FOGSI FOCUS
ON

URINARY INCONTINENCE

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FOGSI FOCUS UROGYNECOLOGY
URINARY INCONTINENCE

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Consultant Urogynecologist, Centre for Urogynecology and Pelvic Health, New Delhi

PRESIDENT'S FOREWORD

Urogynecological issues impact a woman's physical, social and mental well-being. And yet, they are neglected the most, both by the patient and the clinician. In recent years Urogynecology has come up as the most evolving sub-specialty of gynecology. This has led to increased awareness about the issues related to urogynecology. Urinary incontinence is one such distressing issue which can rob a woman off her dignity.

FOGSI has always played a vital role in spreading the knowledge about this evolving subspecialty both among doctors and patients. This year my FOGSI slogan is Swasthya Nari, Sukhi Nari. My CSR activity is defined as Badlaav (Change) including three arms- Ekikaran (integration of thought and action), Samanta (equality of treatment irrespective of economic status) and Takniki (technology to achieve these objectives). These books are a step towards my goal of improving women s health in our country, by providing updated information about the relevant topics in women care.

As president FOGSI, it gives me immense pleasure to present this issue of FOGSI FOCUS on Urinary Incontinence. It is a crisp compilation of chapters on clinically relevant topics on urogynecology by none other than stalwarts in this field from all across the country.

This issue includes basics like anatomy and pathogenesis, evaluation both clinical and imaging-based, details of management in varying clinical scenarios including recurrent incontinence, role of surgery in UI and management of complications after incontinence surgery. Another highlight of this issue is that each of the contributing authors is a master of the topic they have contributed, these chapters are therefore rich with not only the recent evidence but also the vast experiences of the author, hence are full of practical tips and points which the readers will find extremely beneficial.

It will be a ready reckoner for both the students and clinicians to update their knowledge on evidence-based management of Urinary Incontinence. I congratulate Dr. J.B Sharma, chairperson Urogynecology committee and all the editors and co-editors for their sincere efforts to write, collate, edit and publish this book.

I sincerely hope that this issue of FOGSI Focus will benefit and empower all the FOGSIANS.

Dr. Hrishikesh D Pai
President FOGSI 2022-2023

SECRETARY-GENERAL'S MESSAGE

Urogynecology is one of the most evolving sub-speciality branches. Urogynecological problems are faced by women at every stage of life which affects their personal and social relationships. Due to the recent advances in this field, awareness about the issues related to Urogynecology has now increased. FOGSI has been forefront in inspiring and imparting knowledge in the field of Obstetrics and Gynecology.

This issue of FOGSI Focus describes simplistically every aspect of urinary incontinence. All the contributors have done a great job in coming out with this focus making this Focus very educative. This issue is an interesting read and very beneficial in treating patients. Hope the FOGSIANS are empowered by reading this and it helps them in increasing their knowledge and practice in urogynecology

Wishing everyone a Happy New Year 2023!

Dr. Madhuri Patel
Secretary-General, FOGSI

MESSAGE FROM THE DESK OF VICE PRESIDENT FOGSI

Dr Yashodhara Pradeep

It is my great honour and privilege to write this message; I am thankful to the President FOGSI Dr. Hrishikesh Pai & Dr J.B. Sharma Chairperson Urogynecology Committee FOGSI for their vision to decide to publish a FOGSI FOCUS on Urinary incontinence, it is one of the common problemin females age 40-50 years. Indian studies prevalence of UI in female 21-27%. The global prevalence urinary incontinence in population is ranges from 8-45%, more common in females(75-80%). The urinary incontinence has an immense impact on the social and mental health, and the quality of life of a person. There is lot of hesitation among the women in seeking consultation because of lack of awareness & the understanding that the problem of UI is age related and the treatment is mainly surgical. In last decade great deal of research done and with the advent of new moleculeshave shown promising results with medical management.

The FOGSI FOCUS on urinary continence has widely covered the topics from basics evaluation of patient diagnosis and to categorise the womenin need of conservative management with life style modification to pharmacotherapy and who needs surgical management.

Professor J.B. Sharma Chairperson Urogynecology Committee FOGSI and his entire team has made great attempt to focus on the problem of Urinary Incontinence. I congratulate to entire editorial team and the contributors for their enormous efforts. This is going to be great source of education in updating the information and knowledge of all the fellow FOGSIANS.

With Best Wishes

Professor Yashodhara Pradeep
Vice President FOGSI
V.P. in charge of Urogynecology Committee FOGSI

COMMITTEE CHAIRPERSON'S MESSAGE

Greetings to all the FOGSIANS!

As the chairperson of the Urogynecology Committee of FOGSI and editor of this volume, it gives me immense pleasure to bring to you this FOGSI FOCUS dedicated to the topic of Urinary Incontinence.

This volume includes chapters on basics, clinical evaluation, details of conservative and surgical management of prolapse, and conundrums in the surgical management of pelvic, contributed by experts both national and international. The authors have decades of Urogynecology practice experience between them and include some of the most senior, respected teachers and eminent practitioners in this field.

We hope that this compilation serves as a ready reckoner and quick reference guide to common practical scenarios in day-to-day practice. If this publication helps you in your approach to patient management and impacts the lives of the women that we serve, our purpose in publishing this FOGSI FOCUS will have been well served.

We wish to thank FOGSI President Dr. Rishikesh Pai and the office bearers, without whose blessings and encouragement, this book would not have materialized. We wish to place on record our gratitude to our publishers and the academic partners, Jagsonpal Pharmaceuticals Ltd. for their constant support and help in bringing this volume to FOGSIans across India.

We have enjoyed compiling this volume and hope you have a memorable experience reading it. We sincerely thank all the contributors for their excellent work. We welcome any comments and suggestions from our readers.

Dr. J.B. Sharma
Chairperson Urogynecology
Committee FOGSI

From the desk of Co-editor

Great achievements are only possible
with knowledge, experience and hard work.

I am feeling proud and exuberant to present this FOGSI FOCUS on "Urinary Incontinence" as co-editor. It is a comprehensive and crisp compendium with a collection of concise but detailed information that has been designed in such a way to guide, manage and understand many complex issues surrounding this complex disorder. ***I must congratulate Dr J.B. Sharma***, Editor for conceptualization of this FOGSI FOCUS as it will prove to be a boon for every postgraduates as well as practitioners. I also congratulate to all the hardworking and outstanding authors of this FOGSI FOCUS who have shared their valuable clinical experiences and backed every chapter up with important studies, common practices, the diagrammatic representations and illustrations for various operative procedures and evidence based recommendations. I hope that this FOGSI FOCUS will help clinicians to gain more expertise while managing such complex patients in day to day practice.

We need to be aware what others are doing,

Applaud and acknowledge their efforts.

WHEN WE ALL HELP ONE ANOTHER, EVERYBODY WINS.

Dr. Kiran Pandey
Co-Editor
Chairperson, MEC FOGSI

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LIST OF CONTRIBUTORS

Dr. Kiran Pandey

MBBS, MD, FICOG, FIMSA, FICMCH, MAMS,
CIMP, Advance diploma in ART (Germany Keils)
Professor & Ex. HoD, Dept of Obs & Gynae, GSVM
Medical College, Kanpur
Peer reviewer Ind. Journal of Obs. & Gynae.

Prof. Subhash Chandra Biswas

MBBS(Cal), MD (PGI, CHD), FICOG, FMAS, FIMSA
Head of the Department
Department of Obstetrics & Gynaecology
IPGME&R-SSKM Hospital, Kolkata-20, WB
Member, Urogynae Committee, FOGSI
National Corresponding Editor, JOGI
Member, Publication Committee, IUGA

Prof. Ramprasad Dey

MBBS, DCH(Cal), MD(O&G), FICOG, FMAS
Professor, Department of Obstetrics & Gynaecology
Chittaranjan Seva Sadan, Kolkata, WB
National Corresponding Editor, JOGI
Editor-in-Chief, Journal of ISOPARB
Vice President, Bengal OBG Society

Dr. Geeta Mediratta

Vice - Chairperson
Institute of Obstetrics & Gynaecology
Sir Ganga Ram Hospital, New Delhi

Dr. Karishma Thariani

M.S, D.N.B, MNAMS
Fellowship Urogynecology and Pelvic Reconstructive Surgery (AIIMS)
Consultant, Center for Urogynecology and Pelvic Health, New Delhi

Dr. Aparna Hegde

Assoc Professor (Hon), Urogynecology, Cama Hospital, Grant Medical College, Mumbai
MD, DNB, FCPS, DGO, MS (Stanford University), IUGA International Fellowship,
Urogynecology and Pelvic Reconstructive Surgery, Cleveland Clinic Florida,
Consultant Urogynecologist, Global Hospital, Surya Hospital, Womens Hospital,
Mumbai and Mitr Hospital, Kharghar Founder and Director, C.U.P (Center for Urogynecology and Pelvic Health), New Delhi

Dr. Meera V. V. Raghavan
MD,DNB,MNAMS,FRCOG(UK),DFFP(UK),
PGCTLCP(Lancaster,UK)
Senior Consultant Obstetrician and Urogynaecologist and Robotic Surgeon
Apollo Hospitals,Chennai
The Chennai Speciality Klinic

Dr. Rajesh Kumari
Additional Professor
Department of Obstetrics and Gynaecology
AIIMS, New Delhi

Dr. Mohini Agrawal
MS, DNB
Fellow Urogynecology and Reconstructive Surgery
Department of OBGY, AIIMS New Delhi

Dr. J.B. Sharma
MBBS; MD; DNB; FRCOG, M.F.F.P, F.A.M.S., PhD, F.I.C.O.G., F.I.M.S.A.
Professor Obs & Gynae at AIIMS, New Delhi
Ex-Prof Maulana Azad Medical College, New Delhi
Worked at St. Bartholomew's Hospital, Homerton University Hospital and Whipps
Cross University Hospital, London, U.K.
Dr B.C.Roy awardee

Dr. Mangesh Narwadkar
Gargi hospital Nanded, Maharashtra

Dr. Pankaj Sarode
Cradle hospital, Pune, Maharashtra

Dr. Amita Jain
MS (Obs-Gyn)
Fellow Urogynaecology (Australia)
Senior Consultant Urogynecology
Medanta Institute of Urology & Robotic Surgery
MEDANTA - The Medicity Hospital, Gurugram

Prof. Dr. T. Srikala Prasad
M.D., D.G.O., M.Ch (Urology)
Professor & Head of the Department
Department of Urology
Chengalpattu Medical College, Tamil Nadu

Dr. K. Jessima Subahani
M.S., D.G.O., M.Ch (Urology)
Assistant Professor, Institute of General Surgery,
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CONTENTS

Notes

CHAPTER 1

ANATOMY AND PHYSIOLOGY OF URINARY CONTINENCE

Dr. Karishma Thariani

Dr. Kiran Pandey

Introduction:
The lower urinary tract consists of the bladder which is a storage organ and the urethra which is a conduit for the expulsion of urine. The bladder has two functions: urinary storage and expulsion. The storage of urine requires low bladder pressure that does not exceed bladder outlet resistance. Voiding requires intact neurological pathways which govern volitional voiding, adequate bladder contractility, and coordinated relaxation of the bladder outlet and pelvic floor.

