

# Canine urinary incontinence

## Part 2: Treatment

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Urinary incontinence is a common presentation in small animal practice. The main differential diagnoses for urinary incontinence, and the diagnostic investigations performed in such cases, were summarised in Part 1 of this article. The primary goal of treatment of urinary incontinence is correction of any underlying abnormality, if possible. For example, overflow incontinence secondary to urethral occlusion should be managed by removal of the obstruction, and likewise ureteral ectopia treated by ureteral reimplantation at a more anatomically correct site. The management of each individual cause of urinary incontinence is beyond the scope of this article. The following review will concentrate on the medical management of urinary incontinence secondary to acquired urethral sphincter mechanism incompetence (USMI).

### NEUTERING AND URINARY INCONTINENCE

Urethral sphincter mechanism incompetence is more common in bitches than dogs, and in spayed than entire females. The incidence of urinary incontinence in neutered bitches is reported to be between five and 20%, compared to less than 1% reported in entire females. The mean age of onset is approximately four years, with over 70% of cases developing the condition by the age of five years (Holt 1987). Seventy-five per cent of cases in spayed animals develop within one year of neutering, with 28% becoming incontinent immediately after surgery; however, clinical signs of USMI can be delayed for up to 10 years post-surgery. It has been estimated that there is almost an eight-fold increase in the risk of developing urinary incontinence in neutered compared to entire bitches (Thrusfield *et al.* 1998).

Although it has been established that ovariectomy is one of the major contributing factors to the development of USMI, the exact mechanisms are poorly understood. The aetiology is believed to be multi-factorial. Decreased urethral length and tone, altered bladder neck position, structural and functional alterations in bladder and urethral musculature, increased collagen deposition within the bladder wall, and altered concentrations of hormones such as oestrogen and

gonadotropins have all been implicated in the development of USMI; many of these factors have also been associated with ovariectomy. No significant difference in incidence has been reported following ovariectomy compared to ovariectomy, and removal of the cervix has not been identified as a risk factor (Thrusfield *et al.* 1998; van Goethem *et al.* 2006).

The increased risk of development of USMI following ovariectomy must be balanced against the many benefits of the procedure. Perhaps the most compelling reason to have bitches spayed at an early age is the reported decrease in prevalence of mammary neoplasia. It has been estimated that the risk of development of mammary neoplasia decreases to 0.05% if ovariectomy is performed prior to the first oestrus, 8% if performed between the first and second oestrus and 26% if performed after the second oestrus, when compared to entire females (Schneider *et al.* 1969). No decreased risk was identified when ovariectomy was performed after the fourth oestrus cycle, or when the animal was greater than 2.5 years old. Other factors that should be considered include population control and decreased risk of pyometra and other reproductive tract disorders.

Although it is generally accepted that the incidence of USMI increases post ovariectomy, the effect of age at the time of performing gonadectomy is more controversial. The most commonly compared groups are those with gonadectomy performed at an early age (6-14 weeks), before the first oestrus, and after the first oestrus. Early age (6-14 weeks old) neutering is rarely performed in Ireland. A study of 1,842 dogs and bitches suggested early age gonadectomy was associated with an increased rate of cystitis, and that decreasing age at gonadectomy was associated with an increased rate of urinary incontinence (Spain *et al.* 2004). In this study, the projected cumulative incidences of urinary incontinence during the first six years of life were 12.9% and 5% for female dogs spayed before and after three months of age, respectively. The authors recommended postponing ovariectomy in dogs until at least three months of

age. Thrusfield *et al.* (1998) demonstrated no significant difference in the incidence of urinary incontinence between animals spayed before and after their first oestrus. Stocklin-Gautschi *et al.* (2001) reported a decreased incidence (9.7%) in animals spayed prior to their first oestrus when compared to previously published incidences. Thus, there is little evidence to-date to suggest that the incidence of urinary incontinence is higher in bitches spayed prior to their first oestrus cycle.

