Teddy's Cord Calamity

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Introduction:

Castrations are one of the most common surgical procedures performed by equine veterinarians.[3,4,5,7] It is reported that approximately 10% of equids that undergo castration develop a complication from the surgery.[6] The odds of developing complications are significantly higher when the semi-closed technique is used as compared to the closed technique.[6] The majority of these complications are minor and can typically be managed in the field.[3,4,5] Occasionally, major complications can occur and have the potential to be life-threatening.[3,4,5] Appropriate preoperative examination should always be performed which allows for a preoperative and perioperative plan tailored to each individual patient to help reduce these risks.[5] It is important to understand the risks involved and be knowledgeable on how to manage these complications, as they are the most common cause of malpractice claims filed against equine practitioners in North America.[3,4,7] These complications include scrotal swelling, edema, seroma formation, excessive hemorrhage, bacterial infection of the incision or spermatic cord, omental herniation, eventration, peritonitis, hydrocoele formation, penile damage, and continued stallion-like behavior.[5,6,7]

It is reported that approximately 21% of castration complications are due to bacterial infection at the surgical site.[6] This is typically managed in the field with establishment of appropriate drainage, exercise, and antibiotic therapy.[3,4,5,7] The use of preoperative antibiotics may help reduce the risk of postoperative infection.[5] This is debatable and generally based on surgeon preference, but every horse undergoing a surgical procedure should be current on tetanus prophylaxis.[5] Occasionally, infection of the surgical site may be chronic or will not resolve with initial medical therapy, requiring surgery and management at a referral facility.[3,4,5,7] Scirrhous cord is the term used to describe chronic infection of the spermatic cord stump and is often used

interchangeably with the term septic funiculitis.[4,5] Horses with scirrhous cord may not present for months to years after castration and their presenting signs usually include scrotal and preputial swelling, discharge, pyrexia, and lameness.[3,4,5,7] With appropriate and timely treatment, these horses typically recover well with a favorable prognosis for return to normal function.[5]

History and Presentation:

Teddy is a 1 ½ year old Quarter Horse gelding that presented to the Mississippi State University College of Veterinary Medicine Equine Service on March 30, 2021, for scrotal swelling, drainage, and suspected scirrhous cord (septic funiculitis). Teddy had been castrated by his previous owner approximately 1 month prior to presentation. His current owners had purchased him 3 days prior to presentation and noticed swelling of his prepuce and scrotum, and tissue protruding from the castration site. He was initially evaluated by his primary care veterinarian the morning of presentation. At this time, the castration site was opened and flushed, expelling yellow, purulent, malodorous fluid and tissue. A firm mass of tissue was felt on palpation of the scrotum which was presumed to be one of the spermatic cord stumps. The referring veterinarian administered a tetanus toxoid vaccination and a dose of ceftiofur crystalline free acid (Excede). He was also given a 500-pound dose of flunixin meglumine (Banamine) and a dose of trimethoprim and sulfadiazine (Uniprim) before presenting to Mississippi State University. He had been drinking well at home and had a moderate appetite. Owners were planning to use him as a trail or barrel horse. His diet consists of alfalfa and timothy hay.

On presentation, Teddy was bright, alert, and responsive. He weighed 850 pounds (386 kilograms) with an ideal body condition score of 5/9. His vital parameters were within normal limits with a temperature of 100.9 degrees Fahrenheit, a heart rate of 48 beats per minute, and a

respiratory rate of 24 breaths per minute. His mucous membranes were pink and moist with a normal capillary refill time of less than two seconds. Cardiopulmonary auscultation was within normal limits with no arrhythmias, murmurs, crackles, or wheezes appreciated. He had normal Borborygmi present in all four abdominal quadrants and normal digital pulses were appreciated in all four limbs. There was significant swelling and edema appreciated of the prepuce and scrotum. There was an open incision along the median raphe of the scrotum approximately 10 centimeters in length, presumed to be the castration site. There was a mild amount of discharge from the incision that on evaluation was yellow, purulent, and malodorous. The incision site was sterilely prepped with 4% chlorhexidine and 70% isopropyl alcohol. On aseptic evaluation of the inguinal area inside of the incision, a firm mass of tissue approximately the size of a golf ball could be palpated, presumed to be one of the spermatic cord stumps.