The Urinary Bladder
The urinary bladder is a hollow muscular organ, which acts as a reservoir for urine. When it is empty it lies entirely in the true pelvis, and when it is starts to fill it rises antero superiorly towards the abdomen. The bladder wall consists of three histological layers: an inner layer comprised of urothelium, a middle muscular layer, and an outer adventitial layer.
(Figure 1)

The inner urothelial layer is comprised of multilayered transitional epithelium and is continuous with the ureters above and urethra below. It is impermeable to fluids and solutes functioning as an elastic barrier against urine. The middle layer (the detrusor muscle) is composed of smooth muscle fibers accounting for most of the thickness of the bladder wall.

These muscle fibers allow for both the relaxation of the bladder during filling and contraction during emptying. The outermost adventitial layer is composed of connective tissue which functions by holding the bladder in the pelvis via its various fascial condensations and is covered superiorly and posteriorly by peritoneum.

The base of the bladder is located posteroinferiorly and is triangular in shape. Each ureter forms the superolateral angle of the triangular base, while the internal urethral orifice forms the anteroinferior angle. This triangle, within the base of the bladder, is referred to as the trigone and can be seen on cystoscopy. Its smooth appearance is attributed to the lack of trabeculations, seen in the bladder mucosa elsewhere

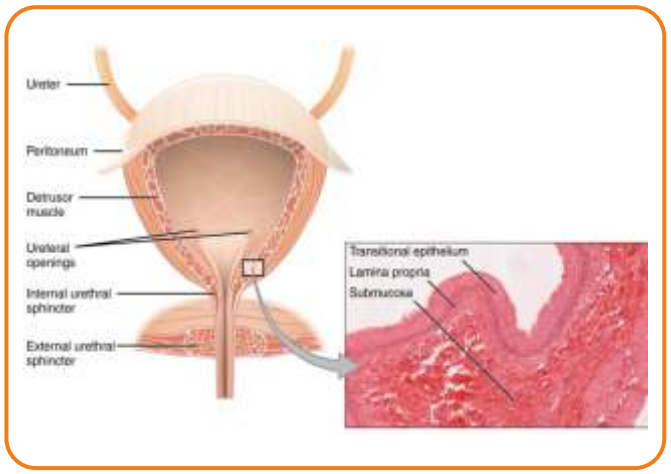


Figure 1: Layers of bladder

Urethra and Sphincter Mechanisms
In the female, the urethra is approximately 4 cm in length and exits the body at the external urethral meatus situated between the clitoris and vagina.

There are two urethral sphincters involved in continence.

Internal Urethral Sphincter (IUS)
At the level of the bladder neck, the IUS surrounds the proximal urethra and is seen as a continuation of the detrusor smooth muscle, therefore favoring proximal urethral closure by constricting its lumen. This sphincter is not under voluntary control and remains closed during bladder filling.

External Urethral Sphincter (EUS)
Skeletal muscle, derived from the inner fibers of the levator ani muscle, surrounds the urethra as it traverses the deep perineal pouch therefore forming the EUS. In females, the EUS begins at the inferior end of the bladder and includes (i) sphincter urethrae muscle, (ii) the compressor urethrae muscle, and (iii) the urethrovaginal sphincter. The EUS is innervated by nerves originating from the Onuf's nucleus in the S2–S4 spinal segments (mainly via the pudendal nerve).

Pelvic Floor and Supporting Structures
In addition to the structures of the lower urinary tract, the pelvic floor musculature and surrounding

structures also contribute to urinary continence. The pelvic viscera, levator ani muscles, pelvic ligaments, as well as overlying peritoneum all act in concert to assist the sphincters in maintaining continence. The pubourethral ligaments are the fascial support of the midurethra to the inner surface of the inferior pubis. Pubourethral ligament laxity is often attributed as a cause of stress incontinence, whereby there is rotational descent of the urethra & hence distraction with opening of the bladder neck/proximal urethra during times of stress such as coughing.

Innervation of Lower Urinary Tract

Afferent (Sensory) Pathways Sensation of bladder filling and fullness arises from stretch receptors in the detrusor muscle as well as the urothelium and is conveyed via the parasympathetic afferent nerves to the sacral spinal cord. There, they enter ascending spinal pathways to the brain stem (the pontine micturition center) and cerebral cortex.

Efferent (Motor) Pathways

1. Parasympathetic efferents innervate the detrusor muscle. These nerves originate from the sacral spinal cord (S2–S4) and causes detrusor muscle contraction via muscarinic receptors.
2. Sympathetic efferents originate from T10 to L2 spinal segments and innervate smooth muscle of the bladder base, bladder neck, and proximal urethra. These fibers have an inhibitory function during bladder filling by causing relaxation of the detrusor via beta-3 adrenergic receptors.
3. The somatic system consists of the pudendal and pelvic nerves which originate at cord segments S2–S4 (Onuf's nucleus) and innervate the urethral sphincter. (Figure 2)

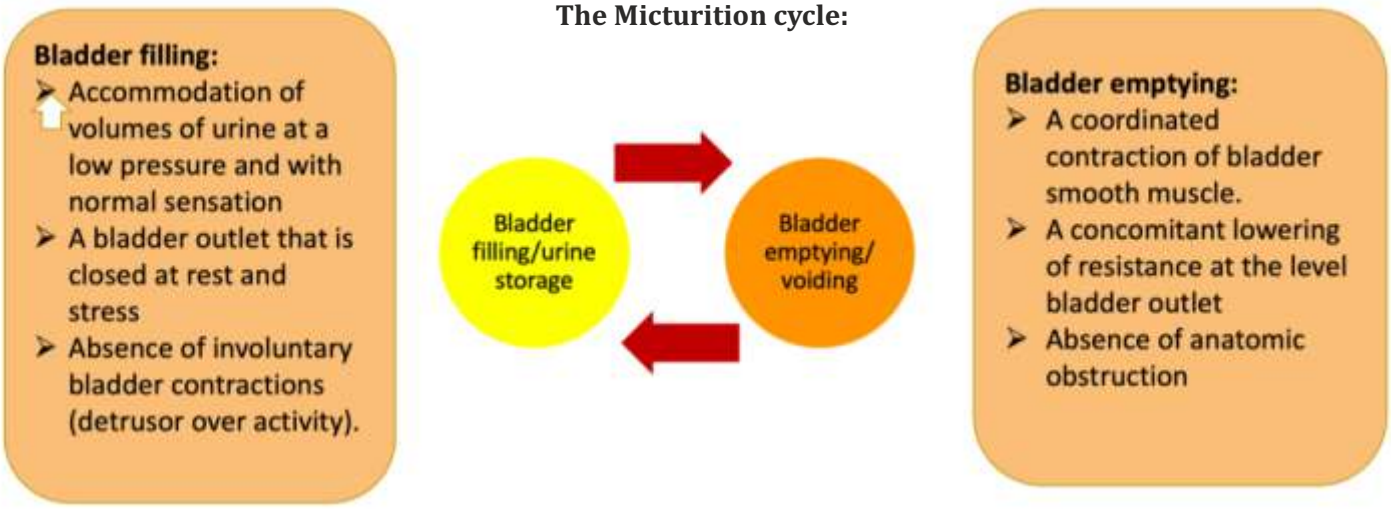
Figure 2: Innervation of lower urinary tract

	Detrusor	Urethral muscle	External sphincter
Symp (T10-L2)	Inhibit (β)	Stimul (α)	---
Parasym (S2-4)	Stimul	Inhibit	---
Somatic (S2-4)	---	---	Stimul

Pontine Micturition Center (PMC)

The PMS is located in the brain stem. It is responsible for coordinated micturition, at an appropriate time and place, by integrating afferent sensory feedback from the lower urinary tract and cortical input to assess the appropriateness of voiding under a particularcircumstance.

The Micturition cycle:



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CHAPTER 2

CAUSES OF URINARY INCONTINENCE AND IDENTIFICATION OF RISK FACTORS

Prof. Subhash Ch Biswas

Prof. Ramprasad Dey

Introduction: Urinary incontinence (UI) is a common but under reported medical condition. The International Continence Society defined UI as "the complaint of any involuntary leakage of urine and which is a social or hygienic problem"[1], affecting approximately 200 million people worldwide[2,3]. The inability to control urine is quite an unpleasant and distressing condition causing substantial morbidity, social seclusion and psychological stress with significant impact on quality of life. Most women with loss of self-confidence are often embarrassed to talk about it and some even believe it to be untreatable[4].

Thus, it is of utmost importance to try defining the possible etiological and risk factors associated with urinary incontinence with a view for subsequent prevention.

There are various types of UI viz, stress, urge, mixed & overflow. Continence is maintained by a team work due to interplay amongst CNS, intact neurological connections, healthy bladder & intact urethra. Any factor which results in urethral hyper-mobility and or intrinsic sphincter deficiency will lead to SUI. Any contributory cause disturbing detrusor activity & modulating bladder receptors may result in urge incontinence. Neurological interruptions may cause overflow incontinence. Bladder diary evaluation points out use & abuse of pharmacological substances & agents of addiction.

This chapter highlightssome plausible risk factors.

Gender: Women are more likely to have stress incontinence. This can be attributed to factors like pregnancy, childbirth, menopause affecting urogenital anatomy & physiology.

Age: Aging has been associated with a higher risk of UI. The association between aging and urge incontinence can be easily explained by the age-related ultrastructural changes in the bladder and distinct changes in the receptor response[5] leading to general loss of muscle tone, long-term effects of denervation injuries experienced during parturition, and/or changes in hormonal stimulation.

Obesity: There are several mechanical and physiologic reasons explaining the association between an increased BMI and an increased incidence of mixed incontinence[6]. Rising BMI causes an increase in intravesical pressure, which in turn may alter pressure gradient between the urethra and bladder[7]. Also, elevated BMIs are associated with a ß3-adrenergic receptor mutation which affects ß3-mediated detrusor muscle relaxation[8].

Pregnancy and childbirth: Pregnancy and childbirth are regarded as key environmental determinants of UI, and more than 60% of incontinent women associate its onset with pregnancy, childbirth, or postpartum. Increasing parity is associated with increased chances of trauma to the innervation of pelvic floor and the urinary tract. Further, the pregnancy related hormonal changes and the increased weight of the fetus can lead to stress incontinence. Swash et al[9] & Singh et al10 support the view.

Labour & delivery - The impact of birth mode on incontinence and possible protective role of caesarean section remains a matter of intense debate. Studies[10,11] have found that vaginal delivery is an important risk factor for UI. The possible explanation for this is the risk of increased trauma to pelvic floor innervation and tissue weakening resulting in pelvic organ prolapse. A history of prolonged labour is thus an established cause[12,13].

Gynaecological Surgery - A history of gynaecological operation imposes risk of iatrogenic trauma to the genitourinary tract increasing risk of UI. The most biologically plausible rationale for this association is surgical trauma damaging the pelvic floor supportive tissues. Hysterectomy could interfere with the intricate urethral sphincter mechanism by damaging distal branches of pudendal nerves and inferior hypogastric plexus but it might also result in changes in bladder and midurethral support[14,15].

Constipation and chronic cough: They create an additional stress on both the anal and urethral sphincter resulting in UI. The studies by Prabhu and Shanbhag14 & Sensoy et al 15 identified constipation

and chronic cough both as risk factors of UI.

Smoking: It affects continence by damaging the urethral sphincter mechanism by frequent coughing, decrease in collagen synthesis, and smoking-related vascular diseases.

