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A New Surgical Technique for Post-Operative Trichomatous Trichiasis

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Abstract

Introduction: The World Health Organization has identified management of post-operative trichiasis (PTT) as one of the key remaining areas of focus needed to eliminate blinding trachoma as a public health problem. We developed the Bevel-Rotation Advancement Procedure (B-RAP) to treat individuals who need repeat trichiasis surgery.

Methods: Scarring caused by trichiasis surgery can cause the eyelid to become thick and distorted, making repeat surgery more difficult. To minimize eyelid thickness following B-RAP, a beveled incision of the tarsus is made allowing a marginal rotation of the eyelash fragment. Dissection between the anterior and posterior lamellae above the beveled incision and removal of scar tissue allows the marginal rotation to be combined with a posterior lamellar advancement to treat severely scarred eyelids with PTT and eyelid contour abnormalities (ECAs).

Results: Two surgeons performed B-RAP on 44 eyelids of 30 patients with PTT. The number of prior TT surgeries ranged from two to more than four. At the 3–6 months post-operative visit, 37 eyelids (84%) had no recurrence of PTT. Three eyelids had central lashes touching; the remaining eyelids with recurrent PTT had nasal and/or temporal lashes touching. Fifteen eyelids (34%) had ECAs, but only one was severe.

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Conclusions: B-RAP was developed considering the altered eyelid anatomy found in the post-surgical eyelid with TT. Thinning of the eyelash fragment and removal of post-operative scar tissue improves the ability to advance and stabilize the eyelash fragment after external rotation. B-RAP shows promise as a procedure for improving outcomes of repeat trichiasis surgery.

Précis

The Bevel-Rotation Advancement Procedure was developed for repeat trachomatous trichiasis surgery.

Introduction

Many surgical approaches have been developed to treat cicatricial entropion of the upper eyelid. The World Health Organization (WHO) endorses two procedures, the bilamellar tarsal rotation (BLTR) and posterior lamellar tarsal rotation (PLTR) techniques, for the treatment of trachomatous trichiasis (TT), which affects an estimated 2.8 million individuals.^{1, 2} Both procedures employ a tarsal incision to facilitate external rotation of the eyelid margin (Figure 1A). Even in the best of circumstances, the one-year post-operative trichiasis (PTT) rate ranges from 8–22%.^{3, 4} Thus, for trachoma elimination programs to be successful, a standardized procedure to effectively treat PTT is needed. Currently, there is no WHO standard procedure for PTT, and BLTR and PLTR are used by default. PTT surgery outcomes are poor, with a higher rate of repeat PTT and eyelid contour abnormalities (ECA)⁵ (Figure 2A) when compared to initial surgery.^{6, 7}

Eyelids with PTT have a distorted anatomy compared to unoperated eyelids with TT (Figure 1B; Figure 2A), so higher rates of repeat PTT and ECA following PTT surgery are not unexpected with the BLTR and PLTR procedures. At the completion of both procedures, the distal tarsal fragment overlaps the proximal tarsal fragment, resulting in a scarred area of the tarsus that is thicker than the tarsus was prior to surgery (Figure 1B). During BLTR PTT surgery, creating a uniform, straight, full-thickness incision through the irregularly-thickened, scarred tarsus is difficult. Additionally, the ability to stably externally rotate the thickened distal fragment during BLTR PTT surgery is limited. The same difficulties exist when making the PLTR PTT incision, which must be placed to release the eyelid margin from the scar. Creating a uniform pocket in the scarred distal fragment can be challenging, and in cases of severe thickening of the proximal tarsus, seating the edge of the proximal fragment into the distal fragment pocket during PLTR PTT surgery is nearly impossible. PTT cases with an ECA are even more difficult to correct with either surgery. To address these anatomic differences in eyelids with PTT, we modified and combined multiple surgical approaches to develop the Bevel-Rotation Advancement procedure (B-RAP) for PTT.

