

A Case Report of Entropion in the Bull

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Introduction

Entropion is inversion of the eyelids, which typically results in trichiasis or margins of haired skin contacting the cornea. This is a common condition in cats, dogs, and small ruminants, but a rare occurrence in cattle.¹ There are many potential causes of entropion influencing the age of presentation including: developmental or genetic, pain induced, and acquired.² This condition can be very uncomfortable for the animal and has the potential to cause further lifelong issues, such as, severe corneal ulceration, corneal rupture, corneal scarring, or loss of the globe itself.

Entropion can affect both production and reproduction, through discomfort and decreased vision. Corneal ulceration, a potential consequence of entropion, can lead to continued pain, loss of vision, and loss of the globe. Loss of the globe is not ideal for any individual; however, for livestock it can affect their production ability. Two visual eyes are required to pass a breeding soundness exam, since a decrease in vision can lead to inadequate estrus detection within a herd.

History and Presentation

Trooper is a 2-year-old Brahman bull that presented to the Mississippi State Food Animal Service on April 10, 2018 for a 2-week history of epiphora and blepharospasm. None of the other cattle on the farm were exhibiting similar clinical signs. Trooper was previously shown, and he had been healthy up to this point. According to the owner, he does have a habit of rubbing his head on wooden posts in the pasture. His referring DVM attempted treatment for presumptive pink eye with oxytetracycline, anti-inflammatories, and an eyepatch, without resolution of his clinical signs. Trooper's intended use was as a breeding bull for his herd, thus proper vision was essential.

On presentation, Trooper's vital parameters were within normal limits with a heart rate of 40 beats per minute, respiratory rate of 20 breaths per minute, and a temperature of 101.8°F. He was blepharospastic in his right eye (OD) and had severe epiphora present. There was blepharedema present

both dorsally and ventrally OD. He was visual bilaterally with normal pupillary light reflex (PLR), palpebral reflex, and menace response. He also had numerous, large, firm subcutaneous nodules present on both sides of his neck from previous injections. The rest of his physical exam was within normal limits.

Proparacaine, a topical anesthetic, was applied OD to facilitate a thorough ophthalmic examination of the eye. This pain relief helped to partially resolve the entropion, which allowed visualization of the globe. The portion of the entropion that resolved was suspected to be spastic in nature due to the presence of a corneal ulcer and ocular pain. After the spastic entropion resolved, there was a thickened, scarred area noted along the lateral aspect of the inferior palpebral margin causing displacement of the eyelid margin toward the globe, which is indicative of cicatricial, or trauma induced, entropion. Complete resolution of the entropion after application of the topical anesthetic did not occur, further supporting that the cause of the entropion was more than just spastic in nature. Additionally, a superficial, ventrolateral corneal ulcer present OD was found measuring approximately 7 by 3mm in diameter. It was surrounded by corneal vascularization and corneal edema. There was pale pink area of granulation tissue present on the ventral aspect of the ulcer presumptively due to continuous irritation from trichiasis.

Our history and ophthalmic exam led us to believe that Trooper's entropion originated from a wound that he incurred on his inferior palpebra while rubbing his face on a wooden post in his pasture. The wound was not treated and the edges of the palpebral margin healed in improper alignment, leading to eyelashes contacting the globe. This wound contracted, bringing the eyelid into closer association with the globe, which led to trichiasis. This trichiasis caused corneal irritation leading to spastic entropion and even more corneal contact with the haired skin. This contact led to corneal ulceration that could not heal appropriately due to the constant hair rubbing.

Pathophysiology

Entropion occurs when the palpebra, usually the inferior, rolls inward toward the eye causing trichiasis, or eyelash contact with the cornea.² It can occur along the entire length or part of the palpebra and may be unilateral or bilateral. Potential signs of entropion include epiphora, blepharospasm, and corneal ulceration with potential for secondary infections.

There are many types of entropion including conformational, spastic, and cicatricial. Entropion can also be caused by an alteration in globe position or a decrease in globe volume. Alteration in globe position would be indicative of a severe alteration in fatty tissue deposition behind the eye.² A decrease in globe volume, i.e. phthisis bulbi or microphthalmia, results in entropion due to decreased pressure on the palpebral margins allowing them to roll inward.

Developmental entropion is most common in sheep and dogs. It tends to be bilateral and heritable. There is the potential for involvement of the superior palpebra of animals that have excessive folds of skin surrounding their eyes, such as Shar-peis, bull dogs, and blood hounds.² For felines, Persians are believed to be predisposed.³ Entropion appears to be hereditary in sheep; therefore, lambs of affected adults should be monitored closely and be considered for culling.

