

Evaluation and Treatment of Female Urinary Incontinence

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[AU: PLS NOTE DRUG BRAND NAMES HAVE BEEN DELETED THROUGHOUT PER JOURNAL STYLE.]

Urinary incontinence in women is a common problem and one that will increase in prevalence as the population ages. This condition can be categorized into three basic types: stress, urge, and mixed incontinence. Careful history taking and a comprehensive physical exam will provide the diagnosis in many cases. With the proper knowledge base, physicians can counsel their patients on the various forms of treatment for incontinence, which range from completely noninvasive behavioral therapies to surgical management. This article offers a basic guideline for the evaluation and treatment of female urinary incontinence. (Am J Med Sports. 2003;5:XXX-XXX.) ©2003 Le Jacq Communications, Inc.

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Female urinary incontinence is a common problem that affects not only the patient, but also her family and society at large. Due to the embarrassing nature of incontinence, it is both underreported and underdiagnosed. Fewer than half of the persons with urinary incontinence living in the community consult health care providers about the problem.¹ Family members who help care for these patients may find the extra burden of incontinence too great to deal with. It is widely accepted that incontinence is a major factor leading to institutionalization. It is also costly. Together, the diagnostic, treatment, routine care, and consequence costs of urinary incontinence in men and women totaled \$25.6 billion in 1995, with an additional \$704 million in lost earnings.²

Estimates of the prevalence of urinary incontinence vary depending on the type of research, the population under study, and the operational definition. One study³ reported a prevalence range of 3%–14% for women in the community when severity of urine loss was defined as “daily,” “weekly,” or “most of the time.” However, in another study involving 2763 postmenopausal women, 56% reported urinary incontinence at least weekly.⁴ Nonetheless, incontinence affects many women and the incidence is increased in those with the following risk factors: vaginal parity, morbid obesity, diabetes, advanced age, smoking, and estrogen depletion.

Research has shown that urinary incontinence and depression are linked,⁵ and successful treatment of incontinence is associated with improved psychological functioning and reduced depression.⁶ Urinary incontinence can also be the presenting symptom for other conditions as varied as multiple sclerosis and diabetes. A solid knowledge base of incontinence is helpful for any physician who treats adult women. This article offers a basic guideline in the evaluation and treatment of female urinary incontinence.

Types of Urinary Incontinence

Urinary incontinence can be categorized into six subtypes: stress incontinence, overactive bladder, mixed

incontinence, overflow incontinence, functional incontinence, and lack of continuity or deformity. Having these categories in mind during an initial evaluation can help guide an examiner toward the correct diagnosis. The majority of women will fall into one of the first three types.

STRESS INCONTINENCE. Stress incontinence is the involuntary loss of urine during an increase in intra-abdominal pressure caused by actions such as coughing, sneezing, laughing, or exercising. The putative mechanism, which leads to this loss of continence, is a lack of normal support beneath the urethra. Defects in fibromuscular support to the urethra cause an overabundance of intra-abdominal pressure (e.g., during coughing and sneezing) to be transmitted to the urethra thus resulting in urine loss. Parity is correlated with incontinence,⁷ and many believe that damage to the endopelvic fascia and nerve supply to the levator ani muscles during vaginal childbirth is at least partly responsible for this lack of normal support in many incontinent women.

Other factors also contribute to the development of this type of incontinence. In some women the severity of urine loss is out of proportion to the stress. In these patients advanced age, inadequate estrogen levels, and previous vaginal surgery can lead to poor urethral sphincter function known as intrinsic urethral sphincter deficiency. Patients with this subtype of stress incontinence lack not only support to the urethra, but intrinsic pressure within the urethra as well. It is diagnosed based on a combination of clinical symptoms and specialized tests such as urodynamics and cystourethroscopy.

OVERACTIVE BLADDER. Overactive bladder is a chronic and distressing medical condition characterized by urinary urgency and frequency.⁸ When urgency is coupled with an involuntary loss of urine, it is termed urge incontinence. Related terms such as detrusor instability and detrusor hyperreflexia are used to describe the presence of involuntary contractions seen during urodynamic studies. Detrusor instability is an idiopathic condition, whereas hyperreflexia is the result of a known neurologic lesion of the suprasacral cord and above (i.e., spinal cord injury and multiple sclerosis).