Procedures to treat cicatricial entropion of the upper eyelid can be divided into two categories: 1) procedures that cut through the tarsus to allow a marginal rotation and 2) procedures that cut between the anterior and posterior lamella to allow advancement of the posterior lamella and recession of the lashes away from the eye. These two basic surgical approaches have been modified in many ways. Additionally, combining a tarsal marginal rotation and a posterior lamellar advancement (TMR PLS) has been described for cicatricial entropion repair from other causes.⁸ In that procedure, the distal fragment is rotated and the

posterior lamella is advanced such that the eyelid ends up twice as thick. A direct application of TMR PLS to the PTT eyelid would result in an eyelid that could be up to four times the thickness of the original eyelid, similar to repeat BLTR and PLTR procedures. To minimize eyelid thickness at surgery completion, we have modified the TMR PLS procedure by using a beveled incision for B-RAP that thins the distal fragment and by removing scar tissue formed from the previous surgeries.

Surgical Technique

A 4–0 silk everting suture is placed as in standard PLTR surgery, and the upper eyelid is everted over a Trabut plate (Figure 2B).¹ A scalpel is used to make a beveled incision about 3 mm from the eyelash follicles (Figure 1C, Figure 2C). This typically corresponds to the scar or a portion of the scar from the original TT surgery. Instead of perpendicular to the conjunctival/tarsal surface, the scalpel blade is positioned closer to parallel to the tarsus and the incision is beveled towards the eyelash follicles with care not to cut the follicles. This releases the scar from the original TT surgery. After the incision has been made, sharp dissection between the scarred orbicularis and the scarred and thickened proximal tarsus is performed. White scar contributing to an ECA can be resected, and the dissection occurs to the extent of the scar near the top of the tarsus (Figure 1D). After dissection, the contour of both the beveled distal fragment and the proximal fragment should be normalized (Figure 2D). The plate and traction suture are removed.

The beveled fragment is then rotated (Figure 1D) and positioned above the posterior fragment, recessing the anterior lamella and effectively advancing the posterior fragment 1 mm (Figure 1E). This position is stabilized with 5–0 polyglactin 910 mattress sutures (Figures 1F and 2E). In BLTR and PLTR, the distance between the arms of the same suture is the same as the distance between 2 sutures.¹ In B-RAP, the distal fragment is thinner and more easily bunched/pleated, so the space between the arms of the same suture is closer than the distance between different sutures to minimize bunching/buckling of the fragment when the sutures are tied (Figure 3C–D). In PLTR, the separation of the orbicularis from the tarsus is performed with blunt dissection using scissors; however, because the full-thickness suture scars from previous surgery are present in PTT, separation of the orbicularis from the tarsus typically requires sharp dissection. An optional suture from Muller's muscle to the skin can be helpful to fixate the eyelid crease in patients with excess upper eyelid skin (Figure 1F).

Patients were followed at 1 day, 2 weeks and 3–6 months after surgery. They were assessed for recurrence of PTT and presence of eyelid contour abnormalities.⁵ The University of Maryland IRB-exemption was obtained for the study. This included a waiver of HIPAA authorization for release of the PHI for this research study. The study adhered to the ethical principles outlined in the Declaration of Helsinki as amended in 2013.

Results

Two experienced surgeons (SLM, DT) performed B-RAP on 44 eyelids of 30 patients in Ethiopia. All eyelids having surgery had entropion of the eyelid margin and at least one eyelash touching the eye or evidence of epilation. The number of prior TT surgeries ranged

from two to more than four. At the 3–6 months post-operative visit, 37 eyelids (84%) had no recurrence of PTT. (Figure 3). Three eyelids had central lashes touching; the remaining eyelids with recurrent PTT had nasal and/or temporal lashes touching (Table S1). Fifteen eyelids (34%) had eyelid contour abnormalities: eight mild, six moderate (Figure 3D), and one severe (Table S1). No post-operative ptosis or upper eyelid retraction was noted.

