

CASE REPORT

Unilateral ovarian absence in a Black-headed Squirrel Monkey (*Saimiri vanzolinii* Ayres, 1985), a threatened neotropical primate species

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Abstract

Ovarian agenesis is an unusual anomaly with traumatic or congenital origin. In the present case report, we describe our findings in a senile *S. vanzolinii* female. As this neotropical primate species is listed as vulnerable, with limited geographic distribution in the Brazilian Amazonia, ovarian agenesis may be an important finding to be reported.

KEYWORDS

Amazonia, female tract, histology, morphology, non-human primate, ovarian agenesis

1 | INTRODUCTION

Ovarian agenesis either or not accompanied by the absence of fallopian tube (oviduct) is a rare phenomenon. It has congenital or traumatic origin.^{1–3} Congenital ovarian agenesis is often associated with alterations on the Müllerian duct differentiation,^{2–4} while the traumatic origin is linked to torsion followed by ovarian necrosis.^{4–6} In both cases, unilateral ovarian agenesis is commonly asymptomatic. Reports describing ovarian agenesis have been published on primates, especially focused on humans,⁷ with scarce reports in non-human primates.⁸ The importance of documentation from reproductive anomalies such ovarian agenesis encompasses not only the formation of a data basis, but this information can also be used to perform a proper analysis of its occurrence and impacts on the natural habitat of the affected females. Herewith we describe a case of unilateral ovarian absence in *Saimiri vanzolinii* (black-headed squirrel monkey), a free-living neotropical non-human primate species recently listed as threatened by the IUCN.⁹

2 | CASE REPORT

All the procedures herein described were approved by Ministério do Meio Ambiente—Sistema de Autorização e Informação em Biodiversidade—SISBIO/ICMBio/MMA no. 29906-1 and by the Ethical Committee in Animal Research of Mamirauá Institute of Sustainable Development (MISD)—no. 002/2012. In 2012, during a field study at MISD, *Saimiri vanzolinii* specimens were selected for genetic studies. All the procedures were performed under the supervision of a veterinary. For this, the animals were firstly anesthetized with ketamine hydrochloride (Ketamine 15 mg/kg; IM; Köning S.A., Avellaneda, Argentina) and xilazine hydrochloride (Anasedan 2 mg/kg; IM; Köning S.A.). During the procedures, however, one senile female did not recover from anesthesia and died. The approximate age (>6 years old) of the female was estimated based on dentition considering tooth eruption, intra-osseous tooth formation and tooth wear.¹⁰ Therefore, the animal was submitted to an exploratory necropsy. The female was presenting head and tail alopecia together

with a high parasitic infection. It was observed also the presence of a dense fibrous tissue in the coelomic cavity. We performed macro- and microscopic evaluation of the reproductive system. For this, tissues were fixed in 10% formalin.

During inspection, extern genitalia, vagina, cervix, and uterus were normal. However, the left oviduct was almost 10 mm shorter than the right one (16.35 mm left oviduct; 26.30 mm right oviduct), and both oviducts were deprived from fimbriae. The left ovary was morphologically normal (length: 5.41 mm; breadth: 3.30 mm; height: 3.21 mm), but at the place of the right ovary, it was found an ovoid and soft structure (Figure 1A). The left broad ligament was shorter than the right one. The uterine ligaments were normal without adhesences.

At microscopic analysis, the left ovary presented evidences of a normal functioning history by the presence of more than 28 000 ovarian follicles at different developmental stages, and a corpus luteum was present (Figure 1B, C). On the right side, however, the ovoid-soft

structure was found to be not an ovary, but a structure similar to the oviducts (Figure 1D), because of its similar folded mucosa with ciliated columnar epithelial cells (Figure 1E).

3 | DISCUSSION

Herewith we report a case of ovarian agenesis in a *Saimiri* species listed in the IUCN list as vulnerable,⁹ a threatened category. For our knowledge, this is the second report of ovarian agenesis in a neotropical primate. The first case was observed in a *Sapajus apella* female.⁸

Alopecia was observed in the examined female. This can be a physiological or not physiological process. For example, it has been shown in other non-human primate species that alopecia can be influenced by aging, seasonality, pregnancy, hormonal changes, or by stress, endocrine disorders, and nutritional imbalance, bacterial, or parasitic infections.¹¹ In the present case report, the female was probably presenting alopecia due to both processes, that is, senility and parasitic infection.

