

Characterization of recessed vulvas in dogs

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OBJECTIVE

To determine the prevalence of vulvar recession in a large population of dogs and to compare the reproductive and physical differences between dogs with and without recessed vulvas.

ANIMALS

250 female dogs presenting to a tertiary referral institution.

PROCEDURES

Female dogs > 6 months of age presenting to a tertiary referral institution were enrolled. At enrollment, a full medical history was obtained with particular emphasis on the presence of lower urinary tract (LUT) disease in the 3 months prior to presentation. All dogs underwent a full physical examination including perivulvar cytologic examination and scoring of the degree of perivulvar skin coverage on the basis of an 8-point scale. Dogs with scores of ≥ 7 were classified as having recessed vulvas. When available, urinalysis data were also included.

RESULTS

Recessed vulvas were identified in 36 of 250 (14%) dogs. Dogs with recessed vulvas had significantly higher body condition scores and body weights than unaffected dogs. In addition, recessed vulvas were more common in spayed than sexually intact dogs. Dogs spayed at ≤ 1 year of age were almost 3 times as likely to have vulvar recession, compared with dogs spayed at > 1 year of age. No significant difference was identified between affected and unaffected dogs with respect to the prevalence of LUT signs, urinary tract infections, or perivulvar dermatitis.

CONCLUSIONS AND CLINICAL RELEVANCE

Although recessed vulvas were relatively common in dogs, they did not appear to be associated with an increased risk of LUT disease or perivulvar dermatitis. (*J Am Vet Med Assoc* 2021;259:744–748)

A recessed vulva, also known as a hooded or juvenile vulva, is loosely defined as the presence of a sunken vulva surrounded by excessive perivulvar skin folds. In clinical settings, although no causal relationship or mechanism has been identified in dogs, recessed vulvas are commonly suggested to be a risk factor for perivulvar dermatitis as well as a variety of LUT diseases including recurrent UTIs and urinary incontinence.¹ Indeed, in dogs undergoing cystoscopies for a variety of reasons including recurrent UTIs, recessed vulvas have been reported in between 36% and 69% of cases.^{2,3} A large retrospective study⁴ of 1,636 urine culture results collected from 1,028 dogs found that recessed vulvas were the most common anatomic abnormality found in dogs with recurrent UTIs, being identified in 64.7% of cases. Similarly, in dogs with LUT disease being evaluated specifically for their urogenital anatomy, recessed vulvas were present in 68% of dogs.⁵ In contrast to these studies, 1 report⁶ of dogs with persistent UTIs reported recessed vulvas in only 4 of 71 (5.6%) dogs. Finally,

although this condition is usually mentioned in association with LUT diseases, recessed vulvas have been reported in dogs free of LUT disease.^{5,7} For these reasons, the exact role of this anatomic finding in LUT disease remains unclear.

Despite the suggested importance of recessed vulvas in urinary and dermatologic disease, risk factors to their development remain poorly characterized. A history of prepubertal ovariohysterectomy with or without concurrent obesity has been proposed to decrease estrogen production resulting in insufficiently developed vulvar folds with resulting recession.⁸ However, longitudinal studies of dogs spayed prior to puberty failed to identify objective changes in vulvar conformation or the presence of dermatologic or urinary disease when compared with sexually intact or late-spayed littermates.⁹ In addition, a study of 34 dogs undergoing vulvoplasty reported that 21% of dogs were sexually intact prior to the procedure and 24% had been spayed when they were > 1 year of age.¹⁰ Taken together, these data suggest that the age at time of ovariohysterectomy alone is an unlikely risk factor for development of this condition.

A major limitation to our understanding of the clinical importance of recessed vulvas in urinary or dermatologic diseases is the lack of a clear consensus on what severity of vulvar recession qualifies as

ABBREVIATIONS

BCS	Body condition score
LUT	Lower urinary tract
UTI	Urinary tract infection
VRS	Vulvar recession score

being clinically relevant. Indeed, inclusion criteria for most published reports¹⁰⁻¹² of dogs with recessed vulvas define this condition on the basis of a history of vulvoplasty rather than on a physical examination finding. The only published^{5,7} objective definition on the basis of physical examination findings defines a recessed vulva as > 75% dorsal or lateral coverage of the vulvar labia.

