ORIGINAL ARTICLE

Assessment of outcomes of the patients undergoing surgery for Trachomatous Trichiasis, Western Province, Zambia

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ABSTRACT

Background: Trachoma is the leading infectious cause of irreversible blindness globally. Trichiasis is the sight-threatening stage of trachoma and is a result of chronic inflammation in response to repeated ocular infection with *Chlamydia trachomatis*, which causes corneal ulceration, entropion, trichiasis and blinding corneal opacification. Trichiasis surgery can reduce the risk of blindness, although some studies have suggested that long-term recurrence rates may be high, hence the need for ongoing technical support and monitoring of surgical services.

Aim: The study aimed to assess outcomes of patients undergoing surgery for Trachomatous Trichiasis in Western Province, Zambia

Methods: A prospective cohort multi-health facility-based study was conducted in trachoma endemic districts in September 2018, using systematic sampling technique to select patient

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records. All selected records were linked to patients who were examined between three-six months post Trabut surgery.

Results: The total number of participants who were selected and assessed was 74 with a mean age of 56 years. A total of 64 (86.5%) participants were female while 10 (13.5%) were males. The majority of the participants 41 (55.4%) had bilateral while 33 (44.6%) had unilateral pre-operative trichiasis. From a total number of 115 operated eyes, the following complications were observed post operatively; eyelid margin abnormality three eyes (2.6%), eyelid closure defect two eyes (1.7%), granuloma one eye (0.9%) and recurrent trichiasis one eye (0.9%).

Conclusion: The surgical outcomes of trachomatous trichiasis using the Trabut technique were acceptable, with complications occurring in less than 20% of operated eyes during the three to six months follow-up period.

INTRODUCTION

Trachoma is the leading infectious cause of blindness worldwide.[1] Trachomatous trichiasis (TT), the sight-threatening stage of trachoma, occurs when distortion of the eyelid brings the eyelashes into contact with the globe and cause damage through repeated abrasion of the cornea which leads to scarring, corneal opacity and eventually blindness. TT causes extreme pain.[2] Blindness from TT is preventable through timely TT surgery. It is equally preventable in those with moderate corneal damage due to TT, as corneal improvements do occur following successful TT surgery.[3] Good post-surgical follow up reviews are essential for patients with high risk of trichiasis recurrence.[4] However, recurrent TT can still occur.[5] Access to routine TT services is greatly affected by being of younger age and widowed, duration of problem, time taken to reach the health facility, absence of TT surgeon, severity of symptoms of trichiasis and epilation practice in areas where TT is a public health challenge.[6] Major trichiasis is defined as $\geq$ 6 eyelashes in contact with the globe, while minor trichiasis involves < 6 eyelashes in contact with the globe.[7]

A study conducted in The Gambia showed high rates of post-operative TT (PTT) of 32%, 40% and 41% at six, 12 and 48 months respectively. Identified risks included severe conjunctival inflammation and severe trichiasis, characterised by more than 10 eyelashes in contact with the globe.[8] Other risk factors include severe preoperative bacterial infection, surgical experience of the surgeon, poor surgical techniques like irregular incision, asymmetric tension and suture position as well as inadequate peripheral dissection and correction.[9] It has been observed in many cases that visual acuity and symptoms improve following successful surgery.[4,10] However, treatment with azithromycin does not improve the surgical outcome.[11]

The high rate of recurrent TT is a clear indication that trachoma elimination programmes should take into consideration the quality of TT surgery, timely intervention, monitoring and surgical techniques. Posterior Lamellar Tarsal Rotation (PLTR) has been recommended over Bi-lamellar Tarsal Rotation (BLTR) surgery in the management of trachomatous trichiasis including complicated cases.[12] Tarsal plate rotation is the preferred surgical method for successful outcomes although other surgical techniques such as electrolysis and cyro-abrasion are available for minor trichiasis.[13,14] However, even though these maybe the preferred treatments, they are not widely available. Epilation is also another treatment procedure that is available for minor TT.[15]

In Africa, advocacy for government investment in eye health is needed through development of targeted policies and strategies that will ensure that eye health care services are affordable, accessible and acceptable.[16] In addition community sensitisation and awareness interventions including door-to-door screening can significantly increase the uptake of TT surgical services.[17]

Western Provincial Health Office (WPHO) has been implementing coordinated trachoma elimination

interventions since 2007 when the first trachoma prevalence survey was conducted. The Ministry of Health has also adopted the "SAFE strategy" as recommended by World Health Organisation (WHO), for Trachoma Elimination. SAFE strategy refers to: **S** – Surgery; **A**- Antibiotics; **F**- Facial cleanliness and **E**- Environmental improvements. Surgery must be integrated into primary health care services. The **S** component of the SAFE strategy serves as a public health intervention, which includes active case finding when the prevalence of trachomatous trichiasis (TT) "unknown to the health system" is equal to or greater than 0.2% among individuals aged 15 years and older.[18] WPHO has also been applying principals of Universal Health Coverage through primary health care interventions in order to make TT surgical services accessible to the community. Primary health care interventions including TT surgery should be provided free of charge.[19] In the past, TT surgery was provided mainly during cataract surgical camps. Trichiasis surgery can mitigate the risk of blindness; nonetheless, some studies indicate that long-term recurrence rates may be high, necessitating continuous monitoring, assessment, and enhancement of surgical services.

