A 16-month-old 517-kg Angus bull presented to the Kansas State University Veterinary Health Center Livestock Services in July 2023 to evaluate unilateral scrotal swelling. The bull was first noticed being ridden by other yearling bulls in the pasture 1 day before presentation, which prompted the owner to notice the scrotal swelling. The bull is housed on a 160-acre pasture with 75 yearling bulls and is the only animal affected. No history of prior medical conditions was reported, and he is vaccinated against clostridial diseases. On physical examination, the bull was bright, alert, and responsive and had a slightly increased heart rate (88 beats/min; reference, 50 to 80 beats/min), normal respiratory rate (48 breaths/min; reference range, 26 to 50 breaths/min), normal temperature (39 °C; reference range, 36.7 °C to 39.1 °C) with pink and moist mucous membranes. Upon visual examination, the scrotum was asymmetrical. Visually, the left scrotal sac appeared enlarged, with diffuse swelling extending proximally to the neck of the scrotum (Figure 1). Upon palpation of the scrotum, the left side was firm and edematous, making distinguishing the testicle and the epididymis difficult. The right testicle was easily movable within the scrotum and the epididymis palpated normally with no adhesions or firm nodules. Subjectively the testicle was soft on palpation, which deviates from the normal turgid texture. Transrectal palpation and scrotal ultrasonography ruled out an inguinal hernia.

Formulate differential diagnoses, then continue reading.

**Diagnosis**

The differential diagnosis for all unilateral scrotal enlargement may include inguinal hernia, hydrocele,
hematocele, spermatic cord torsion, orchitis, periorchitis, abscessation, trauma (testicular rupture), and neoplasia. An ultrasonographic examination of the scrotum was performed using a curvilinear transducer at 4.0 mHz (Logiq e Ultrasound). It revealed a loss of normal homogenous echogenicity of testicular parenchyma on the left side with areas of hypoechogetic to anechoic echogenicity consistent with a hematoma. Hyperechoic areas were also observed, which were indicative of possible fibrosis (Figure 2). The right testicle appeared normal with homogenous, slightly hyperechoic parenchyma (Figure 2). Based on physical examination, history, and ultrasonographic findings, testicular rupture was clinically diagnosed with presumably traumatic origin. To preserve the fertility of the bull, a unilateral castration was recommended.

Figure 2—Ultrasoundographic image of the left (A) and right testicle (B). The left testicle showed loss of normal homogenous echogenicity of testicular parenchyma of the left side with areas of hypoechogetic to anechoic echogenicity compared to the normal right testicle.

Figure 3—Gross longitudinal cut of affected testicle.

Treatment and Outcome

Prior to surgery, the bull received 2.2 mg/kg of flunixin meglumine, IV, and 40,000 U/kg of penicillin G procaine, IM. The bull underwent general anesthesia (pre-medication: 0.05 mg/kg of xylazine, IV; induction: 0.05 mg/kg of midazolam and 3 mg/kg of ketamine IV; maintenance: isoflurane with oxygen). Extra label drug use was performed with owner consent and complied with provisions of AMDUCA and 21 CFR 530. Unilateral castration was performed. An approximately 20 cm elliptical skin incision was made on the left lateral aspect of the scrotum using a #20 scalpel blade approximately the length of the testicle, preserving the parietal vaginal tunic. The affected testicle was dissected from the surrounding scrotal fascia and the numerous associated adhesions using a combination of sharp and blunt dissection. The spermatic cord was isolated, and an incision was made into the vaginal tunic to identify the pampiniform plexus and the deferent duct, which were ligated using 2 strangulating knots with #3 Vicryl (Ethicon). The spermatic cord was transected, evaluated for adequate hemostasis, and released into the abdomen. The vaginal tunic was closed using 0 monocryl (Ethicon) in a simple continuous pattern. Any bleeding cutaneous vessels of the scrotum were clamped with a hemostatic forcep and ligated with an encircling knot using 0 monocryl suture material (Ethicon). The scrotum was lavaged with warm saline before closure. Excess scrotal skin was removed using mayo scissors to reduce dead space. The skin was closed using 2 supramid (Ethicon), starting with a Ford interlocking suture pattern and ending with a single cruciate suture at the distal aspect. A small area was left open at the most distal aspect of the scrotum for drainage. The bull was extubated within 2 hours of intubation and recovered uneventfully in his stall. The bull was kept in a sternal position until he gained the ability to stand on his own. The patient was continually monitored until standing and able to ambulate normally. Once standing prairie
hay and water was reintroduced. Postoperative pain was managed with 0.5 mg/kg of meloxicam given orally every 48 hours for 12 days postoperatively.

