

PELVIC FLOOR DISORDERS

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Introductory Case

A 56-year-old G3P3003 presents to the office with concerns of urinary incontinence. She reports leakage of urine for the past 5 years with progressively worsening symptoms. She also complains of a 'bulge' and vaginal pressure after long periods of standing. Her history is notable for 3 prior term vaginal deliveries. She is postmenopausal since age 52 years old and has not been on hormonal replacement therapy. She is monogamous with her partner and is sexually active.

Milestone-Based Focused Questions

LEVEL 1: DEMONSTRATES BASIC KNOWLEDGE OF NORMAL PELVIC FLOOR ANATOMY

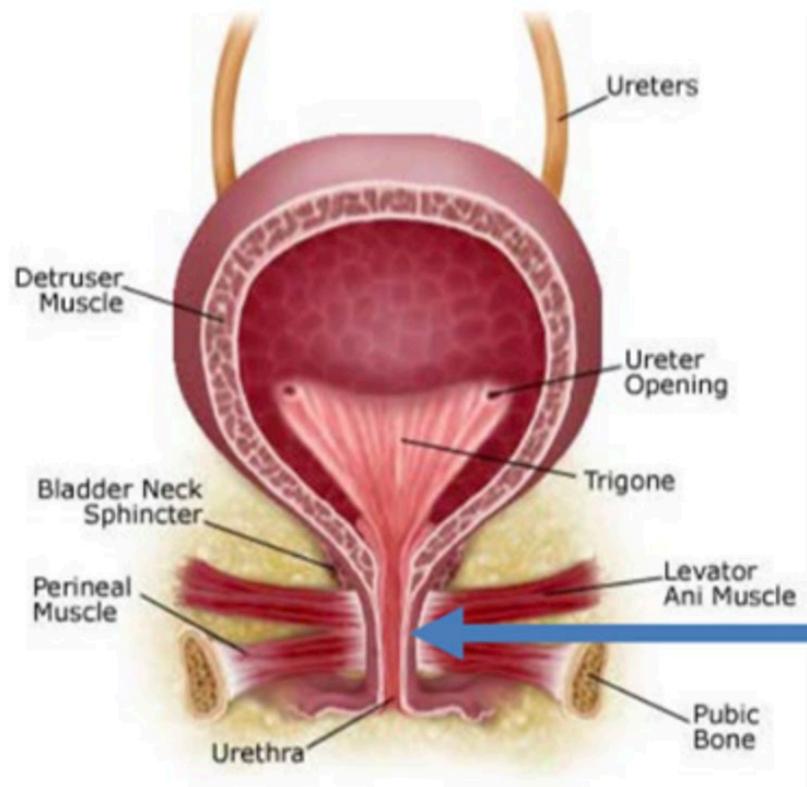


Figure from ACOG Simulation Curriculum: Retropubic Midurethral Sling: Evaluation, Indications, and Procedural Tips

The bladder is composed of multiple cellular layers. The mucosal layer is created by transitional epithelial cells. The contraction of the bladder is controlled by the detrusor muscles, which are composed of 3 smooth muscle layers. The detrusor muscles are innervated by parasympathetic and sympathetic branches with muscarinic and B-adrenergic receptors respectively. The urethral sphincter is composed of striated muscles and is innervated by the *somatic* nervous system, primarily the pudendal nerve.

