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Case Report

Seminoma in a gray brocket deer (*Mazama gouazoubira*) with unilateral cryptorchidism

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Abstract

Cryptorchidism is the incomplete descent of the testes and associated structures, and cryptorchid testes are more likely to develop testicular neoplasms, such as seminoma. This is the first report of a seminoma in a cryptorchid wild-caught gray brocket deer (*Mazama gouazoubira*). The animal developed a unilateral seminoma with classical histopathological findings and benign behavior. Six months after the orchiectomy the cervid presented a metatarsal opened fracture, dying during the orthopedic surgery. No macro or micrometric metastasis was observed at the necropsy.

Key words: pathology, oncology, cervid, wildlife, zoological garden, reproductive pathology.

Introduction

Cryptorchidism is the incomplete descent of the testes and associated structures, being caused by chromosomal, hormonal, structural, and environmental factors (Foster, 2016). Cryptorchid testes are more likely to develop testicular neoplasms, such as Sertoli cell tumors and seminomas (Foster, 2016; Agnew and MacLachlan, 2017). Seminomas are germ cell tumors, derived from the spermatogenic epithelium from the seminiferous tubule, being commonly observed in older dogs and in cryptorchid testes (Foster, 2016; Agnew and MacLachlan, 2017).

The gray brocket deer (*Mazama gouazoubira*) is a Latin-American cervid with a decreasing population trend, found in forests, savannas, shrubland, and wetlands (inland) in Brazil, Bolivia, Argentina, Paraguay, and Uruguay (Black-Decima and Vogliotti, 2016). There are few reports of neoplasms in this species (Lértora et al., 2014; Navas-Suárez et al., 2018; Wilson et al., 2021), with one single case of testicular germ cell neoplasm identified as a teratoma (Lértora et al., 2014). Herein we describe a case of seminoma in a cryptorchid wild-caught gray brocket deer, highlighting the anatomopathological aspects of this condition.

Case Description

A two-year-old male gray brocket deer (*Mazama gouazoubira*) kept under human care at Bauru Zoological Garden was diagnosed with unilateral cryptorchidism. The animal was captured from the wild with suspected bone fracture and arrived at the zoo as a newborn in August 2018. Two years later it was restrained for clinical evaluation and was observed that only the left testicle had the normal scrotal topography, whereas the right testicle was located in the abdominal cavity as demonstrated by ultrasound. Therefore, both testicles were surgically removed, fixed in 10% buffered formalin, and sent to histopathological evaluation. Samples were paraffin embedded, cut in a microtome (4 µm-thick sections), and stained with hematoxylin and eosin (HE) and periodic acid-Schiff (PAS).

Grossly, the right testicle was reduced in volume (3 x 2.5 cm), firm, with multifocal to coalescent nodular whitish

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areas with 0.2 to 0.8 cm of diameter (Figure 1), compressing the adjacent tissue (Figure 2). Histopathology from those nodular whitish nodules demonstrated pleomorphic polygonal to round cells arranged in dense poorly demarcated sheets. These cells had an eosinophilic well delimited PAS-negative cytoplasm, and a round to reniform nuclei with loose chromatin and one prominent central nucleolus (Figure 3). There were 20 mitotic figures per 10 higher magnification microscopic fields (400x), with moderate anisocytosis, marked nuclear pleomorphism, and few multinucleated cells (Figure 4). Few lymphocytes were observed infiltrating the neoplastic tissue. The adjacent seminiferous tubules had moderate to marked degeneration with loss of the germinative cells, thickened basement membrane, with the lumen filled with a round dense basophilic material, interpreted as concretions (Figure 5). Anatomopathological features of the right testicle were compatible with seminoma. The scrotal testicle had no gross changes, whereas microscopically there was a mild multifocal tubular degeneration with nearly normal spermatogenesis.

Six months after the orchiectomy the cervid presented a metatarsal opened fracture. During the first treatment attempt, conservative fixation with an orthopedic splint was chosen. However, upon awakening from sedation, the animal reacted violently to the splint, removing it, exposing the bone fracture even more and dislocating the ankle of the contralateral limb. Surgery was performed, but the animal had severe apnea during anesthesia, becoming comatose, and dying after attempts of resuscitation. Necropsy was performed immediately after death. Anatomopathological findings were characterized by systemic congestion, with multifocal hemorrhage at endocardium and kidney, mild diffuse interstitial pneumonia, and marked diffuse hepatic lipidosis. No gross or microscopic metastatic lesions were observed.

