



# Global Scientific Meeting on Trachomatous Trichiasis

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Meeting discussions, conclusions & suggested research

Moshi, Tanzania

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**ICTC** International Coalition  
for Trachoma Control

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Repeated infections with *Chlamydia trachomatis* can cause a wide spectrum of phenotypes including meta-plastic lashes, misdirected lashes and entropion. Lashes touching eye can cause watering, blurred vision and pain. Programs should consider anyone with an eyelash touching the eye or showing evidence of epilation as person suffering from trichiasis.

Below: A man being examined for trichiasis in Blue Nile, Sudan. Trichiasis patients need to be counseled and offered an intervention appropriate to their condition. Indications for surgery include central lashes, peripheral lashes that touch the cornea and when requested by the patient.

Photo Credit: The Carter Center

Right: Epilation is a common method for self-management of trichiasis through the plucking of eyelashes that touch the eye. This Ethiopian woman holds her locally-made forceps. Some programs offer commercially produced forceps to patients with minor trichiasis. Epilation can reduce the risk of corneal damage; however, surgery provides a more lasting solution.

Photo Credit: The Carter Center



## Executive summary

The estimated global backlog of un-operated trichiasis cases is in excess of 7 million persons. For the goal of eliminating blinding trachoma by the year 2020 to be reached, all of these people plus new cases and those requiring repeat surgery will need to receive service. The current global output averages about 100,000 patients per year and data suggest that under programmatic conditions, 20%-40% of those operated will present with post-operative trichiasis or another unwanted effect of the surgery. There remains a need to increase both the QUALITY and QUANTITY of trichiasis surgery service throughout the trachoma-endemic countries.

Over the last 10 years, the global program has gained momentum and reported around one million surgeries to the GET 2020 Alliance. In response to a call for action by the GET 2020 Alliance, a group of practicing trichiasis surgeons, surgeon trainers, academics, program managers, and NGOs met to review the available evidence from programs and academic research over the past 10 years for improved service delivery. The central focus of the meeting was the patient, how the service can become more effective and efficient and how surgical outcomes can be improved. The meeting was organized around three themes: (1) surgical management guidelines, (2) improving surgical quality, and (3) enhancing surgical uptake and output. For each of these themes, experts prepared a set of brief speaker notes, which summarized the existing evidence and assessed the strength of that evidence. The group then added their own experience and sought to reach consensus on how the sum of the evidence and experience could be applied and where more knowledge is required. The conclusions of these deliberations form a framework for program improvement and further research.

The first key output of this meeting is this report. The report is not intended to be a set of guidelines nor a recipe for planning a program. It is a summary of the available evidence and the presentation of the opinion of the expert group. Of immediate relevance to all programs was the realization that the current

guidelines for recruitment, training, assessment and supervision of trichiasis surgeons are not being followed. Adherence to the WHO's Final Assessment of Trichiasis Surgeons Manual would be an immediate first step to improving surgical outcomes. The group identified the need for additional practical guidelines on planning and managing outreach campaigns, for standardized training of trainers, an update of the current WHO "yellow surgery manual" (which has been in use for 20 years) and a standard user-friendly surgical register. Improving all aspects of the management of trichiasis will enable people living with this condition to have access to high quality services and will enable national and regional programmes to reach their targets of eliminating blinding trachoma.

This report is structured into three sections: (1) a summary of the discussion, conclusions, suggested research and needed tools ("Tool Box"), broken down into the three themes; (2) a compilation of speaker notes prepared in advance of the meeting; and (3) the program and references cited in the speaker notes or used to generate conclusions on the evidence.

Contributing to the meeting were International Coalition for Trachoma Control members: Emily Gower from Wake Forest School of Medicine; Sheila West from The Dana Center for Preventative Ophthalmology at Johns Hopkins University; Saul Rajak and Matthew Burton from the London School of Hygiene and Tropical Medicine; Richard Le Mesurier from

Fred Hollows Foundation; Chad MacArthur from Helen Keller International; Agatha Aboe from Sightsavers International; Martin Kollmann from CBM; Alemayu Sisay from ORBIS; Teshome Gebre from International Trachoma Initiative; Amir Bedri from Light for the World; Edson Eliah, Paul Courtright and Susan Lewallen from Kilimanjaro Centre for Community Ophthalmology; Henry Adala representing Lions Club International Foundation; and Paul

Emerson from The Carter Center. ICTC members were joined by independent experts Hannah Faal (Nigeria); Keith Waddell (Uganda); Essam el Toukhy (Egypt); George Kabona (Tanzania); and representatives from the Ministries of Health: Addisou Mekasha (Ethiopia); Ernest Barasa (Kenya); Ben Nwobi (Nigeria); Islam el Beih (Egypt); and Edward Kirumbi (Tanzania). The principal authors and editors of this report were Matthew Burton, Paul Courtright and Paul Emerson.

Below: The use of patient cards which capture comprehensive data about the patient, extent of the disease, name of surgeon and place of surgery, facilitates follow-up visits and the audit of surgical outcomes and surgeon productivity.

Photo Credit: The Carter Center/Aryc W. Mosher





This surgeon is preparing to be assessed for certification in Niger. Candidates for surgical training should have good vision and manual dexterity. Care needs to be taken to choose the most suitable person for training from the health facility. Strong supervision will maintain this surgeon's technical skills and improve his productivity.  
Photo Credit: The Carter Center/Aryc W. Mosher

# Theme I: Surgical Management

## 1.1. Current WHO Trichomatous Trichiasis (TT) management guidelines

The WHO recommends that surgery should be offered to patients who are diagnosed with Trichomatous Entropion Trichiasis.

The WHO makes a distinction between the simplified screening grading class of TT (WHO Simplified Grading system) and the formal diagnosis of Trichomatous Entropion Trichiasis, made by an appropriately skilled health worker.

The WHO advises that surgery be offered with counselling, which includes a discussion of the risks/complications of surgery and the potential consequences of not undergoing surgery. Surgery is most effective at preventing vision loss when performed on those with clear corneas; however, it should be offered to those with established corneal opacification to prevent further vision loss and can also be offered to people with severe vision loss from corneal opacification to relieve pain. For confirmed cases of trichiasis, epilation is not recommended because of the progressive nature of the disease and the difficulties in re-assessing people in the field. For existing surgical programs, no specific surgical technique is recommended above the other by WHO. However, for newly-established surgical programs, the WHO recommends the use of the Bilamellar Tarsal Rotation Procedure.

### Conclusions:

- Trichomatous Trichiasis is represented a wide spectrum of clinical disease.
- There are several reasons why eyelashes touch the eye: Entropion / Metaplastic Lashes / Misdirected Lashes.
- In an endemic setting, these various phenotypes are highly likely to be due to trachoma.
- For programme purposes, the definition of Trichomatous Trichiasis of "One or more lashes touching the globe or evidence of epilation" is appropriate.

### Research questions / priorities:

- What are the risks of significant visual impairment or corneal opacification from the various patterns and locations of TT?

The WHO suggests surgeons aim for a recurrent trichiasis rate of less than 10%. Trichiasis surgeons should maintain individual logbooks of the cases they have operated. The number of surgeons should be limited to allow for proper supervision, provision of equipment, and maintaining surgical skills through adequate numbers of cases performed each year. The WHO's "Final Assessment of Trichiasis Surgeons" manual should be used during training and subsequent supervision.

## 1.2. What does TT disease look like in endemic populations?

The group concluded that the definition of trichomatous trichiasis (TT) of "one or more lashes touching the globe or evidence of epilation" is appropriate. However, it was recognised there is a very wide spectrum of disease from a single peripheral lash to entropion of the entire lid with all lashes touching the eye.

The location of the lashes is likely to be very important in determining the risk of damage to the cornea and should be recorded if possible. There are different types of trichiatic lashes: entropic (in turned eyelid), metaplastic (growing from an abnormal location) and misdirected (normal location but abnormal direction of growth). More research is needed to determine the relative risk to vision and the cornea of these different types of lashes and the likelihood of them being successfully corrected by surgery.

### 1.3. Surgical procedures for trichomatous trichiasis

The two most commonly performed operations for TT are the Bilamellar Tarsal Rotation (BLTR) and Posterior Lamellar Tarsal Rotation (PLTR). The choice of which procedure is used in a particular region seems to be based on historical decisions in trachoma endemic countries. There is insufficient long-term outcome data comparing both procedures to warrant preference of the one procedure over the other.

In the meeting there were a variety of perspectives on which is the most suitable surgical procedure. Some participants think, based on personal experience, that BLTR might not be the most appropriate procedure to correct severe entropion/trichiasis where all lashes are touching the globe and the conjunctiva is heavily scarred, and that PLTR (modified Trabut) procedure is preferable in such cases. However, others thought, supported by published data, that BLTR can be equally effective if performed well by an experienced surgeon.

There was concern about what is theoretically better versus what is practical in programmatic settings, as it is probably unrealistic in most settings for TT surgeons to be trained in more than one technique. It was agreed that there is a need for a formal randomised controlled trial directly comparing both procedures.

#### Conclusions:

- Data are limited on how to manage total / extensive entropion TT. These people are at highest risk of blindness and post-operative TT.
- Currently data are very limited regarding whether or not the two commonly used operations are equivalent.
- The BLTR procedure has produced excellent results when performed by high quality surgeons in a trial setting.

#### Research questions / priorities:

- There is a need for further research to improve the outcomes of surgery for people with very severe disease (total/extensive entropion TT), who are at the greatest risk of blindness and recurrent trichiasis.
- Are the long-term outcomes of the BLTR and PLTR operations equivalent?

### 1.4. Treating recurrent trichiasis within a trachoma control

There are no specific guidelines on how to manage recurrent cases. The WHO manual recommends referral of recurrent cases to ophthalmologists. However, in trachoma endemic countries there are usually not enough ophthalmologists available to provide this service. It was recognised that there are some trichiasis surgeons (non-ophthalmologists) who are technically competent to manage cases of recurrent TT. In practice, many people with recurrence cannot access appropriate treatment.

If a recurrent case presents, the usual practice is to repeat the original surgery. It was argued that a repeat surgery would only work where there is residual entropion and not for lids where the entropion had already been corrected. Re-operation has a higher risk of failing than a primary operation (up to 13-fold increased risk has been reported). Anecdotally, in some settings routine practice is to repeat the original operation for more severe post-operative TT and to recommend epilation for mild post-operative TT.

The type and severity of recurrence are variable and the treatment needs to be tailored to the clinical situation. One needs to consider the patient's perspective – not just the clinician's perspective. Currently, there is limited information on how to manage recurrent cases. The group agreed that definite indications for repeat surgery include: (1) any central lashes, (2) peripheral lashes that touch the

cornea, (3) when requested by patient who has symptomatic post-operative TT. In view of the poor outcomes reported for repeat surgery it was considered that a few peripheral, asymptomatic lashes without entropion might be reasonably managed with regular epilation.

#### Conclusions:

- The WHO recommends referral to an ophthalmologist. However, this is usually not a practical option, and in such settings an experienced senior non-ophthalmologist may be able to manage many of the recurrent cases.
- Indications for repeat surgery include: (1) any central lashes, (2) peripheral lashes that touch the cornea, (3) requested by patient who has symptomatic post-operative TT.
- In many endemic settings specific guidelines for managing recurrent TT are limited or lacking.
- Programmes are encouraged to develop locally appropriate guidelines for the management of recurrent TT.
- The treatment of post-operative TT needs to be tailored to the patient's perspective and the clinical features.

#### Research questions / priorities:

- There is a need for systematic research into the management options for various patterns of recurrent trichiasis.

### 1.5. Improving the surgical technique

There is considerable scope for improving the surgical technique particularly in operational settings. Clinical trials have achieved good results with low recurrence rates in some settings. However, it was recognised that the available data from operational/programmatic conditions typically report worse outcomes, particularly in settings where surgery is performed infrequently. Therefore, attention needs to be paid to performing the surgery in the manner described in the WHO manuals. These are demonstrated in a new "Trichomatous Trichiasis Surgery Training DVD", which is being distributed to endemic countries in 2012 and initial reports from training programmes suggest that it is a useful tool. Concerns were expressed over some trainers' understanding of the surgical technique and their ability to teach others. It is critical that the correct technique is taught to the trainees from the beginning.

