Urinary Incontinence in the Bitch

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Canine Urinary Incontinence

- **Urinary Incontinence** =
  - Involuntary leakage of urine during storage

- Micturation disorders (non-neurologic):
  - 61% = Urethral sphincter mechanism incompetence
  - 23% = Detrusor overactivity (urge incontinence)
  - 6% = Bladder atony due to muscle weakness or medications
  - 3% = Anatomical or functional urethral obstruction (leading to 2\textsuperscript{nd}ary bladder atony)
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- Micturation control required autonomic, somatic & central nervous system inputs...

S. Rust et al. (The Veterinary Journal 184 (2010) 26-37)

Fig. 1. Automatic and somatic innervation of the bladder and urethra. ACh, acetylcholine; NE, noradrenaline; a, α-adrenergic receptors; p, p-adrenergic receptors; L1-L2, first and second lumbar vertebrae; S1-S3, first to third sacral vertebrae. Reproduced from Aitken and Leasure (2006) with the permission of Wolters Kluwer.

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- Neural control
  - Hypogastric nerve (sympathetic): L1 & 2 – L4
  - Pelvic nerve (parasympathetic): S1-S3
  - Pudendal nerve (somatic): S1 & S2

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- Micturation... What's the chain of events?
  - Bladder fills and passively adapts to the filling and increased urine volume.
  - THEN...
  - You have weak afferent stimuli via the pelvic nerve
    - = "hmm... I feel my bladder filling... I might have to pee!"
  - OR... (you ignore that for a while)
  - Stretch receptors in the detrusor muscle are activated which signals via the hypogastric nerve
    - "OMG! Ow! OMG... I have to pee NOW!"

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- Micturation... What's the chain of events?
  - When the bladder reaches threshold volume...
  - Voiding is initiated by a parasympathetic discharge, which initiates the micturation reflex.
  - Detrusor muscle is activated (Squeeze!!)
  - Sympathetic & somatic nerve stimulations are inhibited (Let her go boys!!)

- And voluntary cortical control of this occurs at the level of the urethral striated musculature via the pudendal nerve (Don’t pee your pants!)
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- Urethral Sphincter-Related Incontinence
Canine Urinary Incontinence

- Pathophysiology URETHRAL SPHINCTER-related incontinence
  - Found in 4.5 – 20% of spayed bitches

Urethral hypotonicity
- Associated with ↓ urethral resistance
- Urine leakage occurs when intra-abdominal pressure rises (i.e. during recumbency or barking)

Canine Urinary Incontinence

- Pathophysiology URETHRAL SPHINCTER-related incontinence
- Associations:
  - Tone of the urethra
  - Bladder neck position
  - Urethral length
  - Neutering
  - Body size (large & giant breeds)
  - Breed (Dobbies, Old English, Rotties, Weims, Springer Spaniels, & Irish Setters)
  - Docked tail
  - Obesity
Canine Urinary Incontinence

- Pathophysiology URETHRAL SPHINCTER-related incontinence
- What has been found?
  - Reduced maximal urethral closure pressure (MUCP)
  - Decreased functional profile length (FPL)
  - The bladder sits more caudal – into the pelvis (more than 5% of the bladder length is located inside the pelvis)... is thought to be associated with a shorter urethra. (This position could alter the pressure transmission between the bladder & urethra)

- After sterilization,
  - A decrease in smooth muscle is observed in both bladder and urethra... whilst an increase in the volume of vascular urethral plexus is observed in the first quarter of the urethra.
  - The total number of types I and II striated fibres is decreased. NOTE: (type II fibres increase in volume.) but (type I fibres contribute to resting urethral tone... so could directly contribute to weakness of the urethral closure mechanism)
  - Urethral length is shorter in spayed bitches
  - Spayed bitches have reduced MULP, FPL, and integrated pressure.
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- Pathophysiology URETHRAL SPHINCTER-related incontinence
- What has been found?
  - 90% of incontinent bitches are spayed. 20% of spayed bitches develop urinary incontinence.
  - Estrogen deficiency is the most common explanation... HOWEVER studies have found no difference in estrogen concentrations in spayed & non-spayed females.
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- **Pharmacology** for URETHRAL SPHINCTER-related incontinence

- **Urethral sphincter mechanism incompetence**
  - Phenylpropanolamine
  - Ephedrine
  SID effects: Restlessness, hypertension, tachycardia, anxiety, excitability

  - Oestriol
  SID effects: Vulva swelling, attraction of males, & uterine bleeding between normal cycles

