

OBSTETRICS AND GYNECOLOGY

Urinary Incontinence

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Objectives:

Not given ☹

Basic Anatomy of the Lower Urinary Tract (LUT) in women

- The LUT composed of the Bladder and Urethra in a functional unit serving the two purposes of storage and voiding during the micturition cycle. (LUT stated in the pelvis neighboring the genital tract vagina, uterus, ovaries, rectum and anus)
- These structures are supported by the pelvic floor.

The Urinary Bladder

- **Is a hollow, muscular organ which:**
 - Acts as a compliant reservoir for urine
 - It comprises the Bladder wall & Bladder cavity in which urine collects.

Bladder wall is composed of several layers

1) The Detrusor: (The main layer)

Is a complex network of smooth muscle fibers and elastic tissue → which allows the bladder to expand without pressure during bladder fillings and is → responsible for bladder contraction during voiding.

The Trigone → is a small muscular triangular area, lying at the posterior wall of the bladder, next to the bladder neck.

>> Functions to prevent reflux of urine to the upper urinary tract during voiding.

>> The two ureters enter the bladder at the superior angles of the trigone.

>> At the lower most apex of trigone is the opening of the bladder through the bladder neck to the Urethra.

2) Urothelium:

- The epithelial lining of the detrusor
- Is smooth at trigone and folded into rugae on the the rest of the bladder when empty.

The Urethra and Sphincters:

- The female urethra is a fibro-muscular tube ~3.5 cm long.
- Consists of outer layer of **striated muscle fibers** (continuation of the pelvic floor muscles), and an inner layer of smooth muscle fibers, lined by the **mucosa, submucosal vessels & connective tissues**.

1) The Urethral Sphincters:

Two mechanisms to control urine flow in women:

A. The smooth muscle sphincter: (Bladder neck & proximal urethra).

- Is a physiological but not anatomical sphincter
- Under involuntary control
- keeps the bladder and upper urethra closed during the storage phase. (During storage when the bladder is fill with urine it's not supposed to leak till you're ready to void, which is called micturition, but if it's involuntary it's called incontinence.)

B. The Striated Sphincter:

Striated musculature, which is part of the outer wall of proximal urethra (**intrinsic sphincter**) + bulky skeletal muscle group lateral to the urethra at the level of the middle segment in female (**extrinsic sphincter**).

2) Mucosa and submucosa:

- Urothelium lining the urethra
- Beneath is a vascular plexus >> helps form watertight seal

Pelvic floor

The pelvic organs are supported & maintained in the correct position by the "Pelvic Floor"

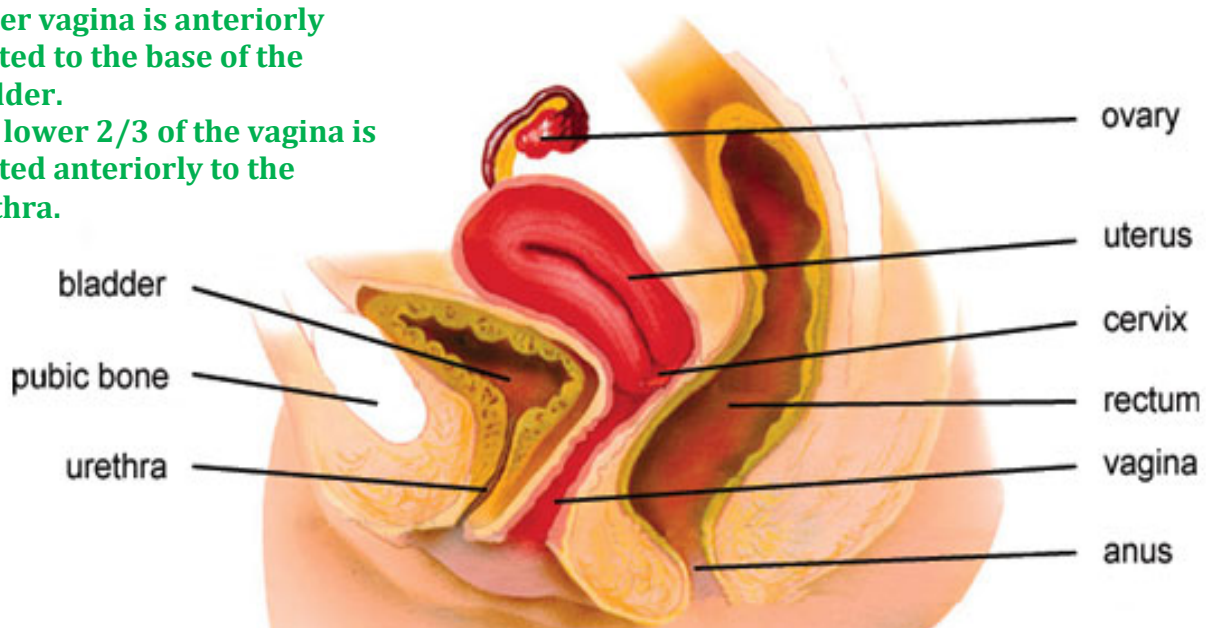
- This is mainly composed of the **LEVATOR ANI** group of muscles.
- Lined by the **Endopelvic fascia**, which is a continuous mass of tissue with various thickened parts
- The largest being the **arcus tendineus fascia pelvis**.
- The endopelvic fascia attaches the vagina to the **pelvic sidewall**.
(Any weakness in those structures result in prolapse.)