## TREATMENT

As discussed, the aetiology of canine acquired USMI is believed to be multi-factorial. For this reason, it is not surprising that no single treatment is effective in all cases. Both medical and surgical therapies have been described. Advantages of medical therapy include the avoidance of anaesthesia and surgery, and it may be successful in cases that fail to respond following surgical treatment; however, life-long therapy is likely to be required. In contrast, surgery, if successful, negates the need for long term medical management and may be successful in animals in which medical therapy is unrewarding. Concurrent disorders, such as urinary tract infections and structural abnormalities (e.g., intrapelvic bladder, ectopic ureters) must be excluded prior to initiation of therapy.

## MEDICAL MANAGEMENT

The most common classes of drug used in the treatment of urinary incontinence are oestrogens and alpha-adrenergic receptor agonists (Table 1). The choice of therapy is limited by the legal availability of a number of drugs within Ireland.

### Oestrogen therapy

Lack of oestrogen production is considered to be one of the principal factors associated with the development of urinary incontinence in ovariectomised bitches. This is supported by the presence of high affinity oestradiol receptors within the urethra, reports of significantly lower oestradiol-17-beta concentrations in neutered bitches than intact bitches in

**Table 1: Medical management of canine urethral sphincter mechanism incompetence**

Drug	Dose	Class	Comments
Phenylpropanolamine*	1 mg/kg TID, or 1.5 mg/kg BID	Alpha-adrenergic agonist	See text
Estriol*	Initial dose 1 mg/dog SID, adjusting from 0.5 mg EOD to 2 mg SID as required	Oestrogen	See text
Diethylstilboestrol	1 mg once weekly	Oestrogen	Side effects, including bone marrow suppression, are more common than with estriol therapy.
Pseudoephedrine	0.2-0.4 mg/kg q8-12h	Alpha-adrenergic agonist	Less effective than phenylpropanolamine. Some dogs clinically improve.
*licensed for use in dogs in Ireland			

anoestrus, and clinical improvement of affected animals following treatment with oestrogens.

Oestrogens improve urethral tone by increasing the density and responsiveness of adrenergic receptors in urethral smooth muscle. Suppression of gonadotropin secretion may also contribute to their effects. Several severe side effects have been reported, including bone marrow suppression and an increased risk of mammary gland and reproductive tract neoplasia. Bone marrow suppression is more common with synthetic and long-acting preparations such as diethylstilboestrol and oestradiol esters. Vulval oedema, mammary gland development and attractiveness to male dogs have also been reported during therapy, but these effects are reversible with reduction of the administered dose. Pyometra is a rare side effect following oestrogen therapy in ovariectomised bitches; exposure of the uterus to progesterone is required to initiate cystic endometrial hyperplasia. However, an increased risk of pyometra is feasible following the administration of oestrogens to entire bitches. Its use is contraindicated during pregnancy and in dogs less than one year of age.

Currently, Oestriol (Incurin, Intervet Schering Plough) is the only licensed oestrogen available for this use in dogs in Ireland. Side effects appear rare with this naturally occurring, short-acting oestrogen. Response rates of 82% have been reported, with 33% of owners reporting excellent, 37% reporting good, and 12% reporting adequate efficacy (Mandigers and Nell 2001). Mild and transient oestrogenic effects (vulval swelling and attractiveness to male dogs) have been observed at higher dose rates (incidence 5-9%) and are reversed by dose reduction. Bone marrow suppression has not been reported at recommended doses.

### Alpha-adrenergic receptor agonists

Alpha-adrenergic drugs exert their effect by direct stimulation of the smooth muscle comprising the internal urethral sphincter. Currently, phenylpropanolamine (Propalin, Vétquinol) is the only licensed product for use in Ireland, available as an intermediate release formulation. Approximately 85% of treated dogs have complete urinary continence after four weeks of therapy, compared to 33.3% of placebo treated cases (Scott *et al.* 2002). Side effects are rare, and are typically mild and transient, although aggressiveness, restlessness, vomiting and diarrhoea have been reported following treatment. Hypertension and an increased risk of haemorrhagic stroke have been associated with the use of phenylpropanolamine in humans, but these effects have not been observed in dogs.