LEVEL 2: DEMONSTRATES KNOWLEDGE OF BASIC PELVIC FLOOR PHYSIOLOGY AND FUNCTIONAL ANATOMY

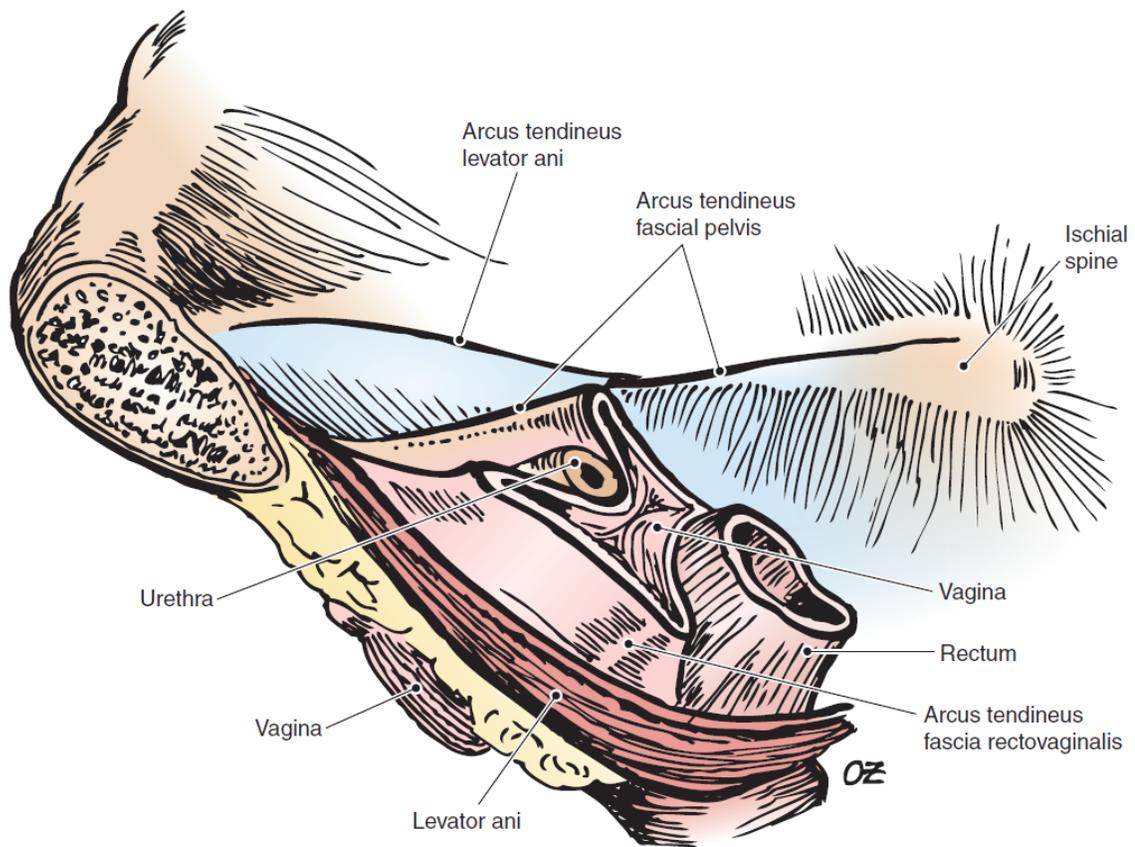


Figure by Dr. Oz Harmanli

Continence is defined as the ability to store urine until voluntary emptying the bladder. During the filling stage, the detrusor muscles of the bladder relax due to **sympathetic** nerve activation of B-adrenergic receptors at the dome of the bladder. At the same time, the striated urogenital sphincter muscles contract. During voiding, **parasympathetic** nerves activate muscarinic receptors to cause detrusor muscle contraction and the striated muscles of the urogenital sphincter relax to allow voiding to occur.

Normal pelvic floor anatomy is maintained by pelvic floor muscles, connective tissue and the vaginal wall. The *levator ani muscles* are the main pelvic floor muscles and are composed of striated muscles. These muscles can sustain injury during childbirth, which contributes to pelvic organ prolapse. Connective tissue within the pelvis also contributes to maintaining normal pelvic anatomy. The *arcus tendineus fasciae pelvis* provides lateral and apical suspension of the anterior vagina. The *uterosacral ligaments* provide apical support by suspending the uterus, cervix and upper vagina to the sacrum. The *cardinal ligaments*, formed by the condensation of connective tissue around the uterine vascular bundle, also attach to cervix and fan out laterally to suspend the apical vagina.

LEVEL 2: DEMONSTRATES BASIC UNDERSTANDING OF PATIENTS PRESENTING WITH PELVIC FLOOR DISORDERS AND IDENTIFIES RISK FACTORS, SYMPTOMS AND PHYSICAL EXAM FINDINGS. FORMULATES INITIAL DIFFERENTIAL DIAGNOSIS.

WHAT ARE THE MOST COMMON RISK FACTORS FOR PELVIC FLOOR DISORDERS?

Risk Factors for Pelvic Floor Disorder

Increasing age

Obesity

Parity

COPD, Chronic cough, smoking

WHAT ARE THE VARIOUS TYPES OF URINARY INCONTINENCE?

Stress urinary incontinence (SUI): urinary incontinence associated with laughing, coughing, sneezing, or with physical exertion (running, biking etc). Patients often report small, frequent losses of urine.

Urge urinary incontinence (UUI): urinary incontinence preceded by urge to urinate which is unable to be deferred. Patients often report higher volume of urinary loss.

