Trachomatous Trichiasis (TT) Surgery

A procedure using new clamp method
Trachomatous Trichiasis (TT) Surgery:

A procedure using new clamp method

Produced by:

Orbis International Ethiopia

Zelalem Eshetu, MD, Ophth. Program Consultant
Alemayehu Sisay, MD, MPH, Ophth. Country Director
Dereje Zewde, MBA, Deputy Country Director
Yilikal Adamu, MD, Ophth.
  Consultant Oculoplastic Surgeon, Addis Ababa University, Department of Ophthalmology

External

Gabremaskal Habtemariam, PhD
Wondu Alemayehu, MD, MPH
  General Manager and Consultant ophthalmologist at Berhan Public Health and Eye Care Consultancy

Editors

Eugene Helveston, MD
  Orbis International, Consultant Ophthalmologist and Cyber-Sight Director

Lynda Smallwood
  Orbis International, Senior Manager Cyber-Sight
# Table of Contents

**Introduction** .................................................. 1

**Part I: Trachoma Background** .................................................. 1
- Trachoma - Definition .................................................. 1
- Stages of Trachoma .................................................. 2
  - Stage 1 - Follicular Conjunctivitis .................................................. 2
  - Stage 2 - Conjunctival Scarring .................................................. 2
  - Stage 3 - Trachomatous Trichiasis .................................................. 2
  - Stage 4 - Corneal Scarring .................................................. 2
- Trachoma Magnitude .................................................. 3
  - Global .................................................. 3
  - Sub-Saharan Africa .................................................. 3
  - Ethiopia .................................................. 4
- Impact of Trachoma .................................................. 5
- Orbis Involvement in Trachoma Control in Ethiopia .................................................. 6
- Trachoma Control Project Objectives .................................................. 7
- Strategies Employed by Orbis to Control Trachoma .................................................. 7
  - TT Surgery .................................................. 8
  - Mass Drug Administration (MDA) .................................................. 8
  - Facial Cleanliness .................................................. 8
  - Environmental Improvement .................................................. 8
- Implementation of the SAFE Strategy .................................................. 8
- Challenges of Trachoma Prevention in Orbis Project Areas .................................................. 9
- The Way Forward .................................................. 10

**Part II: Trachomatous Trichiasis (TT) Surgery** .................................................. 11
- The Eye .................................................. 12
- Step 1: Placement of Anesthetic Drops in Cul-de-sac .................................................. 14
- Step 2: Injection of Anesthetic .................................................. 14
- Step 3: Insertion of Clamp .................................................. 16
- Step 4: Incision of Lid .................................................. 17
- Step 5: Inspection of Incision .................................................. 18
- Step 6: Placement of Sutures .................................................. 18
- Step 7: Tying of Sutures .................................................. 21
- Postoperative Course .................................................. 23

**Conclusion** .................................................. 24
Introduction

This manual is designed to show a technique for trachomatous trichiasis (TT) surgery using a clamp that protects the cornea, maintains hemostasis, and provides markers for standardizing the surgical technique. As an introduction to the subject, background information about trachoma is included. This will enable the reader to understand the scientific background of trachoma, the magnitude of the problem, and the Orbis experience with trachoma control in Ethiopia. The first part is based primarily on experience in Ethiopia with Orbis supported programs. However, the activity described can be used as a model for a program in any part of the world where trachoma and trachoma-related blindness is a problem. Moreover, this information is intended for any local organization or international group interested in and dedicated to this work wherever it can be carried out.

This manual is prepared in two parts. The first part deals with background information for trachoma and the second part describes a surgical technique for TT surgery that employs a newly designed clamp that promises to promote faster, and safer, surgery with more predictable results.

Part 1: Trachoma Background

Trachoma - Definition

Trachoma is one of the oldest infectious diseases known to mankind. It is caused by Chlamydia Trachomatis – a microorganism which spreads through contact with eye discharge from the infected person (on towels, handkerchiefs, fingers, etc.) and through transmission by eye-seeking flies. Trachoma is more likely to occur when general hygiene and cleanliness is lacking, water supply is limited, and environmental control with management of waste is inadequate. After years of repeated infection with trachoma causing chronic conjunctivitis, the undersurface of the eyelid (tarsal conjunctiva) of an individual becomes so severely scarred that the eyelid margin and/or eye lashes turn inward. This leads to a condition called entropion which in turn creates a condition that is called trachomatous trichiasis with the lashes rubbing on the eyeball, abrading the conjunctiva and cornea, leading to scarring of the cornea (the clear front of the eye). If untreated, this constant rubbing of the lashes on the cornea results in irreversible corneal opacity and eventually blindness.

