Let the
Life of Every Mother &
Neonate Count

November 2012

FOGSI Focus on

SUI-Facts and Fiction

Dr Laxmi Shrikhande
Senior Vice President ,FOGSI
Editor

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Let the Life of Every Mother & Neonate Count

President's Message

Dr. P. K. Shah

It gives me immense pleasure to write a few words for FOGSI Focus on "Urogynecology".

I congratulate Dr. Laxmi Shrikhande for making it possible to bring out FOGSI Focus on Urogynecology. All the contributors have done great job in making this focus very informative.

I am sure that this information provided in this FOGSI Focus will tremendously help FOGSI members know and understand all related to Urogynecology.

This wonderful efforts and my best wishes to Dr. Laxmi Shrikhande & team for future.

Thanking you,

Yours sincerely,

Dr. P. K. Shah
President, FOGSI

President Elect of FIGO

Dr. C. N. Purandare

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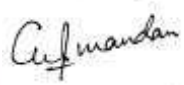
"SUI" affects 4% to 14% of younger women and 12% to 35% of older women. The risk factors that predispose to the development of this condition are incompletely understood. However, risk factors which are reasonably confident like aging, obesity, and smoking are increasing in prevalence among the female population, which will likely result in an increased number of women with SUI. As gynecologists become more aware of the impact of SUI, as well as its evaluation and treatment, more patients with the disorder will find the appropriate care available to them.

The topics of this FOGSI FOCUS are very carefully selected and contributors are highly experienced and expert in the field of SUI.

I am sure that this issue of FOGSI FOCUS will make an interesting reading as well as throw light on the new developments in understanding the subject and treatment modality of SUI which will serve as useful resource to all concerned whose Mission is to give quality life to women.

With warm regards,



Dr. . C. N. Purandare

President Elect of FIGO

President FOGSI - 2009

Editorial

Dr. Laxmi Shrikhande

Dear Colleagues,

Urogynecological problems are an important cause of morbidity in women. However, they are largely quality-of-life issues and very rarely lead to life-threatening complications. One-third of all women suffer from these disorders at some point in their lives, yet majority of them hesitate in seeking health care keeping in mind the sensitivity of the problem.

The treatment modalities in Urogynecology are advancing rapidly and it is the aim of this edition to make our members aware of these advances to improve patient care. In this issue, the reader will find a comprehensive outlook into the latest diagnostic strategies and recent advances in therapy in Urogynecology.

This scientific work is the combined efforts of multidisciplinary teams composed of a widening group of pelvic floor specialists, including gynecologists, physiotherapists, urologists, and urogynecologists.

I would like to thank all the expert contributors for their timely and updated inputs in making this FOGSI FOCUS interesting and useful for everyone.

Sincerely,

Dr. Laxmi Shrikhande
Senior Vice President FOGSI

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Chapter 1

Anatomocal Aspects In Stress Urinaryincontinence (Sui)

Dr. Poonam Verma
Prof & HOD MGIMS, Sewagram

Definition

Involuntary loss of urine in sufficient amount or frequency to constitute a social and/or health problem or a heterogeneous condition that ranges in severity from dribbling small amounts of urine to continuous passage of urine is defined as urinary incontinence The term stress incontinence is reserved for the women who pass scanty or large amount of urine with some events that cause sudden increase in intra abdominal pressure without detrusor activity.

How Common Is Stress Urinary Incontinence?

- Exact figures not known due to under reporting
- In Western countries its nearly 40% along with prolapse
- 5%women seek medical helpas they have annoying symptoms
- Prevalence increases with age (but it is not a part of normal aging)
- 25-30% of community dwelling older women

Stress Urinary Incontinence Is Often Under-diagnosed And Under-treated

- Only 32% of primary care physicians routinely ask about incontinence
- 50-75% of patients never describe symptoms to physicians
- 80% of urinary incontinence can be cured or improved using simple techniques such as exercises and minor surgerie

Why Is Stressurinary Incontinence Important ?

- Social stigmata - leads to restricted activities and depression, embarrassed by incontinence
- Medical complications - skin breakdown, increased urinary tract infections
- Institutionalization - SUI is the second leading cause of admissions due to urinary problems

Categories Of Urinary Incontinence

- Urge incontinence
- Stress incontinence
- Overflow incontinence
- Functional incontinence

Points To Remember

- Stress Urinary incontinence is common in women
- Stress Urinary incontinence of all types aretreatable
- Stress UrinaryIncontinence is treatable at all ages

Etiology

1. Congenital weakness of the internal urethral sphincter, seen in the young nullipara.

2. Congenital defects as:

1. Short urethra (less than 1 cm)
2. Wide bladder neck, and
3. Separation of symphysis pubis

3. Trauma to the region of the bladder neck due to vaginal delivery or operation.

The incidence of stress incontinence increases with parity due to repeated birth trauma.

In fact vaginal delivery is the commonest cause of stress incontinence

4. Menopause: Lack of oestrogen leads to atrophy of bladder neck supports.

5. Pregnancy and continuous administration of oestrogen-progestogen preparation to induce psuedopregnancy state to treat endometriosis.

The hormonal imbalance with increased progesterone weakens the internal urethral sphincter.

Anatomy Of Bladder And Urethra - It includes anatomy, innervation and supports

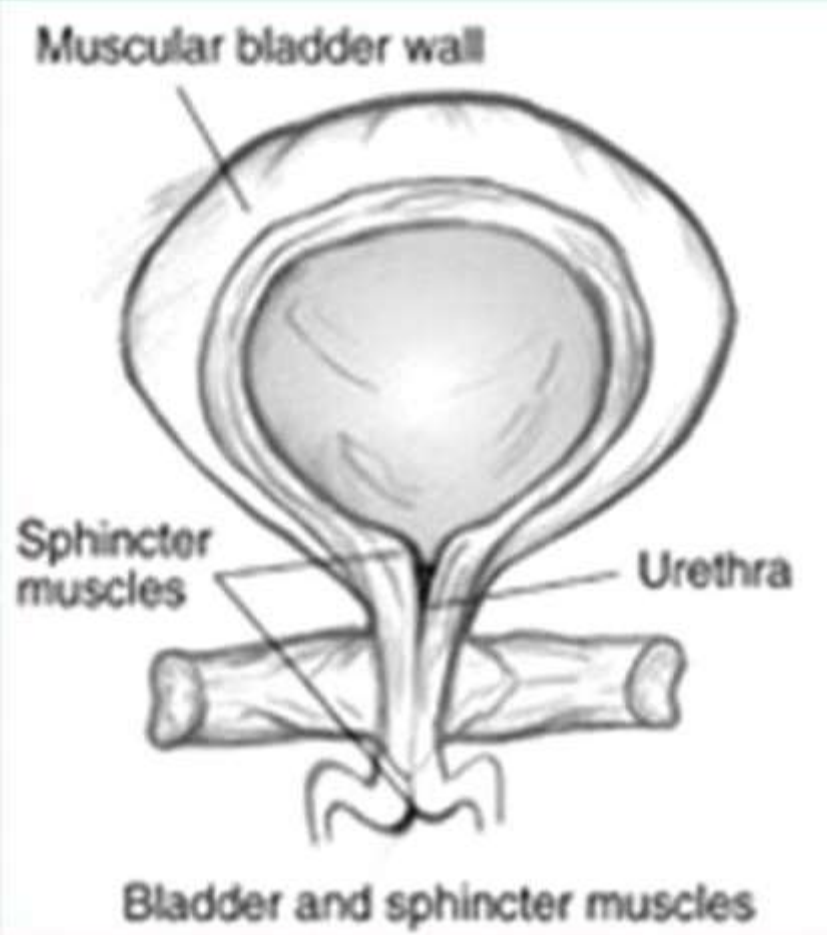
Anatomy

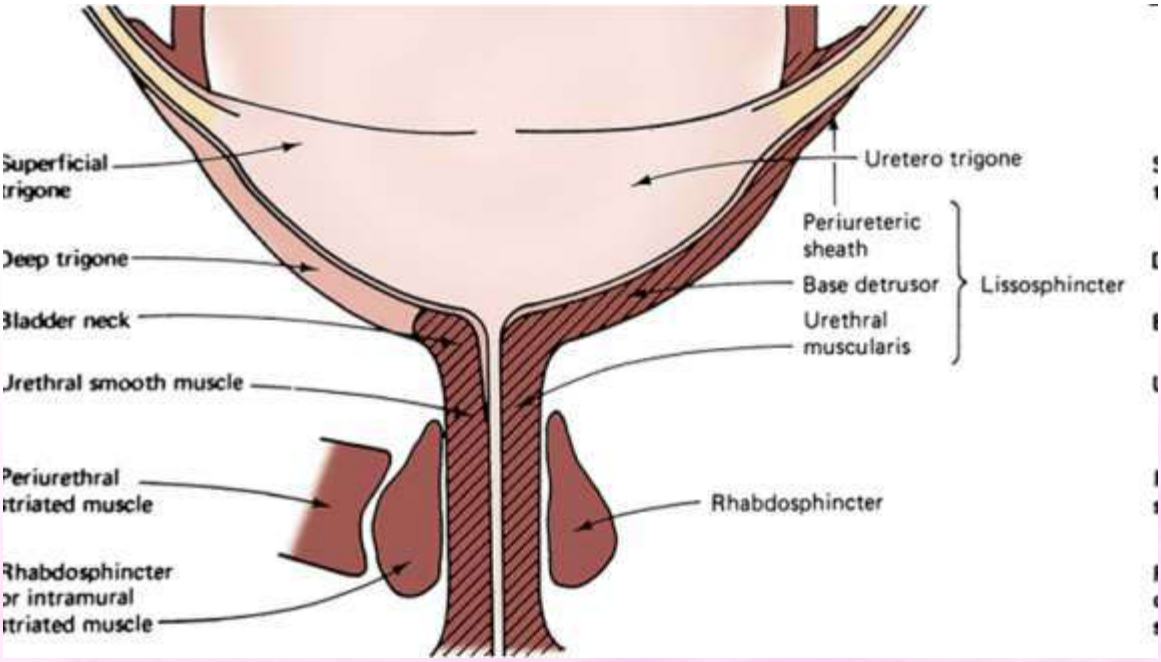
Bladder - Bladder has transitional epithelium in mucosa, it has three layers musculature contracting as single unit called detrusor and serosa covers anterior and superior surface.

Urethra - Proximal mucosa has transitional epithelium continuous with bladder and distal part has stratified squamous epithelium. Musculature has internal smooth muscle forming internal sphincter which is continuous with detrusor muscle of bladder and outer striated circular muscles forming external sphincter. It has two parts - sphincter urethrae called rhabdosphincter in upper two third of urethra responsible for urethral closure. The fibres of distal urethra are made uppubourethralfibres of Levatorani. This provides additional closure force.

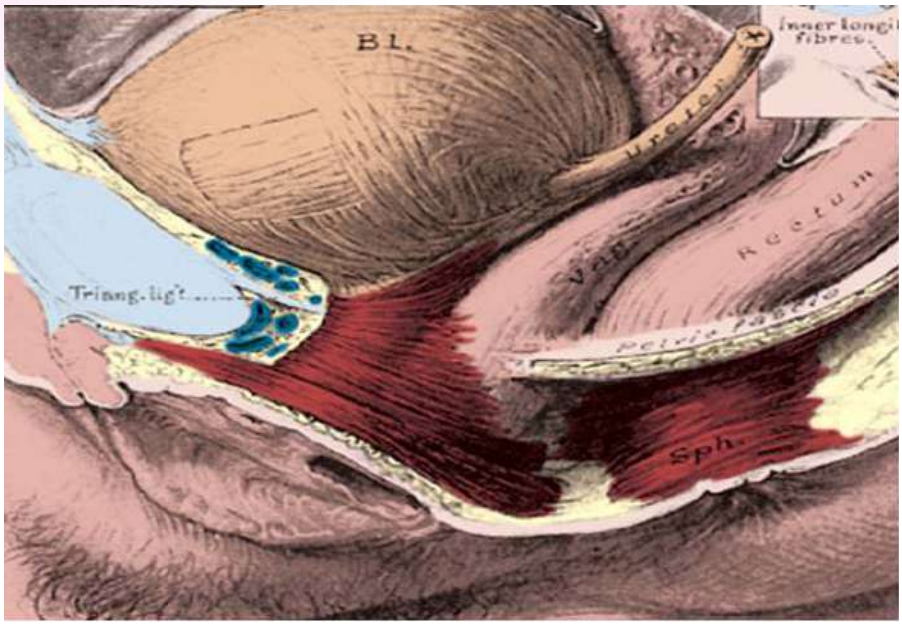
Pubo- urethral ligament attaches urethra to pubic symphysis to prevent its mobility.

