

Canine Urinary Incontinence

- Micturation control required autonomic, somatic & central nervous system inputs...

S. Noël et al./The Veterinary Journal 186 (2010) 10–17

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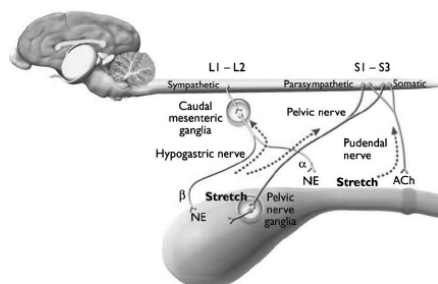


Fig. 1. Autonomic and somatic innervation of the bladder and urethra. Ach, acetylcholine; NE, norepinephrine; α , α -adrenergic receptors; β , β -adrenergic receptors; L1–L2, first and second lumbar vertebrae; S1–S3, first to third sacral vertebrae. Reprinted from Acemio and Labatto (2006) with the permission of Felecia Paras.

Canine Urinary Incontinence

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

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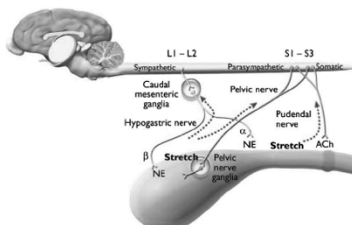


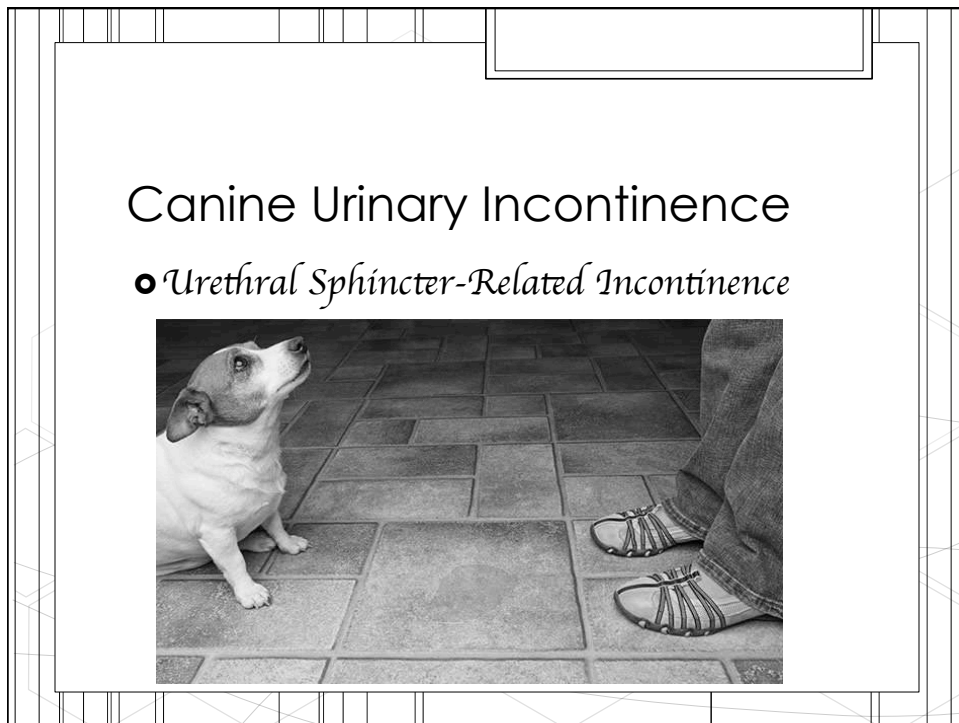
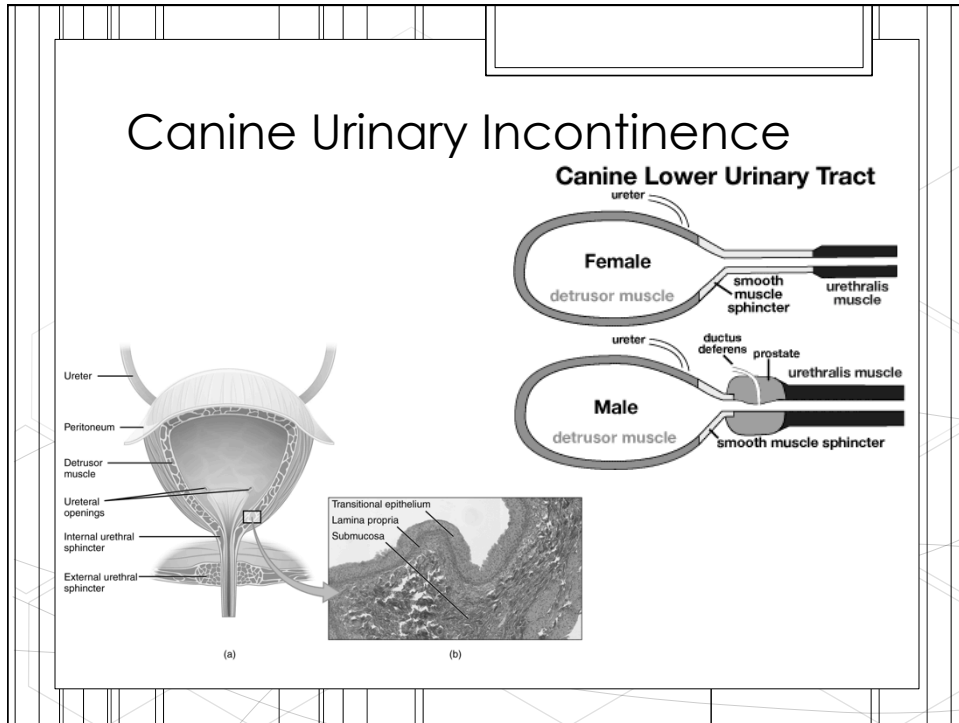
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Canine Urinary Incontinence