Discussion

To eliminate blinding trachoma as a public health problem, an estimated 2.8 million individuals will need trichiasis surgery.² Given the rate of PTT after initial trichiasis surgery and the poor outcome of BLTR and PLTR surgery on individuals with PTT, trachoma experts agree that one of the most critical remaining questions in trachoma elimination is how to manage PTT. Developing a standardized PTT surgery that considers the altered PTT eyelid anatomy and addresses the variability and challenges of repeat surgery is imperative, timely, and has the potential to make a huge contribution to future trachoma elimination. We developed B-RAP, considering the differences in eyelid anatomy found in the post-surgical PTT eyelid, with a particular emphasis on thinning the distal fragment and removing scar tissue that has formed from previous surgeries. This improves the ability to advance and stabilize the fragment and also provides more surface for the distal fragment to adhere to the advanced posterior lamella. However, the thinner distal fragment is more easily buckled,⁸ which can result in an ECA (Figure 3C–D). To minimize this distortion when the sutures are tied, in contrast to BLTR and PLTR, the space between the arms of the same suture is smaller than the distance between different sutures. B-RAP shows promise as a procedure for improving outcomes of repeat trichiasis surgery, although it should be noted that this study had a relatively short follow-up period. Larger clinical studies that are currently ongoing are needed in order to assess the long-term outcomes of this procedure.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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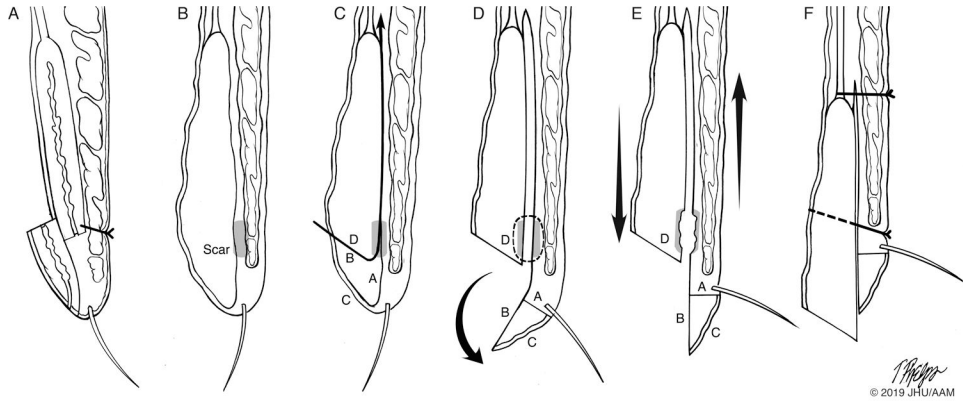


Fig. 1. Steps of Bevel-Advancement Rotation Procedure. **A**, Sagittal section of eyelid immediately after successful BLTR surgery to correct for trichomatous trichiasis; **B**, Eyelid after TT surgery with PTT and scarring at the site of the previous incision and suture; **C**, Beveled incision through the tarsus between B and D, and extending superiorly between the tarsus and the orbicularis (arrow); **D**, Rotation of the beveled distal fragment and removal of excessive scarring (dotted line) if present; **E**, Posterior lamellar advancement (down arrow) and anterior lamellar recession (up arrow); **F**, After placement of full-thickness fixation suture between the two fragments just above the eyelash line. An additional mattress suture between Muller's muscle and the skin is placed in cases with excess skin to fixate an eyelid crease.

