Field Surgery of the Eye and Para-Orbital Tissues

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KEYWORDS

• Ocular • Surgery • Eye • Bovine

Ocular disease and injury remain a common occurrence in cattle. In many instances medical management is sufficient for resolution and amelioration of clinical signs. In selected cases, surgical intervention is required. Fortunately, field surgery remains a viable option for most cases of bovine ocular disease. While the surgical techniques are not new, thorough physical examination, proper preparation of the patient, appropriate perioperative management, and good surgical technique will assure the best results possible.

OCULAR EXAMINATION

Diagnosis

A thoroughly performed systematic physical examination and ocular examination of the cow is vital to determining the correct diagnosis and extent of disease (**Fig. 1**). These examination findings will dictate the potential surgical options and associated prognosis for survival, return to productivity, and risk of subsequent condemnation at slaughter. Factors such as age, pregnancy status, and economic value influence the owner's decision regarding treatment.

Restraint

Proper restraint will allow for a thorough examination of the eye. For most cattle a chute with halter restraint is sufficient; however, mild sedation may be required in some cattle. Care must be taken in dosing sedation as to avoid recumbency in cattle and abortion in pregnant cows. Use of local anesthesia (eg, Lidocaine HCl) to induce regional anesthesia of the eye by sensory and motor blockade greatly facilitates examination and treatment.

Motor Blockade of Upper Eyelid

Motor blockade of the associated eyelid musculature and sensory blockade of corneal nerve endings can greatly enhance the ease of examination. Motor innervation to the upper eyelid musculature can be blocked via an auriculopalpebral nerve block. This is

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Fig. 1. Adult angus bull with panuveitis and corneal abscess secondary to trauma. (*Courtesy of* David Adams, Manhattan, KS and David E. Anderson, DVM, MS, Manhattan, KS.)

accomplished by infiltrating 5 mL to 6 mL of a 2% lidocaine solution into the subcutaneous tissue along the dorsal aspect of the zygomatic arch roughly 5 cm to 6 cm caudal to the frontal process of the zygomatic bone (ie, caudal to the lateral canthus of eye).

Sensory Blockade of Cornea

Sensory blockade of the corneal surface will also aid in examination of the eye. Administering 3 to 5 drops of proparacaine (1%) ophthalmic solution topically to the corneal surface of the eye will reduce corneal sensation.

Examination

The extent of ocular examination will be dictated by the clinical signs present. Fluorescein stain can be used to detect the presence of corneal ulcers. Intraocular disease will require the use of an ophthalmoscope and topical instillation of drops to dilate the pupil. Any masses visible within the lid margins, third eyelid, conjunctiva, or sclera should be palpated with a gloved and lubricated finger to determine degree of infiltration into adjacent periorbital structures. The third eyelid can be grasped with an atraumatic forcep to facilitate exteriorization and examination of the base of the nictitating membrane.

PATIENT SURGICAL PREPARATION

Restraint

Proper restraint is essential for surgical manioulation of the eye and para-orbital tissues. Most bovine field surgeries can be performed with the patient standing in a chute or head catch, with the head securely restrained in a head catch with a halter or some type of head board restraint.

Surgical Site Preparation

Infection of the surgical site is one of the most common complications of ocular surgery done when done in field settings. Care must be taken to reduce the risk of contamination to the planned surgical site. The hair should be clipped, the skin disinfected with solutions such as betadine or chlorhexadine, the ear should be draped, and the lateral portion of the halter covered to decrease contamination to the surgical site. Saline rinse rather than alcohol should be used between the disinfectant scrubs to prevent irritation and damage to the cornea. An ophthalmic ointment should be placed on

the cornea before aseptic preparation to further protect the cornea from damage in cases other than enucleation.

ANESTHESIA

Sedation

Appropriate sedation as described previously may be warranted in certain cattle. The author most often uses xylazine (0.05 mg/kg body weight intravenously or IV) and butorphenol (0.02 mg/kg IV) for standing restraint. Addition of dissociative doses of ketamine (0.1 mg/kg IV) aids in management of fractious patients and these three drugs in combination have been referred to as a ''Ket-Stun'' technique.