Stress Incontinence - Bladder and sphincter muscles





• Urethral sphincter – 2 components striated and smooth muscle

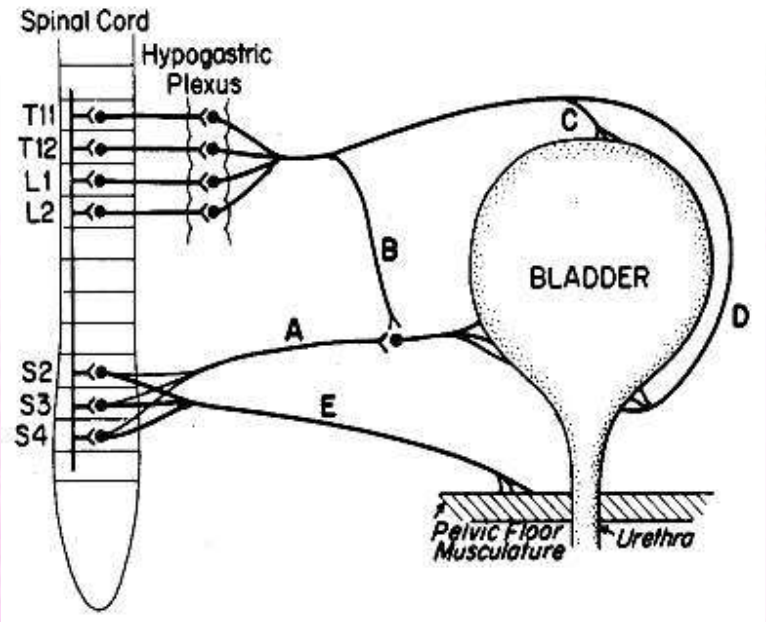


Striated sphincter is a horseshoe configuration

Apart from the musculature of bladder and sphincter the peripheral nerves play a great role anatomically in proper micturition

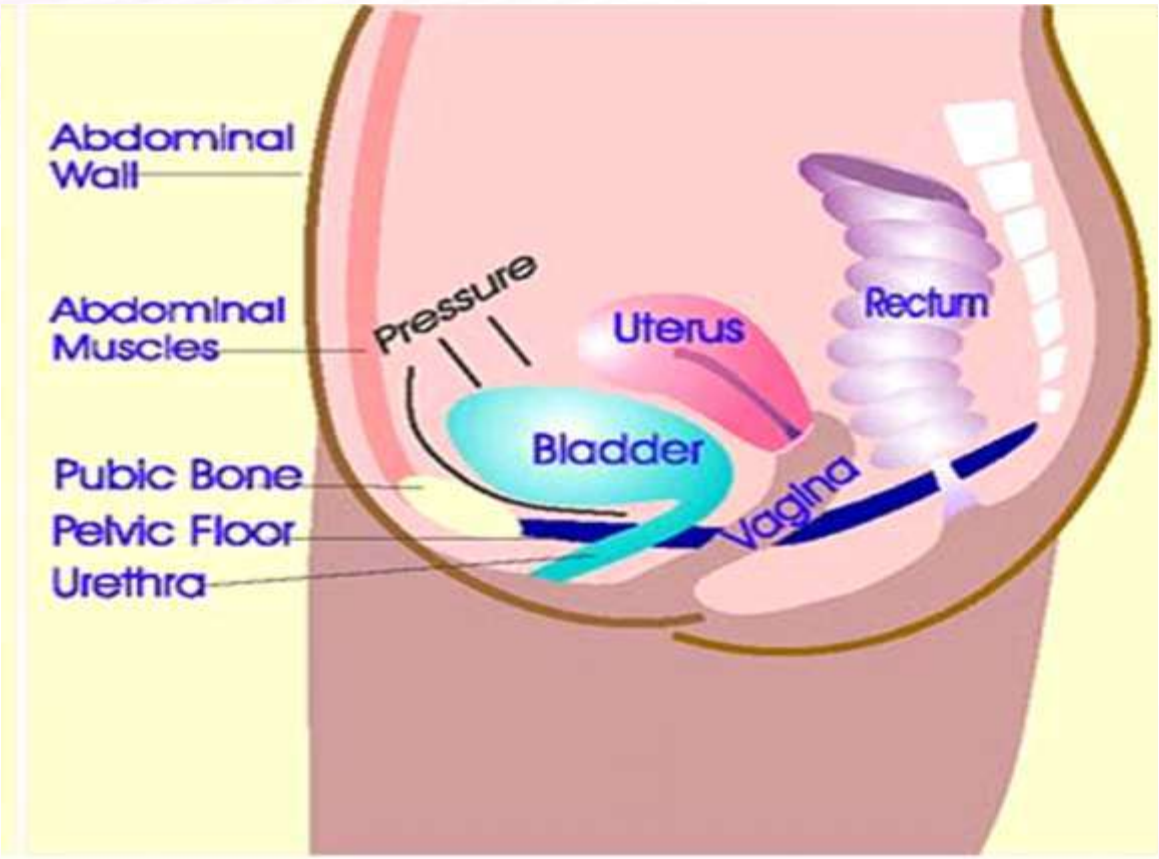
Innervation

- Parasympathetic (cholinergic) – Bladder contraction and urethral relaxation – S2 to S4
- Sympathetic – Bladder Relaxation and urethral contraction – T 11 to L 2 – Sympathetic – Bladder Relaxation (β adrenergic) whereas Sympathetic – Bladder neck and urethral contraction (α adrenergic)
- Somatic (Pudendal nerve) – contraction pelvic floor musculature and promote contraction under efforts



In a normal adult there is a bladder filling phase (Storage)and a bladder emptying phase (Voiding). Both the phases are managed by the collaborative action of bladder musculature and the sphincteric action of the urethra due to its specific innervation. Normal lower urinary tract functions requires

- The ability to store urine at low pressure while the detrusor muscle is quiescent as well as completely empty the bladder voluntarily with low resistance urine passage
- During transient increase in abdominal pressure there is not only increase in pressure delivered to bladder but also to the proximal urethra.
- Normal position of the organs ensures that the intra abdominal pressure transmitted equally to both, decreasing the chances of urine leakage .
- In addition to this contraction of external urethral sphincter levatorani contraction may contribute for it too.



Supports of bladder neck and urethra

Intrinsic factors

Intrinsic Rhabdo sphincter urethrae

Urethral submucosal venous plexus

Urethral smooth muscles

Sympathetic activity to maintain urethral tone by alpha adrenergic respecters

Oestrogen to increase collagen connective tissue

Extrinsic Factors

Contraction of pubo-coccegeous part of levatorani calledpubourethralis

Pubo-urethral ligament

Condensed endo pelvic fascia--Arcustendineus fascia pelvis

Anterior vaginal wall with its fascia

Exercise to increase collagen turn over and also to maintain the strength of levatorani

Mechanism Of Urinary Continence

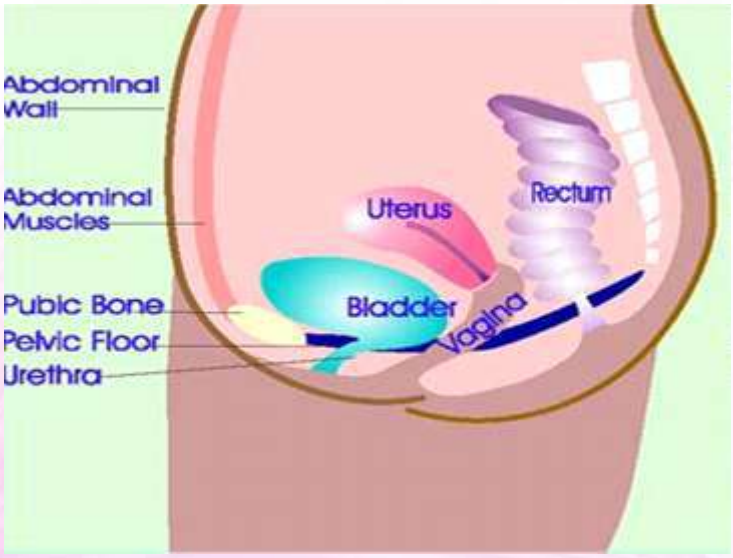
Normally intra urethral pressure at rest and with stress is much higher (20-50cm of water) than intra vesicle pressure (10cm of water).

At rest it is maintained by

- Apposition of longitudinal mucosal fold
- Submucosal vascular plexus
- Abundant deposition of collagen and elastic tissue throughout urethra
- Tonic contraction of the smooth muscles in the urethra
- Rhabdosphincter in mid urethra and levatorani muscle

During stress when the intra-abdominal pressure raises, the escape of urine is prevented by

- Reflex contraction of urethral striated sphincter and preiurethral musculature
- Kinking of urethra due to downward and backward movement of bladder base and upward and forward movement of bladder neck and urethra behind the pubic symphysis.
- Centripetalforce of intra-abdominal pressure being transmitted to proximal urethra
- When abdominal pressure increases the urethra is forced inferiorly and compressed against anterior vaginal wall providing physical closure of lumen .



Development of Stress Incontinence

Two hypothesishave been proposed for the stressincontinence

- Anatomical
- Neurogenic

Anatomical - Due to

- Urethral Hypermobility – When the supports are weak urethra moves down, there is funneling of urethra and thus leakage of urine occurs.

- Intrinsic Sphincter Deficiency

Integrity of urethra is maintained by epithelium and sub epithelium vascular plexus along with the smooth and striated muscle layer. Any damage to the urethra causes ineffective urethral closure.

Normally intra vesicle pressure is less than the intra-urethral pressure preventing the leakage of urine , however in some situations the reverse occurs leading to stress-incontinence.

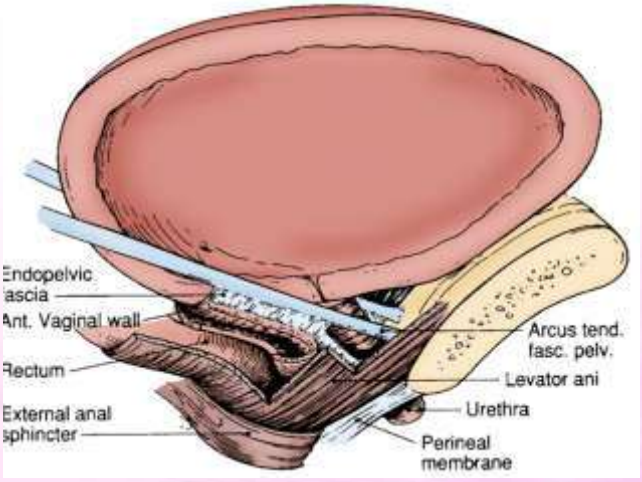
Urethra-It has three parts

1. Proximal urethra - weakest part, fails to withstand the rise of intra-vesicle pressure
2. Mid urethra - strongest part, has additional support by intrinsic striated muscle which encircles the whole urethra, it has extrinsic support from levatorani too
3. Distal urethra - It is just a passive conduit which is rich in elastic and collagen fibers

Child birth Injury or aging shifts urethra to lower side causing unequal pressure distribution between bladder and urethra resulting in stress urinary incontinence

Hammock hypothesis also explains anatomically the development of stress incontinence.

- Strength of which urethra is compressed against anterior vaginal wall decreases leading to SUI.
- Enlargement of pelvic floor muscle.

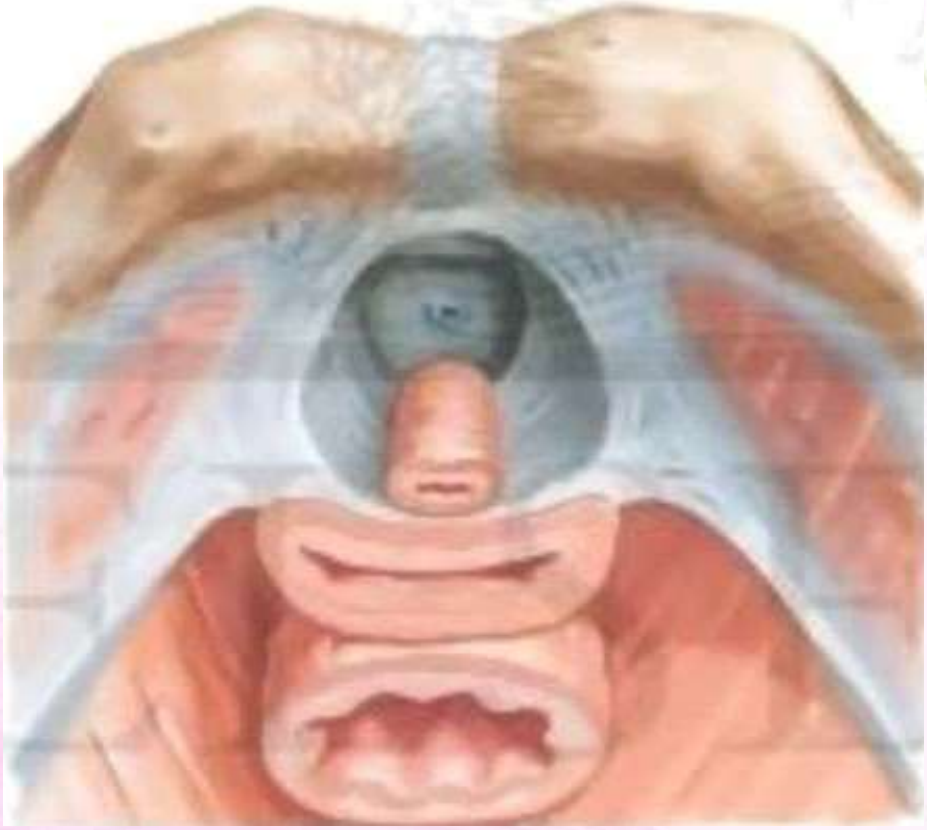


- Thus urethral hyper mobility and loss of structural support .
- Bulging of anterior vaginal wall on straining indicative of posterior rotation due to defective support

