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That's not normal: how to handle vaginal anatomic anomalies
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Objectives
- To discuss a variety of congenital and acquired vaginal diseases that can be seen in dogs and cats.
- To provide surgical treatment recommendations for various vaginal anatomic abnormalities.

Key points
- Fortunately many vaginal anatomic anomalies occur rarely, however prompt identification and recommendations are necessary to minimize morbidity to the patient.
- Abnormalities in embryonic canalization of the paramesonephric duct between the end of the Müllarian duct and the urogenital sinus can cause many variations of anatomic abnormalities, including hypoplasia, atresia and septa of the vagina, or abnormal connections between the vagina/vestibule and rectum/anus.
- To date there is no definitive documentation that sterilization prior to the first estrus will cause vulvar hypoplasia (juvenile/recessed vulva) in dogs. However sterilization prior to the first estrus will decrease the risk of mammary tumor development in dogs.
- Clitoral hypertrophy most commonly occurs in dogs with intersex disorders, hyperadrenocorticism, or after having received anabolic steroids. Dogs with intersex disorders will often have ovotestes in place of one or both ovaries.
- Vaginal septa or bands may be digitally broken down or surgically removed. Vestibulovaginal stenosis may be identified in many patients, but clinical significance and the need for surgical correction depends on severity and clinical signs.
- Vaginal edema must be differentiated from vaginal prolapse. Vaginal edema involves prolapse of edematous mucosa on the floor of the vaginal vault. Vaginal prolapse is a circumferential prolapse of the vagina and often includes the cervix.
- Of the reported vaginal neoplasias, 73-94% are benign, with leiomyomas being the most common, and appear to be sex hormone dependent.

Overview
There are a number of developmental and acquired conditions affecting the vagina and vulva that can be seen in both dogs and cats. Most commonly, dogs will be affected with these aberrations. Congenital conditions, which primarily affect younger dogs and cats, include rectovaginal fistula and anovulvar cleft; vulvar/vaginal hypoplasia and atresia; clitoral enlargement; and vaginal septa, bands, or stenosis. Acquired conditions generally affect older animals and include vaginal neoplasia and vaginal prolapse. However, some acquired conditions such as vaginal hyperplasia and perivulvar dermatitis can affect younger dogs. It is important to note that some acquired problems may develop secondary to abnormal anatomy of the reproductive tract so a thorough examination of the reproductive system is imperative in these animals.

Anovulvar cleft
Anovulvar cleft is a rare defect that occurs as a result of inappropriate fusion of the urogenital folds, with a cleft or trough present between the anus and vulva. This abnormality can be observed in sexually normal females or those with intersex disorders. The vestibular floor and clitoris are exposed, resulting in fecal contamination and hyperemia. If not corrected, this abnormality will cause increased occurrences of urinary tract infections due to fecal contamination, inflammation, and constant licking by the patient. This defect is easily corrected with a perineoplasty, and provides a good cosmetic appearance. Surgical correction is done by creating an H-shaped or inverted V-shaped incision along the mucocutaneous junction of the cleft. The skin and mucosal edges are separated, allowing the submucosa
and skin to be closed primarily across the midline of the perineum. The vestibular mucosa is then apposed to the skin edges to recreate the dorsal wall of the vestibule/vulva.

**Rectovaginal fistula**
Patients with a rectovaginal fistula, or connection between the rectum and vagina, will often also have some degree of atresia ani. In these patients fecal material is excreted through the vulva. Severity of clinical signs (tenesmus, distended abdomen, bulging perineum) depends on the degree of anal atresia (or stenosis), type of diet, and size of the fistula. In one study evaluating puppies and kittens with atresia ani, 12 animals were identified, and eight of them had rectovaginal fistulas. Dogs with atresia ani may have megacolon as a complicating factor. Vaginography or a barium sulfate enema can be used to demonstrate the location and size of the fistula. Correction of the rectovaginal fistula is usually simple, with the difficulty being addressing of the atresia ani. The anal opening is reconstructed by in situ anoplasty, full anal reconstruction, or balloon dilation to allow normal fecal excretion through the anus. The rectovaginal fistulous tract is then resected and both the vaginal and rectal walls are closed. In severe cases of atresia ani (type III - rectum ends in blind pouch with no anal structures), fecal incontinence may be a long-term problem.

**Vulvar hypoplasia**
Vulvar hypoplasia (also called recessed/juvenile/infantile vulva) frequently occurs in spayed females. To date there is no definitive documentation that sterilization prior to the first estrus is the cause for this abnormality. Theoretically it makes sense that development of the vulva may be affected without hormone stimulation, however occurrence of vulvar hypoplasia has been reported in intact bitches. Waiting for the first heat to allow for vulvar maturity has been proposed, but there is no evidence that letting a bitch go through a heat cycle is associated with long term increase in vulvar size. However the risk for development of mammary cancer increases significantly increases after the first heat.

