

# HOSPITAL PHYSICIAN®

## UROLOGY BOARD REVIEW MANUAL

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## Stress Urinary Incontinence in Women

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# Stress Urinary Incontinence in Women

Neil T. Dwyer, MD, FRCSC

## INTRODUCTION

### EPIDEMIOLOGY

Urinary incontinence (UI) affects 23% to 55% of women.<sup>1-3</sup> The 3 most common types are stress urinary incontinence (SUI), urge urinary incontinence (UUI), and mixed urinary incontinence (MUI).<sup>4</sup> SUI is defined as the involuntary leakage of urine on effort/exertion or sneezing/coughing or, urodynamically, as the involuntary leakage of urine during increased abdominal pressure in the absence of a detrusor contraction. UUI is the involuntary leakage of urine accompanied by or immediately preceded by urgency. MUI is the involuntary leakage of urine associated with urgency as well as with exertion, effort, or sneezing.

Studies examining the prevalence and distribution of the types of UI in noninstitutionalized women have shown that 49% of those affected have SUI, 21% have UUI, and 29% have MUI.<sup>5</sup> However, the prevalence of the different types of incontinence varies in older women. Molander and colleagues<sup>6</sup> surveyed 4206 women aged 70 to 90 years and found that 49% had UUI, 27% had MUI, and 24% had SUI.

### PATHOPHYSIOLOGY

SUI is thought to be caused by a sphincteric abnormality, which in the past was considered to be either urethral hypermobility or intrinsic sphincteric deficiency (ISD). SUI is now thought to be due to an abnormality in the urethra itself rather than abnormalities in vaginal position or mobility.<sup>7</sup> On magnetic resonance imaging (MRI) of the pelvic floor, SUI was associated with unequal movement of the anterior and posterior walls of the bladder neck and urethra in the presence of increased abdominal pressure. MRI demonstrated the urethral lumen being pulled open as the posterior wall moved away from the anterior wall.<sup>8,9</sup> Anatomic specimens have demonstrated that the urethra is compressed against a hammock-like musculofascial layer upon which the bladder and bladder neck rest. If this supporting layer becomes unstable, significant changes in abdominal pressure can cause SUI.<sup>10,11</sup>

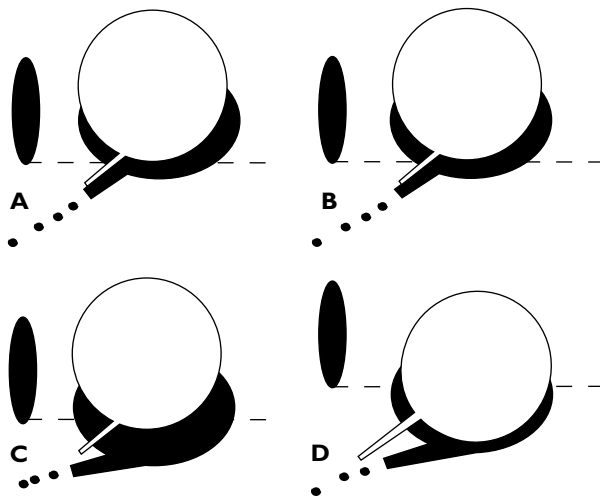
In 1988, Blaivas and Olsson<sup>12</sup> developed a videourodynamic method to categorize SUI (**Figure 1**):

- Type 0: complaint of SUI, but urodynamic study is unable to demonstrate leakage visually; during stress, the bladder neck descends and opens, mimicking type I or type II SUI.
- Type I: the bladder neck is closed at rest and is situated above the inferior margin of the symphysis pubis; with stress, the bladder neck and proximal urethra open and drop less than 2 cm in relation to the pubis, and UI is visualized.
- Type IIA: the bladder neck is closed and above the symphysis pubis at rest; with stress, there is a rotational descent, typical of a cystourethrocele, and UI is seen.
- Type IIB: the bladder neck is closed at rest but is situated at or below the inferior margin of the symphysis pubis; with stress, it may or may not descend further, but the proximal urethra opens and UI occurs.
- Type III: the bladder neck and proximal urethra are open at rest; UI may be gravitational or with increased intravesical pressure. (The term ISD has replaced type III SUI and refers to an intrinsic malfunction of the urethral sphincter regardless of its anatomic position.)

