

ENUCLEATION/EXENTERATION



BASICS

OVERVIEW

- Enucleation is the surgical removal of the eye leaving the adjacent eye muscles and remaining orbital contents intact.
- Exenteration is the surgical removal of all the contents of the eye socket, including the globe, fat and muscles.
- Although farm animal practitioners often refer to this procedure as “eye enucleation”, the actual approach taken is an exenteration.
- Most common indications for exenteration are: traumatic injuries to the head (ex. globe rupture), squamous cell carcinoma (SCC), retrobulbar lymphosarcoma and, severe pink eye (IBK, infectious bovine keratoconjunctivitis).
- The surgical procedure is most often performed in a standing cattle chute using a halter restraint followed by local anesthesia. Patient sedation is recommended for unruly or fractious animals.
- Typically, ruminants do very well with one eye, however, the farmer should expect a period of herd adaptation.
- If ocular neoplasia is suspected, a complete physical examination should be performed to determine metastatic lesions elsewhere. Findings may help the practitioner decide on surgical options and associated prognosis for survival, return to productivity, and potential risk of condemnation at slaughter.
- It is imperative to mention that cattle sent to slaughter without an eye or with severe neoplastic lesions with orbital involvement and or associated lymphadenopathy, are most likely to be condemned for human consumption. In cases like this, for welfare reasons, euthanasia must be recommended.

SIGNALMENT

- All ruminants of all ages and breed can be affected.
- Adult ruminants are more often affected with ocular and or periocular tumors. Squamous cell carcinoma and lymphosarcoma are the most common orbital tumors in cattle.
- Periocular white pigmented areas predispose to SCC growth. White faced breeds are thought to have increased risk of SCC due to their white pigmented periocular tissues. Genetic manipulation allows the selection of dark pigmented genes.
- Ruminants on pasture or dry lots are more likely to be affected by SCC, IBK, and trauma.

SIGNS

- Clinical signs associated with trauma, such as, eyelid lacerations, periorbital swelling, corneal ulceration, and or rupture of the globe.
- Masses or growths on the globe, nictating membrane (3rd eyelid) and or upper/lower eyelids.
- Exophthalmos followed by exposure keratitis or proptosis
- Epiphora

ANESTHESIA AND RESTRAINT

- Livestock chute system plus a halter are typically sufficient. Appropriate stabilization of the head must be achieved.
- Sedation is not typically necessary but when needed, the author recommends one of the following protocols: Xylazine at 0.05 – 0.1 mg/kg IV, using the coccygeal vein or a combination of Xylazine at 0.05 mg/kg and Butorphanol at 0.02 mg/kg IV. “Ket-Stun” technique can also be used by adding 0.1 mg/kg of Ketamine to the Xylazine + Butorphanol combination.
- Single retrobulbar, Peterson and “4 point” retrobulbar local nerve blocks are some of the techniques available for local anesthesia, and it is the practitioner’s choice on a case by case basis.
- Single retrobulbar block: An 18-gauge, 6-inch needle is bent into a half circle and inserted through the skin at the center of the dorsal orbit. The needle is then advanced slowly along the bone to its apex. Ten to twenty (10-20) milliliters of 2 % lidocaine HCL is injected.
- Peterson block: An 18-gauge, 6-inch needle is placed through the skin at the notch formed by the zygomatic arch and the supraorbital process caudal to the globe. The needle is advanced slightly caudally until the coronoid process of the mandible is encountered. The needle is then walked rostrally off the process and advanced into the pterygopalatine fossa. Ten to twenty (10-20) milliliters of 2% lidocaine HCL is injected slowly.
- “4 point block”: Easier technique compared to the other two, using an 18-gauge, 1 ½ inch needle, five (5) milliliters of 2% lidocaine HCL is injected at on the dorsal, lateral, ventral and medial aspects of the eye, at 12-, 3-, 6-, and 9-o’clock positions, respectively.
- Lidocaine toxicity must be taken into consideration, especially in small ruminants and calves. Six to twelve (6-12) mg/kg, averaging 10mg/kg is a conservative target. If volume is needed, diluting the 2% lidocaine HCL with sterile saline to 1% is always a doable option.
- A recommended meat withdrawal of 4 days and milk withdrawal of 72 hours after subcutaneous 2% lidocaine infiltration.