Overactive bladder is an overarching syndrome which encompasses urge incontinence. Symptoms of urgency can present with or without incontinence, and patients usually experience increased frequency and nocturia.

Mixed urinary incontinence: urinary incontinence associated at times with urge and other times with physical exertion (stress).

Overflow urinary incontinence: urinary incontinence due to the inability of the bladder to empty voluntarily. The inability to effectively empty the bladder can occur at the level of the bladder or the urethra. An underactive bladder, which is usually associated with neurological disorders, can lead to ineffective emptying. At the level of the urethra, there can be kinking of the urethra due to advanced pelvic organ prolapse or iatrogenic obstruction of the urethra following a surgical intervention.

Functional urinary incontinence: urinary incontinence due to cognitive, functional, or mobility impairments.

WHAT DISORDERS CAN PRESENT AS URINARY INCONTINENCE?

DIAPPERS mnemonic:

Delirium

Infection (urinary tract infection)

Atrophic vaginitis

Pharmaceuticals (diuretics, calcium channel blockers, ACE inhibitors, opioids, muscle relaxers, antihistamines)

Psychological disorder

Excessive urine output (for example, hyperglycemia)

Reduced mobility

Stool impaction

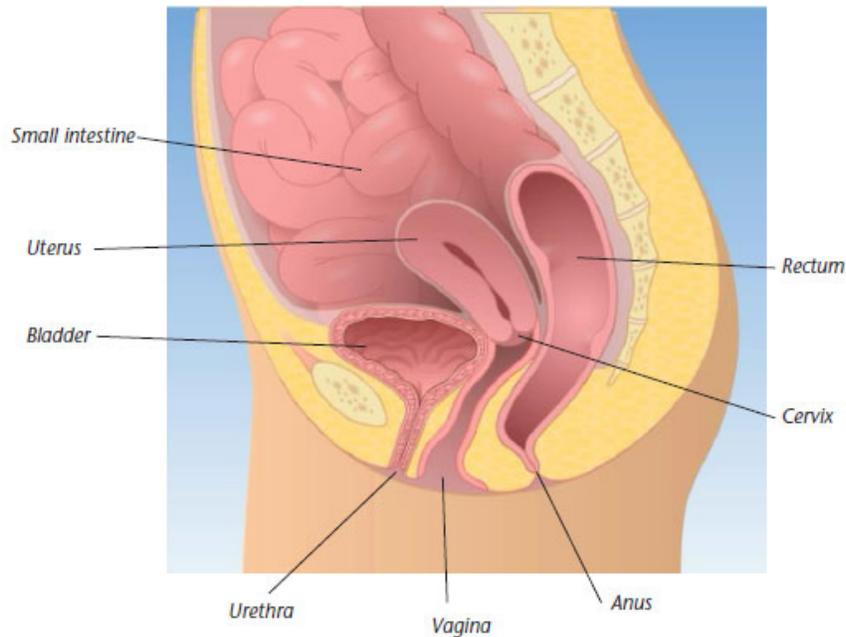


Figure from ACOG Patient Resources, Videos: Pelvic Organ Prolapse

WHAT IS PELVIC ORGAN PROLAPSE? WHAT ARE SOME COMMON SYMPTOMS REPORTED BY PATIENTS?

Pelvic organ prolapse (POP) is the descent of one or more aspects of the vagina and uterus including the anterior vaginal wall, posterior vaginal wall, uterus, or vaginal apex after hysterectomy. Most patients with POP are asymptomatic.

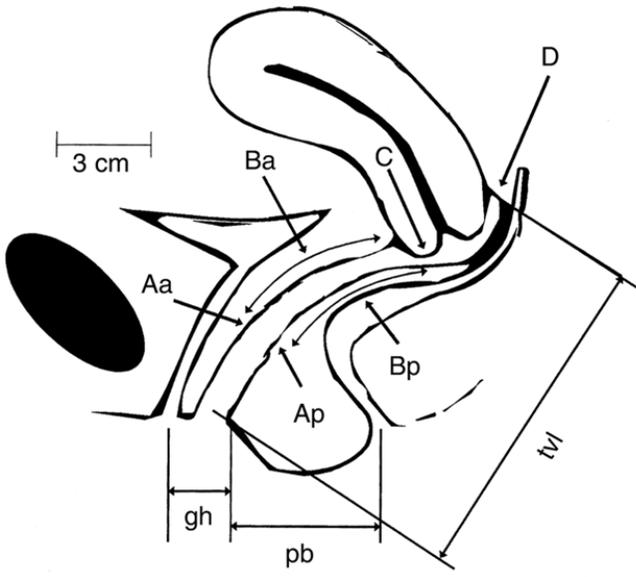
Commonly reported symptoms include: vaginal pressure, bulge sensation in the vagina, sexual dysfunction, and voiding or bowel dysfunction. Patients may also complain of incomplete emptying of bladder and/or bowels requiring ‘splinting’ to complete emptying.

