Atypical spontaneous lymphoma affecting the testicles and nasal cavity of a one-year-old bull

Jennifer H. Koziol, Esther G. Martinez Romero, Jennifer W. Koehler, Dwight F. Wolfe, Herris S. Maxwell
College of Veterinary Medicine, Auburn University, Auburn, AL

Summary

A one-year-old bull was presented to the J. T. Vaughan Large Animal Center at Auburn University with a six-week history of mucopurulent discharge from both nares. The owner reported that the bull had increased stridor of the last several weeks that did not respond to systemic antibiotics. On physical examination the bull had stenotic nares due to bilateral masses reducing the diameter of the nasal cavities. The bull's scrotum was enlarged due to enlargement of both testes, with a scrotal circumference of 53 centimeters. On palpation the testicles were firm with adhesions within the vaginal cavity. The heads of the epididymides were more firm than normal. Due to the poor prognosis for future fertility and the ongoing respiratory distress the bull was euthanized and submitted for necropsy. At necropsy, multiple masses were present in the nasal passages, testes, epididymis, and haired skin. Histopathological examination of sections supported a diagnosis of sporadic multicentric bovine lymphoma.

Keywords: Atypical lymphoma, testicular lymphoma, nasal lymphoma, spontaneous lymphoma

Background

Bovine sporadic multicentric lymphoma occurs independently of bovine leukemia virus infection. Tumor involvement of either the nasal cavity or testicle is rare in cases of sporadic and enzootic bovine lymphoma, and concurrent involvement has never been reported. Nonetheless, this case highlights the importance of adding neoplasia due to enzootic bovine lymphoma or sporadic bovine lymphoma to differential lists when examining bulls for scrotal enlargement.

Case presentation

A one-year-old mixed-breed beef bull was presented to the J. T. Vaughan Large Animal Teaching Hospital at Auburn University in March 2015, for a complaint of nasal discharge and increased respiratory effort of six-weeks duration. The owner reported that initially a bilateral serosanguineous discharge was present from both nares. The serosanguineous discharge progressed to a mucopurulent discharge associated with increased respiratory effort over the following two weeks. At that time the owner administered tulathromycin (Draxxin® Zoetis Animal Health, Florham Park, NJ) systemically and the bull's clinical signs appeared to improve. Approximately one week prior to presentation clinical signs of mucopurulent discharge and increased respiratory effort returned. On initial examination the bull was depressed but responsive, with a body condition score of 4/9. Rectal temperature was 103.1°F. Cardiac auscultation was unremarkable, with a regular heart rhythm and rate of 56 beats per minute. The bull had a significant increase in inspiratory effort and was tachypneic with paradoxical abdominal effort with mucopurulent discharge from the nares (Fig. 1). There was a marked decrease in lung sounds beyond the seventh intercostal space bilaterally. Both nasal passages had visible masses protruding into the nasal canal causing severe stenosis of the passage and were believed to be cause of the respiratory distress. The scrotum was greatly enlarged with a circumference of 53 centimeters and the scrotal contents were abnormal. Both testes were firm on palpation and adhesions could be palpated within the vaginal tunic (Fig. 2). The heads of the epididymides were also enlarged and more firm than normal on palpation . Ultrasonic examination revealed the testes and heads of the epididymides to be enlarged and hyperechoic. No lung pathology was detected on ultrasonic evaluation. Multiple small circular masses were also present on the upper and lower right eyelid.

Differential diagnosis

Due to the involvement of both the nasal passages and the testes, differential diagnoses for the nares included: mycotic rhinitis, nasal granuloma, neoplasia or sinonasal cysts and for the testes orchitis, epididymitis, periorchitis, and neoplasia.

Outcome

Severe stenosis of the nasal passages and palpable scrotal pathology resulted in a poor prognosis and the bull was euthanatized and submitted for necropsy. At necropsy, numerous 5 mm to 3.5 cm in diameter, well demarcated, slightly raised masses were present on the upper and lower right eyelid, inguinal region, and haired skin over the right lateral thorax and flank. Both testicles were diffusely firm, pale yellow to tan with an imperceptible mediastinum. The head and tail of the epididymides were diffusely enlarged by multifocal to coalescing, white to tan, firm masses. There was bilateral mucopurulent discharge from the nostrils. Multiple expansile, individual-to-coalescing, light grey to purple nodules ranging from 1 cm to 4 cm in diameter were on the alar and basal folds of the nasal mucosa and conchae and were partially occluding the passages of the dorsal and middle meatus.