A child with trachomatous conjunctivitis
Stages of Trachoma

Stage 1 - Follicular Conjunctivitis

Follicular conjunctivitis is the first stage of trachoma.

Stage 2 - Conjunctival Scarring

The second stage of trachoma is characterized by linear scarring of the upper tarsal conjunctiva (Arlt's line) leading to in-turning of the upper lid (entropian). Also shown: pits at the superior limbus (Heberts pits) a characteristic reaction with trachoma.

Stage 3 - Trachomatous Trichiasis

The third stage of trachoma is in-turning of the upper lid causing the lashes to turn inward and abrade the cornea creating a condition called trachomatous trichiasis (TT) in adults with trichiasis.

Stage 4 - Corneal Scarring

The fourth stage of trachoma is corneal scarring causing reduced vision as shown in the right eye of this patient.
Trachoma Magnitude

Global

Trachoma affects over 162 million people worldwide. Taylor in 2008\(^1\) puts the prevalence at 146 million active cases, 10.6 million with trichiasis, and 5.9 million blind. Trachoma, once endemic in most of the world, is responsible at present for more than 3\% of the world’s blindness. Fortunately this number continues to get smaller as a result of socio-economic development and current control programs for this disease.\(^2\) In spite of this, trachoma continues to be hyper-endemic (active trachoma more than 40\%) in many of the poorest and most remote areas of Africa, Asia, Central and South America, Australia and the Middle East. In hyper-endemic areas, active disease is most common in pre-school children with prevalence rates as high as 60-90\%.\(^2\) Trachoma tends to strike the most vulnerable members of communities who are women and children. Adult women are at much greater risk of developing the blinding complication of trachoma than are adult men. This increased risk has been explained by the fact that women generally spend more time in close contact with children who are the main reservoir of the infection.

Sub-Saharan Africa

Trachoma has been declining in many areas of the world largely due to increased use of antibiotics and some improvements in sanitation and water supply as well as economic developments; however it remains the second leading cause of blindness in Africa. While trachoma is prevalent throughout much of sub-Saharan Africa, accurate statistics are not readily available because in some areas there is too little reliable information to even estimate the burden of disease (WHO 2006). The bulk of research on trachoma has been carried out in Tanzania, Ethiopia, Gambia, Mali, and Malawi where studies have shown that women account for about 75\% of all trachomatous trichiasis and subsequent blindness due to corneal scarring. Although the prevalence of active disease is similar for boys and girls, adult women tend to be more severely affected because of the aforementioned interaction with infected children. In some areas trachoma is holo-endemic meaning that every child has active trachoma and every adult shows some evidence of conjunctival scarring. At any one time, rates of active disease for children in endemic areas can range as high as 50\%.\(^3\)
**Ethiopia**

Trachoma is the second leading cause of blindness in Ethiopia exceeded only by cataract. According to the national survey conducted in 2006, trachoma accounts for 11.5% of all blindness and 7.7% of people with low vision. It is estimated that over 138,000 people in Ethiopia are already blinded by this disease.  

The prevalence of active trachoma (AT) in children age 1-9 is 40% for the whole country ranging from 0.5% to 62.6% depending on the region. It is fourfold higher in rural children compared with those in an urban environment. This disparity is largely due to poor sanitation and inadequate water supply seen predominantly in rural areas. Over 9 million children aged 1-9 years have active infection.

Prevalence of trachomatous trichiasis (TT), a chronic form of trachoma, is estimated to be 3.1% for Ethiopia. This means there are an estimated 1.3 million people age 15 and above who are at risk of blindness unless treated urgently.

The Southern Nation Nationality Peoples Region (SNNPR), where an Orbis Rural Program is located, is the third most populated (~ 15 million) region in Ethiopia among the 9 regional states and two city administrations. It is located in the southern part of the country and has more than 45 different ethnic groups. The SNNPR has a prevalence of trachomatous trichiasis (TT) of 2%, which is one of the highest in the country.

Flies which are a vector for the spread of trachoma cluster on the face of this child with conjunctivitis.