## RISK FACTORS AND APPROACH TO EVALUATION

### CASE 1 PRESENTATION

A 44-year-old woman presents to the urologist complaining of urine leakage that occurs mainly with chores around the house. She explains that the problem began approximately 2 years ago and has progressed to the point that she now wears 2 to 3 pads per day. She is obese (body mass index [BMI], 35 kg/m<sup>2</sup>) but is otherwise healthy. She is gravida 3, para 3, and all deliveries were vaginal and uncomplicated. She takes no medications and had a vaginal hysterectomy 9 years prior, after the birth of her last child.



**Figure 1.** (A) Type I stress urinary incontinence (SUI). (B) Type IIA SUI. (C) Type IIB SUI. (D) Type III SUI. (Adapted from Blaivas JG, Groutz A. Urinary incontinence: pathophysiology, evaluation, and management overview. In: Walsh PC, Retick AB, Vaughan ED, Wein AJ, editors. *Campbell's urology*. 8th ed. Philadelphia: Saunders; 2002:1031–3. Copyright 2002, with permission from Elsevier.)

- **What are the risk factors that predispose patients to SUI?**

**RISK FACTORS**

Risk factors for UI in women were reviewed at the second International Consultation on Incontinence in 2001 (Table 1).<sup>7</sup> When considering SUI, the most important risk factors are generally thought to be age, history of pregnancy and childbirth, and obesity.

A survey of 3110 Danish women demonstrated a steady increase in UI prevalence in women aged 30 to 59 years.<sup>13</sup> The study also found that, with age, the prevalence of SUI decreased while the prevalence of UUI appeared to increase.

In 2004, Groutz and colleagues<sup>14</sup> followed 363 women for 1 year after childbirth to examine the effects of childbirth on the incidence of SUI; all study subjects denied a history of SUI prior to pregnancy. The women were subdivided according to method of delivery. The incidence of SUI was 10.3% in women who had a vaginal delivery, 12% in women who had a cesarean section due to obstructive vaginal delivery, and 3.4% in women who had an elective cesarean section. Viktrup<sup>15</sup> evaluated the relationship between the incidence of UI during pregnancy/ puerperium and the future development of SUI. At 5 years, women who were continent during pregnancy and immediately afterward had a 19% rate of SUI, those

**Table 1.** Risk Factors for Urinary Incontinence in Women

Age*
Pregnancy*
Childbirth*
Menopause
Hysterectomy
Obesity
Lower urinary tract symptoms
Functional impairment
Cognitive impairment
Occupational risks
Family history and genetics

Data from Koelbl H, Mostwin J, Boiteux JP, et al. Pathophysiology. In: Abrams PC, Khoury S, Wein A, editors. *Incontinence: 2nd International Consultation on Incontinence*. Plymouth (UK): Health Publication Ltd.; 2002:203–41.

\*Major risk factors for stress urinary incontinence.

who were incontinent during pregnancy/puerperium but were continent 3 months after childbirth had a 42% rate of SUI, and women who were incontinent during pregnancy/puerperium and 3 months following childbirth had a 92% rate of SUI. The overall prevalence of SUI symptoms in this study population 5 years after childbirth was 30%.

Studies have shown that obesity is also a factor in the development of UI, including SUI.<sup>16–18</sup> Brown et al<sup>18</sup> found that the prevalence of at least weekly SUI increased 10% per 5-unit increase in BMI. Obesity can cause chronic strain and stretching and weakening of the muscles, nerves, and other structures of the pelvic floor.

- **What is the work-up for a patient with suspected SUI?**

**EVALUATION**

Initial assessment for SUI should include a comprehensive history and physical examination and urinalysis. In addition, voiding diaries can be kept for 1 to 2 days. A pad test and a urodynamic study may also need to be performed.

**History**

The type of incontinence should be narrowed down by asking focused questions regarding when the leakage occurs. SUI may be suspected if UI is caused by activities such as coughing, sneezing, or jumping. A

sudden urge to urinate around the time of the leakage may point to UUI. If both of these circumstances seem to elicit leakage, MUI should be suspected.

The severity of incontinence can be assessed by asking the patient what causes the leakage, how many pads are used per day, and if the pads are damp, wet, or soaked each time. The patient's quality of life should also be assessed by asking how the incontinence has impacted her life and if there are activities that she avoids because of UI.

