

True Hermaphroditism in a Dog: A Case Report

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ABSTRACT

True hermaphroditism in a dog is described in this case report. An eight month old cross-breed dog with enlarged structure protruding from the vulva was brought for an ovariohysterectomy operation. Physical examinations exposed the presence of an os clitoris and urethral orifice at the base of the os clitoris. Exploratory laparotomy was performed as a diagnostic and therapeutic procedure. Both gonadal tissues and the genital tract were removed during surgery and brought to the laboratory for pathological examinations. Microscopic examinations showed that the right gonad had both seminiferous tubules like testis and primer follicles like ovarium. The concentrations of serum progesterone, testosterone and 17 β -estradiol were 0,188 ng/ml, 1,008 ng/ml and 23,61 pg/ml respectively. We concluded that this is a true hermaphroditism case due to the simultaneous presence of two sex gonads.

Keywords: Dog, Intersexuality, True hermaphroditism, Ovary, Hormone concentrations

Bir Köpekte Gerçek Hermafroditizm: Olgu Sunumu

ÖZ

Bu çalışmada, gerçek hermafrodit bir köpek anlatılmıştır. Vulvasından dışarıya doğru çıkan büyük bir kitle olan 8 aylık melez bir köpek kısırlaştırma operasyonu için araştırma merkezimize getirildi. Fiziksel muayenelerde os klitoris varlığı ve bunun bazalinde uretral deliğin olduğu saptandı. Teşhis ve tedavi amacıyla hayvana ovariohysterectomy operasyonu uygulandı. Her iki gonadal doku ve uterus patolojik incelemeler için laboratuvara gönderildi. Mikroskopik incelemeler, sağ gonadın hem testis gibi seminifer tubuller hem de ovaryum gibi primer foliküller içerdiğini gösterdi. Serum progesteron, 17 β -östradiol ve testosteron düzeyleri sırasıyla 0,188 ng/ml, 23,61 pg/ml, 1,008 ng/ml olarak ölçüldü. Köpekte her iki gonadal dokunun aynı anda bulunması nedeniyle olgunun bir gerçek hermafroditizm olgusu olduğu kanısına varıldı.

Anahtar Kelimeler: Köpek, İnterseksüalite, Gerçek hermafroditizm, Ovary, Hormon seviyeleri

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INTRODUCTION

The chromosomal sex of zygote resulting in XY or XX is determined after fertilization. During the normal sex development of males, the SRY gene in the Y chromosome causes differentiation of primordial follicles in the testes at the sexual differentiation stage of the embryo. Secretion of testosterone and Mullerian Inhibiting Substance (MIS) results in the development of male genital organs. The absence of the Y chromosome and the SRY gene leads to the development of ovaries and female genitalia (Hare 1976, Poth et al. 2010). Any defect at this progression stage may cause the development of sexual disorders such as hermaphroditism. An animal that has genitalia with a part or all of the genital organs of both sexes is called a 'Hermaphrodite' (Alam et al. 2007). Male pseudohermaphrodites have testicular gonadal tissue with female genital organs, while female pseudohermaphrodites have ovarian gonadal tissue with male genital organs. As for true hermaphrodites, they have the gonadal tissues of both sexes (Hare 1976). There are various combinations involving the presence of both ovarian and testicular tissues in true hermaphrodites. A testis and ovary may be found in contralateral sides, ovotestis may be found in both sides or the ovotestis may be paired with one ovary or testis (Alam et al. 2007). Poth et al. (2010) classified the reproductive tract abnormalities into three categories as sex chromosomes, gonadal sex development and phenotypic sex development disorders. Developmental disorders like these are caused by genetic or chromosomal abnormalities and iatrogenic hormonal or chemical exposure (Pasello-Legrand and Mowat 2004). Hermaphroditism is generally reported to be rare in dogs and it is often associated with infertility (Hare 1976, Kim and Kim 2006). In this paper, we report a case of true hermaphroditism in a dog.

CASE HISTORY

A cross bred dog aged 8 months was brought to the Veterinary Health, Practice and Research Centre of Afyon Kocatepe University for an ovariohysterectomy. The owner noted that the dog was classified as a female at birth and no abnormalities were reported except the absence of estrous behavior and an enlarged clitoris. The initial examination of the external genital organs revealed that an enlarged clitoris protruded from the vulva (Fig. 1). It was approximately 4 cm in length and 0,5 cm wide. Palpation of the enlarged tissue indicated the presence of an urethral orifice at the base of the os clitoris. During transabdominal ultrasonography,

neither follicles nor pathological structures were observed on the ovaries. Blood samples were collected for sex hormone analyses and it was decided to perform exploratory laparotomy for diagnosis and treatment.

