

MODULE 9: URINARY INCONTINENCE

KEYWORDS: PROSTATIC HYPERTROPHY, PROSTATIC HYPERPLASIA, PSA, VOIDING DYSFUNCTION, LOWER URINARY TRACT SYMPTOMS (LUTS).

Learning Objectives

At the end of this clerkship, the medical student will be able to...

1. Identify and name the major anatomic and histologic features of the bladder and urethra in the male and female
2. Define incontinence
3. List the symptoms and signs of the various types of incontinence; stress, urge, overflow and mixed
4. Describe the epidemiological features of incontinence
5. List the risk factors for incontinence
6. List the important components of the history when interviewing a patient with incontinence
7. List the important components of the physical exam of a patient with incontinence
8. Summarize the laboratory, radiologic, or urodynamic tests, if any, that should be ordered in a patient with incontinence
9. List the indications for treatment of incontinence
10. List the nonsurgical treatment options for stress and urge incontinence, describe their side effects, and outline the mechanisms by which they work
11. Briefly describe the surgical treatment options for stress and urge incontinence

Urinary Incontinence

Urinary incontinence is a significant problem, affecting tens of millions of Americans. Patients may not report incontinence to their primary care providers due to embarrassment or misconceptions regarding treatment. Since incontinence is often treatable, it is imperative the health care professional be adept at identifying patients who might benefit from treatment. Since the treatment of incontinence varies depending on the etiology, the aim of evaluation is to identify the specific type of incontinence.

Etiology

Urinary incontinence is generally the result of either bladder or urethral dysfunction (Table 1)

TABLE 1: Etiology Of Incontinence

Bladder Dysfunction

1. Urge Incontinence

Detrusor over activity:

- of nonneurogenic origin
- of neurogenic origin

Poor Compliance

2. Overflow Incontinence

Urethral Dysfunction

3. Stress Incontinence

- anatomic (due to mobility of the bladder neck)
- intrinsic sphincter deficiency (due to bladder neck dysfunction)

There are other commonly used classifications of incontinence.

TABLE 2: Transient Causes of Incontinence (*Diappers*)

CAUSE	COMMENT
Delirium	Incontinence may be secondary to delirium and will often stop when acute delirium resolves.
Infection	Symptomatic infection may increase urinary tract irritation and resulting incontinence.
Atrophic vaginitis	Vaginitis may result in the same symptoms of an infection.
Psychological	Depression may be occasionally associated with incontinence.
Excessive urine production	Excessive intake, diabetes, hypercalcemia, congestive heart failure and peripheral edema can all lead to polyuria, which can exacerbate incontinence.
Restricted mobility	Incontinence may be precipitated or aggravated if the patient is unable to toilet in a timely fashion.
Stool impaction	Patients with impacted stool can have urge or overflow urinary incontinence and may also have concomitant fecal incontinence.
Pharmacologic	
• Sedatives	Alcohol and long-acting benzodiazepines may cause confusion and secondary incontinence.
• Diuretics	A brisk diuresis may overwhelm the bladder's capacity and cause uninhibited detrusor contractions, resulting in urge incontinence.
• Anticholinergics	Many nonprescription and prescription medications have anticholinergic properties. Side effects of anticholinergics include urinary retention with associated frequency and overflow incontinence.
• alpha-adrenergics	Tone in the bladder neck and proximal sphincter is increased by alpha adrenergic agonists and can manifest with urinary retention, particularly in men with prostatism.
• alpha-antagonists	Tone in the smooth muscles of the bladder neck and proximal sphincter is decreased with alpha adrenergic antagonists. Women treated with these drugs for hypertension may develop or have an exacerbation of stress incontinence.

Incontinence may also occur due to a non-urologic cause which is usually reversible when the underlying problem is treated (Table 2).

More uncommon causes of incontinence include anatomic abnormalities such as urinary fistula or ectopic ureteral orifices.