Entropion due to trauma to part of the eyelid, resulting in scarring or contracture, is known as cicatricial entropion. This occurs when there has been a previous surgical procedure, laceration, chronic inflammation, or other trauma to the margin of the palpebra and it does not heal properly.⁴ Portions of or the entire eyelid margin constricts inward allowing the eyelashes to contact the cornea. This can occur with ectropion overcorrection, as well as improper eyelid laceration repair or failure to repair an eyelid laceration if there is excessive scarring or contracture.

Spastic entropion occurs due to marked contraction of the orbicularis oculi muscle resulting from pain within the globe or surrounding tissues. It commonly worsens the other causes of entropion,

particularly cicatricial or traumatic, due to the associated pain.³ This is why it is important to treat concurrent issues prior to permanent entropion correction. Spastic entropion can be ruled out by applying topical anesthetic, such as proparacaine, to the eye. Entropion can also be temporarily corrected in order to allow for resolution of spastic entropion, using methods that will be discussed later.

There are numerous methods for correcting entropion with some being permanent and others being temporary. Repair technique selection depends on the cause of the condition. A major consideration for treatment includes resolution of the spastic component. This is especially important prior to permanent corrections, otherwise overcorrection could result in ectropion. Another essential consideration is that facial maturity is achieved before performing hereditary entropion correction because the individual is still growing and could fill in their excess skin.

Temporary correction measures prevent continuous trauma to the globe while the animal grows or while the underlying cause of entropion is resolved. A common temporary correction measure is placing stay sutures or staples to retract the inferior palpebra. The sutures/staples are placed from the junction of the haired and non-haired area of the inferior palpebral margin to a ventral location near the orbital rim that provides adequate retraction of the palpebral margin².

Permanent correction techniques are not reversible, and the degree of eyelid rotation tends to increase as fibrosis occurs during healing. A permanent correction method that has been utilized in many lamb production systems is subcutaneous injection into the inferior palpebra.² This alters the eyelid alignment by causing inflammation and fibrosis in the inferior palpebra to rotate the margin superficially.² This method is not recommended due to the increased risk of infection and very inconsistent results. Wedge resection is a permanent correction method, which involves removing a full thickness section of tissue from the margin of the lid. This segment needs to come to a point ventrally to

allow for proper alignment of the lid margin. Wedge resection is commonly used with euryblepharon (elongated palpebral margins) or cicatricial entropion to remove the section that is causing irritation.² If possible, it is best to remove the wedge near the lateral canthus.⁴ This will ensure any scar that forms will overlie the sclera rather than the cornea, preventing interference with vision. However, with proper alignment during closure of the wedge resection, it is unlikely to result in significant scarring that would cause irritation.

The Hotz-Celsus technique is the most common surgical correction technique used for permanent repair of the entropion. It is performed by making an incision parallel to and just ventral to the inferior palpebral margin, allowing the best chance of adequate eversion. A slightly elliptical incision is made ventral to the initial incision. The widest gap should be at the area of most severe entropion and it should taper to a point where the incisions meet. The deep margin of the segment removed should be wedge shaped. There is conflicting evidence regarding including part of the orbicularis oculi muscle in the resection.^{2,3,4} The evidence is unclear whether including this muscle in the resection creates unnecessary morbidity, or if it helps to ensure adequate correction. The resulting defect from the tissue resection should be closed in a simple interrupted pattern, ensuring proper alignment. This can be combined with a lateral wedge resection or lateral canthus closure to address potential euryblepharon^{4,5}. This technique is commonly used in small animals to reduce the likelihood of requiring a second surgery.

Considerations

Corneal ulcers commonly occur along with entropion due to continuous friction of eyelashes rubbing on the cornea. However, entropion is a rare cause of corneal ulceration in cattle. Corneal ulcers much more commonly have an infectious etiology, with the most common organisms being *Moraxella bovis* (Infectious Bovine Keratoconjunctivitis) and bovine herpes virus.

The mechanism for ulcer formation with entropion is that a small abrasion to the cornea, that would normally be able to heal on its own, becomes an ulcer due to the constant irritation from trichiasis. Corneal ulcers are more likely to become deeper, chronic ulcers when the underlying cause is not addressed. Regardless of the cause of the ulcer, intervention is required to relieve corneal irritation and allow the ulcer to heal. Handling cattle in a production system can be difficult; therefore, treatment methods that require minimal handling are preferred.