Trachoma patients waiting for examination at a clinic.
Orbis works in 4 zones and one special Woreda (district) in the SNNP region with an estimated population of 6 million. The prevalence of active trachoma in this region is 33%, which is third in magnitude behind the Amhara and Oromia regions which are the two largest regional states of the country.

Impact of Trachoma

Frick et al., in 2003 attempted to assess the economic impact of trachomatous visual loss using national survey data on trachomatous blindness or visual impairment occurring since 1980. It was concluded that countries with known or suspected blinding trachoma have 3.8 million cases of blindness and 5.3 million cases of low vision resulting in a potential productivity loss annually of 2.9 billion US dollars. Trachomatous vision loss results in 39 million lifetime disability adjusted life years. This number is influenced by the fact that trachoma affects more women and young adults who make up an especially productive component of society. Women have been called the “backbone” of household productivity in developing countries like Ethiopia. Considering this and the feasibility of successful interventions, Orbis International launched a program aimed at the control and eventual elimination of blinding trachoma beginning 12 years ago in Ethiopia.
Orbis Involvement in Trachoma Control in Ethiopia

The Orbis Ethiopia country office was officially registered in 1999. Between 2000 and 2001, a comprehensive assessment of the extent of blindness and low vision, including the prevalence of trachoma, was conducted in the Gurage zone to learn more about the magnitude of eye health problems from trachoma. Training for nurses enabling them to perform trichiasis surgery was initiated in 2000 and a study of the outcome of surgeries done by these trained nurses known as Integrated Eye Care Workers (IECWs) compared with that done by ophthalmologists was conducted. It was determined that results of surgery done by these two groups were comparable.6

In 2002 and 2003, Orbis International Ethiopia (Enemor Woreda), in collaboration with World Vision Ethiopia (Artuma Fursi Woreda) and The Carter Center (Ebnat Woreda) implemented the World Health Organization's initiatives known by the acronym “SAFE” as a strategy for the control of blinding trachoma and its effects: Surgery, Antibiotic, Facial cleanliness and Environmental hygiene. This program was carried out in three districts or Woredas - as they are locally called. Additional funding for this effort was obtained from International Trachoma Initiative (ITI) and Pfizer. This Orbis initiated project was the first of its kind designed to implement the SAFE strategy in Ethiopia. It included mass treatment of the affected populations with Zithromax donated by Pfizer and trachomatous trichiasis (TT) surgeries for affected individuals along with education on face washing and environmental improvement for all at the community level. Records were kept and the program moved forward based on lessons learned.
Trachoma Control Project Objectives

The project objectives were aimed at addressing each of the four components of SAFE as follows:

**Surgery**
- Train nurses to perform trichiasis surgery and carry out primary eye care.
- Equip and supply health centers to deliver trichiasis surgery and primary eye care service to reduce backlog of trichiasis through both static and outreach services.
- Determine the recurrence of TT after surgery with and without Zithromax treatment at time of surgery.
- Develop and standardize training and certification of trichiasis surgeons.

**Antibiotics**
- Reduce prevalence of active trachoma through antibiotic (Zithromax) treatment aimed at reducing the pool of infection and interrupting transmission, as well as providing treatment of active infections through mass distribution at health facilities.
- Provide information and education activities to the population to create awareness on how to prevent trachoma through the use of antibiotics.
- Carry out a variety of different studies on ways to improve the distribution of Zithromax and to determine the effectiveness of this treatment.

**Face Washing**
- Increase the level of understanding and awareness about the value of face washing through education in schools and in the community by producing and distributing educational materials.
- Upgrade local water sources to enable a safe and adequate water supply.
- Collaborate with other NGOs working on water and sanitation improvement.

**Environmental Improvement**
- Raise awareness to increase utilization of appropriate sanitary methods for the human and animal waste and household rubbish.
- Construct model household latrines to be used in the community.
- Construct school and communal latrines in selected areas.

**Strategies Employed by Orbis to Control Trachoma**

Orbis has employed the WHO endorsed SAFE strategy for control of trachoma as described above in the belief that reducing one or more of the factors in the transmission of the bacteria that causes trachoma, *Chlamydia Trachomatis*, will reduce the prevalence of blindness from trachoma.

