



Reviewed By
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Video Case

Pelvic Organ Prolapse & Urinary Incontinence

Objectives:

- Describe pelvic anatomy and pelvic support
- List risk factors for pelvic floor disorders
- Describe signs and symptoms of pelvic floor disorders
- Discuss the steps in the evaluation of pelvic floor disorders
- Describe the anatomic changes associated with pelvic floor disorders
- Describe non-surgical and surgical management for pelvic floor disorders
- Define Pelvic organ prolapse
- Describe the types of POP and their clinical picture
- Discuss the etiology of POP
- List surgical and non-surgical management options for POP
- Define, identify incidence and effect of urinary incontinence
- Compare between the different types of urinary incontinence



- Slides
- **Important**
- **Golden notes**
- Extra
- **439 Doctor's notes**
- **441 Doctor's notes**
- **441 Female Presentation**
- **Reference**

Female presentation

Video Case | Editing File

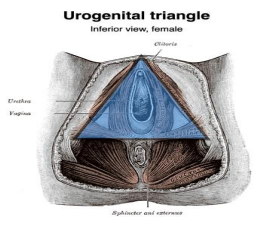
Pelvic Floor disorders

> Introduction:

- The lifetime risk for **undergoing a surgery** for prolapse or urinary incontinence is 11%.
- The most common indication for hysterectomy for women age 55 and greater is pelvic prolapse.
- POP is more common in Caucasian than african or asian population.
- Pelvic organ prolapse (POP or female genital prolapse) is the protrusion of bladder, rectum, intestines, uterus, cervix, or vaginal apex into the vaginal vault due to decreased pelvic floor support

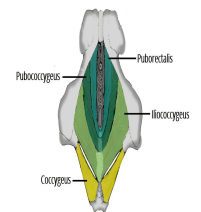
> Pelvic Anatomy:

- The pelvic floor is made up of muscles, and fascia (perineal membrane)
- The muscles are named the pelvic diaphragm, consisting of levator ani muscles (puborectalis, pubococcygeus, iliococcygeus) and coccygeus muscles
- The peritoneal membranes (part of the urogenital diaphragm) is present in the urogenital triangle. The vagina and urethra pass through it.



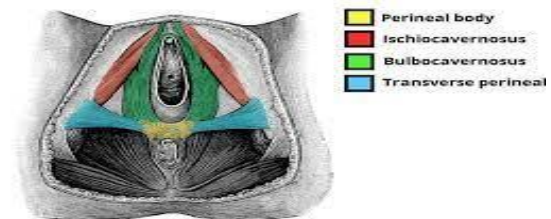
• Support:

- The uterus is supported by the cardinal ligaments, uterosacral ligaments, and endopelvic fascia. They are usually disturbed by episiotomy or 3rd degree tear. **Transverse(Cardinal) is the strongest and provide the most support to the ligaments (80%common MCQ question).**
- Arcus tendineus fascia pelvis: gives lateral support to the vagina which supports the cervix.



> Pelvic organ prolapse classification: Prolapse is basically a hernia

- Uterine prolapse
- Vaginal prolapse, which includes:
 - Cystocele
 - Rectocele
 - Enterocele



> Risk Factors:

Pelvic organ prolapse is related to pelvic relaxation, usually related to:

Most commonly is vaginal childbirth (3 or more)	Advanced age	Obesity	Genetic predisposition.
Menopause	Pelvic surgery By injuring the ligaments	Connective tissue diseases	Increased intra-abdominal pressure

C-Section? Can't prevent prolapse (pressure 9 months can also predispose it)

Pelvic Floor Disorders

> Pelvic organ prolapse symptoms:

01

Majority are **asymptomatic** (no intervention) due to the degree

02

Vaginal pressure or heaviness

03

Abdominal lower back pain (not a main presentation because it's common in male and female)

04

Vaginal or perineal pain or discomfort

05

Mass sensation/bulging (most common)

06

Urinary or fecal loss or retention

07

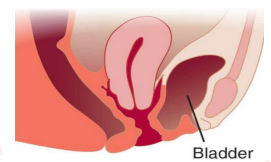
Sexual health issues

Uterine Prolapse

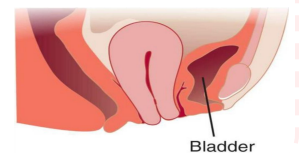
- Half of parous women who had a vaginal delivery will show a prolapse when clinically examined, but might not have any symptoms or functional abnormalities
- Physical findings may not correlate with specific pelvic symptoms.
- Grades: The severity of prolapse is indicated by increase in grade from 1 to 4.

Baden Walker System	APGO Video
	Stage 0 : No prolapse, the cervix or vaginal cuff is at the top of the vagina
Grade 1 : cervix descends halfway to the hymen	Stage I : The leading part of the prolapse is more than 1 cm above the hymen
Grade 2 : cervix descends to the hymen	Stage II : The leading part of the prolapse is less than or equal to 1 cm above or below the hymen
Grade 3 : cervix extends halfway past the hymen	Stage III : The leading edge is more than 1 cm beyond the hymen , but less than or equal to the total vaginal length (around 80% of total vaginal length)
Grade 4 (procidentia) : entire uterus, as well as the anterior and posterior vaginal walls, extends outside the introitus	Stage IV (Procidentia) : Complete eversion

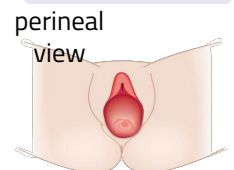
Grade 1



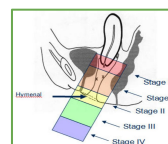
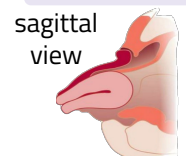
Grade 2



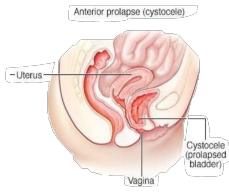
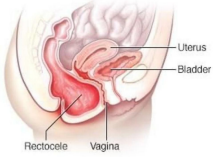
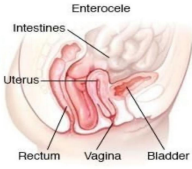
Grade 4



Grade 4



Vaginal Prolapse

<p>Cystocele</p>		<p>Herniation or bulging of the anterior vaginal wall and overlying bladder base into the vaginal lumen</p> <ul style="list-style-type: none"> ➤ Postmenopausal woman due to decreased estrogen and weak muscles ➤ Anterior vaginal wall protrusion ➤ Urinary incontinence
<p>Rectocele</p>		<p>Herniation or bulging of the posterior vaginal wall and underlying rectum into the vaginal lumen</p> <ul style="list-style-type: none"> ➤ Postmenopausal woman ➤ Posterior vaginal wall protrusion ➤ Digitally assisted removal of stool
<p>Enterocele</p> <p>Peritoneum of cul de sac (small bowel)</p>		<p>Herniation of the pouch of Douglas containing small bowel into the vaginal lumen.</p>

Examination and diagnosis:

- Mainly made through observation at the time of pelvic examination.
- The prolapsed vagina, rectum, and uterus are easily visualized, particularly as the patient increases intra-abdominal pressure by straining.

Management:

- Since this is mainly a lifestyle problem, usually it is treated depending on the effect on the lifestyle.
- **Non-surgical treatment** for a minor degree of relaxation.
 - **Kegel exercises (voluntary contractions of the pubococcygeus muscle)**
 - Estrogen replacement in postmenopausal women. (local or combined with progesterone)
 - Pessaries (objects inserted into the vagina that elevate the pelvic structures into their more normal anatomic relationships) most gynecologists use them as **first-line therapy**.
 - Ring pessary: supportive and used for **mild prolapse**.
 - Gellhorn or Cube pessaries: space occupying and used in **high degree prolapses or Procidentia**.
- **Surgical treatment** when more conservative management has failed.
 - **Vaginal hysterectomy > uterine prolapse**
 - **Anterior vaginal repair (Colporrhaphy) > cystocele**
 - **Posterior vaginal repair (Colporrhaphy) > rectocele**
 - The anterior and posterior colporrhaphy uses the endopelvic fascia that supports the bladder and the rectum, and application of this fascia restores normal anatomy to the bladder & rectum.
 - Limit strenuous activity for 3 months postoperatively to avoid recurrence of the relaxation.
 - Abdominal sacral colpopexy: suspending the vagina to the sacrum.
 - Colpocleisis: closure of the vagina. It's used in older women who won't tolerate invasive surgery and are no longer sexually active.

Urinary Incontinence

- Urinary incontinence is the inability to hold urine, producing **involuntary urinary leakage**.
- Urinary incontinence is a common benign condition happening in females at all ages.
- It affects quality of life on a day to day basis like DM, HTN, Asthma and osteoarthritis.

Evaluation Of Incontinence:

History

- A 3-day (full, 24-hour days) voiding diary (a record of the bladder's behavior that helps to identify the diagnosis)
- List the amount of fluid taken in and the amount of urine produced, record how much urge is felt and whether there is pain at, before, or after voiding.
- Urine loss with physical activity suggests stress.
- Urge to empty but not getting to the toilet fast enough suggests urge.
- Incontinence with both physical activity and sense of urgency suggests mixed.
- Continuous loss of urine day and night suggests fistula.

Physical Exam

- An abdominal exam should rule out masses, ascites, and organomegaly, which can influence intra-abdominal pressure.
- pudendal nerve innervation of the perineum with the bulbocavernosus and clitoral sacral reflex (lightly brushing the labia majora or tapping the clitoris should produce a reflex of the external anal sphincter muscle).
- pelvic exam to evaluate for inflammation, infection, and atrophy, which can increase bladder sensitivity and lead to urgency, frequency, and dysuria.
- Vaginal wall prolapse findings will identify cystocele, rectocele, and enterocele.
- Q-tip test to assess for hypermobility of the urethrovesical junction.
 - With patient in supine position, place a sterile, well-lubricated cotton-tipped swab in the urethra (angle the swab <30 degrees from the horizontal; with inadequate bladder neck support, angle will be >30 degrees)

Urinalysis & culture

A urinalysis should be performed in all patients, looking for leukocytes (WBC), bacteria, and RBC.