The physician should elicit other risk factors and comorbidities that may contribute to the presence of SUI (eg, pelvic surgery, prior anti-incontinence surgery, neurologic disease). Questions regarding symptoms of pelvic organ prolapse should also be asked (eg, dragging sensation in the vaginal area, difficulty with urination/defecation), as this may coexist with SUI in up to 63% of women.<sup>19</sup> Pelvic organ prolapse is a weakness and descent of the anterior, apical, or posterior pelvic wall. This is more commonly called a cystocele, enterocele, rectocele, or vault prolapse.

### **Physical Examination**

The physical examination should focus on key areas and begin with the patient's bladder comfortably full. The patient should be asked to strain or cough before emptying her bladder to see if SUI can be visualized. The abdominal examination should be performed after voiding to ensure the bladder is not palpable. A pelvic and perineal examination is very important. Sensation of the legs, thighs, and perineum and strength of the legs and thighs should be evaluated, the presence of pelvic organ prolapse should be noted (requires that the patient perform a Valsalva maneuver), the level of estrogenization (ie, thickness, color, texture) of the tissues should be examined, and anal/pelvic floor tone should be tested with a rectal and bimanual examination.

### **Tests and Procedures**

Urinalysis should be performed in all patients; if positive, urine culture should also be performed. Assessment of bladder emptying is also important and may be accomplished via ultrasonography or with a clean catheter placed after voiding. A voiding diary may also prove invaluable in the assessment of SUI. Many types of voiding diaries are available, ranging in duration from 1 to 14 days. Generally, a 1- to 2-day diary is sufficient in clinical practice; longer voiding diaries are necessary for clinical studies.<sup>20</sup>

A weighed pad test is an optional diagnostic tool. The test may be short (1 hour) or up to 24 hours. The pad is weighed first dry and, after a set amount of activ-

ity and time, is reweighed to measure the difference. References exist for fluid weight depending on the duration of the pad test.

Other tests, such as renal function assessment, urinary tract imaging, and cystoscopy, are recommended on an individual basis depending on the patient's history and results of the physical examination.

### **Urodynamic Evaluation**

Urodynamic evaluation is recommended for patients with neurogenic bladders or complicated incontinence as well as prior to invasive treatments and after treatment failures. Urodynamic testing may play a more important role in patients with SUI. For example, the presence of detrusor instability during cystometrography will help tailor therapy for SUI. In addition, leak point pressure (LLP) has been shown to correlate with SUI. When the abdominal LLP is less than 60 cm H<sub>2</sub>O, there is a high correlation with videourodynamically defined type III SUI. The abdominal LLP, or Valsalva LLP (VLLP), appears to be a reliable index of sphincteric function.<sup>21</sup>

### **CASE 1 RESOLUTION**

A comprehensive history and physical examination reveal a woman with typical clinical symptoms of SUI who is obese and has had 3 vaginal births and a prior hysterectomy. Urinalysis is negative, and postvoid residual volume is 10 mL. The patient reports that she has gained 30 lb over the past 3 years and that prior to her weight gain she had no urinary leakage symptoms. The urologist discusses options for addressing the patient's UI, including nonpharmacologic and pharmacologic interventions. The patient opts to be seen again in 6 months after a trial of nonpharmacologic treatment. She is advised to attempt a 15- to 20-lb weight loss through diet and exercise and to perform pelvic floor exercises. Before leaving the office, a nurse provides verbal and written instruction on how to perform Kegel exercises and refers the patient to a helpful Web site for further information.

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## **NONSURGICAL MANAGEMENT**

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### **CASE 2 PRESENTATION**

A 56-year-old woman with a history of 2 uncomplicated vaginal deliveries states that she leaks urine per urethra with activity and occasionally at night or while resting. Currently, she is using 6 pads per day. Her BMI is 32 kg/m<sup>2</sup>. The patient has read about Kegel exercises and wants to know about nonsurgical treatment for her incontinence.

- **What are the nonsurgical management options for a patient with SUI?**

### **CONSERVATIVE THERAPY**

The list of potential conservative treatments to help patients with SUI is extensive. However, a careful examination of this list reveals that only certain interventions offer the patient a proven benefit.

#### **Weight Loss**

As previously noted, several studies have shown an association between obesity and development of UI. A study examining women who had lost weight as a result of bariatric surgery found that there was a significant decrease in both subjective and objective SUI and UUI.<sup>22</sup> Another study found the prevalence of SUI was reduced from 61% to 12% after bariatric surgery.<sup>2</sup>

#### **Fluid Intake and Voiding Habits**

The association between fluid intake and UI seems evident, but the number of patients who do not realize that drinking copious amounts of water will directly influence their voiding habits is impressive. Trials have demonstrated that an increase in fluid intake will increase the number of incontinence episodes.<sup>23</sup> Thus, decreasing fluid intake is a reasonable first suggestion for patients with high fluid consumption. In addition, voiding prior to strenuous activity may dramatically help women with mild SUI; however, it is unlikely to significantly improve symptoms of ISD.

