Holy Cow! It's all in your head!

A Case Report of Frontal Sinusitis in Cattle

Jalin Myrick

Mississippi State University

College of Veterinary Medicine

Class of 2020

Clinicopathologic Conference

May 24th, 2019

Advisor:

Gretchen Grissett, DVM, MS, DACVIM

Introduction

Sinusitis is inflammation of the nasal sinuses. In ruminants, the frontal and maxillary sinuses are of the most clinical significance, in all they have six main paranasal sinuses including: lacrimal, sphenoid, conchal and palatine.[6] Most commonly frontal sinusitis is associated with dehorning complications. However, frontal sinusitis can also result from traumatic fracture or injury to the horn, horn tipping, bone sequestrum secondary to dehorning, facial fracture, *O. ovis* infection in sheep and goats, extension of neoplasia or actinomycosis, hematogenous, or extension of respiratory pathogens. Most cattle are routinely dehorned without concern to possible infection post-operatively. Risk factors for developing frontal sinusitis include age of the calf at the time of dehorning, cleanliness of the procedure, and environmental factors. Post-operatively, excessive dust, water, and flies should be minimized to prevent complications.

Common clinical signs of sinusitis include fever, lethargy, anorexia, exophthalmos, and nasal discharge. Diagnosing sinusitis is generally done based on history and clinical signs. However, radiographs and computed tomography (CT) are often indicated for severe cases. Treatment generally consists of sinus lavage, antimicrobial therapy, and sinus trephination in more chronic cases. Prognosis is fair to guarded depending on severity at time of diagnosis.

Patient History and Presentation

Diana (previously known as 753) an approximately one-year-old Beefmaster heifer presented to Mississippi State University Animal Health Center Food Animal Department on June 25, 2018 for dehorning site drainage. The dehorn was performed approximately one month

prior to presentation. Her sinuses were flushed with a chlorhexidine solution and florfenicol was administered subcutaneously by the owner. On presentation, she was bright, alert, and responsive with purulent material draining from her frontal sinuses through her previous dehorning sites. The area was aseptically prepped and a cornual nerve block was performed using 2% lidocaine. Her right and left frontal sinuses were lavaged with dilute povidone-iodine and the necrotic tissue was debrided and sequestered bone removed. Lavage and debridement were repeated every 48 hours until discharge. Diana was discharged on June 28th with instructions to monitor her dehorning sites and continue to clean and apply fly repellant as needed.

Approximately three weeks later, July 16, 2018, Diana returned to MSU-CVM Food Animal Department for continued purulent drainage from the dehorning sites and a swollen left eye. The owner admitted negligence regarding cleaning the dehorning sites for approximately one week prior to presentation. On presentation, she was depressed, but responsive. Additionally, her body condition score was 3 out of 9, approximately 30kg less than her previous exam. Her vital parameters were within normal limits with a temperature of 101.3 degrees Fahrenheit, pulse of 72 beats per minute, and respiration of 24 breaths per minute. Upon physical examination, she had severe mucopurulent discharge bilaterally from her nostrils and dehorning sites. She had marked exophthalmos and epiphora of her left eye.

Diagnostic Approach/Considerations

Based off Diana's physical examination, she was diagnosed with frontal sinusitis. Due to the chronicity of her disease, radiographs were performed to determine presence of a possible bony sequestrum, fluid, or possible concurrent disease process such as, dental disease, neoplasia, or osteomyelitis. Diana's radiographs revealed increased soft tissue opacities that superimposed

over the left frontal sinuses with horizontal lines of soft tissue opacity over the frontal sinuses. Exophthalmous of the left globe, as well as, thickening of the surrounding soft tissues were appreciated. These findings were indicative of the previous diagnosis of sinusitis.

Due to the severity of Diana's exophthalmos, an ophthalmic examination was performed. Fluorescein stain of her left eye revealed a superficial corneal ulcer in the ventral part of her eye. Cytology revealed no presence of bacteria and an increased neutrophil count. Superficial corneal ulcers can be caused by a primary infection, secondary to a systemic disease, or due to a traumatic event. Diana's ulcer was likely due to exposure from excessive swelling of her frontal sinuses. She was prescribed topical atropine ointment q12h OS and triple antibiotic ointment (neomycin, polymyxin B and bacitracin) q8h OD.

Pathophysiology

Sinusitis in cattle can be an acute or chronic disease process. Clinical signs can arise in as early as one week to many months after the time of infection. Generally, sinusitis is most often a disease process following amputation of the horns (dehorning).[1] Horns are made up of keratin, which is produced at the corium. These develop into buds, which transform into horns that attach to the periosteum of the bones over the frontal sinuses.[5] In calves approximately three to four months of age, the center cavity of the horns and the frontal sinuses communicate with one another, which is referred to as the cornual diverticulum. When horn amputations are performed beyond the point of communication, the frontal sinuses are exposed to the environment allowing possible skin and environmental contaminates into the sinuses. If bacteria have access to the sinuses, a thick mucopurulent discharge will accumulate in the sinuses, between the turbinates and into the nasal passages.[7] Treatment is warranted when the degree of severity of the sinusitis

prevents proper drainage of the sinuses. Common clinical signs of sinusitis include anorexia, lethargy, fever, frontal bone distortion, exophthalmos, abnormal posture, nasal discharge, and neurologic abnormalities. Severity of the clinical signs of sinusitis determine the extension and invasiveness of the treatment required for resolution.[1] Typically, sinusitis is a unilateral disease process occurring on either the left or right side. Diana was unique in that hers occurred bilaterally.