- Many WBC and bacteria would suggest a UTI; do urine culture for identification of bacteria and antibiotic sensitivities. Treat with appropriate antibiotics.
- Microscopic hematuria would suggest a bladder stone or foreign body and tumor. Do further work-up with cystoscopy.

Urinary Incontinence

Cystometric studies:

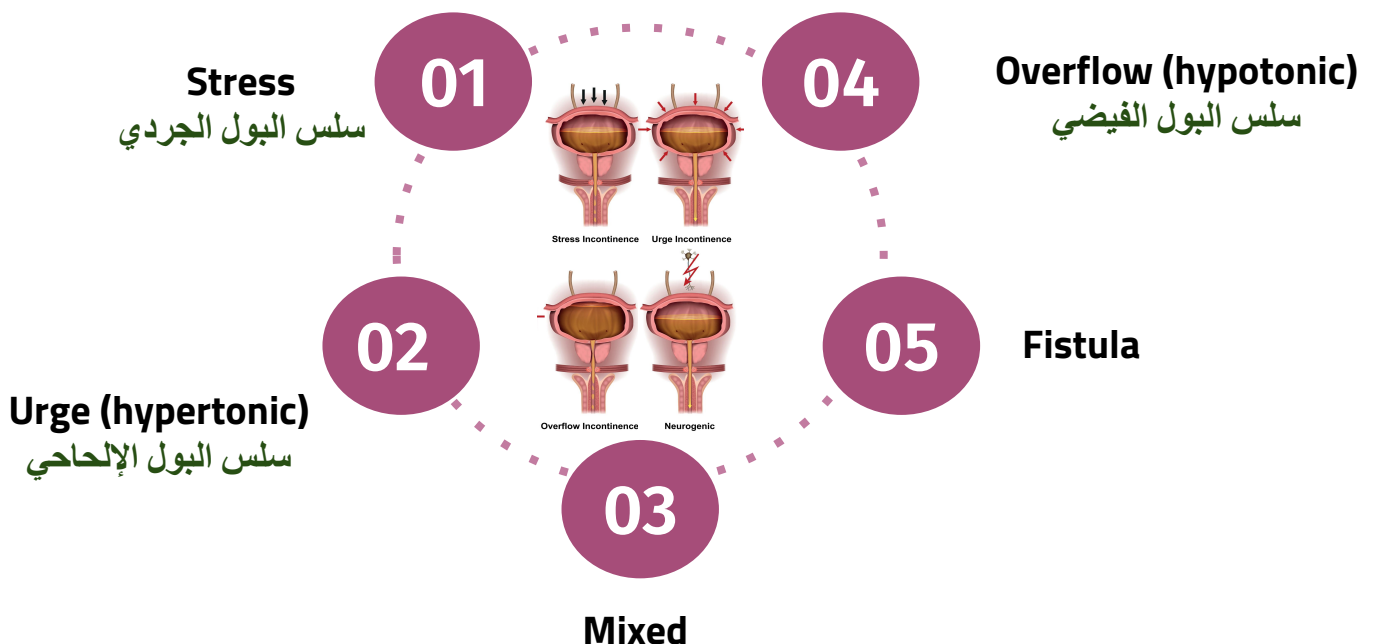
Basic office cystometry begins with the patient emptying the bladder as much as possible. A urinary catheter is first used to empty the bladder and then left in place to infuse saline by gravity retrograde assessing the following:

- **Residual volume:** how much is left in bladder after voiding (normal <100 mL)
- **Sensation-of-fullness volume:** how much infusion (in mL) until patient senses fluid in bladder (normal 200–225 mL)
- **Urge-to-void volume:** how much infusion (in mL) until patient feels the need to empty bladder (normal 400–500 mL)
- **Involuntary bladder contractions:** detect involuntary detrusor contractions by watching saline level in syringe rise or fall (absence of contractions is normal)

post-void residual	<100mL
sensation of fullness	200-225mL
urge to void	400-500mL

cystometric volume measurements

Classification Of Incontinence:




Urinary Incontinence

➤ Genuine stress incontinence:

Most common incontinence in **young women**.

- The result of rises in bladder pressure due to intra-abdominal pressure increases (e.g., coughing and sneezing). Which are not transmitted to the urethra.
- May be associated with urethral hypermobility (loss of integrity of pelvic floor muscles) or less commonly with intrinsic sphincteric deficiency (weakness of urethral sphincter itself).

Diagnosis:

- 
- **History:**
 - Loss of urine simultaneous with activities which increase abdominal pressure such as coughing, jumping, laughing or sneezing.
 - No urine loss when sleeping.
 - 25% of women will have stress incontinence for the first 4-6 months after vaginal delivery.
 - Multiparity
 - Obesity
 - Current pregnancy (transient)
 - **Examination:**
 - Normal neurologic test
 - Positive Q Tip test
 - **Investigation:**
 - Normal urinalysis, culture and cystometric studies.


Management:

Kegel exercise

Estrogen replacement therapy in menopausal women

Urethral bulking: involves injecting a bulking agent (water-based gel or collagen) around the urethra. This narrows the urethra, so leakage is less likely to occur.

Surgical therapy

- 
- Tension tension-free vaginal tape procedure (minimally invasive):
 - A mesh tape is placed transcutaneously around and under the mid urethra. It does not elevate the urethra but forms a resistant platform against intra-abdominal pressure.
 - Urethropexy: Surgical therapy aims to elevate the urethral sphincter so that it is again an intraabdominal location.
 - This is done by attachment of the sphincter to the symphysis pubis, using the Burch procedure as well as the Marshall-Marchetti-Krantz (MMK) procedure. The success rate of both of these procedures is 85–90%.

Urinary Incontinence

> Hypertonic incontinence (motor urge):

- Most common incontinence in **older women**.
- The result of involuntary rises in bladder pressure, occurring **from idiopathic detrusor contractions that cannot be voluntarily suppressed**.
- **Diagnosis:**
 - **History:**
 - Loss of urine in large amounts often **without warning**.
 - Takes place **both day and night**.
 - The most common symptom is urgency.
 - **Examination:**
 - Pelvic examination shows normal anatomy.
 - Neurologic examination is normal.
 - **Investigation:**
 - Urinalysis and culture are normal.
 - **Cystometric studies show normal residual volume, but involuntary detrusor contractions are present even with small volumes of urine in the bladder.**
- **Management:**
 - Behavioral Therapy
 - **Anticholinergic medications (e.g., oxybutynin and tolterodine);** NSAIDs to inhibit detrusor contractions; tricyclic antidepressants; calcium-channel blockers.

> Mixed incontinence:

- Occurrence mostly in older women.
- A combination of both stress and urge incontinence.
- The contribution of each type of involuntary urine loss varies by individual.
- **Diagnosis:**
 - **History:**
 - Loss of urine may occur with both physical activity, coughing and sneezing as well as after experiencing an overwhelming urge to urinate.
 - **Examination:**
 - Pelvic exam may or may not show vaginal prolapse (cystocele, rectocele, or enterocele).
 - Q-tip test is variable. Pudendal nerve innervation will be normal.
 - **Investigation:**
 - Urinalysis will be unremarkable.
 - Cystometry will show a normal residual volume, but sensation-of-fullness and urge-to-void volume may be decreased. Involuntary detrusor contractions may be seen.
- **Management:**
 - No single therapy works for everyone; options will be directed by whether the stress or the urge component is greater.

Urinary Incontinence

> Overflow (hypotonic) incontinence:

- A rise in bladder pressure occurs gradually from an overdistended, hypotonic bladder.
- When the bladder pressure exceeds the urethral pressure, involuntary urine loss occurs but only until the bladder pressure equals urethral pressure. The bladder never empties. Then the process begins all over.
- This may be caused by denervated bladder (e.g., diabetic neuropathy, multiple sclerosis) or systemic medications (e.g., ganglionic blockers, anticholinergics).
- **Diagnosis:**
 - **History:**
 - Loss of urine occurs intermittently in small amounts.
 - This can take place both day and night.
 - The patient may complain of pelvic fullness.
 - **Examination:**
 - Pelvic examination may show normal anatomy; however, the neurologic examination will show decreased pudendal nerve sensation.
 - **Investigation:**
 - Urinalysis and culture are usually normal, but may show an infection.
 - Cystometric studies show markedly increased residual volume, but involuntary detrusor contractions do not occur.
- **Management:**
 - Possible intermittent self-catheterization, discontinuation of the offending systemic medications, cholinergic medications to stimulate bladder contractions, and α -adrenergic blocker to relax the bladder neck.

> Fistula:

- A fistula is an **abnormal** connection between two body parts.
- The normal urethral-bladder mechanism is intact but is bypassed by urine leaking out through a fistula from the urinary tract.
- **Diagnosis:**
 - **History:**
 - The patient usually has a history of radical pelvic surgery or pelvic radiation therapy. Loss of urine occurs continually in small amounts. This can take place both day and night.
 - **Examination:**
 - Pelvic examination may show normal anatomy and normal neurologic findings.
 - **Investigation:**
 - Urinalysis and culture are normal.
 - An intravenous pyelogram (IVP) will demonstrate dye leakage from a urinary tract fistula.
 - With a urinary tract- vaginal fistula, intravenous indigo carmine dye will leak onto a vaginal tampon.
- **Management:**
 - Surgical repair of the fistula.