Short incision lengths (relative to the total length of the eyelid) has been associated with an increased risk of recurrence. There was a discussion about whether the handedness of the surgeon has an impact on the outcome of the operation. Two studies have found recurrence rates to be higher in the left eye, which was attributed to right-handed surgeons finding left eyes harder to operate on comfortably. However, this has not been a consistent observation in the literature.

Several studies have reported that conjunctival granulomas can often develop following surgery. These can be large and do not spontaneously resolve, requiring an additional minor procedure to remove them. It was suggested that single incision cuts lead to less inflammation and fewer granulomas. One trial comparing silk and polyglactan (vicryl) sutures reported lower granulation formation rates with polyglactan sutures; silk is recognised to be more pro-inflammatory.

Two lid clamps have been developed for use during the BLTR operation. One of these is undergoing clinical trial in Tanzania. The other has been in use for some time in Uganda, and both are said to make the operation easier to perform. As yet no data are available on surgical outcomes where either clamp is used. Data from the clinical trial will be forthcoming later this year.

The position and appearance of the eyelid at the end of the operation may be predictive of the longer-term outcome. Studies are currently underway in Tanzania and Ethiopia to evaluate which features of the post-operative lid position are predictive of the outcome and what measures should be undertaken to correct these at the time of the initial surgery. It is expected that photographic grading cards will be available shortly to guide the surgeon on the optimal post-operative lid position and the corrective measures needed to achieve this.

#### Conclusions:

- There is realistic scope to improve the surgery.
- Surgeons need to follow the surgical techniques as described in the WHO "Final Assessment" manual.
- Short incision length (relative to overall eyelid

length) is associated with lashes touching the globe after surgery.

#### Tool Box:

- Improved surgical training materials
- Immediate post-operative lid position & contour grading tools

### 1.6. Role of post operative antibiotic

It was recognised that both *C. trachomatis* and other bacteria can infect the conjunctiva and may play a role in the recurrence of TT following surgery. Therefore, preparation of the surgical field with the appropriate ocular formulation of povidone iodine (or equivalent) is important.

Topical post-operative antibiotic use to prevent infection is usual practice. In addition, clinical trials have examined whether single dose post-operative azithromycin can reduce trichiasis recurrence. Where overall recurrence rates are low, there is evidence to suggest that azithromycin use post-surgery can reduce recurrence. However, it is not reasonable to expect that an antibiotic can overcome TT recurrence likely due to poor surgical technique. Given high rates of recurrence within program settings, more attention needs to be paid to reduction of surgeon-related factors in reducing recurrence.

#### Conclusions:

- Infection of the conjunctiva is common in TT patients.
- Preparation of the surgical field with povidone iodine (or equivalent) and maintaining sterility during the procedure are very important.
- Post-operative topical antibiotic should be used. Overall, the evidence suggests that post-operative azithromycin does not have a down-side.
- Some evidence shows that with very good quality surgery, TT recurrence can be reduced with the use of immediate post-operative oral azithromycin. Other evidence suggests that if surgical quality is less good and post-operative TT rates are high, an effect from azithromycin is unlikely to be found.
- The emphasis on improving surgical outcomes needs to be on improving surgical quality.

### 1.7. Sutures for trichiasis surgery

A trial comparing silk (standard) to an absorbable suture (Polyglactan [PGA] / Vicryl) found no difference in TT recurrence outcome. The incidence of granulomas was less frequent with Vicryl. There may be operational reasons to use absorbable sutures, as patients do not have to be seen at one week to have sutures removed. However, there remains a need to a review several months after surgery, which allows the surgeon to detect the bulk of recurrent TT cases that develop, many of which are not apparent at the time of suture removal. Absorbable sutures are therefore associated with lower transport and time costs to both the programme and the patient. There is no trial data on the use of catgut, which is widely used in some TT surgery campaigns. Smaller needles are preferable to the large needles that are currently used in TT surgery.

#### Conclusions:

- Current evidence indicates that there is no difference in the TT recurrence rates between silk and synthetic absorbable (PGA) sutures.
- Granuloma formation rates are lower with PGA sutures.
- There are operational reasons to use absorbable sutures (PGA/catgut), for example by allowing for rolling surgery campaigns. No trial data are available on the use of catgut.
- Use of absorbable sutures would remove programme and patient costs related to suture removal. Other cost implications related to the use of absorbable sutures need to be evaluated.
- Smaller needles are preferable to large needles.

### 1.8. Indications for trichiasis surgery

The current definition of TT (one or more lashes touching the globe or evidence of epilation) is preferred. It was noted that the WHO indication for surgery currently refers to "Trichomatous Entropion Trichiasis". However, the group considered entropion to be a difficult sign to reliably determine. Therefore, the group concluded that this should not be included in the definition for the indication for surgery.

Studies demonstrate some improvements in visual acuity and corneal opacity following BLTR and PLTR. Central lashes pose a high risk for corneal opacity and should be operated. In cases where there are a few peripheral lashes not touching the cornea the risk is low but not zero and has to be balanced against risks of surgery, including poor outcomes.

Programs need to place the patient in the centre of the decision-making process and consider options beyond surgery. Patients with symptoms and access to affordable, high-quality TT services are generally more willing to accept surgery. For many, epilation is very popular and widely practiced as it relieves symptoms. Epilation appears to be an alternative in certain circumstances, specifically, for minor TT when high-quality forceps and training on their use are available. However, there is currently a lack of long-term evidence on which to make recommendations.

Any TT is an indication for an intervention. However, in some instances the presence of

TT may not be an indication for surgery. It is important to distinguish clearly between a basic diagnosis of TT (defined above) and the indication for surgery. An indication for surgery is affected by the context: disease type/severity, patient's preference, available health care personnel and resources. Patients requesting surgery with at least one central lash, with any lash touching the cornea, or with symptomatic peripheral lashes should receive surgery. For patients with a few asymptomatic peripheral lashes not touching the cornea and for patients refusing surgery, programmes could consider offering alternatives such as epilation. This may include training and provision of quality forceps with good follow up. Often there are community epilators that can be engaged.

As programmes deal with the backlog and incidence there is need for active case detection and training of low-level village based health volunteers. General health workers need to be able to detect any lash touching the eye or establish history of epilation. Trained eye care workers should review referrals to decide on whether TT surgery is indicated. Considerable training is required for both cadres. Programs should be allowed to report numbers of TT patients contacted, not only operated (thus including those refusing surgery). However, there is a risk for people missing out on surgery and programs are encouraged to motivate eligible TT cases to accept surgery.

## Conclusions:

- Patients with TT need to be identified / counselled / offered an intervention appropriate to their condition and context.
- Definite indication for surgery: the group agreed (1) any central lashes, (2) peripheral lashes that touch the cornea, (3) requested by TT patient.
- There is a consensus that even very few lashes touching the peripheral globe need managing with an intervention appropriate to the condition, particularly considering the patient's symptoms. There is uncertainty as to what the best option is under operational conditions, because of variable results of surgery and the need for more information on the long-term effects of epilation for different types/locations of trichiatic lashes.
- The group notes that even minor peripheral TT can progress and can cause corneal damage. The group concluded that epilation can be considered for the patient. But this MUST be accompanied with appropriate counselling and follow-up.
- Patients with one or more central lashes should be counselled advocating for surgery and carefully counselled if they show reluctance to accept surgery. For those who still decline to be operated, there are data to suggest that epilation is associated with a reduced risk of corneal opacity. However, the risk to the cornea is not entirely removed, and the data show that surgery is the best option.

## Research questions / priorities:

- More data are needed on the effects of epilation on various subgroups of TT patients (based on location of trichiatic lashes).
- There is a need to assess the surgical outcome for eyelids that initially have metaplastic / misdirected lashes without entropion.

## 1.9. Surgical outcomes

Data suggest that under operational conditions surgical outcomes (recurrence rates and lid contour abnormalities) are variable and in some places often are poor. Data clearly show significant inter-surgeon variability.

The current definition of trichiasis recurrence and the criteria for repeat surgery are based on the presence of one or more lashes touching the globe. Discussion focused on what the appropriate criteria for repeat surgery should be and how the presence of trichiasis after surgery should be categorized. The group proposed the following terminology:

(i) Post-Operative TT: encompasses all trichiasis after surgery, regardless of whether it was due to a failure of the operation to correct the TT (surgical failure), or recurrence due to the primary disease process or wound healing events.

(ii) Early and Late Post-Operative TT: with the dividing point being at 6 months post-operatively. The majority of post-operative trichiasis develops within the first 6 months following surgery. The group agreed that early post-operative TT (presenting <6 months) was most likely to be surgical failure and that late post-operative TT (presenting >6 months) was most likely to be due to primary disease progression. Additional cases of trichiasis recurrence continue to occur over time, but at a slower rate.

(iii) Clinically Significant and Clinically Insignificant Post-Operative TT: it was observed that much of the post-operative TT is relatively mild compared to the pre-operative disease. Therefore, it was thought that it would be useful to subdivide Post-Operative TT by clinical severity. Clinically significant would include (1) any central lashes, (2) peripheral lashes that touch the cornea,

or (3) identified as a significant problem by the patient. It is possible that clinically insignificant post-operative TT can progress to become clinically significant.

Evaluation of the patient post-operatively is critical both for patient care and for surgeon feedback. Ideally, patients would be seen on the day following surgery, to correct any in-turned lashes. All patients should also be seen 6-12 weeks after surgery. Other outcome measures should be evaluated in addition to post-operative TT, including granuloma and eyelid contour abnormalities. If a provider who was not the original surgeon evaluates the patient for outcomes, such data should be sent to the original surgeon to provide feedback on outcomes. This is especially important in surgical camp situations where the operating surgeon may not see the patient again. The group also felt that follow up data should be recorded systematically and should include information on trichiasis severity, granulomas and eyelid contour abnormalities, possibly using photo grading cards that are currently under development/assessment.

Future research needs to focus on other aspects of trichiasis surgery outcomes. Quality of life, patient perceptions and cosmetic outcomes are important components of the surgical evaluation process; however, little data have been published in this area. In addition, economic and intergenerational effects of trichiasis need to be included in evaluating the importance of trichiasis programs. Some trichiatic lashes post-operatively may not be true entropion trichiasis, but instead may be misdirected or metaplastic lashes.

## Conclusions:

- There is evidence from research and program data that rates of post-operative TT are often very high and that rates could be lower.
- There is good evidence from multiple countries that there is considerable variation in the rate of post-operative TT recurrence rates by operating surgeon.
- Pre-operative TT should be stratified and recorded as: minor 0-4 lashes, major 5-20, and severe 20+.
- The group agreed on the definition of post-operative TT as any TT after surgery.
- Post operative TT should be subdivided into early (<6 months) or late (>6 months), and clinically significant and non-significant, where clinically-significant TT includes: (1) any central lashes, (2) peripheral lashes that touch the cornea, or (3) any other lashes regardless of location that are identified as significant by the patient.
- Ideally initial post-operative follow-up should take place the day after surgery, and again, preferably between 6-12 weeks, but definitely before 6 months.

- Patient follow-up should include recording rates of post-operative TT, granuloma, lid-closure defect, notching, and contour abnormality (in reference to the proposed card).
- Patient satisfaction, while difficult to assess objectively, is an important component of the service.
- There are limited data on patient perspectives on outcome in areas such as cosmesis, economic status, quality of life and mental health.

## Research questions / priorities:

- Development of valid and reliable tools to assess patient satisfaction with the service across a range of cultural and geographical contexts.
- Studies on patient perspectives on outcomes including: cosmesis, economic status, quality of life and mental health.

## Tool Box:

- There is a need for a new tool for assessing the eyelids following TT surgery.