On light microscopic examination, the cutaneous masses were poorly circumscribed, densely cellular, and composed of sheets of monomorphic neoplastic round cells that infiltrated the dermis, and separated and surrounded the adnexae, pre-existing collagen bundles, and blood vessels (Fig. 3). Neoplastic cells were large (three times the diameter of an erythrocyte) with distinct cell borders and scant pale, granular, eosinophilic cytoplasm. Nuclei were round to ovoid, with occasional cerebriform convolutions of the nuclear membrane, coarsely stippled chromatin and 1-2 basophilic nucleoli. There were more than 100 mitotic figures in ten 400X fields. The nasal passages, testes, and epididymides contained monomorphic round cells similar to the neoplastic cells in the haired skin (Fig. 4). The neoplastic cells invaded the nasal submucosa and surrounded the nasal cartilage, and partially effaced the testicular and epididymal parenchyma. The final diagnosis was multicentric lymphoma, large cell-high grade. Histological features were strongly suggestive of a B-cell lymphoma. However, with immunohistochemical staining, the neoplastic cells did not exhibit cytoplasmic immunoreactivity for CD3 or Pax5.

Discussion

Bovine lymphoma is classified on epidemiological and clinicotopograhical criteria into two types: enzootic bovine leukosis (EBL), and sporadic bovine leukosis (SBL). Enzootic bovine leukosis is endemic in the USA. It is the predominant cause of lymphoma in cattle and is associated with infection with bovine leukemia virus (BLV). Bovine leukemia virus is an exogenous C-type oncovirus of the *Retroviridae* family infecting the B- lymphocyte cell lineage.[1,2] Enzootic bovine leukosis usually occurs in animals greater than three years old, with higher incidence in dairy herds compared with beef herds. The virus can be transmitted either horizontally or iatrogenically to susceptible hosts via biological material containing B-lymphocytes such as blood, milk/colostrum or saliva. Insect vector transmission may play a role in BLV transmission.[1] Once infected, 80-90% of animals become BLV seropositive. Of these seropositive animals, approximately 30% will develop a persistent lymphocytosis but less than 5% develop clinical disease or lymphoma.[1,3]

In contrast, SBL has no known etiology, does not have an association with BLV infection, and occurs uncommonly in cattle less than three years of age. Sporadic bovine leukosis has a much smaller incidence, affecting 0.5 to 1.2 out of every 100,000 cattle compared to enzootic bovine leukosis.[1] Sporadic bovine leukosis has four clinical presentations: the cutaneous form, juvenile/calf form, thymic/adolescent form, and the atypical form which is reserved for those cases that do not fit any of the previous three categories.[1,4,5] The cutaneous form is the most commonly reported and the thymic form the least commonly reported. The cutaneous form typically affects cattle aged one to hree years and manifests primarily as skin nodules. It has been reported that that cases of the cutaneous form may undergo a brief period of remission in which the nodules regress; however, four to six weeks after regression a generalized lymphoma returns and is always fatal. The calf or juvenile form occurs most

commonly in calves less than six months of age, but is occasionally reported in animals up to two years of age.[1,6] The calf form presents as a generalized lymphadenopathy, with weight loss, depression, and weakness followed by death two to eight weeks after the onset of the disease. The thymic or adolescent form is universally fatal, occurs in animals six to 24 months old, and is more common in beef than dairy calves. Lymphoma of the thymus presents as a large, firm enlargement extending cranially from the thoracic inlet.

The cutaneous form of SBL is associated with a helper/inducer T-cell origin and the thymic form arises mainly from a T-cell origin. The calf form originates from band T-cell lines.[2] B-cell lymphoma is also possible with SBL.[5] In Europe, due to the eradication of BLV positive animals from most of the continent, sporadic bovine leukosis is the predominant type of leukosis.