It would be best to simply *prevent* trachoma by encouraging better personal hygiene, improved environmental cleanliness, and by controlling the flies that serve as vectors of transmission. However, once trachoma is prevalent and is considered a public health problem, it is necessary to apply *all four* components of the SAFE strategy for control.
TT Surgery

Trachoma causes blindness after repeated infections of the eye, resulting in scarring of the conjunctiva that subsequently pulls the eyelid margins inward (i.e., toward the globe of the eye). This then causes the eyelashes of the inverted eyelid margins to rub on the cornea. This is called Trachomatous Trichiasis or TT. Over time, the in-turned eyelashes rubbing the cornea results in opacity/scar development. This changes the cornea from a clear transparent window to one that will not allow normal passage of light through the cornea, reducing vision and eventually causing blindness. This problem is best dealt with before serious cornea damage ensues. Trachomatous trichiasis can be reversed by performing surgery on the in-turned eyelid returning it to the original (normal) position.

Mass Drug Administration (MDA)

The second component of the SAFE strategy is treatment of the entire affected communities with a potent antibiotic known as Azithromycin (Zithromax). Mass treatment is indicated when the level of active trachoma in a district is 10% or higher as measured by trachoma follicular index (TFI). TFI is the percentage of children with follicular conjunctivitis from trachoma infection. The Mass Drug Administration (MDA) addresses two important issues: the pool of infection at the community level, and treatment of active infection. This helps individuals to remain free of trachoma that is also controlled with positive personal hygiene practices.

Facial Cleanliness

The third component is facial cleanliness. This is an important part of trachoma control strategy. It is aimed primarily at eliminating transmission of the infecting agent from unclean faces by flies, and as a means of maintaining individuals in a trachoma free state after initial treatment is received through MDA. This is a key component of trachoma control in that it reduces the rate of re-infection with trachoma.

Environmental Improvement

The fourth component is environmental improvement. This is an important strategy for controlling flies which transmit the infecting agent for trachoma and which flourish in an unclean environment. Breeding of flies can be reduced by proper disposal of refuse through burying or burning and of human and animal waste by using latrines and other appropriate methods that eliminate breeding places for flies. Supplying abundant clean water is also a goal.

Implementation of the SAFE Strategy

Implementation of the SAFE strategy begins with building the capacity of rural eye care facilities starting with training of various cadres of eye care workers. These workers include health professionals such as nurses who will lead the rural primary eye care service, perform eyelid surgeries on patients with TT, and provide other treatment for active trachoma. Nurses who are trained for one month in primary eye care including TT surgery are called Integrated Eye Care Workers (IECWs). When one or two IECWs are trained per health center, TT surgery sets are provided (three per center); sterilization equipment and supplies are also provided initially. In order to be more effective, it is necessary to integrate the primary eye care activities within the regular health service to make it sustainable.
Teachers in primary schools are trained to inform their students about the prevention of trachoma through personal and environmental hygiene. Community level eye care personnel such as Health Extension Workers (HEWs) and volunteers such as Community Health Agents (CHAs) and Women Group Leaders (WGLs) are trained to teach community members about trachoma and tell them about preventive measures such as face washing and environmental cleanliness. These community eye care workers also identify and refer patients to Primary Eye Care Units (PECUs) where they can receive medical and surgical treatment for trachoma as needed.

All cadres mentioned above should receive close support including annual refresher training to keep them motivated and to help them stay current with methods to provide quality eye care. It is also important to produce targeted and effective key messages that these community eye care workers can use to educate community members.

As part of the overall support to communities to practice the whole SAFE package, it is necessary to address the overall problems of sanitation, something outside of the usual expertise of a blindness prevention organization such as Orbis. This can be addressed by collaboration with other agencies who deal with clean water and sanitation utilizing their expertise and resources. Success in the eradication of blinding trachoma will require a team effort.

Challenges of Trachoma Prevention in Orbis Project Areas

► Lack of awareness of eye problems associated with trachoma on the part of the population and the decision makers
A large proportion of the population is unaware that trachoma is a “water washed” disease, and one that can be prevented by personal hygiene including face washing with soap every day. Many people are not aware that trachomatous trichiasis (TT) can be treated and blindness prevented in some cases through surgical interventions. There is a need for local decision makers to acknowledge that lack of eye care is a significant health problem.

► Lack of suitable supplies of clean water and of adequate sanitation
In addition to the lack of overall awareness, clean water and adequate sanitation facilities are lacking in many areas, especially rural villages. This problem is exacerbated by a lack of coordination between responsible agencies.

► Limited availability of eye care services
The type and volume of services that are currently available are inadequate. This is mainly due to scarcity of trained eye care professionals, lack of infrastructure and supplies, and insufficient allocation of budget for eye care.