WHAT IS THE INITIAL OUTPATIENT EVALUATION FOR PELVIC FLOOR DISORDERS?

- Screen for urinary tract infection (UTI) with urinalysis and reflexive urine culture as needed
- Record post void residual volume with either straight catheterization or bladder scan following a void in order to rule out urinary retention
- Perform simple cough stress test: during the pelvic exam, ask the patient to cough when her bladder feels full. If she has leakage of urine, it is considered a positive cough stress test. If the initial test is negative but the patient reports stress incontinence, have patient stand and cough. If this test is positive with a recently emptied bladder, it may be a sign of *intrinsic urethral sphincteric deficiency*.
- Perform pelvic exam:
 - Assess the degree of descent with reference to the hymenal ring in anterior, apical and posterior pelvic support compartments
 - If pelvic organ prolapse is present on exam, reduce the prolapse during exam and perform cough stress test to assess for occult SUI
 - Assess pelvic floor muscle strength by having the patient perform Kegel during exam and rate the strength of contraction

LEVEL 3: DEMONSTRATES KNOWLEDGE OF COMPLEX GYNECOLOGIC CONDITIONS, FORMULATES MANAGEMENT PLANS AND INITIATES TREATMENT

WHAT IS THE EXAMINATION FOR EVALUATING PELVIC ORGAN PROLAPSE?



Anterior wall Aa	Anterior wall Ba	Cervix or cuff C
Genital hiatus gh	Perineal body pb	Total vaginal length tvL
Posterior wall Ap	Posterior wall Bp	Posterior fornix D

Pelvic Organ Prolapse Quantification (POP-Q) System. Nine defined points measured in the midline and relative to the hymen assessed during maximal Valsalva except for TVL: Aa, 3 cm proximal to the external urethral meatus; Ba, most prolapsed portion of the anterior vaginal wall; C, leading edge of the cervix or vaginal cuff; gh, middle of the urethral meatus to the midline of the posterior hymen; pb, middle of the posterior hymen to the middle of the anal opening; tvl, maximum depth of the vagina with prolapse reduced; Ap, 3 cm proximal to the posterior hymen; Bp, most prolapsed portion of the posterior vaginal wall; D, posterior fornix in a woman who has a cervix. TVL= total vaginal length

Figure in ACOG Practice Bulletin 214: Pelvic Organ Prolapse, November 2019, adapted from Bump et al 1996.

POP-Q is used to quantify POP. Prolapse is measured relative to the hymenal ring. All points except for total vaginal length are measured with patient performing Valsalva maneuver.

POP-Q measurements

Anterior Wall Prolapse	
Aa	measures the point on anterior vaginal wall that is 3 cm proximal to external urethral meatus, which is the approximate location of the urethrovesical junction
Ba	measures the most protruding point of the anterior vaginal wall between Aa and the anterior vaginal fornix
Posterior Wall Prolapse	
Ap	measures the point of posterior vaginal wall 3 cm proximal to hymen, at the approximate location where perineal body ends
Bp	measures the most protruding portion of the posterior vaginal wall between Ap and posterior vaginal fornix
Apical Prolapse	
C	evaluates apical prolapse and the most protruding edge of cervix for women who have had a hysterectomy, it represents the most protruding point of the vaginal cuff
D	measures the distance from the most posterior fornix with relation to hymen. if cervix is absent, point D is omitted
Other measurements	
Gh	Genital hiatus (Gh) is the measurement from middle of urethra to mid-point of posterior hymen
Pb	measures from midline posterior hymen to mid-anal opening
Total vaginal length	measures the greatest vaginal length, which is evaluated after reducing the prolapse

The POP-Q can be used to quantify POP into stages.

