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Surgical Correction of Female Pseudohermaphroditism in Five Pit Bull Dogs

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ABSTRACT

Congenital urogenital anomalies are well recognized but infrequent finding in dogs. Due to the complex urogenital anatomy such congenital anomalies encompasses a wide range of phenotypic variations. The most common complication associated with these anomalies includes dysuria, urinary incontinence, skin scald dermatitis and recurrent urinary tract infection. The objective of the present study was to report five Pit Bull dogs diagnosed to have female pseudohermaphroditism with special reference to their surgical management. Complete physical, radiographic and ultrasonographic examinations were done. Corrective surgery was designed individually for each case including clitorectomy, reconstruction of the vaginal floor and correction of penile direction. All surgeries resulted in uncomplicated wound healing and relieve of the associated urinary incontinence and/or urinary tract infection following surgery. When considering surgical correction in dogs with female pseudohermaphroditism, the outcome of surgical decision is usually depend upon the course of the urethra and the position of the external urethral orifice.

Key words: External genitalia, anomaly, hermaphrodite, bitch

INTRODUCTION

Disorders of sexual differentiation are well recognized but infrequent finding in dogs. Limited reports have been published giving details of the variety of anatomical derangements of internal and external genitalia (Holt *et al.*, 1983; Howard and Bjorling, 1989; Schlafer and Miller, 2007). Disorders from gonadal and phenotypic sex (hermaphroditism) may results in errors in sex differentiation (Meyers-Wallen *et al.*, 1999; Christensen, 2012). In true hermaphroditism, both gonadal tissues are present; but the secondary sex characteristics and external genitalia of the opposite sex are also present. Testicles and ovaries are present in various combinations: A testis may be found on one side and an ovary on the other side also an ovotestis or bilateral ovotestis may be present (Alam *et al.*, 2007; Poth *et al.*, 2010). In female pseudohermaphroditism (FPH), animals have XX chromosomes but external genitals appear masculine. The female has an enlarged clitoris and even a prostate (Hubler *et al.*, 1999; Meyers-Wallen, 1990; Sacks and Beraud, 2012). In male pseudohermaphroditism (MPH), the chromosomal gender is XY but the external genitals appear feminine. In several cases the dog has vestigial oviducts, uterus and even vulva. A penis can be present or, more often; it is an enlarged clitoris (Villagomez *et al.*, 2009). It has been reported that MPH is much more frequently reported than FPH (Sacks and Berand, 2012).

In dogs with complex congenital urogenital malformations, urinary incontinence occurs with failure of the normal voluntary control of urination (Morton, 2000). Urinary incontinence also predisposes to the development of urinary tract infection and urine scalding (Holt *et al.*, 1983; Morton, 2000).

The objective of the present study was to report five Pit Bull dogs diagnosed to have female pseudohermaphroditism with special reference to their surgical management.

MATERIALS AND METHODS

The present study was performed on five Pit Bull dogs of different ages 8-36 months (Mean±SD, 18.8±11.5) and weighing 18-30 kg (Mean±SD, 24.2±4.3) presented with abnormal external genitalia and diagnosed to have FPH. Dogs were admitted to the clinic of the Department of Surgery, Anesthesiology and Radiology, Faculty of Veterinary Medicine, Cairo University. Complete physical examination of external genitalia was performed with especial emphasis on the position, course and direction of the urethra. A radio-opaque urinary catheter was introduced through the urethral orifice and right lateral abdominal radiograph was taken. Abdominal ultrasonography was performed for detection of presence or absence of ovaries. Surgical correction of abnormal external genitalia was carried out either by excision of abnormally protruded clitoris with reconstruction of vaginal floor in 3 dogs or through redirection of protruded clitoris in 2 dogs. Ovariohystrectomy was performed in 3 cases. Post-operative follow up included daily administration of ceftriaxone HCL 500 mg (Epicephine[®], EPICO Co., Egypt) for 5 days as well as vaginal douches with povidone iodine (Betadine[®], Nile Pharm. Co., Egypt). Follow-up of cases was continued for 6 months following surgery. A consent form was obtained from all owners confirming their approval that dogs will be included in research purposes based on the Institutional Animal Care and Use Committee (IACUC), Faculty of Veterinary Medicine, Cairo University.