Only one case of lymphoma invading the testis has been reported and disease in that animal was reportedly due to enzootic bovine leukosis secondary to infection with bovine leukemia virus.[3] Similarly, a single case with invasion of atypical SBL into the nasal cavity of a 22 month old Brown Swiss heifer has been reported. To the authors' knowledge, the case outlined in this report is the first in which there was both testicular and nasal involvement with SBL. While there is no means of prevention or treatment, it is important to remember that lymphoma is the most common neoplasm of young cattle and should be included on differential lists for stenosis of the nasal passage or scrotal enlargement.

Learning points

- Lymphoma is the most common neoplasm in young cattle.
- Sporadic bovine leukosis should be considered in cases of scrotal enlargement in bulls less than three years of age.
- Enzootic bovine leukosis is the predominant cause of lymphoma in the United States and is associated with bovine leukemia virus. In contrast sporadic bovine leukosis has no known etiology with a low prevalence as compared to the enzootic form.

References

1. Nasir KS: Sporadic juvenile thymic lymphoma in a 6-month-old Holstein heifer. Can Vet J 2005;46:831-833.
2. Dubreuil P, Lanevschi A, Perrone MA, et al: Atypical sporadic lymphosarcoma in a 7-month-old Holstein heifer. Can Vet J 1998;39:431-433.
3. McCain D, Estill CT: Theriogenology question of the month. Scrotal enlargement caused by lymphosarcoma associated with bovine leukemia virus. J Am Vet Med Assoc 1999;215:1777-1779.
4. Klintevall K, Berg A, Svedlund G, et al: Differentiation between enzootic and sporadic bovine leukosis by use of serological and virological methods. Vet Rec 1993;133:272.
5. Braun U, Brammertz C, Maischberger E, et al: T-cell lymphoma in the nasal cavity of a Brown Swiss heifer. Acta Vet Scand 2015;57:8.
6. Grunberg W, Eisenberg SW: Atypical form of sporadic bovine leukosis (SBL) in the Netherlands. Vet Rec 2013;173:398.

Figure 1. Mucopurulent nasal discharge was present bilaterally.

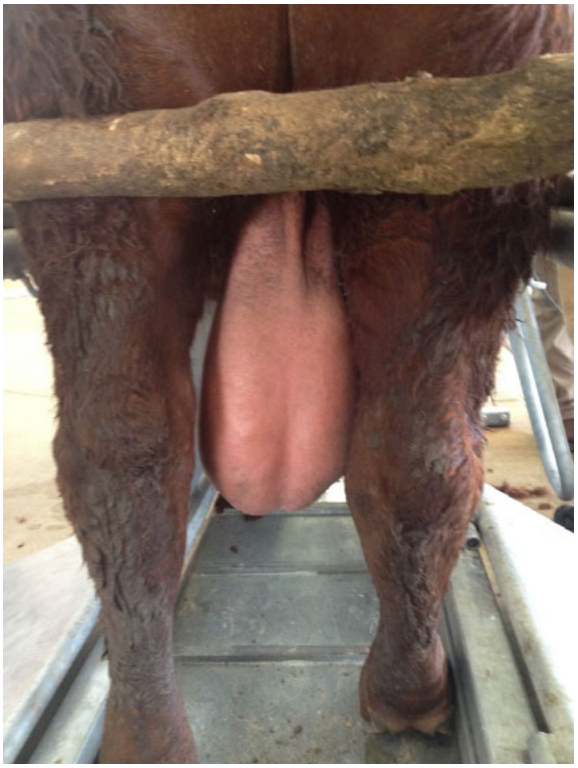

Figure 2. The scrotum was greatly enlarged with a circumference of 53 centimeters and the contents were abnormal.