Caffeine and alcohol: High caffeine and alcohol intake is related to detrusor instability and increases the risk of UI.

Menopause: Lack of estrogen reduces bladder wall sensation, lessens urethral resting pressure by affecting coaptation of mucosa & submucosal vascularity. Deterioration of the tissues maintaining urethra-vesical configuration can aggravate incontinence.

Co-morbidities like **diabetes mellitus** and **asthma** are also known to increase the risk of urinary incontinence.

Neurological disorders such as multiple sclerosis, Parkinson's disease, stroke, brain tumours or spinal injuries can interfere with nerve signals involved in the bladder control causing UI.

Obstruction: Any tumour along the urinary tract & urinary stones may obstruct the normal flow of urine, leading to overflow incontinence.

Conclusion: Clinical characteristic and risk factors analysis is very crucial in urinary incontinence. This is will help health care workers to educate women regarding prevention of the modifiable risk factors by life style modifications and to plan appropriate therapy.

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CHAPTER 3

EVALUATION OF A PATIENT WITH URINARY INCONTINENCE

Dr. Geeta Mediratta

EVALUATION

• The evaluation should start with a thorough history, physical examination, and urinalysis

• Characterizing and classifying the type of incontinence

• Identifying underlying conditions (e.g. neurologic disorder or malignancy) that may manifest as urinary incontinence.

• Identifying potentially reversible causes of incontinence

• Additional evaluation is warranted in the presence of complex medical conditions or concerning findings on history and/or physical examination

History

a) History of present illness such as onset, timing, duration of symptoms.

b) Severity

c) Precipitating or alleviating factors • Associated pelvic floor symptoms

d) Contributions of medical and surgical events as well as medications

e) Prior treatments attempted • Information on pad use

f) Impact of UI on sexual function and lifestyle limitations around UI can (further indicate degree of bother)

g) Inquiry about an inciting event that may have prompted the patient to come in can further determine motivation for intervention.

Incontinence Impact Questionnaire- (Table.1)

SYSTEMIC SYMPTOMS

• Fever, dysuria, pelvic pain, and hematuria (UTI)

• Symptoms that are concerning for other underlying conditions as the cause of urinary incontinence include

• Lifelong or sudden onset of incontinence

• Associated abdominal/pelvic pain or gross hematuria without urinary tract infection.

• Changes in gait or new lower-extremity weakness, cardiopulmonary or neurological symptoms (for example, the combination of overflow urinary incontinence, perineal anesthesia, and new accidental bowel leakage suggests cauda equina syndrome)

• Mental status changes

• Recurrent documented UTIs (three or more per year)

• Advanced pelvic organ prolapse beyond the hymen, elevated PVR (>1/3 total volume)

• Long-term urinary catheterization, or difficulty passing a urinary catheter

MEDICATIONS

• Some medications can contribute to urinary incontinence. **(Table -2)**

• Alcohol and caffeine- Caffeine intake has been postulated to exacerbate urinary incontinence due to its smooth muscle stimulant and diuretic effects.

VOIDING DIARIES

a) Neither sensitive nor specific for determining the cause of incontinence

b) Helpful to determine if urinary incontinence is associated with high fluid intake

c) Span 3 to 5 days

d) Information gathered includes frequency and quantity of voids, frequency and severity of leakage and urgency episodes, events surrounding leakage episodes and timings and amount of fluids intake

e) Various bladder measures can be quantified and analyzed such as average bladder capacity, approximate daily fluid intake and output, noctural urine output, nocturia, stress incontinence episodes and urgency incontinence episodes

f) Nightly output that is > 33% of the patient's total 24 hours output. • Distinguish between wet and dry QAB

BLADDER DIARY – **(Table 3-** suggestive of urge incontinence)

(Table 4 suggestive of stress incontinence)

IMPACT ON QUALITY OF LIFE

• Symptoms that are most bothersome to the patient

• Kings Health Questionnaire are available for evaluating impact of incontinence on quality of life)

• Patient Global Impression of Severity (PGIS)

• Symptom questionnaires are a simple comprehensive and time saving method to determine the presence of UI and delve into the specifics of degree, bother, and subtype.

• Urogenital distress inventory, often administered in conjunction with the Incontinence Impact Questionnare (IIQ). **(Table 5)**

• It is designed to identify the presence and degree of bother from UI.

• Using a scale of 0 (no bother) to 4 (greatly bothered), the urogenital distress inventory originally contained 28 questions and assessed urgency frequency, leakage, pain, obstructive and irritative symptoms.

COUGH STRESS TEST

Objective Demonstration of SUI is a Pre-Requisite for Surgical management of Sui and the CST is the simplest and least expensive method to document SUI

• Immediate visualization of urine from the urethral meatus with increased abdominal pressures,either with cough or bearing down is diagnostic of SUI

• Can be done in the standing or lithotomy position, with provocative maneuvers and ideally with a full bladder

• If negative with an empty bladder, the patient can be retro filled with typically 300 ml of fluid and the test repeated

• Delayed release of urine

• Possible stress induced detrusor over activity

PHYSICAL EXAMINATION

1. Mobility

2. Cognitive status

3. P/A- scar, masses, hernia

4. Local Examination – LP, L Sch, Vaginal discharge

5. Evaluate for Pelvic floor muscle integrity, vaginal atrophy, pelvic masses, and advanced pelvic organ prolapse beyond the hymen- (POP-Q)

6. Q-tip test – visual inspection of AVW during cough or valselva- for urethral hyper mobility

7. Assess for Occult stress incontinence in advanced POP

8. Palpation of urethra (Diverticulum)

9. Check for fistulas/ ectopic ureteric opening

NEUROLOGICAL EXAM

• Involves sensory and motor assessment of lumbosacral nerve roots in addition to general mental status.

• Sensory function can be assessed by response to light touch, pin prick, and temperature

• The perineum and perianal skin supplied by the pudendal nerve(S2-4), mons pubis and upper labia majora supplied by the ilioinguinal nerve (L1-2), front of knees (L3-4), and sole of feet (S-I)

• The bulbocavernosus and anal reflex can be used to assess the integrity of the S2-4 sacral segments as well as the afferent and efferent pathways of the pudendal nerve.

• Motor Function - Assessed by observing extension and flexion of the hips, knees, ankle and foot.

PELVIC FLOOR EVALUATION

Pelvic floor muscle examination involves palpation of the levator ani complex with determination of strength, tone, tenderness and ability of the pelvic floor musculature to relax & contract (modified Oxford scale)

Rectal examination provides information regarding resting anal sphincter tone, contraction strength.

Impaction of stool, can help diagnose constipation or obstipation which is a common, treatable cause of UI

Laboratory tests- A urinalysis should be performed for all patients, and urine culture performed if a UTI or hematuria is suggested on screening.

POST-VOID RESIDUAL URINE

• Not required for initial therapy for stress or urgency urinary incontinence.

• Parameters for interpreting the results of PVR testing are neither standardized nor well-evaluated.

• Done by USG visualization or catheterization

• However, measuring the PVR can be helpful when diagnosis is uncertain, initial therapy is ineffective, or in patients where there is concern for urinary retention and/ or overflow urinary incontinence.

(neurologic disease, recurrent urinary tract infections, history concerning for detrusor underactivity or bladder outlet obstruction, history of urinary retention, severe constipation, pelvic organ prolapse beyond the hymen, new -onset or recurrent incontinence after surgery for incontinence, diabetes mellitus with peripheral neuropathy, or medications that suppress detrusor contractility or increase sphincter tone).

• PVR of less than one-third of total voided volume is considered adequate emptying.

• PVR of >150 mL or >1/3 total volume as a cutpoint for further evaluation of voiding dysfunction.

• Additional suggested parameters include a PVR under 50 mL as normal and a PVR greater than 200 ml as abnormal

OTHER TESTING

• Renal ultrasounds

Evaluate for hydroureteronephrosis a long-term upper tract sequela of urinaryretention, in the setting of over flow incontinence.

• Cystoscopy

a) Irritative voiding refractory to first line and second line treatments

b) Bladder pain

c) Recurrent cystitis

d) Other suburethralhematuria

e) Women with lower urinary tract symptoms and known risk factors for urothelial cancers such as smoking

Not required in the initial workup of most women with UI

Intravenous pyelograms and Computed tomography

URODYNAMIC TESTING

• We do not routinely refer for urodynamic testing in the initial evaluation of urinary incontinence in women whose symptoms are consistent with stress, urgency or mixed, urinary incontinence.

• Systematic review of 99 studies including over 80,000 women found insufficient evidence to support the ability of urodynamic testing to predict the outcomes ofnonsurgical treatmentfor SUI.

Urodynamic testing may be indicated. In women with suspected overflow incontinence (e.g underlying neurologic conditions, history of diabetes, or by symptom history)

SPECIALIST REFERRAL

• Associated abdominal or pelvic pain in the absence of UTI

• Culture-proven recurrent UTIs (three or more per year or two in six months)

• Gross or microscopic hematuria with risk factors for malignancy in the absence of a UTI.

• Lifelong incontinence or suspected vesicovaginal fistula or urethral diverticula on vaginal examination

• Other abnormal physical examination findings (e.g pelvic mass, pelvic organ prolapse beyond the hymen)

• New neurologic symptoms in addition to urinary and/or bowel incontinence

• Uncertainty in diagnosis

• History of pelvic reconstructive surgery or pelvic irradiation

• Persistently elevated PVR volume, after treatment of possible causes (e.g medications, stool impaction)

• Suspected overflow incontinence, particularly in the setting of underlying conditions (e.g neurologic conditions, diabetes)

• Chronic urinary catheterization or difficulty passing a catheter

TO CONCLUDE

Urinary incontinence is a significant, quality of life health condition affecting millions of women. Increasingly common as the population ages. With basic in-office evaluation, most subtypes of urinary incontinence can be defined, evaluated, and treated. Involves a detailed history with a review of current medical problems and medications, a physical examination, and selective in-office testing.

Please Turn Over for

Graphics & Tables

Table 1: Incontinence Impact Questionnaire (3 IQ)

Table 2: Some medications can contribute to urinary incontinence

Table 3: Bladder Diary - Stress incontinence

Table 4: Bladder Diary - Urge incontinence

Table 5a: Incontinence Impact Questionnaire (IIQ)

Table 5b: Urogenital distress inventory, often administered in conjunction IIQ

Table 1:

The 3 incontinence questionnaire (3IQ)

1. During the last three months, have you leaked urine (even a small amount)?

   ☐ Yes ☐ No

   → *Questionnaire completed*

2. During the last three months, did you leak urine:
   (Check all that apply)

   ☐ a. When you were performing some physical activity, such as coughing, sneezing, lifting, or exercise?

   ☐ b. When you had the urge or the feeling that you needed to empty your bladder, but you could not get to the toilet fast enough?

   ☐ c. Without physical activity and without a sense of urgency?

3. During the last three months, did you leak urine *most often*:
   (Check only one)

   ☐ a. When you were performing some physical activity, such as coughing, sneezing, lifting, or exercise?

   ☐ b. When you had the urge or the feeling that you needed to empty your bladder, but you could not get to the toilet fast enough?

   ☐ c. Without physical activity and without a sense of urgency?

   ☐ d. About equally as often with physical activity as with a sense of urgency?