The objectives of the study presented here were to assess the prevalence and severity of recessed vulvas in a large population of dogs presenting to a tertiary referral institution. In addition, we wanted to characterize the historical and physical differences between dogs with and without substantial vulvar recession. We hypothesized that dogs with recessed vulvas would have greater body weights and BCSs than dogs without recessed vulvas and that affected dogs would have a higher prevalence of LUT signs and perivulvar dermatitis.

Materials and Methods

Study population

Female dogs were recruited from various services of the Iowa State University's Lloyd Veterinary Medical Center. The study protocol was approved by the center's Institutional Animal Care and Use Committee. Informed consent was obtained from all dog owners prior to enrollment. For inclusion in the study, all dogs had to be females > 6 months of age. Dogs were excluded from the study if they had a history of a vulvoplasty.

Enrolled dogs had a full physical examination with breed, age, weight, BCS (9-point scale), and perivulvar examination results recorded. For vulvar recession scoring, a first photograph was taken with dogs in a natural standing position. A second photograph was taken with the skin folds parted to complete a visual dermatologic assessment. Photographs were later scored by a veterinary student (SL). The percentage of lateral and dorsal vulvar skin coverage were separately scored on a 4-point scale as follows: 0 = no coverage; 1 = 1% to 25% coverage; 2 = 26% to 50% coverage; 3 = 51% to 75% coverage; and 4 = 76% to 100% coverage (personal communication^a) and added to produce an 8-point final VRS. To have vulvar recession severe enough to be classified as having a recessed vulva, a VRS of ≥ 7 was required.

A thorough history of enrolled dogs was obtained to determine the reproductive status as well as the approximate age at time of ovariohysterectomy, when relevant. The presence of LUT signs such as hematuria, dysuria, or pollakiuria, as well as the presence of urinary incontinence or the use of medication for the management of incontinence in the 3 months prior to presentation was also recorded.

When possible, urine samples were obtained for urinalysis. Presumptive diagnosis of an active UTI was made on the basis of the concurrent presence of bacteriuria and > 5 WBCs or > 10 WBCs/micro-

scopic field (400X total magnification), depending on whether the sample was obtained by cystocentesis or by natural voiding, respectively. In cases where the method of urine collection was not stated, the criteria for natural voiding was applied. Two direct impression smears of the perivulvar area were obtained for each dog included in the study. Samples were acquired by use of a strip of adhesive tape firmly applied to the skin.^b Slides were stained by use of a modified-Romanowsky stain technique and were evaluated under light microscopy for the presence of bacteria, *Malassezia* spp, and inflammatory cells. Cellularity was measured by review of 15 random microscopic fields (1,000X total magnification) and calculating the average per field.

Statistical analysis

For statistical analysis, continuous variables were analyzed for normality by use of a D'Agostino test. For normally distributed variables, differences between dogs with and without recessed vulvas were assessed with a simple *t* test. For nonnormally distributed variables, differences between dogs with and without recessed vulvas were compared by use of a log-rank test. χ^2 Analysis was used to compare proportions of quantitative variables between dogs with and without recessed vulvas. For assessment of correlations between continuous variables, Spearman correlation analysis was performed. Values of $P < 0.05$ were considered significant. Statistical tests were performed with 2 commercially available software packages.^{c,d}

Results

The study population included 250 female dogs with 216 being spayed and 34 being sexually intact at the time of enrollment. The 5 services that contributed the most cases were orthopedic surgery ($n = 59$), primary care (57), internal medicine (51), ophthalmology (47), and soft tissue surgery (16). Of the 250 dogs, 15 presented specifically for problems pertaining to the upper or LUT. On the basis of visual scoring of vulvar recession (**Table 1**), the median VRS of our study population was 4 (range, 0 to 8), with 36 of 250 (14%) dogs being classified as having recessed vulvas on the basis of a VRS of ≥ 7 . A significantly ($P = 0.007$) higher proportion of dogs with recessed vulvas were spayed, compared with dogs without recessed vulvas (**Table 2**). Of dogs without recessed vulvas, the 3 most represented types and breeds were mixed-breed dog ($n = 57$), Golden Retriever (21), and Labrador Retriever (12). Of dogs with recessed vulvas, the most common type and breeds were mixed-breed dog ($n = 14$), Labrador Retriever (9), as well as 2 each of English Bulldog, Golden Retriever, and Shetland Sheepdog.

