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# Acquired incontinence (usmi urethral sphincter mechanism incontinence) in the spayed bitch: etiology and pathophysiology

Susi Arnold

*Prof Dr Med Vet, Dipl ECAR, Zurigo, Svizzera*



Reichler Iris, *Med Vet, Zurigo, Svizzera*

Hubler Madeleine, *Med Vet, Dipl ECAR Zurigo, Svizzera*

Urinary incontinence is the most frequent side effect of spaying, embarrassing not only to the owner but to the affected dog itself. The underlying pathophysiological mechanism of urinary incontinence after spaying is a reduced closure pressure of the urethra, known as "urethral sphincter mechanism incompetence (USMI). Within one year after spaying the urethral closure pressure is significantly reduced. Because many bitches only become incontinent years after surgery it took a long time until spaying was considered to be the cause. In one study, 83 (=20%) of 412 bitches, incontinence occurred 3 to 10 years after surgery (1).

## Risk factors

In 1978 it was already pointed out that the tendency towards incontinence after spaying is significantly higher in large dogs compared to small dogs (5). This was confirmed in our own study: of 205 bitches with a body weight of less than 20 Kg, 19 (=9%) became incontinent, whereas 64 bitches (=31%) out of 207, weighing more than 20 Kg, were affected (1).

## Breed disposition

In one study (1) on the incidence of urinary incontinence after spaying, 7 breeds were represented by more than 10 animals: German Shepherd (47), Dachshund (36), Boxer (20), Poodle (15), Spaniel (14), Appenzeller (13) and Bernese Mountain Dog (12). The incidence of incontinence in Boxers was very high (65%), but among German Shepherds (11%) and Dachshunds (11%) was less than the average for all dogs (20%). Remarkably, there was no incontinence recorded for the 14 Spaniels and the 12 Bernese Mountain Dogs (1). Due to the small numbers in other breeds, no statement can be made about their predisposition to urinary incontinence. Of the numerous bitches referred to the Veterinary Animal Hospital in Zurich for the endoscopic injection of collagen, Doberman Pinschers and Giant Schnauzers were obviously well represented.

## Method of surgery

Some authors assumed that after ovariectomy, adhesions around the uterine stump could cause some neu-

ronal damage, leading to urinary incontinence (6; 7). However, there was no significant difference in the incidence of urinary incontinence between ovariectomised and ovariohysterectomised bitches. Of 260 ovariectomised bitches 21% had urinary incontinence after surgery, whereas of 152 ovariohysterectomised bitches 19% became affected (1).

Therefore, the hypothesis of a neuronal damage due to surgery can be disregarded.

## Time of neutering

The question of whether the timing of neutering, before or after the first heat, or the increasing age of the bitch will alter the risk of incontinence, is of importance to the practitioner.

An English study showed that 3 (21%) of 14 bitches spayed after puberty became incontinent, but only 1 (0.5%) of 180 bitches neutered before puberty was affected (8). Regarding these results, early spaying seems to be advantageous for urinary incontinence. A study was therefore done to evaluate the risk of urinary incontinence after spaying before the first heat (9). 206 owners of early spayed bitches were questioned on the side effects. The average age of the bitches was 7 years at the time of the survey. Urinary incontinence occurred in 9.7% of bitches.

## Conclusion:

As a result of early spaying the incidence of incontinence was greatly reduced. This result was confirmed by a recent study (10). But, when/if early spayed bitches became incontinent the degree of severity was markedly increased. This relative disadvantage of early spaying is negligible when compared to the benefits, such as lower incidence of urinary incontinence and the well known protection against mammary tumours.

## Etiology

The causal relationship between the removal of the ovaries and UI is clearly demonstrated (11). It is still unknown what is the triggering mechanism of UI after spaying. Initially an estrogen deficiency after spaying was assumed to be the underlying cause (6). This hypothesis is contradictory to several observations. For example bitches treated with depot preparations of

Incidence of incontinence in bitches spayed before / after the first heat: Comparison of two analogous studies			
Examined parameters	Incidence after early spaying (9)	Incidence after later spaying (1)	Statistical analysis early/late spaying
Incidence of incontinence: - < 20kg body weight - > 20kg body weight	5.1% 12.5%	9.3% 30.9%	SD (p= 0.001)
Type of incontinence: - only during sleep - in sleep and awake - only when awake	35% 60% 5%	98% 2% --	SD (p= 0.000)
Frequency of incontinence - daily - 1 x per week - 1 x per month	90% 10% --	57% 30% 13%	SD (p= 0.018)
Type of operation: - ovariectomy - ovariohysterectomy	8% 15%	21% 19%	NS (p= 0.9)
Time after spaying until occurrence of incontinence	2.8 years	2.9 years	NS (p= 0.9)
SD= Significantly different (p<0.05); NS= No significant difference.			

gestagens, for suppressing the estrus, have not an increased risk of UI, although this treatment results in ovarian atrophy and the estrogen level remains on a basal level (12). Another side effect after spaying is the increase of plasma gonadotropin levels, because of the lack of the negative feed back of the ovaries (13). About 42 weeks after the removal of the ovaries the gonadotropin levels reach a plateau, whereas the plasma FSH-level is 17 times and the plasma LH- level is 8 the initial concentration (14).

One could therefore ask of whether the elevated FSH- and LH plasma levels are responsible for the increased risk of UI in spayed bitches. If this were correct, then affected bitches could be successfully treated with depot preparations of GnRH-analogs, through a down-regulation of GnRH-receptors of the hypophysis and this in turn decreasing the plasma gonadotropin levels. Indeed, in 7 of 13 bitches suffering from USMI continence was achieved, for an average of 247 days, with the injection of GnRH-analogs (15). However, it is questionable whether the success of this treatment is due to a decrease in gonadotropin levels as the levels between responders and non-responders are not different (16). It is possible that GnRH has a direct effect on the lower urinary tract, but the success of therapy is not based on of a normalisation of the urethral sphincter competence (16). Recent studies in Beagle bitches have given rise to the assumption that GnRH modulates the bladder function (16).

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### Author's Address for correspondence:

Prof. Dr. Susi Arnol - Dept. of Animal Reproduction  
Vetsuisse-faculty University of Zurich,  
Winterthurerstr, 260 - 8057 Zurich - Switzerland