#### **Pelvic Floor Exercises**

Kegel<sup>24</sup> first described pelvic floor muscle (PFM) exercises in 1948 for female UI and reported success rates of more than 80%. Others have not matched Kegel's success rate but have shown that PFM exercise is more effective for symptom control than no treatment in SUI.<sup>25–27</sup> Fantl et al<sup>28</sup> studied the effect of PFM exercise in a population of women with both UUI and SUI. Patients showed a 57% decrease in incontinence episodes and a 54% decrease in quantity of leakage after 6 weeks of therapy.

Not all women know how to do a PFM contraction properly. In fact, more than 30% of women are unable to contract their PFM at initial examination.<sup>29–31</sup> Many women strain abdominally instead of squeezing and lifting, which may unintentionally worsen their symptoms. Several groups have shown that the most effective program of PFM exercises is instructor-based rather than self-instruction.<sup>27,32</sup> In 1 study, 60% of patients in the exercise-intense PFM training group reported to be continent or to have improved continence compared

with 17% in a less intense exercise program.<sup>27</sup> Both groups received initial instruction and were told to practice 3 times daily for 8 to 12 contractions, but the exercise-intense group also had weekly PFM classes.

The use of biofeedback, vaginal cones, and electrical stimulation has been explored to improve success rates with PFM exercises. To date, most studies show no improvement in using these modalities over simple PFM exercise; however, these training aids may help women learn how to properly perform PFM exercises.<sup>33</sup>

### **MEDICAL THERAPY**

#### **Estrogen Therapy**

Estrogen has trophic effects on the urethral epithelium, subepithelial vascular plexus, and connective tissue,<sup>34</sup> suggesting that estrogen therapy may be useful in the treatment of SUI, although this has not been clinically proven. Fantl et al<sup>35</sup> reviewed 23 articles and found that patients had subjective improvement with estrogen therapy, but there was no objective evidence of decreased SUI. A second review examined the effects of estrogens with or without progesterone in SUI patients and found only 1 nonrandomized study that showed improvement in SUI symptoms with estrogen therapy.<sup>36</sup> Considering the lack of favorable evidence and the recent literature regarding the cardiovascular and breast cancer risks associated with estrogen/progestin replacement, estrogen therapy is not recommended for treatment of SUI.<sup>37,38</sup>

#### **$\alpha$ -Adrenoceptor Agonists**

$\alpha$ -Adrenoceptor agonists, such as ephedrine, pseudoephedrine, and phenylpropanolamine (PPA), are used in the treatment SUI to increase urethral smooth muscle contractility. PPA was the most studied  $\alpha$ -adrenoceptor agonist but was removed from the market due to evidence supporting an increased risk of hemorrhagic stroke in women.<sup>39,40</sup> Although the use of  $\alpha$ -adrenoceptor agonists has been popular, no long-term data support their use. Selective  $\alpha_1$ -agonists have been explored (ie, midodrine and methoxamine) but have failed to show a significant improvement in the urodynamic findings in women with SUI.<sup>41,42</sup>

#### **Tricyclic Antidepressants**

Imipramine, a tricyclic antidepressant (TCA), has been used to treat women with SUI. By inhibiting the reuptake of norepinephrine and serotonin in the adrenergic nerve endings, imipramine is believed to enhance the contractile effects of the urethral striated muscle as well as the PFM.<sup>43</sup> Two nonrandomized studies evaluated the effect of 75 mg/day of imipramine in

women with SUI; 21 of 30 women (70%) in 1 study subjectively improved on imipramine therapy,<sup>44</sup> and 24 of 40 women (60%) in the second study had objective signs of improvement after 3 months of imipramine.<sup>45</sup> TCAs block the muscarinic receptors and frequently cause dry mouth, blurred vision, constipation, urinary retention, and orthostatic hypotension. TCAs also block histamine<sub>1</sub> receptors, causing drowsiness and sedation and possibly causing heart rhythm abnormalities and a decrease in the force of contraction. The significant side effect profile and lack of randomized or long-term evidence of efficacy limit the use of TCAs in the treatment of SUI.