Because patients with urge incontinence are treated with the same medications as continent women who experience the urgency/frequency syndrome, the US Food and Drug Administration has adopted the term "overactive bladder" to pool these patients together for clinical trials. In this article, this term will be used in place of urge incontinence, detrusor instability, and detrusor hyperreflexia. In addition to neurological conditions, some patients with overactive bladder symptoms can suffer from specific lower urinary tract

conditions such as chronic and acute infections, as well as bladder cancer and stones. However, most patients who present with these symptoms have an idiopathic inability to suppress detrusor contractions.

MIXED INCONTINENCE. It can be helpful to think of urinary incontinence as a spectrum, with stress incontinence on one end and overactive bladder on the other. Many patients fall at each end of the spectrum with a distinct disorder, but others fall somewhere in the middle. These women are said to have mixed incontinence. In these cases, the goal of the physician is to quantify which type of incontinence is greater and treat accordingly. However, if the plan is surgery, it is best to confirm the diagnosis with urodynamic testing. This way, if the patient has overactive bladder symptoms postoperatively, one can be assured that the condition was pre-existing rather than de novo.

OVERFLOW INCONTINENCE. Overflow incontinence is any involuntary loss of urine associated with overdistention of the bladder. Overdistention is usually caused by outlet obstruction, an underactive detrusor muscle, or both. Although outlet obstruction is much more common in men, it can be seen in women with severe pelvic organ prolapse or prior anti-incontinence surgery. Weak detrusor contraction can be caused by psychotropic medications, diabetic neuropathy, multiple sclerosis, low spinal cord injury, and radical pelvic surgery. Patients with overflow incontinence fail to adequately empty their bladders, resulting in large postvoid residual volumes. They can present with symptoms ranging from frequent dribbling to chronic urinary tract infections.

FUNCTIONAL INCONTINENCE. Women with cognitive, psychological, or physical impairments that make it difficult to reach the toilet in time or engage in appropriate toileting are said to have functional incontinence. Many functionally impaired women can also have other forms of urinary incontinence; therefore this is a diagnosis of exclusion. An accurate pathophysiologic diagnosis is a prerequisite to successful treatment.⁹

LACK OF CONTINUITY OR DEFORMITY. Urinary fistulas, ectopic ureters, and urethral diverticulae represent the most rare form of urinary incontinence. What they share in common is an anatomic bypass of the normal continence mechanism. Fistulas and ectopic ureters present with constant dribbling. Fistulas most commonly form after extremely prolonged or traumatic childbirth or following complicated pelvic surgery. Urethral diverticulae present with either a painful, suburethral mass or postvoid dribbling upon arising from the commode.

Evaluation

One of the largest obstacles to making a diagnosis of urinary incontinence is a reluctance on the part of the physician to inquire about its symptoms. Simple questions during a routine annual exam such as, "Do you have problems with urine loss?" or "Do you leak urine?" can establish a need for further evaluation. If the patient answers in the affirmative, a follow-up visit to address this specific issue can be scheduled. In preparation for that visit, the patient should be instructed to complete a 24-hour bladder diary that will be reviewed at the subsequent appointment (Figure 1).

A preliminary diagnosis of urinary incontinence can be made the basis of a history **[AU: WORDS MISSING]** physical examination, and a few simple laboratory tests. All of these processes can be completed in one dedicated follow-up office visit, and initial therapy can be started based on the findings. If the condition is more complex or the initial therapy is unsuccessful, more specialized testing or referral to a specialist may be necessary.

HISTORY. A relatively small number of questions can be used to assess the severity of a patient's symptoms and to determine the most likely type of incontinence. A sample of these valuable questions is listed in Table I. The goal of these questions is to determine the events or sensations associated with each incontinent episode, as well as the frequency and volume of urine lost. Determining the compensatory measures thus taken, will also allow the physician to assess how substantially this condition has affected the patient's quality of life. These questions can also help diagnose more rare conditions such as interstitial cystitis and outlet obstruction.