Teaching Case

A 75-year-old woman G5P5 woman presents for an annual exam and reports a “fullness” in the vaginal area. The symptom is more noticeable when she is standing for a long time. This feeling is bothersome to her and is affecting her daily activities. She does not complain of urinary or fecal incontinence. She has no other urinary or gastrointestinal symptoms. There has been no vaginal bleeding. Her past medical history is significant for well-controlled hypertension and chronic bronchitis. She has never had surgery. Pelvic exam reveals normal appearing external genitalia except for generalized atrophic changes. The vagina and cervix are without lesions. Relaxation of the anterior and posterior vaginal wall are noted to approximately one centimeter beyond the hymen when she is asked to Valsalva. The cervix also descends to the level of the hymen with Valsalva. Uterus is normal size. Ovaries are not palpable. No rectal masses are noted. Rectal sphincter tone is slightly decreased. The patient wishes to discuss options for treatment.

Q1 What are the most important support mechanisms for the pelvic organs?

- Levator ani muscles It's the most important supporting muscle composed of 4 semi contracted muscle which will angulate pelvic organs: puborectalis, pubococcygeus, iliococcygeus, coccygeus.
- Uterosacral ligaments for the uterus and vaginal apex two ligament provide uterine support cardinal (transverse) it goes lateral. and uterosacral ligaments (goes backward) while the round ligament is responsible for uterine orientation (ante or retroverted).
- The vesicovaginal (pubovesical or pubocervical fascia) and rectovaginal connective tissues for the anterior and posterior vaginal wall (Endopelvic fascia = Advantita of pelvic organs “margins”)

Q2 What increases this patient's risk for pelvic organ prolapse?

- **One vaginal delivery or more** with or without instruments. (Especially with episiotomy)
- Genetic predisposition
- Menopause and age it will make atrophic changes for the muscle and tissue.
- Advance age
- Pelvic surgery e.g hysterectomy
- Connective tissue diseases e.g marfan syndrome and danlos syndrome, in this case the patient might be nulliparous young female and present with uterine prolapse with or without other risk factor.
- Increased intra-abdominal pressure, e.g Chronic cough is an important risk factor (mangable risk factor) or constipation
- Smoking weakens connective tissue
- Use of forceps during operative vaginal delivery that's why physicians prefer ventose over forceps.
- Obesity; it's a very common and important risk factor.

Q3 What are the symptoms of pelvic organ prolapse?

- Vaginal pressure or heaviness (could come with **pelvic muscle spasm** due to trauma from delivery, obesity or anxiety)
- Abdominal lower back pain, suprapubic pain, vaginal pain, pelvic pain
- Vaginal or perineal pain or discomfort
- Mass sensation/bulging, heaviness, pressure, and visible mass —> prolapse symptoms
- Urinary & fecal loss/retention, incontinence, urgency, frequency, straining > urinary & bowel symptoms
- Sexual health issues —> Sensation of wide vagina, loss of gratification “pleasure” , hear sounds when moves

Teaching Case

Q4 What are the different types of pelvic organ prolapse?

Name of prolapse	Pelvic structure	Kaplan notes
Cystocele	Anterior wall of the vagina	Herniation or bulging of the anterior vaginal wall and overlying bladder base into the vaginal lumen. Triad: 1. Postmenopausal woman 2. Anterior vaginal wall protrusion 3. Urinary incontinence
Rectocele	Posterior wall of the vagina	Herniation or bulging of the posterior vaginal wall and underlying rectum into the vaginal lumen. Triad: 1. Postmenopausal woman 2. Posterior vaginal wall protrusion 3. Digitally assisted removal of stool
Enterocoele	Peritoneum of cul de sac	Herniation of the pouch of Douglas containing small bowel into the vaginal lumen

Q5 What are the steps in evaluating someone with prolapse?

- The most important thing to evaluate is the patient's complaint. Prolapse is not dangerous on woman unless it is impacting her ability to empty her bladder (causing urinary retention).
- The Pelvic Organ Prolapse Quantitative (POPQ) is an objective evaluation tool that gynecologists and pelvic floor specialists (Urogynecologists) use to measure prolapse.
- Grading systems (such as the Baden Walker system) may also be used to document prolapse.
- If indicated, evaluation for urinary retention (such as performance of a post void residual) should be completed.
- Some providers will also evaluate levator muscle strength by asking a woman to perform a Kegel squeeze on examination.

Q6 What are treatment options that you should discuss with this patient?

Non-Surgical:

1. **Lifestyle/ risk factors modification. "imp"**
2. **Kegel exercises (Kaplan)**
3. **Estrogen** for post-menopausal women, *pt has symptoms of atrophic vaginitis which bother her, and if we are planning to do surgery since we want the tissue be in a better thickness (Kaplan)*
4. **Pessaries:** most gynecologists use them as first-line therapy, it has many types, such as:
 - a. Ring pessary: supportive and used for mild prolapse
 - b. Gellhorn or Cube pessaries: space occupying and used in high degree prolapses or Procidentia

Surgical:

5. **Hysterectomy:** apical support is provided by either:
 - a. Uterosacral ligament suspension
 - b. Sacrospinous ligament suspension
6. **Abdominal sacral colpopexy:** suspending the vagina to the sacrum
7. **Colpocleisis:** closure of the vagina. It's used in older women who won't tolerate invasive surgery and are no longer sexually active. (Kaplan: The anterior and posterior colporrhaphy uses the endopelvic fascia to restore the bladder and the rectum to their normal anatomy)

Teaching Case

> Q7 When is surgery indicated for prolapse?

- Patients desire to for surgical correction
- Recurrent vaginal ulceration or other complications for pessary use

> Q8 What are the different types of urinary incontinence?

- **Stress urinary incontinence:** loss of urine associated with coughing, sneezing, laughing, or physical activity
- **Urge incontinence:** loss of urine associated with or immediately preceded by urgency.
- **Mixed urinary incontinence:** a combination of stress and urge incontinence
- **Continuous incontinence:** continual urine passage (commonly caused by vesicovaginal fistula)
- **Overflow incontinence:** Loss of urine intermittently in small amounts and pelvic fullness.
- **Functional incontinence:** Physical or psychological inability to go to and urinate

> Q9 What are the steps in evaluating someone with urinary incontinence?

- Questions (history) to clarify what type of incontinence they are experiencing, along with a physical examination and a **urinalysis**
- Many providers may do a cough stress test ,**Valsalva maneuver** or a post void residual to further evaluate bladder function during physical examination. Urodynamic testing may be performed if the provider feels that this is warranted. Some providers will have patients fill voiding diaries to evaluate symptoms

> Q10 What are nonsurgical treatment options for urinary incontinence?

- Behavioral modification is important to discuss with patients with incontinence symptoms. Decreasing bladder irritants and timed voids can be important and low risk treatments for many women.
- Pelvic floor physical therapy (Kegel exercises) can be important and effective in managing urinary incontinence symptoms.
- Medical therapy primarily focused on treatment of detrusor over-activity (anticholinergics)
- Incontinence pessaries can be an effective treatment of stress incontinence
- **Urge incontinence: medical treatment, no improvement go with botox injection**
- **Overflow incontinence: leave it as is or catheter from time to time.**

439 Dr's Notes

1. Pelvic floor disorder it is a group of conditions related to each other, If a patient came with any of the following complaints you should ask about other conditions symptoms:
 - a. Pelvic organ prolapse.
 - b. Lower Urinary tract symptoms(incontinence, retention...).
 - c. Bowel disorder (symptoms: anal incontinence, constipation...)
 - d. Sexual disorder (dyspareunia, loss of gratifaction, inorganismia)
 - e. Chronic pelvic pain (back, pelvic or vaginal pain,most common presentation in female).

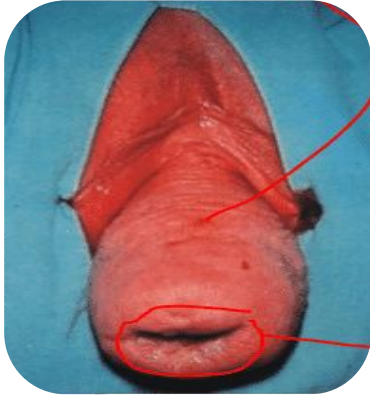
2. Related to Q1:
 - a. what is the direction of cardinal and uterosacral ligaments?
 - i. Cardinal: from the isthmus part of uterus + cervix + upper vagina it goes to pelvic sidewall.
 - ii. Uterosacral: from cervix + upper vagina goes in a curve way to the sacrum
 - b. What run through cardinal ligaments?
 - i. Uterine vessels
 - c. Endopelvic fascia:
 - i. Between vagina and urinary bladder the pubovesical or pubocervical fascia.
 - ii. Between rectum and vaginal rectovaginal fascia.

3. Q2:
 - a. How pelvic surgery is considered a risk factor?
 - i. During surgery (e.g: hysterectomy) we may cut some ligaments that support the uterus and vagina leading to herniation or weakness.
 - b. Any constant increase in intra-abdominal pressure like obesity, constipation, pelvic mass put the pelvic organ and supporting organ under pressure.

