Surgical treatment of refractory incontinence in the bitch

Chirurgische behandeling van refractaire incontinentie bij de teef

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ABSTRACT

Urinary incontinence is a common condition in spayed, female dogs with a reported prevalence between 3.1% and 20.1%. In the majority of dogs with acquired urinary incontinence, urethral sphincter mechanism incompetence is the underlying cause. Approximately 15% of bitches that initially respond to medical therapy ultimately become refractory. Surgical intervention is indicated when patients do not respond or become refractory to medical treatment. Based on the current literature, placement of an artificial urethral sphincter, i.e. an inflatable cuff around the proximal urethra connected to a subcutaneous injection port, provides a very reliable and long-term incontinence resolution in bitches and has a low complication rate.

SAMENVATTING

Urinaire incontinentie is een vaak voorkomende aandoening bij gesteriliseerde teven met een gerapporteerde prevalentie tussen 3,1% en 20,1%. Bij de meeste honden met verworven urinaire incontinentie is er sprake van een onderliggende urethrale sfinctermechanisme-incompetentie. Ongeveer 15% van de teven die initieel verbeteren met medicamenteuze behandeling, wordt uiteindelijk refractair. Chirurgische interventie is aangeraden wanneer patiënten niet verbeteren ondanks medicamenteuze behandeling of refractair worden aan medicamenteuze behandeling. Gebaseerd op de huidige literatuur biedt de plaatsing van een artificiële urethrale sfincter, dit is een opblaasbare "cuff" rondom de proximale urethra die verbonden is met een subcutane injectiepoort, een zeer betrouwbare en langdurige oplossing voor incontinentie bij teven, waarbij zelden complicaties optreden.

INTRODUCTION

In spayed, female dogs, urinary incontinence (UI) is a common condition with a reported prevalence between 3.1 and 20.1% (Arnold et al., 1989; O'Neill et al., 2017). The majority of dogs with acquired UI suffer from urethral sphincter mechanism incompetence (USMI) (Byron et al., 2017). The first treatment option in dogs affected by acquired UI is medical management. Although some cases become refractory to treatment, medical management is highly efficient in many cases. (Applegate et al., 2018). Urinary incontinence and subsequent medical management have been discussed in more detail in a previous literature review article published in this journal (Timmermans et al., 2019).

Historically, different surgical options have been researched. In this review, indications for surgical treatment in patients with acquired UI due to USMI are highlighted and the currently available surgical options are discussed.

SURGICAL TREATMENT

Surgical treatment is indicated 1. when patients do not respond to medical treatment or encounter severe adverse effects from it, 2. to treat refractory urinary incontinence, or 3. when owners are reluctant to administer lifelong medication. A large number of dogs with USMI are eventually presented as candidates for surgical treatment, since approximately 15-20% of
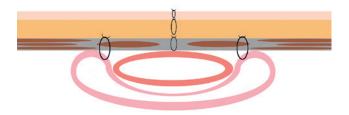
Figure 1. Schematic representation of the colposuspension technique illustrating how the vaginopexy (pink) compresses the urethra (orange) to the abdominal wall (grey).
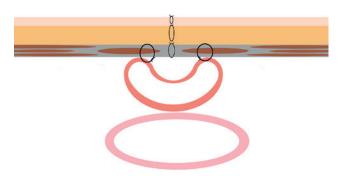

Figure 2. Schematic representation of the urethropexy technique illustrating how the procedure is reducing the diameter of the urethral lumen (orange).

bitches that initially respond to medical therapy ultimately become refractory (Scott et al., 2002; Adin, 2014). Additionally, until recently, most surgical procedures could not provide long-term continence; however, technological advances seem to have eliminated this problem.

Colposuspension

Colposuspension is essentially a vaginopexy that entraps the urethra between the vagina and the abdominal wall using nonabsorbable, monofilament suture material (Mcloughlin and Chew, 2009; Claeys et al., 2010b). Increased external compression of the proximal urethra is caused both by the compressive effect from the vaginopexy and also by the repositioning of both the bladder neck and proximal urethra into a more cranial intra-abdominal position (Rawlings et al., 2001; Applegate et al., 2018) (Figure 1).