- 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!"

Canine Urinary Incontinence

- 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 *pubdental nerve* (Don't pee your pants!)

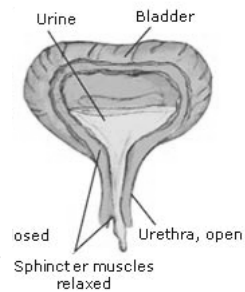


Canine Urinary Incontinence

- 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)

Canine Urinary Incontinence

- Pathophysiology URETHRAL SPHINCTER-related incontinence
- What has been found?
- 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 MUCP, FPL, and integrated pressure.

Canine Urinary Incontinence

- 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.



Canine Urinary Incontinence

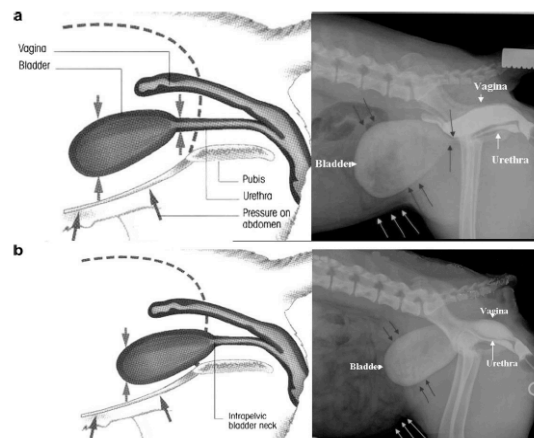


Fig. 3. (a) Theory of abdominal transmission pressure in a case of intra-abdominal bladder using a schematic drawing (left) and vaginourethrography (right). Pressure changes in the abdomen (grey and green arrows) are transmitted to both the bladder and urethra (brown and red arrows), tending to cancel each other out. (b) Theory of abdominal transmission pressure in case of intrapelvic bladder in a schematic drawing (left) and with vaginourethrography (right). Intra-abdominal pressure (grey and green arrows) are transmitted more to the bladder than to the urethra (brown and red arrows), creating a pressure gradient. Reprinted from Holt (2008), p. 151 with permission.