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- **Pharmacology** for URETHRAL SPHINCTER-related incontinence

- **Functional urethral outlet obstruction**
  - Phenoxybenzamine
  - Prazosin
  - Diazepam
  - Dantrolene

  General SID effects: Hypotension, hypertension, intraocular pressure, tachycardia, GI upset, nasal congestion, sedation, weakness, dizziness, headache.
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- **Surgery** for URETHRAL SPHINCTER-related incontinence
- **Colposuspension:**
  - Vagina is anchored to prepubic tendon
  - **GOAL:**
    - to relocate the bladder neck in an intra-abdominal position,
    - to increase urethral length & to increase functional urethral length,
    - to increase leak-point pressure, &
    - to improve the transmission of intra-abdominal pressure changes to the proximal urethra.

Effectiveness (3 studies): 40 – 53% cured; 37 – 42% improved; 9 – 18% failed to respond
1-year follow-up: 14% cured; 33% improved with surgery alone... Surgery plus medication = 38% cured & 43% improved.
Canine Urinary Incontinence

- **Surgery** for URETHRAL SPHINCTER-related incontinence

- **Colposuspension:**

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Canine Urinary Incontinence

- **Surgery** for URETHRAL SPHINCTER-related incontinence

- **Urethropexy:**
  - Urethra anchored to ventral abdomen wall at level of cranial pubic brim

- **GOAL:**
  - Relocation of the bladder neck into a more cranial position.

- **Effectiveness**
  - 56% cured; 27% improved; 17% failed
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- **Surgery** for URETHRAL SPHINCTER-related incontinence
- **Urethral submucosal injections:**
  - Endoscopic injection of collagen in three submucosal sites of the proximal urethra;
  - A non-invasive way to increase urethral resistance.

Canine Urinary Incontinence

- **Surgery** for URETHRAL SPHINCTER-related incontinence
- **Urethral submucosal injections:**
  - Effectiveness
    - Continence from a single injection of purified bovine collagen yielded continence lasting from 2 – 42 months (mean 21 mo)… in 43% of dogs.
    - Recurrence is common
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- **Surgery** for URETHRAL SPHINCTER-related incontinence
- **Other surgeries (few studies, few cases):**
  - Artificial sphincters (only tried in 14 dogs – 2 studies)
  - Cystourethropexy (1 studies, 10 dogs)
  - Sling urethroplasty (2 studies)
  - Transpelvic sling procedure with/without colposuspension (1 study)

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- **Bladder-Related Incontinence**
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- Pathophysiology BLADDER-related incontinence
  - Caused by detrusor over-activity or atony

  **Detrusor Over-activity**
  - = detrusor instability, described as involuntary detrusor contractions

  **Detrusor Atony**
  - = may be 1° or 2° to an increase in urethral resistance of anatomical or functional origin

Clinical signs:
- Nocturia (waking at night needing to urinate)
- Pollakiuria (abnormally frequent urination)
- Urinary incontinence
- Urgency
Canine Urinary Incontinence

- Pathophysiology BLADDER-related incontinence

**Detrusor atony**
- Clinical signs:
  - Stranguria (slow, painful urination caused by muscular spasms of the bladder or urethra)
  - Overflow incontinence
  - Could lead to tearing of the detrusor junctions, resulting in weaker, uncoordinated, or absent bladder contractions
  - May have a relation with neutering

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- Pharmacology for BLADDER-related incontinence

**For Detrusor Over-Activity**

<table>
<thead>
<tr>
<th>Anti-muscarinic Drugs</th>
<th>Side effects of anti-muscarinic drugs</th>
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<tbody>
<tr>
<td>Propantheline</td>
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<tr>
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<tr>
<td>Flavoxate</td>
<td>Urinary retention</td>
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<td>Emepronium bromide</td>
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- **Pharmacology** for BLADDER-related incontinence
  - **For Detrusor Atony**
    - Bethanechol
      - Side effects: vomiting, diarrhea, salivation, anorexia

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- **Conclusions**
  - A comparison between urethral sphincter mechanism incompetence and stress urinary incontinence in women is of interest since both conditions are frequently described during hypooestrogenism.
  - The initial treatment is usually medical.
  - Colposuspension and urethropexy offer a rate of complete continence of about 50%. Those techniques are however invasive.
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References:


Canine Urinary Incontinence

And so... what can we learn from humans?

(and in particular human physiotherapy treatment for stress urinary incontinence in women)

Next video: Management of Urinary Incontinence in Women