Short-term continence is achieved in approximately 55% of cases. However, in a study by Rawlings et al. (2001), continence decreased to 14% one year postoperatively (n = 23 dogs). Additional medical therapy resulted in regained continence in a total of 38% of dogs after one year (Rawlings et al., 2001) (Table 1).

Major complications, including (partial) urethral obstruction, are rare (Rawlings et al., 2001; Mcloughlin and Chew, 2009). Transient dysuria is the most commonly observed minor complication.

Table 1. Data summary of surgical treatment options of refractory incontinence other than the artificial urethral sphincter.

	n	Follow-up (months)	Short-term continence		Long-term continence		Complications		Owner satisfaction
			SX	SX + MED	SX	SX + MED	Minor	Major	
Colposuspension									
Rawlings et al. (2001)	23	12	55%	N/A	14%	38%	N/A	N/A	83%
Urethro(cysto)pexy									
Massat et al. (1993)	10	14	N/A	40%	10%	30%	20%	0	60%
White (2001)	100	54	N/A	N/A	56%[†]	-	20%	3%	77%[†]
Urethropexy and colposuspension									
Martinoli et al. (2014)	30	39	N/A	N/A	70%	N/A	10%	0	97%
Urethral bulking									
Barth et al. (2005)	40	12	68%	83%	28%	65%	15%	0	70%
Bartges and Callens (2011)	22	1	77%	-	N/A	N/A	18%	0	N/A
Byron et al. (2011)	21[*]	56	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Transobturator vaginal tape									
Claeys et al. (2010)	7	11	71%	85%	71%	85%	14%	0	85%
Deschamps and Roux (2015)	12	48	92%	N/A	25%	-	58%	25%	83%
Hamon et al. (2019)	12	85	83%	-	40%[‡]	80%[‡]	17%	0	80%[‡]

Short-term continence < 6 months; long-term continence > 6 months, SX: surgery, SX + MED: surgery and medication, N/A: data not available in the publication, *Study on a total of 31 dogs of which 21 patients with USMI, †40 out of 100 dogs were excluded from long-term analysis, ‡2 out of 12 dogs were excluded from long-term analysis.

Urethro(cysto)pexy

Urethropexy consists of attaching the urethra to the ventral abdominal wall whereas with cystourethropexy, both the urethra and the bladder are attached to the abdominal wall (Mcloughlin and Chew, 2009). Nonabsorbable monofilament sutures are used in these techniques (Mcloughlin and Chew, 2009). During both procedures, the bladder neck and proximal urethra are repositioned more cranially in the abdomen. When performing a urethropexy, the diameter of the urethral lumen is reduced, creating higher urinary flow resistance (Massat et al., 1993; Mcloughlin and Chew, 2009) (Figure 2).

A prospective study on urethropexy performed by White (2001) revealed 87% short-term improvement (n = 100 dogs). However, long-term continence decreased to 56% approximately three years postoperatively (Table 1). Unfortunately, the effects of additional medical treatment following a urethropexy were not evaluated in the study by White (2001). Results after cystourethropexy are less positive than the urethropexy results, with only 10% continence after surgery and 30% long-term continence when phenylpropanolamine was administered (n = 10 dogs) (Massat et al., 1993).

Major complications are rare, with 3% of affected dogs requiring revision surgery due to anuria or avulsion of the urethropexy site (White, 2001; Martinoli et al., 2014). Minor complications are common, occurring in 20% of affected dogs, and include transient pollakiuria and dysuria.

Martinoli et al. (2014) described the combination of urethropexy and colposuspension in female dogs with refractory UI (n = 30 dogs) and found higher success rates compared to the rates found when either of these techniques were used alone. In that study, the combination therapy achieved long-term continence in 70% of dogs after a median follow-up of approximately 39 months. Complications were mild and temporary in 10% of cases. Remarkably, combining these two techniques is likely to decrease the risk of avulsion; this combination has been successful in bitches with previous avulsion of the soft tissues (Martinoli et al., 2014).