RESULTS

All the Bit Pull dogs that were presented with abnormal external genitalia including both male and female external genitalia. All dogs had history of regular estrous cycles with normal behavior during the time of estrous. Three cases had history of pooling of urine in the vagina and two cases were with backwardly directed urination that leads to recurrent urinary tract infection, urine scalds dermatitis. The urethral orifice is abnormally located at the dorsum of the vagina (Fig. 1). Physical examination of the external genitalia revealed presence of markedly enlarged vulva. The vulva was in its normal position in the perineal region in 3 dogs while it was ventrally placed in 2 dogs with an enlarged protruded penis-like clitoris supported by palpable "Os-clitoridis" (Fig. 1 and 2). The clitoris had a linear blackish discolorations suggested being a tortuous and corrugated vasculature. An accumulated infected fluid was seen at the vulvar opening in 2 dogs. Strong offensive odor and skin scald dermatitis was seen at the medial and posterior aspects of the thigh. The urethral orifice was at the dorsal aspect of the vagina in 3 dogs and introduction of urinary catheter revealed clear straw yellow urine. In 2 dogs, the urethral orifice was found on the lateral aspect of the protruded clitoris approximately 1 cm away from its tip. Introduction of a urinary catheter through the lateral urethral orifice revealed redirection of the urethra as detected by palpable catheter on its way to the ventral aspect of the clitoris and turbid hemorrhagic urine came out of the catheter (Fig. 3 and 4).

Plain radiography revealed a clearly identified os-clitoridis (Fig. 5 and 6). Abdominal ultrasonography revealed clearly identified right and left ovaries in 4 dogs while, only the left ovary



Fig. 1: A 3-year old female pseudohermaphrodite Pit Bull dog with a large clitoris protruded from enlarged vulva



Fig. 2: A 10-month old female pseudohermaphrodite Pit Bull dog with large clitoris protruded from the vulva



Fig. 3: A 3-year old female pseudohermaphrodite Pit Bull dog demonstrating a large protruded clitoris with congested vasculature



Fig. 4: A10-month old female pseudohermaphrodite Pit Bull dog demonstrating a large clitoris with bilateral swelling resembling the bulbourethral glands



Fig. 5: Lateral radiograph of a 3-year old female pseudohermaphrodite Pit Bull dog demonstrating the os-clitoridis at the perineal region



Fig. 6: Lateral radiograph of a 10-month old female pseudohermaphrodite Pit Bull dog demonstrating the course of the urethra through radio-opaque catheter and a faintly radio-opaque os-clitoridis

was identified in one dog. Surgical management included excision of the protruded clitoris with its entire os-clitoridis while securing the urethra by introduction of a urinary catheter through the urethral orifice. The clitoris was pulled out from the vulva and incision was made at its attachment to the ventral aspect of the vulva followed by blunt dissection till complete excision. The ventral surface of the vagina was reconstructed through suturing of the vaginal floor with simple continuous suture pattern (Fig. 7). Laparotomy was done for ovariohystrectomy where a full female reproductive tract was present including two ovaries, two uterine horns and uterine body, cervix and vagina. Two tubular structures were found lateral to the uterine horns, attached to the ovaries and coursed through the inguinal canal suggested being male gubernaculum. In 2 dogs, the surgical excision of the protruded clitoris was difficult or even impossible as the deviated urethra was passing through the lateral and ventral aspect of the clitoris. A correction of the position of the protruded clitoris was done through forward direction of the protruded clitoris with its entire urethra instead of the backward direction (Fig. 8). One week post-operative, urine scalds and dermatitis were markedly improved and the accumulated infected fluid was markedly decreased. None of the dogs developed urinary incontinence and/or urinary tract infection for 6 months following surgery.