Bladder Dysfunction

Bladder dysfunction, either related to storage or emptying, can provoke urgency or overflow incontinence. Urgency incontinence occurs when the bladder pressure is sufficient to overcome the sphincter mechanism which is fundamentally programmed to open during periods of elevated detrusor pressure which occurs with normal voiding. However, elevation in detrusor pressure may occur from intermittent abnormal bladder contractions (detrusor over activity) or due to an incremental rise in pressure with increased bladder volume (poor compliance). Detrusor over activity may be idiopathic or associated with a neurologic disease (detrusor over activity of neurogenic origin). Detrusor over activity is exceedingly common in the elderly and may be associated with bladder outlet obstruction. Poor bladder compliance results from loss of the viscoelastic features of the bladder or because of a change in neural-regulatory activity. Patients with urgency incontinence may appreciate a sudden sensation to void which is difficult to defer. In severe cases, the patient may not be aware of the sensation of needing to void until they are actually leaking. The amount of leakage in patients with urgency incontinence is variable, depending on the patient's ability to suppress the contraction and the strength of their outlet. Patients with urgency incontinence will often manifest frequency, nocturia, and occasionally nocturnal enuresis.

Overactive bladder has become the popularized term for describing patients with frequency and urgency with or without urgency incontinence.

Overflow incontinence occurs at extreme bladder volumes or when the bladder volume reaches the limit of the urethral mechanism or the bladder's viscoelastic properties. The loss of urine is driven by an elevation in detrusor pressure which overcomes the outlet resistance. Overflow incontinence is seen with incomplete bladder emptying caused either by obstruction or poor bladder contractility. Obstruction is rare in women but can result from severe pelvic prolapse or following surgery for stress incontinence. Patients with overflow incontinence will complain of constant dribbling and often describe extreme frequency.

Urethral Related Incontinence

Urethral related incontinence, or stress incontinence, occurs because of either urethral hypermobility or intrinsic sphincter deficiency (ISD) or a combination of both. The patient with stress incontinence will leak urine with any sudden increase in abdominal pressure. Incontinence associated with urethral hypermobility has been called anatomic incontinence, since the incontinence is due to malposition of the sphincter unit. Displacement of the proximal urethra below the level of the pelvic floor does not allow for the appropriate transmission of abdominal pressure that normally aids in closing the urethra. ISD refers to a dysfunction of the proximal smooth muscle sphincter at the bladder neck and is often correlated with more severe stress incontinence. The clinical utility of

these terms revolves around complex decisions for optimal treatment and quantification for research, however it is likely that patients who demonstrate stress leakage manifest a combination of pathologies.

Evaluation of urinary incontinence

The evaluation of the patient presenting with urinary incontinence includes a history and a physical, often combined with basic laboratory tests and possibly functional evaluation with urodynamic testing. The onset, frequency, severity and pattern of incontinence should be sought, as well as any associated symptoms such as frequency, dysuria, urgency or nocturia. Incontinence may be quantified by asking the patient if he or she wears a pad and how often the pad is changed. Obstructive symptoms, such as a feeling of incomplete emptying, hesitancy, straining or weak stream, may coexist with incontinence, particularly in males and in female patients with previous pelvic surgery, prolapse or poor detrusor contractility. Female patients should be asked about symptoms of pelvic prolapse, such as recurrent urinary tract infection, a sensation of vaginal fullness or pressure, or the observation of a bulge in the vagina. All incontinent patients should be asked about bowel function and neurologic symptoms. Response to previous treatments, including pharmaceutical agents, should be noted. Important features of the history include previous gynecologic or urologic procedures, neurologic problems and past medical problems. A list of the patient's current medications, including use of over-the-counter medications, should be obtained.

Although the history may define the patient's problem, it may also be misleading. Urgency incontinence may be triggered by activities such as coughing, so that according to the patient's history, he or she would suggest symptoms consistent with stress incontinence. A patient who complains only of urgency incontinence may often have comorbid stress incontinence, termed mixed incontinence. Mixed incontinence is very common, with at least 65% of patients with stress incontinence reporting associated urgency or urgency incontinence.

Complete physical examination is performed with emphasis on a neurologic assessment and the abdominal, pelvic and rectal examination. In females, the condition of the vaginal epithelium and the degree of urethral mobility is determined. Simple pelvic examination with the patient supine is sufficient to determine if the urethra moves with straining or coughing. In the patient with suspected stress incontinence urethral leakage with a cough or a stress maneuver must be demonstrated prior to invasive treatment. The presence of associated pelvic organ prolapse should be noted as it can contribute to the patient's voiding problems and may have an impact on diagnosis and treatment. A rectal exam in both males and females includes the evaluation of sphincter tone and perineal sensation. Urinalysis is performed to determine if there is any evidence of hematuria, pyuria, glucosuria, or proteinuria.