Urethral bulking

Urethral bulking is a minimally invasive treatment method where bulking agents are injected into the urethral submucosa (Arnold et al., 1996). Under videoendoscopic guidance, the bulking agents are injected in the proximal urethra at the 2-, 6-, and 10-o'clock positions to increase the urethral closure pressure (Klarskov and Lose, 2008; Byron et al., 2011; Applegate et al., 2018) (Figure 3). Bovine glutaraldehyde cross-linked collagen used to be the gold standard (Bartges and Callens, 2011; Byron et al., 2011), but is no longer available on the European market (Lüttmann et
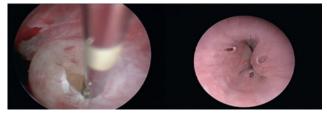

Figure 3. Videoendoscopic view of urethral bulking during (left) and after (right) injection of bulking agents (From: Applegate et al., 2018).

Figure 4. Schematic representation illustrating the placement of the transobturator vaginal tape using the inside-out variant (From: Deschamps and Roux, 2015).

al., 2019). In a study by Bartges and Callens (2011), polydimethylsiloxane was used as an alternative. In that study, 22 female dogs, of which 77% were continent, were included; there was a follow-up period of only one month (Bartges and Callens, 2011). Recently, continence results after endoscopic urethral injections of dextranomer/hyaluronic acid copolymer have been reported by Lüttmann et al. (2019). Their findings identified the new copolymer as a valuable substitution. However, it provided a shorter duration of continence than bovine glutaraldehyde cross-linked collagen (Lüttmann et al., 2019).

Efficacy of solo-treatment with urethral injections is approximately 60-70%, but rises to 83% when dogs simultaneously receive alpha-adrenergic agonists, such as phenylpropanolamine (Barth et al., 2005; Byron et al., 2011) (Table 1). Over time, migration and flattening of the material in the mucosa occur, leading to a 40%-decrease in efficacy after one year of injecting collagen and the recurrence of UI (n = 40 dogs) (Barth et al., 2005). To assure life-long continence, repeated injections are required (Byron et al., 2011).

No major complications, meaning patients requiring revision surgery, have been reported. Minor complications, usually of transient nature, occur in approximately 15% of patients that underwent urethral bulking and include stranguria, hematuria, and vaginitis (Barth et al., 2005; Lüttmann et al., 2019).

Table 2. Published results of the surgical treatment of refractory incontinence with an artificial urethral sphincter.

	n	Follow-up (months)	Short-term continence		Long-terme continence		AUS cuff inflation	Complications cations		Owner satis-faction
			SX	SX + MED	SX	SX + MED		Minor	Major	
Rose et al. (2009)	4	27	75%	N/A	100%	-	75%	75%	0	100%
Delisser et al. (2012)	11	14	27%	N/A	36%	-	55%	82%	0	73%
Currao et al. (2013)	18	32	N/A	N/A	56%	77%	67%	44%	17%	N/A
Reeves et al. (2013)	27 (3M)	13	N/A	N/A	N/A	N/A	56%	37%	7%	89%
Gomes et al. (2018)	20	40	35%	-	35%	40%	65%	65%	5%	90%
Morgan et al. (2018)	9 (2M)	27	N/A	N/A	28%	N/A	71%	14%	14%	N/A

Short-term continence: < 6 months; long-term continence: > 6 months, SX: surgery, SX + MED: surgery and medication, N/A: data not available in the publication, M: male dogs. Only data from female dogs was evaluated when possible.

Transobturator vaginal tape

The technique was first described in women by Cho et al. (2011). Its most recent modification, the transobturator vaginal tape inside-out variant, is currently used in veterinary medicine (Claeys et al., 2010a; Hamon et al., 2019) (Figure 4). A polypropylene tape is applied around the distal third of the urethra using a specific needle and polyethylene tubes as a guide (Claeys et al., 2010a). The exact mechanism of action remains unclear, but increased periurethral tension due to the foreign body or an inflammatory response induced by the device might be the reason for regaining continence (Hamon et al., 2019).