Fig. 7: A 3-year old female pseudohermaphrodite Pit Bull dog after surgical excision of the clitoris with its entire os-clitoridis and reconstruction of vaginal floor



Fig. 8: A 10-month old female pseudohermaphrodite Pit Bull dog after corrective surgery demonstrating forward direction of the protruded clitoris

DISCUSSION

Developmental disorders of the urogenital system have been described in numerous species including humans, pigs, goats, horses and dogs (Kim and Kim, 2006). During normal fetal development of a female with the XX genotype, the undifferentiated gonads develop into ovaries in the absence of a testis and the testis-dependent products (mullerian inhibiting factor, testosterone and dihydrotestosterone). The uterus and vagina develop from the mullerian duct system and the wolffian duct system regresses. The caudal vagina and vestibule develop from the urogenital sinus, the clitoris develops from the genital tubercle and the vulva develops from the genital swellings which remain open (Meyers-Wallen and Pattersond, 1986).

The normal sexual differentiation occurs mainly through three sequential phases including establishment of chromosomal sex, then development of gonadal sex and lastly, development of phenotypic sex (Lyle, 2007). Pseudohermaphrodite occurs where there is a disagreement between phenotypic and gonadal sex (Del Amo *et al.*, 2001). Individuals with pseudohermaphroditism usually have a single type of germinal tissue, according to which they are male or female pseudohermaphrodite (Kennedy and Miller, 1993). A female pseudohermaphrodite has ovaries but male external genitalia (Hubler *et al.*, 1999; Villagomez *et al.*, 2009). It has been reported that most cases of FPH may be resulted from administration of steroids to pregnant bitches during critical stages of fetal development, inducing virilization of female fetuses (Olson *et al.*, 1989). It has been hypothesized that the presence of masculinized external female genitalia is mainly due to fetal (*in utero*) androgenization (Macarthur and Mahomed, 2006; Sacks and Beraud, 2012). The presence of partially developed internal male system in the form of male gubernaculum cannot be a result of androgen/testosterone stimulation from interstitial cells of testicular tissue, as the male system would have been then fully developed. Sources of fetal androgenization may be due to exogenous exposure to androgens or due to adrenal hyperplasia as explained by Waghmare *et al.* (2010).

It is therefore, hypothesized that stimulation from an alternative (non-testicular) androgen source occurred, in amount sufficient for partial but not full development of the male reproductive system (Meyers-Wallen *et al.*, 1991).

Limited reports of FPH with urethral abnormalities has been reported in dogs that were managed surgically have been previously reported (Gregory and Trower, 1997; Sacks and Beraud, 2012). The position of the urethra and the course of the external urethral orifice were very crucial in the design and decision of the corrective surgeries of the presented cases of FPH. In 3 dogs, the urethra was abnormally located on the dorsum of the vagina but it was away from the enlarged protruded clitoris. So, the excision of clitoris with its entire os-clitoridis was performed safely. In the other 2 dogs, the urethral orifice was abnormally located on the lateral aspect of the protruded clitoris and passes on its ventral aspect. So, it was impossible to excise the protruded clitoris so, the decision was made for correcting the direction of the clitoris with its entire urethra to overcome urinary incontinence and recurrent urinary tract infection rather than its excision. The surgical management was successful in preventing the recurrent urinary tract infection and incontinence similar to the previously reported result of (Sacks and Beraud, 2012).

Excision of internal abdominal genitalia (ovaries and uterus) was a part from surgical management of FPH to reduce the risk of serious ovarian or uterine diseases, overcomes the potential risk of neoplasia, as well as allowing accurate classification of the type of hermaphroditism (Gregory and Trower, 1997; Sacks and Beraud, 2012).

The main limitation of the present study is the relatively low number of cases and the absence of full data concerning hormonal treatment during pregnancy.

CONCLUSION

In conclusion, surgical correction of congenital external genital anomalies in cases of FPH is a successful technique that allowed overcoming complications associated with this anomaly. Surgical decision is usually based upon the course of the urethra and the position of the external urethral orifice.

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