Dogs with vulvar hypoplasia often present for perivulvar dermatitis, which is often exacerbated by persistent moisture from urine within the skin perivulvar skin folds. Perivulvar dermatitis is also seen in obese dogs, as the vulvar cleft becomes tucked underneath the more prominent perineal skin folds. Recurrent vaginitis and urinary tract infections are very common in these patients as well. Management of these patients generally involves weight loss and medical and surgical management. Gentle cleansing of the skin folds (benzoyl peroxide shampoo, topical astringent, antibiotic-steroid creams) will help minimize local inflammation prior to surgery. Once the initial inflammatory process is controlled, then an episioplasty is recommended.

An episioplasty (vulvoplasty) is performed to remove the excess perivulvar skin folds and the underlying subcutaneous fat. The goal is to remove enough skin so that the vulva is no longer recessed without creating excessive tension on the incision site. Excessive subcutaneous fat dorsal to the vulva is also removed, which is critical in obese animals. The amount of skin to be removed is assessed by elevating the skin folds and assessing expected tension. Two crescent-shaped skin incisions are made around the vulva. The outlined skin and subcutaneous tissues are removed, allowing for closure of the incision. Initial apposition at 3, 9, and 12 o’clock is recommended to determine if adequate amount of skin has been removed. Additional skin can be removed from the outer margin if the vulva is still recessed or the skin folds persist. If the vulvar folds are effectively removed, then dermatitis is usually resolved; however, persistent urinary incontinence may be present. One study (Hammel, 2002) showed that the incidence of urinary incontinence was reduced by vulvoplasty but it remained as the most common residual sign after surgery. In that study, the incidences of urinary tract infection (UTI), vaginitis, and external irritation were greatly improved following surgery.

**Vaginal hypoplasia and atresia**
Abnormal development of the vagina is rarely reported in dogs and cats. Abnormalities in embryonic canalization of the paramesonephric duct between the end of the Müllerian duct and the urogenital sinus can cause variations of these abnormalities. In sterilized females, vaginal hypoplasia
may never be identified; however, in a breeding bitch or queen, infertility, painful breeding, or dystocia may be the presenting problem. With vaginal atresia, the patient would present for suspected ‘pyometra’ due to a dilated/distended uterus from accumulation of normal secretions. Routine ovariohysterectomy should be recommended for any patient with these abnormalities. Although there is no information regarding the genetics of these abnormalities, breeding of animals with these traits is not encouraged.

**Clitoral hypertrophy/os clitoridis**

Hypertrophy of the clitoris most commonly occurs in dogs with intersex disorders, hyperadrenocorticism, or after having received anabolic steroids. This condition can also be observed in normal females. The clitoris often protrudes through the vulvar cleft and may contain an os clitoridis. Clinical signs most often involve excessive licking of the vulva due to clitoral irritation from exposure. These patients may be presented by owners for cosmetic reasons. Withdrawal of anabolic steroids and treatment for hyperadrenocorticism may resolve the clitoral hypertrophy. Gonadectomy is recommended in these patients. The presence of an abnormal uterus and ovotestes is common in these animals. If an os clitoridis is present, clitoral enlargement may not resolve with gonadectomy. In these cases amputation of the clitoris is recommended. Clitoral amputation is performed by simple submucosal dissection and mucosal apposition. Dogs with intersex disorders may have significant bleeding during dissection because of the presence of erectile tissue. An episiotomy may assist with visualization.

**Vaginal septa, bands and stenosis**

A number of vaginal and vestibular congenital abnormalities occur as a result of imperfect joining of the genital folds, genital swellings, or Müllerian ducts. These conditions may be incidental findings on a physical examination. Females with stenosis or bands may present with clinical signs of chronic vaginitis or recurrent UTI, which may be associated with urine pooling in the anterior portion of the vagina. Others may present for unsuccessful attempts or painful natural breeding. Digital and visual examination of the vagina is imperative in these patients. Evaluation for other abnormalities of the genitourinary system is recommended, as vaginal bands are frequently associated with ectopic ureters in dogs.

A persistent or imperforate hymen and small vaginal bands can be corrected with digital breakdown of the membrane. More fibrous vaginal bands and vaginal septa may require an episiotomy and surgical resection. Depending on the extent of the mucosal defect remaining after surgical removal of the band or septa, the defect can be left to heal by second intention. If a significant band is resected, mucosal apposition is important to prevent significant scar tissue formation or fibrous healing to the opposite mucosal wound.