Definitions of type of urinary incontinence are based on responses to question 3:

Response to question 3	Type of incontinence
a. Most often with physical activity	Stress only or stress predominant
b. Most often with the urge to empty the bladder	Urge only or urge predominant
c. Without physical activity or sense of urgency	Other cause only or other cause predominant
d. About equally with physical activity and sense of urgency	Mixed

Table 2:

Effect of selected medicines and other agents on bladder function

	Medicines and other agents	Effect on bladder function
Allergy		
Antihistamines	First-generation H_1 receptor antagonists (eg, brompheniramine, chlorpheniramine, clemastine, cyproheptadine, dimenhydrinate, diphenhydramine, hydroxyzine, others)	Decreased contractility via anticholinergic effect
Decongestants	Pseudoephedrine, phenylephrine	Increased urethral sphincter tone
Analgesic and sedative		
Benzodiazepines	Chlordiazepoxide, clonazepam, temazepam, triazolam, others	Impaired micturition via muscle relaxant effect
Opioids	Codeine, meperidine, morphine, oxycodone, others	Decreased sensation of fullness and increased urethral sphincter tone
Anticholinergic*		
Antimuscarinics (overactive bladder medications)	Darifenacin, fesoterodine, oxybutynin, solifenacin, tolterodine, trospium	Decreased contractility via anticholinergic effect
Spasmolytic	Dicyclomine, hyoscyamine, glycopyrrolate, methscopolamine, propantheline, scopolamine (hyoscine)	Decreased contractility via anticholinergic effect
Anticholinergics (antiparkinson medications)	Benztropine, trihexyphenidyl	Decreased contractility via anticholinergic effect
Cardiology¶		
ACE inhibitors	Enalapril, lisinopril, ramipril, others	Decreased contractility; chronic coughing
Alpha-agonists	Midodrine, phenylephrine, vasopressors (various)	Increased urethral sphincter tone
$Alpha_1$-blockers	Alfuzosin, doxazosin, prazosin, silodosin, tamsulosin, terazosin	Decreased urethral sphincter tone
Antiarrhythmic	Disopyramide, flecainide	Decreased contractility via local anesthetic effect on bladder mucosa or anticholinergic effect
Diuretics	Various	Increased urine production, contractility, or rate of emptying
Psychotropic		
Antidepressants	SNRIs: duloxetine, reboxetine$^{\Delta}$	Increased urethral sphincter tone
	Tricyclic antidepressants (amitriptyline, clomipramine, desipramine, doxepin, imipramine, nortriptyline, others)	Decreased contractility via anticholinergic effect
Antipsychotics	First-generation (chlorpromazine, fluphenazine, methotrimeprazine); second-generation (clozapine, olanzapine, risperidone); others have lower effect	Mixed effects described; decreased contractility via anticholinergic effect; increased micturition and stress incontinence via stimulation of $alpha_1$ receptors and/or central dopaminergic receptors
Other		
Skeletal muscle relaxants	Orphenadrine, tizanidine (also cyclobenzaprine, baclofen, and methocarbamol; but effect is lower)	Decreased contractility via anticholinergic effect
Estrogens	Oral estrogens (hormone replacement therapy)	Increased urinary incontinence
$Beta_3$-agonist	Mirabegron	Decreased contractility via $beta_3$-adrenergic effect
Alcohol		Decreased contractility
Caffeine		Increased contractility or rate of emptying

ACE: angiotensin-converting enzyme; SNRIs: serotonin-norepinephrine reuptake inhibitors; BPH: benign prostatic hyperplasia.

* Inhaled antimuscarinic bronchodilators (eg, ipratropium, tiotropium) and ophthalmic drops (eg, atropine, cyclopentolate) can be absorbed systemically in varying degrees; urinary retention has been rarely associated with their use particularly among older adults, among men with BPH, and with administration of an inhaled anticholinergic drug by nebulizer.

¶ Increased micturition reported by ≤3% of patients in clinical studies of calcium channel blockers; mixed effects have been described.

Δ Not available in the United States.

Prepared with data from:

1. *Verhamme K, Sturkenboom M, Stricker B, et al. Drug induced urinary retention. Drug Saf 2008; 31:373.*
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Table 3:

Your Daily Bladder Diary

This diary will help you and your health care team figure out the causes of your bladder control trouble. The "sample" line shows you how to use the diary.

Your name: _____

Date: _____

Time	Drinks		Trips to the Bathroom		Accidental Leaks	Did you feel a strong urge to go?	What were you doing at the time?
	What kind?	*How much?*	*How many times?*	*How much urine? (circle one)*	*How much? (circle one)*	*Circle one*	*Sneezing, exercising having sex, lifting, etc.*
Sample	Coffee	2 cups	✓✓	(sm) med lg	sm (med) lg	Yes (No)	Running
6–7 a.m.				sm med lg	sm med lg	Yes No	
7–8 a.m.				sm med lg	sm med lg	Yes No	
8–9 a.m.				sm med lg	sm med lg	Yes No	
9–10 a.m.				sm med lg	sm med lg	Yes No	
10–11 a.m.				sm med lg	sm med lg	Yes No	
11–12 noon				sm med lg	sm med lg	Yes No	
12–1 p.m.				sm med lg	sm med lg	Yes No	
1–2 p.m.				sm med lg	sm med lg	Yes No	
2–3 p.m.				sm med lg	sm med lg	Yes No	
3–4 p.m.				sm med lg	sm med lg	Yes No	
4–5 p.m				sm med lg	sm med lg	Yes No	
5–6 p.m.				sm med lg	sm med lg	Yes No	
6–7 p.m.				sm med lg	sm med lg	Yes No	

Use this sheet as a master for making copies that you can use as a bladder diary for as many days as you need.

Table 4:

Daily Bladder Diary
Please fill in the appropriate blanks below.

Name:_____
Date:_____

Time	Drinks		Urination		Accidental Leaks	Strong Urge to Void? (Y/N)	Activity Prior to Void
	Type	Quantity	No. of Times	Volume (small, medium, large)	Volume (small, medium, large)		
6–7 AM	Coffee	2 cups	2	Medium		Y	Sitting
7–8 AM			1	Small		Y	Sitting
8–9 AM							
9–10 AM			1	Small		Y	Sitting
10–11 AM	Water	10 oz.					
11 AM–Noon			2	Medium	Small	Y	Walking
Noon–1 PM	Iced tea	8 oz.					
1–2 PM			1	Medium		Y	Sitting
2–3 PM	Coffee	1 cup					
3–4 PM			1	Small		Y	Sitting
4–5 PM							

Table 5a:

	Not at all	Slightly	Moderately	Greatly
(1)Ability to do household chores (Cooking, housecleaning, laundry) ?	0	1	2	3
(2)Physical recreation such as walking, swimming, or other exercise?	0	1	2	3
(3)Ability to travel by car or bus more than 30 minutes from home	0	1	2	3
(5)Participation in social activities outside your home	0	1	2	3
(6)Emotional health (nervousness, depression , etc,)	0	1	2	3
(7)Feeling frustrated	0	1	2	3

Table 5b:

UROGENITAL DISTRESS INVENTORY (UDI-6)

Name: _____ Date: _____

DO YOU EXPEREINCE ANY URINARY INCONTINENCE? _____YES _____NO

Please circle the number that best describes what you are feeling. Use the following as your guide.

(0) Not at All

(1) Slightly

(2) Moderately

(3) Greatly

Do you experience, and if so, how much are you bothered by:

1. Frequent urination? (0) (1) (2) (3)
2. Urine leakage related to the felling of urgency? (0) (1) (2) (3)
3. Urine leakage related to physical activity, coughing, or sneezing? (0) (1) (2) (3)
4. Small amounts of urine leakage? (0) (1) (2) (3)
5. Difficulty emptying your bladder? (0) (1) (2) (3)
6. Pain or discomfort in the lower abdomen or genital area? (0) (1) (2) (3)

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CHAPTER 4

BASICS OF URODYNAMICS

Dr. Karishma Thariani

Dr. Aparna Hegde

Introduction to Urodynamics

The term urodynamics means observation of the changing function of the lower urinary tract over time. Urodynamics (UDS) forms the cornerstone investigation to assess the function and dysfunction of the lower urinary tract (LUT) [1].

Although a detailed history and clinical examination are usually enough in diagnosing different types of lower urinary tract symptoms (LUTS), urodynamic testing is done with the premise to replicate the patients' symptoms in clinical setting, increase the diagnostic accuracy and thereby help in planning of treatment before any invasive interventions. It is also of utility in patients in whom the initial treatments or surgery have failed to relieve the symptoms.

Urodynamics provides an insight into the physiology of bladder storage and voiding function with wide variety of outcomes, which have no meaning by themselves unless coupled with the overall history and examination [1,2]. The aim of any invasive UDS test is to reproduce the patient's storage or voiding symptoms and to relate them to any synchronous urodynamic observation.

Physiology of normal micturition

A prerequisite to performing and interpreting a urodynamic study is having a full understanding of normal lower urinary tract function. The micturition cycle comprises of 2 phases the storage phase and voiding phase [3]. A normal bladder due to its property of accommodation fills with no increase in pressure or detrusor contraction. During this phase the bladder outlet is tightly closed with contraction of the extrinsic and intrinsic urethral sphincter. Whereas in the voiding phase the urethral sphincter relaxes along with contraction of detrusor initiating the process of voiding. The urethral pressure is equal to or more than the intravesical pressure always during the filling phase of bladder. In normal anatomic position the urethral pressure increases with any rise in intraabdominal pressure to prevent leakage of urine. Any abnormality in this well orchestrated mechanism can lead to LUTS.

Role of Urodynamics

Before prescribing UDS in any patient the basic question that should be kept in mind is , will the result of the evaluation either alter the management plan or be able to identify a potentially life threatening condition in the patient. That is to say that the study should only be considered in situations where it helps in making the accurate diagnosis or helps in knowing the impact of a disease that has the potential to cause irreversible damage to the urinary tract. The American Urological Association (AUA) in collaboration with the Society for Urodynamics, Female Pelvic Medicine, and Urogenital Reconstruction (SUFU) summarizes the main indications for performing urodynamic studies into following categories [4]

1. To identify or rule out factors contributing to lower urinary tract dysfunction and assess their relative importance.
2. To obtain information about other aspects of lower urinary tract dysfunction.
3. To predict the consequences of lower urinary tract dysfunction on the upper tract.
4. To predict the outcome including undesirable side effects of a contemplated treatment.
5. To confirm the effects of an intervention or understand the mode of action of a particular type of treatment (especially a new one).
6. To understand the reasons for failure of previous treatments for symptoms or for lower urinary tract function in general.

Types of Urodynamic tests

UDS comprises of a number of tests that individually or collectively can be used to gain information about lower urinary tract function. These tests are summarized below[5]

1. Uroflowmetry: It is the measurement of the rate of urine flow over time. It is also an assessment of bladder emptying and is the only non-invasive test of urodynamics. A normal uroflow is a bell-shaped curve **(Figure 1).** When the flow rate is reduced or the

pattern is altered, this may indicate bladder underactivity or bladder outlet obstruction.