### **Duloxetine**

Duloxetine is a norepinephrine and serotonin reuptake inhibitor that increases norepinephrine and serotonin activity in Onuf's nucleus within the sacral spinal cord. The net effect is an increase in urethral sphincter activity and possibly PFM activity, thus increasing urethral closure pressure. Duloxetine is still investigational, but phase III studies appear promising. One study evaluated 683 North American women (aged 22–84 years) with at least 7 weekly incontinence episodes who received either 80 mg/day of duloxetine or placebo for 12 weeks.<sup>46</sup> Incontinence episodes decreased by 50% in the duloxetine group versus 27% for the placebo group, and patients with more severe SUI seemed to improve more. At the end of the study, 10.5% of the duloxetine group and 5.9% of the placebo group were continent. A similar study performed in Canada and Europe involving 494 women with SUI also showed a 50% decrease in incontinence episodes.<sup>47</sup> Both studies had a high placebo response, which is not uncommon in SUI studies. Side effects of duloxetine appear to be minimal, with nausea occurring in 8% of patients.<sup>46,47</sup> Currently, the U.S. Food and Drug Administration (FDA) is examining duloxetine for approval for the treatment of SUI.

### **DEVICES FOR INCONTINENCE**

Various devices exist to help improve continence in women with SUI. Often, these are considered when conservative treatment has failed, when surgery is not an option, or in patients unwilling to undergo surgical management.<sup>48</sup>

Pads, diapers, and incontinence pants do not improve continence. Further, they are expensive, cumbersome, and associated with a decreased quality of life.

Urethral meatal devices and stents work by creating a dam to prevent urinary leakage. Three meatal devices have been developed and are effective for mild to mod-

erate SUI. These devices are cumbersome for patients and are not effective for severe SUI. Urethral stents passively occlude or coapt the urethra. Efficacy of urethral meatal devices and urethral stents has not been proven in clinical trials. They are only used for pure SUI, as they may exacerbate UUI or overactive bladder.

Vaginal support devices and pessaries require appropriate fitting and follow-up. In addition, they must be removed prior to intercourse. The devices do not work well with ISD, as they support the bladder neck and not the urethra. No vaginal support devices have been directly compared with other treatment options for incontinence.

### **CASE 2 RESOLUTION**

The patient decreases her fluid intake from 3 L to 2 L per day, begins an exercise program, and starts biofeedback sessions with a nurse to learn how to do PFM exercises properly, with periodic refresher lessons. Over the following year, she loses 30 lb and performs PFM exercises 3 times daily. During this time, her SUI symptoms decrease and she has leakage only with heavy exertional activities. She finds that if she voids prior to these events, she has less leakage. She wears a light pad daily and is satisfied with the management strategies for her condition.

At 2-year follow-up, the patient reports that she no longer has SUI, but she periodically has a severe urge to urinate and is barely able to get to the bathroom in time. An anticholinergic medication is prescribed and resolves her urge problem.

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## **SURGICAL MANAGEMENT**

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### **CASE 3 PRESENTATION**

A 50-year-old woman (gravida 3, para 3) is referred to the urologist with complaints of SUI. The patient has leakage with any activity and denies leakage at night or any UUI symptoms. She was previously treated by her family physician and per his instructions has lost weight; her current BMI is 27 kg/m<sup>2</sup>. She also has performed Kegel exercises for more than a year on a regular basis and has completed an experimental drug trial for SUI. None of these measures has significantly improved her SUI symptoms.

- **What surgical options are available for patients with SUI?**

Surgical options for SUI fall into 3 main categories: urethral bulking, colposuspension, and suburethral sling procedures (**Table 2**).

**Table 2.** Surgical Options for Stress Urinary Incontinence

Procedure	Goal
Urethral bulking agents (eg, collagen, carbon, silicone)	Injection of bulking agents into the periurethral tissue to increase urinary outlet resistance
Colposuspension (eg, Burch, Marshall-Marchetti-Krantz)	Elevate and stabilize urethra and bladder neck
Suburethral sling (eg, fascial, tension-free vaginal tape)	Urethral and bladder neck stabilization and support

**URETHRAL BULKING AGENTS**

The ideal bulking agent is a nonimmunogenic, non-migrating, biocompatible compound with favorable characteristics for injection. No agent currently exists that satisfies all of these characteristics; thus, physicians should be familiar with the agent or agents used at their institution and take into consideration individual patient factors. Many urethral bulking agents have been used to treat SUI in women, including both nonautologous and autologous agents (Table 3).