➤ Urogenital hiatus:

- ❖ The opening within the **levator ani** muscles through which the urethra and vagina pass.
- ❖ **The constant** activity of levator ani muscle (like that of postural muscle) >>closes the lumen of the vagina eliminating any opening within the pelvic floor.
- ❖ The interaction between the pelvic floor muscles and supportive ligaments is critical for pelvic organs support.
- ❖ Although the ligaments can sustain the load of the pelvic organs for a short period of time, they ultimately fail to hold the vagina in place if they are not assisted by the pelvic floor muscle musculature.
- ❖ This happens when the muscles are damaged or paralyzed.

Upper vagina is anteriorly related to the base of the bladder.

The lower 2/3 of the vagina is related anteriorly to the urethra.



The uterus is anteverted anteflexed in position and it's held in this position by the round ligament. The uterus can't be seen in vaginal examination only it can be felt.

All pelvic organs are held in position by the pelvic floor muscles and cardinal ligament.

PHYSIOLOGY MICTURITION CYCLE

❖ The micturition cycle is composed and alternate between:

- 1) Storage phase
- 2) Voiding phase

❖ A normal micturition cycle requires a coordination and adequate interplay between the **Reservoir** and **Outlet Functions** of the LUT structures including:

- 1) The detrusor muscle
- 2) The urethral smooth muscle
- 3) The striated urethral sphincter
- 4) The pelvic floor muscles (PFM)

1) Filling and Storage:

Bladder accommodation during filling is primarily a passive phenomenon.

- ❖ It depends on the Elastic Passive Phenomenon dependent on the **elastic** properties and viscoelastic properties of the bladder wall and an increase in the outlet **resistance** by the striated sphincter. (The bladder can accommodate up to 500ml)
- ❖ **Continence** is maintained during increases in intra abdominal pressure by the intrinsic competence of the bladder outelet (bladder neck and proximal / mid urethra) and the pressure transmission ratio to this area with respect to the intravesical contents.

2) Emptying and voiding:

Can be voluntary Or involuntary

- ❖ Involves inhibition of the spinal **somatic** and **sympathetic reflexes** and activation of the vesical **parasympathetic** pathways, the organizational center (brain stem).
- ❖ Initially there is **relaxation of the outlet** musculature mediated by cessation of somatic sympathetic spinal reflex.
- ❖ **Contraction** of the bulk of the bladder smooth musculature occurs through a highly coordinated parasympathetic input.
- ❖ With amplification and facilitation of the detrusor contraction from other **peripheral reflexes** and from spinal cord supraspinal sources and the absence of anatomical obstruction between the bladder and the urethral meatus
→ → **Complete Emptying** will occur.

Urinary Incontinence

➤ Definition:

- Incontinence is the **involuntary** loss of urine.
- Urine leakage (incontinence) occurs when the **pressure in the bladder** (expulsive force) **exceeds** that **within the urethra** (closure force). (Detrusor muscle is able to accommodate up to 500 cc of urine when the pressure rises).

Classification of UI:

- **Urgency Urinary Incontinence (UUI)** ~22% = involuntary leakage occurs with a strong, sudden, and uncontrollable desire to urinate as result of **involuntary detrusor contraction**.
- **Stress Urinary Incontinence (SUI): (49%)** (The most common) = involuntary leakage on **effort** or exertion or on sneezing or coughing, as a result of **insufficient urethral closure pressure**.
- **Mixed Urinary Incontinence** à 29% = UUI + SUI

(All women in their life will experience an accidental episode of urinary incontinence when they cough, laugh, and sneeze. This is not considered abnormal. Unless it happens frequently with small volume of urine then investigation and treatment will be recommended)

- ❖ The symptomatic definitions can be supported by signs from physical examination:
 - 1) Urine leakage during **stress / cough test**. (Patient is placed in lithotomy position, ask the patient to cough and inspect for any urine leakage).
 - 2) **Urodynamic testing** such as filling cystometry (e.g. involuntary detrusor contractions during the filling phase) (Urodynamic testing demonstrate that the patient has a problem not in the sphincter it's rather somewhere else such as involuntary contraction of the DM during filling phase).