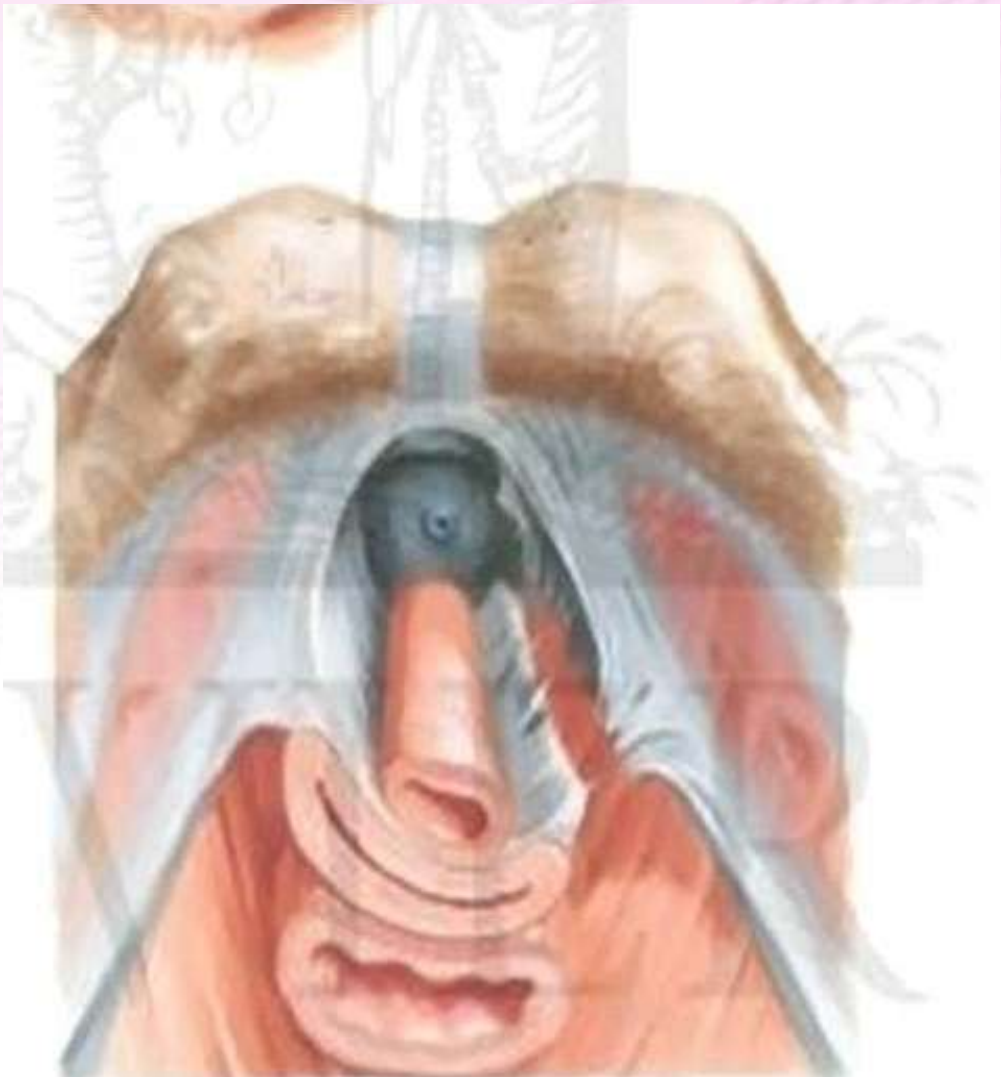
Anatomical Hypothesis

Bulging of anterior vaginal wall on straining indicative of posterior rotation due to defective support

- Increased intraabdominal pressure forces urethra against intact pubocervical fascia closing urethra and maintaining continence



- Defective facial support allows posterior rotation of UV junction due to increased pressure opening urethra causing urine loss



Neurogenic Hypothesis

Childbirth at times causes injury to pudendal nerve leading to urethral dysfunction and decreased urethral resistance and development of SUI.

Conclusions

- SUI is a under reported problem in women which can be cured by small procedures initially so its early detection is important
- To understand SUI it is important to know the complete anatomy, innervation and supports of bladder neck and urethra
- SUI develops due to hypermobility of urethra and / or intrinsic sphincter deficiencies
- Avoiding risk factors as mentioned in etiology can prevent SUI

Chapter 2

Pathophysiology Of Sui

Dr Monica Agrawal

Micturition requires coordination of several physiological processes. Somatic and autonomic nerves carry bladder volume input to the spinal cord, and motor output innervating the detrusor, sphincter, and bladder musculature is adjusted accordingly. The cerebral cortex exerts a predominantly inhibitory influence, whereas the brainstem facilitates urination by coordinating urethral sphincter relaxation and detrusor muscle contraction. As the bladder fills, sympathetic tone contributes to closure of the bladder neck and relaxation of the dome of the bladder and inhibits parasympathetic tone. At the same time, somatic innervation maintains tone in the pelvic floor musculature as well as the striated periurethral muscles. When urination occurs, sympathetic and somatic tones in the bladder and periurethral muscles diminish, resulting in decreased urethral resistance. Cholinergic parasympathetic tone increases, resulting in bladder contraction. Urine flow results when bladder pressure exceeds urethral resistance. Normal bladder capacity is 300-500 ml. and the first urge to void generally occurs between bladder volumes of 150 and 300 ml.

Incontinence occurs when micturition physiology, functional toileting ability, or both have been disrupted. During episodes of stress incontinence, an increase in intra-abdominal pressure raises pressure within the bladder to the point where it exceeds the urethra's resistance to urinary flow.. In stress incontinence abdominal leak-point pressure is 50 cm H2O or lower. This is objectively identified as leakage and the cystometrogram is flat, indicating no detrusor pressure component.

According to the International Continence Society (ICS) definition, stress incontinence is present when Pves is greater than urethral pressure (Pura), when it is simultaneously determined that the detrusor pressure is nearly zero. Stress incontinence exist s when involuntary leakage is produced by an increase in total vesical pressure (Pves), a value that includes abdominal pressure (Pabd) and detrusor pressure (Pdet). To be "genuine," stress incontinence must involve little or no Pdet component in the expulsive force.

If the detrusor contracts or there is poor compliance, the expulsive force is not mainly Pabd but includes a significant Pdet component. In these cases, one cannot be sure that sphincteric dysfunction and abdominal pressure interact to induce leakage. Therefore, in any case when Pabd causes leakage and Pdet at the time is minimal, true stress incontinence is present.

Urethral hypermobility

Urethral hypermobility is related to impaired neuromuscular functioning of the pelvic floor coupled with injury, both remote and ongoing, to the connective tissue supports of the urethra and bladder neck. When this occurs, the proximal urethra and the bladder neck descend to rotate away and out of the pelvis at times of increased intra-abdominal pressure. Because the bladder neck and proximal urethra move out of the pelvis, more pressure is transmitted to the bladder. During this process, the posterior wall of the urethra shears off the anterior urethral wall to open the bladder neck when intrinsic sphincter deficiency is present.

In women without urethral hypermobility, the urethra is stabilized during stress by three interrelated mechanisms .

1) One mechanism is reflex or voluntary closure of the pelvic floor. Contraction of the levator ani complex elevates the proximal urethra and bladder neck, tightens intact connective tissue supports, and elevates the perineal body, which may serve as a urethral backstop. The second mechanism involves intact connective tissue support to the bladder neck and urethra.

2) The pubocervicovesical or anterior endopelvic connective tissue in the area of the bladder neck is attached to the back of the pubic bone, the arcus tendineus fascia pelvis, and the perineal membrane. The pubourethral ligaments also suspend the middle portion of the urethra to the back of the pubic bone. These connective-tissue components form the passive supports to the urethra and bladder neck. During times of increased intra-abdominal pressure, if these supports are intact, they augment the supportive effect of muscular closure of the pelvic floor.

3) The third mechanism involves 2 bundles of striated muscle, the urethrovaginal sphincter and the compressor urethrae, found at the distal aspect of the striated urethral sphincter. These muscles may aid in compressing the urethra shut during stress maneuvers. These muscles do not surround the urethra, as the striated sphincter does, but lie along the lateral and ventral aspects. The exact function and importance of these muscles are controversial. Some suggest that the urethrovaginal sphincter and the compressor urethrae may provide compression and increased pressure in the distal urethra during times of stress.

To evaluate SUI gynecologists use the Q-tip test to determine whether urethral mobility is present. The existence of urethral mobility suggests that achieving better urethral support with an operation might cure the leakage. If the urethra is not mobile but nonetheless leaks, there may be a problem with intrinsic closure of the urethra and, thus, a support operation may be unsuccessful.

Damage to the nerves, muscle, and connective tissue of the pelvic floor is important in the genesis of stress incontinence. Injury during childbirth probably is the most

important mechanism. Aging, hypoestrogenism, chronic connective tissue strain due to primary loss of muscular support, activities or medical conditions resulting in long-term repetitive increases in intra-abdominal pressure, and other factors can contribute.

Injuries during Childbirth

3 types of lesions can occur: levator ani muscle tears, connective tissue breaks, and pudendal/pelvic nerve denervation. Any of these injuries can occur in isolation but 2 or more in combination are more likely to occur. The long-term result may be the loss of active and passive urethral support and loss of intrinsic urethral tone. Ultrasound visualization of the bladder neck and proximal urethra during stress maneuvers found that 93% of patients with stress incontinence displayed funneling of the proximal urethra with straining, and half of those individuals also showed funneling at rest. Although mobile, the anterior urethral wall has been observed to stop moving, as if tethered, while the posterior wall continued to rotate and descend. Possibly, the pubourethral ligaments arrest rotational movement of the anterior wall but not the posterior wall. The resulting separation of the anterior and posterior urethral walls might open the proximal urethral lumen, thus allowing or contributing to stress incontinence.

Intrinsic sphincter deficiency

Intrinsic sphincter deficiency is a condition in which the urethral sphincter is unable to coapt and generate enough resting urethral closing pressure to retain urine in the bladder. The anatomic support of the urethra may be normal. Intrinsic sphincter deficiency is due to devascularization and/or denervation of the bladder neck and proximal urethra. The urethral sphincter may become weak after pelvic surgery (eg, failed bladder suspension surgery) because of nearby nerve damage or excessive scarring of the urethra and surrounding tissues. Additional causes of urethral dysfunction include pelvic radiation or neurologic injury, including myelomeningocele. Women with severe intrinsic sphincter deficiency do not always have the usual urethral hypermobility during a Valsalva maneuver. Paradoxically, the urethra appears well supported. This results in so-called lead pipe urethra, where the urethra remains open at rest. Whenever intra-abdominal pressure exceeds proximal urethral pressure, involuntary urine loss ensues. Because the urethra cannot remain closed, the patient experiences almost continuous urinary incontinence.

Female urethral function is influenced by estrogen. The lack of estrogen at menopause leads to atrophy and replacement of submucosa (ie, vascular plexus) by fibrous tissue. When estrogen is administered to postmenopausal women with atrophic vaginitis, the mucosa regains its turgor, with simultaneous up-regulation of alpha-receptors and angiogenesis of vascular plexus. Lack of estrogen is a risk factor for developing intrinsic sphincter deficiency . There are many examples of congenital and acquired absence of urethral function involving only the proximal urethra in which severe stress urinary incontinence is nonetheless present. These include myelodysplasia; T12-L1 spinal cord injuries and pelvic nerve injury associated with abdominal-perineal resection and, occasionally, radical hysterectomy. Children with myelodysplasia often have enough fixed urethral resistance to require high detrusor pressures to induce voiding. If voiding pressures are greater than 40 cm H2O, a direct risk to renal and ureteral function exists, but there is nonetheless severe SUI with coughing, straining, and transfers .

Chapter 3

Clinical evaluation of incontinent women

Dr. Renu Yadav

Defining urinary incontinence would seem an easy task: women that leak urine must be "incontinent". The international continence society , an organisation charged with defining the various disorders of pelvic floor dysfunction, recently defined incontinence as " the complaint of any involuntary leakage of urine" .unfortunately, this definition does not take in to account the wide variation in this symptom and the disruption it cause. For example , half of the young nulliparous women report occasional minor urine leakage.; for most this not neither a bother nor a symptom for which they would seek treatment. At the other extreme ,5% to 10% of adult women have severe leakage daily. These women often dramatically alter their lives because of leakage, curtailing activities, social outing and intimacy. Many suffer marked deterioration in self-esteem. In between these two extremes lies another one-third of adult women who report leakage at least weekly , but with out the same degree of life altering severity as the women previously noted.

Severity and quantity of urine lost and frequency of incontinence episodes which should be considered in history are.

Duration of the complaint and whether problems have been worsening

Triggering factors or events (eg, cough, sneeze, lifting, bending, feeling of urgency, sound of running water, sexual activity/orgasm)

Constant versus intermittent urine loss and provocation by minimal increases in intra-abdominal pressure, such as movement, changes in position, and incontinence with an empty bladder

Associated frequency, urgency, dysuria, pain with a full bladder, and history of urinary tract infections (UTIs)

Concomitant symptoms of fecal incontinence or pelvic organ prolapse

Coexistent complicating or exacerbating medical problems

Obstetrical history, including difficult deliveries, grand multiparity, forceps use, obstetrical lacerations, and large babies

History of pelvic surgery, especially prior incontinence procedures, hysterectomy, or pelvic floor reconstructive procedures

Other urologic procedures

- **Spinal and CNS surgery**

  Lifestyle issues, such as smoking, alcohol or caffeine abuse, and occupational and recreational factors causing severe or repetitive increases in intra-abdominal pressure.

- **Medications**

  Patients with coexisting pelvic organ prolapse may report dyspareunia, vaginal pain upon ambulation, and a bulging sensation in the vagina.

Patients with severe pelvic organ prolapse

- **Cancer of pelvic organs**

Medications that may be associated with urinary incontinence include the following:

- Cholinergic or anticholinergic drugs
- Alpha-blockersOver-the-counter allergy medications
- Estrogen replacement
- Beta-mimetics
- Sedatives
- Muscle relaxants
- Diuretics
- Angiotensin-converting enzyme (ACE) inhibitors

If the leakage is distressing to the patient, evaluation and treatment should be offered. Incontinence can be improved and frequently can be cured, often using relatively simple, nonsurgical interventions.

Reversible causes of incontinence

D- delirium
I-infection
A- atrophic urethritis & vaginitis
P- Pharmacologic causes
P- psychological causes
E- excessive urine production
R-restricted mobility
S- stool impaction

Risk factors of urinary incontinence

Pregnancy & delivery predispose women to stress urinary incontinence, at least during their younger years.

Initial Evaluation

The initial evaluation of patients with incontinence requires a systematic approach to consider possible causes.

History: A thorough medical history should be obtained from every incontinent patient.

Quality of life measures: Physicians caring for incontinent patient. should ask them about how the incontinence specially affects their lives and to what degree the incontinence bothers them.