Urethral bulking agents are injected under local anesthesia, via a retrograde or an antegrade fashion, into the periurethral tissue around the bladder neck and proximal urethra. The agent can be injected transurethraly (through the cystoscope) or periurethrally (via a needle inserted in the urethral meatus; Figure 2).<sup>49</sup>

The most-studied agent used in urethral bulking is collagen. In studies with at least a 1-year follow-up, the reported cure or improvement rates range from 26% to 95%.<sup>50</sup> However, these results are difficult to evaluate because “cure” and “improvement” have been variably defined. Another complicating factor is a 22% reinjection rate over 2 years in patients with initial success.<sup>51</sup> One study demonstrated that of women who require repeat injections, only 40% will regain initial treatment success.<sup>52</sup> Up to 4% of woman have an allergy to the compound, and patients should have a collagen skin test prior to collagen injection therapy for SUI.<sup>53</sup> Otherwise, there are no contraindications to the use of collagen injections. De novo urgency (13%) and urinary retention (2%) are the most common complications and tend to resolve without intervention.<sup>54</sup>

Carbon injection (ie, Durasphere) is approved by the FDA for use in the treatment of SUI. Carbon has been compared with bovine collagen and in 1 study showed a similar decrease in pad weight at 1 year.<sup>55</sup> In addition, the mean number of injections per group was similar, but the carbon group used a smaller volume of injectable material. An advantage of using carbon is that it does not require a preinjection skin test, but it does require a larger needle to inject as compared with collagen (18 gauge versus 21 gauge).<sup>50</sup>

**Table 3.** Urethral Bulking Agents

**Nonautologous agents**

- Bovine cross-linked collagen (Contigen; Bard, Covington, GA)
- Pyrolytic carbon-coated zirconium beads (Durasphere; Boston Scientific, Natick, MA)
- Silicone polymers (Macroplastique\*; Uroplasty, Inc., Geleen, The Netherlands)
- Polytetrafluoroethylene (polytef\*)

**Autologous agents**

- Autologous blood
- Autologous fat

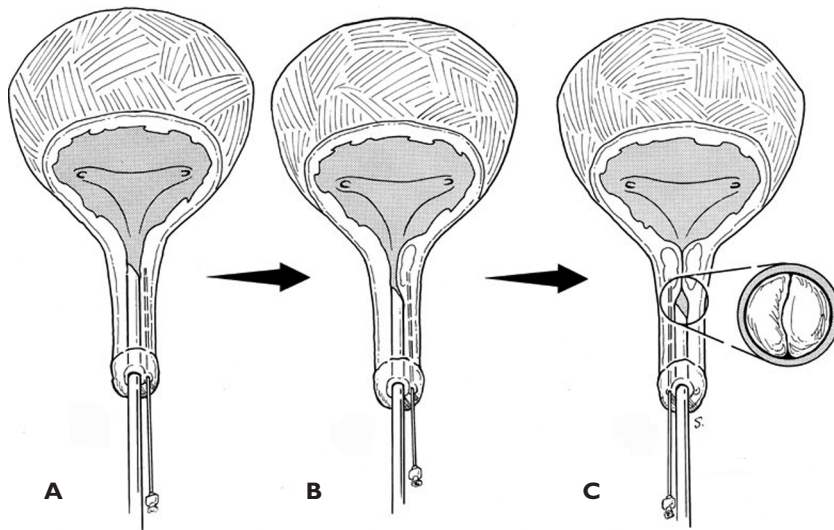
\*Not approved for use in the United States.

Although not approved for use in the United States, Macroplastique (Uroplasty, Inc., Geleen, The Netherlands) is available in Europe and Canada. Results seem promising, with 68% to 75% of females with SUI experiencing continence at approximately 6 months.<sup>50,56–58</sup> Longer-term follow-up data are variable. One study shows that efficacy is maintained to a median of 31 months,<sup>59</sup> while other studies show a decrease in efficacy over time.<sup>57,58</sup>

Overall, urethral bulking agents offer an alternative to more invasive surgical options. Long-term data indicate declining efficacy over time and the need for repeat injections. Over the long term, performing repeated urethral injections can be more costly than a definitive surgical procedure, such as a fascial sling operation.<sup>60</sup> Urethral bulking agents are best suited for patients who have significant cardiac or respiratory comorbidities, making a more invasive surgery an unsuitable option, or for patients who have secondary SUI after multiple failed procedures.<sup>49</sup>