Generally, sinusitis secondary to dehorning complications culture *Truperella pyogenes*. Whereas, sinusitis due to other causes, such traumatic events or extension of respiratory disease, more commonly culture *Pasteurella multocida*.[1] Therefore, reasonable antibiotic choices include procaine penicillin and oxytetracyline. Ideally antimicrobials should be based on culture and sensitivity results. However, empirical antimicrobial therapy should be initiated immediately and altered based on culture results.

Timing and proper dehorning techniques are the best preventions for frontal sinusitis. Ideally horn amputation should be performed before the age of communication between the horn cavity and sinuses. Surgical dehorning or “cosmetic” dehorning has several advantages including: allowing dehorning to take place during fly season, minimizing risk of infection and hemorrhage, and short healing time. Disadvantages of this method include increased expense, increased surgical time, and the loss of drainage access due to the closure of the hole created during dehorning. In cases where an open dehorning technique is performed, caution should be exercised to control flies, rain, dust, and wind from entering the sinus cavity.[4] Patching of open dehorn sites with gauze has shown to decrease incidence of secondary infection.[3]

Treatment and Management

As previously stated, antimicrobial therapy should be started immediately after diagnosis. Penicillin is usually a good therapy to start due to its ability to treat *Truperella pyogenes*. Additionally, nonsteroidal anti-inflammatory drugs should be used for the control of pain and inflammation. Generally additional therapy is required for resolution of sinusitis with sinus lavage and drainage being the treatment goals. Sinus lavage, debridement, and removal of devitalized bone is a very frequent therapy used in acute sinusitis.[7]

In chronic sinusitis cases or cases with inadequate drainage, trephination of the frontal sinus is indicated. Trephination is the procedure of creating a hole in the skull directly into the sinuses to allow a drainage outlet for purulent material. Anatomy of the different compartments of the frontal sinuses is important for the proper placement of the trephine so that appropriate drainage of the sinuses can be achieved. Diana's trephine was placed 3 cm off midline to the left intersecting a line drawn between the orbits to access the turbinate portion of her frontal sinus. The rostral frontal sinus can be accessed just off midline and caudal to a line drawn between the orbits. To access the postorbital diverticulum, a hole should be made just above the temporal crest, 4 cm caudal to the dorsal rim of the orbit. Generally, the worse of the sinusitis can be found in the caudal part of the frontal sinus. This is due to the accumulation of contaminates and bacteria through the open dehorn site causing inflammation and thick mucopurulent drainage.[1] The animal should be adequately restrained and aseptically prepped for the procedure. Lidocaine is injected subcutaneously at the level of the anterior turbinate portion of the frontal sinus. Skin, muscle and other tissues should be removed. Using a Galt trephine, a hole approximately 2 cm in diameter should be cut into the bone to give access to the sinus.[2] At this time, it is generally recommended that a drain be placed to guarantee premature closure does not take place. Once appropriate placement of the trephine, sinus lavage is performed daily or every two days until

sinus drainage is resolved. Povidone-iodine solution diluted to 5% has shown to have better success than flushing the sinuses with saline alone.[7] Healing time is at least three to four weeks.[2] Diana's first sinus trephination procedure was performed on July 18, 2018 as described above, on the left side. Once a drain was placed, diluted povidone-iodine was used to flush the sinus. Diana's second trephination procedure was performed on July 26, 2018 on the right side. Her left side had begun to granulate and heal, however her right side began to worsen by increased mucopurulent drainage coming from her right horn base and right nostril. This trephination procedure was performed as described above, flushing the site every couple of days. Another hole was also cut into the anterior turbinate to allow adequate drainage through the sinus. After resolution of her sinusitis, a bilateral cosmetic dehorn was performed due to the presence of cornual tissue that was left after her first dehorn.

Case Outcome

Diana stayed in the care of MSU-CVM Food Animal Department through December 2018. Every 48 hours, Diana's sinuses were flushed to ensure proper drainage and adequate removal of debris. Her trephination sites healed, and her frontal sinusitis was officially resolved as of September, three months after presentation. No further complications with her sinuses were noted beyond that point and Diana was sold at auction.

References

1. Anderson, David E., and Guy St. Jean. “Surgery of the Upper Respiratory System.” *Veterinary Clinics of North America: Food Animal Practice*, vol. 24, no. 2, 2008, pp. 319–334., doi:10.1016/j.cvfa.2008.02.003.
2. “Chapter 2 Head and Neck Surgery.” *Bovine Surgery and Lameness*, by A. David. Weaver et al., Wiley Blackwell, 2018, pp. 54–62.
3. Fordyce, G, et al. “Postoperative Healing and Behaviour When Surgical Swabs Are Applied to Calf Dehorning Wounds.” *Australian Veterinary Journal*, vol. 96, no. 12, 2018, pp. 508–515., doi:10.1111/avj.12771.
4. Hoffsis, Glen. “Surgical (Cosmetic) Dehorning in Cattle.” *Veterinary Clinics of North America: Food Animal Practice*, vol. 11, no. 1, 1995, pp. 159–169., doi:10.1016/s0749-0720(15)30514-4.
5. Knierim, Ute, et al. “To Be or Not to Be Horned—Consequences in Cattle.” *Livestock Science*, vol. 179, 2015, pp. 29–37., doi:10.1016/j.livsci.2015.05.014.
6. Murray, Gerard M., et al. “The Bovine Paranasal Sinuses: Bacterial Flora, Epithelial Expression of Nitric Oxide and Potential Role in the in-Herd Persistence of Respiratory Disease Pathogens.” *Plos One*, vol. 12, no. 3, 2017, doi:10.1371/journal.pone.0173845.
7. Schleining, Jennifer A. “Surgery of the Sinuses and Eyes.” *Veterinary Clinics of North America: Food Animal Practice*, vol. 32, no. 3, 2016, pp. 571–591., doi:10.1016/j.cvfa.2016.05.004.