SURGICAL TECHNIQUE

- Standard surgical preparation with hair clipping and aseptic scrubbing is performed.
- A continuous suture pattern or a Backhaus (towel) clamp can be used to bring both eyelids together.
- A transpalpebral technique is used by making an elliptical incision 0.5 to 1 centimeter from the eyelid margins through skin to the subcutaneous tissues, but not through the conjunctiva. The practitioner must pay attention to this initial incision, as incising far from the eyelids will make closure difficult at the end of the procedure.
- A plane of dissection is determined by palpating the orbit. Using Mayo scissors and a new scalpel blade the ocular muscles are severed starting at the lateral aspect of the orbit and working medially. Always following the bony orbit aiming medially (to the back of the eye).
- NOTE: excessive and extensive hemorrhage will occur, do not try to stop the hemorrhage, but rather work quickly to finish the procedure. The goal is to sharply transect the optic nerve and free the globe from the orbit, as quickly as possible
- The practitioner must ensure the lacrimal gland is removed to minimize post-operative complications.

- Rapid closure of the skin with a number 1 or 2 polypropylene or equivalent non-absorbable suture in a tight continuous suture pattern (ex. Ford interlocking) is used.
- Prior to closure the author recommends to pack the wound with a roll gauze (NOT 4x4 gauze), leaving a tag at the end, with the goal to help with hemostasis while suturing. The roll gauze must be removed prior to finishing the pattern.
- Drains, bandages or pressure bandages although not generally recommended, may be required in some cases.

POSTOPERATIVE CARE

- Always allow time for the animal to adapt to the herd and its surroundings. the author recommends keeping the animal confined to a small paddock or stall until sutures are removed.
- Human and animal safety must be observed.
- Broad-spectrum antimicrobial therapy is typically recommended but not necessary.
- Procaine Penicillin G (22,000 IU/kg IM), Florfenicol (40 mg/kg SC), Oxytetracycline (9 mg/lb SC-IM) or Ampicillin (5 mg/lb IM) are commonly recommended.
- Antiflammatory therapy should be used for analgesic purposes. Flunixin meglumine (1.1 mg/kg IV, once), Meloxicam (1mg/kg orally followed by 0.5 mg/kg q24hr or 0.5mg/kg SC or IV once), Carprofen (1.4mg/kg SC or IV once) or ketoprofen (3.3mg/kg IM q24hr) are appropriate.
- Skin sutures should be removed in 14-21 days.

EXPECTED COURSE AND PROGNOSIS

- Prognosis is good in cases of trauma, IBK, or neoplasia with clean margins.
- If neoplasia with bone infiltration is suspected, prognosis is poor to grave.
- Extended therapy and or wound management may be needed if infection occurs during the healing process.

PRECAUTIONS

When recommending antimicrobial and anti-inflammatory therapy, the practitioner must observe the type of production animal and follow the product label, beef or dairy quality assurance program guidelines, regional drug-use regulations, and milk and meat withdrawal times.



MISCELLANEOUS

ASSOCIATED CONDITIONS

Squamous cell carcinoma, infectious bovine keratoconjunctivitis, corneal ulceration, lymphosarcoma of the peripheral lymph nodes.

AGE-RELATED FACTORS

Adult ruminants are more often affected by ocular neoplasms.

ZOONOTIC POTENTIAL

N/A

PREGNANCY

Reproductive status may influence owner decision to pursue surgical treatment.

BIOSECURITY

All instruments used must be properly washed and autoclaved as transmission of diseases such as BVDV and BLV may occur via blood contamination. The same reasoning applies to the use of clean gloves between patients.

PRODUCTION MANAGEMENT

- Genetic selection of animals (breeds) with pigmented peri-ophthalmic tissue is recommended.
- Effective fly control during fly season is advantageous and strongly advised to reduce IBK
- Overall environmental hygiene and cleanliness is suggested, as well as appropriate pasture management.

SYNONYMS

N/A

SEE ALSO

- Anesthesia: Local and Regional
- Corneal Disorders
- Prudent Use of Antimicrobials (www.fiveminutevet.com/ruminant)
- Squamous Cell Carcinoma
- Wound Management

ABBREVIATIONS

- BLV = bovine leukemia virus
- BVDV = bovine viral diarrhea virus
- IBK = infectious bovine keratoconjunctivitis
- IM = intramuscular
- IV = intravenous
- SC = subcutaneous
- SCC = squamous cell carcinoma

Suggested Reading

Schulz KL, Anderson DE. 2010. Bovine enucleation: A retrospective study of 53 cases (1998-2006). *Can Vet J.* Jun;51(6):611-4.

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Irby, N.L. 2004. Surgical Diseases of the Eye in Farm Animals. In *Farm Animal Surgery*. Fubini, S.L., Ducharme, N.G. (eds) Saunders, St. Louis MO. pp. 429–459.

Author Ricardo M. Stockler

Consulting Editor Kaitlyn A. Lutz

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