**COLPOSUSPENSION**

Colposuspension is best used in patients with evidence of urethral hypermobility but not ISD. As a general guideline, a suburethral sling is more appropriate



**Figure 2.** Periurethral injection therapy. (A) Needle insertion. (B) Needle positioned at posterior urethra near bladder neck. (C) Postinjection appearance. (Adapted from Appell RA. Injection therapy for urinary incontinence. In: Walsh PC, Retick AB, Vaughan ED, Wein AJ, editors. *Campbell's urology*. 8th ed. Philadelphia: Saunders; 2002:1177. Copyright 2002, with permission from Elsevier.)

for patients with ISD.<sup>61-63</sup> The 2 main types of colposuspension are the Marshall-Marchetti-Krantz (MMK) and the Burch procedures.

#### Marshall-Marchetti-Krantz Colposuspension

The MMK procedure was first described in 1949<sup>64</sup> and involves a suprapubic approach and placement of 3 sutures on each side of the bladder neck through the paraurethral fascia and anterior vaginal wall and then into the cartilaginous portion of the symphysis pubis. The major complication of this surgery is osteitis pubis (2.5% of patients).<sup>65</sup>

A review examining outcomes for patients undergoing MMK colposuspension for SUI showed subjective continence in 88.2% of 2460 patients and objective continence in 89.6% of 384 patients with 3- to 12-month follow-up.<sup>66</sup> Patients with no prior incontinence surgery tended to have better results. Long-term data show a decreasing continence rate following MMK colposuspension, from 77% at 1 year to 57% at 5 years and 28% at 10 years.<sup>67</sup> The cause of failure in the long-term data studies was not determined, but de novo UUI could play a role.

#### Burch Colposuspension

Initially described in 1961,<sup>68</sup> the Burch colposuspension is still considered one of the treatment standards for SUI surgery.<sup>49</sup> Although the procedure has been modified, generally 2 to 3 sutures are placed on each side of the bladder neck. The first suture is placed in the vaginal wall at the level of the bladder neck and is passed through Cooper's ligament. Subsequent sutures are placed proximal to the initial suture in a similar fashion. Once placed, the sutures are tied to suspend

the bladder neck, without kinking it closed. Postoperative complications include voiding dysfunction in 10.3% of patients, de novo detrusor instability in 17%, and genitourinary prolapse in 13.6% of patients.<sup>69</sup>

The Burch procedure produced subjective continence in 91% of more than 1300 patients with 3 to 72 months follow-up and objective continence in 84% of more than 1700 patients with 1 to 60 months follow-up.<sup>66</sup> As a group, patients had better results if the Burch procedure was their first anti-incontinence surgery and if they had no evidence of MUI. Two studies examining long-term data show durability of the Burch colposuspension, with success in 69% of patients at 7.6 and 13.8 years.<sup>70,71</sup> Studies comparing the Burch and MMK procedures for SUI do not show a significant difference in cure rate after 3 years.<sup>72,73</sup>

Burch colposuspension can also be performed laparoscopically and is viewed as less invasive than an open Burch procedure. Two analyses by Moehrer et al<sup>74,75</sup> revealed an 8% relative risk of failure with a laparoscopic versus open Burch repair, but this was not significantly different. There was no significant difference in de novo detrusor overactivity as well. A large multicenter trial is currently underway that may determine which technique produces better results.

#### SUBURETHRAL SLING

Suburethral sling procedures can be categorized into classic and tension-free vaginal tape (TVT) procedures. The classic sling procedure can be performed with autologous material (eg, rectus fascia, fascia lata) or nonautologous material (eg, cadaveric fascia, Mersilene [Ethicon, Piscataway, NJ], Gore-Tex [W.L. Gore, Flagstaff, AZ]).<sup>63</sup>

The classic sling procedure is advised for use in women with ISD or those who have failed previous anti-incontinence surgery. The classic sling involves placement of the sling material at the level of the bladder neck, using a combined suprapubic and vaginal approach; the suprapubic incision may be minimal depending upon where the fascia is harvested. The TVT procedure requires placement of the woven Prolene (Ethicon, Piscataway, NJ) mesh at the mid-urethra. This surgery is performed with only a vaginal incision, although suprapubic punctures are necessary for tape placement.<sup>63</sup>