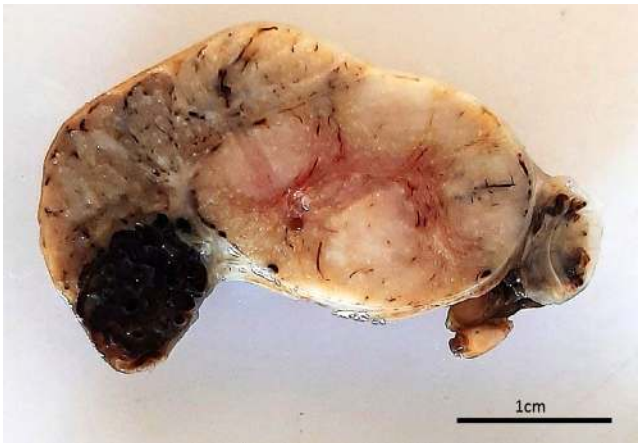

Figure 1. Cut surface of the formalin-fixed cryptorchid testicle, which is smaller, withmultifocal seminoma, characterized by whitish multifocal nodules. Scale bar = 1 cm.

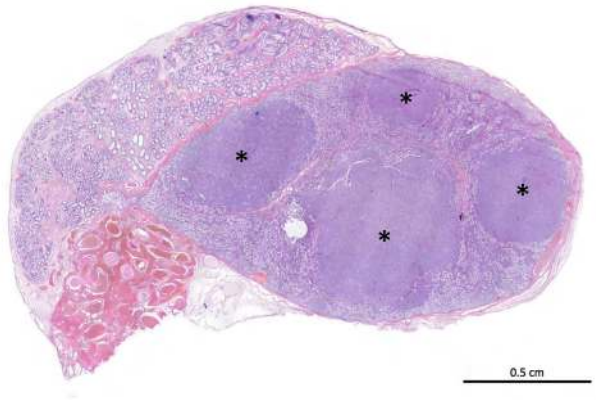

Figure 2. Sub-macroscopic view of the cryptorchid testicle, with densely cellular and poorly delimited multifocal areas interpreted as neoplastic tissue (*) compressing de adjacent tissue, right testicle, HE, scale bar = 0.5 cm.

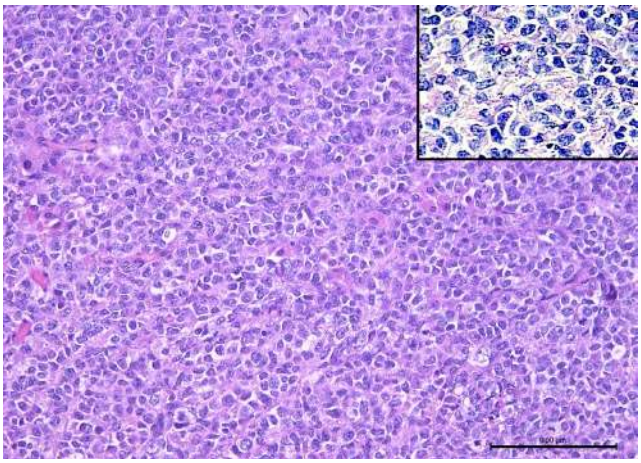

Figure 3. Testicular neoplasm composed of polygonal to round neoplastic cells arranged in dense sheets delimited by a delicate fibrous tissue, with an eosinophilic well delimited PAS-negative cytoplasm (top right) and moderate anisokaryosis, right testicle, HE, scale bar = 100 µm.

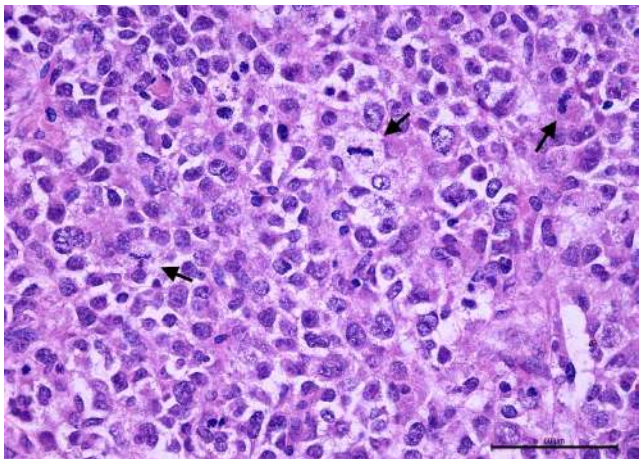

Figure 4. Neoplastic cells had round to reniform nuclei, loosely chromatin and one central well evident nucleoliright testicle. High numbers of mitotic figures (arrows) were observed, HE, scale bar = 60 µm.