Dogs had a median age, body weight, and BCS of 7 years (range, 0.5 to 16.6 years), 20.5 kg with a range of 2.0 to 65.8 kg, and 5 (range, 1 to 9), respectively. Age did not differ significantly between dogs with and without recessed vulvas. Although body

Table 1—Total VRs in 250 dogs.

Total VRs	No. of dogs (%)
0	37 (15)
1–2	50 (20)
3–4	45 (18)
5–6	82 (33)
7–8	36 (14)

The percentage of lateral and dorsal vulvar skin coverage were separately scored on a 4-point scale as follows: 0 = no coverage; 1 = 1% to 25% coverage; 2 = 26% to 50% coverage; 3 = 51% to 75% coverage; and 4 = 76% to 100% coverage (personal communication^a) and added to produce an 8-point final VRs.

Table 2—Comparison of characteristics for 250 dogs with and without recessed vulvas.

Variables	Dogs with recessed vulvas (n = 36)	Dogs without recessed vulvas (n = 214)	P value†
Age (y)*	6.3	7.3	0.601
Weight (kg)*	27.9	19.9	0.001
BCS*	6	5	0.007
Spayed (%)	100	84	0.007
Clinical signs (%)	31	25	0.536
UTI (%)	0	7	0.999

*Median values. †Statistically ($P < 0.05$) significant.

weight ($R = 0.239$, $P < 0.001$) and BCS ($R = 0.232$, $P < 0.001$) had weak correlations with VRs (**Figure 1**), dogs with recessed vulvas weighed significantly ($P = 0.001$) more and had significantly ($P = 0.007$) higher BCSs than dogs without recessed vulvas.

Although the median age at time of ovariohysterectomy did not differ between dogs with and without recessed vulvas, a significantly higher proportion of dogs with recessed vulvas were spayed. Odds ratio analysis revealed that dogs spayed at ≤ 12 months of age had significantly increased odds ratio of having a recessed vulva than dogs spayed at > 12 months of age (**Table 3**). Similarly, dogs spayed at ≤ 24 months of age were more likely to have recessed vulvas than dogs spayed at > 24 months at age.

Lower urinary tract signs, including hematuria, stranguria, pollakiuria, incontinence, or the need for medical management of urinary incontinence were present in 11 of 36 (30.6%) and 53 of 214 (24.8%) dogs with and without recessed vulvas, respectively. Of the dogs receiving medications for urinary incontinence, 9 were receiving phenylpropanolamine and 1 was receiving estriol. The latter dog did not have a recessed vulva. The presence of LUT signs did not differ significantly ($P = 0.536$) between dogs with and without recessed vulvas. Urinalyses were available for 71 dogs, of which 15 dogs had recessed vulvas. Urine was collected by cystocentesis in 36 dogs and by natural voiding in 23 dogs. Urine collection method was not stated in 12 dogs. Four dogs had urinalysis results consistent with a UTI, none of which had

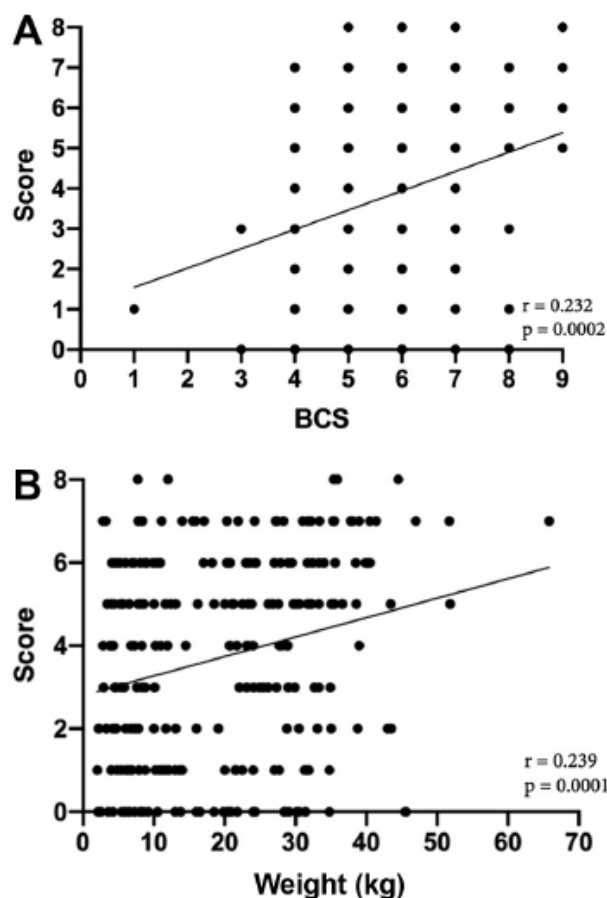


Figure 1—Correlation between VRs and BCS (panel A) or body weight (panel B) in 250 dogs.