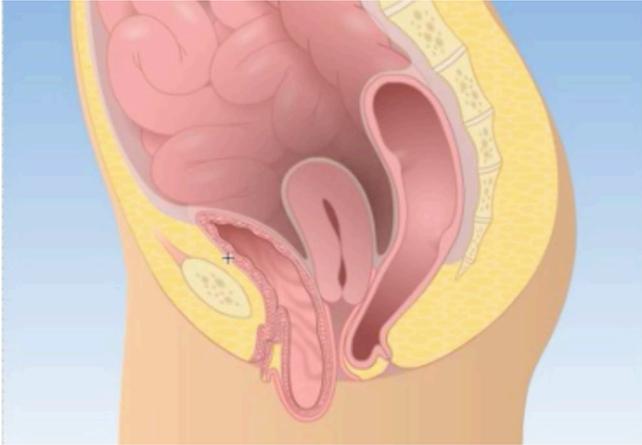
Stages are based on the maximal extent of prolapse relative to the hymen, in one or more compartments.

Stages of Prolapse

Stage 0	No prolapse; anterior and posterior points are all -3 cm, and C or D is between $-TVL$ and $-(TVL - 2)$ cm.
Stage I	The criteria for stage 0 are not met, and the most distal prolapse is more than 1 cm above the level of the hymen (less than -1 cm)
Stage II	The most distal prolapse is between 1 cm above and 1 cm below the hymen (at least one point is -1 , 0 , or $+1$)
Stage III	The most distal prolapse is more than 1 cm below the hymen but no further than 2 cm less than TVL
Stage IV	Represents complete procidentia or vault eversion; the most distal prolapse protrudes to at least $(TVL - 2)$ cm

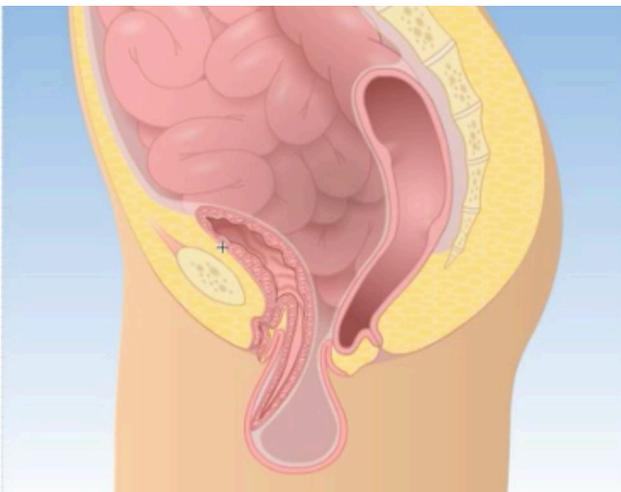
WHAT ARE SOME EXAMPLES OF POP?

Stage III Anterior vaginal wall predominant prolapse:



Aa 3	Ba 3	C -6
Gh 2	Pb 3	Tvl 10
Ap -2	Bp -2	D -10

Stage IV vaginal vault prolapse (s/p hysterectomy):



Aa 3	Ba 4	C 7
Gh 5	Pb 2	Tvl 9
Ap 0	Bp 0	X

Figures from ACOG Patient Resources, Videos: Pelvic Organ Prolapse

WHAT ARE THE TREATMENT OPTIONS FOR THE DIFFERENT TYPES OF INCONTINENCE?

Treatment of Urge urinary incontinence

First-line: Behavioral

- Lifestyle modifications: appropriate amount of fluid consumption, timed voids, limitation of caffeine, alcohol or high sugar beverages, limitation of nocturnal liquid intake, avoidance of bladder irritants, weight loss
- Pelvic floor exercises:
 - Unmonitored: Perform Kegel exercises 3 sets of 10 contractions 3 times daily

<ul style="list-style-type: none"> ○ Monitored: Pelvic floor physical therapy to teach Kegel exercise and ensure correct muscles are being recruited
<p>Second-line: Medications</p> <ul style="list-style-type: none"> ● Antimuscarinics: Block parasympathetic effect on detrusor muscles <ul style="list-style-type: none"> ○ Side effects: dry mouth, constipation, altered mental status ○ Not recommended for women with cognitive impairment ○ Examples include oxybutynin, solifenacin, tolterodine ● Beta-3 sympathomimetic: Activates sympathetic effect on detrusor muscles <ul style="list-style-type: none"> ○ Not recommended if uncontrolled hypertension, end stage renal disease, or significant liver dysfunction ○ Example include mirabegron ● Vaginal estrogen for peri- or postmenopausal women
<p>Third-line</p> <ul style="list-style-type: none"> ● Botox injections into detrusor muscle: <ul style="list-style-type: none"> ○ Effects can last between 6-12 months ○ Risks include UTI, temporary voiding dysfunction due to urinary retention ● Sacral nerve modulation <ul style="list-style-type: none"> ○ Electrical modulation of sacral nerves with an electrode placed through sacral foramina ○ Battery-operated generator implanted in the buttock after a testing period with an external generator ○ Needs replacement every 5-10 years ● Posterior tibial nerve stimulation <ul style="list-style-type: none"> ○ Posterior tibial nerve and bladder innervation share the same afferents. Nerve stimulation acts through the afferent nerves. ○ An acupuncture-like needle is inserted into the posterior tibial nerve area for 30 minutes weekly for 12 weeks.

