

Eye Enucleation

Relevant Anatomy

The anatomy of the eye can be divided into the structures of the eyeball (globe) and the adnexa. In the procedure, the adnexal structures are emphasized as the eyeball itself is removed. Structures of the adnexa include ocular muscles, orbital fasciae, the eyelids, conjunctiva, and the lacrimal apparatus. The eyelids have three basic layers; the outer skin, a fibromuscular layer, and the palpebral conjunctiva. The palpebral conjunctiva, together with the bulbar conjunctiva, comprises the conjunctival sac. The dorsal and ventral distal extremities of the sac are called fornices. The third eyelid attaches to a T-shaped plate of cartilage on the medial aspect of the eyeball. Between the dorsolateral wall of the orbit and the eyeball is the lacrimal apparatus. Several accessory glands of the lacrimal apparatus exist but are detailed in other anatomy texts.

The muscles responsible for moving the eye are all located near the optic foramen behind the eyeball, except for the ventral oblique muscle. The ventral oblique muscle originates on the ventromedial wall of the orbit and passes laterally below the eyeball. The four rectus muscles all insert anterior to the equator of the eye at a dorsal, ventral, medial, and lateral site. The retractor bulbi muscle inserts posteriorly on the eyeball and envelopes the optic nerve.

The locations of the ophthalmic and maxillary nerves are also relevant to this procedure for local anesthesia of the eye. These nerves enter the orbit with the extraocular muscles through the foramen orbitorotundum, which is a combined round and orbital foramen that is unique to bovine species. This is the site of injection for anesthesia during eye extirpation.

Indications and General Considerations

- A. Indicated for extensive neoplastic or traumatic involvement of the cornea (invasion of the anterior chamber) and the upper, lower, or third eyelid.
- B. Not indicated if neoplasia involves the bony orbit or has metastasized to regional lymph nodes; it is nearly impossible to remove the tumor successfully in such cases.
- C. Before surgery, determine the patient's age and pregnancy status, which are pertinent for determining the feasibility of eye enucleation. Old age and nonpregnancy may negate the merits of surgery.
- D. From a humane standpoint, never remove both eyes. Even a one-eyed animal may have social problems in a herd, especially in a herd in close confinement. Beef range bulls with only one eye may be at a disadvantage in defending themselves against other bulls.

E. Sale value for breeding purposes may decrease after enucleation.

Presurgical Procedures

- A. Administer IV sedation or analgesia as deemed prudent for standing surgery (e.g., xylazine/butorphanol combination).
- B. Remove hair in the orbital area with a No. 40 small animal clipper head.
- C. Scrub the area with an iodophor solution and tepid water. Chlorohexidine is toxic to the eye and therefore should not be used
- D. Trim excess neoplasia with scissors to aid enucleation.
- E.

Anesthesia

- A. Use a Peterson block or a retrobulbar infusion with an auriculopalpebral nerve block.
- B. Retrobulbar anesthesia with local infiltration of the lid margins is acceptable.

Surgical Procedure

Following surgical preparation, the patient's eyelids are grasped with towel clamps and are closed to minimize contamination of the surgical field. A recommended alternative is to suture the eyelids together and to leave the suture ends long. Sutures provide a better seal from necrotic debris than towel clamps. Using these methods, the instruments or ends of the sutures can be used to put traction on the eye throughout surgery. A transpalpebral incision is made around the orbit, leaving as much normal tissue as possible. The incision is generally 1 cm from the margin of the eyelid. The ventral incision and subsequent dissection are done first. Sharp or blunt dissection is used for 360° around the orbit continuing down to the caudal aspect of the orbit, but avoiding entrance through the palpebral conjunctiva. All muscles, adipose tissue, the lacrimal gland, and fascia are removed, along with the eyelids and eyeball. If the indication for enucleation is neoplasia, then one must make sure that all neoplastic tissue is removed. If the eye is enucleated for a non-neoplastic condition, such as irreparable trauma, then the surgeon can afford to leave some of the retrobulbar tissue, to reduce the amount of dead space and intraoperative hemorrhage.