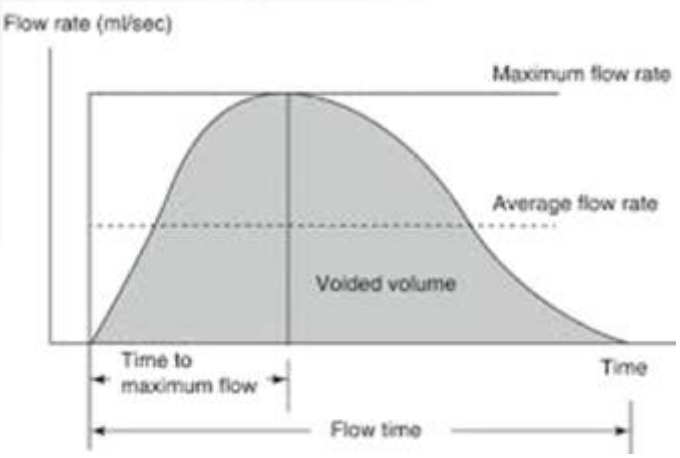

Figure 1: Bell shaped curve of normal uroflow

The 2 phases of standard invasive urodynamic testing include cystometry during the filling phase and a pressure-flow study during the voiding phase. **(Figure 2)**

2. Cystometry: Filling cystometry is the method by which the pressure/volume relationship of the bladder is measured during bladder filling. It is the dynamic measurement of detrusor pressure during the continuous filling of the bladder. It begins with the infusion of fluid into the bladder with a catheter. This can be done as a single channel or multichannel procedure. Multichannel is more reliable and usually preferred as it eliminates the changes in bladder pressure due to raised intraabdominal pressure and is also known as subtracted cystometry. Two pressure transducers are placed in the bladder and rectum to record the intravesical (Pves) and intraabdominal pressures (Pabd) respectively. The bladder is filled at the rate of 50 ml/min with normal saline and Pves and Pabd are measured continuously and detrusor activity Pdet is calculated by subtracting Pabd from Pves (Pves-Pabd). It also determines the compliance and the capacity of the bladder. The competence of the sphincter also needs an assessment during any abnormal detrusor contraction that occurs as well as on increasing the intraabdominal pressure by coughing, performing Valsalva maneuver and other activity that reportedly causes incontinence in the patient. Cystometry ends with a micturition command, or "permission to void."

3. Pressure flow study: Also known as voiding studies and are the method by which the relationship between pressure in the bladder and urine flow rate is measured during bladder emptying. Detrusor pressure is measured with a simultaneous measurement of flow. The voiding phase starts when permission to void is given or when uncontrollable voiding begins and ends when the patient considers voiding has finished. Following the pressure-flow study, once again, the post-void residual urinary volume is estimated, and the total cystometric bladder capacity is calculated.

4. Urethral Pressure Profile provides the measurement of the urethral length and its competence. It is typically performed in women to help determine the cause of stress urinary incontinence.

5. Electromyography records the electrical potentials generated by the pelvic floor muscle activity utilizing surface electrodes.

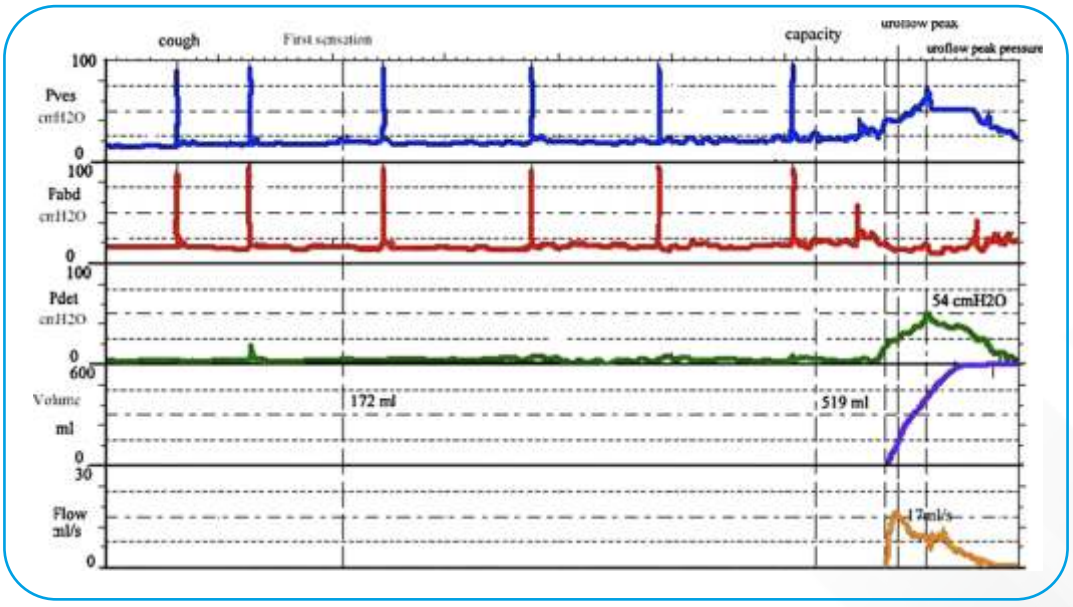

Figure 2: A normal UDS showing all phases of filling cystometry and pressure flow study

ICS standard urodynamics protocol

Urodynamic tests should be performed with the goal of answering a specific question. "Formulating the urodynamic question" is a process of reviewing the clinical assessment already available and what potential therapy options may subsequently be appropriate, so the test can identify appropriate treatment options and potential adverse effects. Following steps should be followed before performing the invasive testing. [6]

1. Clinical history, including valid symptom and bother score(s) and medication list.
2. Relevant clinical examination (abdominal /pelvic/genital examination, and checking for possible neurological disease or oedema).
3. Three day bladder diary.
4. Representative uroflowmetry with post-void residual (PVR)

Urodynamic Equipment

The basic requirement of a standard urodynamic system is that it can measure at least two pressures and calculate detrusor pressure (pdet) in real time, defined as the simultaneous difference between intravesical (pves) and abdominal (pabd) pressures. It can measure the flow rate of the voided volume and regulate the rate of fluid infusion. It has an on-line display of pressures and flow, with adequate scale and resolution. Systems using liquid-filled catheters and external transducers are recommended by the ICS. [7] Using ICS standard pressures based on liquid-filled systems allows comparison of data between patients and centers.

The test should ideally be performed in a quiet room with little distractions and keeping the number of observers to minimum so as to minimize patient embarrassment. It is best that the clinician who has evaluated and examined the patient initially, also does the urodynamic testing and designs the test as per the clinical questions in mind.

It is best to explain the procedure in detail to the patient beforehand, use of reading materials and leaflets is encouraged. The test may be performed preferably in sitting position.

Normal Urodynamic Parameters

Invasive UDS warrants insertion of catheters in the patient raising the probability of its non-physiological recording. Therefore, these tests are best performed and evaluated by a trained clinician who understands the patient's clinical profile. Several important parameters, such as age, sex, and body mass index, affect urodynamic values, rendering it more challenging to precisely define normality from tests performed on patients [8]. **Table:1** shows some normal urodynamic parameters.

Urodynamic Parameter	Normal value
First Sensation (ml)	100-250
First Desire to void (ml)	200-330
Strong Desire to void (ml)	350-560
Bladder Compliance (ml/ cm H2O)	≥ 50
Detrusor activity	Stable
Maximum Cystometric capacity (ml)	450-550
Maximum Flow	13-25 ml/s
Detrusor pressure at maximum flow	18-30 cm H2O
Voided volume	250-600 ml
Valsalva leak point pressure	< 60 cm H20 suggestive of ISD
MUCP	< 20 CM H20 suggestive of ISD

Table 1: Normal range of values of various parameters assessed in urodynamic evaluation

Reporting

A standard urodynamic report should include the details clinical assessments, along with a urodynamic diagnosis and a management recommendation. Additional details regarding the temperature and type of fluid used, the rate of filling, the size of the catheter, and patient position should also be in the report. [6]

Complications

Risk of invasive UDS includes:

- UTI
- Urinary retention
- Dysuria
- Pain
- Hematuria

Prophylactic antibiotics reduce the risk of bacteriuria following urodynamic testing, but there is insufficient evidence to suggest it reduces rates of symptomatic urinary tract infections. [9] Therefore current advice is against giving prophylactic antibiotics for invasive urodynamic testing in all patients.

Clinical significance of UDS

UDS is the gold standard to assess LUTS. However, it is non physiological test which may itself induce abnormal findings. Therefore, it should only be used as an accessory to the history, examination and clinical work up of the patient and not routinely in all cases.

Cochrane review demonstrated that urodynamics affects clinical decision making in women, but there is a lack of similar fitting trials for men and children. [10] Women who undergo urodynamic testing are more likely to have a change made to their management

compared to those who do not undergo testing.(10) They are also more likely to receive medical management and less likely to undergo surgical intervention, following a urodynamic investigation.[10] However, the evidence does not show a difference in overall continence rates, nor an improved quality of life, following urodynamics testing.[10]

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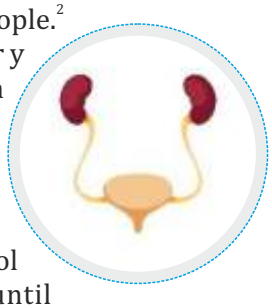
CHAPTER 5

SELF-CARE PRACTICES AND LIFESTYLE INTERVENTIONS TO CONTROL URINARY INCONTINENCE

Dr. Meera V. V. Raghavan

Introduction: Urinary incontinence is defined as the loss of bladder control. It is a common problem and often embarrassing for the patients suffering from it.[1] Globally, urinary incontinence has been reported between 5-69% during a female's life time. The prevalence is more in elderly people.[2]



The severity of urinary incontinence differs from patients to patients with some having the problem during coughing or sneezing while others may severe problem to the extent that they can't control their urge to urinate even until reaching a toilet in time.[1] Different types of urinary incontinence include stress incontinence, overflow incontinence, urge incontinence, functional and mixed type of incontinence.[1] Underlying conditions such as overweight, smoking, older age, neurological disorder, diabetes can cause urinary incontinence. Those with family history of urinary incontinence have higher risk of developing it compared to those without family history. Complete evaluation is necessary to find out the cause of urinary incontinence.[1]

Self-care practices to control urinary incontinence: Following self-care practices and behavioural modifications can help to reduce the risk of urinary incontinence.