The certification of surgeons according to the WHO Final Assessment of Trichiasis Surgeons manual provides unified standards for surgeon knowledge and performance. The translation of this manual into various languages and adoption by all national programs will strengthen surgical capacity.

Photo Credit: The Carter Center/Aryc W. Mosher



## Theme 2: Surgical Quality

### 2.1. Current WHO training and certification guidelines

**Training for more and better surgeries:** Simply producing more surgeons is not the answer to getting more & better surgeries. There is a need to systematically and comprehensively address the quality of trainers, the selection of candidates, the quality of the training, supportive supervision, equipment, consumables and support staff – all in the context of the specific environment. Where it happens, cascade training (training by peers) of TT surgeons should be avoided. TT surgeon training is ideally conducted by a suitably qualified ophthalmologist familiar with trichomatous trichiasis.

**Trainers:** More emphasis has to be put on the quality of trainers, and the definition of quality has to be standardized within and between programs.

**Surgery:** WHO recommends providing every surgeon with 2 surgical kits. However, this recommendation only works for static surgical settings. Kits should be provided according to the need of service delivery models. It is important to ensure the adequate near vision of surgeons (e.g. correct for presbyopia). Loupes can be helpful in performing the surgery and their use is encouraged. However, it is noted that some surgeons may have difficulties in adapting to the use of operating loupes. There is need to facilitate regular re-equipping of surgeons with instruments and consumables.

**WHO Final Assessment of TT-surgeons Manual:** In the context of the recommended systems approach, all programs should adopt the WHO Final Assessment of TT-surgeons Manual.

#### Conclusions:

- The WHO Final Assessment of Trichiasis Surgeons manual is well written and clear. The use of the assessment manual should be adopted by all programs and incorporated at all levels of training.
- An official translation of the WHO Final Assessment of Trichiasis Surgeons manual should be produced and made available in all official languages of WHO.
- Provision of surgery service needs to be considered as a 'systems' approach and not just in terms of trained surgeons and availability of equipment.

### 2.2. Selecting Trainee Surgeons

**Aptitude & attitude:** Aptitude and attitude of surgeons are important, but difficult to gauge at recruitment. The most productive surgeons are the ones 'who just want to do it'. Selecting trainees based on current job status (post) will not select those who have a passion to get the work done, nor the best surgical skills.

**Attrition & productivity:** Good people sent for TT surgery training also excel in the general service and are often promoted out of positions in which they can provide TT surgical service. Highly productive surgeons typically gain no financial or career-development benefit from their service; how can we expect them to stay in the service?

Attrition is lower and productivity is higher for dedicated eye workers than for occasional TT-surgeons.

**Selection:** MoH often select personnel for training on rotation because it is 'their turn' to have the opportunity to attend a training course, and not considering the needs of the post. Consequently, surgeons are often lost to the program after training before they are even deployed. Selection of surgeons is best from staff already within the system. Typically, Health Services select staff and trachoma control / eye care programs have limited influence: expectations can be in disequilibrium. Local regulations prevent vertical programs from distorting established pay structures. Thus, rewards are often limited to the

health facility and not the individual surgeon. Resources should be focused on training those likely to operate, and specialist eye care workers should have TT surgery as part of their standard duties. Should we train non-specialist TT surgeons at all? Or should attention focus on ophthalmic medical assistants (OMAs) or dedicated eye care workers launching a career? However, different

cadres of surgeons may be appropriate for mobile outreach (TT surgeons) and base unit services (eye cadres), which may require a broader ophthalmic training than those in the mobile service.

Pre-Training Tests: There is need for simple and reliable tools to test binocularity, near and distance vision and manual dexterity prior to the training.

#### Conclusions:

- There is evidence from the programs that trainees are being put forward for TT surgery training based on criteria such as length of service, location of posting and in rotation with peers.
- Although there is good evidence that there is considerable variation between surgeons on the quality and quantity of surgeries performed, there is insufficient evidence to determine what characteristics the high-performing quality surgeons have.
- Programs should produce and adhere to clear criteria for surgeon selection.
- Candidates for training should have good binocularity, near and distance vision and be able to pass a simple test of manual dexterity such as suturing an orange skin.

#### Research questions / priorities:

- Identify and assess simple tools to test for manual dexterity in selection of TT surgeons.
- Review curricula for inclusion in TT surgery training.
- Audit criteria for TT surgeon selection.
- Determine methods of selection that result in increased quality and quantity of TT surgical services.
- Development of a standard tool to test for manual dexterity.

#### Tool Box:

- Standard tools for testing manual dexterity and binocular vision of potential TT surgeons

### 2.3. Training Programmes:

The various manuals on trichiasis surgery do not actually capture what is needed to ensure that a trainee gains the competence to carry out surgery. There is little mention of patient recruitment and counselling or epilation. It is likely that the existing manuals will need to be revised, particularly as new information becomes available. Training programmes need harmonization and, as a starting point, some level of evaluation would be helpful.

#### Conclusions:

- There is a need to review and update, as necessary, the “yellow TT manual” to reflect experience in its use and new information over the last 20 years. A small group should be convened to make the revisions.
- There is little information on training of the trainers.
- Within countries there is often a lack of standardized/harmonized training of TT

surgeons. Where needed, national level harmonized curricula are desired to ensure that the outcome of the training programmes are equivalent.

#### Tool Box:

- Updated surgical procedure training manuals
- Training of trainers’ manual
- Manual on evaluating training programmes

### 2.4. Supervision of Trichiasis Surgeons

Supervision is a vital component of all TT-surgery programmes, but unfortunately is often limited or lacking. It is central to the process of improving the quality and productivity of the service being delivered. Two studies from different African countries have suggested that the lack of supervision was linked to low productivity of trichiasis surgeons.

For supervision to be effective it needs to be built into the entire system. It should not be seen as a discrete activity or a vertical structure. Supervisors require training in supervisory skills and need to be supervised as well to ensure their performance is of a high standard. The training and supervision of supervisors should emphasize supervision as a mentoring and supportive function that encourages two-way communications between the supervisor and supervisee. Though evaluation of the supervisees’ work is a necessary part of a supervisor’s job, it should not be viewed as the primary one. The supervisor should have the skills that the TT surgeons are expected to demonstrate in their work, specifically the necessary surgical skills to perform high-quality surgery, counselling, post-operative care and management of logistics. The supervisor ideally would also have a broader programmatic view to be able to measure the output of surgeons against program goals, demonstrate leadership skills and help to ensure that the TT surgeons have the necessary equipment and consumables to be able to operate. As the skills may be more broad-based than one person possesses, a management team approach may need to be considered. Whether an individual or a team, the authority to make decisions is essential for program success.

#### Conclusions:

- Supportive supervision needs to be built into the programs from the design stage onwards.
- Surgery team leaders should be selected from the cadre of active TT surgeons and receive additional training and resources to ensure they are empowered to do their job.
- The surgeon supervisor should be a ‘team leader’ with the following characteristics:
  - o an understanding of the magnitude and severity of TT in her/his area;
  - o technical skill to manage patients through the whole process of surgery including case identification, patient counseling, the ability to operate successfully, ability to give advice on post-operative care, and knowing when to refer patients for care at the next level;
  - o authority and decision-making power to ensure supply of consumables, provide rewards, recommend a staff member take additional or further training and institute disciplinary action;
  - o good communication skills and have the tools to facilitate communication;
  - o have a working knowledge of the existing health structure, authority within the structure, and be accountable within the structure.

#### Research questions/priorities:

- Evidence should be compiled to determine the degree to which supportive supervision by team leaders results in increased quality and quantity within the TT surgical service.

### 2.5. Surgical Quality and Audit

Concerns were raised over the quality of the surgical results in programmatic settings. Data point to significant variation in the TT recurrence rates between surgeons and a growing realisation that in some settings the cosmetic results of the surgery are sometimes unsatisfactory.

Clinical Audit and Service Quality Assessment are internationally accepted components of routine good clinical practice. The aim of programmes should be not only to operate on TT cases in a timely manner, but also that the surgery should be of good quality and the experience not unpleasant for the patient. Therefore, some form of clinical audit / quality assessment should be an integral part of all TT surgery service programmes. However, at the same time the group also recognised that to conduct detailed audits of surgeon-specific outcomes may be unrealistic, so practical solutions need to be developed.

Audit should ideally be conducted at two levels (1) the programme and (2) the individual surgeon. Preferably someone who is independent of the service and the surgeon would conduct the audits. The surgeon level audit needs to involve evaluation of operated patients to assess the clinical outcomes and also the productivity of the surgeon (number of people treated per unit time). It was recognised that to conduct a meaningful audit may be expensive and needs a specific budget by programmes.

As a minimal first step to developing an audit / QA process, specific data should be collected by the surgeon on each operated case (see conclusions list).

The critical time for evaluating the surgeon is the first year after a surgeon is trained. This is a period when they will need enhanced supervision and monitoring of results to detect problems at an early stage. Therefore, the group felt that by the end of the first year after training, each newly trained surgeon should be formally assessed to examine their productivity, record keeping, and the assessment should include direct observation of surgery and direct assessment of the results. Ongoing audits of surgeons would be helpful on a periodic basis, as surgeons may develop specific negative habits over time.

#### Conclusions:

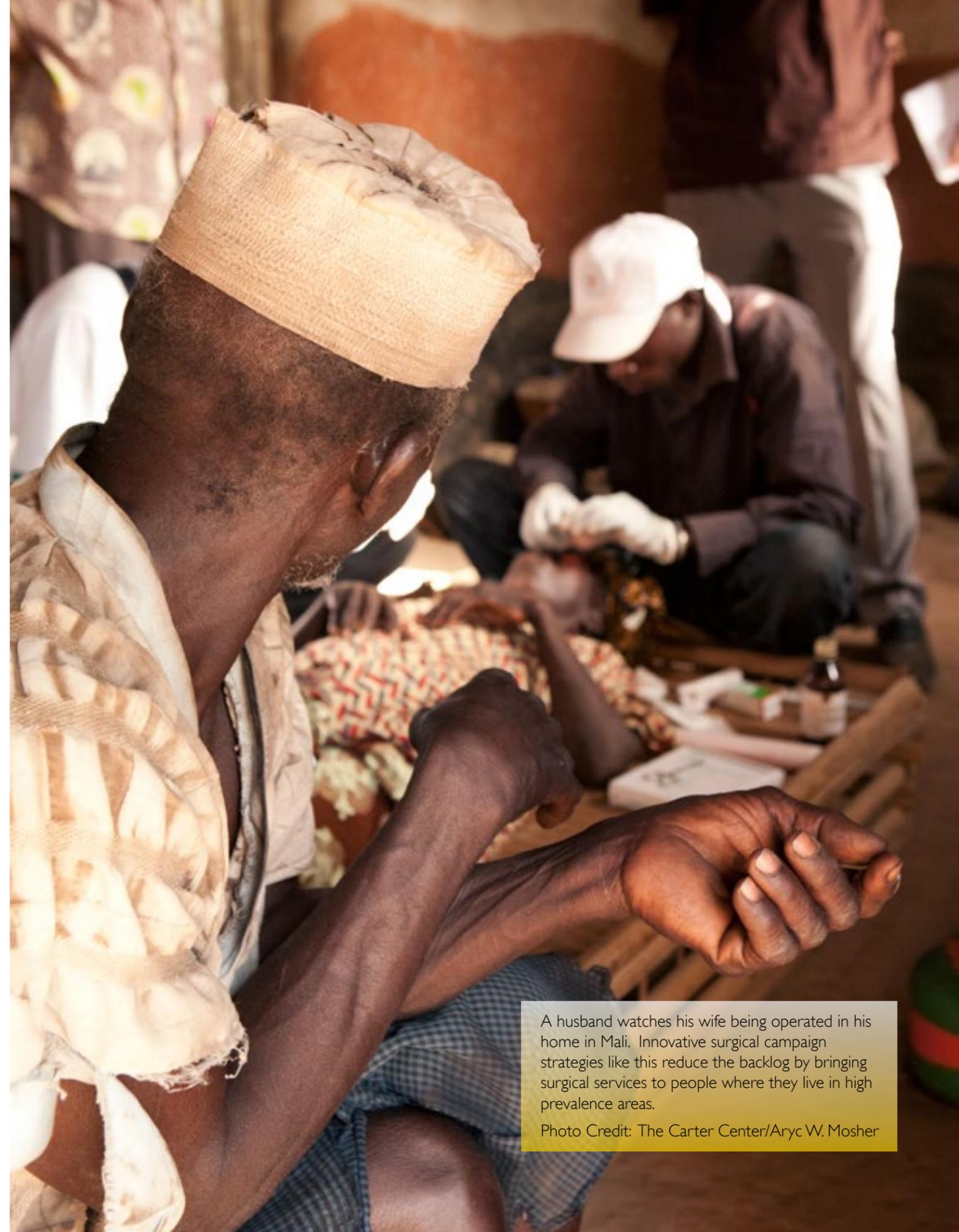
- Surgeons should maintain a surgical register of patients to include (at a minimum):
  - o Name of surgeon, date, and location of surgery
  - o Patient name, sex, age and tracing data (including cell phone of patient or neighbour)
  - o Type of operation performed (and on which eye)
  - o Baseline severity (mild, major or severe)
  - o Comparison of post-operative appearance against post-operative card
  - o Patient outcome at 6-12 weeks post-op or within six months post-op
- Audit should be part of on-going supervision.
- An audit during the first year after training is important, including a review of patient cards, productivity and some review of patient outcomes and observation of surgery.