Local Anesthesia

Local anesthesia to the intended surgical site will assure comfort on the part of the cow undergoing the procedure, as well as ease in handling for the surgeon.

Nerve Blocks

The nerve blocks outlined below are described in several text books.[1–7] Reasons for choosing one block over the other should include the surgeon's comfort and skill at performing the blocks, the disease process present, and the knowledge of the risks associated with each block. While the Peterson eye block is considered more technically challenging, it is associated with less risk of trauma to the orbit with regards to penetration of the globe, hemorrhage, and damage to the optic nerve. However, there are risks of neurologic signs or death because of cardiopulmonary arrest if lidocaine is injected into the optic nerve meninges or nasal turbinates. The 4-point block is technically less challenging to perform and appears to yield better anesthesia of the periocular tissues. While there is risk of intrameningeal injection, the authors' clinical experience has shown it to be less of an issue than with the Peterson nerve block.

Auriculopalpebral Nerve Block

Surgical manipulation of the eye is facilitated by nerve blockade of the eyelids. Auriculopalpebral nerve block can be placed to reduce upper eyelid movement before performing a Peterson or retrobulbar block. The auriculopalpebral nerve can be palpated as it crosses the zygomatic arch, roughly 5 cm to 6 cm behind the supraorbital process. Inject 5 mL of 2% lidocaine HCl subcutaneously on the dorsal aspect of the zygomatic arch at this location.

Peterson Nerve Block

After performing a small local skin block over the intended site of puncture, a 3.8-cm long, 14-gauge needle is inserted through the skin as a cannula for introduction of an 18-gauge, 9-cm long needle for the nerve block. The cannula is inserted caudal to the junction of the supraorbital process and zygomatic arch and is introduced through the skin. Then, the 18-gauge, 9-cm long needle is introduced through the cannula needle and is directed in a horizontal and slightly dorsal direction until the coronoid process is encountered. The needle is ''walked off'' the rostral aspect of the coronoid process and advanced in a ventromedial direction along the caudal aspect of the orbit until the needle encounters the bony plate encasing the foramen orbitorotundum. Once the needle is advanced to the foramen, it is advised that the needle be drawn back a few millimeters to reduce the risk of intrameningeal injection. After aspirating to assure the needle is not in the internal maxillary artery, 10 mL to 15 mL of lidocaine (2%) is deposited, with an additional 5 mL of lidocaine deposited as the needle is slowly withdrawn. Mydriasis indicates a successful block.

4-Point Retrobulbar Nerve Block

The 4-point retrobulbar block is technically easier and can be done more rapidly as compared with the Peterson eye block. In this technique, an 18-gauge, 9-cm long needle is introduced through the skin on the dorsal, lateral, ventral and medial aspects of the eye, at 12-, 3-, 6-, and 9-o'clock positions, respectively. Introduction of the needle through the conjunctiva should be avoided to reduce the occurrence of ocular contamination. The needle is directed behind the globe using the bony orbit as a guide. When the needle is introduced into retrobulbar sheath, the eye will move slightly with the tug of the needle. After this location is reached and aspiration is performed to assure that the needle is not in a vessel, 5 mL to 10 mL of lidocaine (2%) is deposited at each site. Mydriasis indicates a successful block.

Retrobulbar Block

An alternative to the 4-point retrobulbar block is the single retrobulbar block (**Fig. 2**). In this technique, the 9-cm long 18-gauge needle is bent into a half circle. The needle is inserted immediately ventral to the dorsal orbital rim and directed such that the needle impacts into the bone of the orbit. Then the needle is advanced as it is rotated ventrally in a progressive manner, such that the needle remains in close proximity to the bone. After the needle is inserted to the caudal aspect of the eye, 20 mL of 2% lidocaine HCl is administered after aspiration to ensure that the needle is not positioned in a vessel or other fluid structure. Successful deposition of lidocaine causes mild proptosis of the globe.

Ring Block

Additional local anesthesia of the eyelids is recommended as the Peterson and retrobulbar blocks typically result in incomplete analgesia of the eyelids. Five to 10 mL lidocaine (2%) is infiltrated subcutaneously 2.5 cm from the eyelid margins as a ring block.