The medical history should also identify such contributing factors as diabetes, stroke, lumbar disk disease, chronic lung disease, fecal impaction, and cognitive impairment. An obstetric and gynecology history is imperative and should include gravity; parity; the number of vaginal, instrument-assisted, and cesarean deliveries; the time between interval deliveries; sterilization procedures; previous abdominal/vaginal hysterectomy and indication; reconstructive vaginal or bladder surgery; pelvic radiation; trauma; and estrogen status.

Patients should also be questioned about pelvic organ prolapse symptomatology, as this is a common comorbidity. Factors that suggest a history of prolapse include dyspareunia, prior use of a pessary, and the sensation of vaginal pressure or fullness. Likewise, because fecal impaction has been linked to urinary incontinence,¹⁰ information regarding frequency of bowel movements, length of time to evacuate, and whether the patient must

TABLE I. Ten Important Questions in the Evaluation of Incontinent Patients

- 1) Do you leak urine with activities such as laughing, sneezing, coughing, and/or exercise?
- 2) Are there times when you have the urge to urinate but leak before you get to the bathroom?
- 3) Do you leak urine daily, weekly, monthly, or less than once a month?
- 4) When you leak would you characterize the loss as drops, small splashes, or more than small splashes?
- 5) Do you wear protective pads, and if so, how many per day?
- 6) How often do you get up at night to urinate?
- 7) How many times do you void during the course of the day?
- 8) Do you ever leak without a preceding urge or stress?
- 9) Do you ever feel that you do not completely empty your bladder?
- 10) Do you have bladder pain or pain with voiding?

splint her vagina or perineum during defecation should be obtained. Although it is beyond the scope of this article, patients should also be asked about fecal incontinence. In general, people are even more reluctant to discuss this than urinary incontinence, so direct questioning is necessary.

A number of pharmacologic agents that can affect continence are listed in Table II. It is important to obtain a complete list of all the prescription and non-prescription drugs a patient is taking because some of them may be exacerbating the problem. When appropriate, these medications should be stopped or changed to help manage the patient's incontinence.

BLADDER DIARY. A bladder diary is a 24-hour record of the type and amount of fluid consumed, the number and volume of voids and leaks in each hour, and what the patient was doing at the time of each leak. It serves as a diagnostic tool as well as a record of each patient's baseline condition.

Events associated with incontinent episodes can help guide the diagnosis (i.e., leaking while unlocking the front door suggests an overactive bladder). The document can also uncover problematic

TABLE II. Drugs That Affect Urinary Function

DRUG	SIDE-EFFECT
Alpha-adrenergic blockers	Decrease urethral tone
Alpha-adrenergic agonists	Increase urethral tone, urinary retention
Beta-adrenergic agonists	Inhibited detrusor function, urinary retention
Calcium channel blockers	Urinary retention
Antidepressants, antipsychotics	Urinary retention
Anticholinergics	Urinary retention
Narcotics	Urinary retention
Diuretics	Urinary frequency and urgency
Caffeine	Urinary frequency and urgency
Alcohol	Urinary frequency and urgency

Your Daily Bladder Diary								Your name:		
This diary will help you and your health care team understand your bladder function. It is a 24 hour record of your intake and output as well as leakage episodes. The "sample" line (below) will show you how to use the diary.										
Date:					ACCIDENTS					
Time	Drinks		Urine		Accidental Leaks			Strong urge to go?		What were you doing at the time?
	What kind?	How much?	How many times did you "pee"?	How much? Use measuring cup (ml's or oz's)	How much? (√) sm	med	lg	Circle one		
Sample	Coffee	2 cups	2	2 oz or 2 ml	√			Yes	No	Running
6-7 am								Yes	No	
7-8 am								Yes	No	
8-9 am								Yes	No	
9-10 am								Yes	No	
10-11 am								Yes	No	
11-12 noon								Yes	No	
12-1 pm								Yes	No	
1-2 pm								Yes	No	
2-3 pm								Yes	No	
3-4 pm								Yes	No	
4-5 pm								Yes	No	
5-6 pm								Yes	No	
6-7 pm								Yes	No	
7-8 pm								Yes	No	
8-9 pm								Yes	No	
9-10 pm								Yes	No	
10-11 pm								Yes	No	
11-12 mid								Yes	No	
12-1 am								Yes	No	
1-2 am								Yes	No	
2-3 am								Yes	No	
3-4 am								Yes	No	
4-5 am								Yes	No	
5-6 am								Yes	No	