OAB / Overactive bladder:

- Symptoms of urgency with or without urgency incontinence usually with frequency and nocturia.

(Frequency > 8 mict day time)

(Nocturia > 2mict at night)
- UUI and mixed urinary incontinence are only part of the OAB.

(Increase in the fluid intake increase the micturition during the day that is known as frequency but it's not pathological, it's more likely a bad habit).

DETRUSOR OVERACTIVITY (DO)

- Is an **urodynamic observation** characterized by involuntary detrusor contractions during the filling phase.

N.B. - Not all OAB patients show DO

(OAB is a terminology that can be due to DO or it could be due to other problems.)

- DO can be found on urodynamic studies without complaints by the patient of OAB symptoms.

1) Urgency incontinence:

1. Definition:

- **The complaint of involuntary leakage accompanied by / immediately preceded by Urgency.**
 - The symptoms are due to an Overactive Detrusor muscle that contracts inappropriately during the filling phase
 - The symptoms caused by the overactive bladder are typically:
 - Frequency
 - Urgency
 - Urge incontinence
- The incidence of overactive bladder increases with age, about 30% in the geriatric patient population.
- **Frequency** = emptying the bladder more often than 8 times a day.
 - **Urgency** = strong compelling desire to urinate which is difficult to defer.
 - **Nocturia** = Night time frequency which disrupts the sleeping pattern, resulting in tiredness that may affect all aspects of social life.

2. AETIOLOGY: Urge incontinence is mainly secondary to OAB.

A. IDIOPATHIC DETRUSOR OVERACTIVELY

- **Majority of cases**
- **Pathophysiology** of DO is not fully understood / no objective causes are found. However several explanations have been proposed: 1. ↓ Supra pontine inhibition 2. ↑ Afferent activity 3. ↑ Sensitivity of detrusor to Acetyl choline.

B. Neurogenic detrusor overactivity:

- In this case, there is an objective evidence of neurological disease e.g. multiple sclerosis, upper motor neuron lesions, peripheral nerve lesions following pelvic surgery.

2) Stress incontinence:

1. Definition:

- As a result of variable **combination of:**

- Intrinsic urethral sphincter muscle weakness
- Anatomical defect in urethral support

-Leading to insufficient closure pressure in the urethra during physical effort, e.g. lifting, coughing, sneezing, and running.

2. AETIOLOGY: multifactorial

- **Pregnancy Damage** to the **pubendal n.** during childbirth contributing to
- **Vaginal delivery** >> pelvic floor and sphincter **denervation**
- **Pelvic surgery** >> Damage to the **pelvic nerve** (autonomic) during extensive pelvic surgery can deinervate the urethra.
- **Neurological causes** >> central or peripheral neurological **problems** can disrupt the continence mechanism.
- **Lifestyle** >> ↑ abdominal pressure
>> Stretching of perineal muscles
- **Promoting causes** >> Due to mainly aging and co-morbidities.

3) Mixed Urinary Incontinence:

- The complaint of involuntary leakage associated with **urgency** and also with **effort**, exertion, sneezing and coughing

Evulation:

History:

- **Personal detail**
- **Urological Symptoms:**
 - Incontinence symptoms (**detailed hx to differentiate between stress and urgency incontinence**)
 - How often? D/N (**to determine if it's affecting the QoL and the need for tx**)
 - How much urine do you leak? (**To determine the amount of urine if it's drops or the whole underwear will be wet**)
 - Stream / incomplete emptying

➤ **Other associated symptoms:**

- Childhood enuresis Dysuria
- Perineal discomfort / vaginal prolapse (sometimes the UI is associated with prolapse due to the weakened pelvic floor) muscles
- Sexual problem
- Rectal soiling (anal incontinence)

➤ **Quality of life assessment:**

How much does leakage of urine interferes with your everyday life!

0 >> 10 scales
Not at all a great deal

➤ **OBS/GYN HISTORY:**

- Menstrual
- Pelvic Surgeries
- Pregnancy
- Delivery (mode of delivery because vaginal delivery is a risk factor)
- Pelvic radiotherapy (damage to the nerve)

➤ **MEDICAL HISTORY:**

- Chronic cough, constipation Cardiac problem / failure (diuretic intake)
Renal failure Endocrine problem (Ex. DM due to polyuria)
- Neurological problem (Parkinson, multiple) Sclerosis, spinal injury).