The presence of a functioning ovary, that is, presenting follicles at different developmental stages and corpus luteum, in senile squirrel monkeys has been previously reported.^{12,13} The observed anomaly was restricted to the absent right ovary, which was supplanted by an ovoid structure with histological characteristics of an oviduct. The differences in the length of the oviducts and broad ligaments might be attributed to a developmental malformation,^{1,8,14} probably related to a congenital defect in which the migration of the germ cells did not occur,¹⁴ leading to the non-formation of one of the ovaries.¹⁵ Such defect is more unusual than other anomalies attributed to a failure in the Müller duct development, which causes defects in the oviduct, uterus, cervix, vagina, and extern genitalia.^{16,17}

In the present studied case, a possible hybridization effect was discarded, once there is no evidence of contact between *S. vanzolinii* and its congener and neighbor species, *S. cassiquiarensis*.⁴ Although individuals presenting inefficient reproductive performance may impact their population, absence of one ovarian will not circumvent the generation of descendants.¹⁸ However, it may contribute to a decrease in the size of the population. For instance, women with a single ovary will be not less fertile, but there is no compensatory mechanism for the number of reserve follicles.¹⁹ Thus, similar effects are expected in non-human primates as well. This is an unusual case and will be mostly accidentally observed in non-human primates, especially those free-living species. Reporting this finding will stimulate other groups to also maintain attention on the reproductive system during unforeseen necropsies.

One could suggest a further ovarian function evaluation through ultrasound using a larger number of females. However, *Saimiri vanzolinii* is a vulnerable species, and the Environmental Ministry does not allow the capture of many females for such analysis. Also, ovarian agenesis is not expected to be a common condition, but a rare observation as reported for other primates. Capturing a large number of free-living animals for such a study may lead to undesirable stress and end up with negative effects on their reproductive performance,

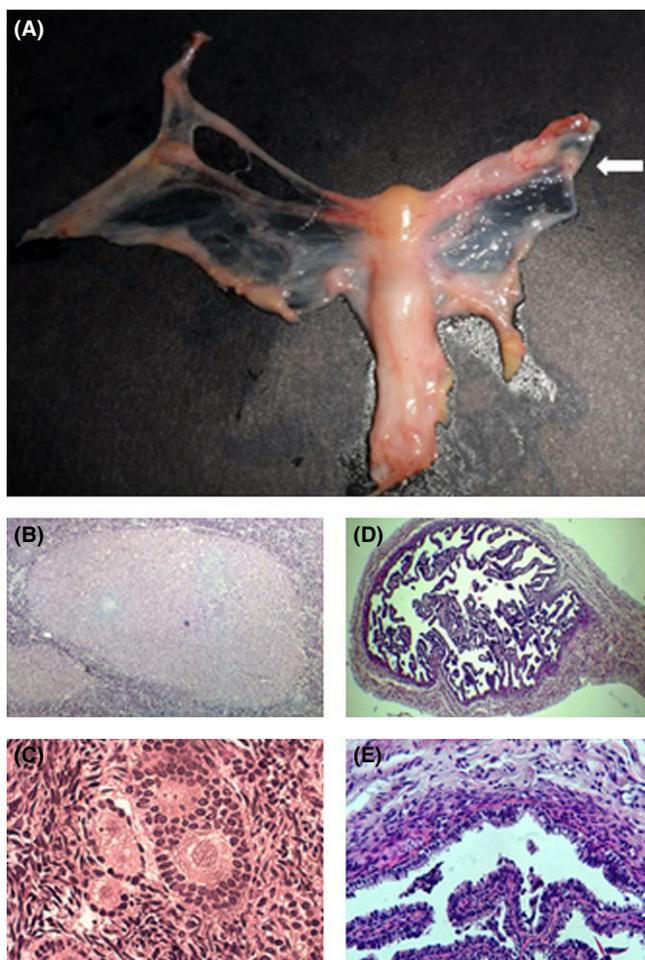


FIGURE 1 Images depicting the reproductive tract of a senile *S. vanzolinii* female, showing the found ovoid-soft structure occupying the location of the right ovary (A; see white arrow). After routine histology staining (hematoxylin–eosin), the left ovary presented a corpus luteum (B) and ovarian follicles at different developmental stages (C). The ovoid structure, however, showed a folded mucosa with ciliated columnar epithelial cells (D), similar to the microscopic characteristics of the oviduct (E)

which is not ethically approved. On the other hand, comparative biology can be used to study more deeply the closest species which are not endangered and share the same geographic area, such as *S. cassiquiarensis*. Recently, we have shown similarities among *S. vanzolinii*, *S. cassiquiarensis*, and *S. macrodon*, when evaluating reproductive female organs.²⁰ These findings will support the development of reproductive biotechniques for *S. vanzolinii* using, as models, the not threatened species *S. cassiquiarensis* and *S. macrodon*.

The present manuscript is not an attempt to induce a change in the conservation status of *S. vanzolinii*, which is already listed as threatened by IUCN, due to its current restricted geographic distribution and small population size. The present information is relevant because animals with ovarian agenesis can present, in the best of scenarios, a reduced reproductive potential, leading to a decrease in the natural population growth rate of the species. Something that is not desirable in the case of threatened species. Hence, it is an additional cause for caution in relation to the need of protection for *S. vanzolinii*.

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