Evaluation of asymptomatic microscopic hematuria should follow AUA guideline: (<https://www.auanet.org/education/guidelines/asymptomatic-microhematuria.cfm>). The urine is cultured if there is pyuria or bacteriuria. Infection should be treated prior to further investigations or interventions.

A post void residual (PVR) is frequently useful to guide treatment and may be measured

either with bladder ultrasound or directly with a catheter. A normal PVR is less than 50 mL and a PVR in excess of 200 mL when associated with urinary symptoms should raise concern. A significant PVR urine may reflect either bladder outlet obstruction or poor bladder contractility. The only way to distinguish outlet obstruction from poor contractility is with functional urodynamic testing.

A voiding diary may be used to quantitate the amount of fluid taken in, the amount of urine per void, the number of voids and the number of incontinent episodes.

A pad weight test may be performed in select instances to quantitate the amount of incontinence, but is most often reserved for research endeavors.

Urodynamic testing is used to accurately diagnose the etiology of patient's incontinence, however current guidelines for both stress and urgency incontinence indicate many patients can be successfully treated without such functional testing. The purpose of urodynamic testing is to examine bladder compliance, detrusor overactivity, urethral function, and to rule out obstruction as a cause of either overflow or urgency incontinence. Urodynamics are often performed prior to invasive therapies and are indicated in patients undergoing repeat procedures following failed treatments.

For expanded information, refer to the AUA guidelines on urodynamics:

<https://www.auanet.org/education/guidelines/adult-urodynamics.cfm>

Recently, subspecialty certification has been offered specifically for Urologists interested in treating female urinary incontinence, prolapse, and general pelvic reconstructive surgeries. The American Board of Urology has developed a comprehensive program for fellowship training resulting in certification in Female Pelvic Medicine and Reconstructive Surgery (FPMRS) which provides consistent, high-level expertise in the diagnosis and management of incontinence and bladder dysfunction.

Treatment of Urinary Incontinence

Urgency Incontinence

The patient with urgency incontinence should be counseled that urine leakage occurs because their bladder contracts with little or no warning. First line treatment will involve behavioral measures such as timed voiding. Often, reminding patients to void every one to two hours during the day, before they get an urge to void, will result in significant reductions in leakage. Other behavioral interventions such as modification of fluid intake, avoidance of bladder irritants, or bladder retraining, where the patient attempts to consciously delay voiding and to increase the interval between voids, may also have a role in the treatment of urgency incontinence. Pelvic muscle exercises can be used to abort a detrusor contraction provided that the patient gets a warning of needing to void prior to the detrusor contraction starting.

Anticholinergic-antimuscarinics are the mainstay of medical therapy for urgency incontinence. The side effects of anticholinergics include urinary retention, dry mouth, constipation, nausea, blurred vision, tachycardia, drowsiness and confusion. They are

contraindicated in patients with narrow-angle glaucoma. Caution should be employed utilizing anticholinergic medications in the elderly, and agents that do not cross the blood-brain barrier, such as trospium, are often preferred to diminish adverse effect on cognition. Anticholinergic-antimuscarinics are also used to decrease bladder pressure in patients with poor compliance. Anticholinergic-antimuscarinics are combined with clean intermittent catheterization in patients who have a significant PVR prior to treatment, or in patients who develop retention while on anticholinergics.

Additional pharmaceutical options include beta 3 adrenergic receptor agonists, which promote detrusor relaxation during bladder filling and may reduce urgency incontinence without many of the adverse side effects of antimuscarinic agents.

Patients with intractable detrusor over activity may require surgical intervention, consisting of neuromodulation with a sacral nerve stimulator or various forms of bladder augmentation. Injection of the detrusor muscle with botulinum toxin (Botox) has also been successfully utilized for idiopathic, medication refractory OAB.

The primary goal in treating the patient with poor bladder compliance is to treat the high bladder pressure. Complete bladder emptying with clean intermittent catheterization combined with anticholinergics will often lower bladder pressure to a safe range. A combination of anticholinergic- antimuscarinics and alpha-agonists may be required in some patients and Botox may additionally be employed in these dysfunctional situations. Bladder augmentation is required when medical management fails.