#### Research questions/priorities:

- Assess impact of audit on quality and quantity of TT surgical service.

#### Tool Box:

- User-friendly standard surgical register needed.



A husband watches his wife being operated in his home in Mali. Innovative surgical campaign strategies like this reduce the backlog by bringing surgical services to people where they live in high prevalence areas.

Photo Credit: The Carter Center/Aryc W. Mosher

# Theme 3: Surgical Output and Uptake

## 3.1. TT Service Delivery models

There are two clear needs for provision of TT surgery: 1) to clear the backlog of unoperated cases quickly and efficiently and 2) to provide a sustainable on-going service at health facilities in trachoma endemic areas. The two needs are distinct: the first an urgent response requiring a campaign style “attack,” and the second an institutional service requiring a systems approach.

TT patients are not distributed evenly across the landscape, and the first step in clearing the backlog is to identify where the patients are concentrated and to focus surgery services on these areas. This is needs-based planning. Many programs currently try to apply resources equitably across all trachoma endemic districts and do not adjust resource delivery according

to need. Surgery camps or campaigns typically fall into two categories: large scale vehicle-based campaigns involving multiple surgeons or individual campaigns utilizing a single operator on a motorbike or local transport. Successful campaigns require that patient mobilization be matched by the logistical preparedness of the teams. For a country programme to achieve ultimate success services need to be provided for recurrent and incident cases. By definition this has to be via an on-going system and not via outreach. Currently most programs report no more than 10-20% of cases operated via static facility-based service. There are many questions with often locally specific answers on how best to provide a surgical service for TT:

General:

- How is access to the surgery service enhanced?
- How are patients best screened, identified, counselled and mobilized to present to the field teams when the camps are running?
- What is the role of mass-media, health workers and volunteers in mobilizing patients?
- How does the cost per patient operated change through the life of a program? Is there a cost-per-surgery that can be used for long range resource planning?

Outreach: the campaign approach.

- We know that camp productivity varies greatly from place to place. What factors lead to the efficient and respectful handling of patients

throughout the process?

- Are health volunteers, health workers, nurse auxiliaries, IECWs (operators), and supervisors utilized appropriately in a campaign?
- When should a program shift from a large vehicle-based caravan to the individual worker motorbike or facility based approach?

Sustainability: the static facility-based approach.

- Service is available in many facilities in trachoma endemic countries, but uptake is usually low. What factors lead to sustained uptake of service?
- How are patients fed into the system and what is stopping the facility-based model producing greater output?

Conclusions:

- Static service delivery alone will not solve the problem.
- Outreach (bringing the service to the patient) is needed to address the backlog.
- The current priority is to address the backlog; this needs to be based upon the needs (burden of trichiasis) of the specific area.
- Where there is a large burden a large-scale campaign will be needed. The decision on “high priority” areas needs to be determined country by country. The focus of the campaign approach will be on providing a high quality, high productivity service. This has to be designed to strengthen the local health system as well.
- Other models of service delivery (based on static service with outreach to communities) will need to be strengthened for long term follow up and long term patient service.
- An “outreach/campaign” manual could help to provide a more effective and efficient TT service.

Research questions / priorities:

- What is the cost per patient operated in different settings (campaign and static-site), which can be used to estimate overall program cost?
- Does using an outreach approach improve the quality of outcomes?
- How does the “campaign events” model strengthen or weaken the health system?

Tool Box:

- Develop a best practice guide to organising a successful outreach campaign based on case studies.

Left: Refinement of surgical skills can reduce post-operative trichiasis and improve overall surgical outcomes. For example, longer incision length is associated with decreased incidence of post-operative trichiasis. More information is needed about whether Bilamellar Tarsal Rotation or Posterior Lamellar Tarsal Rotation perform equally. The use of absorbable sutures greatly benefits the patient because they will not have to take time away from their work and families to have their sutures removed.

Photo Credit: The Carter Center



### 3.2. Determinants of TT surgeons' attrition and output

There was recognition that the current levels of productivity will not be adequate to meet GET 2020 targets. Additionally, the high attrition level of health workers trained as trichiasis surgeons noted in two countries limit the ability of these programmes to meet targets. Existing outreach activities are often badly organized with a waste of time and resources (financial and human). Patient flow is particularly problematic. Much of this is a result of inadequate planning at all levels. Resource allocation is often not matched to the needs. Motivation of TT surgeons will likely need to come from the external work environment indicating the importance of good, on-going, supervision. Given the problems with some existing

programmes relying upon general health workers, it was felt that dedicated eye care workers need to be supported more effectively to provide TT surgery. Eye care NGOs and others need to start or continue engaging with the MoH units on human resources in order to ensure that there is support for workers providing TT surgery. Having adequate consumables and equipment is essential for the provision of TT surgery and problems with this have been highlighted in several locations. Equipment requirements are wider than just the provision of surgical kits but also include items such as sterilising equipment and suitable operating bed/table.

#### Conclusions:

- Evidence suggests that well-planned, well-organized and effectively-managed campaigns can provide up to 20 surgeries (eyes) per surgeon per day.
- Decisions on who to train as TT surgeons will be country specific. The high level of attrition of health workers trained as TT surgeons requires MoH attention.
- Increasing the number of dedicated eye care workers and the funds they have for performing surgery (specifically transport and consumables costs) are required to manage TT.
- In the short term, strategies are needed to improve the productivity and quality of surgery done by general health workers. The concept of training general health workers, giving them two TT surgical sets and releasing them to the system is an ineffective management concept and it does not lead to patients receiving a quality TT surgery.

#### Research questions / priorities:

- What factors govern the productivity of general health workers and are these site specific?
- What retention strategies will lead to reduced attrition?

#### Tool Box:

- A policy brief that outlines the evidence of attrition (including economic loss) and its impact on TT surgery should be drafted and presented at GET 2020.

### 3.3. Barriers to receiving surgery & strategies to increase uptake

Many people living with TT are not receiving surgery, for a variety of reasons. This is supported by published reports of relatively low surgical uptake from several countries. However, it may be that there is significant variation in uptake between countries/regions, with some actually doing somewhat better. A critical issue is cost to the patient – both direct and indirect. These costs can

be reduced through the provision of surgery within communities free or at highly subsidised rates. However, even when free surgery is provided in the community a significant residual group of people decline the offer of surgery. This suggests that there are more subtle factors that influence this decision than simply the cost to the patient.

There are examples from various programmes that suggest that uptake of surgery can be improved by "TT monitors"; this is often because they have had personal experience with TT surgery and their voice is trusted. It was noted that in many countries treated cataract patients are used to recruit cataract patients for surgery; can this approach be used to recruit trichiasis

patients for surgery? In the end, a programme will need to focus on the "needs of a patient" rather than a specific eye condition. Determining the best way to do this will be site-specific. There was a general recognition that it will not be possible to convince everyone to have surgery and that other interventions (e.g., epilation) need to be on offer.

#### Conclusions:

- Findings in multiple settings suggest that the development of mobilization programmes should be driven by an understanding of the barriers that a community faces.
- Communities can have a very positive role in supporting service delivery.
- Women have a higher risk of TT than men. In some settings, where use of services is lower in women, gender-focused strategies are needed.
- There is sufficient evidence that bringing the service to the patient increases uptake; however, even with community-based trichiasis surgery it is unlikely that a programme will achieve 100% coverage and that interventions are needed to manage those who do not accept/refuse surgery.

#### Research questions / priorities:

- .....Detailed profile of "refusals" and "accepters" and "converters" (positive deviance model)

Trichiasis patients commonly suffer from infection of the conjunctiva. The use of topical povidone iodine 5% antiseptic before surgery and topical antibiotics, like the tetracycline ointment being administered in this South Sudanese woman's eye, is recommended to prevent post-surgical infections. Oral antibiotics may also help improve results; however, improving the quality of surgery will likely have a greater impact.

Photo Credit: The Carter Center/Aryc W. Mosher



## Annex A: Speaker Notes

### 1.2. What Does TT Disease Look Like in Endemic Populations

#### Introduction

The appearance of trichomatous trichiasis varies widely, ranging from severe entropion trichiasis to a single trichiatic lash without entropion. Correct identification of the disease is fundamental for:

- Instituting treatment
- Training TT surgeons
- TT research

#### Key Findings In The Literature

##### Entropion

- Frank entropion is frequently absent or only mild in TT (54% in two large Ethiopian studies).<sup>1,2</sup>
- Classification of entropion is difficult; there are multiple different descriptions and grading systems.<sup>3-7</sup>
- 'Conjunctivalisation' of the lid margin (anterior movement of the muco-cutaneous junction) has been looked at in trachoma, and is probably an early indicator of entropion.<sup>3,4</sup> However, it is difficult to see without loupes and experience.

##### Trichiasis

- Trichiatic lashes can be entropic, metaplastic (originate from an abnormal position) or misdirected (originate from the normal lash line but deviate towards the eye), i.e. it is possible (in fact common) to have trichiasis in the absence of frank entropion.<sup>1,3</sup>

#### Questions for Discussion

- What is the association/causation pathway between entropion and aberrant lashes?
- Is severe entropion without trichiasis threatening to the cornea?
- Are peripheral trichiatic lashes threatening to the cornea?
- Does the nature of the trichiatic lashes impact on the risk to the cornea or on the success of treatment?
- Can we develop a tighter definition of the term TT?
- Do we need to distinguish between those with and without entropion? And therefore, should we be teaching health workers to look for entropion?
- Can we develop better definition of entropion?

#### Saul Rajak

### 1.3. Surgical Procedures for Trichomatous Trichiasis (TT)

Lid surgery for TT is one of the components of the SAFE strategy that was launched by the WHO in 1997 to eliminate blinding trachoma. The current WHO guideline for treatment of TT recommends lid surgery using one of the following procedures: bilamellar tarsal rotation (BLTR), posterior lamellar tarsal rotation (PLTR or Trabut) and Cuenod Nataf procedure.<sup>8-10</sup>

A randomized controlled trial (RCT) that compared several techniques found that BLTR was equally effective as tarsal advance and rotation but more effective than techniques that do not create a full-thickness incision of the tarsal plate and complete rotation of the lash bearing distal fragment.<sup>11</sup> A second

RCT found the BLTR procedure is more effective than tarsal advance and rotation for correcting major TT.<sup>12</sup> BLTR is the technique endorsed by WHO to be used as a procedure of choice especially in setting up new trachoma control programmes.<sup>8,9</sup>

The Trabut technique or PLTR is widely used in West Africa and Ethiopia. A RCT that compared BLTR and PLTR found no significant difference in the rate of recurrence at three months post-op.<sup>13</sup>

The Cuenod Nataf procedure is reported to have low recurrence rate and is used in Vietnam and Myanmar to correct TT.<sup>14</sup>

There is no study which has compared the long-term outcome of BLTR and PLTR procedures. There are no studies that compared the Cuenod Nataf procedure either with BLTR or PLTR procedures.