Canine Urinary Incontinence

- **Pharmacology** for URETHRAL SPHINCTER-related incontinence
- **Urethral sphincter mechanism incompetence**

 - Phenylpropanolamine
 - Ephedrine

SIDE EFFECTS: Restlessness, hypertension, tachycardia, anxiety, excitability
- Oestriol

SIDE EFFECTS: Vulva swelling, attraction of males, & uterine bleeding between normal cycles

Canine Urinary Incontinence

- **Pharmacology** for URETHRAL SPHINCTER-related incontinence
- **Functional urethral outlet obstruction**

 - Phenoxybenzamine
 - Prazosin
 - Diazepam
 - Dantrolene

GENERAL SIDE EFFECTS: Hypotension, hypertension, intraocular pressure, tachycardia, GI upset, nasal congestion, sedation, weakness, dizziness, headache.

Canine Urinary Incontinence

- **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.

Canine Urinary Incontinence

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

- o **Surgery** for URETHRAL SPHINCTER-related incontinence
- o **Colposuspension:**

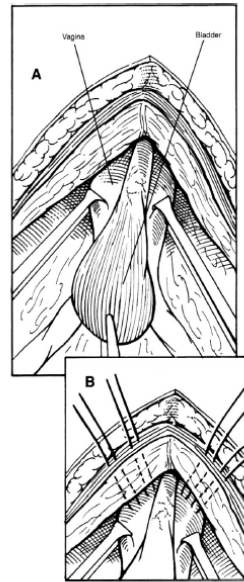


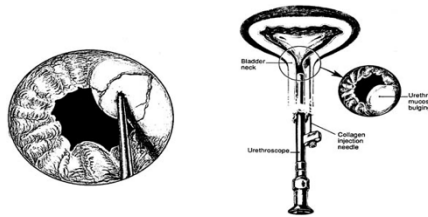
Fig. 1. Colposuspension (ventral view). (A) Allis forceps are placed on the lateral wall of the vagina on either side of the proximal urethra and a cranial traction is exerted. (B) Two sutures are placed through the vagina and around the prepubic tendon bilaterally. Reprinted with permission from Fossum (2002).

Canine Urinary Incontinence

- o **Surgery** for URETHRAL SPHINCTER-related incontinence
- o **Urethropexy:**
 - o Urethra anchored to ventral abdomen wall at level of cranial pubic brim
 - o **GOAL:**
 - o Relocation of the bladder neck into a more cranial position.
 - o **Effectiveness**
 - o 56% cured; 27% improved; 17% failed

Canine Urinary Incontinence

- **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
 - Continenence 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



Canine Urinary Incontinence

- **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)

Canine Urinary Incontinence

- *Bladder-Related Incontinence*



Canine Urinary Incontinence

- 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

Canine Urinary Incontinence

- Pathophysiology BLADDER-related incontinence

Detrusor over-activity

- 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



Canine Urinary Incontinence

- **Pharmacology** for **BLADDER**-related incontinence

For Detrusor Over-Activity

<i>Anti-muscarinic Drugs</i>	<i>Side effects of anti-muscarinic drugs</i>
Propantheline Oxybutinin Imipramine Flavoxate Emeprium bromide	Sedation Vomiting Constipation Urinary retention

Canine Urinary Incontinence

- **Pharmacology** for BLADDER-related incontinence
 - For Detrusor Atony**
 - Bethanechol
 - Side effects: vomiting, diarrhea, salivation, anorexia

Canine Urinary Incontinence

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

Canine Urinary Incontinence

References:

- Noel S, Claeys S, Hamaide A. 2010, Acquired urinary incontinence in the bitch: Update and perspectives from human medicine. Part 1: The bladder component, pathophysiology and medical treatment. *Vet J.* 186: 10 – 17.
- Noel S, Claeys S, Hamaide A. 2010, Acquired urinary incontinence in the bitch: Update and perspectives from human medicine. Part 2: The urethral component, pathophysiology and medical treatment. *Vet J.* 186: 18 – 24.
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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