Physical examination

The physical examination of the patient with incontinence should focus on both general medical conditions that may affect the lower urinary tract as well as problems related to urinary incontinence . Such conditions include cardiovascular insufficiency , pulmonary disease, occult neurologic processes (e.g., multiple sclerosis, stroke, parkinson's disease, and anomalies of the spine and lower back) , abdominal masses, and mobility.

Simple(primary care level) tests

It is important to realise that formal urodynamics tests are neither the only , nor the most important , tests of bladder function.other simple test that can easily be performed in the primary care setting provide useful information to guide patient care.

Symptoms:- The following questionnaires have been recommended by the International consultation on incontinence to assess symptoms of incontinence and its impacts on quality of life in women.

- Urogenital distress inventory.
- Urge-UDI.
- King's health questionnarie.

Quality of life:

Quality of life in persons with urinary incontinence(I-QOL)

Incontinence impact quationnaire

Incontinence impact quationnaire (IIQ)-7

Urge-IIQ

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Quality of life:

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Incontinence impact quationnaire

Incontinence impact quationnaire (IIQ)-7

Urge-IIQ

Voiding diary

A frequency/ volume bladder chart(often termed a bladder diary) is an invaluable aid in the evaluation of patient with urinary incontinence.

Physical examination of a women with lower urinary tract dysfunctions.

- **Neurologic :**
  - Mental status
  - perineal sensation
  - perineal reflexes
  - patellar reflexes

Abdominal examination: Masses

Cardiovascular :

- Congestive heart failure
- lower exterimites edema

Mobility: Gait assesment

Pelvic examination:

- prolapes
- atrophy
- Levator muscles palpations(symmtery,ability to squeeze)
- Anal sphincter fuction

Test of urethral mobility (e.g. Q-tip test)

Urinalysis

Postvoid residual volume

Incomplete bladder emptying may cause incontinence..

Cough stress test

Patient should be examined with a full bladder,particularly if stress incontinence is consideration. Urine egress from the urethra at the time of a cough documents stress incontinence.

Pad test

Pad test ,usually performed in women with the full bladder, quantify the volume of urine lost by weighing a perineal pads before and after specified activities.

Paper Towel Test

A paper towel test provides a quick estimate of the degree of stress urine loss.[45]The patient is asked to cough repetitively and forcefully with a paper towel held a short distance from the urethra.

Cotton swab test

A cotton swab angle greater than 30° denotes urethral hypermobility.

Urodynamics

Obtaining clinically valuable information does not always requires the use of expensive, complex technology. After basic testing ,further testing is recommended in the following circumstance : the diagnosis is uncertain(for example, because of major discrepancies between the history, the voiding diary, and symptoms scales); surgery is being considered; or the patient has hematuria in the absence of an infection, an elevated PVR, a neurological conditions that may complicate treatment, such as multiple sclerosis marked pelvic organ prolapse, or numerous prior surgical attempts at correction.

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Chapter 4

Urodynamic assessment of women with urinary incontinence

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Urodynamic studies are a means of evaluating pressure flow relationship between bladder & urethra. These provide objective evidence about lower urinary tract function.

Indications:

1. Presence of mixed symptomatology (GSI & detrusor instability).
2. Marked pelvic organ prolapse.
3. Associated frequency/nocturia/voiding difficulties.
4. High post void residual volume.
5. Associated neurologic condition.
6. Previous failed surgery.(1)

Components:

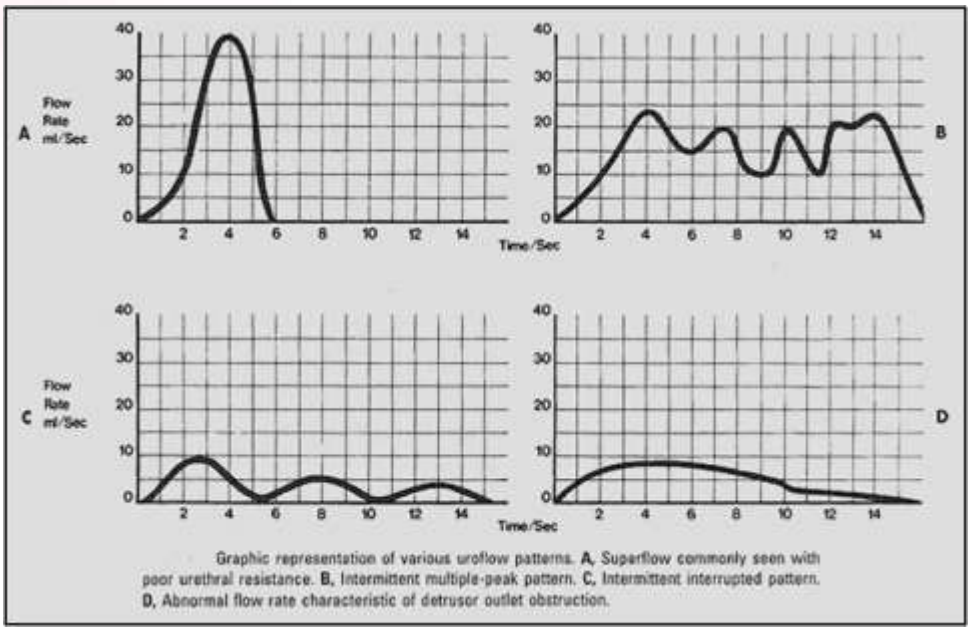
- Uroflometry-nonivasive.
- Cystometry: 1)Single channel cystometrography(CMG).
  2) Multichannel cystometrography.
- Postvoid residual urine volume.
- Urethral pressure profiles for urethral closure pressure.
- Leak point pressure measurement.
- Neurophysiologic studies.

Uroflometry-:

It is measurement of rate of flow of urine . Volume of urine voided over time is plotted on a graph. Normal flow rate is 15to 25ml/sec. Flow rate less than 10ml/sec indicates atonic bladder or outlet obstruction.(2)

Special equipment automatically measures the amount of urine and the flow rate. Uroflowmetry equipment includes a device for catching and measuring urine and a computer to record the data. During a uroflowmetry test, the person urinates privately into a special funnel that has a container for collecting the urine and a scale. The equipment creates a graph that shows changes in flow rate from second to second.

Uroflometry graph



Graphic representation of various uroflow patterns. A, Superflow commonly seen with poor urethral resistance. B, Intermittent multiple-peak pattern. C, Intermittent interrupted pattern. D, Abnormal flow rate characteristic of detrusor outlet obstruction.

Cystometry:

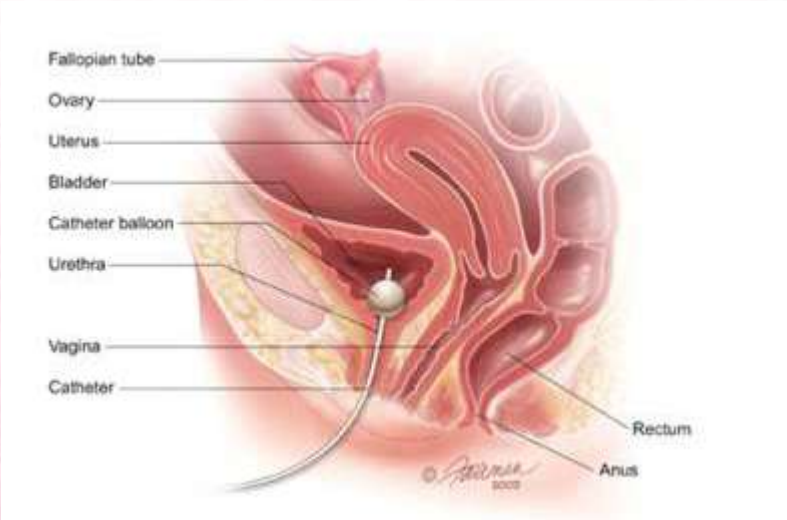
Cystometry is done to assess bladder & urethral function during filling and voiding phase.

1) Single channel cystometry :

In this bladder pressure is measured during filling phase. Since bladder is an intra abdominal organ, pressure recorded in bladder is a combination of several other pressures, such as detrusor activity & pressure exerted on bladder by intra abdominal contents. So one does not get true bladder hence, multichannel cystometry is useful.

2) Multichannel cystometry :

The detrusor pressure(Pdet) is obtained by measuring total intravesical pressure (Pve & intra abdominal pressure (Pabd) & then subtracting as follows-P(det)=P(ves)-P(abd). Multichannel urodynamics gives the most accurate result(3) about true bladder pressure.



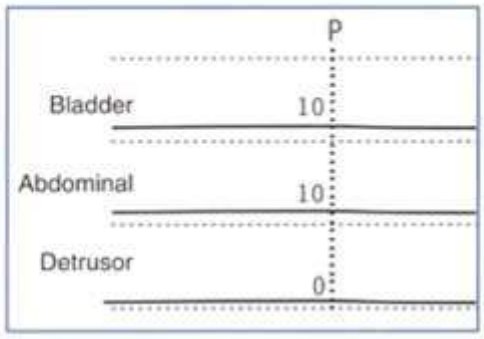
Method : A catheter is used to empty the bladder completely. Then a special catheter is placed in the bladder which has a pressure-measuring device called a manometer. Another catheter is placed in the rectum to record pressure there. The bladder is filled slowly with warm water or saline through a filling catheter. During this time, the person is asked to inform when the need to urinate arises. When the urge to urinate occurs, the volume of water and the bladder pressure are recorded.

Cystometric phases of bladder function-

1) Initial small increase in intravesical pressure at the beginning of filling.
2) Stable pressure that comprises majority of filling phase .
3) Terminal rise in pressure at bladder capacity representing limit of viscoelastic expansion.
4) The last phase is voiding phase with an inconsistently observed rise in intravesical pressure.

Multi-channel CMG recording examples

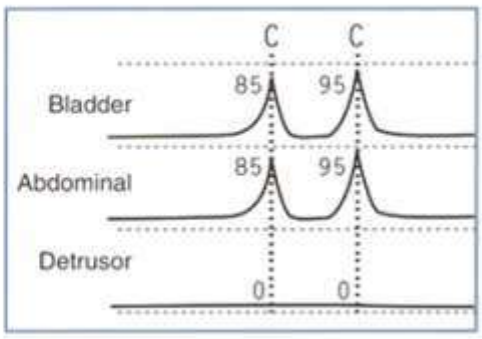
Filling Phase – Bladder at rest



P = Pressure

In a person with normal detrusor function, detrusor pressure remains at zero or rises slightly while collecting urine, even at maximum capacity.

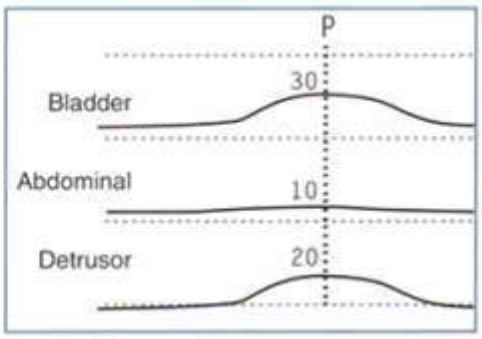
Filling Phase – Cough



C = Cough

In a person with normal detrusor function, coughs and other maneuvers are seen as sharp rises and falls, with equal transmission to bladder and abdominal channels. There is no rise in detrusor pressure.

Voiding Phase



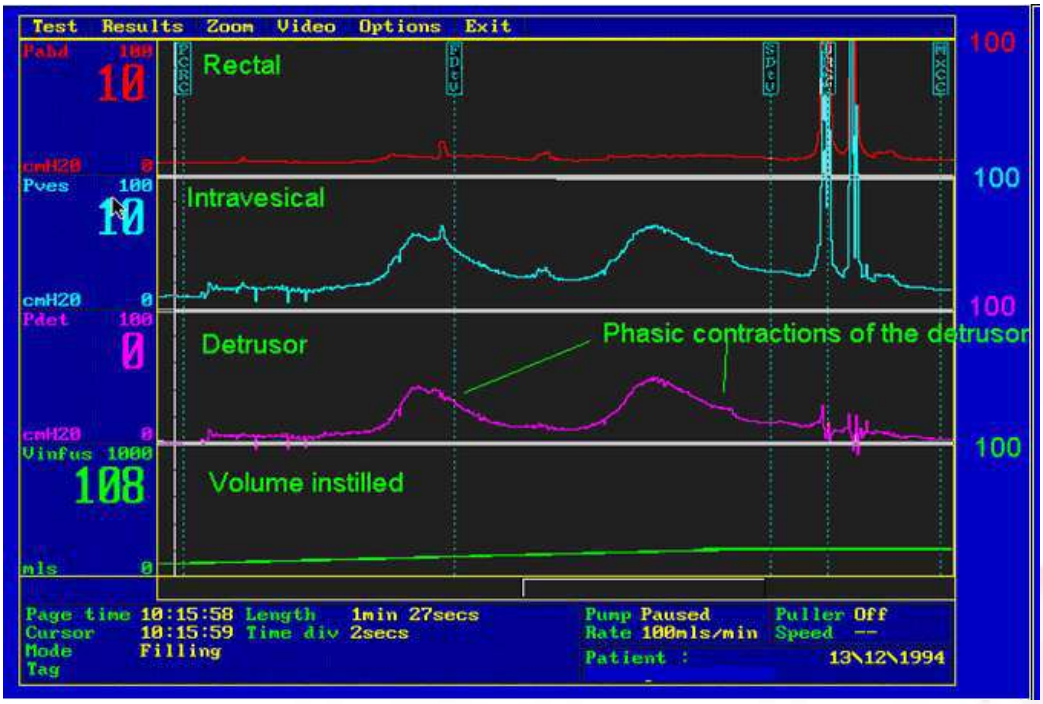
P = Pressure

In a person with a normal voiding pattern, the detrusor pressure rises as the bladder contracts to empty. There is little or no rise in abdominal pressure during voiding (unless the person strains).