Recurrence with current procedures, especially under operational conditions, is still high and there is a need to look into ways of how to reduce it.

Amir Bedri Kello

#### 1.4. Treating recurrent trichiasis within a trachoma control program

Surgery for trichiasis is an integral part of the SAFE strategy. Three procedures are recommended by the WHO, however all of them have a high incidence of recurrence.<sup>8,15,16</sup> Recurrence that occurs early after surgery is probably more related to surgical factors (surgeon skill and training, choice of the procedure, sutures used, needles used, etc.) and is better called surgical failure.<sup>15,16</sup> This should be reduced or eliminated. Recurrence that occurs later is probably due to ongoing disease pathology & fibrosis and/or reinfection.

The incidence of recurrent trichiasis outside well-organized studies is probably underestimated as many recurrent cases do not re-present. It varies from as low as 6% in one study up to 60% in another with an average of 20-30%.<sup>17</sup> This high incidence has several implications of which the negative impact on surgery uptake and the increased corneal scarring and visual loss are the most important.

Risk factors for recurrence include: surgical method, severity of TT/TF, length of time since surgery, occurrence of infectious conjunctivitis, type of needle used and gender.<sup>16,18</sup> Ophthalmic nurses have comparable results with ophthalmologists.<sup>19</sup> The more severe fibrosis, the more is the incidence of recurrence and a long interval of TT predisposes to more recurrence. Repeated infectious conjunctivitis predisposes to more recurrence and a single dose of azithromycin at the time of surgery may lower this incidence. More trauma to the tarsus during the procedure as with large needles increases the incidence of early recurrence. Finally women have a higher incidence of recurrence.

Management of recurrent trichiasis:

Theoretically, many options are available and are categorized in 2 main categories:

- 1 - Destruction of the lashes by electrolysis, laser, cryo, radiofrequency or excision of the lash follicles.
- 2 - Repositioning of the misdirected lashes by anterior lamellar recession, insertion of a graft or repeating the original BLTR procedure.

Within a trachoma control program, excision of the lash follicles in small localized trichiasis and recession of the anterior lamella in diffuse trichiasis may be the procedures of choice.

Essam el Toukhy

#### 1.5. Improving the Surgical Technique

Several clinical trials have demonstrated substantial differences in recurrence rates across surgeons. Of note, in the Gambian antibiotic trial, recurrence rates ranged from nearly zero to over 80% across surgeons.<sup>16</sup> In addition, the STAR trial reported significant differences across surgeons in terms of rates of granuloma formation and eyelid closure defects. Early recurrence data from that trial showed shorter incision lengths as primary factor in recurrence, with incisions shorter than 20 mm having nearly a four-fold increased risk of recurrence.<sup>18</sup> Some observational studies also have suggested that surgeon-factors are important. Analyses of a Tanzanian cohort showed 40% increased risk of recurrence in the left eye as well as significant variation in recurrence rates across districts.<sup>20</sup>

Little recent research has gone into investigating how to improve the surgical technique. Recent field experience (unpublished data) has shown that the appearance of the eyelid contour immediately post-operatively can be used to predict poor outcomes six weeks after surgery. This finding has resulted in the development of a photograph assessment card which we plan to review at the meeting. The goal of this card would be to allow surgeons to compare their patients' eyelid contours with gold-standard pictures. It also provides examples of poor post-operative eyelid contours and instructions as to how to correct them.

In addition, trichiasis surgeons are frequently left to their own devices with little to no monitoring. A recent study evaluating surgeon retention and supplies in Northern Ethiopia showed very limited supervision and very limited supplies.<sup>21</sup> In order to adequately perform surgery, all necessary supplies need to be on hand. Furthermore, in many areas, the individual performing surgery does not examine the patient post-operatively. This practice makes it very difficult for the surgeon to obtain feedback on how certain aspects of the procedure and immediate post-operative appearance can influence both short and long-term outcomes. Having lower-skilled individuals perform suture removal also may result in a higher frequency of residual suture fragments remaining in the lid and causing granulomas. Even in controlled clinical trials, silk suture fragments have been reported in 2.6% of eyelids.<sup>22</sup> Rates likely are much higher in standard field settings.

Key questions to be address at the meeting include:

- Is there realistic scope for improving the surgical technique?
- Why are so many techniques being used? Is one better than another, or should we be focused on developing a new technique?
- How do we better manage resources to ensure complete, functional surgical kits?
- How do we ensure appropriate supervision?

Key components needed:

- Better definitions and more information are needed for the trainee
- Surgeons need better, longer supervision, both immediately after training and again after many surgeries have been performed.

Emily Gower

## 1.6. Role of Post Operative Antibiotic

### Background

Trichiasis is the end result of multiple and prolonged infection with *C. trachomatis*. The destruction of normal conjunctival tissue and underlying structures leaves the eyelid vulnerable to infections.

Data suggest that persons at greatest risk of developing trichiasis are individuals with scarring and active or persistent infection with *C. trachomatis*. Research has documented *C. trachomatis* infection in adults, including those who do not have clinical signs of disease. Data on increasing risk of scarring and trichiasis in those with infection support the importance of the presence of *C. trachomatis*, even in the absence of clinically active disease, in the progression of this process. While it may be likely that ongoing exposure to infection drives trichiasis in endemic areas, there is also evidence that incident trichiasis continues to occur even in the absence of active trachoma in the community. Other pathogenic bacteria may also continue to drive this process and likely continue to elevate the risk of corneal opacity.

Thus, eyes with trichiasis appear to be at more risk of infection. This likelihood has implications for surgery carried out to correct trichiasis.

One of the mainstays of trachoma control programs is surgery to correct trichiasis. The World Health Organization currently recommends the use of topical antibiotics in its manual for trichiasis surgery and few would argue, especially under the conditions under which trichiasis surgery is often performed, that immediate post-operative care should include use of antibiotics as part of wound care, especially for these eyes that are at greater risk of infection coming into surgery.

Part of the issue for post operative antibiotic use is the whether or not we can prevent recurrent trichiasis or other complications by use specifically of azithromycin. Azithromycin has broad spectrum activity, including against *C. trachomatis*, has a high tissue level and has in addition anti-inflammatory properties. One study in Tanzania following surgical cases two or more years post-surgery demonstrated that individuals with trichiasis recurrence were more likely to have trachomatis inflammation than individuals without recurrence. Participants living with two or more household members with trachoma were 3.7 times more likely to have recurrence than individuals living alone or with no other household members with trachoma. A case-control study in Nepal also demonstrated an association between infection and trichiasis recurrence; 82% of individuals with recurrence were infected at 12 months post-surgery, while none of the controls, individuals with trachomatis scarring, were infected.

To date there have been two randomized clinical trials that have investigated the impact on post operative trichiasis following use of azithromycin.<sup>16 23-26</sup>

### Current Evidence

Review of the two trials, which have opposite conclusions, must consider the differences in setting, design, and approach to surgery. The first trial was carried out in The Gambia, a trachoma hypoendemic setting. Surgery was carried out in a programmatic setting by 17 eye nurses using a variation in surgical technique from BTRP called PLTR (where the skin and anterior lamella are not cut). All persons received two weeks of topical tetracycline post operatively. Participants randomized to azithromycin in addition received a single dose post surgery. Patients were randomized within surgeon. The study enrolled 451 subjects, with 216 receiving azithromycin. At one year, the recurrence rate overall was 40.3%, with high variability between surgeons (recurrence rate 0-83%) There was no

evidence of a protective effect of azithromycin (OR=0.99 for any trichiasis, 95% CI=0.67-1.46).

The second trial was carried out in a trachoma hyperendemic region of Ethiopia. Surgeons were standardized and certified using the WHO manual on Final Assessment of Surgery and required to pass a review by an ophthalmologist. Five Integrated Eye Care Workers carried out the surgeries using BLTR. Participants were randomized to azithromycin single dose following surgery or 6 weeks of tetracycline eye ointment. Patients were not randomized within surgeon, but there were not surgeon differences in outcome. At one year, the overall recurrence rate was 10%. Azithromycin was associated with a 30% reduction in risk of recurrent trichiasis (OR= 6.9/100 person-years, compared with topical tetracycline, 10.3/100 person years (P=.047). Three years later, trichiasis recurrence in both groups was still low, 10% versus 13% and the difference by treatment arm no longer significant but the study by three years was underpowered to detect the 30% difference.

### Comments

It is not reasonable to expect that an antibiotic can overcome recurrence of trichiasis post surgery likely due to poor surgical technique. Where recurrence rates can be low, there is evidence to suggest that azithromycin use post surgery can reduce recurrence. However, given high rates of recurrence within program settings, more attention needs to be paid to reduction of surgeon factors in reducing recurrence.

Sheila West

## 1.7. Sutures for TT surgery

### Introduction

Surgical sutures are broadly divided into non-absorbable sutures such as silk and nylon and absorbable sutures such as cat gut and polyglactin-910 (Vicryl). At present WHO recommends silk sutures.<sup>27</sup> Vicryl (polyglactin-910) is widely used in high-income settings in most surgical disciplines. Its tensile strength decreases gradually over several weeks (50% at 21 days) and the suture dissolves in approximately 6-8 weeks.<sup>28</sup> The use of absorbable sutures offers the advantage of not needing an early review of patients particularly in remote areas.

### Key Findings in the Literature

A RCT (n=1300) comparing silk and Vicryl sutures found no significant difference in recurrence rates between the two sutures (OR: 0.9, 95% C.I.: 0.68-1.20).<sup>22</sup> It did not find any increased rate of infection, despite the sutures being left in situ until they dissolved. It did find a significantly lower granuloma formation rate in the vicryl arm (OR = 0.63, 95% CI 0.40–0.99, p= 0.045).

In contrast a prospective non-randomised study from Egypt which found silk was associated with a significantly higher recurrence rate than Vicryl sutures (RR: 54.82, 95% C.I.:7.72-389.4).<sup>15</sup> However, there was selection bias, as the two different sutures were used in different settings.

### Suture Diameter and Needle

These are likely to be important in facilitating successful and 'easy' surgery. There is no consensus on the optimal suture diameter and needle profile and shape for TT surgery. The WHO guidelines suggest

4-0 silk, but many surgeons prefer a narrower gauge, such as 5-0 or 6-0.<sup>29-33</sup>

The needle needs to be able to penetrate the scarred lid tissue; spatulated or conventional cutting profile is probably advisable. Reverse cutting needles pass through tissue planes more easily. Although this can be beneficial in TT surgery, there is increased danger of inadvertently penetrating the cornea and great caution must be exercised in field settings. A 3/8 circle needle is the optimal shape for directing the everting sutures correctly. If the needle is more curved than this (e.g. 1/2 circle), it can be difficult to traverse from the proximal posterior lamella segment to just above the lash line.

#### Gaps in Our Knowledge

Is catgut an acceptable alternative to Vicryl?

Why does Vicryl cause less granuloma formation?

#### Discussion points

1. What is the place of absorbable sutures in TT surgery programmes?
2. ....Is a Vicryl donation programme possible? What would the cost be if it is not donated?
3. Can surgical programmes be designed to have a follow-up at 3-6 months after surgery (and not at 7-10 days) to look for recurrence?
4. What suture size and needle shape and size should be recommended?
5. What is the optimal management of granulomas?
6. Should catgut continue to be used?