Treatment of Stress Urinary Incontinence: least to most invasive

<p>Behavioral/lifestyle modifications: appropriate fluid intake, timed voids</p>
<p>Pelvic floor exercises:</p> <ul style="list-style-type: none"> ● Unmonitored: Perform Kegel exercises 3 sets of 10 contractions three times daily ● Monitored: Pelvic floor physical therapy teach Kegel exercise and ensure correct muscles are being recruited
<p>Incontinence Pessaries: A pessary is inserted into vagina and may help support urethrovesical junction during increases in intraabdominal pressure.</p> <ul style="list-style-type: none"> ● Unclear if any additional benefit from incontinence pessaries compared to lifestyle changes and pelvic floor exercises.

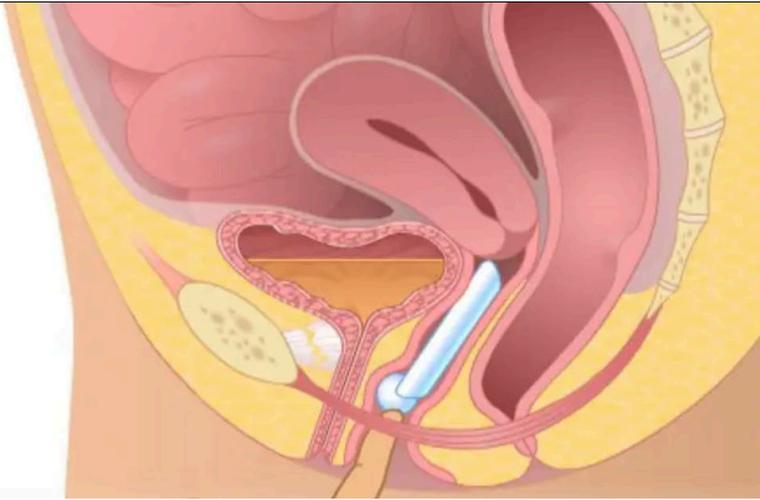


Figure from ACOG Patient Resources, Videos: Pelvic Organ Prolapse

Surgery:

- Mid-urethral sling:
 - The most commonly performed surgery for SUI
 - A 1-cm-wide strip of polypropylene mesh is placed in a tension-free manner underneath the mid-urethra without any anchoring
 - The mesh helps close the urethra during increased intraabdominal pressure
 - Implanted either through retropubic or transobturator approach
- Retropubic urethropexy:
 - Rarely used
 - Requires larger incision
 - Burch modification: popular modification prior to adoption of mid-urethral sling as standard of care
- Pubovaginal sling procedure:
 - Rarely used
 - Used when foreign permanent material is contraindicated
 - Autologous fascia from rectus muscle or fascia lata is utilized
 - Prolonged need for catheterization for incomplete bladder emptying

WHAT ARE THE TREATMENT OPTIONS FOR POP?

Non-surgical management: consider non-surgical management if patient not interested in surgery or is a poor surgical candidate.

1. Pelvic floor training: May help slow progression of pelvic floor prolapse. Not effective at treating underlying prolapse.
2. Pessary: removable plastic or silicone device inserted into vagina to hold prolapsed organs in place
 - a. Needs to be removed and reinserted at the maximum every 3 months
 - b. Caution in patients with dementia. Must have reliable caregiver and be able to present for follow-up visits
 - c. Risk of erosion of vaginal mucosa if pessary is left in place too long
 - d. Can add vaginal estrogen to help vascularize vaginal epithelium, especially in postmenopausal patients

Surgical options:

- a. Anterior/Posterior repair: Repairing the defective part of the anterior and/or posterior vaginal wall using patient's own (native) tissue. The repair will not be complete if any co-existing apical prolapse is not corrected at the same time.
- b. Apical prolapse repair:
 - i. Native tissue approaches: Vaginal approach
 - Sacrospinous ligament fixation: Vaginal apex is anchored to one or both sacrospinous ligaments
 - Uterosacral ligament suspension: Vaginal apex is anchored to one or both uterosacral ligaments, considered the anatomic repair.
 - ii. Sacrocolpopexy: A piece of mesh is used to attach uterine cervix or vaginal cuff to sacrum. This technique can be accomplished laparoscopically, often with robotic assistance.
- c. Transvaginal mesh-based repairs: Unlike mid-urethral slings which utilize mesh for SUI, transvaginal mesh use for the treatment of pelvic organ prolapse has been found to cause complications and are no longer recommended.
- d. Obliterative procedures: Also known as colpocleisis. Vagina is shortened with either LeFort (partial) or total colpocleisis. These procedures are reserved for older women who are not sexually active and do not desire to be sexually active again. This approach offers the most durable treatment while being the least invasive with lowest operative risks and shortest operating time.

LEVEL 4: FOR PATIENTS WITH COMPLICATED PRESENTATIONS REFRACTORY TO INITIAL MANAGEMENT, USES A MULTI-DISCIPLINARY APPROACH.

WHAT ADDITIONAL DIAGNOSTIC TESTS CAN BE PERFORMED WHEN EVALUATING PATIENT WITH PELVIC FLOOR DISORDER? HOW SHOULD THEY BE INTERPRETED?

The diagnosis of urinary incontinence can usually be made based on history and physical exam during an initial assessment. If a patient has an unclear diagnosis based on the initial office visit or is planning surgical intervention for treatment of SUI, POP or both, then consider referral for detailed bladder function tests, namely urodynamic testing.

Patients with uncomplicated reports of stress urinary incontinence with in-office testing consistent with stress urinary incontinence likely do not have to undergo complex urodynamic testing. There have been studies to suggest these patients have similar outcomes with or without complex urodynamic testing.

If a patient reports mixed urinary incontinence with plans for surgical management, has history of prior stress incontinence surgery, or concern for intrinsic bladder or neurologic dysfunction, urodynamic testing may be useful for diagnosis of complex voiding dysfunction.

Urodynamic testing gives objective information about the two main functions of the lower urinary tract, storage and emptying of urine. It provides evidence regarding bladder detrusor muscles both during filling and emptying. Testing will evaluate bladder capacity and compliance and monitor for signs of detrusor overactivity. Urodynamic testing may be conducted with or without video and may include the following:

- **Cystometry** provides a graphic interpretation of bladder (and abdominal) pressure relative to volume during filling, storage, and voiding to assess bladder sensation, capacity, and compliance. It is used to determine the presence and intensity of voluntary and involuntary detrusor contractions.

- **Uroflowmetry and pressure-flow studies** measure the rate of urine flow and the mechanism of bladder emptying. The presence or absence of coordinated detrusor contractions and urethral relaxation can be determined.
- **Measures of urethral function** include urethral pressure profiles and assessment of Valsalva leak point pressures
- **Electromyography** is used to study pelvic muscles and urethral sphincter during voiding. It can detect if there is coordination between detrusor muscle contraction and simultaneous urethral sphincter relaxation.