1. Pelvic floor exercises: The pelvic floor consists of levator ani muscles. Exercises of pelvic floor muscles are known to improve pelvic floor muscle strength and power

which provides support to urethra and help to prevent leakage of urine from the bladder and reduce the risk of urinary urgency.[3] These exercises are known as Kegel exercises as they were first described by Arnold Kegel.[4] Pelvic floor muscle exercises are recommended as first line treatment for the treatment of urinary incontinence, especially stress urinary incontinence.[3]

Patients may be advised sets of 8 to 12 contractions. Each contraction should be maintained for about 8 to 10 sec. Such activities may be done 3 times in a day for a minimum of 15 to 20 weeks. Specific regimen of the exercise may differ in terms of frequency and duration.3 There are also regimens for pelvic floor exercises which can be done in lying down position, sitting position or standing position.[3]

During Kegel exercises, the person should lift and squeeze the muscles responsible for stopping or slowing the urination. The person should contract the pelvic floor muscle and not the other muscles such as those of abdomen, buttock, or inner thigh.[4]

2. Reduction of body weight in overweight or obese people: Obesity is a known risk factor for the development of urinary incontinence. It is one of the important and modifiable risk factors for urinary incontinence.[1] Patients should reduce their body weight, if overweight or obese. Patients should maintain healthy weight, as obesity is a risk factor for urinary incontinence.1[1]

A study by Subak and colleagues have demonstrated efficacy of 6-month behavioral intervention targeting weight loss in reducing frequency of self-reported urinary-incontinence episodes in overweight and obese females.[5] In this study, females from the weight-loss group reported higher improvement in incontinence and they were also more satisfied with improvement.[5]

3. Other behaviour interventions:
Other behavioral interventions include those reduce bladder symptoms or those help improve urinary bladder health. For healthy urinary bladder habbits, patients should do lifestyle modifications.

a. Eliminating or avoiding intake of food items which can irritate urinary bladder: Patients should avoid intake of food items such as caffeine, alcohol and acidic food items.[1,6]

b. Bowel habits:

Moreover, patients with urinary incontinence should also manage their bowel habits and bowel regularity.[6] As pelvic floor support and helps in controlling both rectum and urinary bladder, constipation is known to be associated with urge incontinence. In patients with constipation, intra-abdominal pressure causes more pressure on the bladder which adds to a sense of urinary urgency.[7] In order to avoid constipation, they should increase intake of fiber in the diet. Eating more fiber helps to reduce constipation, which may be the cause of urinary incontinence.[1]

c. Avoid smoking: According to the results of a questionnaire based study by Swanson and colleagues smoking cigarettes was significantly associated with urinary incontinence independent of cough.7 Therefore, patients should avoid smoking. Those who are smokers should get help from the experts to quit smoking.[1]

d. Treatment of cough: In some patients, cough may be a contributing factor for urinary incontinence. Medical disorders associated with cough can increase the risk of urinary incontinence. Clinicians should consider this risk factor also and take appropriate medical history. In such patients, treatment of cough may help to reduce the incontinence.[7] e. Patient education: Patients should be educated about normal and abnormal bladder function. Such education can also help in developing healthy bladder habits.[6]

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CHAPTER 6

ROLE OF CONSERVATIVE MEASURES IN MANAGEMENT OF UI

Dr. Rajesh Kumari
Dr. Mohini Agrawal
Dr. J.B. Sharma

Urinary incontinence (UI) is defined as any involuntary loss of urine [1]. It is a common condition that affects up to 28% of women and men of all ages and cultural backgrounds.[2] There are many types of urinary incontinence.[3] Regardless of its type, it is important to address UI as it is associated with a significant impact on quality of life. Indications of conservative management-

In mild to moderate cases of urinary incontinence

1. Primary prevention- As a preventive tool against pelvic floor disorders

2. Secondary prevention- In cases of severe type of incontinence to decrease the impact of incontinence on quality of life [4]

3. Tertiary prevention- In cases of pelvic floor rehabilitation [1]

4. As an adjuvant to medical and surgical treatment

5. It is used as a first line treatment modality in cases pelvic organ prolapse, pelvic floor dysfunction

6. It can be used in circumstances where medical and surgical intervention are contraindicated like antenatal and immediate postpartum period

7. As a combination therapy using more than one intervention

8. Subjects not willing for surgical or medical management

9. It is used to address faecal incontinence also The conservative management involves (5)– 1. Pelvic floor muscle training (PFMT) with or without biofeedback 2. Lifestyle education 3. Bladder training 4. Pessary 5. Absorbent products and catheter

These interventions are most often delivered by a physiotherapist or a registered nurse, Urogynaecologist or a Gynaecologist. The long-term effectiveness of conservative management of urinary incontinence is recognized to be dependent on long-term adherence of patients to the treatment.

1. Pelvic floor muscle training (PFMT)

It is mainly composed of kegel's exercises which may be supervised or unsupervised. All pelvic floor exercises mainly focus on strengthening, relaxation, timing and consistency. PFMT acts by increasing urethral pressure, through support of the bladder neck, and by interacting with the transversus abdominis via coordinated contractions between the pelvic floor muscles and the transversus abdominis. PFMT restores muscle tone and strengthen the pubococcygeus to prevent or reduce pelvic floor problems[7] Graded weighted vaginal cones provide progressive muscular overload, they are to be inserted into the vagina. The use of heavier cones can be gradually increased. The goal is to retain the cone for at least 20 minutes while walking. Pessaries provides mechanical support for the urethra has been used for the treatment of SUI and prolapse. Electric and Magnetic stimulation of pelvic floor can also be offered. Supervised pelvic floor exercises has been found to be more effective than unsupervised in control of urinary incontinence symptoms.[6] Pelvic floor muscle strengthening may also be done by mechanical devices like vaginal cones.

Instructions for Pelvic Floor Muscle Education and Training

After emptying your bladder

- In a comfortable environment, it can be done as a only thing or while watching screen, reading newspaper, taking shower, etc
- Can be done in lying down, sitting, standing (in either of these, preferably in all positions)
- To do 45 pelvic floor muscle exercises every day
- 15 a time, three times a day
- For each exercise, squeeze your pelvic floor muscles (as if trying to hold urine) as quickly and as hard as you can.
- Contraction followed by a period of relaxation using 1:1 or 1:2 ratio (for allowing recovery of muscle)
- Hold and relax for 5-10 sec, gradually to progress from 5 to 10 sec
- Remember to relax all the abdominal muscles when you do these exercises and continue to breathe normally

2. Lifestyle modification

The lifestyle modifications help in improving the modifiable risk factors predisposing to urinary

incontinence. Fluid management: maintaining fluid balance, 6-8 glasses of fluid each day, reducing fluid intake in evening hours may be helpful for reducing nocturia Dietary modification: eliminating bladder irritants from diet, managing bowel regularity by increasing fibre in diet or with the help of medical supplements, decreasing caffeine intake. To promote smoking cessation. Physical activity: helps in weight balance. Yoga, in many RCT has been shown to be effective mode to treat urinary incontinence as a first line therapy.[8]

3. Bladder training

A behavioural intervention to break the cycle of urgency and frequency using consistent, incremental voiding schedules. Instructions to void at predetermined intervals, and over a period of several weeks, the voiding interval is gradually increased. To determine the interval, bladder diary is used as a guide. [9]

4. Pessary

It is used in treatment of stress urinary incontinence and prolapse. There are two types of pessary- Support and space. It is supposed to act by increasing functional urethral length, urethral support.[10]

5. Absorbent products and catheter

Absorbent products in form of perineal pads are available. The main purpose of these products is to absorb urine. It also helps to lock odour and provide skin protection. It does not directly help in urinary incontinence management, but provides a great help in incontinence associated dermatitis (allows lesions to heal).[11]

Catheter for incontinent management is particularly useful as a palliative care, caregiver respite. [12] It can be done as Indwelling catheter, suprapubic catheter and clean intermittent catheterisation (CIC). Dexterity – to properly position oneself and ability to access perineal area is one of the major pre-requisite criteria for CIC. Other evaluation are willingness, good cognitive ability, low pressure bladder capacity and informed consent and risks.

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CHAPTER 7

DRUG THERAPY IN URINARY INCONTINENCE

Dr. Mangesh Narwadkar

Dr. Pankaj Sarode

Female urinary incontinence is common. While the prevalence varies by population being studied, up to 60 percent of reproductive-age females have reported urinary incontinence at any one time. Risk factors for urinary incontinence include obesity, vaginal parity, older age, and family history.

Types of female urinary incontinence

The major clinical types of urinary incontinence are

- Stress urinary incontinence (SUI; leakage with manoeuvres that increase intraabdominal pressure)
- Urgency urinary incontinence (sudden urgency followed by leakage)
- Mixed urinary incontinence (symptoms of both stress and urgency)
- Overflow incontinence

We will discuss drug therapy in OAB and stress incontinence here

Overactive bladder (OAB) Definition- Urinary urgency, usually accom-panied by frequency and nocturia, with or without urge urinary inconti-nence, in the absence of UTI or obvious pathology

A Hidden Condition*

1. Many patients self-manage by voiding frequently, reducing fluid intake, wearing pads & dark clothes, deodorants, avoid lifting bending and use of perfumes
2. Nearly two-thirds of patients are symptomatic for 2 years before seeking treatment.
3. 30% of patients who seek treatment receive no assessment
4. Nearly 80% are not examined during their visits to doctors
5. OAB Impact on Quality of Life. It affects physical & psychological wellbeing.
6. Patient misconceptions and fears are the barriers to treatment.

Treatment approach

- There is a definite role of patient education & we should give emphasis on to improve quality of life aligned with their goals and expectation
- They should adapt healthy lifestyle and behaviour like weight loss, alter fluid intake and avoid constipation.
- Pelvic floor muscle exercise (Teach them the technique to control ur-gency and frequency) & there is a scope for Bladder training & timed voiding (poor compliance and dry rate 25%)
- Topical oestrogen therapy initially daily for 14 days and then twice weekly for one year.
- After this consider second line treatment in the form of Medication
- Beta-3 adrenergic agonist drugs and antimuscarinic agents are the main options for treatment of OAB symptoms [1]. Both classes can be used for single-agent treatment or used together for combination treatment.
- As efficacy is similar for the two groups, initial drug treatment with beta-3 adrenergic agonists is preferable because of the increased risk of side effects, including long-term risk of dementia, with anticholinergic drugs as reported in case-control and cohort studies[1,2-6].
- β3-Agonists

The beta-3 adrenergic agonists mirabegron and vibegron work by stimulat-ing the receptors in the bladder responsible for smooth muscle relaxation [7].

A. The first in its class, and the first new class of medications in over 30 years.

B. These are exciting alternative to the Antimuscarinic's.

C. These have lower rates of dry mouth and constipation Headache, GIT effect, rhinorrhoea, nasopharangits and hypertension.

D. Mirabegron-extended release, 25/50 mg, needs to be swallowed.

E. Vibegron- 75 mg OD can be crushed/taken with food, there is no risk of hypertension.

F. These do not impact on cognitive and cardiac function.

G. Only 2-10 % discontinue due to side effect.

Efficacy of Vibegron and Mirabegron for Overactive Bladder

- Vibegron showed no measurable β1 and low β2 activity compared with mirabegron, which showed low β1 and some β2 activity.
- Both showed considerable selectivity at β3-adrenergic receptors; however, vibegron demonstrated near-exclusive β3 activity and a higher maximum β3 response.
- Vibegron was associated with significant improvement in total incontinence episodes versus mirabegron at 4 and 52 weeks and volume voided at 12 and 52 weeks.
- Improvement in micturitions was similar between vibegron and mirabegron.
- Incidence of AEs was generally comparable between vibegron and mirabegron.

Antimuscarinics

These agents block muscarinic receptor stimulation by acetylcholine and reduce smooth muscle contraction of the bladder. Such blockade during

bladder storage results in increased bladder capacity and decreased urgency. There are seven antimuscarinic agents available in different doses and formulations: darifenacin, fesoterodine, oxybutynin, solifenacin, tolterodine, trospium, and propiverine. We attempt to tailor therapy based on the risks and side effect profiles of each medication [8]. As efficacy across the various formulations is similar, selection of the appropriate drug for an in-dividual patient is primarily dictated by side effect profile, tolerability and medical comorbidities [9].