#### Suture price (UK Hospital)

6-0 Vicryl double ended: £145.61 for 12 sutures

4-0 Polysorb (alternative to Vicryl) single ended: 79.80 for 12 sutures

6-0 silk double ended £106.58 for 12 sutures

Saul Rajak

## 1.8. Indications For TT Surgery

### Introduction

The risk of corneal opacification rises with increasing burden of trichiasis.<sup>7 16 34</sup> At present the WHO recommends TT surgery for all patients irrespective of severity.<sup>9</sup> The older, but still widely used WHO surgery training manual, suggests that epilation can be performed for a few peripheral lashes.<sup>27</sup> However there is variation in what happens in the field.

### Key Findings in the Literature

One cohort study of individuals with TT who refused surgery found that over a 4-y period, 37% progressed from minor to major TT and 5.1% developed new corneal opacity.<sup>34</sup> In a parallel cohort of patients from the same area who had accepted TT surgery, the comparable risks were 41% and 5.2%, respectively.<sup>35</sup> A second longitudinal study also found no difference in risk of developing new corneal opacity between people receiving TT surgery and those declining it, over a 1-y period.<sup>36</sup>

Studies from several trachoma endemic regions suggest that the majority of people with TT epilate.<sup>7 37</sup>

Two cross-sectional studies have found that epilation is associated with a reduced risk of CO.<sup>2 38</sup>

One RCT has compared epilation and surgery as a treatment for minor TT.<sup>39</sup> Key findings:

- After two years 8.1%-13.9% more patients receiving epilation reached the trial endpoint (5 or more lashes) than those receiving surgery.
- There was no difference in change in visual acuity between the two arms.
- Direct comparison of the baseline and two year digital corneal photographic found no significant difference in changes in corneal scarring in those patients receiving surgery and epilation (progression in 5.5% of epilation and 4.1% of surgery patients, p=0.25). Field grading scores reported more variation (both increase/decrease in CO) in both arms, with a greater proportion of patients in the epilation arm showing some degree of CO progression (16.8% epilation arm, 10.4% surgery arm p=0.001).
- At the end of the trial 185/593 (31%) epilation arm participants accepted an offer of free surgery.
- Investigators conclusion: surgery should be performed whenever possible but epilation be used for treatment of minor trichiasis patients without access to or declining surgery.

### Gaps in Our Knowledge and discussion points about the indications for surgery

Given the burden and field conditions, what are the practical indications for TT surgery?

How should mild cases without entropion be managed?

What is the evidence that all cases need operating?

How would epilation and surgery compare outside the controlled environment of a clinical trial?

Is epilation acceptable and safe after two years?

How should we help the patient who refuses surgery?

How should recurrent TT after surgery, eg: 1 peripheral metaplastic lash?

No trained surgeons available for the foreseeable future

What should be advised for patient who is happy to attend for follow-up and prefers not to have surgery?

Saul Rajak

## 1.9. Standards for Outcomes

To date the primary focus for trichiasis surgery outcomes has been on recurrence. Recurrence rates have most commonly been reported for the bilamellar tarsal rotation procedure (BTRP or BLTR) and the posterior lamellar tarsal rotation procedure (PLTR), with some information also available on Cuenod Nataf. Trabut is also used in some countries, but again limited information is available on recurrence rates. In many settings, recurrence rates are very high, with more than 50% of individuals having recurrence in at least one eye within a few years following surgery. Some individuals with recurrence have 1-2 misdirected lashes touching the globe while the remainder of the eyelid is normal and there is

no evidence of entropion.<sup>1</sup> At present, using the WHO definition, these individuals would be classified as having recurrence and may be recommended for repeat surgery. However, repeat surgery would not be useful as it would result in severe over correction of the lid in order to correct the few misdirected lashes.

The accumulated data suggest that a substantial proportion of recurrence occurs within the first 6 months following surgery, but cumulative incidence of recurrence continues to go up with time. Studies suggest that there are 2 phases of recurrence: that which happens in the first few months following surgery and that which happens in later years. Early recurrence is more likely related to the procedure itself while later recurrence is more likely genetic or environmentally driven. Both are likely related to pre-operative trichiasis severity. The STAR trial in Ethiopia provides evidence that under optimal conditions, recurrence rates can remain low as many as 3 years after surgery. That trial reported recurrence rates of <10% at 1 year and 10-13 % by three years.<sup>23,26</sup>

Other outcomes of importance include pyogenic granuloma formation on the upper tarsal conjunctiva and eyelid contour abnormalities. Two studies to date have reported on the frequency of granuloma in Ethiopia.<sup>22,23</sup> Additional information will soon be available for a third study conducted in Tanzania. The Ethiopian studies reported granuloma rates between 5 and 10% overall, but rates vary across surgeons, ranging from 6-14% across surgeons in the STAR trial.<sup>18</sup> Granulomas typically occur within the first few weeks after suture removal, and often excised granulomas contain suture fragments, even under the best of monitoring conditions.<sup>22</sup> These reports are based on controlled clinical trials with trained individuals responsible for suture removal. It is likely that in regular field settings suture fragments are more common.

Several clinical trials have reported data on lagophthalmos and central lid notching. Lagophthalmos is fairly uncommon, occurring approximately 1 percent of the time. Reported rates of lid notching vary from 1.2% in the STAR trial to 14% in the trial by Rajak et al.<sup>22,23</sup> While the WHO defines lid closure defect (WHO), standard definitions for eyelid contour defects not resulting in lagophthalmos have not been published and lid contour abnormalities in addition to central lid notching have not been well characterized in the literature.

Key questions for this meeting:

How often should we be evaluating outcomes?

Who should be evaluating them?

What is an acceptable rate of recurrence?

What standards and definitions should we set for granuloma formation? Eyelid contour abnormalities?

Emily Gower

## 1.10. Data on Program and Research Surgical Outcomes

### Background

There are several outcome measures that could be assessed post surgery to correct trichiasis, as discussed in the previous presentation. These include the surgical outcomes of the operation itself, measured for example as recurrent trichiasis, development of granuloma and lid contour abnormalities

of varying severities. Other outcomes include visual outcomes, measured most often as the effect of surgery on visual acuity but could include progression of corneal opacity, ocular pain and photophobia. Finally, outcomes of patient satisfaction and effect on function in daily life can also be measured.

When evaluating the data from measurement of any or all of these outcomes, several factors must be taken into account. The first is the severity of trichiasis/entropion prior to surgery, a known risk factor for recurrence of trichiasis. Second is previous trichiasis surgery as previously operated lids are more difficult to correct properly. Third, acuity at the time of surgery may predict the likelihood of recovering any vision, for if an eye is blind it is unlikely that vision will improve. Fourth, patients with trichiasis are often older in age, and may suffer from visual loss due to other factors as well as the infirmities of old age. If acuity or measures of physical function are assessed too long after surgery then these other factors may mute any effect of the surgery itself. While a control group of similar age and gender but without trichiasis may be informative as comparison, the fact that patients with trichiasis may as a result be more frail at the outset cannot be discarded and while they may improve, they may not resemble their unaffected controls. Fifth, assessing patient satisfaction with surgery in many settings is complicated as there is a tendency to please and, if asked by programs, patients may not feel able to respond in an open fashion.

Finally, there is evidence for large variation in surgical outcomes by surgeons which can seriously confound attempts at studying interventions or evaluating overall outcomes of a program.<sup>16,20,22,23,40</sup> With these factors in mind, we look at published reports of outcomes following trichiasis surgery.

### Current evidence

Trichiasis recurrence rate is the most commonly used outcome measure, often reported as any trichiasis recurrence and recurrence of some severity. The widest range in recurrence reported was from the Gambia, with 0% to 83% at one year, depending on surgeon.<sup>16</sup> Several studies have reported about 40% recurrence in Gambian series. In Tanzania, recurrence rates also vary by surgeon, from 16% to 38%, with recurrence rates not increasing over time past one year; overall rates were 28%.<sup>20</sup> In Oman, two clinical trials reported one year recurrence rates of 20%, with variance by surgeon but primarily attributed to pre-operative severity and prior surgery.<sup>11,12</sup> Studies from Ethiopia report lower recurrence rates, 10% in one trial of azithromycin use, and 19% in a trial of different sutures. The latter had significant surgeon variation in recurrence from 13% to 45%.<sup>22,23</sup>

Lid closure defect or lid contour abnormalities are less often reported. At six weeks in one trial, 1.3% had lid closure defect, with variation by surgeon.<sup>18</sup> At 10 days in another trial, 11-14% had lid notching.<sup>22</sup> Granuloma formation has also been infrequently reported. At 6 weeks post operation in one trial, 10.5% of patients had a granuloma. In another study, at ten days post operation 8.7% to 5.7% (depending on the suture material) had granulomas.<sup>18,22</sup>

A few studies have reported patient satisfaction with the surgery. From the Gambia, despite high recurrence rates, 77% reported "improvement". In Tanzania, 59% reported seeing better. Reports of patient improvement in symptoms have been published. In Ethiopia, where 100% of pre operative trichiasis patients reported significant pain and 96% reported photophobia, at 6 months 96% reported no pain and 30% reported photophobia. In the Gambia, 94% in a series of patients reported more comfort following surgery.

Visual acuity improved on average by one line in two series, from Ethiopia and The Gambia. The authors attribute this to both improvement in the ability to take the visual acuity test (reduction of

photophobia) as well as possible resolution of some reversible corneal damage

An early report from Tanzania noted that 28% of patients 2 to 7 years post surgery were able to carry out farm or housework where before they were unable to do so. A more comprehensive analyses pre and post surgery was carried out in a series from Ethiopia, where significant improvement in physical function was reported 6 months post surgery and was associated with the improvement in visual acuity. A report from India also noted improvement in quality of life indices following surgery, but was unable to attribute the improvement to an improvement in vision.

#### Comments

There is clear evidence of surgeon variation in surgical outcomes, and proper certification, standards, supervision and audit are needed to control poor outcomes. Some surgeons should not be allowed to continue operating in the face of poor outcomes, and they serve as a major impediment to success.

Recurrent trichiasis is the most commonly noted surgical outcome in the literature, although granuloma formation and severe lid notching or lid closure defect is increasingly being reported as well. All three are complications that should be reported as evidence of surgical outcome.

Patient satisfaction with surgery, despite high recurrence, appears to be high, and the surgery appears to remove pain and photophobia. Patients appear to improve their ability to function in everyday life following surgery as well, which indicates some decrease in disability, but this has been documented only following a series where recurrence of trichiasis was very low. These outcomes could be used in behavioural change approaches to help recruit patients for surgery.

Sheila West

## 2.1. Selecting Trainee Surgeons

In most trachoma endemic countries there are too few ophthalmologists to address the huge TT backlog. It has been shown that non-ophthalmologists can do the surgery with good outcome at the community level.<sup>29</sup> It has also been demonstrated that the outcome of BLTR surgery by integrated eye care workers (IECWs) is similar to that of ophthalmologists.<sup>19</sup> Therefore, most trachoma control programmes train non-physician health professionals as TT surgeons.

According to WHO guideline, trainees could be surgeons, physicians with surgical experience, eye care nurses or eye care assistants. Trainees must have prior surgical experience with good surgical skills, knowledge of sterile techniques and experience in eye examinations as well as giving injections.<sup>9,27</sup>

In most trachoma endemic countries, the trainees are mostly nurses or medical assistants. In Ethiopia, the trainees are either junior nurses or nurses with diploma or BSc degree. In Mali, they have to be qualified nurses.

Currently, some programmes do not have written selection criteria for trainees but select trainees on the basis of aptitude for surgical procedures or because they happen to be stationed where the programme is running. WHO selection criteria are not necessarily strictly adhered to.