In human medicine, sustained-release preparations of phenylpropanolamine combined with diphenylpyraline, or paracetamol and diphenhydramine are available, but these are not licensed for use in the dog. Additional side effects can be seen with these products due to the paracetamol and antihistamine components. One study has evaluated the effectiveness of the sustained release phenylpropanolamine combined with diphenylpyraline, and concluded it was effective in treating some bitches which failed to respond to the licensed product (Byron *et al.* 2007).



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### Combination and other therapies

Combination therapy with both oestriol and phenylpropanolamine has been suggested in animals that fail to respond to either therapy alone. In theory, oestriol increases the density and sensitivity of alpha-adrenergic receptors, thereby increasing the response to administered phenylpropanolamine. Although urethral profilometry studies in dogs have failed to demonstrate any additional urodynamic effect over oestriol therapy alone (Hamaide *et al.* 2006), several human clinical studies have demonstrated a synergistic therapeutic effect for the treatment of stress incontinence in post-menopausal women. Further studies are necessary to evaluate the effectiveness of combination therapy in dogs. Novel medical treatments include the use of gonadotropin releasing hormone analogues such as leuprolide, buserelin and deslorelin in neutered females. Gonadotropin concentrations (luteinising hormone and follicle stimulating hormone) increase markedly in neutered animals, due to loss of negative feedback on the hypothalamic pituitary axis. It has been proposed that these hormonal changes contribute to the development of USMI, and that administration of GnRH analogues to downregulate GnRH receptors within the pituitary gland, thereby suppressing gonadotropin secretion, could have therapeutic benefit. A double-blind placebo-controlled study assessing the effect of a long-acting GnRH analogue showed complete continence in nine of 22 treated dogs, with partial improvement in a further 10 dogs (Reichler *et al.* 2006). However, the efficacy of treatment was less than that observed for phenylpropanolamine administered in the pre-study period, and there was no correlation between the decrease in gonadotropin concentrations and the clinical response, suggesting these drugs may have additional methods of action. Further studies are required before treatment can be recommended in clinical practice.

### SURGICAL MANAGEMENT

An incomplete response to, or total failure of, medical management occurs in a proportion of cases. A variety of surgical techniques directed toward increasing resistance to urine flow through the urethra have been described. Despite several reports of alternative therapies, none are uniformly effective.

#### Colposuspension

Colposuspension is a procedure in which the urethra and vagina are moved cranially surgically, relocating the bladder neck from an intrapelvic to an intra-abdominal location (Figure 1 and 2). In a case series of 150 bitches, Holt (1990) reported continence in 56% with surgery alone; an additional 40% significantly improved and 10% exhibited refractory incontinence based on owner evaluation. Marchevsky *et al.* (1999) reported similar results with 40% of bitches cured, 42% markedly improved or totally continent with concurrent medication, and 18% failing to respond. Despite these encouraging results long-term follow-up has revealed continence rates of only 14% one

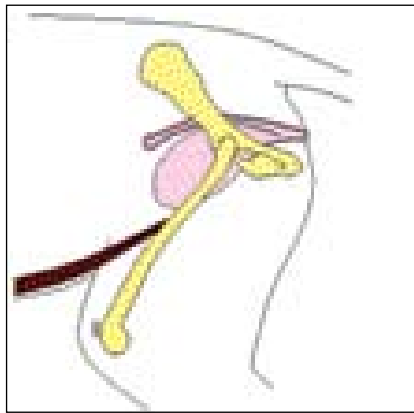


Figure 1: Lateral diagram of a dog with an intrapelvic bladder.