In a study by Claeys et al. (2010a) including seven dogs, a complete continence was observed in 86% of patients after a mean follow-up of eleven months (Claeys et al., 2010a) (Table 1). Although Deschamps and Roux (2015) reported a complete urinary continence in eleven out of twelve dogs (92%) within two weeks after surgery, long-term results revealed complete long-term continence in only 25% of the dogs and an additional 25% of patients with major improvement at a median follow-up of four years. In a more recent study by Hamon et al. (2019), more positive results were reported, with complete continence in four out of ten dogs at a median follow-up of seven years (n = 12 dogs). However, two dogs in that study were excluded from the long-term analysis due to factors outside of the study's control. Additional medical treatment consisted of phenylpropanolamine, oestrogen or a combination of both. Due to this additional treatment, the continence rates of four out of the six remaining dogs that were not responding to solo treatment, improved (Hamon et al., 2019).

In a study by Deschamps and Roux (2015), major complications, such as fistula formation, occurred in three out of twelve dogs (25%) and required implant removal; however these complications did not occur in the two other studies (Claeys et al., 2010; Hamon et al., 2019). Minor complications occurred in 14-58% of patients and included transient dysuria and an iatrogenic urethral tear (Claeys et al., 2010; Deschamps and Roux, 2015; Hamon et al., 2019).

Artificial urethral sphincter

The artificial urethral sphincter (AUS) consists of an inflatable silicone cuff placed around the urethra that is connected to a subcutaneous access port (Adin et al., 2004) (Figure 5). The device is available in different sizes depending on the diameter of the urethra, which is measured either preoperatively via ultrasonographic examination or intraoperatively.

Tapered cuff inflation with sterile saline, adapted to the individual patient, is a unique advantage compared to other surgical techniques. In approximately 25-50% of patients, continence is regained due to the semi-rigid structure of the cuff and the more intra-abdominal position of the bladder (Rose et al., 2009). However, in dogs that remain incontinent four to six weeks postoperatively, inflation of the silicone cuff with 0.1–0.2 ml increments is performed (Reeves et al., 2013). According to a cadaveric study performed by Adin et al. (2004), the minimum volume to obtain complete occlusion of the lumen of the AUS cuff is 0.4 ml. Interestingly, recent studies show that higher total cuff inflation volumes of up to 2 ml might be required to achieve continence and can be tolerated by patients without adverse effects (Gomes et al., 2018; Morgan et al., 2018). In the event of side effects, such as stranguria or pollakiuria, the cuff can easily be deflated via the subcutaneous access port (Rose et al., 2009; Delisser et al., 2012; Currao et al., 2013; Gomes et al., 2018; Morgan et al., 2018).

Long-term continence rates in the literature vary between 28-100% (Rose et al., 2009; Delisser et al., 2012; Currao et al., 2013; Gomes et al., 2018; Morgan et al., 2018) (Table 2). When interpreting these results and comparing them with other surgical techniques, it is important to note that dogs with major improvement are not included in the continence rates. Delisser et al. (2012) for example found that 36% of the eleven dogs in their study were completely continent at the end of

the study. However, the median continence score of all dogs in that study was 9/10 (range, 7/10-10/10). In a recent study by Gomes et al. (2018) with a follow-up of three years (range: 365-2.257 days), 40% of complete continence and another 50% with major improvement (n = 20 dogs) were shown. In other studies, similar continence scores have been reported (Delisser et al., 2012; Currao et al., 2013; Gomes et al., 2018; Morgan et al., 2018) and scores at two weeks, three and six months were 8 (4 to 10). Another important factor in the evaluation of the results of the AUS system is the owner compliance (Currao et al., 2013). Final continence results may be lower due to owners deeming the situation clinically manageable and declining further follow-up visits to fill the cuff until full continence is achieved (Reichler et al., 2006; Currao et al., 2013; Byron, 2015). Currao et al. (2013) reported a long-term complete continence rate of 56% in dogs approximately 2.5 years after placement, which increased to 77% in cases with compliant owners allowing continued cuff inflations (Table 2).