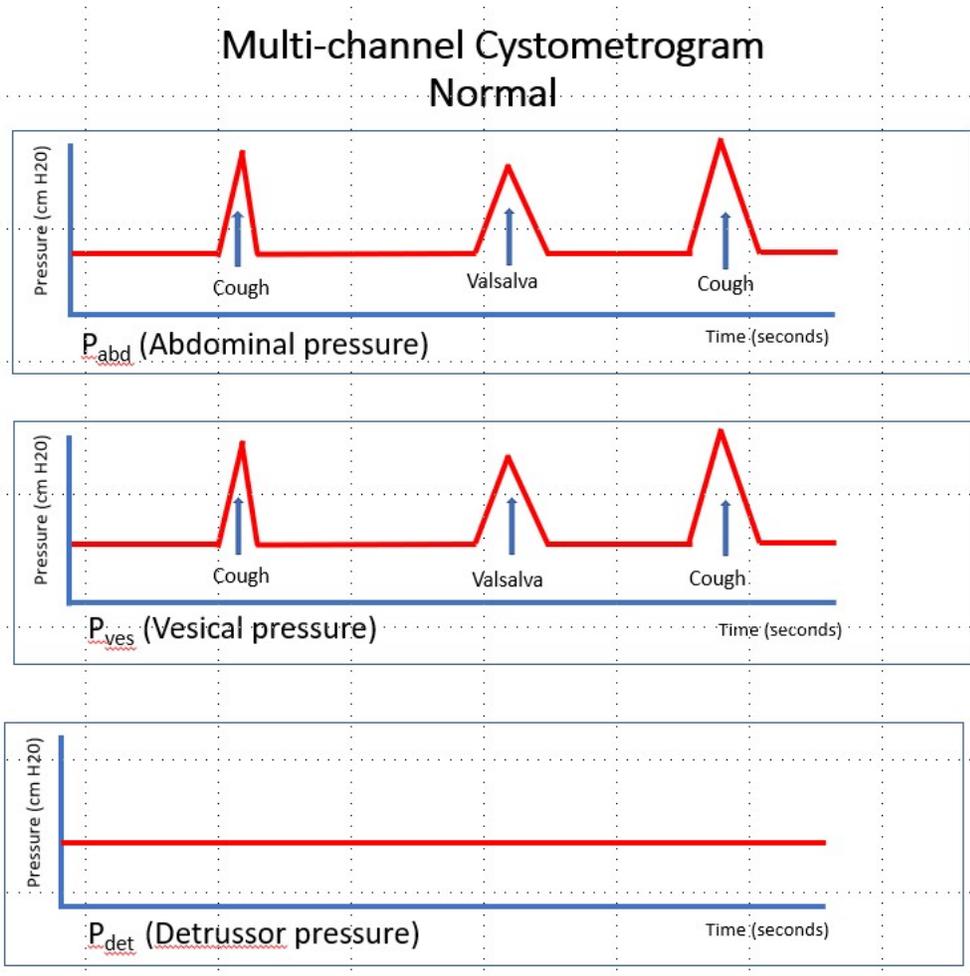


Figure by Dr. Oz Harmanli

Multi-channel Cystometrogram Detrusor Overactivity

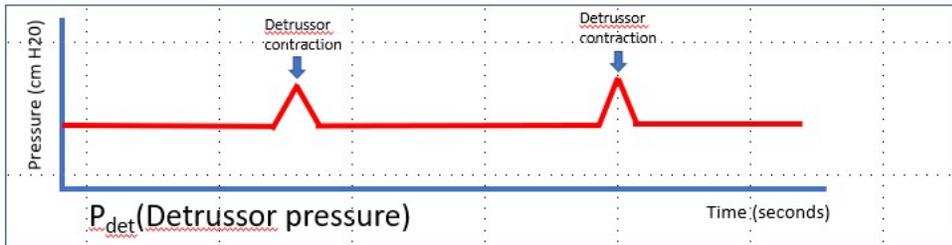
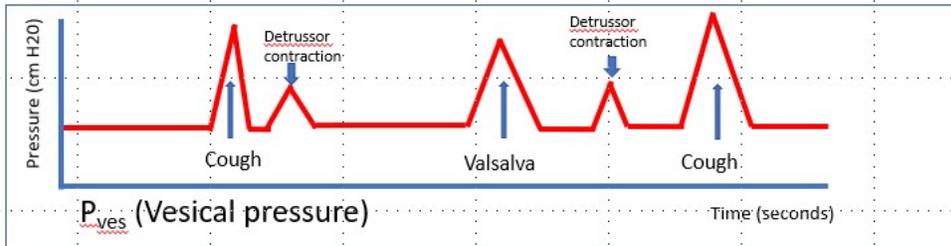
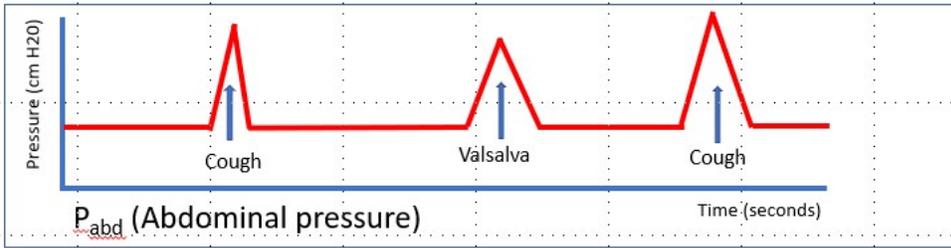


Figure by Dr. Oz Harmanli

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