Contraindications - Uncontrolled tachyarrhythmias, myasthenia gravis, gastric retention and narrow angle-closure glaucoma

Adverse drug effects

- Dry mouth, constipation, blurred vision for near objects, tachycardia, drowsiness, and decreased cognitive function.
- urinary retention. Consider a PVR >1/3 of the total voided volume to be abnormal
- 65 percent increased dementia risk and Alzheimer disease too

IMPORTANT FACTS

I. All Antimuscarinic's have dry mouth and constipation as the most bothersome side effects
II. All crosses blood brain barrier, so use cautiously.
III. Long-term adherence to antimuscarinic medications is generally low.
IV. Antimuscarinic's produce continence in less than one-third of patients.
V. By six months and one year, less than 50 and 36 percent of patients continue medication, respectively
VI. Dry mouth was the most common reason for discontinuation.
VII. Constipation and compensatory fluid intake for dry mouth may exacer-bate urinary incontinence.

IMPORTANT TIPS

- Prefer trospium or darifenacin rather than other antimuscarinic agents to potentially minimize risk of cognitive impact
- Standard practice to begin with the lowest available dose with an option to increase to a higher dose after two weeks as needed if side effects are tolerable.
- An adequate trial is at least four to six weeks at the maximally-tolerated dose.
- Patients who do not achieve adequate response to one antimuscarinic should be tried on another.
- There is data to support the use of extended over immediate release for-mulations.
- The adverse drug effects - reduced by slow titration and extended-release formulations.
- Antimuscarinics may have additive side effects with other medications that have strong anticholinergic effects (e.g. first-generation H1 antihistamines, muscle relaxants, tricyclic antidepressants, antipsychotics, inhaled anticholinergic bronchodilators).

Stress incontinence

No pharmacologic therapies have been approved by FDA for treatment of stress incontinence in women, although multiple medications have been evaluated [10].

Duloxetine is a serotonin-norepinephrine reuptake inhibitor that may be effective for incontinence. However, because of potential adverse effects, it is not routinely used as treatment for stress incontinence. If patients require treatment for depression, it is reasonable to discuss the option of duloxetine as primary treatment for depression due to the potential benefit of decreasing incontinence.

Systematic reviews of duloxetine in stress urinary incontinence find that treatment is associated with improvements in quality of life, >50 percent reductions in incontinence episodes (relative risk [RR] 1.56; 95% CI 1.46-1.66), and global improvement (RR 1.24; 95% CI 1.14-1.36) but were un-able to determine if outcomes were sustainable and noted that one in three patients reported adverse events [11,12.13].

Other medications – Alpha-adrenergic agonists (eg, phenylpropanolamine), which stimulate urethral smooth muscle contraction, had been used previously for the treatment of stress incontinence. They are no longer recommended because they are only mildly efficacious compared with placebo and have a high rate of adverse effects.
There is insufficient evidence for the efficacy of imipramine in stress and mixed incontinence, and side effects are significant [15-19].

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CHAPTER 8

SURGICAL MANAGEMENT OF URINARY INCONTINENCE

Dr. Amita Jain

Introduction

Though types of urinary incontinence also includes overflow incontinence usually caused by neurological deficit and continuous incontinence resulting from vesicovaginal/ ureterovaginal fistula, but the more prevalent types are stress incontinence (SUI), urgency incontinence (UUI) and mixed incontinence. This article is mainly focused on the surgical management of urge and stress incontinence.

When patients are resistant to or cannot tolerate both conservative and pharmacological treatment, need for surgical management arises to improve quality of life of the suffering women.

Urge Incontinence

In refractory cases, surgical management techniques such as intravesical onabotulinum toxin A (oBTXA), sacral neuromodulation, and posterior tibial nerve stimulation are considered as third-line options, whereas augmentation cystoplasty or urinary diversion can be considered as a last option.

Onabotulinum toxin A is injected by using a flexible or rigid cystoscope into the detrusor muscle under local or general anaesthesia. The main side effects of treatment are urinary tract infection (UTI), incomplete bladder emptying and urinary retention (5% risk) requiring clean intermittent self-catheterisation[1]. NICE now recommends offering oBTXA to patients with proven detrusor overactivity at an initial dose of 200 units; however, EAU guidelines recommend an initial dose of 100 units [2,3]. Patients should also be counselled about the requirement for repeat injections every 6 to 9 months.

Sacral neuromodulation (SNM) involves the placement of an electrode into the third sacral (S3) foramen which is connected to a generator and battery, electrically stimulating the nerve root and suppressing the reflexes responsible for involuntary detrusor contractions. Currently, NICE guidelines recommend offering SNM to patients if they have not responded to conservative management, including drugs, and are unable to perform clean intermittent catheterisation (that is, they would be unsuitable for oBTXA) whereas EAU guidelines recommend offering SNM to patients who have UUI refractory to anticholinergic therapy[2,3].

Percutaneous tibial nerve stimulation (PTNS) involves stimulating the sacral nerve plexus for 30 minutes weekly for 12 weeks by placing a needle percutaneously into the posterior tibial nerve peripherally[4]. The effect usually last between 3 and 12 months [5]. Despite encouraging data, long-term data for PTNS are sparse. It is recommended by NICE as an option only for patients who fail conservative management and do not want or cannot tolerate oBTXA or SNS.

Stress urinary incontinence

Depending on age, and two broad pathophysiological mechanisms for SUI, the surgical options are directed to treat either urethral hypermobility (weakness in the supporting mechanism of the urethra) or intrinsic sphincter deficiency (defective urethral sphincter mechanism). The surgical options include

Urethral bulking agents injection into the urethral submucosa is a minimally invasive treatment for SUI. It improves mucosal coaptation and thus increasing urethral outlet resistance. The procedure may be performed in the outpatient day case setting under local anaesthetic. The benefits diminish with time and repeat injections are required [3].

Complications include urethral discomfort, overactive bladder syndrome, temporary urinary incontinence and UTIs [6].

Burch colposuspension was initially described in 1961 and involves suspending the anterior vaginal wall to the ileopectinal ligament (Cooper's ligament). This was the gold-standard surgical approach for many years and can be performed by using the open or laparoscopic approach. Complications include bladder perforation, haemorrhage, de novo overactive bladder syndrome and prolapse. An updated Cochrane Database Review in 2017 of 55 trials involving 5517 women found that the overall continence rate for colposuspension was between 85 and 90% at 1 year after procedure and that 70% of patients remained dry at 5 years. Patient-reported incontinence rates were not significantly different between open and laparoscopic colposuspension, but

laparoscopic surgery was found to have a lower rate of complications and a shorter length of stay in hospital [7].

Autologous fascial sling/ pubovaginal sling (PVS) was first popularised by McGuire and Lytton in 1978 and involves harvesting a strip of rectus fascia which is placed suburethrally by using a vaginal incision, though fascia can be retrieved from other sites as fascia lata. In 2007, the Stress Incontinence Surgical Efficacy Trial (SISTEr) and later on other studies reported that PVS has high satisfaction rates at 5 years compared with colposuspension. Still it lost the popularity after the introduction of the MUS, which does not require the additional morbidity of harvesting of fascia. Increasing patient and surgeon concern with mesh-related complications has renewed interest in PVS because of the lack of mesh-type erosion and pain-related complications.

Mid-urethral synthetic slings. Ulmsten described the original retropubic tape (TVT) procedure in 1996. This is inserted in a "bottom up" approach through a suburethral incision in the vagina to the anterior abdominal wall posterior to the pubic symphysis. Transobturator tapes were developed in the early 2000s, when Delorme introduced an "outside in" procedure (TOT), and subsequently an "inside out" procedure (TVT-O) was popularised by de Leval [8]. Retropubic TVT has a higher subjective cure rate (OR 0.83) and objective cure rates (0.82 OR) compared with TVT-O but this is at the cost of higher rates of intra-operative bladder/vaginal perforation, pelvic haematoma and UTI and lower urinary tract symptoms.

EAU guidelines suggest offering colposuspension (open or laparoscopic) if a mid-urethral sling (MUS) cannot be considered6. NICE guidelines state that colposuspension, mid-urethral tape or autologous fascial sling can be offered as first-line surgical options but that laparoscopic colposuspension should be offered only by an experienced laparoscopic surgeon working within a multi-disciplinary team[3].

Artificial urinary sphincter (AUS) has been used for neurological and recurrent stress incontinence in females for several years but is not in widespread use. Laparoscopic and robotic insertion were first reported in 2015[9] but still the overall numbers of patients and reporting centres have remained comparatively small.

Conclusions

Surgeons must discuss the risks and benefits of the different procedures and involve the patient in the choice of treatment.

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CHAPTER 9

MANAGING COMPLICATIONS AFTER SUI (STRESS URINARY INCONTINENCE) SURGERY

Prof. Dr. T. Srikala Prasad
Dr. K. Jessima Subahani

Surgical management is the definitive way of managing SUI if conservative management has not helped in resolving the patient's condition. A thorough knowledge about the etiopathology, the different treatment modalities available and their possible complications, its prevention and management are desirable.

Evaluation of SUI

A thorough history, methodical examination, and relevant investigations form the basis of patient care. They help in choosing the right surgery for the right patient. Patients need to be briefed regarding their condition, the anticipated treatment plan, the risks involved especially with the use of mesh, alternative treatment modalities if any are available and, informed consent obtained. The performance of meticulous surgery is the key to success. The treating surgeon should also communicate with patients within the early postoperative period to assess if the patients are having any significant voiding problems, pain, or other unanticipated events.[1] Avoiding mesh complications is considered the best strategy for the surgeon doing a Mesh Mid Urethral Sling.[2]

Investigations for assessing suspected mesh-related complications [3]

Ultrasound scan (transperineal, transvaginal or, translabial) shows the location of the mesh in relation to the vaginal wall and urethra. They can also identify hematoma. Cystourethroscopy allows diagnosis of bladder or urethral perforation, calculus formation on the sling by direct visualisation and can aid management planning. Others include CT, MRI studies of the abdomen and pelvis, examination under anaesthesia, Fluoroscopic studies, Urodynamic studies, Nerve conduction studies etc according to symptomatology and severity.

Contraindications for placement of mesh

Absolute Contraindications for placement of mesh include inadvertent injury to urethra during dissection for mesh placement, presence of a urethro vaginal fistula needing repair and surgery for urethral diverticulum.

Risk factors for Mesh Sling Complications:

Risk factors for mesh exposure or perforation include factors causing poor wound healing like diabetes, smoking, poor nutrition, and advanced age, as well as intraoperative factors, such as bleeding/hematoma formation and trocar perforation.[4]

Complications in SUI surgery:

Table 1: The various time zone of occurrence of complications.[5]

Intra operative	Bleeding Injury to the urethra or bladder Hematoma formation
Early postoperative	Urinary retention Other voiding symptoms UTI Groin pain Vaginal, Pelvic, and thigh pain Denovo, persistent, and worsened storage symptoms
Late postoperative	Urinary retention Need for urethrolysis or sling revision dyspareunia Recurrent or de novo prolapse Persistent SUI
Harvest site complications	Wound infection Seroma formation Incisional hernia
Very late complications unique to synthetic mesh placement	Sling perforation Sling extrusion Calculus formation in the perforated portion of the mesh in the bladder

Complications related to SUI Surgery
Intraoperative complications:

Bleeding:
Meticulous surgical technique minimises the risk of bleeding during SUI surgery. Hydro-dissection is helpful during vaginal dissection to minimise

bleeding. Ensuring the correct plane of dissection is vital. In the presence of undue bleeding, it is prudent to re-evaluate and proceed in the correct plane.