For expanded information, refer to the AUA guidelines on overactive bladder:
<https://www.auanet.org/education/guidelines/overactive-bladder.cfm>

Overflow Incontinence

Overflow incontinence is treated by emptying the bladder. If the cause of overflow is obstruction, then relieving the obstruction should lead to improved emptying. Anatomic obstruction in males is from either urethral stricture disease or prostatic obstruction. Depending on the severity of urethral stricture disease the patient may require a urethral dilation, internal urethrotomy or an urethroplasty. Prostatic obstruction may be treated in a variety of ways but transurethral resection remains the "gold standard." If a woman is obstructed from previous surgery or from pelvic prolapse, she may benefit from an urethrolysis or surgical correction of the prolapse. Clean intermittent catheterization is an option in the obstructed patient who does not want or could not tolerate further surgery.

The patient with overflow incontinence secondary to poor detrusor contractility is best treated with clean intermittent catheterization.

Indwelling catheters are not an optimum long term treatment modality in the treatment of incontinence. All patients with indwelling catheters will have infected urine which predisposes them to bladder calculi and ultimately to squamous cell carcinoma of the bladder. Any foreign object in the bladder can cause or exacerbate elevated bladder pressure which then causes hydronephrosis, ureteral obstruction, renal stones and eventually renal failure.

Stress Incontinence

The amount of incontinence and how it affects the patient will often determine the aggressiveness of treatment. The patient who is severely restricted because of severe leakage with minimal movement may not want to try medical therapy but may opt for surgical treatment, whereas the patient who leaks small amounts infrequently may choose conservative treatment. Pelvic floor exercises can improve anatomic stress urinary incontinence by augmenting closure of the external urethral sphincter and by preventing descent and rotation of the bladder neck and urethra. To benefit from the exercises, women must be taught to do them properly and they must do them. Adjuncts to learning pelvic floor exercises include weighted vaginal cones, a perineometer or electrical stimulation.

Alpha-agonists such as pseudoephedrine (Sudafed) may be used for the treatment of stress incontinence. The bladder neck and proximal urethra have abundant alpha receptors. Activation of these receptors by alpha-agonists leads to an increase in smooth muscle tone. The usual dose is twice daily, but some women who are incontinent with exercise may benefit from taking an alpha-agonist one hour before exercise. Tricyclic antidepressants, such as imipramine (Tofranil), although not approved for incontinence, have both alpha-agonist and anticholinergic properties.

Pessaries that support the bladder neck can also provide relief to the patient with stress incontinence.

Surgical therapy for stress incontinence is indicated when a patient doesn't wish to pursue non-surgical therapy or if medical treatment has failed. The type of surgical therapy depends on the diagnosis. Patients who have anatomic stress incontinence can benefit from a variety of surgical repairs that restore the bladder neck to its normal retropubic position, retropubic bladder neck suspensions, or improve urethral support, sling procedures. Patients with intrinsic sphincter deficiency usually have a well-supported bladder neck. These patients require a procedure that will close or coapt the proximal urethra. Coaptation may be achieved with a variety of bulking agents that are injected into the bladder neck or proximal urethra.

A pubovaginal sling which is placed at the bladder neck is the ideal procedure for the patient with both intrinsic sphincter deficiency and anatomic stress incontinence, as a sling will coapt the proximal urethra and restore the bladder neck to its normal location.

Synthetic mid urethral slings are ideal for the patient with anatomic stress incontinence who is looking for a surgery with minimal recovery time. In randomized surgical trials for stress incontinence the TVT mid urethral sling has been shown to be comparable to a Burch colposuspension which is a retropubic suspension at 6, 12 and 24 months. Due to concerns of bladder, bowel or major vessel injury slings have been developed that are placed transversely underneath the mid urethra from one obturator foramina to the other. The advantage of this sling is that the retropubic space is avoided. These slings do have more groin issues with pain and or numbness at the site of the sling at the top of the leg. Infection, although exceedingly rare, may result in necrotizing fasciitis. A randomized surgical trial by the NIH comparing a TVT mid urethral sling to two different obturator slings, Monarc and TOT, showed that no procedure is superior to the other.

The newest synthetic slings are very small, approx. 4-6 cm, and therefore have none or less retropubic or obturator issues such as vessel injury or exit site pain. One year outcome data is promising but more work needs to be done to sort out which patients are best treated with these procedures.