There are limited data on the short-term and long-term outcome of TT surgery. The study sought to assess the outcomes of patients undergoing TT surgery in the Western Province of Zambia. The findings from this study will guide relevant health authorities in developing policy and strategies for integrating and improving TT surgery outcomes at primary health care level.

MATERIALS AND METHODS

Study location and types of health facilities

Western Province is one of the ten provinces in Zambia and is located in the western part of the country. The province is divided into sixteen districts, namely, Kalabo, Kaoma, Lukulu, Mongu, Mulobezi, Senanga, Sesheke, Shangombo, Nalolo, Limulunga, Nkeyema, Sikongo, Sioma, Mitete, Mwandi and Luampa. There are two second-level Hospitals, 12 first level hospitals and 146 health centres and 150 health posts in Western Province.

Study settings

A series of TT surgical operations were performed in Senanga, Luampa, Nalolo, Kaoma and Nkeyema districts at various health facilities. Suspected TT cases were identified in the community by case finders and referred to the health facility where, once confirmed by the TT surgeon, TT surgery was conducted. Western province was selected for this study because it is one of the provinces with highest prevalence of trachoma and TT.[20] Furthermore, WPHO had partner support for provision of TT surgical services. Western Province also had six local trained and certified TT surgeons who were Ophthalmic Clinical Officers.

TT cases that were operated three to six months prior to the study met the inclusion criteria for the study. Consent was obtained from each participant before administering questionnaire and performing physical examination.

Participant sampling

Systematic sampling was performed by the principal investigator, with a sampling interval of two, to select 74 participants from a sampling frame of 129 patients who had undergone TT surgery three-six months prior to the study. The TT surgeries were conducted by three TT surgeons in almost equal measure, who were not involved in patient sampling, but were fully aware of the surgical audit. Although the minimum number of patients recommended to assess the quality of TT surgery per surgeon was 20 at the time;[21] we opted for a larger sample to improve accuracy of reporting.[22] TT case finders were used to contact trace sampled patients for clinical assessment at the nearest health facility where the surgery had been conducted. All participants were reviewed and findings documented as follows; first day, seven-14-days and three-six-months post-operatively. A prospective

cohort study design was implemented because it tracks patients from surgery through post-operative follow-ups, facilitating direct observation of outcomes over time, which may aid in establishing a clear cause-and-effect relationship between the surgical intervention and patient outcomes.[23] Furthermore, a prospective cohort study does not necessitate withholding of treatment, making it ethically appropriate in resource-limited settings where TT is endemic. It also aligns well with WHO recommendations for monitoring TT surgery programs.[18]

Data collection

Paper based questionnaires were used to collect surgical assessment data. The data collectors were trained for the excise and examined pre-operative, operative and post-operative patient records. Sampled patients were also interviewed and examined for TT during scheduled visits. Severity of TT cases was assessed based on the number of eyelashes touching the cornea.[21] Data was collected by the ophthalmologists and ophthalmic clinical officers. Prospective data collection minimised recall bias in comparison to retrospective studies. Furthermore, the implementation of standardised protocols for surgical assessment reduced observer bias.[24]

Data analysis

Data was checked and cleaned on a daily basis by the data manager. Epi info software was used for data entry, storage and to aid with the descriptive data analyses.

RESULTS

At the time of assessment, 74 participants were due for the three to six months review. Table 1 shows that a total number of 74 post-operative participants were assessed. The participants had a mean age of 56 years and standard deviation (SD) of 17.7. A total of 64 (86.5%) participants were female while 10 (13.5%) were males. There were 41 (82 eyes; 55.4%) patients who underwent bilateral TT surgeries while 33 (33 eyes; 44.6%) had unilateral TT surgery.