TT – trichomatous trichiasis; PTT – post-surgical trichomatous trichiasis; BLTR – bilamellar tarsal rotation

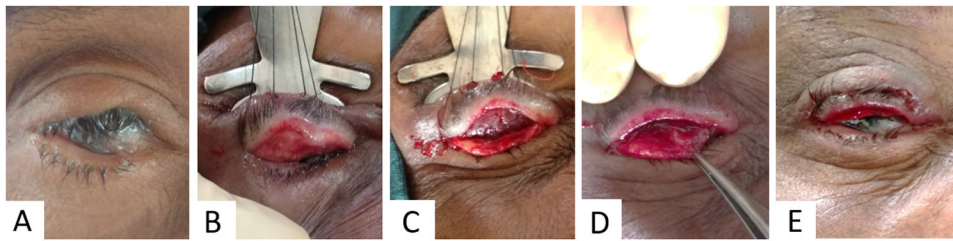


Fig. 2. Bevel-Advancement Rotation Procedure. **A**, Right upper eyelid with PTT; **B**, Eyelid everted with ECA; **C**, Eyelid after incision made, tarsus incised and scar tissue removed between the proximal fragment of the tarsus and the orbicularis, and ECA reduced; **D**, After plate removed prior to suture placement; **E**, After suture placement showing 1 mm posterior lamellar advancement.

PTT – post-surgical trichomatous trichiasis, ECA – eyelid contour abnormality

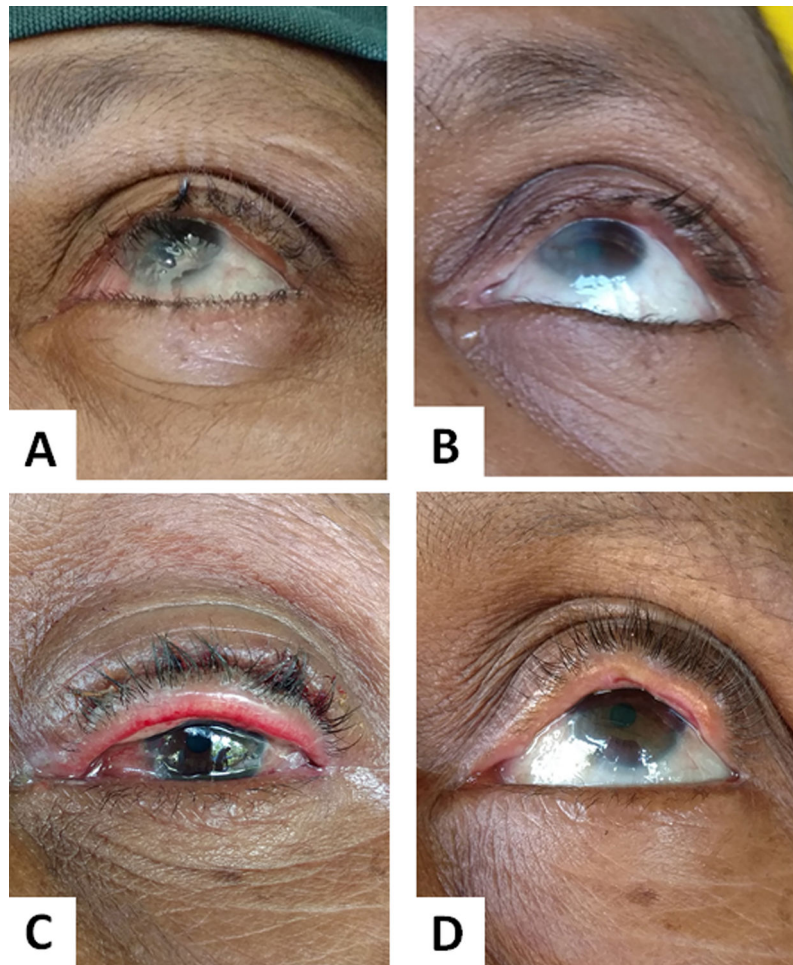


Fig. 3.
A, Left upper eyelid with PTT; **B**, Same eyelid 4 months after successful B-RAP; **C**, Left upper eyelid one day after B-RAP; **D**, Same eyelid with a moderate ECA 3 months after B-RAP. The contour changes correspond to the spaces between the tied arms of the central and temporal sutures.
 PTT – post-surgical trichomatous trichiasis, B-RAP – Bevel-Advancement Rotation Procedure; ECA – eyelid contour abnormality