4. Q5:
 - a. Always start with OB/GYN history then you do physical examination:
 - i. vital signs and BMI is very important for treatment
 - ii. Assess Walking
 - iii. pelvic examination:
 1. in lithotomy position we separate labia minora then ask her to cough to assess leaking of urine(cough stress test) or protruding of a mass
 2. Speculum examination
 3. Pelvic floor muscle strength, spasm and tenderness

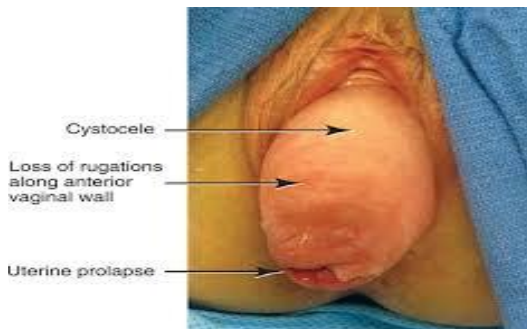
Girls presentation questions

➤ Identify the grade of prolapse:



They are both between grade 3,4 uterine prolapse but in the left it's uterine prolapse with Vaginal wall anterior and posterior

➤ Identify the type of prolapse:



Cystocele



Cystocele



Rectocele



Cystocele

Female Presentation Qs:

- > 85 Y.O women, IHD presented to your clinic with a diagnosis of second-degree uterine prolapse what is the best management option ?
- A. Hysterectomy
 - B. Wall repair
 - C. Ring pessary
- > A 45 YO lady presented to your clinic complaining of urinary inc. while exercising. What do you think the type of her urinary inc.?
- A. Urge
 - B. Stress
 - C. Mixed
- > Patient came complaining of urinary incontinence and urine leak with urgency after the examination involuntary detrusor contractions are **present** even with small amount of urine in the bladder what is the most likely cause of her incontinence ?
- A. Stress incontinence
 - B. Overactive bladder
 - C. Overflow incontinence
 - D. Fistula

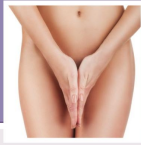
**If a patient was having incontinence throughout the day?
I would think of Fistula even if there are contractions**

Reference

Pelvic Floor Disorders

Pelvic Organ Prolapse, Urinary Incontinence, and Pelvic Floor Pain Syndromes

AMY E. ROSENMAN



CLINICAL KEYS FOR THIS CHAPTER

- Effective clinical evaluation of patients with disorders of the female pelvic floor, such as pelvic organ prolapse (POP) and stress urinary incontinence (SUI), requires a clear understanding of female pelvic anatomy. Defects of vaginal support include anterior vaginal prolapse (cystocele), posterior vaginal prolapse (rectocele and enterocele), and apical uterine prolapse. Symptoms of POP generally affect quality of life, but when complete uterine prolapse (prolapsed) occurs, ureteral obstruction and kidney damage may result.
- A staging system has been developed for POP so that outcomes of surgical and nonsurgical treatment can be quantified, followed, and improved. Medical management of mild to moderate cases of POP includes pelvic muscle exercises and the use of pessaries. Surgical procedures include anterior and posterior repairs (colporrhaphy) using existing natural tissue and synthetic mesh materials, vaginal vault suspension (colpopexy) for apical vaginal prolapse, and complete vaginal closure procedures (colpocleisis) for some women who no longer desire coital function. Robot-assisted procedures are now used for some of these interventions.
- Urinary incontinence is defined as the involuntary loss of urine that is a social or hygienic problem. It is estimated that as many as 50% of women have some urinary incontinence at some time during their lives. SUI occurs in response to physical exertion, coughing, or sneezing. After appropriate testing to document SUI, surgical procedures include retropubic urethropexy, suburethral sling placement, or bulking injections.
- Overactive bladder (OAB) and urge urinary incontinence (UUI) are used interchangeably to describe incontinence that occurs when there is a strong urge to pass urine with a decreased ability to prevent passage. Treatments include behavior modification (bladder training), medications, electrical stimulation, or injections.
- Overflow incontinence and urinary fistulas may also be causes of involuntary passing of urine. Neuropathies account for most of the cases of overflow incontinence, whereas pelvic surgery and radiation damage cause 95% of fistulas. Surgical repair of fistulas is almost always needed. Pelvic pain disorders include painful bladder and myofascial pelvic pain syndrome.

An accurate knowledge of the anatomy of the female pelvic floor enables the student to understand pelvic organ prolapse and its management. Female pelvic medicine and reconstructive surgery (FPMRS) is the newest board-certified subspecialty within the specialties of obstetrics and gynecology as well as urology. This new certification process recognizes the importance of disorders of the female pelvic floor and the increased knowledge and skills necessary to evaluate and treat these disorders.

Normal Pelvic Anatomy and Supports

The bony pelvis acts like a basket, supporting the muscular attachments, pelvic organs, vessels, and nerves contained within it. The pelvic organs, including the vagina, uterus, bladder, urethra, and rectum, are supported within the pelvis by the bilaterally paired and posteriorly fused levator ani muscles. The anterior separation between the levator ani is called the

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course of the day and are most noticeable after prolonged standing or straining. Women may have to apply manual pressure to empty their bladder completely. Other symptoms include stress urinary incontinence (SUI), urinary urgency, and frequency. Significant anterior vaginal wall prolapse that protrudes beyond the vaginal opening (hymen) can cause urethral obstruction caused by kinking, resulting in urinary retention or incomplete bladder emptying.

POSTERIOR VAGINAL PROLAPSE (RECTOCELE AND ENTEROCELE)

Posterior vaginal defects occur when there is weakness in the rectovaginal septum. Symptoms can be indistinguishable from other types of prolapse because the discomfort, pressure, and the sense of a vaginal bulge are nonspecific. When difficulties with bowel function and defecation occur, lower posterior vaginal prolapse is likely. Straining or the need to manually splint for complete bowel elimination may occur. Upper posterior vaginal wall prolapse is nearly always associated with herniation of the pouch of Douglas, and because this is likely to contain loops of bowel, it is called an enterocele.

APICAL VAGINAL UTERINE PROLAPSE

Although vaginal prolapse can occur without uterine prolapse, the uterus cannot descend without carrying the upper or apical portion of the vagina with it.

Complete prolapsed (uterine prolapse through the vaginal hymen) represents failure of all the vaginal supports (Figure 23-2). Hypertrophy, elongation, congestion, and edema of the cervix may sometimes cause a large protrusion of tissue beyond the hymen that may be mistaken for a complete prolapsed. Vaginal vault prolapse or eversion of the vagina may be seen after vaginal or abdominal hysterectomy and represents failure of the supports around the upper vagina.

Symptoms of POP mainly affect a woman's quality of life. However, significant sequelae of POP can occur in neglected cases of prolapsed, which may be complicated by excessive purulent discharge, decubitus ulceration, and bleeding. Ureteral obstruction with hydronephrosis is also a possible result of complete prolapsed.

ETIOLOGY OF PROLAPSE

The pelvic fascia, ligaments, and muscles may become attenuated from excessive stretching during pregnancy, labor, and difficult vaginal delivery, especially with forceps or vacuum assistance. Asian and black women appear less likely than white women to develop prolapse.

Increased intraabdominal pressure resulting from a chronic cough, ascites, repeated lifting of heavy weights, or habitual straining as a result of constipation may predispose women to prolapse. Atrophy of the supporting tissues with aging, especially after menopause, also plays an important role in the initiation or worsening of pelvic relaxation. Iatrogenic factors include failure to adequately correct all pelvic support defects at the time of pelvic surgery, such as hysterectomy.

DIAGNOSIS

Vaginal examination is facilitated by using a single-blade speculum. While the posterior vaginal wall is being depressed, the patient is asked to strain down. This demonstrates the descent of the anterior vaginal wall consistent with prolapse and urethral displacement. Similarly, retraction of the anterior vaginal wall during straining will accentuate posterior vaginal defects and uncover an enterocele and rectocele if present. Rectal and vaginal examinations are often useful to demonstrate a rectocele and to distinguish it from an enterocele.

QUANTIFYING AND STAGING PELVIC ORGAN PROLAPSE

The preferred method for describing and documenting the severity of POP is the Pelvic Organ Prolapse Quantification (POP-Q) system. The extent of prolapse is evaluated and measured relative to the hymen, which is a fixed anatomic landmark. The anatomic positions of the six defined points for measurement are denoted in centimeters above the hymen (negative number) or centimeters below the hymen (positive number). The plane at the level of the hymen is defined as zero (Figure 23-3).

Stages of POP can be assigned according to the most severe portion of the prolapse after the full extent of the protrusion has been determined. An ordinal system is used for measurement of different points along the vaginal canal, which allows for better communication



FIGURE 23-2 Complete uterine prolapse (prolapsed). Note the lesions on either side of cervical dimple (arrows), representing pressure ulcerations from clothing/undergarments. (Courtesy C.M. Farney, MD, Ronald Roagan—UCLA Medical Center.)

levator hiatus. Inferiorly, the levator hiatus is covered by the urogenital diaphragm. The urethra, vagina, and rectum pass through the levator hiatus and urogenital diaphragm as they exit the pelvis. The endopelvic fascia is a visceral pelvic fascia that invests the pelvic organs and forms bilateral condensations referred to as ligaments (i.e., pubourethral, cardinal, and uterosacral ligaments). These ligaments attach the organs to the fascia of the pelvic side walls and bony pelvis. Damage to the vagina and its support system allows the urethra, bladder, rectum, and small bowel to herniate and protrude into the vaginal canal.

The perineal body is a central point for the attachment of the perineal musculature. Although the contents of the abdominal cavity bear down on the pelvic organs, they remain suspended in relation to each other and to the underlying levator sling and perineal body.

Pelvic Organ Prolapse

Pelvic organ prolapse (POP) refers to the protrusion of the pelvic organs into the vaginal canal or beyond the vaginal opening. It occurs because of a weakness in the endopelvic fascia investing the vagina, along with its ligamentous supports. Defects in vaginal support may occur in isolation (e.g., anterior vaginal wall only), but they are more commonly combined. The nomenclature of POP has evolved such that older terms such as cystocele, rectocele, and enterocele have been replaced by more anatomically precise terms (Figure 23-1).