➤ **DRUGS:**

- Sedatives
- **Diuretic**, Anticholinergics (induce urinary retention>> no complete bladder emptying>>accumulation of urine>>start to leak and the leakage is not due to DO but it's due to detrouser under activity)
- Anxiolytics, Alcohol, Caffines, Tobacco.

Physical Examination:

To check for aetiological conditions that may contribute to UI and that might affect the choice of treatment.

➤ **General Examination:**

- Ht, & W BMI - Obesity, is a risk factor for UI
- Abdominal exam >> **scars**, distended bladder, masses

(On abdominal examination we check for any fullness. Then on percussion we try to differentiate if it's from a mass in the pelvis (Ex. Fibroid) or urinary bladder distention)

➤ **Neurological exam:** Concentrating on sacral segment

➤ **Perineal/Genital Examination:**

1. Perineal skin for Excoriation and erythema due to incont.
2. **Stress test - cough**
3. Extra urethral incontinence = urine leakage through channels other than urethra e.g. **urogenital fistula** (urethro-vaginal, vesico- vaginal, vesico-uterine).

(Leakage due to a fistula is usually continuous, and it's not associated with cough or urgency, unlike the sphincter problems unless if the fistula is so small)

4. Assess bladder neck mobility, and presence of **pelvic organ prolapse** (POP) especially with cough / strain
5. **Vaginal Exam:** Assess pelvic muscle function for resting tone and pt's ability to perform a pelvic floor contraction
6. **Rectal exam:** Anal tone, pelvic floor function and the consistency of stool.
(Ask the patient to squeeze to assess the tone of pelvic floor muscles).

INVESTIGATIONS:

- 1) **Standard Urine Analysis** / reagent strip to R/O UTI / microscopic hematuria.
 - 2) **Biochemical tests** →→ Renal function →→ Prior to surgery
 - 3) **Postvoid Residue (PVR):** (we ask the patient to empty her bladder and go to bed. Then we introduce a bladder scanner to see if there is any urine remaining in the bladder).
- Ultrasound or catheterization
 - If > 30% of total bladder capacity (50-100 ml) = significant

➤ **Pad test** 1 hr/24 hr test = Quantify urine loss

> **1 g = +ve** >> 1 hr test

> **4 g = +ve** >> 24 hr test

4) Urodynamic test:

The only way to precisely define bladder and urethral function

- Allow characterization of pathophysiological aspects of the various symptoms.
- Help to determine the prognosis and guide choice of therapeutic strategy.

1) Uroflowmetry: =measures urine flow rate = Indicates outlet bladder obstruction

2) Cystometry = Filling >> Voiding

Summary

There are 3 types on UI: stress incontinence, Urgency incontinence, mixed incontinence

-OAB present with frequency, nocturia, urgency with or without incontinence.

-Not all OAB patients show DO.

- Urgency incontinence is mainly secondary to OAB, and it can be idiopathic DO, or Neurological DO.

-Stress incontinence combination: of Intrinsic urethral sphincter muscle weakness and anatomical defect in urethral support. The cause is multifactorial.

- Evulation of UI:

detailed Hx, physical examination including perinal examination, and investigation including Urodynamic test which precisely define bladder and urethral function.

MCQ's:

1. Which one of the following effects of parasympathetic stimulation on the lower urinary tract is true?

- a. Detrusor contraction enhance
- b. Detrusor contraction inhibited
- c. Urethral contraction
- d. Urethral relaxation

2. A 50-year-old woman complains of leakage of urine. After stress urinary incontinence, which of the following is the most common cause of urinary incontinence?

- a. Functional incontinence
- b. Urge incontinence
- c. Unstable urethra
- d. Urethral diverticulum
- e. Overflow incontinence

3. A 78-year-old woman complains of leakage of urine. Which of the following is the most common cause of this condition in patients in this age range?

- a. Anatomic stress urinary incontinence
- b. Urethral diverticulum
- c. Overflow incontinence
- d. Urge incontinence
- e. Fistula

4. A healthy 59-year-old woman with no history of urinary incontinence undergoes vaginal hysterectomy and anteroposterior repair for uterine prolapse, a large cystocele, and a rectocele. Two weeks postoperatively, she presents to your office with a new complaint of intermittent leakage of urine. What is the most likely cause of this complaint following her surgery?

- a. Urethral diverticulum
- b. Overflow incontinence
- c. Rectovaginal fistula
- d. Stress urinary incontinence
- e. Vesicovaginal fistula

Answers

- 1. a.
- 2. b.
- 3. d.
- 4. d.

For mistakes or feedback

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