**Urinary Incontinence**

* The involuntary leakage of urine.
* **It** remains undetected and undertreated worldwide despite its substantial impact on affected individuals (because patients hesitate to seek medical help , or they lack knowledge ).
* prevalence :
  + 20% In older than 65 .
  + 5-10% in younger and middle-aged women .
* Urinary incontinence has profound effects on quality of life and is associated with depression and anxiety, work impairment, social isolation, and sexual dysfunction, it also increases risk of fractures specially in elderly when they rush to bathroom and fall down , persistent moisture in genital area increases risk of infections .
* Urinary problems are either :
  + Emptying disorders
  + Storage disorders (incontinence)
* Urethra in female is 4 cm in length .
* Anatomy of the urinary system:
  + Urethra : Normal urethral closure is maintained by a combination of intrinsic & extrinsic factors .
    - The extrinsic factors >>
      1. The levator ani muscles (include pubococcygeus, iliococcygeus, puborectalis, and coccygeus)
      2. The endopelvic fascia (it also supports middle third of vagina ) , origen >> pubic bone , insertion >> cardinal ligament .this fascia decreases in density as we go near bladder neck , so it inly supports distal part of urethra .
      3. Attachments to the pelvic sidewalls & the vagina .
    - The intrinsic factors >> (in postmenopausal women problem is mainly in intrinsic factors)
      1. the striated muscle of the urethral wall
      2. vascular congestion of the submucosal venous plexus
      3. the smooth muscle of the urethral wall & associated blood vessels
      4. the epithelial coaptation of the folds of the urethral lining
    - There are 2 urethral sphincters :
      * Internal (it is continuation of bladder , smooth muscle fibers , so involuntary under effect of autonomic nervous system , sympathetic causes contraction and parasympathetic “originate from S 2,3,4 “ causes relaxation )
      * External ( skeletal muscles , so its voluntary , under effect of somatic nervous system which is pudendal nerve originate from S 2,3,4 )
  + Bladder : The bladder is a low-pressure system that expands to accommodate increasing volumes of urine without an appreciable rise in pressure .
    - Filling :

During bladder filling, there is an accompanying increase in muscle fiber recruitment of the pelvic floor & urethra → increase in outlet resistance. The bladder muscle (the detrusor) should remain inactive during bladder filling, without involuntary contractions

* + - Micturition:

When the bladder has filled to a certain volume, fullness is registered by tension-stretch receptors, which signal the brain to initiate a micturition reflex → this reflex is permitted or not permitted by cortical control mechanisms, depending on the social circumstances & the state of the patient's nervous system.

* + - Normal voiding is accomplished by voluntary relaxation of the pelvic floor & urethra, accompanied by sustained contraction of the detrusor muscle, leading to complete bladder emptying .
  + Innervations : The lower urinary tract receives its innervation from three sources:

1. The sympathetic nervous system:

* + - * Originates in the thoraco-lumbar spinal cord, principally T11 through L2-L3
      * Acts on two types of receptors:
        + Alpha-receptors → in the urethra & bladder neck → increases urethral tone & thus promotes closure
        + Beta-receptors → in the bladder body → decreases tone in the bladder body

2.  The parasympathetic nervous system:

* + - * Controls bladder motor function — bladder contraction & bladder emptying
      * Originates in the sacral spinal cord, primarily in S2 to S4

3.  The somatic nervous system

* + - * The somatic innervation of the pelvic floor, urethra, & external anal sphincter originates in the sacral spinal cord, primarily in S2 to S4
  + Normally the cortex sends inhibitory signals to bladder to maintain sympathetic effect , so release Norepinephrine  which binds to beta-3 receptors in bladder muscle (detrusor) wall ,this will lead to relaxation of bladder , it also binds to alpha-1 receptors in internal urethral sphincter , which will lead to contraction of this sphincter . it also maintains effect of pudendal nerve on external urethral sphincter , which leads to its contraction .
  + When the bladder reaches maximum capacity , the tension-stretch receptors will be stimulated and send signals to cortex (to see if patient is at appropriate circumstances to urinate) , if yes >> it will stop inhibitory effect on micturation center in pons , stimulate parasympathetic and release acetylcholine , which binds to M3 receptors in bladder muscle , this will lead to detrusor contraction , and relaxation of internal urethral sphincter , it also inhibit pudendal nerve effect and causes relaxation of external urethral sphincter and eventually >> voiding .
* Classification of urinary incontinence : (urethral or extra-urethral causes)