It is important that programmes have written criteria on how to select trainee surgeons that are applicable to their situation. In order to avoid disappointment for the trainer and trainee alike, there should be a test of surgical aptitude before selection. This could be done by observing the candidates sewing a hem on a piece of cloth or perform suturing.<sup>9</sup> Furthermore, as a very high attrition rate

among TT surgeons has been documented, care has also to be taken to ensure that the trainees are likely to stay in their current position.<sup>21</sup>

Amir Bedri Kello

## 2.2. Overview of Training programs for TT surgeons

### Background

World Health Assembly Resolution 51.11 adopted in May 1998 calls on member states to implement, as required, the SAFE strategy for the elimination of blinding trachoma.<sup>41</sup> This has been interpreted as the elimination of trachoma as a public health problem, and not the elimination of all blindness from trachoma or the elimination of ocular infection with *Chlamydia trachomatis*. The proxy targets at which blinding trachoma is said to be eliminated as a public health problem are: (1) no greater than 0.1% of the total population to have TT and (2) clinical signs of active trachoma less than 5% in children ages 1-9 years.<sup>42</sup>

The definition of less than 1 per thousand of the total population to have TT has been further refined so that the TT cases are 'unknown to the system' [Unpublished report of the 3rd Global Scientific Meeting, draft February 2011]. By this definition, recurrent TT patients, surgical failures and TT patients who have been counselled but not operated are not counted among the 1 per thousand. It is therefore clear that once elimination targets have been reached there will still be a need to manage the recurrent, incident and unknown TT cases.

TT surgeon training programs must consider both the need to provide surgical service to the known or estimated TT backlog in an area (likely via a campaign approach) and to provide a sustainable on-going system (likely via health facilities) once the elimination targets have been reached.

### Areas for discussion

Who should be trained as a TT surgeon? It has generally been accepted that non-specialist staff are suitable for training as TT surgeons, but the criteria for selection vary by country. Output and quality of surgery vary greatly by surgeon and attrition is often high. Attempts to profile the candidates who will have high output and quality have been equivocal.<sup>21</sup>

What makes a good training program? Guidelines for surgery and certification exist<sup>8</sup> (below) but are not always followed. There may be a need for guidelines for the training of trainers and the content of the training modules. It is typical that a few graduates of training programs conduct most operations. Is this a function of the trainee or the training?

Do the trainers and trainees have the tools they need? Individual country contexts are all different and there should not be a one-size-fits-all approach, yet there is a need for guidance and documentation at the global level. The twentieth anniversary of the WHO TT surgery manual<sup>27</sup> is approaching. The certification guidelines do not appear to be widely used, and official translations to French, Spanish, Portuguese or Arabic are not available. The ICEH has recently produced a training DVD in English and French. Are the available tools adequate and used to their potential?

Paul Emerson

## 2.3. Supervision of non-physician surgeons (NPS):

What are the key components in the supervision of a TT surgery service done by non-ophthalmologists?  
Who should be supervisors and what authority do they need to be effective?

Evidence base:

Though it would seem self evident that support will enhance performance, the evidence base is slim. The Cochrane review 'Interventions for trachoma trichiasis' does not mention supervision. One fact is clear – that is that absence of supervision of non-physician surgeons (NPS) is a major barrier to a productive service. Two studies cite lack of senior support as a barrier, even though the papers come from countries (Tanzania and Ethiopia) with some of the best planned services in Africa.<sup>21 43</sup> In TZ many did not know their supervisor. In Ethiopia few are ever observed operating again after training (though with 700+ trained this is not surprising). They quote – "lessons from other healthcare situations suggest that constructive supervision with audit can improve the quality of health care".<sup>44</sup> None of this spells out what 'constructive supervision' should consist of, so it seems we can only try to specify key components just from our practical know-how without evidence.

Problems and paradoxes:

Before specifying key components, some background snags are here listed.

1. Supervision cannot operate without a planned program with training and supply chains on which it can build, but some countries do not have this (none in Uganda, patchy in S Sudan).
2. A senior supervisor from a low incidence place doing general ophthalmology may be less skilled than a NPS who operates often. Manual skill does not correlate closely with rank status.
3. It is in remote places that NPSs are most needed and where workload is often highest, but in those places seniors are fewest.
4. Supervision implies audit of outcome, but it is only practical to audit immediate outcome in a field situation, yet long term outcome would be more revealing.
5. Supervision is of two disparate kinds. First requires a practicing clinician to oversee the surgery. Second requires a manager to ensure supplies and financial support. These are different competences and may not be combined in one person.

What are the key components in the supervision of a TT surgery service done by non-ophthalmologists?

Some suggestions – some need discussion, some hardly need any debate:

- Every NPS must know who the supervisor is and the reverse.
- It must be geographically possible for them to interact fairly frequently.
- This requires financial provision and cannot just be left to a goodwill basis.
- It must be understood that the supervisor is in a position of authority, yet be an enhancer not judge.
- This needs supervisors with suitable attitude; inappropriate personalities will be counter-productive.
- The supervisor must be a clinician experienced in TT surgery, and interaction must include actual surgery.
- The supervisor must also be able to ensure management aspects are cared for.
- Supervision must imply access to corrective action when deficiencies are found.
- Given the many NPSs in some programs, training of sufficient supervisors must be built into programs.
- .... Intermittent outreach programs provide an opportunity to NPSs and seniors to work together.

Who should be supervisors and what authority do they need to be effective?

- Since ophthalmologists are likely to be too few, others like general physician/surgeons and especially ophthalmic clinical officers should be used, provided all have the necessary skills.
- Supervision should be built into a clear staffing structure so that all understand that supervisors are authorized and can institute corrective action when needed.
- The intangible factors of attitude/motivation/leadership in supervisors must not be forgotten.

The above are somewhat of a wish list, but they do address what may be the biggest barrier to productive services.

Keith Waddell

## 2.4. Surgical Audit and Quality

What are the current recommendations for surgical audits?

Globally the current estimate of trachomatous trichiasis stands at eight million.<sup>45</sup> The focus thus far has been in up-scaling surgical outputs rather than on quality. Due to limited availability of eye care professionals in rural areas, a wide range of mid-level health workers (paramedics) in various endemic countries has been trained to assist in reducing the existing backlogs of trichiasis cases. Combinations of treatment strategies, such as facility based, outreach and, in some cases, mobile, have been employed to deliver trichiasis surgeries. The usual outcome measure for TT surgery is the proportion of operated eyes with recurrent TT, reportedly ranging from 10% at one year to 60% at 3 years.<sup>46</sup> As far as the available literature indicates, there were no formal methodologies developed and published to guide the quality assurance process. The most recent scientific article addressing the issue of surgical audit was by Buchan and colleagues, in which Lot Quality Assurance Sampling (LQAS) was recommended as an audit tool for assessing the outcome of upper eyelid TT surgery in terms of postoperative recurrence of TT. This method doesn't estimate the actual recurrence rate experienced, but merely assigns the surgeon or group of surgeons performing the surgery to one of two groups: "high recurrence" or "low recurrence". This is believed to help providing useful information to trigger remedial actions such as additional training and supervision in areas where "high recurrence" has been identified. It is important to note that standardizing the definition of recurrence is mandatory in order to make the audit process more efficient. The most common definition of recurrence currently in use being one or more lashes touching the globe, evidence of epilation or a history of repeated TT surgery. In this regard, the issue of categorizing TT as "major" and "minor" for the purpose of designating cases as requiring surgery or not is something that requires standardization for programmatic decisions.

What are practical audit strategies for surgeons?

The first step in the process of surgical quality assurance should be strict adherence to the certification process. It would be very helpful if trainers of TT surgeons use and strictly follow certification procedures outlined in the WHO manual "Final Assessment of Trichiasis Surgeons".<sup>8</sup> However, it should be noted that this method is mainly focusing and limited to the BLTR method. As a matter of principle, it would be advisable if national trachoma programs consider setting up ongoing surgical audit procedures as ongoing strategy for maintaining surgical quality assurance. The LQAS method, as described by Buchan and colleagues, is also very helpful in identifying individuals and/or groups of TT surgeons with high and low TT recurrence. Regular supervision (by ophthalmic surgeons that have trained the TT surgeons) during/after surgical campaigns, during routine health care deliveries, annual meetings and

refresher workshops would greatly improve performance.

What do you do with the results?

As stated above, the results of surgical audits should be used to improve surgical quality and reduce TT recurrence. Improving the quality of training programs and the performance of trained TT surgeons should remain deserving top priority in all trachoma programs. Data collected through well designed and systematic collection methods would be very helpful for the showcasing and rewarding good performers and correcting poor performers. Lessons drawn from such exercise could serve as living examples for training new TT surgeons as well as retraining existing ones.

How can a culture of quality be promoted in a TT surgery program?

Thus far, the focus in most trachoma programs has been in clearing the backlog and achieving higher coverage, particularly in high burden countries. Although trachoma program managers were aware of the unwanted outcomes such as recurrence, they had limitations in addressing issues related to promoting culture of surgical quality. However, it is evident that if quality is compromised, it would have negative repercussions on acceptance of surgery thereby directly affecting uptake of surgery (coverage). Therefore, it is high time that programs start instituting quality improvement strategies as part and parcel of their regular annual plans. This would involve allocating funds for TT surgery quality improvement activities such as supervision, recurrence studies (using LQAS and other methods), annual meetings with TT surgeons, etc.

Teshome Gebre & Alemayehu Sisay

### 3.1. TT Service Delivery Models

Background

There are two clear needs for provision of TT surgery: firstly an intensive response to clear the backlog of unoperated cases estimated from prevalence surveys and secondly to provide a sustainable on-going service at health facilities in trachoma endemic areas. The two needs are distinct, one an emergency response requiring a campaign style attack and the second an institutional service requiring a systems approach.

Clearing the backlog

TT patients are not distributed evenly across the landscape and the first step in clearing the backlog is to identify where the patients are concentrated and focusing surgery service to these areas. This is needs-based planning. Many programs currently try and apply resources equitably across all trachoma endemic districts and do not adjust resource delivery according to need. Surgery camps or campaigns typically fall into two categories: large scale vehicle-based involving multiple surgeons or individual campaigns utilizing a single operator on a motorbike or local transport. Successful campaigns require that patient mobilization is matched by the logistical preparedness of the teams.

Sustainability

For a country program to achieve ultimate success there must be provision to provide TT surgical service for recurrent, incident and new presenting cases. By definition this has to be via an on-going system and not via outreach. Currently most programs report no more than 10-20% of cases operated

via facility-based service.

Discussion points

Outreach: the campaign approach.

How is access to the surgery service enhanced? How are patients best screened, identified, counseled and mobilized to present to the field teams when the camps are running. What is the role of mass-media, health workers and volunteers in mobilizing patients.

We know that camp productivity varies greatly from place to place. What factors lead to the efficient and respectful handling of patients throughout the process. Are health volunteers, health workers, nurse auxiliaries, IECWs (operators), and supervisors utilized appropriately in a campaign.

When should a program shift from a large vehicle-based caravan to the lone-wolf motorbike approach?

Sustainability: the static facility-based approach.

Service is available in many facilities in trachoma endemic countries, but uptake is usually low. What factors lead to sustained uptake of service? How are patients fed into the system and what is stopping the facility-based model producing greater output?

Cost per patient operated. How does this change through the life of a program? Is there a cost-per-surgery that can be used for long range resource planning?

Paul Emerson

### 3.2. Productivity and attrition of health workers trained in trichiasis surgery

Attrition after training

Data from Tanzania in 2007 showed that 123 TT surgeons were trained by MoH and HKI in Kongwa from 1995-2004.<sup>43</sup> In 2005, 104 returned a mail questionnaire, 20 could not be found, and 8 had died or left eye work. Of the 104, 83 were doing surgery, thus 67% of trainees were "active" (doing one or more surgeries in the past year).

The recent West Amhara, Ethiopia study reported in 2011 that of 247 surgeons trained from 2001-2008, 139 (56%) had definitely quit doing any TT surgery.<sup>21</sup> They had moved to more senior posts, further education or the private/NGO sector. Thus 44% of trainees were still "active."

Information on attrition from other settings is not available.

Productivity of trichiasis surgeons

The 2007 Tanzania report showed a mean of 22.3 surgeries/year (SD 48.1) and a median of 7. This included 21 surgeons who had done 0 surgeries. The recent Ethiopia showed the mean surgeries done to be 41 (not including surgeons who did 0). Unpublished African Health Systems Initiative data from 39 TT surgeons in Tanzania (who did at least 1 case in 2010) gave a mean of 55 surgeries/surgeon.