Additional medical therapy should be considered when patients have recurrence of incontinence and have the cuff filled. Previous reports show a lot of variation in the need for additional medication, from 0-61% (Delisser et al., 2012; Currao et al., 2013). The infrequent requirement of medical therapy after AUS placement is likely a result of the semi-rigid structure of the cuff, as mentioned by Rose et al. (2009).

Major complications, including urethral obstruction, urethral stricture, urethral laceration, implant failure by cuff leakage, or implant infection have been reported in 0-17% of cases (Rose et al., 2009; Delisser et al., 2012; Currao et al., 2013; Reeves et al., 2013; Gomes et al., 2018; Morgan et al., 2018). Treatment consists of device removal (Currao et al., 2013). Minor complications are common (Delisser et al., 2012) and include dysuria, seroma formation and pain originating from the subcutaneous port. These complications are either transient or can be resolved with medications such as non-steroidals. Other minor complications such as stanguria require cuff deflation (Rose et al., 2009; Delisser et al., 2012; Currao et al., 2013; Reeves et al., 2013).

CONCLUSION

Evaluation of the current literature shows that there is a large disparity between results. Comparison is therefore not always accurate. The AUS system provides the best long-term results for the surgi-
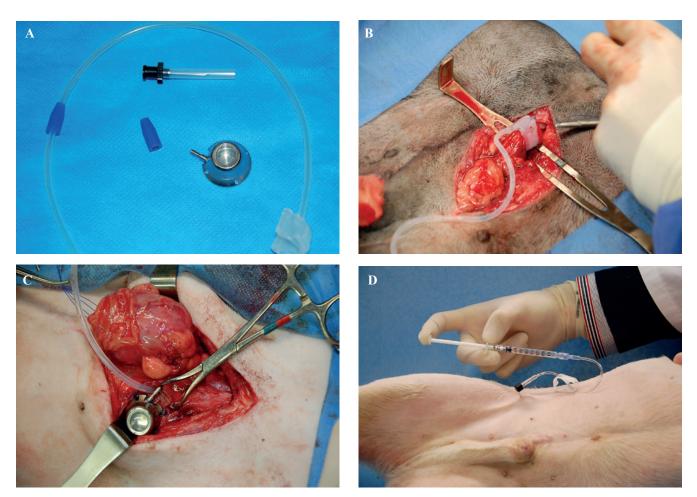
Figure 5. Placement of an AUS. A. An overview of the individual components. B. The inflatable cuff is placed around the urethra distal to the trigone. C. The subcutaneous access port is placed in a subcutaneous pocket lateral to the mammary chain. D. Postoperative filling of the cuff with sterile saline using a dedicated needle.

cal treatment of bitches with refractory UI, with most dogs achieving full continence. Cuff inflation allows individualized tapering until complete continence occurs, although only 55-75% of patients will require inflation to achieve complete urinary continence. For dogs that do not achieve full continence, supplementary medical therapy can further improve the continence rates.

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Uit het verleden

Gynaecologie: geen geschikte term in de diergeneeskunde

Het woord 'gynaecologie' wordt dikwijls gebruikt als synoniem voor verloskunde. Maar die tak van de (dier)geneeskunde is uiteraard veel ruimer. Dat weet iedereen. Etymologisch betekent gynaecologie kennis (Grieks: logos) over de huisvrouw (Grieks gynè: vrouw; oikos: huis). De term verraadt dat eeuwenlang enkel het geslachtsleven en de daarmee gepaard gaande ziektetoestanden van de huisvrouw - de getrouwde vrouw - voor de medische wetenschap van belang waren. 'Geestelijke (geest-gelijke) dochters', religieuzen, werden niet verondersteld een geslachtsleven te hebben en andere vrouwen waren uitschot, tenzij ze, bij voorkeur als jonge maagd, konden 'dienen' om huisvrouw te worden.

Gynaecologie: niet echt een geschikte term dus voor … diergeneeskundig gebruik. Maar welke dan wel?

Luc Devriese