How to Repair a Large Upper Eyelid Defect With a Modified Tenzel Rotational Flap in the Field

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1. Introduction
Eyelid defects are commonly encountered in equine practice and may often be repaired under standing sedation and local anesthesia, with satisfactory results. Larger defects (traumatic or iatrogenic) are much more challenging and are more difficult to repair with standard closure techniques. Smaller defects and lacerations can be closed using a simple interrupted or simple continuous pattern. For small areas requiring eyelid reconstruction, a Y-to-V or a V-to-Y correction technique can be used.1 For more extensive defects, or if more than one third of the eyelid margin has been damaged or needs reconstruction, a blepharoplasty is indicated.2 Facial skin tends to be inelastic and may not stretch adequately to cover a defect of the eyelid without the use of a flap. Many techniques have been described for blepharoplasty, including sliding skin flaps, conjunctival advancement flaps, full-thickness eyelid grafts, rhomboid graft flaps, and sliding Z flaps.1 General anesthesia is recommended in these cases if more than 50% of the eyelid has been damaged or if enucleation or exenteration is going to be performed as part of the procedure.2 If eyelid function has been compromised, a third eyelid flap or temporary tarsorrhaphy may also be required to protect the globe from further trauma.

To the authors’ knowledge, there are no reports of an effective and economic option for repair of moderate-sized defects of the upper lid that can be performed in the field.

The Tenzel rotational flap is a commonly utilized procedure in human ophthalmic surgery for the repair of large rectangular defects of the upper lid.3–5 We describe a modification of this technique used by the authors in a horse that sustained a large traumatic eyelid defect. This technique allows the surgeon equipped with basic surgical equipment and skills to restore a functional and cosmetically acceptable eyelid margin in the field after traumatic injury or surgical resection of a mass of the upper lid.

2. Materials and Methods

Equipment

Basic surgical equipment and a selection of absorbable and nonabsorbable suture materials should be available. In our practice, this procedure is performed under field anesthesia using xylazine,a ketamine,b and “triple drip” (guafenisin50 g, xylazine 500g, and ketamine 1 g).
Procedure
An iatrogenic defect may be repaired at the time of the partial lid resection. Traumatic defects may be closed primarily, or, as in the case pictured (Fig. 1), may be repaired as a delayed primary closure after a several-day period of antimicrobial therapy and granulation tissue growth.

The modified Tenzel rotational flap is performed as follows:

1. The horse is anesthetized with xylazine (1.1 mg/kg IV) and ketamine (2.2 mg/kg IV) and is placed in lateral recumbency. Anesthesia is then maintained with triple-drip IV to effect.

2. The affected eye is lubricated with triple antibiotic ophthalmic ointment and the surrounding area is clipped and aseptically prepared for surgery with dilute povidone iodine solution and irrigation saline.

3. The upper lid is anesthetized by performing supraorbital sensory and auriculopalpebral motor nerve blocks with lidocaine 2%. The cornea is topically anesthetized with proparacaine 0.5% solution.

4. A 3-inch curvilinear incision is made through the skin, beginning at the lateral canthus, curving ventrally, and finally toward the base of the ear, paying special attention to the location of the lacrimal nerve as it courses over the orbital rim just deep to this incision.

5. This skin flap is undermined bluntly from the subcutaneous tissue, and the lid portion is carefully separated from the underlying palpebral conjunctiva to allow the flap maximum mobility. At this time, the lateral canthal ligament is also transected to provide additional mobility to the flap.

6. If performing a delayed primary repair, the rectangular lid defect is “freshened” and the defect is extended dorsally with two 2-cm diagonal incisions forming an inverse V-shape to decrease the formation of a “dog-ear.”

7. The first suture is placed to form a new lateral canthal ligament. This is a simple interrupted suture of 0 polydioxanone placed through the orbital periosteum entering dorsally in the periosteum at the lateral orbital rim and exiting ventrally.