Table 3—Odds ratios for recessed vulvas on the basis of age at time of ovariohysterectomy in 250 dogs with and without recessed vulvas.

Age	OR	95% CI	P value*
≤ 4 m vs > 4 m	2.18	0.80–5.92	0.127
≤ 8 m vs > 8 m	1.49	0.73–3.02	0.271
≤ 12 m vs > 12 m	2.95	1.24–7.03	0.015
≤ 24 m vs > 24 m	3.08	1.48–8.26	0.026

*Statistically ($P < 0.05$) significant.

recessed vulvas. No significant ($P = 0.999$) difference was found in the prevalence of UTIs between dogs with and without recessed vulvas.

Perivulvar dermatologic and cytologic examinations were performed on all dogs. Five dogs had perivulvar dermatitis with erythema, exudate, papules or pustules on the vulvar skin folds. Of these dogs, 2 had recessed vulvas. Microorganisms were noted on cytologic examination of impression smears collected for the perivulvar area of 17 of 36 (47%) and 77 of 214 (36%) dogs with and without recessed vulvas, respectively. No significant differences were found between

dogs with and without recessed vulvas in the proportion with inflammatory cells ($P = 0.341$), bacteria ($P = 0.381$), *Malassezia* spp ($P = 1.00$), or any microorganisms ($P = 0.199$) identified on perivulvar cytologic examination.

Discussion

The present study describes the prevalence of recessed vulvas in a large population of dogs at a tertiary referral institution. Although our data support previous assertions that recessed vulvas occur with higher frequency in larger, more heavily conditioned dogs, the prevalence of clinical consequences such as LUT signs, UTIs, or perivulvar dermatitis was not greater than in dogs with normal vulvar anatomy.

Patient obesity has been suggested to result in the formation of excessive skin folds at multiple areas on dogs including the perivulvar area. Consequently, obesity has been purported to be a risk factor for recessed vulvas. Although we found a significant difference in BCS between dogs with and without recessed vulvas, it is unclear whether this difference is clinically relevant given the modest difference found (BCS of 5 vs 6) and the subjective nature of BCS assessment. This small difference likely explains the weak correlation identified between BCS and VRS. Similarly, median body weight differed between dogs with and without recessed vulvas, suggesting perhaps conformational differences that occur in larger dogs. Use of a more objective method of body fat assessment such as dual energy absorptiometry would have been preferable in evaluating the possible relationship between obesity and vulvar recession.¹³ Because obesity has been reported to be more prevalent in spayed rather than sexually intact females,¹⁴ reproductive status, either alone or as a cause of obesity, has been suggested to play a role in the development of recessed vulvas. However, previous studies question the validity of this belief. Indeed, results of a prospective study¹⁰ of dogs undergoing vulvoplasty reported a substantial proportion of dogs being either sexually intact or having been spayed at > 1 year of age. In our study, all dogs with recessed vulvas were spayed and the prevalence was significantly greater than that found in dogs with a normal vulvar anatomy. Interestingly, we found that being spayed at a pre- or peri-pubertal age (prior to 4 or 8 months) was not associated with a higher risk of development of recessed vulvas. Significantly increased risk of development of this condition was only apparent when an age cut off of 12 or 24 months was used, suggesting that estrus alone might not play a determinant role in the development of vulvar conformation.