ANTERIOR VAGINAL PROLAPSE (CYSTOCELE)

The anterior vagina is the most common site of vaginal prolapse. Women with this type of defect will describe symptoms of vaginal fullness, heaviness, pressure, and/or discomfort that often progress over the

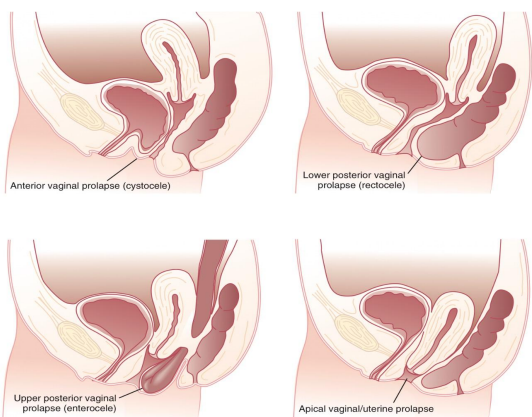


FIGURE 23-1 Diagrammatic representation of the four types of vaginal uterine prolapse.

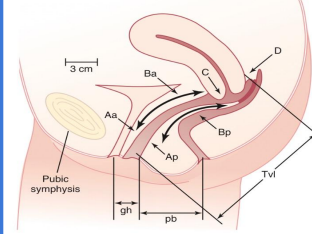


FIGURE 23-3 Illustration showing a side view of the female pelvis. Six sites (points Aa, Ba, C, D, Bp, and Ap), genital hiatus (gh), perineal body (pb), and total vaginal length (TVL) used for pelvic organ support quantification. (Reproduced with permission from Bump RC, Mattiasson A, Be K, et al: The standardization of terminology of female pelvic organ prolapse and pelvic floor dysfunction. *Am J Obstet Gynecol* 175:10-17, 1996.)

between clinicians. This staging system enables more objective tracking of surgical outcomes.

MANAGEMENT

Prophylactic measures to mitigate the symptoms of POP include identifying and treating chronic respiratory and metabolic disorders, correction of constipation and intraabdominal disorders that may cause repetitive increases in intraabdominal pressure, and, for menopausal women, administration of estrogen. Failure to recognize and treat significant support defects at the time of concomitant gynecologic surgery may lead to progression of existing prolapse and the development of urinary incontinence or retention and urinary tract infections (UTIs).

Nonsurgical Treatment

When only a mild degree of pelvic relaxation is present, pelvic floor muscle exercises may improve the tone of the pelvic floor musculature. Pessaries (Figure 23-4), which provide intravaginal support, may be used to correct prolapse by internally supporting the vagina. They can be considered when the patient is medically unfit or refuses surgery or during pregnancy and the postpartum period. They are also useful to promote healing of a decubitus ulcer before surgery. In many patients, pessaries are the treatment of choice, as they are almost risk-free, immediately available, and

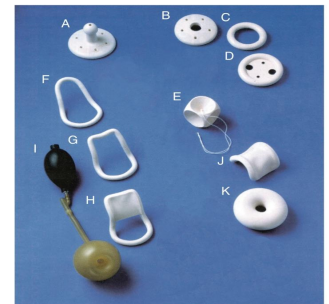


FIGURE 23-4 Some types of vaginal pessaries used for prolapse. A, Gellhorn; B, Shatz; C, ring; D, ring with support; E, cube; F, Smith; G, Hodge; H, Hodge with support for cystocele; I, Infallotall; J, Gehring; K, donut.

useful for interim treatment in those wishing to delay surgery.

Pessaries require proper fitting and must be selected in the appropriate type and size. They should be removed, cleaned, and reinserted every 6 to 12 weeks. They may cause vaginal irritation and ulceration. Neglect may result in serious consequences, including fistula formation, impaction, bleeding, and infection. Many patients are capable of caring for their pessaries themselves. In those cases, the patient inserts, removes, and cleans her pessary several times each week, if not daily. It is similar to the care and use of a contraceptive diaphragm.

Surgical Treatment

The main objectives of surgery are to relieve symptoms and restore normal anatomic relationships and visceral function. Preservation or restoration of satisfactory coital function, when desired, and a lasting operative result are also important goals.

REPAIR OF VAGINAL PROLAPSE. Anterior colporrhaphy corrects anterior vaginal wall prolapse and helps support the urethra. It involves plication of the pubocervical fascia to support the bladder and urethra. When the anterior prolapse involves a direct detachment of lateral vaginal support, it is considered a

Reference

paravaginal defect. Paravaginal defect repairs involve exposure of the retropubic space. **Interrupted permanent sutures are used to reattach bilaterally the anterior superior vaginal sulci to the arcus tendineus fasciae ("white line"),** extending from the ischial spine to the lower edge of the pubic ramus. When the defect is more central, a midline plication of endopelvic fascia is effective in adding support to the anterior vaginal wall. **Polypropylene mesh may be used in appropriate patients to augment the weakened native tissue repair.** In the presence of SUI, additional supportive measures are taken to achieve suspension of the bladder neck and proximal urethra.

Posterior colporrhaphy corrects a posterior vaginal wall prolapse and is similar in principle to anterior colporrhaphy. Site-specific posterior vaginal repairs can be performed after identification of the discrete endopelvic fascial breaks and reapproximation of this thicker tissue identified during rectal examination. **Perineorrhaphy repairs a deficient perineal body.** The outcomes of the site-specific repair are similar to the results of midline plication of the endopelvic fascia.

Recent modifications of these procedures involve the use of permanent suture or the addition of graft materials to augment the durability of the repair. These modifications can be accomplished using minimally invasive techniques such as endoscopic repair. **Permanent mesh grafts are not recommended in the posterior compartment,** because the incidence of complications is higher and outcomes are not as good as those achieved with repairs performed using native tissues.

REPAIR OF APICAL PROLAPSE. When the uterus is present, hysterectomy may be performed to facilitate exposure of the apical support structures. Hysterectomy, however, is not an absolute requirement in settings where uterine removal is not otherwise indicated or desired. The repair of apical defects may require peritoneal entry for the repair of an enterocele. After identification of the enterocele, the contents are reduced, the neck of the peritoneal sac is ligated, and the defect is repaired by approximating the uterosacral ligaments and levator ani muscles to restore continuity in the endopelvic fascia. **The uterosacral ligaments can be reattached to the cervix by either the vaginal or abdominal route.**

Vaginal vault suspension (colpopexy) for apical prolapse is performed to secure a durable fixation point for the top of the vagina. This can be accomplished vaginally or abdominally by suspending the vaginal vault to the sacrum, the sacrospinous ligaments, the uterosacral ligaments, or other firm points of fixation. This can be done with natural existing tissues or with polypropylene mesh.

Robot-assisted surgery for POP may be performed when a stronger attachment is needed in a very active

or relatively young patient or for a woman with a prior failed prolapse repair. Abdominal sacrocolpopexy with polypropylene mesh has been performed for over 30 years using an open incision, and more recently laparoscopically assisted procedures have been used. Since 2008, sacrocolpopexy has been performed with the aid of a surgical robot. This is a minimally invasive abdominal operation in which mesh is placed between the bladder and vagina, the rectum and the vagina, and over the apex of the vagina or the cervical stump. The mesh is supported by attaching it to the sacral promontory. **The robot-assisted procedure is now considered to give the longest-lasting results for POP.**

VAGINAL CLOSURE PROCEDURES. For women with advanced vaginal prolapse who no longer desire coital function, there are less invasive surgical options. A **LeFort colpocleisis** involves suturing the partially denuded anterior and posterior vaginal walls together in such a way that the uterus remains in situ and is supported above the partially occluded vagina. **In women with posthysterectomy prolapse, a complete colpocleisis** involves total obliteration of the vagina. These "obliterative" procedures have traditionally been reserved for elderly women who are not likely to tolerate more invasive reparative operations. Most of these women will get complete resolution of their symptoms with a repair that is much less invasive and is associated with fewer risks and complications.

Urinary Incontinence

Urinary incontinence is defined as the involuntary loss of urine that is a social or hygienic problem. Urinary incontinence has been reported to affect 15-50% of women. The problem increases in prevalence with age, rising above 50% in elderly persons in nursing homes. **It is estimated that the direct financial cost of urinary incontinence in the United States is between \$10 billion and \$15 billion per year.**

ANATOMY AND PHYSIOLOGY OF THE LOWER URINARY TRACT

In the adult woman, the urethra is a muscular tube, 3 to 4 cm in length, lined proximally with transitional epithelium and distally with stratified squamous epithelium. It is surrounded mainly by smooth muscle. **The striated muscular urethral sphincter, which surrounds the distal two-thirds of the urethra, contributes about 50% of the total urethral resistance and serves as a secondary defense against incontinence.** It is also responsible for the interruption of urinary flow at the end of micturition.

The two posterior pubourethral ligaments provide a strong suspensory mechanism for the urethra and serve to hold it forward and in close proximity to the

lithotomy position, the test should be repeated with the patient in a standing position.

Cotton Swab (Q-Tip) Test

This test determines the mobility and descent of the urethrovaginal junction on straining and allows differentiation from anterior vaginal laxity alone. With the patient in the lithotomy position, the examiner inserts a lubricated cotton swab into the urethra to the level of the urethrovaginal junction and measures the angle between the cotton swab and the horizontal. The patient then strains maximally, which produces descent of the urethrovaginal junction. Along with the descent, the cotton swab moves, producing a new angle with the horizontal. **The normal change in angle is up to 30 degrees. In patients with pelvic relaxation and SUI, the change in cotton swab angle ranges from 50 to 60 degrees or more (Figure 23-5).**

Postvoid Residual (PVR) Test

This test determines how well the patient empties her bladder. Within 10 minutes of voiding into the toilet, a catheter is introduced into the bladder to see how much urine is left behind. This can also be determined noninvasively by ultrasound. **Less than 50 mL is con-**

sidered normal. This determination of PVR is helpful in diagnosing the cause of the incontinence and in assisting with the formulation of a treatment plan. If a woman has a high PVR, it is important to avoid treatments that interfere further with emptying or that increase bladder outlet resistance or obstruction.