► Affordability
The majority of the population affected with trachoma is rural and lives in a low socioeconomic status. Households for the most part depend on subsistence farming. Even if services are available, surgery or medical treatment is unaffordable not only due to direct cost, but also indirect costs associated with transportation, accommodation, and food for most patients. It is especially difficult to obtain services when travel is required.
Scarcity and high turnover of trained eye care professionals in rural areas
There is a scarcity of eye care professional in rural areas. Part of this is due to attrition of IECWs resulting from the lack of a career pathway for eye care providers that would attract them to the job and make them remain in a given location.

Limited ownership of programs by the government
There is poor resource allocation on the part of the government particularly for human resources. This contributes to inadequate monitoring and evaluation and allocation of funds to cover operational costs for eye care services.

The Way Forward

1. Training of more eye care professionals including volunteers: Ensure availability of at least two IECWs (or a sufficient number according to population) to provide primary eye care services in each of the existing health centers in all project areas. In addition, collaborate with all stakeholders while continuing to explore ways in which primary eye care is included in the training for health professionals with an emphasis on prevention. Train every new graduate health professional to be skilled in providing basic eye care; this could ensure continuity of services. Emphasize recruitment of new IECWs for ophthalmic nurse training.

2. Strengthening ownership of the program by partners: This will ensure sustainability of services through integration of eye care into the general health services, increasing financial allocation, and cost recovery.

3. Establishing linkage between rural eye care units with higher level eye centers: Establish linkage of Primary Eye Care Units (PECUs) with Secondary Eye Care Units (SECUs) for technical support, referral, and backup for the PECUs. The universities should provide back-up support to Secondary Eye Care Unit activities in all areas of eye health care.

4. Identify and collaborate with organizations working in the area of water and sanitation in the project areas: Strive to create a common understanding among all stakeholders on their roles for ensuring availability of clean water and sanitation for preventing eye disease.
Part II: Trachomatous Trichiasis (TT) Surgery

Trachomatous trichiasis (TT) is the chronic sequel of active trachoma. Epilation (removal of lashes) and surgery to evert the lid thereby redirecting the lashes away from the cornea, are two methods for treatment of trachomatous trichiasis (TT). Epilation is often performed at the community level and is usually done by patients themselves. However after simply pulling out the lashes, the new lashes that replace those that are pulled out are often sharp and more damaging to the cornea than the original in-turned or the remaining non-epilated lashes. Although entropion can recur in some cases after surgery, this is currently the method of choice for treating TT. The two most widely practiced surgical procedures are: bilamellar tarsal rotation (BTR) and tarsal plate rotation (TPR/tarsatomy).

BTR surgery is the surgical procedure recommended by the WHO for trachomatous trichiasis. This surgery is being done by eye care professionals in many parts of the world. Recently a new design for the instrument used to perform BTR surgery has been introduced. It includes a plate to protect the cornea and provide a surface for a clamp that controls bleeding and which can have design features that marks the incision site leading to more consistency. One such instrument was introduced by Dr. Keith Waddell and is manufactured by Collton in the UK. Orbis International is currently using this new clamp at tertiary eye centers and at Orbis rural field facilities. In the last year, ten IECWs and two ophthalmologists used the clamp for surgery done on more than 100 patients. There were no recurrences during the specified follow up period. The feedback from surgeons using this new clamp has been uniform. Their experience compared with a free-hand technique originally recommended by the World Health Organization is summarized as follows:

Advantages of the new clamp:
- Surgery time is reduced.
- The through and through lid incision is made in one step.
- Less surgical equipment is needed.
- Protection for the globe is provided.
- Bleeding is reduced.
- Surgeons have more confidence when performing the surgery.

Disadvantages:
- Need to have different sizes for different age and size of palpebral fissure
- Prolonged clamp placement causing reduced blood flow
- Not available on the local market
- Cost

The surgeon inspecting the surgical instruments.
The Eye

In a normal eye, the upper lashes have a slight initial downward curve before sweeping upward clear of the eyeball itself, away from the cornea and conjunctiva [Figure 1A]. The lashes number 200 to 300, forming two or three rows with two-thirds being in the upper lid. They serve to protect the eye by engaging foreign material and by initiating a protective blink reflex. The lashes regenerate two or three times a year and grow back rapidly if cut. The lashes originate in follicles at the anterior lid margin associated with sebaceous glands of Ziess [Figure 1B]. The lash line is external to the stiff tarsal plate that contains melibomian glands and forms the posterior half of the lid margin.