The dog was administered 0,04 mg/kg atropine sulphate (Atropine sulphate inj®, Vetaş, Turkey) subcutaneously 30 min before the surgery. Intra catch i.v. cannula (18 G) was placed into the v. cephalica antebrachii for applying the anesthetics and intravenous solutions. The animal was premedicated with 0,3 mg/kg midazolam (Dormicum, Roche®, Turkey) given intravenously. Induction of anesthesia was performed with 6 mg/kg propofol (Propofol®, Abbott, Turkey) via IV bolus. Following endotracheal intubation, general anesthesia was maintained with 2% isoflurane (Forane®, Abbott, Turkey). The surgical incision was made on the abdominal midline about 2-3 cm in length. The reproductive internal organs were similar to those of a female dog in the inspection of the abdomen. After two ligations of the ovarian pedicles and the uterine body, both gonadal tissues and the genital tract were removed and brought to the laboratory for pathological examinations. The surgery was concluded in a routine manner by closing the abdominal wall. Additionally the enlarged clitoris protruding from the vulva was removed (clitorisectomy). No complication occurred after the operation.

Uterine horns were 17 cm in length, left and right gonads were 1 cm and 2,5 cm in diameter respectively. Gonadal tissues were fixed in 10% neutral-buffered formalin, embedded in paraffin wax, sectioned at 5-6 µm and stained with hematoxylin and eosin. In the microscopic examination, there were numerous structures such as degenerative seminiferous tubules containing 2-3 layer cells on basal and primer follicles close to the cortex in the right gonad (Fig. 2) and numerous wide vessels filled with erythrocytes in the left gonad (Fig. 3). Microscopy of the uterine mucosa revealed wide hemorrhages between glands in the lamina propria (Fig. 4). Blood samples were transported to the Faculty of Medicine of Afyon Kocatepe University for measuring serum progesterone, testosterone and 17β-estradiol concentrations. Hormone levels were determined by electrochemiluminescence immunoassay (ECLIA, cobas e, Roche Diagnostics GmbH, Mannheim, Germany), according to the manufacturer's instructions. The concentrations of serum progesterone, testosterone and 17β-estradiol were 0,188 ng/ml, 1,008 ng/ml and 23,61 pg/ml respectively.



Fig. 1. Enlarged structure protruding from the vulva.

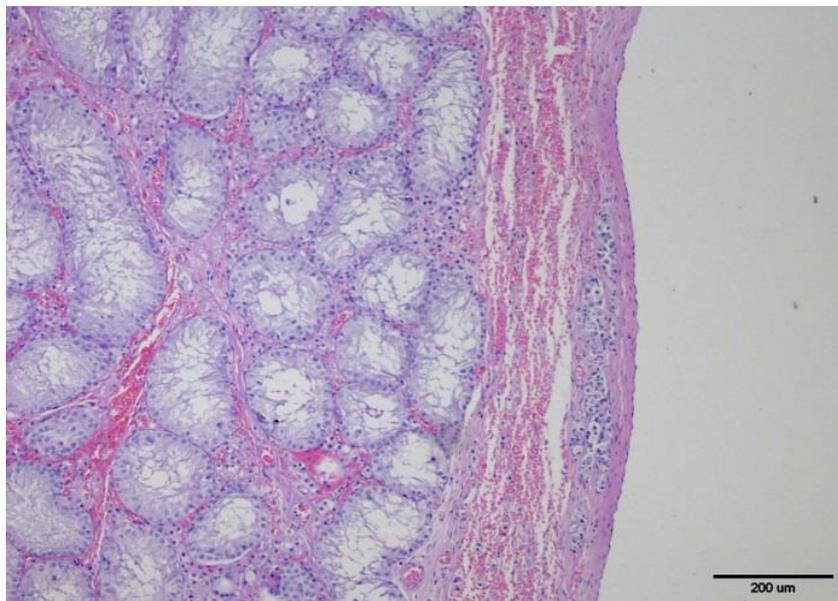


Fig. 2. Right gonad with degenerative seminiferous tubules and primer follicles.

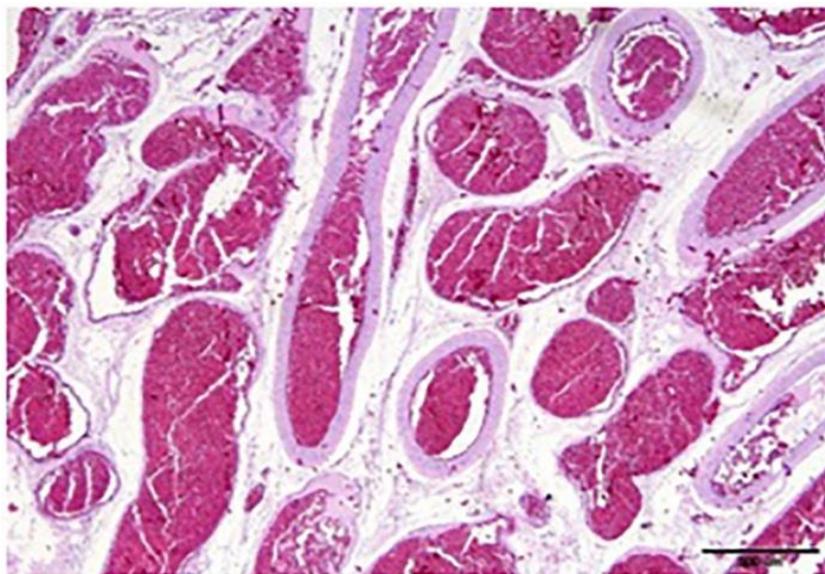


Fig. 3. Left gonad containing wide vessels filled with erythrocytes.