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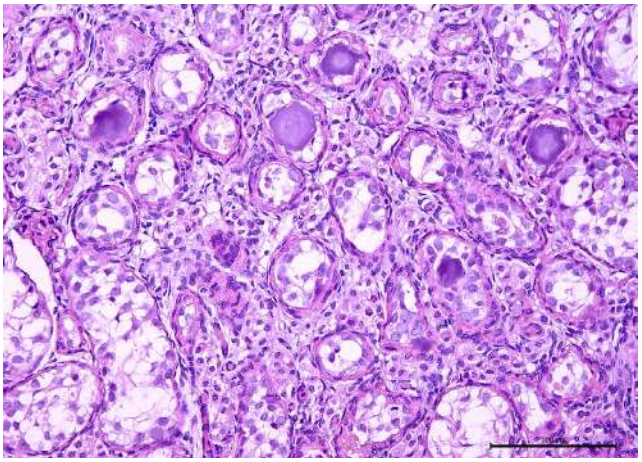

Figure 5. Cryptorchid testicle with moderate to marked tubular degeneration with loss of the germinative cells, thickened basement membrane, with the lumen filled with a round dense basophilic concretions, right testicle, HE, scale bar = 100 µm.

Discussion

To the best of our knowledge this is the first report of seminoma and cryptorchidism in a gray brocket deer. Interestingly, this animal was born in the wild and was diagnosed with cryptorchidism and testicular neoplasia after a clinical check-up. Urogenital neoplasms affecting South American deer is uncommon, previously reported cases include: one case of dysgerminoma, in a retrospective study with 211 marsh deer (*Blastocerus dichotomus*) and *M. gouazoubira* necropsied between 1995 and 2015 (Navas-Suárez et al., 2018); one ovarian mucinous cystadenoma (Monteiro et al., 2011); and two cases of teratoma, one renal (Wilson et al., 2021) and another testicular (Lértora et al., 2014); these later cases affecting *M. gouazoubira*.

Seminomas are common neoplasms observed in cryptorchid testes from domestic animals, being usually considered a benign neoplasm, but metastatic cases may occur (Foster, 2016; Agnew and MacLachlan, 2017). In humans there are two forms of seminoma: classic and spermatocytic (Agnew and MacLachlan, 2017). Classic seminomas usually occur in young man with a more aggressive pattern, with the cytoplasm of neoplastic cells staining strongly for PAS and immunoreactive for placental alkaline phosphatase (PLAP) by immunohistochemistry. Spermatocytic seminomas are negative for both markers and are observed in senile man with a more benign pattern. In domestic animals, there is no correlation established between these different histopathological features and the neoplasm behavior (Foster, 2016; Agnew and MacLachlan, 2017). This case was PAS-negative with a benign pattern, characterized by absence of metastatic foci or neoplastic emboli, and it resembled the spermatocytic form as described in humans, which is the usual morphologic pattern observed in dogs (Agnew and MacLachlan, 2017), in which seminomas as well as other testicular neoplasms are common with a markedly increased prevalence in older individuals (Santos et al., 2000). Additionally, inflammatory lymphocyte infiltration, observed in this case, is also a common feature of seminoma in dogs (Agnew and MacLachlan, 2017).

South American cervids usually reach sexual maturity from 11 to 14 months, when a complete descent of both testes into the scrotum is expected. However, the development of horns and the production of viable spermatozoa will only occur in the second year of life (Zanetti and Duarte, 2014). These parameters are in good agreement with the diagnosis of cryptorchidism in this case, since the animal was two year-old, and the left testicle remained located in the abdominal cavity. Unilateral cryptorchidism, as observed in this case, is far more common in animals than bilateral cryptorchidism, except for Sitka black-tailed deer (*Odocoileus hemionus sitkensis*) from Alaska, which have a prevalence of 69% of bilateral cryptorchidism compared to 7% of unilateral cryptorchidism in the same population (Amann and Veeramachaneni, 2006; Veeramachaneni et al., 2006). In addition to the neoplasm, the cryptorchid testicle in this case was smaller than the scrotal testicle, with "Sertoli cell only" pattern in the remained seminiferous tubule, which is a feature often described in cryptorchid domestic animals and caused by the effects of the high body temperature on the spermatogenesis (Foster, 2016).

Importantly, the left testicle in this case, although presenting mild tubular degeneration, had a nearly normal spermatogenesis, making possible for this animal to breed in its sexual maturity. However, due to possible hereditary etiology, breeding is usually not recommended for cryptorchid animals (Amann and Veeramachaneni, 2006; Foster, 2016). Individual cases of cryptorchidism are usually associated with hereditary basis, while outbreaks are more associated with hormonal and environmental factors (Foster, 2016). In fact, it is known that habitat fragmentation, caused by anthropological factors, have a deleterious effect in genetic diversity, favoring inbreeding and inbreeding depression (Keyghobadi, 2007), which could be a possibility in this case.