Normal findings in cystometry-

- First sensation of urination-150 to 200cc
- Maximum capacity-400 to 600cc
- Intravesical pressure on filing-0 to15cm ofH2O . Peak urinary flow rate more than 15ml/sec
- Absence of systolic detrusor contraction-International continence society has identified a minimal contraction amplitude of 15cm ofH2O over baseline to be considered significant.

In genuine stress incontinence, cystometric evaluation is normal.Values are abnormal in detrusor instability & sensory urge incontinence. Demonstration of urgency coincident with increased true detrusor pressure and urinary leakage in neurologically intact patient defines diagnosis of detrusor instability.

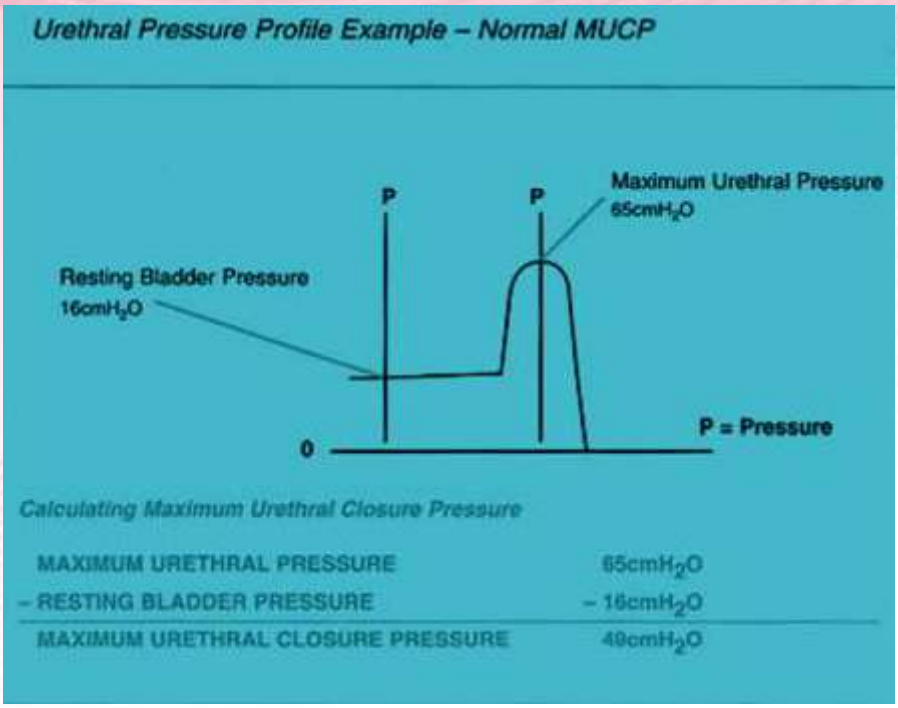


Post void reidual volume determination:

High postvoid residual(PVR) volume indicate outlet obstruction or impaired bladder contractility due to detrusor problems. PVR volumes can be assessed by either direct catheterization or ultrasonography.It is important to perform this test within 10 minutes of void to avoid any false positive result. It is agreed upon that a PVR level less than 50ml is normal &greater than 200ml is abnormal. Bladder scan appears to be reasonably sensitive and specific for elevated PVR measurement.(4)

Urethral pressure profilometry: (UPP)

It is a technique of recording pressures along the length of urethra with the bladder at rest. The maximum urethral pressure is the maximum pressure in the urethra minus the intravesical pressure. The functional length of the urethra is the distance along the urethra in which urethral pressure exceeds bladder pressure.



Technique: The urethral pressure profile is determined by slowly pulling a pressure sensitive catheter through the urethra from the bladder. UPP's have many clinical implications. The resting urethral pressure is 10-15 cmH2O. MUCP'S of less than 20cmH2O suggestive of sphincter deficiency have been associated with higher failure rates when these patients are treated with Burch colposuspension.(5) Closure pressures below 20cmH2O are suggestive of intrinsic sphincter deficiency.

leak point pressure measurement:

The bladder pressure at which involuntary leakage of urine from the urethral meatus occurs is the leak point pressure. There are two different leak point pressures- the detrusor LPP and the abdominal LPP.

Method : LPP measurements are done at bladder volumes of 200-300 ml. Patients are asked to cough with increasing force and finally to strain(valsalva) to increase intravesical pressure. The LPP is measured by marking on the pressure recording at which urinary leak occurs. This can be done by fluoroscopy, direct method or electric conductance measurement. VLPP is defined as minimum total vesical pressure required to cause incontinence in the absence of detrusor contraction.(6)

The primary aim of measuring the detrusor leak point pressure is to assess the risk to the urinary tract in patients of neuropathic bladder. The abdominal LPP is a direct measure of urethral contribution to continence. Higher values(>90-100cmH2O) suggest that stress incontinence is associated with hypermobility. Also cure rates in patients of higher VLPP treated with TOT are good.(7)Low values(<60cmH2O) suggest shorter urethral functional length.(8) or intrinsic sphincter deficiency.(9)

Videourodynamics:

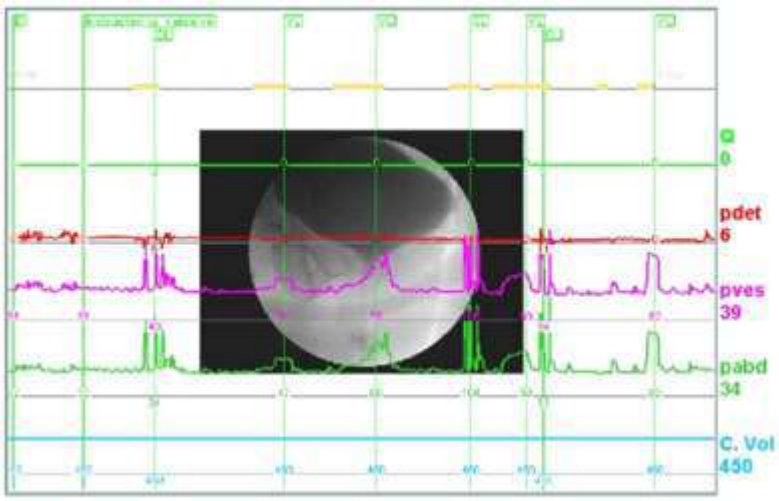
Videourodynamics traditionally combines a routine urodynamic study with X-ray or ultrasound imaging, although new imaging techniques such as MRI and nuclear cystometrography are coming into use.

Videourodynamics is used for patients with complicated lower urinary tract dysfunction, for example lower urinary tract dysfunction due to a neurological condition . It also can offer a more accurate diagnosis in other patients . However it should not be considered as a first line evaluation.

Most of the advantages of videourodynamics stem from

simultaneous measurement of pressure and visualization of the anatomy. Incompetent bladder neck or inadequate urethral closure during filling, or the location of urethral obstruction during voiding, can be documented directly.

Descent of the bladder base, bladder base hypermobility and intrinsic sphincter deficiency can be readily distinguished. Incontinence (leakage of contrast medium) can be demonstrated fluoroscopically.



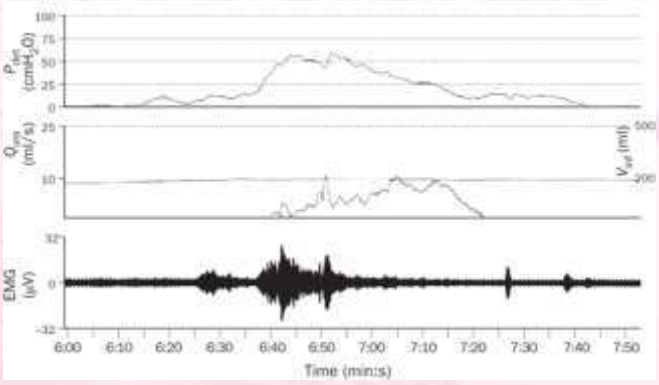
Normally, the bladder should fill without any abnormal appearance to its contour. The bladder neck should be closed throughout filling and the bladder base should be approximately level with the upper border of the symphysis pubis. During coughing or abdominal straining the bladder base should remain at this level without significant movement inferiorly, the bladder neck and proximal urethra should remain closed, and there should be no observable leakage.

During voiding the bladder neck opens smoothly and widely (but with no ballooning).The urethra should be closed during filling and form a smooth conduit during voiding.

Neurophysiological studies:

Electromyography (EMG) of the urethral sphincter, the anal sphincter, or the pelvic floor is an established method for the diagnosis of lower urinary tract dysfunction.

Method : Patch or surface electrodes are often placed so as to record EMG activity in the anal sphincter because of its relatively easy access. However, this activity is not always correlated with the activity in the striated urethral sphincter . In female patients, vaginal surface electromyography may offer a better approximation of urethral sphincter activity.



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Chapter 5

Surgical management of female sui without prolapse

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Introduction

Stress urinary incontinence (SUI) has substantial impact on quality of life for many women. Treatment includes initial conservative therapies, and then surgery is an option for women whose quality of life is still impaired. Advances in surgical techniques have led to availability of a number of different procedures to treat SUI.

Historical Aspect

More than 200 surgical procedures have been described for treatment of SUI. This reflects a combination of the alteration of established and effective procedures and introduction of newer technologies. Surgical techniques involve anterior repair started by Schultz in 1870, followed by Kelly in form of Kelly's plication in 1913. However, in today's surgical practice, performing a Kelly's plication for SUI is substandard compared with more effective procedures. Surgical repair for SUI by placing a material under urethra and suspending it to the abdominal tissues was introduced as early as 1907 when Giordano used gracilis muscle transposed beneath the bladder neck, followed by Goebell in 1910 using pyramidalis.

The fascial sling acts like a hammock under the bladder neck to both elevate the urethrovesical junction into an intra-abdominal location and to provide partial compression of the urethra. These techniques differ from the modern tension-free procedures because the ends of the sling or suspending sutures are fixed to the rectus fascia. During periods of increased abdominal pressure, the abdominal wall moves outward and sling is drawn upward. This compresses the urethra and increases intraurethral resistance. Variations of the sling procedure in which the ends of the sling are attached to an immovable tissue (Cooper's ligament or bone anchors in the pubic symphysis) do not allow upward displacement of the sling and urethra during straining.

In these operations, the sling is thought to create a secure platform of urethral support. Increases in intraabdominal pressure press the urethra downward against the sling, thereby compressing the urethra from both above and below. This compression is believed to increase in urethral resistance and resolution of stress incontinence. However, the potential for excess compression of the urethra also contributes to the most common complications of the sling procedure: voiding dysfunction.

In the maze of surgeries for SUI, paravaginal repair was originally described by White in 1909, renewed by Richardson a quarter century later in 1981. However, this procedure is for correction of lateral defect cystocele and not for treatment of SUI. Long-needle procedures like Peyera, Stamey & Razcame in a big way in last century, but got out of favour because of significant recurrence rates. The gold-standard surgical treatment of SUI has been accomplished through a retropubic approach using either a Burch urethropexy or Marshall-Marchetti-Krantz (MMK) procedure. Vancaillie in 1991 performed laparoscopic Burchwhich became popular in mid-1990s. Numerous modifications were described, which however significantly lowered cure rates as compared with traditional open urethropexy. Placement of four permanent sutures identical to open procedure, though, has yielded similar 1- and 2-year cure rates as an open Burch.

Contemporary management

Although retropubicurethropexy has been widely used and is very effective, the newer midurethral, tension-free sling procedures are equally effective, minimally invasive and easier to perform. Tension-free slings use a synthetic mesh to support the midurethra without tension, a technique first described by Ulmsten. Long-term follow-up has reported cure rates of ~ 85%. The original technique used a retropubic approach, but the transobturator approach is now the most common technique performed worldwide.

Ward demonstrated that TVT superseded the previous gold standard, Burch colposuspension, setting a new benchmark. For a pure primary incontinent population, the cure rates were established at least at 84%. Nevertheless, it was substantial surgery that carried a 7% bladder perforation rate and therefore demanded cystoscopy. For high procedure efficacy, there appeared to be a trade-off of significantly revealed irritative symptoms, with overactive bladder and voiding disorder occurring in almost 8%.

The next generation of slings placed a similar device under urethra, but now exited much more laterally through the medial obturator foramen. A gentler subfascial hammock was created by TOT, rather than the creation of a pubourethralneoligament and restoration of intra-abdominal pressure transmission that was the hallmark of a retropubic sling. A near-zero bladder perforation rate obviated the need for check cystoscopy.

TOT by forming a subfascial hammock of support under the urethra mimics the normal position of the pubourethral ligament, the ligament that typically provides the backboard of support to help prevent urinary leakage with stress events.TOT in a sense replaces the damaged ligament with a permanent mesh that provides the support needed to prevent leakage. The angle of TOT is much less acute than TVT, and therefore, more anatomic. Another advantage is lower rate of urge incontinence. The

TVT is associated with serious though rare complications including intestinal perforation, vascular injury, obturator nerve injury, and even death. The TOT procedure spares the retropubic space eliminating these risks.There is no significant change in patients' sexual life as regards frequency of intercourse whereas there is significant decrease in coital incontinence. In a study conducted on Indian population with the author of this mini-review being the principal investigator, TOT application was successful in 93.2 percent cases with 86.4% of patients completely satisfied with the surgical outcome.

What Future Holds

Treatment for female SUI has seen revolutionary changes in the last ten years. The latest in the logical progression of synthetic slings used in treatment of SUI was mini-sling. Barring the rare complication of groin pain, the risk complications with TOT seemed very low. Quest for advancement and for getting better than the best led to developmentof a system that could be placed through one small vaginal incision. Because of the relatively new introductions of mini-slings, there are limited published data available for these. Overall, short-term results with the TVT-Secur™ have not been very encouraging but with Miniarc have been satisfying. The author has used the latter in many a cases and is evaluating the results. However, the short-term results have been encouraging.