Urethroscopy

Urethroscopy allows the physician to examine inside the urethra, urethrovaginal junction, bladder walls, and ureteral orifices. This procedure is useful to detect bladder stones, tumors, diverticula, or sutures or mesh from prior surgeries.

Cystometry

Cystometry consists of **distending the bladder with known volumes of water and observing pressure changes in bladder function during filling.** The most important observation is the presence of a detrusor reflex and the patient's ability to control or inhibit this reflex.

The first sensation of bladder filling should occur at volumes of 150 to 200 mL. The critical volume (400 to 500 mL) is the capacity that the bladder musculature tolerates before the patient experiences a strong

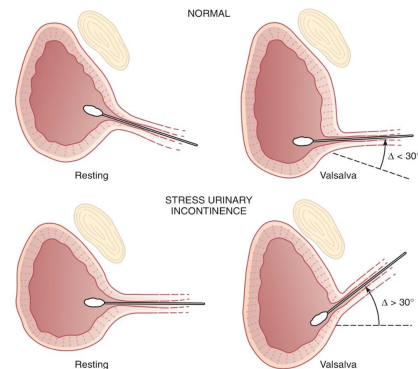


FIGURE 23-5 Diagrammatic representation of the Q-tip (cotton swab) test showing mobility of the urethrovaginal junction in a continent patient and in a patient with stress urinary incontinence.

pubis under conditions of stress. They extend from the lower part of the pubic bone to the urethra at the junction of its middle and distal thirds.

INNERVATION

The lower urinary tract is under the control of both parasympathetic and sympathetic nerves. **The sympathetic fibers originate in the sacral spinal cord segments S2 through S4.** Stimulation of the pelvic parasympathetic nerves and administration of cholinergic drugs cause the detrusor muscle to contract. Anticholinergic drugs reduce vesical pressure and increase bladder capacity.

The sympathetic fibers originate from thoracolumbar segments (T10-L2) of the spinal cord. The sympathetic system has α - and β -adrenergic components. The β -fibers terminate primarily in the detrusor muscle, whereas the α -fibers terminate primarily in the urethra. α -Adrenergic stimulation contracts the bladder neck and the urethra and relaxes the detrusor muscle. β -Adrenergic stimulation relaxes the urethra and the detrusor muscle. **The pudendal nerve (S2-S4) provides motor innervation to the striated urethral sphincter.**

FACTORS INFLUENCING BLADDER BEHAVIOR

Sensory Innervation

Afferent impulses from the bladder, trigone, and proximal urethra pass to the S2 through S4 levels of the spinal cord by means of the pelvic hypogastric nerves. The sensitivity of these nerve endings may be enhanced by acute infection, interstitial cystitis, radiation cystitis, and increased intravesical pressure. The latter may occur in the standing or bending-forward position or in association with obesity, pregnancy, or pelvic tumors. Inhibitory impulses, probably relayed by the pudendal nerve, also pass to S2 through S4 following mechanical stimulation of the perineum and anal canal. Their passage may explain why pain in this region can cause urinary retention or urgency and frequency.

Central Nervous System

In infancy, the storage and expulsion of urine are automatic and controlled at the level of the sacral reflex arc. Later, connections to the higher centers become established, and by training and conditioning, this spinal reflex becomes socially influenced so that voiding can be voluntarily accomplished. Although organic neurologic diseases may interrupt the influence of the higher centers on the spinal reflex arc, patterns of micturition may also be profoundly altered by mental, environmental, and sociologic disturbances.

CONTINENCE CONTROL

The bladder must store and hold urine painlessly and then, in the appropriate social setting, empty urine effectively. The normal bladder holds urine because

the intraurethral pressure exceeds the intravesical pressure. The pubourethral ligaments and surrounding endopelvic fascia support the urethra so that abrupt increases in intraabdominal pressure are transmitted equally to the bladder and proximal third of the urethra, thus maintaining a pressure gradient between the two structures. In addition, a reflex contraction of the levator ani compresses the mid-urethra, decreasing the likelihood of urine loss.

Stress Urinary Incontinence

Stress urinary incontinence (SUI) is involuntary leakage of urine in response to physical exertion, sneezing, or coughing.

ETIOLOGY

The most commonly accepted theory for the pathogenesis of SUI is urethral hypermobility due to vaginal wall relaxation that displaces the bladder neck and proximal urethra downward. When this occurs, increased intraabdominal pressure caused by coughing, sneezing, or physical exertion is no longer transmitted equally to the bladder and proximal urethra. The normal urethral resistance is overcome by this increased bladder pressure, and leakage of urine results.

The second possible mechanism is intrinsic sphincter deficiency whereby the urethra fails to close in response to increases in intraabdominal pressure. This cause of SUI is analogous to having a leaky "valve" in the urethra.

Factors that contribute to SUI include childbearing, previous urogenital surgery or trauma, pelvic radiation, estrogen deficiency (menopause), and medications, such as diuretics and α -adrenergic blockers.

PELVIC EXAMINATION

Inspection of the vaginal walls should be performed with a single-blade speculum, which allows optimal visualization of the anterior vaginal wall and urethrovaginal junction. Scarring, tenderness, and rigidity of the urethra from previous vaginal surgeries or pelvic trauma may be indicated by a scarred anterior vaginal wall. Because the distal urethra is estrogen-dependent, the patient with urogenital atrophy also has atrophic urethritis.

DIAGNOSTIC TESTS AND PROCEDURES

Cough Stress Test

The patient is examined with a full bladder in the lithotomy position. While the physician observes the urethral meatus, the patient is asked to cough. SUI is present if short spurts of urine escape simultaneously with each cough. A delayed leakage, or loss of large volumes of urine, suggests uninhibited bladder contractions. If loss of urine is not demonstrated in the

desire to urinate. At this point, if the patient is asked to void, a terminal contraction may appear and is seen as a sudden rise in intravesical pressure. **At the peak of the contraction, the patient is instructed to inhibit this reflex (indicated by arrows in Figure 23-6, A and B).** A healthy person should be able to inhibit this detrusor reflex and thereby bring down intravesical pressure

(see Figure 23-6, A). In patients with urologic or neurologic abnormalities, the detrusor reflex may appear without the specific instruction to void, and the patient cannot inhibit it (see Figure 23-6, B). This observation is referred to as an **uninhibited detrusor contraction.** Other terms for this disorder include **overactive bladder, detrusor hyperreflexia, irritable bladder, unstable bladder, and uninhibited neurogenic bladder.**

These cystometric procedures allow differentiation between patients who are incontinent as a result of uninhibited detrusor contraction and those who have SUI. Conversely, the hypotonic bladder accommodates excessive amounts of gas or water with little increase in intravesical pressure, and the terminal detrusor contraction is absent when the patient is asked to void (see Figure 23-6, C). The hypertonic bladder is a result of either neurologic disorders or fibrosis of the bladder secondary to inflammation or radiation.

Urethral Pressure Measurements

A low urethral pressure may be found in patients with SUI, whereas an abnormally high urethral closing pressure may be associated with voiding difficulties, hesitancy, and urinary retention.

Urethral function can be evaluated with cystometric testing. The urethral closing pressure profile is a graphic record of pressure along the length of the urethra. The urethral closing pressure normally varies between 50 and 100 cm H₂O. A Valsalva maneuver and/or an abdominal leak point pressure less than 60 cm H₂O or a urethral closure pressure of less than 20 cm H₂O are suggestive of the diagnosis of **intrinsic sphincter deficiency (ISD).**

Uroflowmetry

Uroflowmetry is performed to record rate of urine flow through the urethra when the patient is asked to void spontaneously.

Voiding Cystourethrography

In this radiologic investigation, fluoroscopy is used to observe bladder filling, the mobility of the urethra and bladder base, and the anatomic changes during voiding. The procedure provides valuable information regarding bladder size and the competence of the bladder neck during coughing. It may detect any bladder trabeculation; vesicoureteral reflux during voiding; funneling of the bladder neck, bladder, or urethral diverticula; and outflow obstruction.

Complex Urodynamics

This combination of tests includes a cystometric, urethral pressure profile and flow study, a Valsalva leak point pressure reading, and an electromyogram. Complex urodynamics should be reserved for patients with severe incontinence, those who have had prior surgery for incontinence, or patients whose condition

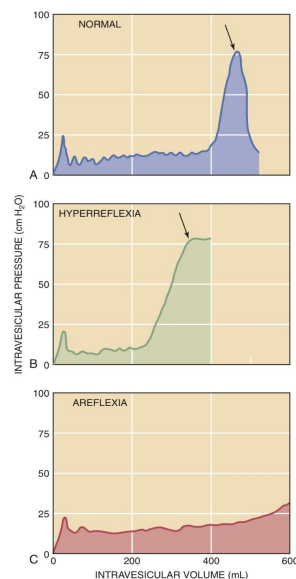


FIGURE 23-6 Water cystometry in a healthy patient (A), a patient with detrusor hyperreflexia (B), and a patient with detrusor areflexia (hypotonic bladder) (C). Arrows in A and B indicate peak of bladder contraction.

Reference

has been refractory to all conservative treatment. Patients with simple stress incontinence do not usually benefit from extra testing, unless their prior surgery has failed.

Other Imaging

By performing real-time or sector ultrasonography, information can be obtained about the inclination of the urethra, flatness of the bladder base, and mobility and funneling of the urethrovesical junction, both at rest and with a Valsalva maneuver. In addition, bladder or urethral diverticula may be identified.

Videourodynamics incorporate fluoroscopy with concurrent measurement of bladder and urethral pressures. **Dynamic magnetic resonance imaging (MRI)** studies are used to detect pelvic floor and relaxation defects in patients with incontinence.