Diagnostic Approach:

Following initial physical examination, Teddy was sedated with detomidine at 0.005 mg/kg and butorphanol at 0.005 mg/kg for thorough aseptic palpation of the scrotal and inguinal area. Digital exploration revealed a firm, abnormal mass of tissue approximately the size of a golf ball, presumed to be one of the spermatic cord stumps. There was a moderate amount of yellow, purulent, malodorous discharge draining from the site at the time of evaluation. Following palpation of the scrotal incision, ultrasound of the scrotal and inguinal area was performed. This revealed multifocal loculated areas with hypoechoic fluid consistent with fluid pockets that could be indicative of abscess, hematoma, or seroma. Fibrotic and thickened tissue could also be appreciated bilaterally, presumed to be each of the spermatic cord stumps. Based on history and clinical findings, a presumptive diagnosis of scirrhous cords was made, and it was decided to perform a castration revision surgery.

Treatment and Management:

An intravenous catheter was placed in Teddy's right jugular vein to facilitate medication and fluid administration. Pre-operatively, he was given gentamicin at 6.6 mg/kg and flunixin meglumine at 1.1 mg/kg intravenously. He was then given xylazine at 0.65 mg/kg and butorphanol at 0.03 mg/kg intravenously for sedation, then he was induced with ketamine at 2.6 mg/kg and midazolam at 0.06 mg/kg intravenously. A 26 mm endotracheal tube was placed, and he was maintained on sevoflurane and mechanical ventilation throughout surgery. Lactated Ringer's solution was administered intravenously throughout surgery at a rate of approximately 800 mls per hour, for a total of 2 liters given.

Once anesthetized, Teddy was placed in dorsal recumbency. The scrotal and inguinal regions were scrubbed with 4% chlorhexidine for 10 minutes and 70% isopropyl alcohol. The surgical field was draped, then the previous castration incision was elongated cranially and caudally using a #10 scalpel blade. The infected and abscessed right spermatic cord stump was dissected away from the skin and fibrous connective tissue using a combination of scalpel blade, mayo surgical scissors, and blunt dissection. The spermatic cords and surrounding tissues were grossly enlarged, edematous, and hyperemic bilaterally. There was a significant amount of malodorous, caseous material present associated with the spermatic cords. In addition, multiple adhesions were observed, including between the vaginal and parietal tunics. The spermatic cord was traced proximally to the inguinal ring and was abnormally enlarged all the way to the inguinal ring and into the abdomen. Due to the significant enlargement of the spermatic cord, the parietal tunic was bluntly dissected free from the vaginal tunic to expose the contents of the spermatic cord. A Serra emasculator was placed on the vaginal tunic of the spermatic cord and its contents (spermatic vessels and vas deferens) and left in place for 5 minutes to crush and

transect the spermatic cord. Two transfixing ligatures were placed around the vaginal tunic proximal to the emasculator using # 3 Vicryl suture. A hemostat was clamped on the ligature to be able to retract the cord remnants to check for hemorrhage and the emasculator was removed from the vaginal tunic. The infected cord distal to the emasculators was removed and the remaining vaginal tunic was retracted into the parietal tunic with controlled release to check for hemorrhage and the hemostats were removed. The emasculator was then placed on the parietal tunic and cremaster muscle, and one circumferential ligature was placed proximal to the emasculators. The incision was copiously lavaged with irrigation saline and manually stretched to allow for better drainage post-operatively. Subsequently, the right inguinal ring was closed using # 3 Vicryl in a simple interrupted pattern. The process was then repeated including closure of the inguinal ring on the left side. The left spermatic cord was also grossly enlarged and infected with significant amount of malodorous caseous material present. The incision site was packed with two lap sponges and temporarily closed using penetrating towel clamps to aid with hemostasis and mechanical debridement for the first 24 hours. Recovery from anesthesia was uneventful.

The day following surgery, the towel clamps and lap sponges were removed from the incision site and the material present was normal in appearance with no purulent or malodorous discharge present. The incision site was then left open to heal by second intention and allow for appropriate drainage. On days 5 and 7 post-operatively, Teddy was sedated with butorphanol at 0.01 mg/kg and detomidine at 0.01 mg/kg intravenously for the incision to be manually opened, stretched, and flushed with sterile saline to ensure adequate drainage. On both occasions, a mild amount of clear serosanguinous fluid drained from the incision during manual manipulation. The incision site was closely monitored throughout his hospitalization to ensure appropriate drainage

and healing. Starting on day 4 post-operatively, Teddy was lunged at a trot for 15-20 minutes twice daily to prevent premature closing of the incision, allow for adequate drainage, and minimize swelling.