A. Urethral causes :

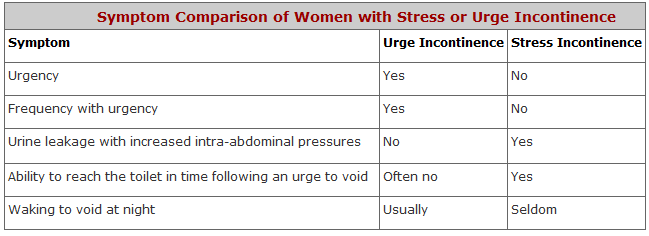
* 1. Stress incontinence “most common”
  2. Urge incontinence
  3. Mixed stress and urge urinary incontinence (Symptoms of urge and stress incontinence)
  4. Overflow incontinence
  5. Functional incontinence

1. Stress incontinence :

* + involuntary leakage of urine that occurs with sneezing, coughing, laughing, or anytime an increase in intra-abdominal pressure exceeds urethral sphincter closure mechanisms
  + Stress incontinence may be provoked by minimal or no activity when there is severe sphincter dysfunction (intrinsic sphincter deficiency ).
  + The only type of incontinence that can be diagnosed clinically (by pressing univalve speculum on posterior vaginal wall “to prevent patient from contracting pelvic floor muscles” while patient in semi sitting position , and ask her to strain or cough , if there is urine leakage from urethra >> Stress incontinence)
  + More in young and middle-aged women .
  + 2 theories explain it :
    - Intrinsic sphincter deficiency
    - Urethral hypermobility (caused by same causes of prolapse eg. vaginal delivery , macrosomic baby , obesity , collagen disorders ) “Pressure-Transmission Theory & hammock theory”
  + Causes
    - Damage of the nerve supply of the pelvic floor , urethral sphincter and damage to pelvic floor muscle during vaginal delivery.
    - Atrophy due to menopause .
    - Chronic raise in intra abd pressure (cough , obesity, constipation)
    - Congenital collagen diseases

2. Urge incontinence:

* + Patient typically have symptoms of involuntary leakage of urine accompanied by urgency (continuous strong desire with minimal amount of urine)
  + Sometimes come with overactive bladder symptoms : urgency , frequency and nocturia .
  + Common triggers include running water, hand washing, and cold weather exposure.
  + Urge incontinence is believed to be caused by detrsuor overactivity.



3. Overflow incontinence :

* + Involuntary, continuous, urinary leakage or dribbling and incomplete bladder emptying.(due to over-distended bladder )
  + It is caused by : impaired detrusor contractility (under-activity) or bladder outlet obstruction (advanced prolapsed , mass , fibroid , cervical tumor , bladder tumor , overcorrected anti-incontinence surgery , pregnancy with retroverted uterus 16-20 weeks) (rare in women)
  + If the bladder is over-distended:
    - An increases in intra-abdominal pressure can force urine past the urethral sphincter, causing stress incontinence
    - In some cases, bladder over-distention may provoke an uninhibited contraction of the detrusor muscle, leading to incontinence.

4. Functional incontinence : (Potentially reversible)

* + Medications ( alpha blockers, ACE inhibitors >> may cause chronic cough, Anti-depressant)
  + Decreased mobility (e.g., post-surgery)
  + Change in cognitive or mental status ( sedation from medications as Morphine & mepredine)
  + Stool impaction
  + Alcohol and caffeine intake
  + Acronym : DIAPPERS (most of them but not all are Potentially reversible )
    - D : delirium
    - I : infection
    - A : atrophy (vaginitis or urethritis )
    - P : pharmacological >>
      * Alpha-blockers (eg. Anti-HTN) , will cause relaxation of internal urethral sphincter
      * Anticholinergics (eg. Antipsychotics , antispasmodics “buscopan” , antihistamines , antiparkinson) , will impair parasympathetic and lead to over-distended bladder >> overflow incontinence .
      * Opioids
      * Sedatives (eg. Benzodiazepines )
      * Alpha1-agonists (eg. Nasal decongestants ) , will cause internal sphincter contraction .
      * Ca channel blockers , will impair detrouser contraction leading to overflow incontinence .
    - P : psychological
    - E : excessive urine output (diabetes insipidus) / endocrine
    - R : restricted mobilization
    - S : stool impaction .
* Causes of urethral incontinence : (dr said its for u only to know)
  + Genitourinary
    - In older women, several physiologic changes occur in the lower urinary tract that can cause incontinence:
    - Involuntary detrusor contractions or overactivity
    - Decreased detrusor contractility
    - Low estrogen levels
    - Decrease in urethral closure pressure
  + Systemic conditions
    - Neurologic disorders: e.g. stroke, multiple sclerosis, Parkinson disease, disc herniation, spinal cord injury…
    - Diabetes mellitus: overflow incontinence and poor urinary stream can be present in patients with diabetic autonomic neuropathy
    - Cancers
  + Others:
    - Interstitial cystitis (painful bladder syndrome).
    - Pelvic organ prolapse (Cystocele)