Table 1: Demographics and TT Pre-operative Presentation

Description	Range	Minimum	Maximum	Mean	SD
N = 74 (Participants)	68	19	87	56.3	17.7
Sex	**Frequency**		**Percentage**		
Male	10		13.5		
Female	64		86.5		
Total	74		100		
Eye with Trichiasis					
Right Eye	18		24.3		
Left Eye	15		20.3		
Both Eyes	41		55.4		
Total	74		100		

Prior to the study, 54 (73.0%) participants had major TT (five or more eye lashes touching the cornea), and 20 (27%) had minor TT (less than five eyelashes touching the cornea). All the selected 74 participants (100%) had bilateral (55.4%) or unilateral (44.6%) TT pre-operatively and 73 (98.6%) participants had no trichiasis post-operatively. Overall, 7/115 eyes (6.1%) (seven patients) had post-operative complications of TT surgery, among eyes with major TT. These complications were three eyes (2.6%) with eyelid margin abnormalities, two eyes (1.7%) with eyelid closure defects, one eye (0.9%) with granuloma and one eye (0.9%) had post-operative TT.

Table 2: TT Pre-presentation and Post complications

Eyelashes touching the Cornea (N = 74 Participants)		
Number of Eyes Lashes	**Pre-Operative (%)**	**Post-operative (%)**
Nil	0 (0.0%)	73 (98.6%)
Less than Six	20 (27.0%)	1 (1.4%)
Six or More	54 (73.0%)	0 (0.05%)
Total	74 (100.0%)	74 (100.0%)
TT Surgery Post-operative Complication (N = 115 Eyes)		
Type of complication	**Yes n (115 Eyes)**	
Eyelid margin abnormality	3 (2.6%)	
Minor TT	1 (0.9%)	
Granuloma	1 (0.9%)	
Eyelid closure defect	2 (1.7%)	

DISCUSSION

The first assessment of TT surgery outcomes in Western Province of Zambia was successfully conducted. During the assessment process, detailed patient information was accessed from the patient surgery day and post-operative record forms which contained pre-operative and outcome data for each patient. There were 74 (115 eyes) participants with a mean age of 56 years and SD = 17.7 in this study, of which 64 (86.5%) were females and 10 (13.5%) males. These findings indicate that TT is a condition of public health significance in Western province[20] and is consistent with studies that have found that TT is more prevalent among women.[25] This could be attributed to the interaction between women and trachoma infected children although some studies have shown no significant difference in prevalence of trachoma signs between the genders.[5] It is of paramount importance to ensure gender equity in TT programmes because of the suspected susceptibility of women to TT. Easy access, adequate patient and family counselling, TT case finders and door to door patient finding can assist narrow the gender inequality in eye care programmes.[16]

The patients who received TT surgery were identified by TT case finders using a door-to-door intervention. TT surgery scale up should address the determinants of access to TT surgical services such as distance to the facility, availability of TT surgeons, epilation practices and creating service demand through sensitisation on TT and its symptoms[6]. This may be achieved through setting up of TT surgical sites as part of the implementation of Primary Health Care and Universal Health Coverage.

The success of TT surgery is measured using several parameters including the post-operative patient symptoms, visual function, incision length, over correction or under correction and other surgical complications. In this study, the focus of measuring success was based on absence of TT surgical complications which was achieved in 67 participants (108 eyes; 93.9%), while TT none recurrence rate was achieved in 73 patients (114 eyes; 99.1%). The Ministry of Health in Zambia considers a recurrence rate of 20% or lower for TT to be an acceptable result with continued technical support and mentorship for TT surgeons, therefore eliminating the need for retraining of the assessed surgeons.

The results in this assessment show that the short-term outcome of TT surgery in Western Province at three-six months post-surgery was acceptable, with a TT recurrence rate of 0.9% (one eye). Additional complications, aside from recurrent TT, were noted in six patients (six eyes) during the assessment. These findings had not been previously documented during follow up in patient records. These included eyelid margin abnormalities three eyes (2.6%), eyelid closure defects two eyes (1.7%) and granuloma one eye (0.9%) at three-six months post-operatively. Post-operative complications such as recurrent TT and eyelid contour abnormality may reduce patient satisfaction for surgery[26] and may affect demand creation.[27] In this study, only seven eyes had post-operative complications, representing a complication rate of 6.1%. In the study conducted in The Gambia, the complication rate was very high (32%) at six months[8] compared to 6.1% in this study. This is a clear demonstration that indeed it is possible to have very low complication rates following TT surgery, although our patients were three-six months post-surgery. However, there should be follow up of the patients of TT surgery at one-two- years to assess late onset of complications.

In this study, 41 (55.4%) patients had both eyes operated on. A total of 71 patients (95.9%) were operated on pre-operatively selected eyes while three operated patients (4.5%) were not operated on the pre-operatively selected eyes. These were patients with bilateral trichiasis who preferred that the first eye surgery be done on the eye of their choice. A total of 54 (73.0%) patients had major TT, while 20 patients (27.0%) had minor TT, an indication that TT was severe in the majority of the patients.