Jarvis<sup>66</sup> reported an 82.4% subjective cure rate and an 85.3% objective cure rate with classic sling procedures. When the suburethral sling was the primary procedure, results improved to 93.9%. In a review of the literature, Leach and colleagues<sup>61</sup> reported that 83% of patients were cured or dry, and 87% were cured, dry, or showed improvement with at least 48 months follow-up. Long-term data show success is persistent at 88% or better at 48 months. De novo urgency occurred in 7% of women, and questionnaires showed a 92% overall satisfaction with the procedure results.<sup>61</sup> Autologous material tends to be associated with a higher cure rate and fewer complications than synthetic material.<sup>76</sup> Synthetic materials (eg, silicone) are associated with a 71% risk of erosion and sinus formation.<sup>77</sup>

The use of TVT was originally described in 1996 by Ulmsten and colleagues.<sup>78</sup> The longest follow-up data are reported at 55 months, with 78.9% of 55 patients with genuine SUI still dry.<sup>79</sup> Other studies have reported cure rates of 61% to 90%.<sup>80–83</sup> The most common complication of the TVT procedure is bladder perforation (9%).<sup>81</sup> Other postoperative complications include voiding difficulties in 3% to 5% of patients, urinary tract infections in 6% to 22% of patients, and de novo detrusor overactivity in 3% to 9% of patients.<sup>81–85</sup>

### **CASE 3 RESOLUTION**

Physical examination reveals no evidence of pelvic organ prolapse. The patient undergoes urodynamic testing, which shows no evidence of detrusor instability. Her VLPP is 46 cm H<sub>2</sub>O at 200 mL. After informed consent, the patient undergoes a TVT procedure without complications.

- **If this patient had evidence of anterior vaginal wall prolapse (cystocele), how should she be managed?**

### **SURGICAL MANAGEMENT OF SUI AND PELVIC ORGAN PROLAPSE**

There has been debate about the treatment of occult

SUI and pelvic organ prolapse (cystocele). Occult SUI is revealed when a cystocele is temporarily corrected with a finger or sponge stick and urodynamic study demonstrates SUI that was not seen on previous evaluation.

Several studies have examined the safety of using TVT for genuine SUI at the time of vaginal repairs. In one study, 91% of patients were dry at 1 year, with de novo detrusor instability developing in 1 of 55 patients.<sup>86</sup> A second study demonstrated a 93% cure rate with no de novo detrusor instability.<sup>87</sup>

The use of TVT in cases of occult SUI and symptomatic pelvic organ prolapse has also been examined. Gordon et al<sup>88</sup> demonstrated no postoperative SUI at 14 months in 30 women with preoperative severe pelvic organ prolapse and occult SUI. Preoperatively, 9 patients had detrusor instability. This number decreased to 6 patients postoperatively, but there were 4 new cases of de novo detrusor instability after surgery (10 total cases). A second study examined 100 women with occult SUI and severe pelvic organ prolapse, all having a vaginal prolapse repair and TVT simultaneously.<sup>89</sup> At a mean of 27 months, 2 patients developed urodynamically proven SUI; 2 patients had vaginal erosion of the tape (treated with tape excision); 18 patients had preoperative UII, which was still present in 13 postoperatively; and de novo detrusor instability developed in 8 other patients. Both studies concluded that the use of TVT to treat occult SUI in conjunction with concurrent prolapse repair was promising.

Finally, in a study of 48 women (29 with proven SUI, 19 with occult SUI), all cases of SUI were diagnosed as hypermobility, and all patients had a cystocele.<sup>90</sup> All cystoceles were repaired with tension-free mesh, 26 patients underwent a TVT, and 22 had no anti-incontinence surgery. The decision to perform TVT in patients with occult SUI was a reflection of the surgeon's practice pattern, which was sequential but changed throughout the study period. In patients with preoperative SUI, postoperative SUI recurred in 1 of 15 in the TVT group and 5 of 14 in the group without TVT ( $P < 0.05$ ). Voiding dysfunction occurred in 2 of 15 patients who had TVT and 0 of 15 without TVT ( $P > 0.05$ ). In the preoperative occult SUI group, postoperative SUI was present in only 1 patient who did not have TVT ( $P > 0.05$ ). Voiding dysfunction occurred in only 3 of 11 TVT patients ( $P < 0.05$ ). This study demonstrated no benefit to TVT if preoperative occult SUI existed but a significant risk of voiding dysfunction in these patients. More studies are needed to address the issue of treating occult SUI at the same time as pelvic organ prolapse surgery.

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