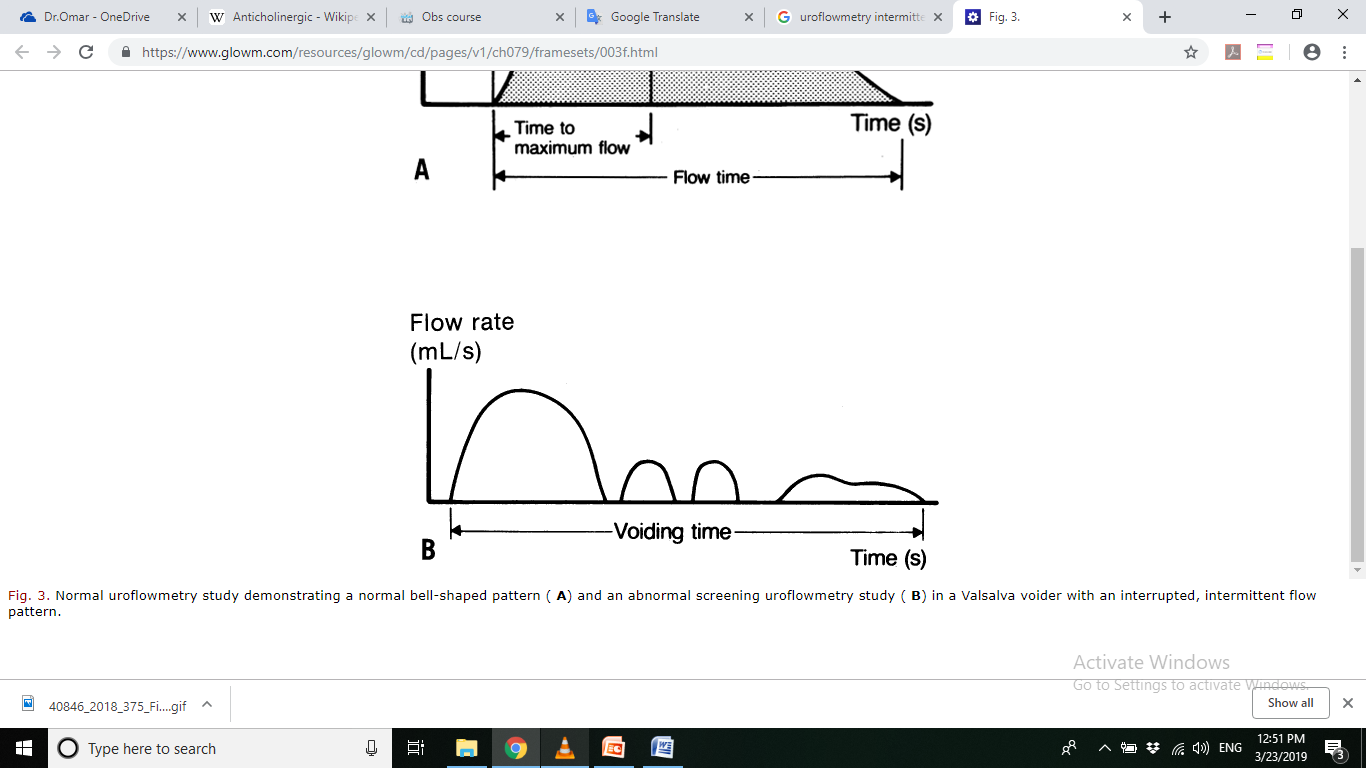
B. Extraurthral causes:

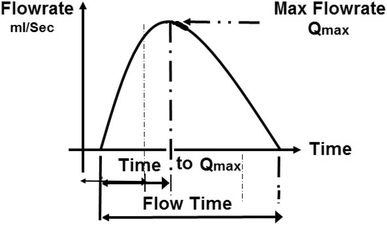
* The observation of urine leakage through channels other than the urethra.
  + Congenital
    - Bladder exstrophy and ectopic ureter
  + Fistula
    - Vesicovaginal fistula “most common” , mostly seen after hysterectomy .
    - Abnormal opening between the urinary tract and the outside
    - It has obstetric and gynaecologycal causes such as obstructed labor , malignancy and radiotherapy
* EVALUATION :
  + History:
    - Patient’s urinary symptoms (volume, onset of incontinence, timing, severity, hesitancy, precipitating triggers, nocturia, intermittent or slow stream, incomplete emptying, continuous urine leakage, and straining to void)
    - Voiding (bladder) diaries// Frequency- volume bladder charts are useful for assessing incontinence frequency, severity, and volume of urine loss during incontinent episodes.
    - Severity of symptoms & degree of bother and effect on quality of life (Questionnaires to assess quality of life and urinary incontinence) :

1- UDI-6: Urogenital Distress Inventory, short form.

2- IIQ-7 : Incontinence Impact Questionnaires, short form.

* + - If there is indications to evaluate for underlying serious causes or potentially reversible conditions. Alarm symptoms on history include:
      * sudden o.nset of incontinence
      * the presence of abdominal or pelvic pain
      * Hematuria
      * changes in gait or new lower extremity weakness,
      * cardiopulmonary or neurologic symptoms
      * mental status changes
    - Other: drug history, constipation, caffeine intake …etc.
  + Physical examination
    - All women presenting with incontinence need a pelvic examination.
    - General look (wheel chair , in pain , pregnant )
    - In addition, a comprehensive examination is often necessary to detect potentially reversible factors and underlying serious conditions
    - The detailed pelvic examination in women includes:
      * Inspect the vaginal mucosa for signs of atrophy (thinning, pallor, loss of rugae), and inflammation
      * Palpate bimanually to evaluate for masses or tenderness.
      * Assess for pelvic organ prolapse: hold the blade firmly against the posterior vaginal wall. Ask the woman to cough once, looking for urethral leakage &/or cystocele.
      * Bladder stress test:  is performed by asking the patient, with a full bladder (while in examination of prolapse bladder should be empty) , to stand, relax, and give a single vigorous cough.
  + Investigations:
    - Urine analysis and culture ( to exclude UTI)
    - Postvoid residual volume (PVR) — In general, a PVR of < 50 mL is considered adequate emptying, and a PVR > 200 mL is considered inadequate and suggestive of either detrusor weakness (overflow incontinence) or bladder outlet obstruction
    - Urodynamic testing: (not done for all patients )
    - group of tests used to assess function of the urinary tract. Some specific types of urodynamic testing are:
      * Cystometry (Cystometrogram) evaluates bladder function by measuring pressure and volume of fluid in the bladder during filling, storage, and voiding.
      * Uroflowmetry measures the rate of urine flow.
    - Clinical evaluation with urodynamics may lead to a more accurate diagnosis of incontinence type .
    - Usually done if patient complains of incontinence but physical exam is –ve , or if patient underwent incontinence surgery and has recurrence .
* Uroflowmetry :
  + Full bladder
  + When patient has urge to urinate start measurements (while she is sitting down )





* Normal Uroflowmetry (bell shaped ) , it measures :
* Intermittent Uroflowmetry (abnormal) :
  + Low Q-max
  + Prolonged voiding time
  + High residual urine
  + Q-max (peak flow rate)
  + Voiding time
  + Total voided urine
  + Residual urine (normally <50 ml

or < 1/3 of total voided urine )