Technologies for the treatment of female SUI will certainly not stop with this.Advances in surgical treatment for SUI via pubovaginal slings have provided physicians and patients with many opportunities and advantages: decreased surgical time, decreased patient morbidity and shortened recovery time, improved outcomes including quality of life, and limited or acceptable complications.

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Chapter 6

Newer advances in management of SUI with prolapse

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Life time risk of pelvic organ prolapse is 9-11%.In about 15-80% cases, pelvic organ prolapse and stress urinary incontinence coexist due to common pathophysiology (1). In about 27–68% patients presenting with high grade uterovaginal prolapse, occult SUI(OSUI) is reported which is unmasked after prolapse repair(2).
In all patients of prolapse, SUI should be demonstrated after reducing the prolapse with pessary, vaginal speculum or vaginal packing. In patients with demonstrable SUI (occult SUI), concomitant procedures for SUI should also be done along with prolapse repair.

A patient presenting with prolapse with SUI should be work up as following:

1. Detailed history and physical examination
2. POP-Q classification of prolapse
3. Frequency, bother and severity of incontinence episodes
4. Impact of symptoms on life style
5. Residual volume assessment
6. Assessment of bladder neck mobility(Q-tip test)
7. Urinanalysis
8. Urodynamic studies
9. Baseline blood investigations
10. History of previous medical or surgical treatment if so.

Patient should be counseled regarding the possible options for treatment and chances of incomplete resolution of symptoms and new onset of SUI, urge incontinence.

Surgical management :

Route of surgery :

- Route of surgery for treatment of SUI and prolapse depends upon type of anatomical defect and best feasible approach to deal with it. In patients with

anterior and posterior defects, vaginal approach is usually preferred.

- Patients with previous abdominal surgeries may be benefitted by vaginal approach
- Laparoscopic or robotic approach may be used depending upon surgeon's experience.

Vaginal procedures include Kelly's stitch and mid urethral slings.

Long term follow up of studies involving Kelly' stitching have shown decreasing success over time. Also the success rate of Kelly's stitch is less than open Burch colposuspension (3). The procedure should not be solely used to treat SUI due to high failure rates (4).

In today's scenario, with the availability of mid-urethral slings for the management of SUI, vaginal approach is preferred. Exception to this is apical vault prolapse where abdominal /laparoscopic approach provides better results.

Abdominal/ Laparoscopic approach

In apical vault prolapse, traditionally sacrospinous fixation was being done. But laparoscopic sacrocolpopexy using polypropylene mesh has shown better results and long term outcome.

1. Sacrospinous fixation is associated with higher failure rates and complications
2. Abdominal/ Laparoscopic sacrocolpopexy maintains vaginal length and axis which is distorted in sacrospinous fixation.
3. The success rates of Burch colposuspension are comparable with mid urethral slings
4. Laparoscopic approach has shown the advantages of maintain vaginal length and axis along with promising rapid recovery than conventional laparotomy.
   Recent Cochrane review favors laparoscopic approach to open Burch as it is associated with less post operative pain, less blood loss and less duration of catheterization (5,6).

Whether the surgery for SUI and prolapse should be combined or staged

The procedure for pelvic organ prolapse and SUI can be performed either concomitantly or sequentially. In sequential procedure, incontinence surgery is done within one year of prolapse surgery.
In a multicentric trial (7) with patients presenting with SUI and prolapse, two groups were randomized. In one group TVT was applied along with vaginal hysterectomy and in other group, it was done 3 months after vaginal hysterectomy. There was no significant difference in SUI cure rate (95 versus 89 percent) or total operative complications (18 versus 13 percent). In 27% cases who underwent only prolapse repair, SUI disappeared spontaneously. SUI repair procedure was done after 3 months in only 56% cases. Rest of the patients had SUI but they declined SUI repair procedure.

In Colpopexy and Reduction of Urinary Effort (CARE) Trial (8), women with grade II or higher prolapse were randomly divided into two groups. In one group Burch colposuspension was done concomitantly and in other group only prolapse repair was done. At 24 months postoperatively, incidence of SUI was significantly lower in Burch group. Also additional Burch did not increase the complication i.e. urge incontinence, urinary tract infection.

Further studies are required whether to perform the both the surgeries combined or in staged manner. Patient should be counseled that there is 60% risk of development of SUI without anti-incontinence procedure. Also even after concomitant SUI procedure, there is still 15% risk of post-operative SUI (9).

SUI with asymptomatic prolapse :

The role of additional prolapse repair along with incontinence surgery in these patients is also controversial. Patients with grade 1 prolapse should not be offered concomitant procedure. Those with grade II and higher prolapse should be properly counseled regarding the benefits of combined procedure. Unnecessary vaginal hysterectomy is also associated with more peri operative morbidity and complications.

Special populations :

- Patients who are high risk because of medical conditions can be offered conservative modalities (pessary). SUI can be managed by vaginal mid uretheral slings which can be done under local anesthesia.
- Patients, who wish to have further children, should be counseled to avoid pelvic reconstructive surgery because delivery can lead to failure of the procedure.

Conclusion :

1. With the risk of unmasking SUI being as high as 68% and the risk of developing de novo urgency being relatively low (3–30%) (10), prophylactic anti-incontinence procedures can be performed with the prolapse repair, possibly reducing the incidence of SUI with acceptable morbidity. Tensioning of any sling should not be done until prolapse surgery is completed.
2. Women with positive occult SUI, mid uretheral slings should be combined with prolapse repair.
3. Because of technical ease and and excellent cure rates associated with mid urethral slings, laparoscopic Burch has only limited role in patients undergoing additional laparoscopic procedure or who have contraindications to synthetic mesh implantation(11).
4. Choice of abdominal or vaginal route depends upon anatomical location of prolapse, associated medical history, patient's preference, expertise of the surgeon and efficacy of the individual procedure.

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Chapter 7

Stress Urinary Incontinence : Primary Treatment

Dr. Nita Thakre

Introduction

Millions of women suffer from urinary incontinence, often in silence. Stress urinary incontinence can cause unnecessary social isolation. Primary etiology of SUI is vaginal parity due to combination of muscular, nerve and connective tissue injuries.

Medical Treatment: (12)

- **Alpha-adrenergic Agonist**: not used due to side effects.
- **Tricyclic Antidepressants: Imipramine**. It decreases bladder contractility and increases urethral resistance (outlet resistance). It also not used due to side effects like tremors, sedation, postural hypotension, sexual side effects, arrhythmia, fatigue, rash, jaundice, agranulocytosis, weakness.
- **Beta adrenergic antagonist: Propranolol**. Its not effective.
- **Beta adrenergic agonist:** clenbuterol. Not used .
- **Estrogens:**
  - It helps through receptor density, sensitivity and neurotransmitter metabolism.
  - Affects vascular and connective tissue of Urethral wall. (1,2,3)
  - Estrogen may be administered as estradiol implants,conjugated oral estrogen,estriol ,high dose estradiol or vaginal estradiol cream.
- **Duloxentine:** It is a duel serotonin-norepinephrine reuptake inhibitor.
  - Given in dose of 20, 40 and 80 mg daily for 12 weeks.

- It lessens incontinence episode frequency and improves quality of life.
- Side effects are nausea, somnolence, dizziness, menorrhagia.
- It enhances pudendal nerve stimulation of pelvic floor.(4,5)
- Women using it had a two fold increase in suicide risk compared with general population so **USFDA denied approval .**(BMJ 2005)

Conservative Treatment: Patients Compliance and motivation are essential factors

- Timed Voiding
- Fluid Management..(Moderation or elimination of tea, coffee and alcohol)
- Smoking and Caffeine Reduction
- Weight Loss and Lifestyle modification
- Behavioral Therapy
- Bio Feedback
- Electrical Stimulation
- Bladder Retraining
- Pelvic Floor muscle training
- Anti incontinence Device
- Periurethral bulking agents

Behavioral Therapy:

- This includes instructions in techniques and strategies to prevent incontinence including PFMT to practice at home.
- It consists of following:
  - Education
  - Fluid restriction
  - Diet modification (coffee, tea, alcohol reduction)
  - Bladder training
  - Timed voiding
  - PFMT or kegal exercise with or without biofeedback
    - **Aim**: It helps regain bladder control by increasing the effective capacity of the bladder.
    - It requires motivation and time commitment from patient and care giver.(12)

Biofeedback:

- It can be a routine component of either primary therapy or as an adjunct to other therapies.
- It involves use of surface vaginal or rectal monitoring instruments to detect physiological events.
- These events are translated electronically into visual or auditory signal.
- These signal help patients develop conditioned response.
- Biofeedback is better than 'no treatment' but not superior to PFMT.
- It helps patients identify pelvic muscles and learn how to contract and relax muscles while keeping abdominal muscles relaxed.
- Patient can take Biofeedback assisted PFMT.
- Biofeedback assisted behavioral therapy can be useful.
- Patients can learn the following
  - Pelvic floor muscle biofeedback
  - Bladder sphincter biofeedback
  - Anorectal biofeedback (6,7)

Electrical Simulation

Pelvic floor electrical simulation is the external application of electrical current to the pelvic floor.

Mechanism of Action

- It may re-innervate pelvic floor.
- Change in muscle fibers from slow to fast switch muscle fibers. (8)

Bladder Retaining

- It can be sole therapy or used in combination with other conservative treatment in all forms of incontinence.
- It has greatest impact on women with genuine SUI.
  - Frequency/Volume chart (voiding log) is used with account of fluid intake.
  - Patient is asked to gradually increase the intervals between voids. (timed voiding) (9)

Its advantages can disappear in three months of discontinuing the practice.

Pelvic Floor muscle training (PFMT)

- Described by Kegal about 60 years ago.
- It can be an adjunct to other forms of therapy
- Consist of repeated high intensity pelvic muscle contractions.(10)

Vaginal Cones:

- It is to be inserted into the vagina and kept in place by active muscle contraction of the pelvic floor. It comes in a variety of weights.

- Patient has to insert progressively heavier cones

Mechanism of action: It acts by sensory feedback mechanism that results in contraction of PFM to keep the cone in place. (11)

Continence Device:

- Only a few such devices are commercially available in the USA.(12)
- As they are single use or disposable the cost of treatment can be substantial
- Sexual activity may be affected

Extraurethral Device

- Applied externally at urethral meatus.
- Must be removed before voiding.
- Examples: Miniguard (disposable, adhesive), Fem assist (reusable for one week, adhesive+suction), capsure (reusable for two weeks, suction based)
- Side effects: irritation, UTI

Intraurethral Device: single use, disposable, thin and flexible to insert into the urethra to obstruct flow of urine.

- Reliance, Viva, Femsoft
- Side effects: Hematuria, UTI and discomfort

Intravaginal Supportive devices (Pessaries)

- Not available
- It has a vaginal ring with two prongs on one side of the ring, which mechanically support the bladder neck and proximal urethra.(13)
- Side effects: vaginal soreness, irritation and UTI

Peri-Urethral Bulking Agents

- Use of bulking agent is usually limited to medically compromised and elderly women who are unable to tolerate surgery. (Rev ob and gynaecol 2010)
- Ideal Periurethral injectable agent has yet to be identified.

Agents

- Bovine glutaraldehyde cross linked GAX collegen
- Polytetrafluoroethylene (Teflon, Dupont) Its safety profile is doubtful.
- Carbon coated zirconium beads
- Autologus tissues: Fat and Cartilage. Its safety profile is doubtful.

Chocrane group found no evidence to recommend injection therapy over open surgery in women fit enough for surgery.

Mechanism of action:

An improved 'Seal' effect or obstructive effect.

Complications: Rate is low.

- UTI
- Voiding dysfunction
- Urinary retention
- Haematuria
- Practical migration leading to granuloma formation

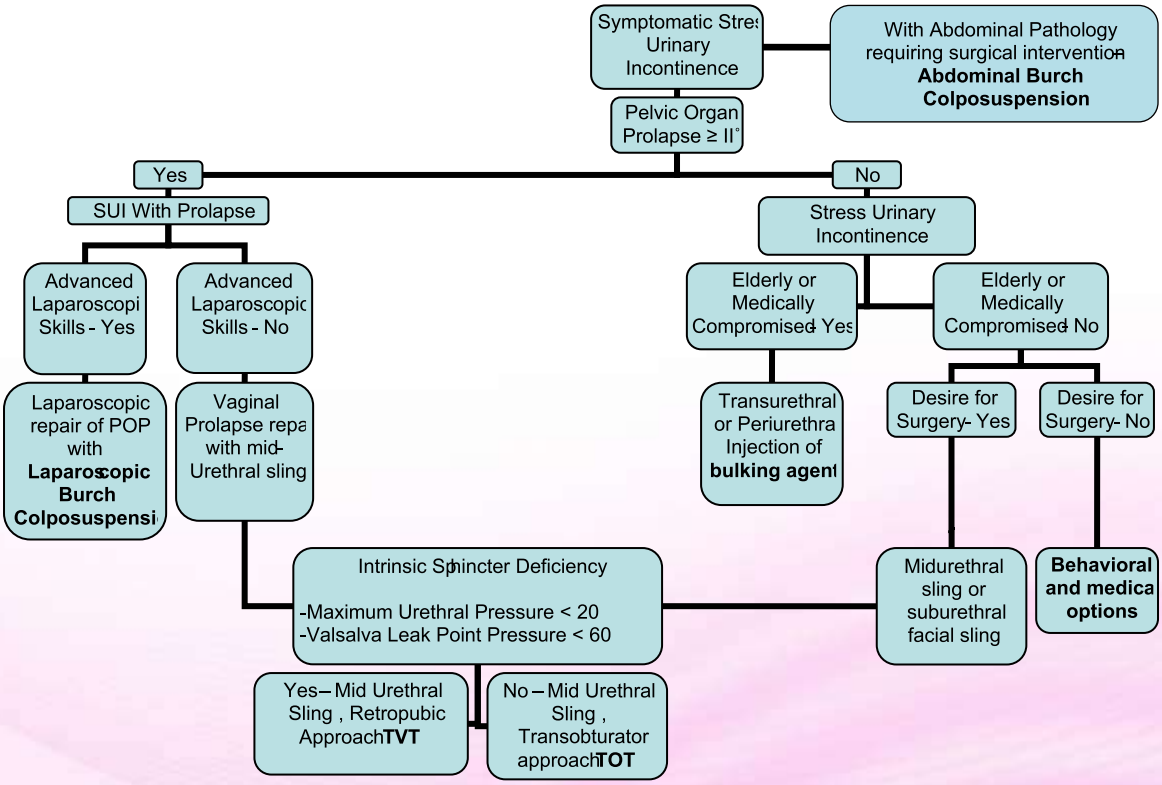
Artificial Urinary Sphincter Devices: (AUS 1970)

- Carried out after failure of other surgical treatments.
- Up in outlet resistance provided by an inflatable cuff around the proximal urethra.