Figure 1. Twenty-four hour bladder diary

types of intake. Excessive caffeine consumption, for example, can create or exacerbate overactive bladder symptoms, and drinking after dinnertime can lead to increased nocturia.

The bladder diary also serves as a good reference to gauge the success of whatever treatment has been instituted as time passes. Patients, who are discour-

aged because they still leak after taking a medication for three months, may be reassured when it is noted that their number of incontinent episodes has been decreased from six to two per day.

PHYSICAL EXAMINATION. When a patient is scheduled for an appointment she should be given or sent

a bladder diary (to be completed before the visit) and asked to arrive with a full bladder. When she arrives, a standing stress test should be conducted. In this test, a patient is asked to stand over an absorbent pad or towel with her feet shoulder-width apart and told to cough vigorously while the examiner watches for leakage of urine. This is an objective sign of stress incontinence. She may then use the lavatory with instructions to void as normally and completely as possible. Record this volume (using a graduated container placed under the seat of the commode), and then check a postvoid residual volume. The residual volume can be estimated with ultrasonography,¹¹ but catheterization is preferable when a specimen for culture and analysis is desired. Residual volume greater than 100 mL is considered abnormal and suggests the diagnosis of overflow incontinence.

A focused physical examination can then be performed. Pulmonary examination should rule out any possible cause of chronic cough. Cardiac and extremity examination should monitor evidence of daytime third spacing, which can lead to nighttime diuresis and nocturia. The abdomen should be checked for evidence of diastasis recti, masses, ascites, and organomegaly that can influence intra-abdominal pressure and urinary tract dysfunction.

The pelvic examination should include an evaluation for inflammation, infection, and atrophy. These conditions can increase afferent sensation and thereby urinary urgency, frequency, dysuria, and overactive bladder. Estrogen status should also be assessed. Signs of estrogen depletion include loss of rugae, atrophy of the labia minora, urethral caruncle, and thinning and paleness of the vaginal epithelium. Estrogen replacement therapy has been shown to improve subjective symptoms of stress incontinence¹² and objective urodynamic values.¹³

Defects in the support of the anterior vaginal wall can be detected by supporting the posterior vaginal wall with the disarticulated lower blade of a Sims speculum while instructing the patient to Valsalva. If the patient leaks in the dorsal lithotomy position soon after emptying her bladder while bearing down in this manner, this puts her at an increased risk for intrinsic sphincter deficiency, a severe form of stress incontinence.¹⁴ With the anterior vaginal wall exposed, the urethra should be examined for evidence of a diverticulum. Palpate from the bladder neck to the urethral meatus, feeling for any masses, and look for milking of purulent discharge from the meatus.

Finally, a bimanual exam should be performed. Levator ani muscle function can be assessed by asking the patient to tighten her “vaginal muscles” and hold the contraction for as long as possible (this motion is also known as a Kegel exercise). Evaluate the strength of the contraction by applying resistance in the direction of the posterior vaginal wall and noting the time it takes for the muscles to fatigue. Five to ten

seconds is a normal duration for a Kegel contraction. Bimanual examination should rule out any pelvic masses that may be putting extra pressure on the bladder. The sensitivity of this exam can be improved by performing a recto-vaginal examination. The rectal portion of this exam also allows the physician to detect fecal impaction and occult blood.