If vaginal palpation identifies the presence of stenosis, a contrast vaginogram can be performed to further evaluate the severity of stenosis. A stenosis to vaginal ratio can be classified as follows: normal – > 0.35; mild - 0.26-0.35; moderate - 0.25-0.20; and severe - < 0.20. This ratio is calculated by dividing the height of the vestibulovaginal junction by the maximum height of the vagina on a lateral vaginourethrogram. Cases with vestibulovaginal stenosis can have two types of surgical procedures, depending on the severity of the stenosis. Cases with moderate to severe stenosis may benefit from a vaginal resection and anastomosis, whereas those with either mild or moderate stenosis may only need a T-vaginoplasty.

The recommendation to perform surgery on these cases is debatable, however addressing those patients with severe stenosis may be advantageous. One study (Crawford, 2002) evaluated the influence of vaginal stenosis, pelvic bladder, and recessed vulva on the response to treatment for clinical signs of lower urinary tract disease in dogs and found that vestibulovaginal stenosis is an important factor in dogs with ratios < 0.20. It is recommended that vaginectomy or resection and anastomosis should be considered in these cases (Kieves, 2011). Subjectively, if the vaginal mucosa (cranial to the stenosis) is more severely inflamed than the vestibular mucosa (caudal to the stenosis), then it is likely that the vaginal stenosis may be playing a role in the chronic inflammation. A vaginal resection and anastomosis is technically difficult due to the close proximity of the urethral papilla to the stenosis. The stenosis is
approached via a perineal incision between the anus and vulva, and does not require an episiotomy. This surgery can be easily combined with a vulvoplasty procedure. A complete vaginectomy is the final option for correction of vaginal stenosis in bitches that are not intended for breeding.

Vaginal prolapse

Vaginal prolapse includes two very different disease processes, although both with similar underlying etiology. Both conditions are estrogen dependent and develop during proestrus or estrus. One process involves prolapse of edematous mucosa on the floor of the vaginal vault, referred to as vaginal edema. The second process involves a true prolapse of the vagina, in which the prolapse is circumferential and often includes the cervix. These dogs have true vaginal prolapse. For ease of discussion, the terms vaginal edema and true vaginal prolapse are used when discussing the two disease processes.

Vaginal edema

Vaginal edema (previously referred to as vaginal hyperplasia) involves prolapse of edematous mucosa on the floor of the vaginal vault. Vaginal edema occurs in young intact bitches in proestrus or estrus; this condition has not been reported in queens. Brachycephalic and large breeds are overrepresented. This disease has a familial predisposition, so breeding of these patients is not recommended. This condition must be differentiated from a neoplastic process.

Normally, during the follicular phase of the estrous cycle, the vaginal and vestibular mucosa becomes thickened and edematous. Occasionally an exaggerated response occurs, resulting in excessive edema. The submucosal tissue edema and redundant mucosa at the floor of the vagina just cranial to the urethral tubercle can create a perineal bulge or protrude through the vulvar labia as a fleshy red mass. In these cases the edematous tissue has been present for some time within the vestibule, and may go unnoticed as a simple bulging of the perineum. Continued growth, movement, and inflammation can cause sudden exteriorization between the vulvar folds. Although the mass can appear large, the base is often small (1-2 cm wide stalk). Often owners call in a panic reporting that this mass suddenly appeared. On examination the tissue may be traumatized due to exposure, desiccation, and self-mutilation. This condition can be differentiated from vaginal prolapse as the urethral tubercle is in its normal position. The vaginal edema usually develops just cranial to the urethral tubercle, so it is visible on evaluation of the base of the mass.

Conservative management consists of protection of the exteriorized tissue with lubricants and prevention of self-mutilation. Once the patient is out of heat, the vaginal edema regresses spontaneously during the luteal phase. However, recurrence is common during subsequent estrous cycles. Recurrence can also occur at parturition, resulting in dystocia. Gonadectomy is curative and should be considered to prevent recurrence. Surgical resection of the mass should be considered if the bitch is intended for breeding or if the tissues are significantly exposed or traumatized. Surgical removal of the mass alone will not prevent recurrence in subsequent cycles. A standard episiotomy is performed to expose the base of the edematous tissue. The mass is lifted off of the vestibular floor to visualize the urethral opening. The urethra is catheterized to prevent iatrogenic trauma during surgery. A transverse elliptical incision is made around the base, removing the abnormal vaginal tissue, and the vaginal mucosal defect is apposed carefully avoiding the urethral orifice. Significant bleeding is often associated with surgical removal.