The testicle weighing 2 lbs 8.2 ounces, was submitted to the Kansas State Veterinary Diagnostic Laboratory for gross examination and histopathology. Results indicated a chronic, ongoing inflammatory lesion of the testicle likely secondary to rupture of the tunic, recognized by marked necrotic orchitis, fibrosis, and granulation tissue (Figure 3). Histopathology revealed extensive, coalescing areas of seminiferous tubule and interstitial coagulative to lytic necrosis and hemorrhage mixed with few scattered neutrophils, with adjacent replacement and expansion by granulation tissue (Figure 4).

**Discussion**

Based on physical examination, history, histopathology, and ultrasonography, testicular rupture was diagnosed with presumably traumatic origin. Infectious causes of orchitis and periorchitis cannot be ruled out. Serologic testing for *Brucella* spp and culture of testicular tissue was not performed. The histopathologic features observed in the testicular sections were not suggestive of neoplasia. Differentials including inguinal hernia, hydrocele, hematocèle, and spermatic cord torsion were excluded based on scrotal palpation and ultrasonographic images.

Scrotal palpation is an important component of the physical examination for bulls with the present ing complaint. Palpation allows the examiner to assess changes in scrotal symmetry, texture, mobility, heat, and size. Testicular hypoplasia can present as asymmetry of the scrotum, interpreted as swelling of the nonaffected side. Ultrasonography is an important diagnostic imaging modality that helps narrow the differential diagnosis list. In the present case, ultrasonography and transrectal palpation eliminated the inguinal hernia, as no intestinal contents were appreciated in the scrotum.

Damage to the scrotum and/or its contents impedes spermatogenesis and will lead to testicular degeneration, which impacts fertility. This can be unilateral or bilateral. The causes of testicular degeneration are local inflammation, age, stress, failure of thermoregulation, or idiopathic. Removal of the inciting cause may result in the regeneration of functionality in the remaining testicular tissue. This is critical in unilateral disease, like the one presented here. Bulls who undergo unilateral castration can still have satisfactory semen production. Compensatory hypertrophy of the remaining testicle can result in 75% of normal sperm capacity. Owners need to be advised that testicular degeneration of the remaining testicle may not be reversible, and the bull may never have semen quality that meets the minimum standards (30% progressive motility and 70% normal morphology) set forth by the Society for Theriogenology.

In cases with unilateral disease, unilateral castration is recommended. Owners of animals that undergo removal of one testicle should be advised that these animals will not be classified as satisfactory breeders on a breeding soundness examination, regardless of spermiogram, when following the standards set forth by the Society for Theriogenology. This information is important for owners.

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**Figure 4**—A—Seminiferous tubules are necrotic cells and the intertubular space is markedly expanded by clear space and lightly eosinophilic fibrillary debris (asterisk). Bands of edema and hemorrhage surrounded by dense fibrosis and granulation tissue expand the tunica albuginea (bracket). Dense fibrosis and granulation tissue markedly expands the tunica vaginalis, lined by plump mesothelial cells (arrowhead). H&E stain; 2X magnification; bar = 1 mm. B—Higher magnification of the tunica albuginea expanded by edema (asterisk), hemorrhage and fibrin (arrowhead), and granulation tissue (arrow). H&E stain; 4X magnification; bar = 500 μm. C—Higher magnification of necrotic seminiferous tubules, characterized by cytoplasmic hyper eosinophilia and karyorrhectic to pyknotic nuclei, separated by variably distinct vacuoles with finely fibrillary lightly eosinophilic debris (arrowhead). The intertubular space is markedly expanded by clear space and lightly eosinophilic fibrillary debris (asterisk). H&E stain; 20X magnification; bar = 100 μm.
who may want to sell through an auction or show where passing a breeding soundness examination is required. It is recommended a complete breeding soundness evaluation be performed 90 to 120 days following removal of the damaged testicles. In chronic conditions it may take several months for the seminiferous epithelium to heal and produce viable semen.2

In this case, the bull was evaluated greater than 90 days after unilateral castration. On reevaluation the bull had a scrotal circumference of 31 cm, 75% progressive motility, and 88% normal morphology (detached heads of 4%, midpiece defect of 8%). It should be noted that a semen sample was not collected upon presentation. Therefore, a limitation of the current case report is the absence of pre- and post-operative semen analysis. Considering the extent of the trauma to the affected testicle we suspect this bull would not have had normal semen at the time of presentation. However, a normal semen analysis would not have resulted in different management of the case.

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