SUMMARY

For a significant percentage of patients with SUI, a good history and physical examination, the cotton swab test, and the cough stress test are adequate investigations. The addition of uroflowmetry, cystourethroscopy, and cystometry are appropriate when more detailed information is needed for diagnosis and treatment. Additional urodynamic, electromyographic, electrophysiologic, and radiologic studies may be necessary in patients with a history of multiple previous surgeries for urinary incontinence and for patients with associated neurologic disease.

TREATMENT

Medical Therapy

In postmenopausal women with incontinence, **estrogens improve urethral closing pressure, vaginal epithelial thickness and vascularity, and reflex urethral function although paradoxically, estrogen has not been shown to reduce loss of urine.** α -Adrenergic stimulants, such as phenylpropanolamine or pseudoephedrine, may enhance urethral closure and improve continence, but they are unproven in placebo-controlled trials. The search for an effective medication to treat SUI is ongoing.

Physical Therapy

Pelvic floor muscle exercises, also known as Kegel exercises, constitute a proven first-line therapy to improve or cure mild to moderate forms of SUI. These exercises involve instructing a woman with SUI to tighten her pelvic muscles repeatedly over time. When performed correctly, the Kegel technique leads to stronger pelvic floor muscles and decreased urethral hypermobility. The exercises require diligence and a willingness to practice at home and/or at work. Some women find them difficult, fatiguing, or time-consuming, but when they are performed diligently, about 80% of women report decreased episodes of

incontinence. **Kegel exercises before and after delivery may help patients with postpartum urinary incontinence.**

Intravaginal Devices

Larger sizes of pessaries (see Figure 23-5) have been used to elevate and support the bladder neck and urethra. They have been shown to be effective for SUI. Some are designed to give added support to the urethra.

Surgical Therapy

Surgery is the most successful and expeditious treatment for SUI. The aim of all surgical procedures is to correct the pelvic relaxation defect and to stabilize and restore the normal supports of the urethra. The approach may be vaginal or abdominal, or a combined abdominovaginal approach may be used.

ABDOMINAL APPROACH. Abdominal retropubic urethroplasty has a long-term success rate of 80%. The **retropubic urethroplasty is performed extraperitoneally (in the space of Retzius) by placing sutures in the fascia lateral to and on each side of the bladder neck and proximal urethra and elevating the vesicourethral junction by attaching the sutures to the symphysis pubis (Marshall-Marchetti-Krantz procedure) or to the Cooper ligament (Burch procedure).**

Postoperatively, a transurethral or suprapubic catheter is left in the bladder for continuous bladder drainage for 48 to 72 hours before instituting spontaneous voiding. Some patients (20-30%) may need prolonged postoperative bladder drainage (more than 7 days). Occasionally, a patient may develop osteitis pubis after the Marshall-Marchetti-Krantz procedure.

The recent popularity of operative laparoscopy for many gynecologic procedures has resulted in the use of the laparoscope for bladder neck suspension procedures. When the laparoscopic procedure is performed by placing two sutures on each side of the bladder neck, the long-term success is similar to that achieved with the open abdominal approach for retropubic urethroplasty. Figure 23-7 illustrates the suture placement for a typical retropubic urethroplasty.

VAGINAL APPROACH. Suburethral sling procedures have long been used to treat patients whose condition has been refractory to therapy or patients with severe SUI. Conventional slings often required harvesting a patient's own fascial tissue to be placed under the bladder neck, but their effectiveness has been plagued by high rates of urinary retention.

The **tension-free synthetic (polypropylene) mesh placed at the level of the mid-urethra** was introduced into the United States from Sweden in the late 1990s. The tension-free vaginal tape was developed as a minimally invasive technique, and **traditionally a mid-urethral sling has been placed retropubically. A**

BOX 23-1

TYPES OF URINARY INCONTINENCE

- Stress Urinary Incontinence (SUI)
 - Involuntary leakage of urine in response to physical exertion, sneezing, or coughing
 - Etiology: Urethral hypermobility due to vaginal wall relaxation displacing the bladder neck and proximal urethra downward; intrinsic sphincter deficiency (leaky valve)
 - Contributing factors include childbearing, previous urogenital surgery, trauma, pelvic radiation, estrogen deficiency, and medications (e.g., diuretics and α -adrenergic blockers)
 - Diagnosis: Cotton swab (Q-tip) and cough stress tests; additional urodynamic testing in appropriate women
 - Treatments: Retropubic urethroplasty, urethral sling procedure, and bulking injection procedures (see Figures 23-8 through 23-10)
- Overflowing Bladder (OAB)/Urge Urinary Incontinence (UUI)
 - Both terms (OAB and UUI) are used interchangeably; both describe problems with bladder control associated with a strong desire to urinate with decreased ability to control flow
 - Etiology: Poorly understood; risk factors include older age, chronic disorders, pregnancy, menopause (estrogen deficiency), operative trauma, medications (e.g., diuretics and psychotropic agents), and smoking
 - Diagnosis: Unstable bladder as demonstrated during urodynamic testing

TREATMENT

The optimal treatment of OAB starts with behavior modification (see below). Pharmacologic and physical interventions, such as electrical stimulation, can be added as needed. Identification of any dietary triggers, such as caffeine, alcohol, acidic or spicy foods, or carbonated beverages, is important. The use of a self-report bladder diary can be helpful for obtaining this information.

Behavior Modification

Reducing fluid intake and avoiding liquids during the evening hours are good initial behavior changes. Gradually increasing the intervals between voidings, as well as pelvic floor muscle strengthening exercises, such as **Kegel exercises**, are effective for attaining better bladder control.

Pharmacologic Treatment

Antimuscarinics, or anticholinergics, have become the mainstay of drug treatment for OAB. They work by suppressing uninhibited bladder contractions.

Current drug therapies include **oxybutynin chloride (Ditropan)** and **tolterodine (Detrol)**. Oxybutynin chloride has been shown to improve symptoms of

Treatments: Behavior modification first, then add medications, Botox injections, or neuromodulation

Overflow Urinary Incontinence (OUI)

- Urinary retention and OUI may result from detrusor areflexia or a hypotonic bladder
- Etiology: Lower motor neuron disease, spinal cord injury, neuropathy due to diabetes mellitus, or outflow obstruction
- Diagnosis: Symptoms of bladder fullness, pressure, and frequent urination
- Treat the underlying causes if possible; intermittent or continuous bladder drainage (suprapubic catheter)

Mixed and Other Urinary Incontinence

- Some women may have signs and symptoms of both SUI and OAB; fistulas are an uncommon cause of incontinence in countries where modern obstetric care is available
- Etiology: For mixed incontinence, the causes are the same as for SUI and OAB; in developed countries, fistulas usually result from surgical injuries
- Diagnosis: The diagnosis of mixed incontinence can be challenging and inconsistent; incontinence from fistulas presents as painless leakage of urine from the vagina
- Treatment: A combination of treatments for SUI and OAB is usually initiated; fistulas may heal spontaneously or with estrogen cream, but surgical repair is usually necessary (e.g., muscle flap or diversion procedure)

urinary urgency in approximately 70% of patients. **Tolterodine** also has anticholinergic activity. Because of its bladder specificity, **tolterodine has a more favorable side effect profile than oxybutynin.** It is also dosed less frequently, which improves patient compliance. Both are available in immediate-release and long-acting formulations. Oxybutynin is also available for delivery in a transdermal patch.

Trospium chloride, solifenacin, and darifenacin are newer agents used in the treatment of OAB. All significantly improve OAB symptoms compared with placebo. Evidence suggests that side effect profiles will be similar to or lower than those of the less specific antimuscarinics.

Mirabegron, the most recent agent, is a β_3 -adrenergic agonist that aids in the storage of urine by assisting relaxation of the detrusor muscle.

Imipramine hydrochloride is a tricyclic antidepressant that acts through its anticholinergic properties to increase bladder storage. The drug improves bladder compliance rather than counteracting uninhibited detrusor contractions. It is given in doses lower than those recommended for use as an antidepressant. It also blocks postsynaptic norepinephrine uptake and thereby increases bladder outlet resistance. With its

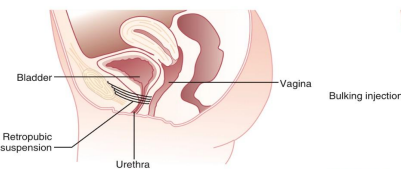


FIGURE 23-7 Illustration of a typical retropubic urethroplasty with suture placement.

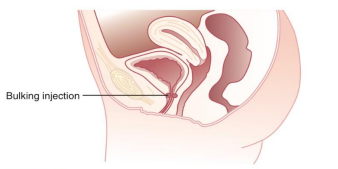


FIGURE 23-9 Illustration of the bulking injection procedure for urethral hypermobility.

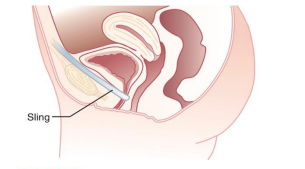


FIGURE 23-8 Illustration of a mid-urethral sling procedure.

variation is the **transobturator approach.** Rather than using a retropubic passage. In this approach the sling is passed through the obturator foramen laterally. The potential advantage of this approach is a reduction in bladder, bowel, or vascular injury. **The retropubic mid-urethral sling has better success rates than the trans-obturator sling when there is sphincter compromise as well.** The success rate of both approaches is about 85-90%. Another variant of the mid-urethral sling is the **one-incision sling or minisling.** These small lengths of polypropylene mesh are attached to the obturator fascia with small tissue hooks. Although there are fewer complications with this approach, it is somewhat less effective.

The mid-urethral sling is now considered a gold standard for the treatment of SUI. It is the most studied procedure in the history of randomized controlled surgical trials. Figure 23-8 is an illustration of a mid-urethral sling procedure for patients with SUI.