Conclusion

Although pubovaginal slings, bulking agents, retropubic suspensions and AUS insertion are effective treatments for SUI as described above, their use is limited to individual cases and current practice appears to suggest an overwhelming preference for suburethral tapes.

TVT should be regarded as a proven gold standard surgical treatment for SUI. Newer techniques should be compared to TVT and evaluated in terms of clinical efficacy, patient acceptability and cost effectiveness.



Flow Chart for Stress Urinary Incontinence Management

Chapter 8

Botox therapy for urinary incontinence

Dr. Laxmi Shrikhande

Dr. Ritu Dargan

Introduction

Stress urinary incontinence (SUI) and urge incontinence (UI) are increasingly significant health concerns for millions of women. Investigation continues into the use of different types of procedures for the surgical management of UI that can be done in the ambulatory office without the use of general or regional anaesthesia. Approximately 180,000 surgical procedures are performed for genuine SUI alone. The lack of a single, reproducible permanent and minimal risk procedure has led to the development of several minimally invasive options that provide the hope of reasonable efficacy and minimal morbidity. Injection therapy has been used sparingly for the management of SUI for nearly 2 decades, but has been limited by durability and antigenicity issues associated with bovine collagen. Selection of patients seems to be crucial to the outcome of the intraurethral injection of bulking agents. The ideal candidate for this procedure has good anatomic support, a compliant, stable bladder, and a malfunctioning urethra as evidenced by low leak point pressure. Other patients who may benefit are those with high leak point pressure and minimal hypermobility and elderly women with bladder base mobility who are less active and are a poor surgical risk for other interventions.[1]

Use of botulinum toxin

Use of botulinum toxin (Botox) has proved to be a safe and effective therapy for a variety of somatic and autonomic motor disorders and seems to have some clinical efficacy in the treatment of detrusor-external sphincter- dyssynergia (DESD), pelvic floor spasticity, and overactive bladder[1]. Clinically Botox has been used to treat patients with spinal cord injury, DESD 15, and neurogenic detrusor overactivity[2] resulting in a significant reduction in maximum detrusor voiding pressure. A long term study of detrusor overactivity in 87 patients reported that the clinical response lasted only 4 to 14 months, but no adverse events occurred [3]. Although treatement with Botox is safe, the maintenance of clinical results requires repeated transcystoscopic injections. This agent is expensive and as yet is not approved by FDA to treat any indication involving the urinary tract. Costs can be reduced by doing the procedure under local anesthesia in an office setting.

Technique for botox injection into the bladder under local anaesthesia.

The urethra is anesthetized with 2% lidocaine jelly, the bladder is emptied, 50 ml of 1% plain lidocaine solution is instilled and is allowed to remain for 10 minutes before placing the cystoscope and beginning the injections. 100 U in 0.5 ml (5U of Botox) aliquots are injected across the back of the trigone (20 small injections in total). Then another 100 U is injected in a radial fashion from the trigone , up the posterior wall and toward the dome of the bladder. In this portion 5 injections are done in each of the four radial positions.

The technique has also been used for patients with idiopathic overactive bladder. In a pilot study Radziszewski and colleagues[4] reported favourably on intravesical Botox injection to treat overactive bladder and functional outlet obstruction. After intravesical and sphincteric injections there was resolution of incontinence and improved voiding efficiency respectively but only for a short duration.

Chemical dennervation of the external sphincter begins within 2 to 3 days and is reversed within 3 to 6 months as terminal nerve sprouting occurs[5].

Conclusion

Injectable treatment for SUI and UI can be effective and safe, however the durability of the positive result remains a primary concern when implementing these minimally invasive techniques. With time and further research improvements the use of injectable agents for treating SUI is inevitable. Chemical denervation for detrusor and sphincter overactivity is in its infancy. The dose and volume injected seem to have important roles in inducing results and probably relate to possible systemic toxicity. Targets for future chemical denervation go beyond DESD and detrusor motor overactivity; involve various forms of bladder neck obstruction, including benign prostatic hyperplasia; and perhaps will move into the sensory and urgency realms, which might include interstitial cystitis.

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Chapter 9

Urethrolysis

Dr. Anil Shrikhande

Dr. Ritu Dargan

Introduction

Urethrolysis after surgery to treat stress urinary incontinence(SUI) is reported to occur in 5% to 20% of patients. Studies report that the incidence of surgery for treating SUI has increased dramatically over the past decade [1]. With this increase in the number of procedures performed, there likely also has been an increase in the number of patients with iatrogenic urethral obstruction. Surgeons who perform these procedures should be adept at recognizing the signs of iatrogenic obstruction and be comfortable with performing a procedure to unobstruct the patient or with referring the patient to someone with more experience in this area.

Mechanism of obstruction

Although an aggressive cystocele repair or other type of pelvic surgery occasionally can lead to iatrogenic urethral obstruction, most cases result from procedures for SUI. Retropubic bladder neck suspensions (BNS), transvaginal suspensions and traditional bladder neck of midurethral slings can obstruct the urethra.

With a retropubic BNS, the sutures elevating the bladder may be too tight or too close to the urethra or excessive scarring may have occurred between the pubis and urethra. This could lead to kinking and compression of the urethra resulting in obstruction.

With a sling there is typically less scarring anterior to the urethra. Not much dissection usually done anterior to the urethra or between the urethra and the pubis. Most scarring occurs in a more lateral area where the sling perforates the endopelvic fascia. In most obstructing slings the cause of obstruction is unrelated to anterior or lateral scarification and more likely is related to the ventral compression of the urethra by the sling.

Patient evaluation

Patients with iatrogenic urethral obstruction may present with obstructive or irritative symptoms. Some may complain of diminished force or urinary stream. Some patients may have more subtle symptoms. Bending forward to void or having to change positions to effectively void usually indicates an element of obstruction. Recurrent urinary tract infections that are associated with an elevated postvoid residual may suggest an obstruction. Irritative symptoms, such as new onset or worsened urgency, may result from the bladder's response to obstruction.

On physical examination, hypersuspension of the urethra may be identified. The anterior vaginal wall in the area of the bladder neck may be difficult to visualise and may be fixed to the undersurface of the pubis. During a Q-tip test, the Q-tip may have to be guided over the bump to pass it into the bladder and a resulting negative (downward) deflection of the tip is noted.

On cystoscopy, a ridge at the point of obstruction may be visualised. The previous findings less commonly are noted in obstruction caused by midurethral synthetic slings. Although these signs may help solidify the diagnosis of obstruction, their absence does not rule it out.

Urodynamic studies can be performed and often demonstrates outflow obstruction. However previous studies have found that outcomes after urethrolysis do not depend on urodynamic findings. [2]

Choice of procedure for urethrolysis

There are a number of ways to free the obstructed urethra. A urethrolysis can be performed transvaginally or from an open retropubic approach. With the transvaginal approach one can start ventral to the urethra and dissect laterally and anteriorly through the endopelvic fascia and between the anterior surface of the urethra and the pubis. Alternatively, one can incise above the urethra and directly separate it from its anterior attachments. A combination of these transvaginal techniques may be required to fully free the urethra. The less invasive technique of sling incision has been described. Wrapping a Martius flap around the urethra at the time of urethrolysis is another option and although most surgeons reserve this approach for patients with recurrent obstruction, some surgeons have advocated its use in primary procdures.[3]

For patients who previously underwent a sling procedure, regardless of whether the sling was placed at the bladder neck or midurethral, a sling incision may be attempted first. If that approach fails to provided adequate release during surgery or if the patient has recurrent problems, a traditional transvaginal urethrolysis should be performed. Cutting the sling sutures from above and not addressing the ventral obstruction caused by the sling itself are unlikely to be helpful. Within a few weeks, the ends of the sling scar into the retropubic space and cutting the sutures above does not release the sling. After a transvaginal BNS, a traditional transvaginal approach is usually the procedure of choice. Some investigators have advocated a suprameatal, transvaginal approach, suggesting that because the endopelvic fascia remains intact, there is less hypermobility and incontinence after urethrolysis.[4]

RESUSPENSION

Performance of a resuspension at the time of urethrolysis is controversial. Outcome studies have demonstrated a similar risk for recurrent SUI whether or not resuspension is performed at the time of urethrolysis.[5]

OUTCOMES

Most large studies on urethrolysis report a success rate of approximately 70% to 80%.[6,7,8,9] Significant symptom relief can be achieved in most patients undergoing repeat urethrolysis after a failed initial attempt.[7] Although most patients have complete or significant relief of obstructive symptoms, it is not unusual that many patients may be left with mild irritative symptoms, albeit they are much improved from their state before urtherolysis. Heavy bleeding or entry into the bladder neck or urethra may occur during urethrolysis. Closure of any accessible lacerations and 2 to 3 weeks of catheter drainage for those that are not accessible usually enable complete healing. In case of bleeding, rapidly finishing the procedure and packing the vagina should allow the bleeding to tamponade and stop.

Recurrent SUI occurs in up to 20% of patients. When it does occur, injection of a bulking agent may prove to be successful in treating incontinence. If that approach fails a resuspension or sling can be performed after the patient is re-evaluated fully.

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Chapter 10

Urethral syndrome: Truth or Myth

Dr. Alok Sharma

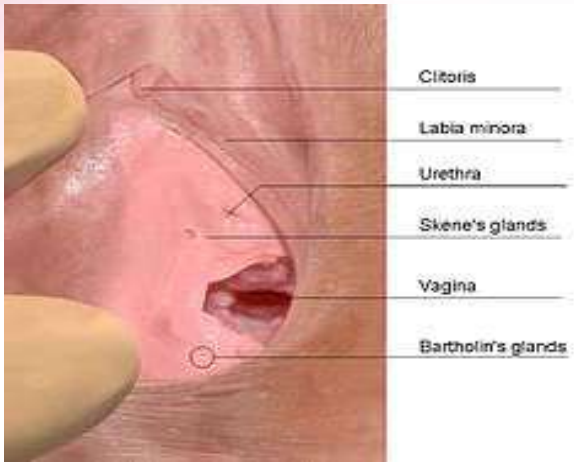
Introduction

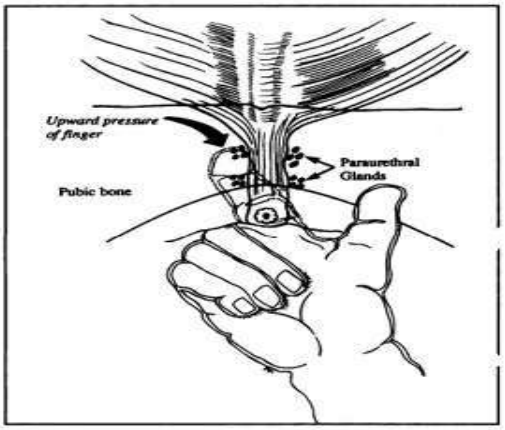
Urethral syndrome is a term that was first coined by Powell and Powell in 1949. Urethral syndrome is more common in females than in males. Patients diagnosed with urethral syndrome are typically aged 13-70 years.The etiology of urethral syndrome is unknown. Historically, urethral stenosis was believed to cause urethral syndrome.There is now strong evidence that the microscopic paraurethral glands connected to the distal third of the urethra in the prevaginal space are homologous to the prostate. They stain histologically for prostate-specific antigen and, like the prostate, are subject to both infection and cancer. The most important aspect of recognizing this microscopic "female prostate" as an anatomic feature is that its infections may completely explain many cases of the urethral syndrome.

Symptoms

Symptoms of urethral syndrome include:

- Increased urinary frequency
- Dysuria
- Suprapubic discomfort
- Constant urge to urinate
- Difficulty starting the flow of urine
- Feeling of incomplete emptying
- Decreased flow of urine
- Weak urine stream
- The above symptoms may be relieved after urinating, but in some cases, the symptoms remain





—Upward fingertip pressure against the pubic bone lateral to the urethra elicits localized tenderness when the paraurethral glands are infected.

Physical Examination

A diagnosis of urethral syndrome is made after exclusion of infection and local vaginal conditions such as genital herpes and variants of vaginitis. Physical examination findings are usually unremarkable; however, genital examination may reveal a cystocele or atrophic urethritis.

Investigations

- Urinalysis: A urine sample should be collected for urinalysis and urine culture.Urinalysis may show up to 3 RBCs per high-power field. More pronounced microhematuria or any history of gross hematuria should prompt (1) cystoscopy to evaluate the bladder and (2) intravenous pyelography (IVP) or CT scanning to assess the upper urinary tract.
- Pap smear results may reveal cervical malignancy, and this test should be performed if the patient has not had one in the past year.
- A urine pregnancy test may be indicated in women in the appropriate age group with an enlarged uterus or history of irregular menstrual cycles.
- Vaginal swabs for routine and viral, chlamydial, and gonococcal culture may be indicated.
- Potassium hydroxide preparation of vaginal secretions helps assess for fungal infection.