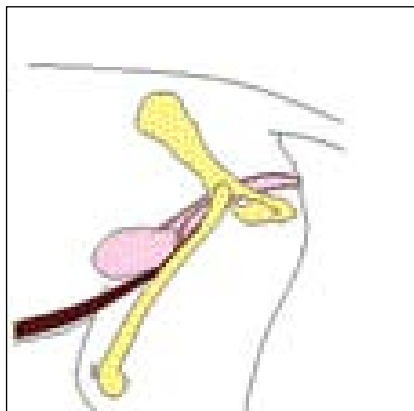


Figure 2: Lateral diagram of the same dog after a colposuspension procedure has been performed.

year after surgery with another 33% described as “greatly improved” (Rawlings *et al.* 2001). An improved response to medical management was noted with 38% of bitches considered continent and a further 43% greatly improved when surgical and medical therapies were combined. The beneficial effects are assumed to be due to increased exposure of the bladder neck and proximal urethra to intra-abdominal pressure, urethral lengthening, and bringing the urethra into close proximity to the pubis. The relative contribution of each of these factors remains unclear. Studies have demonstrated an increase in urethral length following colposuspension but this increase in length is not consistently correlated with functional outcome (Holt 1990). Rawlings *et al.* (2001) reported a higher probability of success in bitches with a more caudal entry point of the urethra into the vestibule. The same authors also demonstrated that the leak point pressure test increases in bitches exhibiting improved postoperative urinary control. Reported complications are uncommon but include postoperative straining to urinate, inability to urinate, tearing of the sutures from the vagina, and recurrence of urinary incontinence. Dyssynergia responsive to administration of diazepam has been suggested as the most common cause of postoperative dysuria. The degree of dysuria may be exaggerated by prior oestrogen administration and it is suggested that oestrogen therapy be discontinued at least a week before surgery. Excessive narrowing of the urethral lumen is another reported complication, especially if sutures are placed too close to the urethra; however, complete outflow obstruction following colposuspension is extremely rare.

### **Cystourethropexy**

In similarity to colposuspension, cystourethropexy aims to restore the bladder neck and proximal urethra to an intra-abdominal position while increasing urethral resistance to urine flow. Described by Massat *et al.* (1993), the procedure is similar to urethropexy, and yielded excellent or good results in 60% of bitches. Dysuria was a common complication; however, all were able to urinate voluntarily.

### **Urethropexy**

White (2001) described a technique of urethropexy in 100 bitches and recorded results that compared favourably with colposuspension. Full urinary continence was achieved in 56% of dogs and improvement recorded in a further 27%. Complications were noted in 21% of cases and, similar to other procedures intended to increase tension within the urethral wall, included increased frequency of urination, dysuria and, rarely, complete obstruction. Spontaneous resolution within 14 days was noted in the majority of cases, although suture removal was required in three bitches with outflow obstruction.

## **OTHER TREATMENT OPTIONS**

### **Endoscopic periurethral injection**

Endoscopic periurethral injection of Teflon (polytetrafluoroethylene) and glutaraldehyde cross-linked collagen has been described in the bitch. Submucosal injections via urethroscopy cause urethral bulging and partial obstruction of the urethral lumen, resulting in improved urethral closure pressure. Promising results have been reported with 68% of dogs treated attaining full urinary continence after the procedure, and a significant improvement described in an additional 25% of cases (Arnold *et al.* 1996; Barth *et al.* 2005). Unfortunately, this improvement appears temporary, with incontinence recurring in approximately two thirds of cases following periurethral injection of Teflon (Arnold *et al.* 1989). Despite this high recurrence rate, many of the dogs responded to repeat injection.

### **Urethral sling**

Sling procedures using synthetic material (Nickel *et al.* 1998) or flaps from the bladder wall (Muir *et al.* 1994) have been described with or without colposuspension to further increase mid-urethral resistance. The authors of these reports propose that dogs with low urethral pressures have a different pathophysiology compared to animals with normal urethral pressure and intrapelvic bladders. It is unclear whether or not there is an advantage to using a combination technique as results of urethral sling procedures combined with colposuspension are similar to those described after performance of colposuspension alone. Complications associated with the surgery included dysuria, stranguria and fistulation.