Lidocaine Toxicity

Particular care should be taken in young calves not to exceed the toxic dose of lidocaine (10 mg/kg). This calculates out to 50 mL of 2% lidocaine per 100 kg of body weight (50 mL per 220 lbs body weight). Dilution of 2% lidocaine in saline can facilitate ease of distribution when restricted amounts are necessary.

Fig. 2. Local anesthesia applied using a 3.5-inch 18-gauge needle bent into a half-circle for injection of lidocaine extensively in the retrobulbar space. (*Courtesy of* David Adams, Manhattan, KS and David E. Anderson, DVM, MS, Manhattan, KS.)

PERIOPERATIVE MANAGEMENT

Anti-Inflammatory and Analgesic Therapy

The disease process and degree of invasiveness will determine the degree of anti-inflammatory therapy required. Flunixin meglumine (1 mg/kg IV) immediately before surgical excision usually is adequate for enucleation procedures; however, further anti-inflammatory management may be warranted depending on the disease process and extent of excision.

Antibiotic Therapy

Because of the typical field conditions present during enucleation procedures, broad spectrum systemic antibiotic therapy is indicated. The disease process will dictate the duration of antibiotic therapy. Although there have been no publications regarding the placement of intraorbital suspensions or boluses, clinical observation of abscess with drainage after this practice cautions against the use of any material that may act as a future nidus of infection or that may cause inflammation or exacerbation of pain because of caustic or chemical effects. Systemic antibiotics combined with general surgical asepsis are likely to be the most efficacious therapeutic option.

SURGICAL TECHNIQUE

Suture

Absorbable sutures (eg, polyglecaprone No. 0) should be used for any ligation or subcutaneous procedure. Skin should be closed with an appropriately sized nonabsorbable suture (eg, nylon No. 3 or polymerized caprolactam No. 6) placed in a Ford-interlocking suture pattern or tension relieving suture patterns (eg, cruciate pattern).

Enucleation

A transpalpebral ablation technique is used to remove the eye. The upper and lower eyelids are sutured closed or alternatively, eyelids can be closed using multiple towel clamps (**Fig. 3**). A circumferential skin incision is made approximately 1 cm from the edges of the eyelids (**Fig. 4**). Using a combination of blunt and sharp dissection, Mayo scissors are used to dissect through the orbicularis oculi muscle, fascia, and subcutaneous tissue surrounding the eye. The interior of the bony orbit is used as a guide. The medial and lateral canthal ligaments are sharply transected to allow access to the caudal aspect of the orbit. As there is a large vessel associated with

Fig. 3. Eyelids sutured closed using No. 2 PG-910 in a Ford interlocking pattern. (*Courtesy of* David Adams, Manhattan, KS and David E. Anderson, DVM, MS, Manhattan, KS.)

Fig. 4. Elliptic incision is made approximately 1-cm distant to eyelid suture margin. (*Courtesy of* David Adams, Manhattan, KS and David E. Anderson, DVM, MS, Manhattan, KS.)

the medial canthus, transection of the medial canthal ligaments is best left until necessary. Complete excision of orbital tissue is necessary in most cases of eye removal. The retrobulbar musculature and the optic nerve sheath should be transected as far caudally as feasible (**Fig. 5**). A vascular clamp can aid in hemostasis while additional excision of remaining orbital tissue is undertaken. In cases where neoplastic infiltration of the bony orbit has occurred, affected areas of ocular periosteum should be thoroughly excised. An orbitotomy may be necessary to remove affected areas of orbital bone; however radical resection of orbital bone and associated lymph nodes is an extensive procedure not recommended except in tertiary care setting.[8]

The skin incision can be closed in a variety of patterns with a nonabsorbable suture, such as No. 3 nylon. Common patterns include the Ford interlocking, cruciate, or simple continuous (**Fig. 6**). An interrupted suture should be placed in the medial canthal portion of the skin closure to allow for facilitation of drainage if necessary.

If a cosmetic result is desired, a ''trampoline'' suture can be employed to reduce the hollow appearance of the orbit. However, it is not recommended in cases where there is periorbital infection or neoplasia present. Placement of a trampoline suture is done by grasping the periosteum on the dorsal and ventral rim of the orbit using a simple continuous pattern with No. 2 polypropylene or equivalent nonabsorbable suture.

