



## Recent Advances in Stress Urinary Continence

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### ABSTRACT

Urinary incontinence has a significant effect on the quality of life for many women. The prevalence of urinary incontinence is low in young women, peaks around menopause and rises steadily thereafter into later life. A full diagnostic evaluation of urinary incontinence requires a thorough medical history, drug history, storage symptoms, abdominal, pelvic, and neurological examination, urinalysis, and other tests. Majority of women do not seek medical help for this condition. Management can be done using either surgical or non-surgical methods. Initially, non-surgical techniques are used to manage the condition and in case of failure, surgical methods are advised. The present article reviews recent advances in the diagnosis and treatment strategies for the management of stress urinary incontinence.

**Key words:** Diagnosis, Female, Urinary bladder, Urinary incontinence

### INTRODUCTION

The primary functions of the urinary bladder include storage and excretion of urine. Looking closely at the anatomy of the bladder, we know there are two ureters and urethral openings, internal urethral sphincter, and external urethral sphincter where the latter is in our voluntary control. The supports of the urethra are classified as extrinsic and intrinsic supports. Extrinsic supports include levator ani, endopelvic fascia and arcus tendineus fasciae pelvis. The intrinsic supports are the striated and smooth muscles of the urethra, epithelial coaptation of the folds of the urethra, tone of the urethra, urethral elasticity, congestion of the submucosal venous plexus.

During childbirth, the extrinsic supports such as endopelvic fascia and arcus tendineus fasciae pelvis get torn or affected. Furthermore, with advancing age of a woman, the estrogen levels drop leading to thinning of the intrinsic supports of the urethra. All of this may result in urinary incontinence at later years of life though not immediately after childbirth.

The proximal urethra is an intraabdominal organ. In extrinsic support-hammock hypothesis, whenever there is a raise in the

intraabdominal pressure, it causes the urethra to close against the hammock. However, after childbirth trauma, the proximal urethra gets displaced. Hence the raise in the intraabdominal pressure is communicated to the bladder but not to the urethra. This leads to a raise in intraabdominal pressure than intraurethral pressure resulting in the leakage of urine.

The sympathetic nervous system is placed from T10-L2, which inhibits the detrusor muscle and the stimulation of the urethral muscle. The parasympathetic nervous system from S2-S4 causes the stimulation of the detrusor muscle and inhibition of the urethral muscle. The somatic nervous system from S2-S4 can stimulate the external sphincter. The parasympathetic nervous system plays a major role in enabling urine passage.

The American College of Gynecology in 2014 defined urinary incontinence as a condition of involuntary loss of urine on effort, physical exertion, sneezing or coughing that is often bothersome to the patient and frequently affects the quality of life.

### GRADING OF URINARY INCONTINENCE

- Grade 0 – Continent
- Grade 1 – Loss of urine with sudden increase in intraabdominal pressure not in bed at night
- Grade 2 – Incontinence worsens with lesser degree of physical stress
- Grade 3 – Incontinence with walking, standing erect from sitting position, or sitting up in the bed
- Grade 4 – Total incontinence occurs, and urine is lost without relation to physical activity.

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## EPIDEMIOLOGY

The prevalence of urinary incontinence is low in young women, peaks around menopause and rises steadily thereafter into later life. The prevalence of mixed incontinence is higher than urge incontinence. According to various studies, an average of 45% of women between 30 and 60 years of age experience urinary incontinence. Among women with stress urinary incontinence (SUI), 77.5% of them have bothersome symptoms. Hence, it is necessary to generate awareness in patients regarding the condition to be able to provide necessary treatments.

In India, there is a 8–9% prevalence of urinary incontinence with a high prevalence of urological symptoms during pregnancy as compared to before pregnancy with incidence of SUI being 19% in second and 21% in the third trimester of pregnancy.

## RISK FACTORS FOR URINARY INCONTINENCE

- Pregnancy and vaginal delivery
- Caffeine and fluid intake
- Medications such as diuretics, alpha-blockers, etc
- Constipation, chronic cough
- Conditions affecting mobility
- Medical conditions such as diabetes, stroke, etc.
- Oral estrogen substitution and body mass index (Modifiable risk factors).

A detailed evaluation of history and other risk factors should be performed to give the best management options. A right diagnosis only will lead to the best management of the condition.

An International Urogynecological Association and International Continence Society Joint on the terminology for female pelvic floor dysfunction is as mentioned below:

- SUI: Complaint of involuntary loss of urine on effort or physical exertion
- Urgency Incontinence: Complaint of involuntary loss of urine associated with urgency
- Postural (urinary) Incontinence: Complaint of involuntary loss of urine associated with a change of body position
- Mixed Urinary Incontinence: Complaint of involuntary loss of urine associated with urgency and with physical exertion
- Continuous Incontinence: Complaint of continuous involuntary loss of urine
- Insensible Incontinence: Complaint of urinary incontinence where the woman has been unaware of how it occurred
- Coital Incontinence: Complaint of involuntary loss of urine with coitus.