The optic artery may be ligated; but most surgeons would consider that unnecessary as hemorrhage is controlled by tight skin closure and subsequent pressure as the orbit fills with blood in the dead

space, which is impossible to obliterate. The cavity fills with a blood clot that will organize during the healing period and will leave a large depression in the orbit.

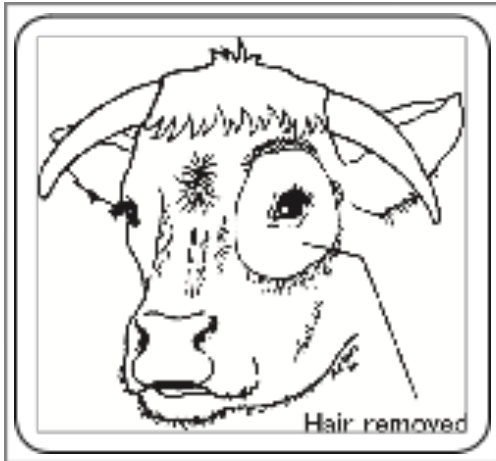
Closure consists of a layer of continuous interlocking sutures in the skin using synthetic nonabsorbable suture material. Sutures are removed 2–3 weeks postoperatively. The tight seal with a skin suture seems to allow pressure to build up within the orbit and to create hemostasis through a tamponade effect. Some surgeons prefer to use an absorbable suture in the skin, to obviate the need for suture removal; this would be useful on the range, where it may be impractical to round up the animal for suture removal

Postoperative Care

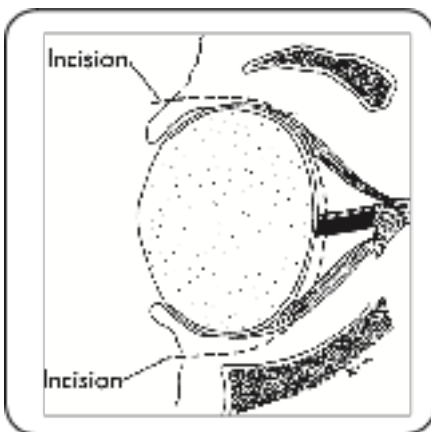
- A. Wipe the orbital area free of blood.
- B. Administer a one-time dose of systemic antibiotics if deemed prudent. Tetanus antitoxin may be considered.
- C. Protect the patient from harsh environmental elements and from other cattle for at least several days.
- D. Postoperative analgesics are indicated.

Complications and Prognosis

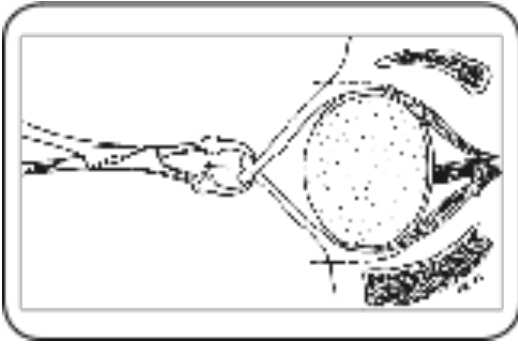
Complications of this procedure include extensive hemorrhage from the optic artery, infection, dehiscence, recurrence of disease, and convulsions due to inadvertent injection of lidocaine into the meningeal reflection of the optic nerve while performing the retrobulbar block.¹¹ Orbital infections following enucleation in a field setting may be common but recurrence of squamous cell carcinoma has not been found to occur frequently. The prognosis for this procedure is generally good but varies with the presenting disease.



Surgical area to be clipped and scrubbed

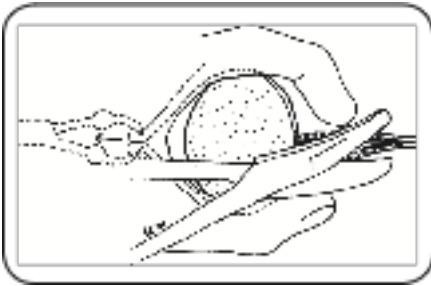


Side view of proposed periconjunctival incisions.



tissue are being incised.

Traction applied to lids while skin and periconjunctival



Traction applied in a postglobal transection.

Video Resource - Video of Enucleation surgery

<https://www.youtube.com/watch?v=N4m5GooXLvI&pbjreload=10>