True vaginal prolapse

True vaginal prolapse occurs less frequently than vaginal edema and also is associated with normal estrus. Prolapse can be either partial or complete, with the cervix being exteriorized with a complete vaginal prolapse. In both cases there is a doughnut-shaped eversion of the edematous vaginal tissues. This is differentiated from vaginal edema in that there is circumferential involvement of the vaginal mucosa and the urethral tubercle, with a central lumen.

As with vaginal edema, no treatment may be necessary, as patients with mild prolapse can have spontaneous regression during diestrus. More severe prolapses may require protection of exposed tissues
and/or replacement of the prolapsed mucosa. Under general anesthesia, the everted tissue is cleaned with
dilute antiseptic solution or saline. With severe tissue edema, application of 50% dextrose solution to
the mucosal surface may decrease its size, facilitating reduction. Digital manipulation or a lubricated
plastic syringe can be used to reduce the tissues. An episiotomy may be necessary to provide better
exposure for reduction. Reduction can also be assisted by traction on the uterus via a ventral abdominal
approach, especially if the patient is intact and an ovariohysterectomy is being performed at the same
time. Once the vagina is reduced, re-prolapse can be minimized by suturing the uterine body or the broad
ligament to the abdominal wall. If an abdominal approach is not performed, reduction can be maintained
by placing mattress sutures between the vulvar lips. A urinary catheter may need to be maintained until
the vaginal swelling subsides.

More chronic prolapses with secondary necrosis, infection, or hemorrhage of the prolapsed
tissues may require surgical resection of the devitalized tissues to prevent further sepsis and self-
mutilation. As well, these patients need to be fully evaluated to treat for any underlying sepsis,
hypotension or anemia. Due to the severity of inflammation of these chronic prolapses, an episiotomy
helps with exposure and placement of a urinary catheter. A stepwise full-thickness circumferential
incision is made in the vaginal wall, with horizontal mattress sutures used to close the incision edges.
This is continued circumferentially in small sections until the entire prolapsed tissue is resected.

**Vaginal neoplasia**

Vaginal tumors are uncommon in dogs and cats, reported in 0.85-3% of females with tumors. Of
the reported vaginal neoplasms, 73-94% are benign, with leiomyomas being the most common.
Leiomyomas appear to be sex hormone dependent and occur most frequently in nulliparous intact dogs
(Kydd, 1986). Leiomyomas originate from the vaginal wall and are often intraluminal and pedunculated.
Based on these findings, most benign tumors are amenable to local resection via episiotomy. Intact
bitches should be spayed at the same time to prevent recurrence. Malignant tumors are less common,
with leiomyosarcomas and transmissible venereal tumors being the common types. Malignant tumors
tend to be more infiltrative and have a wide base. Leiomyosarcomas are more likely to extend into the
extramural regions. Malignant tumors often require more extensive surgical resection, with total or
subtotal vaginectomy being required.

Depending on the location and extent of the vaginal mass, resection may be performed via a
perineal approach, abdominal approach, or combined approach. A pubic osteotomy may be required in
cases where significant adhesions and perivaginal tissue involvement is present. A recent report
(Nelissen 2012) described a combined caudal abdominal and vestibular approach for subtotal
vaginectomy in 11 dogs (six were combined with an ovariohysterectomy). This approach allowed
complete resection of extensive vaginal lesions, with no major complications, and favorable outcomes.
Those patients with benign disease had better prognosis than those with malignancies.

The abdominal approach was used to carefully dissect the fascial and peritoneal attachments
between the vaginal tissue and the rectum and urethra. The cranial and caudal branches of the vaginal
artery and vein were ligated and the perivaginal tissues were dissected as far caudally as possible. A
transfixation suture with a large loop was anchored through all layers of the cranial vaginal opening, and
passed into the vaginal lumen. Once the ventral celiotomy was closed, the patient was placed in sternal
recumbency. Via a midline episiotomy approach, the loop within the vaginal lumen was identified and
retracted caudally, inverting the cranial aspect of the vagina into the episiotomy. Resection of the vagina
just anterior to the urethral papilla was then performed. The vestibule was closed just anterior to the
urethra and the episiotomy was closed routinely. A urinary catheter should be maintained throughout the
procedure to help identify the urethra during dissection, and postoperatively to allow swelling to subside.

Regardless of the method of resection, in cases of malignant neoplasia, follow-up treatments may
be required to minimize or slow down recurrence due to invasion into perivaginal tissues. With benign
tumors, even if aggressive resection is required, prognosis is good.
Selected references