All the 115 TT surgeries were performed using the Trabut technique, which is considered superior to BPTR surgery.[12] A comparison of TRABUT and BPTR one year post-operatively revealed that TT recurred in 22% of BPTR cases and 13% of Trabut cases.[12] Nonetheless, both Trabut and BLTR are routinely recommended procedures by World Health Organisation. Standardised surgical procedures are crucial for improving surgical outcomes.[21] Inadequate techniques, including incision, peripheral dissection, suture type and tension, and eyelash positioning, can lead to a higher incidence of post-operative trichiasis. To enhance the productivity of trained TT surgeons, all assessed TT surgeons were provided with surgical equipment, consumables, technical support, supervision, mentorship, and outreach services.[17]

This study achieved a participation rate of 100%. This can be attributed to the recorded acceptable surgical outcomes through provision of quality surgical services by trained and certified TT surgeons. This may also be explained by the fact that TT causes extreme pain and health deterioration, contributing to insecurity and imposing additional burdens on families, impacting social, economic, and religious activities,[2] thereby motivating patients to adhere to medical advice. Surgery for TT significantly enhances patient satisfaction and improves quality of life (QoL). A study of 483 individuals indicated that 86% expressed high satisfaction with their surgical outcomes, while 96% reported improvement in ocular symptoms. Individuals with postoperative trichiasis or eyelid contour abnormalities exhibited a higher prevalence of persistent ocular problems and demonstrated a reduced willingness to pursue additional surgical interventions.[26] A longitudinal study involving 1,000 TT patients evaluated before and one year after surgery demonstrated significant enhancements in both vision-related and health-related QoL, irrespective of alterations in visual acuity.[28] This highlights numerous advantages of TT surgery beyond simple vision preservation.

While this study suggests that recurrent trichiasis is not a common problem, other research findings indicates that PTT is prevalent and poses a considerable risk to the vision of many individuals.[4] Consequently, it is essential to formulate policies[29] that integrate TT surgical services into routine primary health care services. The national trachoma elimination programme can lead this initiative as it organises surgical services. Trichiasis patients should be operated by well-trained TT surgeons and monitored continuously post-surgery to identify individuals requiring further treatment. Furthermore, WPHO should advocate for resources to enable long-term follow-up to determine the long-term outcomes of TT surgery. This may necessitate additional randomised controlled trials to refine the surgical technique, clinical audits to assess surgeon-specific outcomes, and interventions to manage infection.[4]

This study presents several potential limitations that should be considered. The final assessment was conducted by a different observer during the three-six months follow-up period, making it impossible to evaluate potential interobserver variability. In addition, we were unable to collect data at one-two-year post-TT surgery, which hindered the assessment of long-term surgical outcomes. Due to limited resources, the program prioritized training and certification of TT surgeons and quality data capture within a 3–6-month timeframe, which was essential for effective program management.

In conclusion, the surgical outcomes of trachomatous trichiasis using the Trabut technique were acceptable, with complications occurring in less than 20% of operated eyes during the three- six-months follow-up period. The three TT surgeons who conducted the surgeries could be considered as TT surgery supervisors and mentors under Trachoma Elimination Programme. Furthermore, an assessment of long-term TT surgical outcomes should be considered at one-two-years post-operatively.

Authors' contributions

Study was conceived by: CM*, MFM, and KIMM; designed the study protocol: CM*, MFM and KIMM; training of field teams: CM*, CC, EC, RN, and VS; coordination and management of the research: CM*, KL, GM, RN and VS; analysis and interpretation of data: CM*, EC, GCM, DJK, ML, PM, and KIMM; drafting the manuscript: CM*, CC, ML, EC and KIMM; critically revised the manuscript for intellectual content: CM*, CC, EC, DJK, MFM, PM, and KIMM. All authors read and approved the final manuscript.

Ethical considerations

Ethical clearance was obtained from the Tropical Diseases Research Centre Ethics Committee (TDRC) No. STC/2018/9 and the Ministry of Health. Consultative communication and meetings were held with all stakeholders to inform them of the plan and schedule.

All participants were provided with full survey information conveyed to them in their local language before engaging in the study. Consent was recorded on the data collection forms.

Patients diagnosed with active trachoma or any bacterial ocular condition were provided with two tubes of 1% tetracycline eye ointment free of charge. Patients with TT or other ocular conditions were referred for further evaluation and treatment.

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Disclosure Statement

The authors reported no potential conflict of interest. GM and KL work for Sightsavers Zambia.

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Disclaimer

The views expressed are those of the authors.

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