Imaging Studies

- IVP
- Cystography
- MRI
- Pelvic ultrasonography
- Cystometrics and electromyelography
- Cystourethroscopy with hydrodistention
- Cystoscopy

Treatment

The goal of treatment in urethral syndrome is to relieve the discomfort and urinary frequency. This often involves a trial-and-error approach, involving behavioral therapy and meditation, Kegel exercises, medication, or surgery. One has to try several approaches or combinations of treatments before finding one that is most effective.

Medical treatment

Medication for urethral syndrome:

- **Hormone replacement therapy:** It improves mucosal quality in postmenopausal women and may improve resistance to external irritants.
- **Anesthetics**
- **Antispasmodic medications that relax the bladder**
- **Alpha-blocker drugs**
- **Tricyclic antidepressants**

Activity

- Kegel exercises can help lessen the symptoms of urethral syndrome. These exercises can suppress the urge to urinate by contracting the muscles that control urination. This gradually increases the time between voiding. The goal is to have at least 2 hours between voiding during the day, and 6-8 hours between voiding at night.
- Exercise and massage programs that put patients in better control of their muscles can be very helpful.Yoga and t'ai chi both emphasize balance, posture, and integrated movement that diminish tightness of the muscles. Through these activities, patients learn to better control and relax muscle groups and learn which muscle groups contribute to or improve their chronic pain.
- Walking has a less direct effect on the pelvic musculature but is a potent antidepressant. Walking regularly for 3 months has been shown to yield improvements in depression similar to those of antidepressant medications.

Diet therapy

- Reduce the consumption of foods that irritate the bladder.
- Increasing urinary pH may help with symptom

Behavioral therapy

- Behavioral therapy, including biofeedback, meditation, and hypnosis, has been used with some success. Biofeedback has the most promise in individuals whose symptoms are due to a failure to relax the pelvic musculature during voiding.

Surgery

Surgical procedures for a urethral syndrome may include:

- Urethral dilation:Useful only in those women who have a narrowed urethra.
- Implantable electrical stimulator:
- Nd:YAG laser ablation -to burn inflamed areas of the urethra.

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Chapter 11

Newer treatments in Overactive Bladder

Dr. Amita Jain

Overactive bladder (OAB) is a common condition affecting more than 10% of the global population. After behavioral modification with the possible addition of pelvic floor exercises, anti-muscarinic medications remain the first-line therapy for OAB. Current second-line therapies include various forms of neuromodulation. A fraction of patients will be refractory to both lines of therapies and there is still a need to develop additional effective and well tolerated therapies for the treatment of OAB. A number of promising newer developments in treatment of OAB are under trial [1].

I. Novel Oral Medications

β-Adrenoreceptor agonists causes detrusor relaxation and increased bladder stability during storage through direct activation of **β-adrenoceptors (β3-subtype in** human bladder). Mirabegron is a **specific β3-adrenoreceptor agonist**. Japan granted marketing approval for mirabegron in 2011. The Reproductive Health Drugs Advisory Committee of the United States FDA has recently recommended approval of mirabegron in the United States [2].

Neurokinin-1 receptor antagonist/tachykinins including substance P (SP) , are a group of neuropeptides that bind neurokinin (NK) receptors. SP has the highest binding affinity for NK-1, which is located both centrally and peripherally.

TK-containing afferent nerves may play a role in initiating detrusor contraction and increased densities of suburethelial SP-containing nerves have been found in patients with idiopathic OAB (iOAB). A randomized, double-blind study was conducted by Frenkl and colleagues to determine the safety and efficacy of serlopitant, a highly selective NK-1 antagonist [3]

Potassium channel openers may reduce OAB by mediating detrusor contractility and

altering firing patterns in afferent nerve fibers. An ATP-sensitive potassium channel opener has been shown to limit phasic contractility in human bladder strips [4]. But due to their presence throughout the body, it is difficult to develop highly targeted therapies with controlled effects.

Cannabinoid agonists have got attention in treatment of OAB by the Cannabinoids in Multiple Sclerosis (CAMS) study [5]. Cannabinoids are the active components of Cannabis sativa (marijuana) and selective cannabinoid receptors, CB1 and CB2, have been identified in human detrusor and urothelium.

Phosphodiesterase (PDE) inhibitors prevent the degradation of cyclic guanosine monophosphate (cGMP) and cyclic adenosine monophosphate (cAMP), important mediators in smooth muscle tone. Truss and colleagues provided early evidence regarding the utility of

PDE inhibitors when they conducted a study of 19 patients with refractory urge incontinence [6].

Cyclooxygenase inhibitors may improve OAB symptoms as shown in studies that bladder infusion with PGE2 enhances the micturition reflex and urine levels of PGE2 are increased in patients with OAB [7]. The use of these agents in clinical practice in the treatment of iOAB could be extrapolated from the neurogenic OAB and BPH literature.

II. Novel non-oral medications

Non-oral routes of delivery of oxybutynin minimize the accumulation of Ndesethyloxybutynin, an active metabolite responsible for untoward side effects, such as dry mouth and constipation. A pliable vaginal ring, similar to the vaginal ring used for contraception, has been developed as a means of delivering anti-muscarinics in a human model. A recent randomized, double-blind, placebo-controlled study sought to determine the safety and efficacy of an oxybutynin vaginal ring [8].

Botulinumtoxin inhibits acetylcholine neurotransmitter release and potentially affects afferent sensory neurons in the urothelium. Intradetrusor injection of botulinumtoxin was approved in 2011 by the Food and Drug Administration (FDA) for treatment of neurogenic detrusor overactivity. A number of studies have demonstrated its efficacy in the treatment of refractory iOAB [9].

We now have evidence that inclusion of the trigone is not associated with higher rates of adverse events or vesicoureteral reflux (VUR) in patients with iOAB. Similar to the debate regarding ideal dosing, the exact targeted depth of injection remains controversial. Development of an injection system that could regulate depth of administration would help standardize delivery and would be a welcome advance in the field.

Transient receptor potential (TRP) channels are also expressed in the bladder indicated in many studies. Vanilloid receptor type 1 (TRPV1) is a cation channel activated by noxious stimuli and vanilloids, such as capsaicin and resiniferatoxin (RTX). Early clinical work demonstrated that intravesical instillation of capsaicin in human bladders produced a dose-related reduction in the first desire to void and increase in bladder capacity and recent focus is on animal models of OAB [10].

Gene therapy have shown promising results using human simplex virus vectors in several animal models and one particular model has demonstrated a decrease in detrusor overactivity in spinal cord-injured rats [11].

III. New Innovations in Neuromodulation

Pudendal Neuromodulation (PNM) use was first reported by Spinelli et al. in 2005 [12].

InterStim® device for sacral neuromodulation (SNM) was designed to target the S3 nerve root. Data suggests that by using a perineal or posterior approach, it can be used to target the pudendal nerve (a mixture of fibers from the S2, S3, and S4 nerve roots) with the potential advantage of increased afferent neuromodulation.

Transcutaneous modalities for delivering sacral nerve stimulation (SNS) and posterior tibial nerve stimulation (PTNS) have also generated interest over the past decade.

Patient-managed neuromodulation system (PMNS) is a recently introduced adhesive patch [13] that is placed over the sacral region and transmits a transdermal amplitude modulated signal without need for a percutaneous lead. Temporary skin reactions constitute the majority of adverse events (76.6%). PTNS is a feasible option for patient- or caregiver-conducted home therapy.

Electrical nerve stimulation of dorsal genital nerve (DGN) has shown promising results [14]. DGN is a component of the pudendal nerve, but due to being more superficial perhaps better suited for minimally invasive stimulation techniques. But further development of this technology has been slow owing to concerns regarding potential damage to the DGN and possible negative sexual side effects.

Electrical stimulation of external urethral sphincter (EUS) can also suppress bladder contractions and reduce urinary frequency. A study by Nissenkorn and De Jong utilized an implantable stimulator with the lead placed in a paraurethral position [15].

These newer neuromodulation techniques hold the promise of less invasive and more patient-controlled therapies. With the knowledge of these ongoing developments, we can foresee a new horizon of treatment for patient of OAB.

Chapter 12

Bladder and Ureteric Injuries in Gynaecologic Surgeries

Dr. Sujata Kar

"Speed and ease of operating are the product of accuracy and safety".

- Victor Bonney

Since the inception of our speciality, injuries to the lower urinary tract has been recognized as a potential complication. Obviously, inherent anatomic factors linking the two systems are responsible. Over the years modifications in technique and use of new technology in gynaecological surgery has constantly focused on attempts to reduce urologic injuries. Despite these efforts, bladder and ureteric injuries remain a very real threat for any gynaecologic and obstetric procedure.

There is wide range in studies reporting Urinary Tract injuries. The risks depends on the procedure performed and the skill and experience of the surgeon.

Incidence

Over all urinary tract injuries < 1%.

Urinary tract injuries in Oncologic surgery 1.1 – 5.5%.

Ureteric injuries 0.5 – 1.5%.

Ureteric injuries during radical hysterectomies 2.2%.

Bladder injuries 0.8% (0-2.9%)

Bladder Injuries in Lap. Surgeries (0.02 – 8.3%).

Urologists, Urogynaecologists and Oncosurgeons have greater expertise to deal with such injuries. However, it is mandatory that anyone performing Pelvic surgery should have detailed knowledge of anatomy of the pelvis. Conventional teaching is adequate to learn anatomy. However one of the best methods now is the 3D virtual reality models which combine modern technology and highly advanced imaging techniques to make learning anatomy highly inter active.

Risk factors that increase chances of Urologic injuries.

Table – I

Conditions that reduced visibility or exposure	Conditions that distort anatomy
Large Pelvic Masses	Endometriosis Malignancy
Pregnant uterus Obesity	Chronic inflammatory disease
Pelvic haemorrhage	Broad ligament & Cervical myomas
Malignant disease	Prior pelvic surgery
Inadequate incision	Congenital anomalies
Inadequate lighting and retraction	Pelvic adhesions
	Post radiation therapy

Table – II

"Most commons" for ureteric injuries.

Most common :	
Site	Pelvic Brim near infundibulo pelvic ligament
Procedure	Simple abdominal hysterectomy
Type of injury	Obstruction
Surgeon's activity leading to injury	Attempts at haemo stasis
Time of diagnosis	None : 50:50, intra and post operative

Ureteric Injuries

Ureter is the second commonest organ of the urinary tract to get injured during gynaecologic surgery.

There are five common sites of ureteral injury.

(a) At pelvic Brim, near infundibulo pelvic ligament.

(b) Cardinal ligaments where ureter crosses under the uterine articles.

(c) Lateral Pelvic wall lateral to utero-sacral ligaments.

(d) At vaginal vault intra mural portion of ureter.

(e) Tunnel of Wertheim

Types of Surgical Ureteral injuries during open or laparoscopic surgery.

Transection.
Suture ligation.
Crush.
Devascularization – Ischemic necrosis.
Kinking.
Fibrotic stricture.
Thermal injury.

Bladder injuries

The bladder is the most commonly injured urinary tract organ. Majority of injuries occur at the dome. Bladder base injury is much more serious as it can involve ureters as well. Commonly injury occurs during abdominal wall entry usually in cases of previous scar and during dissection of bladder from cervix. During laparoscopic surgery also the dome is injured commonest. An additional type of bladder injury is from laparoscopic trocars and staplers etc.

Diagnosis of Urinary Tract Injuries

The ability to timely and correctly diagnose these injuries will determine the extent of morbidity the patient will suffer and the amount of litigation the surgeon will face.

Preston (Ref. R 44) published "latrogenic ureteric injury : common medicolegal pit falls" in 2000, in which he stated that it is the cases that result in significant morbidity and inconvenience to patients that are more likely to result in legal action being taken. As would be expected injuries without long term sequelae do not lead to malpractice suits.

Per operative cystoscopy with intravenous indigo carmine and retrograde passage of ureteric stents, should be considered if suspicion exists.

In the first 48hrs careful observation of patients symptoms and clinical findings can suggest the diagnosis.

Sonography, CT and MRI, along with biochemical tests can help in diagnosing surgical injuries not recognized intra operatively.

Repair of Urinary Tract Injuries

Details of different techniques of repair for different types of injury is beyond the scope of this article.

The method of repair of an injury to a ureter depends of the location and the type of injury.

Various techniques used are :

Retrograde stenting.

Primary end to end closure.

Re-implantation – Psoas hitch.
Boari flap

Uretero ileo cystostomy

Bladder injuries are easier to repair. Usually the skill required is less. Careful two layer closure, usually laparoscopic in cases of laparoscopic surgery is optimal. Urethral catheterization for 10-14 days gives good results. Injuries in the trigonal area needs to be carefully closed, multiple interrupted absorbable sutures should be used. Patency of ureter and urethra should be tested after the procedure. Finally ureteral stents and an indwelling catheter should be used for complete healing (Ref. 56)

Some tips for "Best surgical practice".

1. During Pelvic surgery, the surgeon should be aware of the location of the ureters at all times.
2. High index of suspicion should always be there, especially in situations that are prone to ureteric inuuries.
3. Intra operative diagnosis of urinary tract injury is the "Best possible" scenario for both the patient and the surgeon.
4. Appropriate diagnosis and management should involve specialists with necessary skills.

Summary :

Injuries, however unpleasant, are a reality in surgeon's professional life. To be safe at all times would need – constant reflection on the location of vital structures and meticulous attention to optimal surgical techniques. However, should such injury occur, an optimal outcome is possible by accurately diagnosing the type and location of the injury, prompt correction by appropriate surgical or non surgical techniques.

"The most accomplished surgeon appears to be deliberate, making no unnecessary movements and directing both the instruments and assistants accurately". Victor Bonney

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