It is customary to include the Q-tip test, neurological exam, and basic cystometry as part of the routine evaluation of the incontinent woman. However, we believe the findings we gain from these evaluations almost never change the way we manage our patients, so we omitted them from this article. If, for example, we believe a patient will require surgery or if her presentation is so complex that cystometry is needed, we prefer to send her for multi-channel urodynamic testing rather than perform the more imprecise office cystometry.

Some conditions require further evaluation [AU: ON?] an outpatient basis. If a patient with dampness in her undergarments is unsure whether it is being caused by vaginal discharge or incontinence, she can undergo a phenazopyridine (Pyridium) test. This drug turns the patient’s urine bright orange but does not affect the color of vaginal discharge. She is asked to wear a pad after taking the medication. If she truly has urinary incontinence, her pad will be stained orange.

Treatment

As mentioned earlier, the vast majority of women with urinary incontinence suffer from stress incontinence, overactive bladder, or a combination of the two. Overflow incontinence is initially treated with intermittent self-catheterization, but ultimately the goal should be to treat the underlying etiology (e.g., tighter diabetes control). Likewise, therapy for functional incontinence is focused on the debilitating condition rather than incontinence per se. Solutions to these problems can be as simple as placing a commode at the bedside of a patient who has difficulty ambulating. Patients with a pelvic deformity or lack of continuity usually require surgery by a urogynecologist or a urologist. The remainder of this section will address the treatment of overactive bladder and stress and mixed incontinence.

TREATMENT FOR STRESS INCONTINENCE. The treatment of stress incontinence can be divided into the following four approaches: occlusive, behavioral, pharmacologic, and surgical. Some occlusive devices, like pessaries, can mimic the effects of incontinence surgery. Like retropubic urethropexies, the goal of the “incontinence dish” pessary is to maintain the urethrovesical junction in an intra-abdominal placement in the face of a cough or sneeze. The patient should be able to comfortably insert and remove the

nessary, and it should not cause voiding dysfunction. Other types of occlusive devices, such as urethral plugs and stents, have not been widely accepted for use. In fact, most have been removed from the marketplace as a result of poor response.

Behavioral techniques focus on rehabilitating the pelvic floor musculature. Patients work to strengthen their pelvic muscles by performing Kegel or pelvic muscle exercises (with or without biofeedback), using weighted vaginal cones, and undergoing pelvic floor electrical stimulation. There is some evidence that using biofeedback with pelvic muscle exercise significantly improves pelvic muscle electromyogram **[AU: PLEASE CONFIRM THAT ELECTROMYOGRAM IS THE CORRECT TERM HERE]** activity over exercise alone.¹⁵ Nonetheless, up to 38% of motivated patients who follow an exercise regimen for at least three months will experience a cure of pure stress incontinence.¹⁶

Vaginal cones work by fostering sustained increased vaginal muscle tone. The cones come in increasing weight gradations and are worn for fifteen minutes twice a day while the patient is ambulatory. In premenopausal women, success of home vaginal weight training is comparable to treatment in the office with a physiotherapist.¹⁷ Likewise, passive contraction of the pelvic floor with transvaginal electrical stimulation used twice daily for 12 weeks has been shown to improve objective signs of stress incontinence in 62% of subjects vs. 19% of controls.¹⁸ As these methods of therapy are predicated on the intent of returning strength to muscles that have become weak or damaged over time, they have limited use in patients who demonstrate excellent pelvic muscle strength on initial physical examination.

The benefits from medical therapy in the treatment of stress incontinence are limited. There are, however, two categories of drugs that are generally accepted as helpful in the treatment of stress incontinence: estrogens and α -adrenergic agonists. The bladder and urethra are responsive to estrogens, and in postmenopausal women, estrogen replacement therapy increases the vascular supply to the urethra leading to a thickening of the urethral mucosa.¹⁹ Studies report mixed results^{20,21} on the effect of estrogen over placebo on stress incontinence. Overall, however, estrogen is considered to be a good adjunct to other forms of therapy for female incontinence. Fear of systemic side-effects from estrogen should not prohibit patients from use of this hormone as low-dose forms can be given locally in the form of estradiol-impregnated vaginal ring or vaginal tablets.