The presence of a recessed vulva is commonly reported as a possible risk factor for chronic or recurrent LUT disease. However, proof of this association is tenuous because original reports^{10,12} of this condition were limited to dogs with severe perivulvar disease requiring vulvoplasty. By selecting more severely affected dogs, it is possible that these reports

also selected for dogs with other comorbidities that predisposed them to LUT and dermatologic diseases. Indeed, although most dogs with recurrent UTIs had a positive response to vulvoplasty in 1 study,¹² 4 of 14 dogs had persistent UTIs after surgery and the presence of a recessed vulva was not significantly associated with response to treatment. Similarly, we found no difference in the prevalence of LUT disease between dogs with and without recessed vulvas. In more recent reports²⁻⁴ investigating recurrent or chronic LUT disease in dogs, recessed vulvas are 1 of the most common anatomic abnormalities identified. However, these reports fail to compare study populations with a control population, rendering it difficult to understand the true importance of this finding. Furthermore, the definition of what constitutes a recessed vulva is rarely described. Reports^{5,7} that give a quantitative definition on the basis of degree of vulvar coverage define a recessed vulva as having > 75% coverage. Unless such a stringent definition is always observed, it is likely that recessed vulvas are overdiagnosed in a clinical setting. In keeping with Wang et al,^{5,7} we applied a stringent definition of what constituted a recessed vulva. Despite this restrictive criteria, we found recessed vulvas in a substantial portion of the population and, most surprisingly, these dogs were not more likely to have LUT disease. Although previous reports^{2,3} identified recessed vulvas in up to 69% of dogs with LUT disease, we cannot necessarily conclude that there is a causal relationship and it is possible that these high rates are caused by overdiagnosis of this condition rather than a true difference with healthy dogs.

The present study had some limitations. First, although the diagnosis of a recessed vulva in our study was made on the basis of a scoring system that considered the degree of ventral and lateral coverage, this method remains somewhat subjective. All evaluations were performed with dogs in standing position but other factors such as body conformation, fur length, degree of tail elevation, and environmental lighting could have contributed some degree of subjectivity to our assessment. In addition, VRSs were determined by a single novice observer. Although this approach limited the influence of preexisting bias and allowed for a consistent scoring, it is possible that the accuracy might have been decreased, compared with a multi-observer system. Other methods of anatomic measurement such as the dorsoventral length of the vulvar commissure are reported.⁹ However, the clinical usefulness of this variable has not been established. In addition, our definition of a recessed vulva did not consider other factors such as the presence or absence of perivulvar dermatitis. In our study only 5 dogs had gross evidence of perivulvar dermatitis, of which only 2 had recessed vulvas. If our study had included a greater number of dogs with concurrent perivulvar dermatitis, perhaps a stronger association with LUT disease would have been apparent. Future studies investigating the clinical rel-

evance of recessed vulvas should consider assessing the contribution of severe perivulvar disease in the development of LUT disease. Lastly, urinalyses were only performed in 71 dogs of the total population and in less than half the dogs with clinically relevant vulvar recession. This fact unfortunately limited the conclusions that could be made with respect to the relationship between recessed vulvas as a risk factor for lower UTIs. Although owners were questioned about the presence of LUT signs and the patients' histories were assessed for any such signs, this does not exclude the possibility of occult or asymptomatic infections. Indeed, asymptomatic UTIs have been reported in between 2% to 32% of the canine population and comorbidities such as obesity appear to be associated with higher rates.^{13,15-18} Although we defined a UTI relatively stringently on the basis of urinalysis criteria, the lack of quantitative bacterial cultures leaves open the possibility of both over and under diagnosis of UTIs in our population. However, in evaluations of canine urine samples with isosthenuric or hyposthenuric urine, urine sediment examination has been shown to have a relatively high positive and negative predictive value of 75.6% and 96.2%, respectively.¹⁹ Similarly, data from cats revealed that an unremarkable urine sediment examination, defined as the absence of pyuria, hematuria and bacteriuria, had a 97% negative predictive value.²⁰ If these data can be extrapolated to canine populations, false negatives are unlikely in our study population given that only 1 dog classified as negative for a UTI had substantial hematuria.

Results of the present study suggested that although recessed vulvas are a common physical examination finding in larger healthy dogs, their presence alone does not appear to be associated with a greater risk of development of perivulvar or LUT disease.

Acknowledgments

The authors declare that there were no conflicts of interest.

Footnotes

- Chew D, The Ohio State University, Columbus, Ohio: Personal communication, 2020.
- Scotch MultiTask, 3M Corp, Saint Paul, Minn.
- Graphpad Prism, Graphpad Software Inc, San Diego, Calif.
- MedCalc version 19, MedCalc Software, Ostend, Belgium.

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