Teddy's treatment was directed towards broad spectrum antibiotic coverage. Teddy was given gentamicin at 6.6 mg/kg intravenously every 24 hours starting on March 30th preoperatively. Flunixin meglumine at 1.1 mg/kg was given intravenously every 12 hours starting on March 30th preoperatively. Potassium penicillin G at 22,000 IU/kg was given intravenously every 6 hours starting on March 31st. Metronidazole at 15 mg/kg was given orally every 8 hours starting March 31st and continued for the duration of his stay.

The morning following surgery, Teddy had a temperature of 105 degrees Fahrenheit, a heart rate of 60 beats per minute, and a respiratory rate of 36 breaths per minute. He was also lethargic and had a poor appetite. The pyrexia decreased to 101.6 degrees Fahrenheit immediately following a dose of flunixin meglumine but was significantly elevated again by the next dose at 104.7 degrees Fahrenheit. Endotoxemia was a concern with this significantly elevated temperature and antiendotoxin therapy with polymyxin B was pursued. Teddy's creatinine was checked before this change in treatment plan since gentamicin, flunixin meglumine, and polymyxin B can each have a cumulative nephrotoxic effect. His creatinine was within normal limits at 1.28 mg/dl with a reference interval of 1.2 – 1.9 mg/dl. Polymyxin B at 5,000 IU/kg was then given in 1 liter of lactated Ringer's solution bolus intravenously every 8 hours for 24 hours. The flunixin meglumine was then discontinued and ketoprofen at 2.2 mg/kg was started intravenously every 8 hours to assist with the pyrexia. At this time, an abdominal ultrasound was also performed to evaluate for evidence of significant abdominal fluid with concerns of peritonitis. Although this cannot rule out peritonitis, abdominal ultrasound was

within normal limits with minimal free fluid observed. Following the treatment with polymyxin B and the switch to ketoprofen, Teddy's mentation and temperatures improved with only occasional low-grade fevers.

On April 2nd, the ketoprofen was decreased to 2.2 mg/kg intravenously every 12 hours with his temperatures remaining within normal limits. On April 4th, ketoprofen was discontinued and flunixin meglumine at 1.1 mg/kg was started again intravenously every 12 hours. On April 5th, intravenous antibiotics were discontinued and chloramphenicol at 50 mg/kg was started orally every 8 hours for the duration of his stay in preparation for discharge. On April 6th, flunixin meglumine was decreased to 1.1 mg/kg intravenously every 24 hours in preparation for discharge. He was also given 2 scoops of Platinum Balance with his food every 12 hours from April 2nd for the duration of his stay to encourage appropriate gastrointestinal health while on antibiotics.

Teddy recovered well from surgery and the drainage from his incision was already much improved the day following surgery. During his stay in hospital, he would have mild colic episodes after being given potassium penicillin G. It was diluted with saline, given slowly, and he was walked after administration, and this appeared to help with the colic episodes. He also had intermittent elevated temperatures that would decrease but not completely resolve with alcohol baths. Since flunixin meglumine cannot be given more frequently than every 12 hours, he was switched to ketoprofen which could be given every 8 hours to help with his pyrexia. After this change was made in his treatment plan, he would occasionally have a low-grade fever, but it was significantly improved and finally resolved before discharge.

Case Outcome:

Upon discharge from Mississippi State University on April 6, 2021, Teddy was doing well. The flunixin meglumine had been decreased to every 24 hours with his temperature maintaining within normal limits (below 101.5 degrees Fahrenheit). His scrotal incision was healing appropriately with minimal swelling and no purulent or malodorous discharge present. He was sent home with chloramphenicol at 50 mg/kg orally every 8 hours for 30 days until recheck, metronidazole at 15 mg/kg orally every 8 hours for 30 days until recheck, and Platinum Balance at 2 scoops orally every 12 hours until finished to help maintain healthy gastrointestinal flora while on antibiotics. He was also sent home with flunixin meglumine at 1.1 mg/kg orally every 24 hours for 7 days. The discharge instructions included monitoring his temperature twice daily, monitoring his incision site for swelling and purulent discharge, and forced exercise on a lunge line at a trot for 15-20 minutes twice daily until his recheck appointment. He was then scheduled for a recheck appointment 1 week from the time of discharge.