Using data from 13 countries with both TT surgeon data and total surgeries data from the 2011 GET 2020 meeting and "Insight" the mean number of surgeries (105,597 in 2010) per surgeon (1,582 in 2010)

was 66.7, ranging from 4.2 to 240. At the current productivity levels, it will take 28 years to address the backlog in these 13 countries. Three countries (Mali, Niger, and Mauritania) are on track to cover the backlog in the next 9 years.

The unpublished Hilton-supported data for surgeries (Ethiopia, Mali, and Niger) performed in 2010 (only includes surgeons who did at least 1 case) showed means of 76, 156 and 56 surgeries /surgeon respectively.

#### Factors associated with productivity

In the 2007 Tanzania study, conducting outreach was the only significant factor predicting productivity.

In the 2011 Ethiopia study, having adequate consumables and advertising the service were both predictive of productivity for static site surgery. No analysis was presented for factors associated with productivity on outreach. Surgeons productivity on outreach was significantly higher than at static sites.

The unpublished data from Mali, Niger, Ethiopia, and Tanzania consistently show higher productivity among dedicated eye workers. In Niger and Mali 67-89% of surgeries were done on outreach. A lack of instruments and consumables was rare in Mali, Niger and Ethiopia; 25% of Tanzanian TT surgeons reported gaps in supplies.

Paul Courtright

### 3.3. Barriers to receiving surgery

Many people living with TT are not receiving surgery, for a variety of reasons. This is supported by published reports of relatively low surgical uptake from several countries (Table). However, it may be that there is significant variation in uptake between countries/regions, with some actually doing somewhat better.

A critical issue is cost to the patient – both direct and indirect. In recent work in Ethiopia, >2500 people with unoperated TT were asked why they had not had surgery 45% cited lack of time, 43% lack of money and 35% lack of escort (more than one reason counted). Lack of time and of an escort may reflect the indirect cost of lost income during days needed to receive treatment, and the additional expense to the escort. These costs can be reduced through the provision of surgery within communities free or at highly subsidised rates. However, even when free surgery is provided in the community a significant residual group of people who decline the offer of surgery. This suggests that there are more subtle factors that influence this decision than simply the cost to the patient.

Authors	Study description	Surgical uptake	Factors associated with no surgery
Courtright, 199447	Design: Prospective cohort Location: Malawi Number of participants: 29 Follow up period: 9-12 months	37.9%	Distance / Transport Not knowing another women who had received surgery Unilateral TT Not widowed
(1) West 199448 (2) Oliva 199749	Design: Prospective cohort Location: Tanzania Number of participants: 200 Follow up period: (1) 2 years and (2) 7 years	18% at two years 27.4% at seven years	Lack of symptoms Lack of time Additional costs Lack of escort Children at home Transport difficulties Lack of money Don't want surgery Poor knowledge about service Clinic failures (patient attended)
Bowman 200050	Design: Paired cluster randomized trial of Health centre based surgery Village based surgery Location: The Gambia Number of participants: 158 Follow up period: one year	(A) 44% (B) 66% (rate ratio: 1.49, 95% C.I.: 1.11-2.01, p=0.009)	Cost Distance
Bowman 200237	Design: Prospective cohort Location: The Gambia Number of participants: 148 Follow up period: 12 months	23%	Mild symptoms / Happy to epilate Previous bad surgical experience Fear Using traditional eye medicines Family opposition Too expensive Lack of time Lack of escort Do not know how to access surgery
Mahande 200751	Design: Prospective cohort of villages with trachoma education provide by: Village leaders School teachers Location: Tanzania Number of participants: 225 Follow up period: one year	44.8% overall. (A) 52.1% (B) 36.5% in villages served by school teacher education. (RR: 1.4, CI: 0.9-2.1, p=0.006)	Unilateral TT Surgical provision failure Less effective TT surgery education programme. Geographic Clinic failures (patient attended)
Rabiu 200152	Design: Cross-sectional Location: Nigeria Number of participants: 101 Follow up period: cross sectional study	10% (of people with TT had sought treatment)	Cost Lack of symptoms Distance Lack of escort

Matthew Burton

### 3.4. Strategies to Increase Uptake of TT Surgery

Strategies aiming at increasing uptake of TT surgery should address the barriers that lead to low uptake such as lack of awareness, direct and indirect cost, distance to services, social support barriers, and provider- level barriers.

There inadequate evidence in the literature to make comprehensive recommendations on strategies to increase uptake of TT surgery. A study in the Gambia showed provision of free surgical services at the village-level is associated with increased uptake of surgery.<sup>50</sup> However, provision of surgery at the village-level is associated with increased cost of service provision and poses a challenge for optimal sterilization of instruments.

A village-based promotion strategy in Tanzania using school teachers and village leaders to get patients to come for services at existing health facilities found it to be effective in increasing the uptake of surgery.<sup>51</sup> This study suggested that the use of health promotion at the village-level and investment in service providers would improve uptake of TT surgery.

A recent study in Ethiopia found that 86% of TT surgeries done by IECWs were performed during vertically organized outreach campaigns and the number of surgeries done at static sites in an integrated activity manner was very low.<sup>21</sup> The low number of surgeries done at static sites might affect the skill of the TT surgeons and the quality of surgery provided in a negative manner. In hyper-endemic countries like Ethiopia that have huge TT backlog, provision of services in an integrated manner only is not the best solution. It might be interesting to study whether in such conditions provision of TT surgery by highly trained and skilled team of TT surgeons who travel to do high quality surgery in outreach campaigns could result in an increased uptake.

Amir Bedri Kello



Right: Post-surgical follow-up is critical to ensure quality care and patient satisfaction. During the follow-up visit, surgeons can identify post-operative trichiasis and other conditions or complications.

Photo Credit: The Carter Center/Aryc W. Mosher

# Annex B: Meeting Program

## Monday 30th January 2012: Surgical Management Guidelines

Chairperson: Amir Bedri Kello

Facilitator / Recorder: Matthew Burton

Timing	Topic	Overview Talk	Discussion Points / Questions
09:00	Welcome & Introductions	Paul Courtright Matthew Burton	
<b>WHO Guidelines</b>			
09:15	1.1. What are current WHO TT management guidelines?	Silvio Mariotti	Clarification of the current WHO definition of TT for (a) surveys, (b) indications for surgery What are the recommended procedures?
<b>Patterns of Disease</b>			
09:30	1.2. What does TT disease look like in endemic populations?	Saul Rajak	What range of disease does TT include? Can we develop a tighter clinical definition for TT? Do we need to distinguish between those with and without entropion?
<b>Surgical Technique</b>			
10:15	1.3. Surgical Procedures	Amir Bedri	In routine service delivery settings, is there sufficient evidence to favour one of the WHO recommended procedures over another? What are the data showing that the current WHO recommended procedures are better than the alternatives?
11:00	Break		
11:15	1.4. Treating Recurrent TT within a trachoma control programme	Essam el Toukhy	What are the current recommendations for how recurrence should be managed? Are there any special technical considerations? Who / How should this be managed in programmes?
<b>Reducing Recurrent Trichiasis</b>			
12:00	1.5. Improving the surgical technique	Emily Gower	Are there technical modifications that show promise for reducing complications and early surgical failure? Are there specific studies that need to be done? Can we agree an approach for a standardised reporting of TT failure / recurrence (subdivide 0-6 months and > 6 months)?
13:00	Lunch		
14:00	1.6. Post-operative antibiotic	Sheila West	What is the place of post-operative antibiotic in surgery programmes?
14:30	1.7. Sutures	Saul Rajak	What is the place of absorbable sutures in TT surgery programmes?
15:00	Break		
15:30	1.8. Indication for TT Surgery	Saul Rajak	Given the burden and field conditions, what are practical indications for TT surgery? What is the evidence that all cases need operating? How should mild cases without entropion be managed?
16:30	Key Conclusions & Research Priorities		

## Tuesday 31st January 2012: Surgical Quality

Chairperson: Sheila West

Facilitator / Recorder: Paul Emerson

Timing	Topic	Overview Talk	Discussion Points / Questions
09:00	Welcome & Introductions	Paul Courtright	
09:20	2.1. Overview of Day 1	Matthew Burton	
<b>Outcomes of Surgery</b>			
09:40	2.2. Review of current WHO training and certification guidelines	Silvio Mariotti	
	2.3. Standards for outcomes	Emily Gower	Can we agree a standard outcome definition (clinical and timepoint)? What are acceptable outcomes? What about the cosmetic aspects of the surgery? Do these vary much between procedure? Patients perspective?
	2.4. Current data on research and programmatic outcomes	Sheila West	How are we doing against these measures? What is the evidence of inter-surgeon variation ?
10:45	Break		
<b>Training</b>			
11:15	2.5. Selecting trainee surgeons	Amir Bedri	What types of health care workers should be trained for TT surgery? What is actually happening – do we have a global view on this? How do we select them at the moment? What criteria or qualities are important? Should there be a test of practical aptitude before selection?
12:00	2.6. Training programmes	Paul Emerson & Chad MacArthur	What are the various models? Who does the training? Who trains the trainers? What are the key features of a good training scheme, including practical experience? What is the evidence this is related to outcomes? Do training schemes have the “tools” they need to ensure good outcomes? Post-training assessment?
12:45	Lunch		
<b>Supervision &amp; Audit</b>			
13:30	2.7. Supervision of non-physician surgeons	Keith Waddell	What are the key components in the supervision of a TT surgery service done by non-ophthalmologist? Who should be supervisors and what authority do they need to be effective?
14:30	2.8. Surgical Audit & Quality	Teshome Gebre & Alemayehu Sisay	What is a minimum standard for monitoring outcomes within programmes? What are the current recommendations for surgical audits? What are practical / reliable audit strategies? What do you do with the results? How can a culture of quality be promoted in a TT surgery programme?
15:30	Break		
16:00	Conclusions & Research		

## Wednesday 1st February 2012: Surgical Output and Uptake

Chairperson: Alemayehu Sisay

Facilitator / Recorder: Paul Courtright

Timing	Topic	Overview Talk	Discussion Points / Questions
09:00	3.1. Current WHO estimates of TT backlog and surgical activity	Silvio Mariotti	
09:30	3.2. Service Delivery Models	Paul Emerson	Can we define an ideal service delivery model? What factors are used to determine the service delivery models at present? What are the current models that appear to ensure access to surgery by most TT patients? What service delivery models are used and how do these compare in terms of output? How will service delivery models need to change as prevalence of TT changes? What does it cost to deliver the service in different ways?
10:30	Break		
Productivity			
11:00	3.3. Determinants of TT surgeons attrition and output (including instruments & consumables)	Paul Courtright & Susan Lewallen	What level of productivity is needed to address the current backlog? What are current levels of surgeon productivity? How much attrition of surgeons is there? What are the major roadblocks to high productivity? What do we know about the effectiveness and efficiency of surgical outreach? What are strategies for overcoming these roadblocks? What are the best systems for ensuring that surgeons have access to instruments and consumables?
Conclusions & Research Priorities			
12:30	Lunch		
Surgical Uptake			
13:30	3.4. Reasons for not receiving surgery	Matthew Burton	What are the leading barriers? Does it vary by region? What is a realistic proportion of trichiasis patients, no matter what we do, who will continue to refuse surgery?
14:30	3.5. Strategies to increase uptake	Amir Bedri	How can the barriers be effectively addressed? How do programmes identify people needing services? Do we have adequate evidence to recommend specific strategies to improve uptake of trichiasis surgery?
Conclusions & Research Priorities			
15:30	Break		
16:00	Summary and review of conclusions		



Understanding the cultural and community-specific barriers that prevent trichiasis cases from seeking surgery can facilitate surgical uptake. Women face higher risk of trichiasis than men and surgical campaigns may need to specifically target this group.

Photo Credit: The Carter Center/Aryc W. Mosher

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