Session I: Non-reproductive Effects of Spaying and Neutering
Effects on the Urogenital System
By Dr. Karine Verstegen-Onclin

Surgical neutering and the external reproductive system in the dog

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Embryology of the female reproductive tract development

- Fusion of the paramesonephric (Mullerian) ducts to form uterine body, cervix and vagina
- Development of the urogenital sinus into the vestibule, urethra and urinary bladder
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Embryology of the female reproductive tract development
- The hymen separates the vagina (mullerian ducts) and vestibule (urogenital sinus)
- Epithelium (ecto and endo-) and some mesoderm of both original structures
- Hymen has disappeared at the time of birth
- Estrogens and testosterone influence

Stages of the female reproductive tract development
- Development from around days 28-32 and a reproductive system ready at birth
- Growth and maturation from birth to puberty
- Final growth and differentiation obtained after puberty
- Degenerescence and fibrosis with age
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Endocrine control of the female reproductive tract development

- Embryogenesis from around days 28-32

Chromosomal Sex

Gonadal ridges

Bipotent gonads

Gonadal Sex

Ovaries

Thecal cells

SF-1

Testosterone

Regression

Of Mullerian ducts

Phenotype Sex

Female Phenotype

Male phenotype

Endocrine control of the female reproductive tract development

- Embryogenesis from around days 28-32
- Growth and maturation from birth through puberty
  - Dependent on FSH, LH, estradiol, IGF, androgens
- Final growth obtained after puberty


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Endocrine control of the female reproductive tract development

- The ovaries secrete small amounts of androgens and androgen precursors, and, additionally, estrogens stimulate external genitalia growth.
- From birth through puberty, these ovarian secretions induce the changes in mammary glands development, body fat deposition, vaginal and uterine tissues growth and secretions.

Endocrine control of the female reproductive tract development

- Spaying, depending on age at completion, removes the endocrine support needed for full reproductive development and development of the external genitalia.
Endocrine control of the female reproductive tract development

*Questions related to early spaying:*

- Does this affect external genitalia development?
- Is this responsible for pathological processes in dogs?
- Does age at spaying influence the appearance of those pathological processes, if any?

Since in Florida (only 2 years!) we have been impressed by the large number of dogs presented to our SA Reproduction Service at the VMC for recessed vulva and external genitalia problems. These observations are really uncommon in Europe, where early spay is exceptional.

Does early spaying influence external genitalia problems?

- Any influence on development of vaginitis, perivulvar dermatitis, urinary tract problems?
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Recessed vulva, vaginal dermatitis, vaginitis and UTI

- **27 dogs** were seen by the Small Animal Reproduction Clinic at the VMC of the University of Florida within **18 months** (October 2004 through April 2006) with a history of
  - Recurrent UTI (74%), with some cases lasting for more than 10 years!!
  - Vaginitis (100%)
    - Newly diagnosed = 66%
    - Recurrent = 27%
  - Peri-vulvar dermatitis (40%)
- Age at time of presentation ranged from 0.7 to 12.8 years (mean 3.2 years)

Recessed vulva, vaginal dermatitis, vaginitis and UTI

- Recessed-hypoplastic vulva = 85%
- Redundant skin fold = 40%
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- Recessed vulva, vaginal dermatitis, vaginitis and UTI

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Recessed vulva, vaginal dermatitis, vaginitis and UTI

- All dogs, but 2, were spayed dogs
- 21 had been spayed before puberty
  Mean age at spaying 4.7 +/- 3 months n=18
  • 15 were spayed around 2 to 4 months
    Mean age at spaying 11.8 +/- 3 weeks n=12
    (+ 3 unknown)
  • 6 were spayed around puberty
    Mean age at spaying 7.5 +/- 0.8 months
- 4 had been spayed after puberty
  Mean age at spaying 2.4 +/- 0.86 years

### Table

<table>
<thead>
<tr>
<th></th>
<th>Before Puberty</th>
<th>After Puberty</th>
<th>Total</th>
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<tbody>
<tr>
<td>Before 4 months</td>
<td>15 (60%)</td>
<td>0 (0%)</td>
<td>15 (60%)</td>
</tr>
<tr>
<td>After 4 months</td>
<td>6 (24%)</td>
<td>4 (16%)</td>
<td>10 (40%)</td>
</tr>
<tr>
<td>Total</td>
<td>21 (84%)</td>
<td>4 (16%)</td>
<td>25 (100%)</td>
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**Fisher's Exact Test**
The two-sided P value is 0.0166, considered significant.
The row/column association is statistically significant.
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Recessed vulva, vaginal dermatitis, vaginitis and UTI

- All dogs have been treated at least once and sometimes for several years with AB without significant success.
- Dogs were surgically treated with definite resolution of the clinical signs, with the exception of one case.
- One major dehiscence was observed.

Discussion

- Preliminary results
- Higher incidence in spayed animals than in intact dogs
- Higher incidence in animals spayed early than in animals spayed later
- More common in U.S., where early spaying is actually more common than in Europe, where mean age at sterilization is around puberty (when most of the growth is achieved)
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Discussion

- Older textbooks indicate that spaying performed in dogs prior to completion of puberty decreases the release of estrogen, preventing normal development of secondary sex characteristics
- One of the results of this process may be recessed, juvenile vulva
- Furthermore, BW gain being a common feature in neutered animals, redundant skin folds may be present in conjunction with recessed vulva

Discussion

- Our preliminary results seem to confirm those observations
- Contradictory opinions exist in the literature on the effect of early spaying and the reproductive tract of the female dog (e.g., Salmeri et al., 1999; Lightner et al., 2001)
  - Not long-term
  - Limited number of animals
  - Intended to demonstrate the safety of early versus late spaying
  - Anterior to 2000 when early spaying was not as common as today
Discussion

- Recessed vulva and redundant skin folds are associated with
  - Retention of fluids
  - Urine leaking
  - Irritation by hair
  - Continuously moist area
  - Bacterial growth
  - Perivulvar vaginitis
  - Vaginitis
  - UTI
- Surgery is an effective method to correct the trouble

Conclusions

- All early spayed animals shown with some of the previous clinical signs should always first be checked for hypoplastic/recessed vulva
- Hormonal insufficiency (including estrogens and IGF) is probably involved in the determinism of the disease
- For this reason, as well as for all the other related problems, early spaying should be considered with caution when not absolutely needed