For expanded information, refer to the AUA guidelines on stress urinary incontinence:
<https://www.auanet.org/education/guidelines/incontinence.cfm>

Male patients with stress incontinence can be treated with an artificial urinary sphincter or a variety of sling procedures. An artificial urinary sphincter provides continence because a cuff compresses the bulbar urethra. It is considered the gold standard treatment. Male slings provide compression under the urethra and elevate the urethra to a more retropubic position. Slings are best suited for men with lesser degrees of incontinence as determined by a pad weight test.

Mixed Incontinence

Stress and urge incontinence often coexist. Burgio et. al. have advocated pelvic muscle exercises with biofeedback for the treatment of stress and urge incontinence. Behavioral therapy can result in a reduction in incontinence episodes and a patient perceived improvement.

Approximately half of patients with combined incontinence (stress and urge) will be relieved of urge incontinence following a procedure for stress incontinence. Patients whose urge incontinence does not respond to anticholinergics preoperatively may have a good response to anticholinergics once their stress incontinence is treated.

Indications to Refer to Urology

The main indication to refer the patient with incontinence to urology is failure to respond to medical therapy. There is no reason that an internist or family doctor can't do a basic work-up (history, physical, urinalysis, +/- PVR) and consider medical therapy. If the patient fails to respond adequately to medical therapy then referral is warranted. The presence of hematuria, recurrent infections or complicated incontinence, such as following radical prostatectomy in a male, or that thought to be neurogenic, should always prompt a referral.

SUMMARY

Key Diagnostic Points

A. Urge Incontinence

a. Symptoms

- urgency
- frequency
- nocturia
- unable to reach the toilet with urge

B. Stress Incontinence

- a. Symptoms
 - leakage with physical activity
- b. Signs
 - bladder neck mobility
 - positive stress test

C. Mixed Incontinence

- a. Symptoms
 - urgency
 - frequency
 - nocturia
 - unable to reach the toilet with urge
 - leakage with physical activity
- b. Signs
 - bladder neck mobility
 - positive stress test

D. Overflow Incontinence

- a. Symptoms
 - urgency
 - frequency
 - nocturia
 - leakage with physical activity
- b. Signs
 - high post void residual

Key Treatment

A. Urge Incontinence

- a. Behavioural Changes
 - avoidance of bladder irritants
 - timed voiding
 - pelvic muscle exercises
 - weight loss
- b. Anticholinergics - Antimuscarinics - Nonselective for M3 Receptor
 - propantheline (Pro-Banthine)
 - 7.5 to 30 mg orally, three to five times daily
 - tolterodine (Detrol LA)
 - 4 mg orally daily
 - trospium (Sanctura)
 - 20 mg orally two times daily
 - solifenacin (Vesicare)
 - 5 - 10 mg orally, daily
- c. Anticholinergics - Antimuscarinics - Selective for M3 Receptor
 - darifenacin (Enablex)
 - 7.5 - 15 mg orally, daily
- d. Anticholinergics - Antimuscarinics/Smooth Muscle Relaxant
 - oxybutynin

- regular (Ditropan) 2.5 to 5 mg orally, one to three times daily
- extended release (Ditropan XL) 5 - 30 mg orally, daily
- transdermal (Oxytrol) 4.9 mg patch twice per week
- hyoscyamine (Levsin)
 - 0.125 to 0.375 mg orally, two to four times daily

B. Stress Incontinence

a. Behavioural Changes

- weight loss
- quitting smoking
- pelvic muscle exercises

b. Surgery

- anatomic
 - retropubic suspensions
 - Burch
 - Marshall Marchetti Krantz
 - slings
 - pubovaginal
 - midurethral
 - obturator
 - mini slings
- Intrinsic Sphincter Deficiency
 - slings
 - pubovaginal
 - midurethral
 - obturator
 - artificial sphincter
 - submucosal injections with bulking agents
 - collagen (contigen)
 - calcium hydroxyapatite (coapatite)
 - others

Overview of Treatments

A. Behavioural Changes

- a. avoidance of bladder irritants
- b. weight loss
- c. quitting smoking
- d. pelvic muscle exercises

B. Medical Therapy

- a. alpha agonists
 - stress incontinent patients
 - mixed incontinent patients
- b. anticholinergics-antimuscarinics
 - urge incontinent patients
- c. anticholinergics-alpha agonists
 - mixed incontinent patients

C. Surgical Therapy

- a. stress incontinent patients
- b. rare patients with urge incontinence

Table References

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