When trachomatous trichiasis (TT) is present, a portion of the upper lid lashes are pulled inward causing them to touch the cornea and conjunctiva, producing irritation and redness of the conjunctiva and a more serious breakdown of the corneal surface that can, after time, result in reaction in the cornea that produces scarring in the form of a whitish irregular opacity, blocking clear vision and eventually resulting in blindness in many cases [Figure 2].

The cause of the upper eye lashes turning in is scarring and contracture of the upper tarsal conjunctiva that occurs after prolonged infection (conjunctivitis) caused by *chlamydia trachomatis* [Figure 3]. It is common for affected individuals to pluck out the offending eyelashes with “tweezers” but this affords only temporary relief because the eyelashes grow back and often are stiffer and more damaging than originally.
This is the set up of the sterile instrument tray used for TT surgery [Figure 4]. The necessary instruments and material include: 1. Gauze, 2. Fenestrated eye drape, 3. Irrigation bottle, 4. Syringe and needle for injection of anesthetic, 5. Forceps, 6. Bard-Parker handle and knife (#15), 7. Waddell clamp, 8. Scissors, 9. Needle holder, 10. Hemostat.
Step 1: Placement of Anesthetic Drops in Cul-de-sac

After the patient’s eye lids and upper face have been washed with soap and thoroughly rinsed, anesthetic drops are placed in the cul-de-sac [Figure 5]. These drops can be used liberally making sure that several drops reach the tissue to be anesthetized. A typical agent would be tetracaine hydrochloride 1% or proparicaine hydrochloride 0.5%.

Figure 5. Local anesthetic eye drops are instilled immediately after washing the face.

Step 2: Injection of Anesthetic

Xylocaine (lidocaine) 1% is injected subcutaneously just above the lid margin to include the full width of the upper lid [Figure 6]. A small gauge #30 needle is preferred. About 1 or 2 cc of agent is injected.

Figure 6. Injecting 2-3 ml of 2% local anesthesia into the upper lid.
The Waddell clamp for bilamellar tarsal rotation was introduced in 2009 [Figure 7]. The purpose of this clamp is to make the procedure for treatment of trachomatous trichiasis safer and more predictable especially in the hands of technicians who in Ethiopia are called integrated eye care workers (ICEWs).

This clamp has five distinct features:

1) A thin solid plate inserted beneath the lid to protect the cornea and serve as a platform for the fenestrated upper arm of the clamp
2) A slightly raised shelf on this plate to limit and standardize the placement of the clamp in relation to the lid margin
3) A fenestrated plate that clamps on the lid sufficiently tightly to provide hemostasis with an open center to carry out the surgery on the lid
4) A mark on the fenestrated plate 3 mm from the shelf used to locate the site of the through and through lid incision
5) A locking screw to tighten the clamp securing the lid between the plates

Figure 7. Waddell clamp
Step 3: Insertion of Clamp

The Waddell clamp* is placed with the upper lid between the two plates of the clamp [Figure 8]. Before closing, the lower plate is advanced until the shelf abuts the lid margin. With the clamp closed, the marks on the lateral arms of the fenestrated upper plate indicate the location of the lid incision.

* A similar clamp that is less expensive has been described and is currently under clinical trial. [Merbs, SL, et al., The Trachomatous Trichiasis Clamp, Arch Ophthalmology, Vol 130 (no.2) Feb 2012, pp. 220-223]

Figure 8. A) The plate of the clamp is slid beneath the upper lid and the fenestrated arm is on top of the upper lid. The clamp is advanced until the shelf on the lower plate abuts the lid margin. B) When the screw of the clamp handle is tightened, the lid is squeezed between the plates and the fenestrated ring stopping blood flow and creating a bloodless field.
**Step 4: Incision of Lid**

With the Waddell clamp placed, an incision is carried through the full thickness of the lid. The solid lower plate ensures protection of the cornea. Note the bloodless field made possible by the placement of the clamp. Scissors may be used to extend the incision fully at either end [Figure 9].

*Figure 9. A) A Bard-Parker scalpel with a #15 blade is used to make an incision through the full thickness of the lid 3 mm from the lid margin as indicated by the mark on the clamp. B) The incision is completed laterally with scissors. The incision should be the width of the clamp opening.*
**Step 5: Inspection of Incision**

The incision is inspected before placement of sutures [Figure 11]. Note that the field remains bloodless.