## STEPS TO APPROACH PATIENTS WITH URINARY INCONTINENCE

It is important to evaluate patients with urinary incontinence to identify the right cause which will lead to better management outcomes. The common steps to be followed are as mentioned below:

- Patient history: Review all the symptoms with utmost importance including duration, QoL, etc.

- Storage symptoms: Assess the frequency, nocturia, urgency, and incontinence
- Voiding symptoms: Hesitancy, slow stream, position-dependent micturition, dysuria, etc.
- Past medical history: Review all other conditions such as pulmonary disease, neurological disease.
- Drug history
- Previous surgical history and treatment for incontinence
- Menstrual and obstetric history.

Other laboratory investigations and general examination of the patient should include the following:

- Abdominal examination: Mass impinging on the bladder, hernias, over-distended bladder
- Pelvic examination: Excoriation, prolapse, atrophy, tone of the pelvic muscles, demonstration of leak, cough stress test, Bonney's test, Q-tip test, Pediatric Foley's test
- Neurological examination: Mental status, anal reflex, bulbocavernosus reflex, perineal sensation
- Urinalysis: Bacteriuria, hematuria, glucosuria, post-void residual volume ( $n < 50$  ml)
- Cystoscopy, magnetic resonance imaging, computed tomography, and X-ray are not recommended except for some rare cases
- Pad test: This test allows the detection and quantification of incontinence. The test is observed for a period of 1 h after drinking 500 ml of water and doing a certain set of exercises
- Dye test using phenazopyridine, indigo carmine, and methylene blue: This test can be performed when there is a doubt if the discharge is truly urine. It can be done to exclude extra-urethral incontinence.

## BONNEY'S TEST

This is a routine test performed to identify urinary incontinence. Cough stress test is done to confirm SUI.

Elevation of urethra against the pubic bone – No leak on cough stress (Positive Bonney's Test) – Good prognosis for urethral elevation surgeries.

This causes direct urethral compression and hence it is difficult to diagnose urethral hypermobility.

## Miyazaki – Bonney's Test

This test is to assess if Burch colposuspension can be used. When the anterior vaginal wall is stretched superolaterally up to the lateral pelvic wall using ring forceps and the test is positive, Burch procedure can result in favorable outcomes.

## Q-tip Test

This test is used for the demonstration of hypermobility. The measurement of change in the Q-tip angle is checked after the Valsalva maneuver. If the hypermobility is more than 30 degrees, then the Q-tip test is considered positive. Burch procedure is suitable for patients reporting positive for this test.

### Pediatric Foley's Test

This test is performed to screen for intrinsic sphincter deficiency (ISD) and is similar to the test performed for cervical incompetence.

In this procedure, No. 8 Foleys is inserted into the urethra without inflation. In normal patients, the foleys cannot be withdrawn if it is inflated, however, if it can be withdrawn with inflation, the test is considered to be ISD positive.

A micturition diary is a tool that helps in observation and record-keeping for both the HCPs and the patients to understand the leakage frequency, duration, etc. Maintaining records for a minimum of 3–7 days can ensure good understanding and results.

## URODYNAMICS

Both the American College of Obstetricians and Gynecologists and the Royal College of Obstetricians and Gynecologists recommend urodynamics to be done only for certain cases and not all cases.<sup>[1]</sup> It is especially useful for complicated incontinence cases.

It is recommended to be done in indications such as:

- Where the results may change the management such as prior to most invasive treatments
- After any treatment failure if more information is needed to plan further therapy
- As a part of both initial and long-term surveillance programs in some types of neurogenic lower urinary tract dysfunction.

The urodynamic study gives objective information about the lower urinary tract function. It also helps in the correct diagnosis and classification of incontinence. There are 4 main components of this study as mentioned:<sup>[2]</sup>

- Uroflowmetry: It is a simple procedure where the volume of urine is plotted over time. The normal flow rate is 15–25 ml/s and if the flow rate is <10 ml/s it must be considered as an atonic bladder or having urethral obstruction
- Cystometry: It is a pressure study conducted using a filling catheter, a bladder pressure catheter, and a vaginal pressure catheter to measure the results [Table 1].
- Tests of urethral function: Valsalva leak point pressure, fluoroscopic and cystoscopic assessment of the bladder neck<sup>[3]</sup>
- Voiding cystometrogram: Pressure flow study.

According to the European Association of Urology, 5–69% of women have at least one episode of SUI. About 50% of women with incontinence have SUI. The annual incidence of SUI is 4–10%.