### **Urethral lengthening**

Described to treat urinary incontinence secondary to congenital USMI in dogs and cats, urethral lengthening

involves the creation of two full thickness V-shaped flaps on the ventral aspect of the bladder wall. The resultant defect is closed to decrease the diameter of the bladder neck. Excellent results were described in a series of eight cats and good results in one dog (Holt 1993).

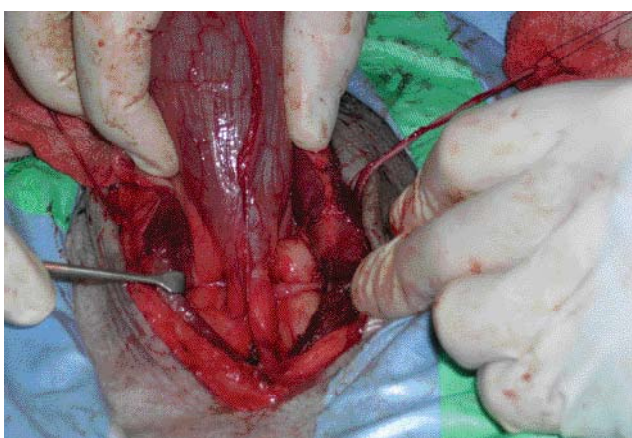
### **Sphincter reconstruction techniques**

Creation of a urethral sphincter using muscle flaps or artificial sphincters has been described experimentally but these techniques have not been evaluated clinically.

## **USMI IN MALE DOGS**

The pathophysiology and treatment of USMI in male dogs is less well understood, with reported response rates to medical treatment significantly poorer compared with their female counterparts. As in the female, it is more common in large breeds and there is some evidence that castration may predispose to this condition.

Neither alpha-adrenergic agonists nor oestrogens are licensed for male dogs; however, their use has been reported. In one study, only seven of 16 dogs responded to phenylpropranolamine treatment (five excellent and two good responses), and oestrogen therapy resulted in a good response in three of eight dogs (Aaron *et al.* 1996). Testosterone therapy has been attempted, but has been shown to have minimal efficacy, as well as multiple side effects, including aggression and prostatic disease. Contrary to the situation in the bitch, the intrapelvic bladder neck of incontinent male dogs is not associated with a shorter urethral length (Power *et al.* 1998). Cranial advancement of the intrapelvic bladder neck into an intra-abdominal position has been achieved by pexy of the vas deferens, either by conventional surgery (Weber *et al.* 1997) (**Figure 3**) or by laparoscopy (Salomon *et al.* 2002). A case series reported excellent or good results in six of seven male dogs treated, with improvement attributed to restoration of the bladder neck and proximal urethra into an intra-abdominal position (Weber *et al.* 1997). Prostatopexy avoids the need for concurrent castration and has been proposed as an additional method of treating male dogs with USMI that do not respond to medical therapy (Holt *et al.* 2005). Reported results are disappointing and prostatopexy appears less successful than other techniques, such as intraurethral Teflon injections and vas deferentopexy.



**Figure 3:** Intra-operative photograph of vas deferens pexy.

## FAILURE OF THERAPY

If initial medical or surgical treatment of USMI is unsuccessful, alternative treatments may be attempted. Surgical therapy proves effective in some cases that fail to respond to medical therapy, and vice versa. However, if incontinence persists despite treatment, the case should be reviewed to ensure the correct diagnosis was initially made, and that a concurrent disorder has not been missed. In addition, the development of secondary problems, such as urinary tract infection or polyuria may result in the development of incontinence in a previously well-controlled individual. In such cases, further diagnostic tests should be performed before concluding that treatment has failed.

## SUMMARY

Acquired USMI is a multifactorial disorder and, as such, it is not surprising that no single treatment modality is effective in all cases. Before commencing therapy, it is necessary to ensure other causes of urinary incontinence have been excluded. However, in the majority of cases satisfactory control can be obtained by a variety of medical and/or surgical therapies.

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