Teddy arrived for his recheck appointment on April 12, 2021. Owners reported that he had been doing well at home. His flunixin meglumine had been discontinued 2 days prior to recheck since he was maintaining a temperature under 101 degrees Fahrenheit. On presentation, his physical examination and vital parameters were within normal limits. He was sedated with butorphanol at 0.01 mg/kg and detomidine at 0.01 mg/kg intravenously for a thorough, aseptic examination of the scrotal incision. His scrotal incision appeared to be healing well with no redness, swelling, or discharge. The left side had already closed, and the right side still had a small opening. He was sent home with instructions to continue forced exercise, monitor the incision site and temperatures, and to recheck in about 3 weeks. He was continued on the chloramphenicol at 50 mg/kg orally every 8 hours until recheck, metronidazole at 15 mg/kg orally every 8 hours until recheck, Platinum Balance at 2 scoops orally every 12 hours until

finished, and flunixin meglumine at 1.1 mg/kg orally up to every 12 hours as needed based on temperature checks until his recheck appointment. Teddy never returned to Mississippi State University for his 3 weeks recheck appointment, so it is presumed that he was doing well and followed up with his primary care veterinarian.

Discussion:

Diagnosis of scirrhous cord is predominantly based upon history, clinical signs at presentation, thorough physical examination, and ultrasound findings. History typically involves castration being performed weeks to years prior, with an average of 29-33 days.[1,2,3,4,5,7] Presenting clinical signs of significance include swelling of the prepuce or scrotum, pyrexia, discharge from the incision site or draining tract, and lameness or stiffness of gate.[3,4,5,7] All of these signs do not have to be present to raise concern. Physical examination findings that may be indicative of scirrhous cord include the identification of abnormal tissue in the scrotal or inguinal area through aseptic palpation.[5] Ultrasound can also be valuable to evaluate abscesses in the inguinal area and identify abnormalities of the spermatic cord to assist in determining whether surgical resection may be indicated.[5]

There are multiple proposed etiologies that can lead to the development of scirrhous cord. Potential sources of infection include a scrotal infection that extends to the spermatic cord, or a contaminated emasculator or ligature.[5] It is also thought that ligature could serve as a nidus for infection, or that failure to remove the external cremaster muscle and tunica vaginalis during an open castration could predispose horses to scirrhous cord.[5,7] Formation of a seroma postoperatively could also lead to infection by allowing for an abscess to develop.[4,5] Typically, with scirrhous cord, the scrotal incisions heal while the spermatic cord stump continues to be infected or abscess, eventually leading to formation of a draining tract.[3,4,5] The most common

isolate from post-castration infections is *Streptococcus equi* subspecies *zooepidemicus*.[3] A variety of other bacteria have been isolated from scirrhous cords, including but not limited to *Staphylococcus spp*, Enterobacteriaceae, *Actinomyces spp*, *Bacteroides spp*, and *Pseudomonas spp*.[1,3,5] A bacterium that is rarely isolated from these but should be considered in horses not current on tetanus prophylaxis is *Clostridium tetani*.[3,4] An infection with this would require aggressive treatment as it could result in serious illness and potentially death.[3,4]

For infections caught early, medical management can be performed in the field and is typically effective.[3,4,5,7] This usually includes administration of systemic broad-spectrum antibiotics, aseptic opening and stretching of the incision to allow for drainage, and appropriate exercise to prevent premature closure of the incision site and allow for adequate drainage.[3,4,5,7] Culture of the affected site is also recommended to help guide antibiotic therapy.[3,4,5] For chronic cases or those that do not respond to initial medical management, referral to a specialty center for surgical removal of the infected tissue is indicated.[3,4,5,7] Although prognosis is typically favorable for those that undergo appropriate and timely treatment, it should be noted that these do have the potential to extend into abscesses of the abdomen or septic peritonitis if neglected.[5]

In conclusion, this case highlights the importance of appropriate surgical and aseptic technique and postoperative care. No matter the surgical technique used, one incision should be made over each testicle. In this case, only one incision was made along the median raphe which could have resulted in inadequate drainage and premature closure. It also demonstrates the importance of adequately discussing potential postoperative complications with owners and the signs associated with each. Although uncommon, severe postoperative complications do arise from castrations. Equine veterinarians must have thorough understanding and knowledge of how to prevent and approach each potential complication that could result from castration.

Resources

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