Sustained-release phenylpropanolamine is the most studied α -adrenergic agonist. Its mechanism of action is believed to be an increase in resting urethral tone. Although some women have an improve-

ment in their symptoms, it is not a cure for stress incontinence, and the side effect profile is more extensive than estrogen. Patients can experience anxiety, insomnia, agitation, and cardiac arrhythmias.

The therapy that has proved to be the most successful in the treatment of stress incontinence is surgery. The gold standard of surgical treatment is retropubic urethropexy (e.g., the Burch and Marshall-Marchetti-Krantz procedures). For patients with intrinsic sphincter deficiency or prior failed urethropexies, treatment with a suburethral sling is appropriate. Together these types of surgeries have 80%–93% cure rates.²² Anterior colporrhaphy for the treatment of stress incontinence is no longer considered to be within the standard of care.

Some new, minimally invasive suburethral sling procedures are now being widely used as first line surgical therapy for patients with or without intrinsic sphincter deficiency. The tension-free vaginal tape sling procedure has less postoperative morbidity than traditional slings, while still achieving long-term (5 year) cure rates greater than 86%.²³ A similar, new minimally invasive sling, the SPARK device **[AU: PLS PROVIDE MANUFACTURER INFO]** shows great promise, but comparable long-term cure data are not available at this time. These procedures are typically done in the operating room on an outpatient basis under local anesthesia with mild intravenous sedation.

Another minimally invasive procedure for the treatment of stress incontinence is the periurethral injection of bulking agents. This procedure can be done in the office with local anesthesia in women who have a weakened sphincteric mechanism. It involves injection of material just under the urothelium at the level of the bladder neck. The injection can be performed using either a periurethral or transurethral approach. The two materials that have been labeled by the US Food and Drug Administration for treatment of stress incontinence are glutaraldehyde cross-linked bovine collagen (Contigen/Bard Collagen Implant, C.R. Bard, Inc., Covington, GA) and carbon-coated beads (Durasphere, Advanced Uroscience, Inc., St Paul, MN) (Figure 2). The most suitable patients for peri-urethral injection are elderly women, patients who constitute high operative risk, and those with stress incontinence due to intrinsic sphincter failure.²⁴

TREATMENT FOR OVERACTIVE BLADDER. In most patients, the first line of therapy for overactive bladder should be behavior modification. Initial steps include fluid management and altering the patient's diet. Patients should be told to only drink when thirsty and to avoid fluids after dinner if they have trouble with excessive nocturia. They may also benefit from avoiding spicy foods and acidic drinks that can irritate the bladder. Patients should limit their

demonstrated $\geq 50\%$ reduction in incontinence episodes after 6 months of treatment. Candidates for this therapy must have previously failed conservative management. They then keep bladder diaries before and after a staging procedure in which an electrode is connected to an external stimulator. If a candidate shows $\geq 50\%$ objective improvement (per diaries) in symptoms, a permanent stimulator can then be implanted subcutaneously.

TREATMENT FOR MIXED INCONTINENCE. Treatment of mixed incontinence should start with the treatment of a patient's most bothersome symptoms. If a patient suffers predominantly from overactive bladder, behavioral and/or pharmacologic therapy can be initiated. If this effectively controls her overactive symptoms, and her quality of life is not significantly affected by an occasional small leak with a cough or sneeze, she may waive any further treatment at that point. On the other hand, effective treatment of overactive bladder can sometimes result in an increase in average bladder capacity, which can subsequently lead to more voluminous stress incontinence episodes. In these situations the patient and physician must pursue further treatment of the stress incontinence.

When stress incontinence is the predominant complaint, initial conservative treatment is warranted. If, however, definitive surgical treatment is required, it is wise to perform urodynamic testing on patients with mixed symptoms preoperatively. This allows both patient and physician to understand the extent of any pre-existing detrusor instability. Its existence should not necessarily discourage one from proceeding with surgery. Our experience shows that approximately half of patients with mixed incontinence have an improvement in their overactive bladder symptoms following surgery for stress incontinence.

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