Environmental factors are also implicated in the development of cryptorchidism (Foster, 2016). In populations of Sitka black-tailed deer (*O. hemionus sitkensis*) from Aliulik Peninsula of Kodiak Island, Alaska, that have 76% of cryptorchid animals, besides classical gene mutation concentrated by inbreeding, high levels of estrogen compounds in the environment were also speculated to justify this high frequency of cryptorchidism (Veeramachaneni et al., 2006). There are also studies associating pre-natal exposure of wildlife animals to anthropogenic environmental contaminants, such as pesticides, fertilizers, petroleum derivatives, pharmaceuticals hormones, with the development of "testicular dysgenesis syndrome", that have cryptorchidism as one of the manifestations (Edwards

et al., 2006). Organic pollutants were also implicated as associated with cryptorchidism in children (Koskenniemi et al., 2015). Unfortunately, it was not possible to know if other animals from the same group were affected and which factor led to the development of cryptorchidism in this case. However, the fact that this animal was originally from wildlife raises a concern about the reproductive status from this wild population.

Acknowledgements

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References

1. Agnew DW, MacLachlan NJ. Tumors of the Genital Systems. In: Meuten DJ, editor. Tumors in Domestic Animals, fifth edition. Iowa: Wiley; 2017. p. 689-722.
2. Amann RP, Veeramachaneni DNR. Cryptorchidism and associated problems in animals. Anim Reprod. 2006;3(2):108-120.
3. Black-Decima PA, Vogliotti A. *Mazama gouazoubira*. The IUCN Red List of Threatened Species. 2016; e.T29620A22154584. https://dx.doi.org/10.2305/IUCN.UK.2016-2.RLTS.T29620A22154584.en. Accessed on 03 May 2022.
4. Edwards TM, Moore BC, Guillette Junior LJ. Reproductive dysgenesis in wildlife: a comparative view. Int J Androl. 2006;29:109-121.
5. Foster RA. Male Genital System. In: Maxie MG, editor. Jubb, Kennedy & Palmer's Pathology of domestic animals, sixth edition. Philadelphia: Elsevier; 2016. p. 465-508.
6. Keyghobadi N. The genetic implications of habitat fragmentation for animals. Can J Zoo. 2007;85(10):1049-64.
7. Koskenniemi JJ, Virtanen HE, Kiviranta H, Damgaard IN, Matomäki J, Thorup JM, Hurme T, Skakkebaek NE, Main KM, Toppari1 J. Association between levels of persistent organic pollutants in adipose tissue and cryptorchidism in early childhood: a case–control study. Environ Health. 2015;14(78):1-10.
8. Lértora WJ, Fernandez J, Negrette MS. Testicular Teratoma in Gray Brocket Deer (*Mazama gouazoubira*). Braz J Vet Pathol. 2014; 7(2):82-5.
9. Monteiro LN, Salgado BS, Grandi F, Fernandes TR, Miranda BS, Teixeira CR, Rocha RM, Rocha NS. Ovarian mucinous cystadenoma in a gray brocket deer (*Mazama gouazoupira*). J Vet Diagn Investig. 2011;23(3):589–92.
10. Navas-Suárez PE, Díaz-Delgado J, Matushima ER, Fávero CM, Sánchez Sarmiento AM, Sacristán C, et al. A retrospective pathology study of two Neotropical deer species (1995-2015), Brazil: Marsh deer (*Blastocerus dichotomus*) and brown brocket deer (*Mazama gouazoubira*). Plos one. 2018;13(6):e0198670.
11. Santos RL, Silva CM, Ribeiro AFC, Serakides R. Testicular tumors in dogs: frequency and age distribution. Arq Bras Med Vet Zootec. 2000;52:25-26.
12. Veeramachaneni DNR, Amann RP, Jacobson JP. Testis and antler dysgenesis in Sitka Black-Tailed Deer on Kodiak Island, Alaska: sequela of environmental endocrine disruption? Env Health Perspect. 2006;114 (suppl.1):51-59.
13. Wilson TM, Machado M, Sousa DER, Laufer-Amorim R, Neto RT, Chagas NTC, Castro MB. Pathology in Practice. J Am Vet Med Assoc. 2021;259(S2):1-3.
14. Zanetti ES, Duarte JMB. Reprodução e Obstetrícia de cervídeos neotropicais. In: Cubas ZS, Silva JCR, Catão-Dias JL, editor. Tratado de Animais Selvagens Medicina Veterinária, second edition. São Paulo:Roca; 2014. p. 2519-2537.