Bulking Injections

Conventional surgical procedures for incontinence sometimes fail in patients with a diagnosis of **urethral ISD.** ISD is a subtype of SUI marked by a very poorly functioning urethral sphincter. These patients are

treated with a suburethral sling procedure or **peri- or transurethral bulking injections** to improve urethral function. A commonly used bulking material is **nonabsorbable calcium hydroxylapatite,** which is nontoxic, nonantigenic, and unlikely to degrade. Figure 23-9 illustrates the bulking injection procedure for the ISD form of SUI.

Overactive Bladder/Urge Urinary Incontinence

The terms overactive bladder (OAB) and urge urinary incontinence (UUI) are often used interchangeably to describe a problem with bladder control that is associated with a strong desire to pass urine with a decreased ability to control it. UUI is defined as the involuntary leakage of urine accompanied by or immediately preceded by urgency. UUI can be associated with small losses of urine between normal micturitions or large volume losses with complete bladder emptying. **OAB, previously described as UUI associated with detrusor muscle instability, is a more descriptive, symptom-based term that more accurately encompasses the common clinical presentation.** **OAB is defined as "urgency, usually with but sometimes without urge incontinence and with frequency and nocturia."** OAB has become the preferred term as it comprises symptoms of urgency, UUI, frequency, and nocturia.

The incidence of OAB increases with age and is approximately 30% in the geriatric patient population. **In most patients, the exact etiology of OAB remains unknown,** but a number of risk factors (Box 23-1) are associated with its development.

Classically, women with OAB describe a sudden, strong urge to urinate with an inability to suppress the feeling, rushing to the bathroom, and experiencing leaking before making it to the toilet. Awakening several times a night to urinate is also a prominent feature (nocturia).

dual action, **imipramine may be effective in patients with mixed incontinence (both SUI and OAB).** It should be taken in the evening, as it may be sedating, and it should be used with caution in elderly patients because of its potential to cause orthostatic hypotension.

Functional Electrical Stimulation

Functional electrical stimulation offers an alternative for treating stress or urge incontinence when other treatments fail. A vaginal or rectal probe is inserted, usually twice daily for 15 to 30 minutes, to provide electrical stimulation to the pelvic floor muscles or to the nerves to these structures. Stimulation of the afferent fibers of the pudendal nerve can produce contractions of the pelvic floor and periurethral skeletal muscles, improving their tone and function in women with SUI.

Posterior Tibial Nerve Stimulation

Posterior tibial nerve stimulation (PTNS) involves the placement of an acupuncture-like needle into the posterior tibial nerve near the ankle and the application of electrical stimulation to this site. It is a form of neuromodulation that may reduce OAB symptoms with 3 to 4 months of treatment.

Sacral Stimulation (InterStim Device)

In appropriate patients, an implantable device used to stimulate the sacral nerve directly in the spine is effective for the treatment of OAB (or fecal incontinence).

Botulinum Toxin A Injection

Botulinum toxin A (Botox) can be injected into the bladder submucosa and detrusor muscle for 6 to 9 months of relief from OAB. It is as efficacious as other medications, has far fewer side effects, and gives longer benefit. **Cost-effectiveness studies show it to be more beneficial than oral medication.**

Overflow Incontinence

Urinary retention and overflow incontinence may result from detrusor areflexia or a hypotonic bladder, as is seen with lower motor neuron disease, spinal cord injuries, or autonomic neuropathy (diabetes mellitus). These patients are best managed by intermittent self-catheterization.

Overflow incontinence may also occur when there is an outflow obstruction. Straining to void, poor stream, retention of urine, and incomplete emptying may indicate an obstructive disorder. **Overdistention of the bladder because of unrecognized urinary retention may occur in the postoperative period.** This is a temporary problem related to postoperative pain and may be managed by continuous bladder drainage by catheter for 24 to 48 hours.

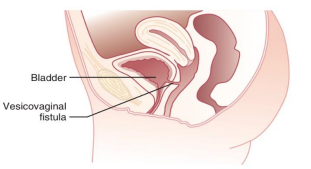


FIGURE 23-10 Illustration of a typical vesicovaginal fistula.

Urinary Fistulas

Fistulas are an uncommon cause of urinary incontinence in developed countries, because obstetric injuries, once the leading cause of urinary fistulas, have almost disappeared. When they do occur, they usually result from **operative deliveries (e.g., forceps)** rather than from neglected labor and pressure necrosis. **Obstetric fistulas remain a tremendous source of social and physical distress in developing countries.**

Pelvic surgery, irradiation, or both now account for 95% of the vesicovaginal fistulas in the United States. More than 50% occur following simple abdominal or vaginal hysterectomy (Figure 23-10). Approximately 1-2% of radical hysterectomies are followed in 10 to 21 days by a urinary fistula that is usually **ureterovaginal.** These fistulas are usually caused by devascularization of the ureter rather than by direct injury. Of all approaches to hysterectomy, vaginal hysterectomy has the lowest incidence of urinary tract injury.

Uterovaginal fistulas generally occur as complications of surgery for urethral diverticula, anterior vaginal wall prolapse, or SUI. Urethral diverticula are rare, can cause incontinence, and are best diagnosed by MRI.

DIAGNOSIS OF A FISTULA

The usual history of painless and continuous vaginal leakage of urine soon after pelvic surgery is strongly suggestive of a fistula. **Instillation of methylene blue dye into the bladder will disclose a vaginal tampon or pack if a vesicovaginal fistula is present.** **Intravenous indigo carmine is excreted in the urine and will disclose a vaginal tampon or pack in the presence of a vesicovaginal or ureterovaginal fistula.** In addition, cystourethroscopy should be performed to determine the site and number of fistulas. The majority of posthysterectomy vesicovaginal fistulas are located just anterior to the vaginal vault. **A computed tomographic (CT) scan with contrast dye or a retrograde pyelogram should be obtained to localize a ureterovaginal fistula.**

Reference

FISTULA REPAIR

Most obstetric fistulas can be repaired immediately on detection. For postsurgical fistulas, it is usual to wait some weeks to allow the inflammation to resolve. During this waiting period, UTIs should be treated and estrogen therapy instituted in postmenopausal women. **Steroids have been advocated to hasten resolution of inflammatory changes and allow early surgical intervention. Their use in this circumstance is controversial. Bladder rest with a Foley catheter, with or without tissue glue, may be effective in resolving isolated, small vesicovaginal fistulas. The majority of cases require surgical repair.**

Vesicovaginal Fistula

The **vaginal approach (Latzko operation)** is the procedure of choice. A **bulbocavernosus muscle flap or fat pad (Martius graft)** may be interposed between the bladder and vagina to provide support, vascularity, and strength to the suture line, especially in patients who have had multiple previous attempted repairs and in those with a **postradiation fistula**. Large radiation-induced fistulas may necessitate urinary diversion.

Ureterovaginal Fistula

Treatment of a ureterovaginal fistula depends on its size and location. **Small fistulas usually close spontaneously after placement of a ureteric stent (double J), provided the tissues have not been irradiated.**

If the fistula is close to the ureterovesical junction, the ureter proximal to the fistula can be reimplanted into the bladder (**ureteroneocystostomy**). If the fistula is several centimeters from the bladder, a **Boari flap** may be useful, a **segment of ileum may be interposed** between the proximal ureter and the bladder, or, rarely, a **transureteroureterostomy** may be employed.

Pelvic Floor Pain Syndromes

PAINFUL BLADDER SYNDROME

Painful bladder syndrome (PBS) refers to the continuum of lower urinary tract symptoms of discomfort that begin with mild OAB and end with interstitial cystitis. **PBS includes the following symptoms and signs: bladder pain, frequency, urgency, nocturia, dysuria,**

dyspareunia, and a feeling of incomplete bladder emptying, all in the absence of detectable infection or anatomical abnormality.

Diagnosis is based on a careful history and physical examination to localize the pain in the bladder and urethra, negative urine cultures, and otherwise nondiagnostic cystourethroscopic and urodynamic studies. One theory of causation is a defect in the waterproof mucopolysaccharide lining of the bladder that allows caustic urine to seep into the submucosal tissue, causing inflammation and pain.

Treatment of PBS, starting with bladder training and behavior management, **includes pentosan polysulfate sodium (Elmiron)**, an oral form of heparin; **hydroxyzine**, an oral antihistamine and anti-inflammatory agent; and **amitriptyline (Elavil)**, a potent agent for treating neuropathy. When women are not responding, an intravesical combination of heparin, lidocaine, and sodium bicarbonate may be instilled weekly for relief, in addition to the oral agents listed above. Urethritis, which is usually caused by an infection with *Mycoplasma* or *Ureaplasma* species, may contribute to pelvic floor pain. This infection can be treated with 2 weeks of tetracycline or erythromycin after cultures have been obtained.

MYOFASCIAL PELVIC PAIN SYNDROME

Myofascial pelvic pain syndrome (MFPPS) is most likely a reaction of pelvic floor tissues to the other causes of pelvic floor pain mentioned above. The **muscles of the pelvis that form the basket containing the pelvic organs react with chronic contraction and spasm to pain from other causes, resulting in more pain.** MFPPS is diagnosed on the basis of physical examination by identifying a painful reaction when the levator and lateral obturator muscles, along with the anterior retropubic attachments of the pubourethral ligaments, are palpated. This condition can cause severe pain at trigger points. **The pain and spasm can interfere with defecation or voiding. The treatment includes medications such as amitriptyline, gabapentin, duloxetine, or specialized transvaginal physical therapy. Intramuscular injection of botulinum toxin A is also effective in stopping the spasm in some cases.** The prognosis for relief of pain is good with appropriate treatment.



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Good Luck!



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