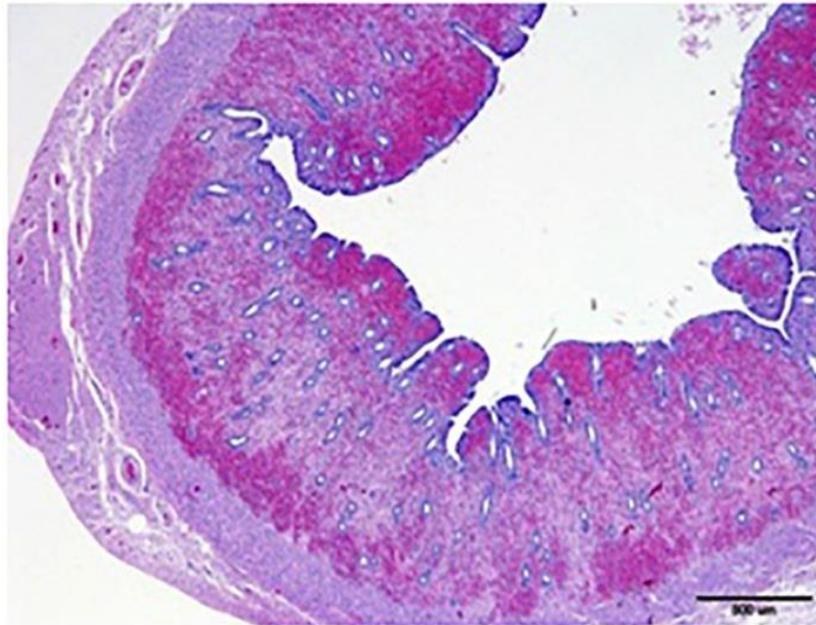


Fig. 4. Uterus

DISCUSSION

The intersexuality (true hermaphroditism or pseudohermaphroditism) in mammals has been described in numerous species including humans, cattle, horses, dogs and monkeys (Atakam 1954, Dunn et al. 1968, Meyers-Wallen et al. 1997, Del Amo et al. 2001, Pasello-Legrand and Mowat 2004). A defect at any step of sexual development, the chromosomal, gonadal or phenotypic level of differentiation can lead to sexual abnormalities (Kim and Kim 2006). Incorrect timing of releasing the Mullerian Inhibiting Factor and inadequate secretion of testosterone by leydig cells can cause the presence of Mullerian and Wolffian structures together in true hermaphrodites (Vani 2008). In this case, a rare condition, true hermaphroditism, has been reported with the findings of macroscopic, histological and the hormonal profile of a dog.

Serum levels of testosterone, estradiol and progesterone were reported as 0,01-41,5 ng/ml, 33,6-66,6 pg/ml and 0,02-0,5 ng/ml in healthy male dogs and 0,01-0,3 ng/ml, 31,5-69,0 pg/ml and 0,01-0,65 ng/ml in healthy female dogs, respectively (Concannon and Castracane 1985, Frank et al. 2003). However, we were unable to find any research that reported steroid levels of true hermaphrodite dogs, Del Amo et al. (2001) and Alam et al. (2007) reported hyperestrogenemia and low serum concentrations of testosterone in male pseudohermaphrodite dogs. In this case, the concentrations of serum testosterone were found to be 1,008 ng/ml. The level of testosterone is similar to the basal levels of male dogs but higher than females and male pseudohermaphrodites. It is suggested that the

normal testosterone concentrations may be due to true hermaphroditism and the presence of seminiferous tubules. The estrogen level (23,61

pg/ml) was lower than that of healthy males, females and male pseudohermaphrodites. Del Amo et al. (2001) suggested that the hyperestrogenemia and low testosterone serum concentrations in male pseudohermaphrodite dogs may be due to the sertoli cell tumors. In the present study, no evidence of sertoli cell tumors has been observed. The serum progesterone level of the patient was similar to that of healthy male and female dogs. Since there were no clear discrepancies regarding the concentrations of progesterone, it might be suggested that there is no association between the concentrations of progesterone and hermaphroditism.

True hermaphrodites have the gonads of both sexes (Alam et al. 2007). Although it is very rare; they can have one testis on one side and one ovary on the other (Atakam, 1954) or ovotestis may be paired with one ovary or testis (Alam et al. 2007). In our case, pathological examinations revealed that there are degenerative seminiferous tubules similar to testis tissue and primer follicles close to the cortex on the right gonad and the other gonad has numerous blood vessels filled erythrocyte. It is suggested that this is a true hermaphrodite dog because of the pathological findings.

Pasello-Legrand and Mowat (2004) reported that hermaphroditism is caused by genetic or chromosomal abnormalities and incorrect hormonal or chemical exposure. According to the anamnesis,

no hormonal or chemical treatment was applied to the patient. Therefore, it is suggested that the abnormality originates either from genetic or chromosomal defects. This report describes the first true hermaphrodite case in a cross-bred dog in Turkey.

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