![Figure 11. Checking the completely incised eye lid](image)

**Step 6: Placement of Sutures**

Sutures are now placed beginning with the needle entering at the upper conjunctival surface and passing through tarsus exiting beneath orbicularis. In the technique shown, a single heavy needle with an eye is used with 4-0 black silk suture* [Figure 12]. The field remains bloodless while sutures are being placed.

- * Some surgeons use absorbable suture to avoid the need to return for suture removal.

![Figure 12. 4-0 suture placed in the proximal segment of the tarsus entering from the conjunctival side on a heavy cutting “eyed” needle.](image)
After the first suture pass, the needle is “re-loaded” with the other end of the suture and a second arm of the suture is brought through the tarsus from the conjunctival side in a mattress fashion [Figure 13].

**Figure 13.** A) The needle is removed and re-loaded with the other end of the suture and a similar pass is made. B) The first half of the mattress suture has been completed.

Two additional sutures are placed in a similar manner into the upper lip of the lid incision [Figure 14]. The start of a mattress suture in the upper margin of the incision is shown.

**Figure 14.** Three mattress sutures are now placed in the proximate segment of Tarsus.
Each arm of the sutures placed in the upper margin of the lid incision is loaded on the needle and the needle is passed through orbicularis muscle exiting through skin just above the lash line [Figure 15]. This procedure is repeated to complete the placement of the three mattress sutures [Figure 16].

Figure 15. The sutures are placed in the distal segment of the lid by passing superficial to the tarsus (through the muscle between the tarsus and skin), completing placement of the mattress sutures.

Figure 16. A) One mattress suture has been completed. B) All three mattress sutures are placed and are ready for tying.
The path of each suture is as follows:

1) Enter through the conjunctival surface of the upper margin of the incision;

2) Enter tarsus, pass through the substance and exit between tarsus and orbicularis;

3) Enter the lower incision margin above the tarsus at the level of the orbicularis;

4) Exit through skin just above the lash line.

Figure 17. The essence of this procedure is to evert the distal lid by abutting the proximal tarsus.

Step 7: Tying of Sutures

Each of the mattress sutures is tied securely with a surgeon’s knot* [Figure 18].

* A surgeon’s knot is a modification of the square or reef knot. It differs by having an extra twist or a double overhand knot in the first twist and a single on the second. This provides more friction and produces a more secure knot.

Figure 18. Tying the mattress sutures securely.
With all three knots tied securely, the lid margin is everted [Figure 19].

Figure 19. Knots after tightly tying the sutures.

Note the path of the sutures through conjunctiva and tarsus at the upper limb of the incision and through orbicularis and skin at the lower limb of the incision. This in effect everts the lid margin [Figure 20].

Figure 20. A) Shown in frontal view. B) Shown in sagittal plane.
Post Operative Course

After surgery the patient uses antibiotic ointment once or twice a day. An overcorrection is seen early, partly due to edema from use of the clamp and from the surgery itself. Sutures are removed in one week [Figure 21].

Figure 21. The patient is shown: A) Pre-operative; B) Immediately post operative; C) Day one - post operative with lids open and closed; D) Day 7 - post operative before suture removal; E) Day 7 - post operative suture removal; F) Appearance of the lids after removal of the sutures.
Conclusion

Orbis trained integrated eye care workers (IECWs) who had been using the “free hand” technique for trachomatous trichiasis (TT) surgery as recommended by the World Health Organization (WHO) were provided instruction in the use of the new Waddell clamp. After successfully completing the training, these workers and the ophthalmologist who trained them performed TT surgery on more than 100 patients in the course of a year. After this experience the IECWs reported the following: 1) surgery time was reduced; 2) there was less bleeding; 3) the operators had more confidence; 4) the surgery was conducted in a more controlled and standardized manner; and 5) the chance of harming the cornea was eliminated because of protection provided by the clamp.

This experience in Ethiopia suggests that a technique for TT surgery that provides protection for the cornea, creates a bloodless field, and offers a way to standardize the procedure should be considered by anyone doing this type of surgery. The Waddell clamp which utilizes the principle that provides all of these advantages is one such clamp. Another clamp designed by Merbs that is lower cost and comes in different sizes is now undergoing evaluation.

This manual is not intended to endorse a specific clamp but instead to alert those who will be doing this type of surgery to consider using some type of clamp that offers the advantages described here.

References