**Table 1:** Normal cystometric values

Parameter	Value
Residual urine	<50 ml
First desire to void	150–250 ml
Cystometric capacity	400–600 ml
Maximum detrusor pressure	
Filling	<15 cm H <sub>2</sub> O
Voiding	<70 cm H <sub>2</sub> O
Peak urine flow rate	>15 ml/s

### McGuire Classification of SUI

There are three types of SUI according to this classification as mentioned below:

- Type 1 and 2: Occur because of urethral hypermobility
- Type 3: Occur because of ISD.

### Management of SUI

The management of SUI can be done either through surgical or non-surgical methods. Initially, non-surgical techniques are used to manage the condition and in case of failure using these, surgical methods are advised.

The non-surgical management methods include:

- Lifestyle changes such as weight reduction, decreased caffeine intake, fluid restriction, and bladder training
- Physical therapy for pelvic floor muscle training with Kegel's exercises restore the muscle tone, strengthen the pelvic floor muscles, and improve the pelvic organ support. Improvement of symptoms can be seen in 6 weeks
- Bladder drill and bio feedback are computerized bio feedback devices using small sensors close to the muscles being monitored to record electrical activity. This feedback mechanism allows the patient to understand which muscles are being used. There are two types of sensors – tampon-link to be placed in the vagina and external stick-on type of sensor outside the vaginal opening
- Vaginal cones are not available in India but are a good way of toning muscles
- Medical management using estrogens, alpha agonists, beta-blockers etc. are not beneficial.
  - Duloxetine: It is a selective serotonin and norepinephrine reuptake inhibitor. It stimulates the pudendal nerve increasing the urethral sphincter tone.<sup>[4]</sup>

The surgical management methods include the following:

- Abdominal retropubic suspension
  1. Burch retropubic urethropexy
  2. Marshall-Marchetti-Krantz procedure
  3. Paravaginal repair
  4. Vaginal obturator shelf.
- Laparoscopic retropubic suspension
  1. Laparoscopic Burch suspension
  2. Laparoscopic paravaginal repair.
- Tension free midurethral slings
  1. Tension free vaginal tape (TVT)
  2. Transobturator approach – inside out/outside in
  3. TVT secur
  4. Mini arc slings surgery
  5. Minitape.

### Burch Colposuspension

This procedure ensures 90% cure rate within 1 year and 70% cure rate for 5 years. Complications can include voiding difficulty, *de novo* detrusor overactivity, and genitourinary prolapse. Types of Burch Colposuspension are given in Table 2.

**Table 2:** Types of burch colposuspension

Transabdominal	Transvaginal	Laparoscopic
<b>Advantages:</b> <ul style="list-style-type: none"> <li>• Excellent exposure and access</li> <li>• Long-term data supporting its durability</li> <li>• Opportunity to repair coexisting abdominal pathology</li> </ul>	<ul style="list-style-type: none"> <li>• Less complications, short operating time</li> <li>• More effective than TVT or TOT (BJOG, 2008)</li> </ul>	<b>Advantages:</b> <ul style="list-style-type: none"> <li>• Miniature abdominal incision</li> <li>• Decreased postoperative pain and recovery</li> <li>• Decreased postoperative voiding dysfunction</li> <li>• Reduced blood loss</li> <li>• Shortened hospitalization</li> </ul>
<b>Disadvantages:</b> <ul style="list-style-type: none"> <li>• Large incision</li> <li>• Prolonged hospital stay and recovery period</li> </ul>		<b>Disadvantages:</b> <ul style="list-style-type: none"> <li>• Surgeon's expertise</li> <li>• Longer operating time</li> </ul>

TVT: Tension Free Vaginal Tape

**TVT**

- Introduced in 1996 by Ulmsten *et al.* and is a long-term treatment for SUI
- In this procedure, a synthetic tape is passed transvaginally at the mid-urethral level through the retropubic space, and the rationale for the treatment is based on the integral hammock theory of UI
- TVT is widely accepted as it is minimal invasive procedure, shorter hospital stays, similar success rates as Burch, decreased morbidity, and cost-effective procedure
- The success rate is 96.6% in 1-year post-surgery and 83% at 5 years.

**Pubovaginal Sling**

- It combines the vaginal and abdominal procedure with the sling passing around the bladder neck and the urethra
- It provides support and compresses the urethra
- The types of slings include autologous, heterologous, and synthetic models.

**Artificial Sphincter**

- This can be used as a primary procedure in women with ISD where an inflatable cuff is placed around the bladder neck and proximal urethra to provide occlusion, reservoir is placed to allow deflation, and a pump in labia majora
- When the patient wants to void, the cuff is deflated by labial pump, and it reinflates after 2 min of voiding
- The cure rate is 80% and the improvement rate is 90%.

**CONCLUSION**

The treatment of SUI in women has seen revolutionary changes in the past years. Advances in the treatment of SUI have provided physicians and patients with various options and advantages. The future trends include stem cell therapy where myoblasts, fibroblasts, and neuronal stem cells are used. Injected ultrasonography guidance into the external urethral sphincter can be another explorable option.

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