It is mandatory to follow the anatomical landmarks and instructions for doing the sling surgeries. This will achieve safe negotiation of the trocars and needles without actually visualising the vascular structures.

Bleeding can occur when the endopelvic fascia is perforated either from the vaginal side or by trocars from the abdominal side. While the procedure is done diligently following all safety precautions, the bleeding is usually self-limiting. It can be copious at times. Packing, elevation of the anterior vaginal wall and manually compressing it against the back of the pubic symphysis for several minutes can effectively tamponade the bleeding. It is not possible to locate the bleeding point and one need not waste time and energy on that. In case there is persistent brisk bleeding, it would indicate major vascular injury. Retropubic exploration or angioembolisation would be needed. Fortunately, this occurs only very rarely. Bleeding during retropubic procedures can be easily tackled by compression, diathermy, and or suture ligation because they can be easily visualised.

Hematoma:

A rapidly expanding vulval hematoma will require, open evacuation via the vaginal incision, removal of clots and suture ligation of bleeders followed by vaginal packing. Hematoma can happen after the vaginal removal of the obturator sling also.

Injury to bladder:

Retropubic taping has more chances of inadvertent bladder entry than transobturator taping (TOT) (4.8% vs. 0.6%). Emptying bladder prior to insertion of trocar minimises the chances of inadvertent bladder entry. Strictly following the landmarks and instructions is important. The AUA guidelines panel concluded that intraoperative cystourethroscopy should be performed in all patients undergoing sling surgery.[5,6] The bladder now needs to be filled so as to ensure that even a small injury is not missed. Intra operative cystoscopy is done with a flexible cystoscope or a rigid cystoscope with 70-degree lens systematically with special emphasis at the dome and the lateral walls. It is easier to pick up a bladder entry with the trocar in situ rather than after putting the mesh. The trocars must be in contact with the pubic bone during passage during retropubic taping. The trocars can be moved back and forth. The integrity of the bladder mucosa is confirmed and only then the mesh is introduced. In case of inadvertent bladder entry, the trocar can be withdrawn and reinserted carefully following standard instructions and careful check cystoscopy done again to confirm that the trocar has not entered the bladder. The mesh is now placed on this side. The procedure is repeated on the opposite side taking all safety precautions. There is no need for any formal repair of the bladder. The cystotomy heals with Foley catheterisation itself. The duration of which depends on the degree of cystotomy and whether there is gross hematuria.

Injury to urethra:

Placement of a Foley catheter in the urethra at the start of the procedure will not only safeguard the urethra but also facilitate intraoperative detection of the urethral injury as evidenced by seeing the catheter in the operative field. Primary repair of the urethra is done in 2 layers in a watertight fashion using 3-0 delayed absorbable suture over a 14 Fr. Foley catheter. The integrity of the repair can be checked by instillation of saline through a Venflon sheath inserted into the urethra, closer to the foley, with the distended foley balloon snugged up against the bladder neck. Catheter drainage is continued for 10-14 days. In the unfortunate event of urethral injury during the planned mesh placement, prompt urethral repair is done and use of synthetic slings is forbidden. However, use of autologous fascial slings can be used.

Postoperative complications:
Bladder outlet obstruction (BOO):

It is easy to diagnose BOO in patients coming back after surgery for SUI with frank urinary retention or when they reveal evidence of significantly elevated post void residuals especially when they did not have any prior difficulty in passing urine. Women who have developed obstruction as a result of the SUI surgery can also present with symptoms like difficulty in passing urine, need to strain, thin stream, double voiding, or the need to assume unusual positions which help them to pass urine.

A patient with prior voiding difficulty could be having an underlying pathology such as an underactive bladder which is not uncommon in the diabetic or in patients with neurogenic bladder. To avoid landing up in these situations, it is essential to have a detailed history taking and evaluation which includes USG examination of not only the pelvis but also the post void residual assessment. If there is significant residue, performing a Urodynamic evaluation will assess if there is any voiding dysfunction especially hypotonic bladder.

Acute urinary retention is best managed by an

indwelling catheter. A short-term catheterisation will help reduce any oedema around the bladder neck especially in pubovaginal slings where the sling is placed around the bladder neck. Urethral dilatation not only does not help, but also has the risk of causing urethral extrusion of the mesh because of the trauma it causes over the mesh.

If the patient does not have relief of obstruction even after a week, attempt can be made to loosen the sling by opening the vaginal incision. An attempt is made to introduce an instrument between the mesh and the urethra and gently tug it. In case the sling is embedded in the tissue and does not loosen, the sling is divided in the middle taking care to see that the edges of the sling are away from the incision.

Pubovaginal sling obstruction can be tackled by making a small suprapubic incision and cutting the knot in the prolene threads used to anchor the edges of the rectus fascial sling.

Urgency and Urgency Incontinence:

Patients who were suffering from Mixed urinary incontinence preoperatively, need to be counselled prior to the placement of sling that surgery will only correct the stress leak and patients need to take medication for Urgency and urgency incontinence (though a few patients have some relief from urgency also). It is possible that urgency is secondary to BOO because of the sling or it may be be due to bladder overactivity. If BOO is not the reason, patients benefit from the usual treatment given for urgency. Anticholinergics like Solifenacin 5-10 mg once daily alone or in combination with B adrenergic agonist, Mirabegron 50 mg once daily is helpful.

Bladder perforation / Extrusion:

Bladder perforation / Extrusion may result from a missed intraoperative bladder perforation or a possible migration of the mesh into the bladder sometime after the procedure. These patients present with irritative lower urinary tract symptoms, hematuria, recurrent UTI, vaginal pain, dyspareunia, and vesico vaginal fistula. There is no role for any conservative management. Cystoscopy is diagnostic. Using endoscopic scissor or laser transection or transurethral resection of the perforated mesh with electrocautery loop, the perforated mesh can be removed. It is mandatory to achieve complete clearance of the mesh present in the bladder. If this is not possible, open procedure or laparoscopic exploration to ensure complete removal of the eroded mesh followed by meticulous closure of the bladder & continuous drainage of the bladder will solve the problem.

Figure 1: Mesh erosion into bladder

Mesh extrusion into the urethra:

Patients present with severe pain in the urethra during micturition, pelvic, urethral and vaginal pain, urgency, dysuria, hematuria and recurrent UTI and this begins from the date of surgery itself.
Urethroscopy not only confirms the diagnosis but also enables us to know the location of the injury. Endoscopic scissors and /or holmium laser can be used to achieve clearance endoscopically. Transvaginal approach can accomplish complete removal. An inverted U-shaped flap is reflected after hydro dissection. The mesh is identified and carefully dissected laterally almost up to the lateral sulcus on the uninjured side and cut. The mesh is now carefully peeled off the urethra. With the help of the smallest defect possible in the urethra, complete removal of the perforated mesh is achieved. Over dissection of the urethra is avoided to safeguard the continence mechanism and prevent stricture.[2]
In case the mesh is seen to perforate the urethra along its diameter, the urethra is exposed by an inverted U-shaped incision. A midline urethrotomy is employed to completely remove the mesh. Careful closure of the urethra is done with 3-0 delayed absorbable suture material. Closure of the periurethral fascial layer in addition will protect against any urethrovaginal fistula formation. It is important to counsel patients regarding the possibility of recurrence of SUI or developing new or persistent urgency or urge urinary incontinence.[2]

Vaginal Mesh Exposure and Extrusion:

Delayed infection of the incision or mesh, wound healing, hematoma that could have led to separation of the incision, undue sling tension, placement errors like a missed injury to the vagina or not ensuring good amount of epithelial thickness over the mesh could be contributory. Patients complain of vaginal discharge, persistent bleeding, pain, dyspareunia and recurrent UTI.[2] Clinical examination will reveal a midline exposure which could be a result of wound dehiscence or at the anterolateral vaginal fornix which could possibly be a result of a missed injury at the time of the sling placement itself.[7]

Figure 2: Vaginal mesh extrusion at the anterolateral fornix

Asymptomatic small vaginal exposures can be managed conservatively with topical estrogen cream application for 6 weeks. Larger exposures especially those causing pain need to be surgically managed. The vaginal incision can be made based on the mesh exposure. It could be a vertical midline, horizontal, or a circumscribed incision around the exposure. Hydro dissection with the readily available lignocaine and adrenaline mix will help facilitate a vaginal flap with good epithelial thickness. Care must be taken not to cut the mesh during the initial vaginal incision itself, because the undivided mesh will help in localisation and correct removal. Measures like using a metal instrument to sound over the dissected space or use of trans labial USG will help in accurate location. The location of the mesh can vary and extend from the urethral meatus down to the bladder neck. The mesh is exposed by careful blunt and sharp dissection. Placement of a haemostat carefully behind the sling will safeguard the urethra when the mesh is divided and removed. Care also needs to be exerted to avoid blind lateral dissection to prevent hematoma formation. After the optimum amount of the mesh is excised, the vagina is approximated with a running 3-0 absorbable suture. Continuous bladder drainage is needed in case there is concomitant bladder or urethral injury.[2]

Figure 3: Midline vaginal extrusion of the mesh

Vaginal, Pelvic, and Thigh pain:

Patients who complain of severe pain which is definitely immediately after the procedure, must be carefully evaluated to rule out mesh complications. Early removal of the offending mesh before tissue ingrowth has occurred is safer. In these patients it is vital that we remove as much sling as possible to achieve as reasonable pain free status as possible.

Groin pain and neuromuscular injury:

Trans obturator (TOT) sling surgeries frequently encounter these problems. Pain can be transient and settle in a few days. Persistent and severe pain may warrant excision of the TOT mesh.

Patients who complain of severe pain in the absence of any complications like mesh extrusion or perforation pose a great diagnostic challenge. Detailed history of prior pain conditions and physical examination which is focussed specifically to find out the cause of pain like vaginal bands, palpation of which reproduces the same pain. Pain can be caused by mesh shrinkage, undue tension caused by the mesh on nearby structures, muscle hypertonia caused by the entry of the mesh through the muscles and obturator neuralgia. In patients in whom pain is a significant problem, decision making needs to be tailored to the problem pertaining to the patient. This may vary from removing only the transvaginal portion of the sling to removing the entire sling which by itself is a major surgical venture with its attendant morbidity. Patients who have generalised pain which is not reproducible on clinical examination may not benefit from surgical removal of the mesh.

Dyspareunia:

The risk of patients suffering from sexual dysfunction after surgery for SUI is low. However, when patients complain of dyspareunia following surgery, one needs to do a physical examination to look for mesh extrusion, vaginal scarring, any narrowing of vagina because of excessive trimming or any band formation. They may be appropriately treated.

Other complications:

Intraoperative ureter or bowel injury has also been rarely reported. The occurrence of urinary fistula may rarely occur due to a missed injury which was not repaired. De novo enterocele may occur following Burch colposuspension. Complications related to the harvest site (around 15%) include seroma and incisional hernia formation in pubovaginal sling sugeries.

The Mesh Oversight Group Report, July 2017, advised that women with mesh complications should be seen in a specialised mesh centre offering a multidisciplinary team approach.8 The ultimate goal of achieving a successful and safe surgery for SUI comes only with adequate knowledge, expertise, experience and regularly following safe surgical principles.

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Notes

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