests that recurrence rates may be higher as the surgery programme begins, because of the high proportion of severe cases. We will be able to examine recurrence rates over time in the context of the prospective clinical trial.

Secondly, about 31% of patients presented with TI, and only 1% presented with TF; 19% presented with chlamydial infection There was a strong association between TI and current chlamydial infection ($p<0.0001$), suggesting that the high rate of TI may be a result of repeated chlamydial infection which has led to trichiasis. Some of the TI may be an indicator of severe inflammation associated with the constant abrasion of lashes against the cornea or may be a result of other bacterial infections.

Thirdly, one quarter of these patients were less than age 40, pointing out the relatively early onset of trichiasis in this population. Trichiasis has been reported in children and teenagers in Ethiopia, attesting to the enormity of the trachoma problem in these communities.[4] The availability of services to correct trichiasis in young people who may not be able to have just local anaesthetic should be considered. In this region, a local district hospital with anaesthetists was available for surgery on those age <18.

Additionally, epilation was a common practice in this community, with over two thirds reporting epilating and 23% removing all lashes touching the globe. Because of the inability to grade the number of lashes touching the globe in this group it was not possible to evaluate the association of the number of lashes ever touching the globe with risk of corneal opacity.

The high rate of blindness and visual loss in trichiasis cases presenting for surgery indicates that the severely affected are coming forward, at least initially, but mild cases are not. In part, this may be because the surgery offered is new to this area, and patients with severe trichiasis, and who have vision loss already, think they have nothing to lose by trying out a new procedure. Those patients with no vision loss who have one or two lashes that are epilated may think there is no need to undergo surgery until the severity increases. The surgery and all its attendant potential costs, including transport, were covered by the project so there were no cost considerations for the patients. This is an area for health education research into motivating patients to come forward before severe, vision impairing, trichiasis occurs in order to prevent vision loss. Another possible explanation is the referral pattern of the CHAs. They were not given loupes to identify trichiasis, and early trichiasis with only one or two lashes may be more difficult to determine under such conditions. In such circumstances, the CHAs would refer more severe cases. We have no way of knowing for certain if this is the case.

In summary, in the context of a clinical trial of antibiotic treatment post-trichiasis surgery, we were able to evaluate the characteristics of 1635 patients who presented for surgery in an area of Ethiopia where surgery had not been available previously. The STAR participants had severe trichiasis with a high rate of vision loss, indicating a large backlog of cases in this area. Epilation is a common practice, although the ability of epilation to prevent vision loss is unknown. The demand for surgery is apparently huge when first offered; 1635 patients came forward in 7 months, and we were operating an estimated average of 11–12 patients (most were bilateral, so 22–24 operations) per day. A low recurrence rate will be key to maintaining high demand, and we will be observing the recurrence as the trial progresses.

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ECHO

Asymptomatic uveitis follows JIA into adulthood

Please visit the *British Journal of Ophthalmology* website [www.bjophthalmol.com] for a link to the full text of this article.

A clinical study has confirmed that asymptomatic uveitis associated with juvenile idiopathic arthritis (JIA) persists into adulthood—often with continuing arthritis. Sight remains good overall despite some complications, but development of the condition in early adulthood in some patients suggests that routine eye examinations throughout adolescence are advisable.

Asymptomatic uveitis was present in 19 patients, acute uveitis in six, and 98 patients had no history of eye inflammation. Mean age to diagnosis of JIA was 4.3 (range 1.5–16.8) years, and asymptomatic uveitis developed shortly after in most cases whereas acute uveitis developed much later (mean age at diagnosis 10 (range 2.6–23.5) *v* 20 (14.5–22) years, respectively). Patients with asymptomatic uveitis had developed arthritis at a significantly earlier age than those without (4.3 *v* 2.7 years), and a higher proportion were HLA B27 positive. They also tended to show active arthritis at clinical evaluation (risk ratio (RR) 1.45 (1.42 after correction for HLA B27 antigen)). Complications of asymptomatic uveitis amounted to secondary glaucoma in four and cataract in five patients but sight remained good with treatment.

The study took place at a tertiary referral centre for JIA in Helsinki, Finland, in 123 patients born between 1976 and 1980, whose JIA was diagnosed between 1976 and 1995, who had comprehensive clinical re-evaluation some 6–23 years (mean 19.3 years for asymptomatic uveitis and 15.5 years for non-uveitis) from first diagnosis of arthritis.

Asymptomatic uveitis and JIA often coincide, but until now the connection has been tenuous because arthritis activity has been poorly recorded.

▲ Kotaniemi, *et al*. *Annals of the Rheumatic Diseases* 2005;**64**:871–874.

Asymptomatic uveitis follows JIA into adulthood

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