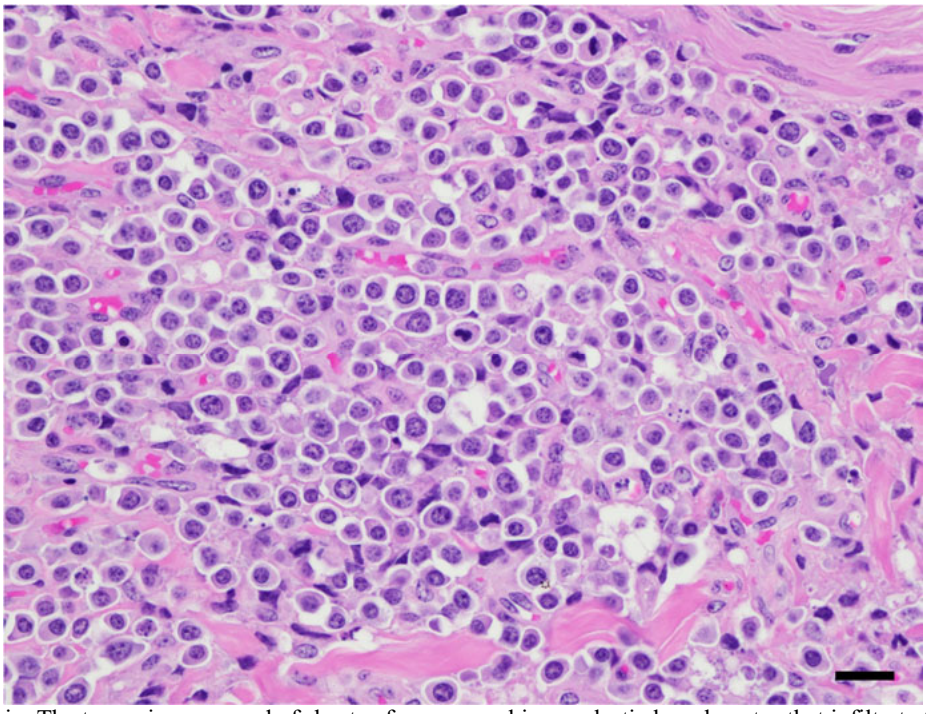

Figure 3. Haired skin. The tumor is composed of sheets of monomorphic neoplastic lymphocytes that infiltrate the dermis, and separate and surround the pre-existing collagen bundles (H&E). Bar = 20 µm

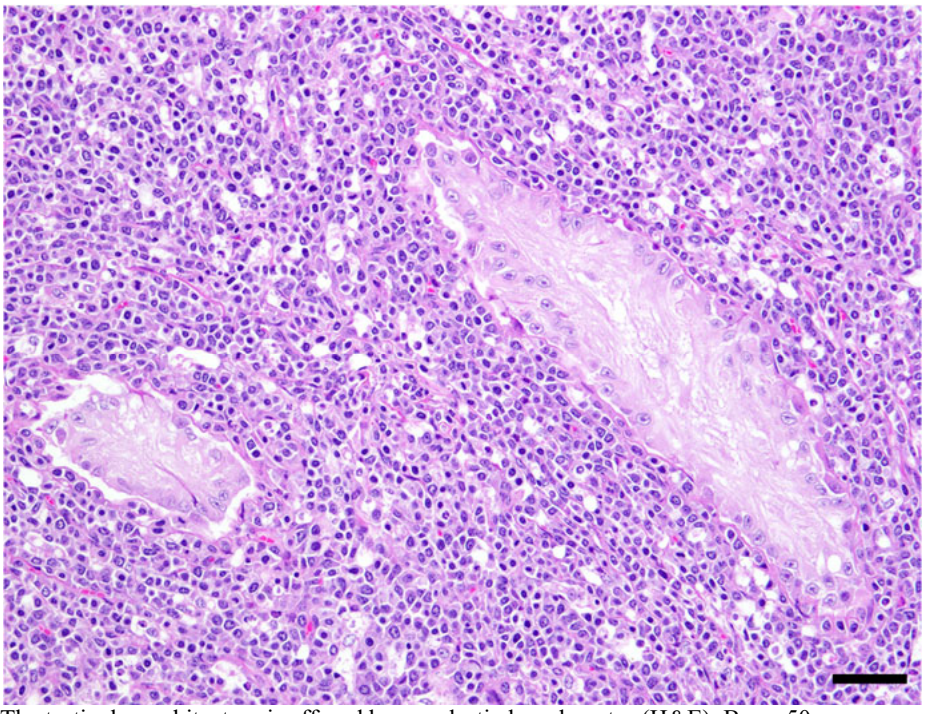

Figure 4. Testicle. The testicular architecture is effaced by neoplastic lymphocytes (H&E). Bar = 50 µm.

(Editor's note: The photographs in this manuscript are available in color in the online edition of Clinical Theriogenology.)