* H
* Cystometry :
  + After patient has voided , put one catheter in bladder (to measure vesicular pressure ) and one in rectum after patient has emptied her bowel (to measure intraabdominal pressure , if patient has constipation put this catheter in vagina )
  + Start filling the bladder by certain rate , then we measure :
    - Intraabdominal pressure
    - Vesicular pressure
    - detrusor pressure (vesicular pressure - Intraabdominal pressure) .
  + Normally while filling the bladder there won’t be detrusor contractions (it will be relaxed), it should only increase if bladder is full and patient has urge to urinate .
  + While filling the bladder, ask the patient to cough (this normally will increase Intraabdominal and vesicular pressure but should be equal , so detrusor pressure= 0 )
  + If there is leakage during coughing but without detrusor contractions , this means stress incontinence (it is better called urodynamic stress incontinence USI , because its diagnosed by urodynamics).
  + If there is detrusor contraction while filling but without leakage , this is detrusor overactivity .
  + If there is detrusor contraction while filling with leakage , this is urge incontinence .
  + Notes :
    - Maximum bladder capacity (compliance) = 400-600 ml
    - 1st desire to void : 1st time you feel you want to urinate , normally at 150 cc .
    - Strong desire to void : before reaching Maximum bladder capacity , normally > 250 cc .
    - Pressure flow study : detrusor pressure during emptying
    - Flow rate during voiding is > 15 mL / sec with detrusor pressure of < 25 cm H2O .
    - Normally there shouldn’t be destructor contraction during filling, despite provocation
* Treatment :
  + Conservative :
    - Behavioral and lifestyle changes: weight loss for obesity, smoking cessation, increasing physical activity/exercise, improving diet.
    - Pelvic floor muscle exercises are effective in preventing and reversing some urinary incontinence in the first year after vaginal delivery or following pelvic surgery (useful only in stress incontinence , not in urge)
    - Management of conditions associated with incontinence (Diabetes, constipation)
    - Specific medications and surgical procedures may adversely affect continence such as hysterectomy.
  + Stress incontinence
    - Non-surgical Treatment
      * Reduce factors that worsen the problem → obesity, smoking, medication, excessive fluid intake
      * Pelvic floor exercise & biofeedback, Electrical stimulation of pelvic floor muscle
      * Estrogen therapy (in postmenopausal women with urogenital atrophy).
      * Vaginal Pessaries (same as in POP but with knob ).
      * Medication: Duloxetine (antidepressant “selective serotonin-epinephrine reuptake inhibitor” needs monitoring because it may cause liver toxicity , nausea and vomiting , now they don’t use it unless patient has depression with incontinence) , Impiramine (TCA , has anti-cholinergic effect , but not used nowadays ).
    - Surgical Management
      * Anterior vaginal colporrhaphy , ineffective in stress incontinence
      * Retro-pubic bladder neck suspension operations (Burch, MMK)
      * Tension-free vaginal tape (TVT, TVT-O)” 10% risk of bladder perforation”
      * Sling operations (Miniarc, Monarc)”gold standared specially if patient has urethral hypermobility”
      * Peri-urethral injections (used in intrinsic sphincter deficiency )
  + Urge incontinence
    - Conservative measure:
      * Cut down volume of fluid consumed – should consume between 1 & 1.5 liters a day
      * Avoid caffeine based drinks
      * Bladder training: the patient is instructed to void on a timed schedule, starting with a relatively frequent interval
    - Medications:
      * Anti-muscarinic drugs (tolterodine and oxybutynin these 2 have side effects >> dry mouth “most common” , constipation , palpitations and blurred vision), after 4-6 weeks of treatment we should measure residual volume because these may cause urine retention .
      * Beta3-agonist : mirabegron “expensive , less side effects , but same risk for urine retention”
      * Estrogen (more useful in stress than urge )
    - Intra-vesical therapy ( Botulinum toxin )
    - Sacral nerve root neuromodulation
    - Surgery (cystoplasty, urinary diversion) in refractory cases
  + Overflow incontinence:
    - Medical therapy to enhance bladder emptying provided there is no obstruction (neostigmine or non-selective alpha-blocker >> phenoxybenzamine )
    - Treatment of the underlying cause of obstruction e.g. myomectomy or hysterectomy in the case of fibroid, removal of the urethral stricture …etc.
    - Intermittent self catheterization (every 3-4 hours)
* Urine retention can occur during labour if patient took epidural analgesia (because epidural is given at level of L3-L4 , and this will block parasympathetic and lead to retention , so we must put catheter or do Intermittent catheterization)

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Check pictures in the slide