8. The skin flap is rotated axially until the defect is covered satisfactorily. The defect in the upper lid is temporarily apposed with a simple interrupted stay suture using 1–0 supramid to relieve tension while the repair is being performed. The repair then begins in the tarso-conjunctival layer at the new eyelid margin junction with 4–0 polyglactin 910 in a buried figure-8 pattern. Once the margin is repaired, the remainder of the defect is closed in two layers in a simple continuous pattern using 2–0 suture material could be performed if more pre-
cise “sculpting” is required. After this, the stay suture is removed. It is important to ensure that none of the sutures in this layer are placed deeply enough to penetrate the conjunctiva and rub the cornea.

(9) The portion of the skin flap now forming the lateral canthus is apposed to the freed portion of palpebral conjunctiva with a subcutaneous pattern beginning at the lateral canthus and moving toward the center of the eye with 4–0 polyglactin 910.

(10) The curvilinear skin incision is then closed using a simple continuous pattern with 1–0 supra-mid beginning at the new lateral canthus and proceeding toward the base of the ear.

Postoperative Care

After surgery, the cornea is treated twice daily with topical triple antibiotic ophthalmic ointment. Systemic treatment with oral trimethoprim sulfamethoxazole (25 mg/kg, q 12 hours, PO, for 14 days) and flunixin meglumine (1.1 mg/kg, q 24 hours, PO for 7 days) is initiated. The cornea should be examined frequently and stained if indicated to ensure that no ulcerations have occurred. The sutures are removed at 10 days after surgery.

3. Results and Discussion

The Tenzel rotational flap procedure is frequently utilized in human surgery for repair of large upper eyelid defects.3–5 In our practice, this procedure has been performed once in a young Quarter Horse mare with a large (3 cm) rectangular defect in the upper lid (Fig. 2). This mare recovered uneventfully, did not have any complications, and the defect has completely healed (Fig. 3). The upper lid has a very small notch noticeable only on close examination, but the mare has full function of her upper eyelid. Follow-up examinations—most recently at 2½ years after surgery—have revealed no complications due to corneal exposure, and the incisions have all healed nicely. Potential complications after performing this technique include exposure keratitis if the newly formed “eyelid” does not allow for complete closure of the eyelids and corneal microtrauma or irritation from trichiasis if the hair from the flap impinges on the cornea. However, these are also potential complications for horses with large eyelid defects due to trauma or masses, and careful dissection and placement of the flap should minimize these risks. This unique technique allows the surgeon to have another option for repairing large defects of the upper eyelid in the field. The use of field anesthesia to restore the function of the upper eyelid affordably is an advantage of this modified Tenzel rotational flap procedure. Depending on the level of experience and comfort of the surgeon performing this procedure for the first time, this technique may be slightly difficult but is not impossible to perform. Because there is a steep learning curve for this procedure, we recommend practicing on a cadaver before attempting this technique. Although not done in this case, it might be possible to perform this surgery with the horse standing under sedation and local anesthesia, especially if the clinician is experi-

Fig. 2. Repair of a large upper eyelid defect using a modified Tenzel technique. Original defect, during surgical closure, and resultant repair (left to right).

Fig. 3. Photograph of the eyelid 2½ years after the repair was performed.
enced in this surgical technique. The main advantage of this procedure is that it allows the surgeon equipped with basic surgical equipment and skills to repair large upper eyelid defects—either due to traumatic injury or after surgical resection of a mass—in the field, with a functional and cosmetically acceptable outcome.

References and Footnotes


Xylazine, IVS Animal Health, Inc, St Joseph, MO 64503.
Ketaset, Fort Dodge Animal Health, Fort Dodge, IA 50501.
Guaifenesin, Rood and Riddle Veterinary Pharmacy, Lexington, KY 40511.
Triple antibiotic ophthalmic ointment, Fougera Pharmaceuticals Inc, Melville, NY 11747.
Lidocaine, Sparhawk Laboratories Inc, Lenexa, KS 66215.
Proparacaine hydrochloride, Falcon Pharmaceuticals, Ltd, Fort Worth, TX 76134.
PDS, Ethicon, Brunswick, NJ 08901.
Vicryl, Ethicon, Brunswick, NJ 08901.
Sulfamethoxazole trimethoprim, MWI Veterinary Supply, Boise, ID 83705.
Banamine, MWI Veterinary Supply, Boise, ID 83705.