A third eyelid flap is a method that can protect the cornea, prolong topical medication contact with the globe, and allow the ulcer to heal.² The downfall of this procedure is that you are not able to see the ulcer or apply additional topical medications during this time, which can lead to undetected worsening of the ulcer. An eye patch is commonly used in cattle to prevent further damage to an ulcerated eye, but it is not an acceptable option with entropion because it does not address trichiasis. A temporary tarsorrhaphy can be performed in order to align the eyelid margins and prevent irritation from spastic entropion.² Tarsorrhaphies have a lower risk of causing corneal damage when compared to third eyelid flap because the sutures do not contact the conjunctiva. The deepest that the sutures should go is to the margin of the palpebral fissure. Temporary tarsorrhaphies offer similar concerns as the third eyelid flap because the cornea cannot be visualized while the eyelids are closed; however, topical medications may be applied if the medial canthus area is left open. If the ulcer heals, the spastic portion of the entropion should resolve. The eye can then be re-evaluated to determine if a more permanent entropion repair is necessary.

If it is determined that the initial permanent correction surgery did not provide adequate retraction of the palpebral margin, either the third eyelid flap or a temporary tarsorrhaphy may be used to provide retraction while the surgical site heals. It is important that any follow up or revision surgeries are delayed for 4 to 6 weeks after the surgery to allow for healing maximal contraction to occur. The patient will be at an increased risk of ectropion if surgery is pursued sooner.²

Treatment and Management

After the initial examination on April 10, #2 Braunamid was used to place two tacking sutures in the inferior palpebra OD to retract the lashes from the cornea to encourage the ulcer to heal. He was started on Atropine Sulfate 1% ophthalmic ointment every 24 hours to assist with pain relief by paralyzing the ciliary body due spasm that was occurring from corneal ulcer pain. Triple antibiotic ophthalmic ointment containing bacitracin, neomycin, and polymyxin was started every 8 to 12 hours to provide broad spectrum antibacterial protection for his eye. He was given a 1.1mg/kg dose of flunixin meglumine intravenously for pain and inflammation management. Epiphora and blepharospasm continued the next morning, which showed that the tacking sutures were insufficiently retracting the eyelid.

The next day a third eyelid flap was placed OD using #2 Braunamid suture to protect the ulcer from both his eye lashes and environmental irritants. Atropine and triple antibiotic ointment were applied prior to placement of the flap but discontinued due to inability to apply directly to the globe. Application of Vaseline to his right cheek twice daily was implemented to prevent scalding and irritation due to the continuous, severe epiphora. Meloxicam was started for continued pain management at a tapering dose of 1mg/kg PO every 24 hours for 3 days followed by 0.5mg/kg orally every other day for 3 days. He received a 20mg/kg dose of Oxytetracycline subcutaneously on both April 11 and April 20, since this antibiotic can concentrate in the tear film and offered continued protection while it was not possible to apply topical medications.

The third eyelid flap was removed one week later. During the week under the flap, the corneal ulcer partially healed. Fluorescein stain was used to definitively diagnose the corneal ulcer and defined the diameter as approximately 2mm at that time. Trooper exhibited moderate pruritis during his stay in the clinic, so he was bathed during his time in hospital to remove any potential topical irritants and to

encourage him to stop rubbing his face as frequently to minimize trauma to his eye. He was also treated with a topical permethrin for potential undetected parasites.

Because the ulcer and significant entropion were still present, Trooper was sedated for entropion repair surgery on April 23 using a standing ketamine stun (0.01mg/kg Butorphanol, 0.02mg/kg Xylazine, and 0.04mg/kg Ketamine) and placed in the hydraulic chute with his halter tied to the head plate for restraint. An auriculopalpebral nerve block and a line block ventral to the lash line of the inferior palpebra, in the location of the proposed incision, were performed using 2% lidocaine for sensory and motor blockade of the eyelid. The Hotz-celsus technique was used to correct his entropion. A segment of epidermis and superficial dermis, approximately 6mm in diameter, was removed from the inferior palpebra. This width of resection was found to provide adequate retraction of the palpebral margin, so the resulting defect was closed using 0-Nylon suture in a simple interrupted pattern applied in a bisecting fashion. A temporary tarsorrhaphy was placed with 2-0 Nylon suture using segments of IV line tubing to support the sutures. The tarsorrhaphy was placed to prevent trichiasis from the remaining spastic entropion while the surgical site healed. This was a concern due to the presence of a corneal ulcer which was causing pain.

The temporary tarsorrhaphy was removed five days post-operatively because it was no longer sufficiently keeping his palpebral fissure closed and there was the potential for suture contact with the cornea. Upon removal, there was no visible ulcer remaining and his entropion was successfully corrected. His epiphora had ceased and he seemed very comfortable. His topical anthelmintic dosing was repeated two weeks after his initial dose to ensure adequate parasite treatment.

Case Outcome

Trooper's sutures were removed nine days post-operatively and he was discharged two days later. At this time, his incision and corneal ulcer were adequately healed, and entropion was fully corrected. Today he is doing well at home and has had no recurrence of issues with his eye.

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