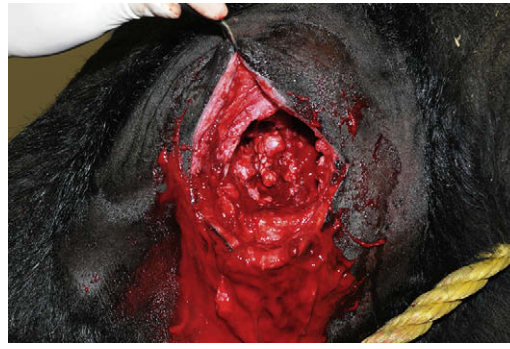

Fig. 5. Empty orbit after excision of globe. Optic pedicle has been ligated using No. 2-0 PG-910. (*Courtesy of* David Adams, Manhattan, KS and David E. Anderson, DVM, MS, Manhattan, KS.)

Fig. 6. Skin sutured closed using No. 6 Nylon in Ford interlocking pattern. (*Courtesy of* David Adams, Manhattan, KS and David E. Anderson, DVM, MS, Manhattan, KS.)

The sutures are tightened to allow for support of the overlying ocular skin. The skin is subsequently sutured using a Ford interlocking, cruciate, or simple continuous pattern and No. 2 or No. 3 nylon suture. The skin sutures are removed routinely in 14 to 21 days, leaving the underlying trampoline sutures in place as a permanent support.

POSTOPERATIVE CARE

The animal should be kept in a confined area for several days after surgery to allow for appropriate hemostasis to occur. Daily observation of the surgical site and assessment of general well being is recommended until suture removal. Sutures should be removed in 14 to 21 days to allow for complete healing of the skin.

Postoperative Complications

Postoperative complications can include simple incisional infection, orbital infections, dehiscence of the suture, significant infections of the periorbital tissue, or progression of neoplasia into bone or regional lymph nodes. Cattle often demonstrate pruritis after surgery, which can lead to incisional dehiscence because of head rubbing. If purulent drainage is noted during the course of healing in an enucleation procedure, the medial interrupted suture may be removed and the cavity flushed with a dilute disinfectant solution daily until resolution of the orbital infection. Antibiotic therapy is recommended if systemic signs of infection are noted.

H-BLEPHAROPLASTY

For invasive eyelid lesions where greater than one-third of the lower eyelid is involved, straightforward surgical excision of the mass is not advised. A sliding skin graft procedure, the H-blepharoplasty can be performed in these cases to remove the affected tissue and create a functional lower eyelid margin.[9] The procedure is relatively easy to perform in selected candidates.

Two full thickness skin incisions are made perpendicular to the eyelid margin on either side of the mass, extending beyond the mass approximately the length of the mass. A full thickness skin incision parallel to the eyelid margin is made at the base of the eyelid mass, connecting the two initial vertical skin incisions, thus creating an H shape. Two equilateral triangular pieces of skin exterior to the intended graft are then removed, extending from the horizontal crossbar to the base of the vertical incisions of the graft to allow for movement of the graft toward the eyelid margin. The

mass is excised from the underlying subcutaneous tissue via dissection using Mayos or Metzembaum scissors. To create the sliding graft, the base of the H is then dissected free from the underlying subcutaneous tissue. The graft is placed in alignment with the original vertical skin incisions and the eyelid margin. The graft is sutured to the skin incisions using a nonabsorbable suture in an interrupted pattern. The eyelid margin is typically left to heal by second intention.

Sutures are removed in 14 to 21 days and care is taken to assure the animal does not excessively rub the surgical site during the healing period.

RETROBULBAR FAT PAD REMOVAL

Prolapse of the retrobulbar fat pad is an uncommon but relatively striking disorder diagnosed by visual appraisal and digital examination. If surgical intervention is required, either because of aesthetics or visual compromise, the fad pad is easily removed with the aid of an auriculopalpabral nerve block and topical anesthetic. After appropriate restraint and anesthesia, a small incision is made through the conjunctiva enveloping the retrobulbar fat. The fat is excised using a Mayo scissors. If possible, the ensuing rent in the conjunctiva can be closed using small absorbable suture in a simple interrupted or continuous pattern (eg, polyglycolic acid No. 3-0).

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