

Pranathi Reddy

Urinary incontinence is defined as the complaint of involuntary loss of urine [1], which could be urethral or extra-urethral loss. It is a common problem and affects women of all age groups with a significant effect on their quality of life. The prevalence of urinary incontinence increases with age. Among young adults and middle aged, it is reported in 25 % of women and in those aged 40 and over, the mean prevalence is 34 % [2]. The common types of urinary incontinence in women are stress urinary incontinence (SUI), urgency urinary incontinence (UUI), and mixed urinary incontinence. Urinary incontinence resulting in extra-urethral loss, a feature of fistula, is more of gynecological etiology now rather than obstetric in most parts of the world.

The evaluation of any incontinent patient includes a thorough history, focused physical examination, appropriate investigations including laboratory tests and possibly urodynamic testing.

History Taking

History taking is the cornerstone of urinary incontinence assessment and in combination with physical examination allows categorization of

patients into stress urgency, or mixed urinary incontinence [3]. The purpose of history taking is to determine the type of urinary incontinence (UI) that is bothersome to the patient and identify any precipitating factors [1].

Questions should be asked to assess symptoms related to bladder storage and voiding functions. Storage symptoms include frequency, nocturia, urgency with or without incontinence, and leak on cough, sneeze, effort, or physical exertion. Voiding symptoms include hesitancy, slow stream, intermittency, straining to void, spraying of urinary stream, and feeling of incomplete emptying [4]. Complaint of continuous leakage and leak without sensation are suggestive of extra-urethral loss and further assessment should be directed towards it. Symptoms such as recurrent urinary tract infection and hematuria, especially in women over the age of 40, need evaluation of both lower and upper urinary tract to rule out benign and malignant pathology.

The effect of incontinence on quality of life can be assessed by eliciting the frequency of occurrence, severity of leak, need for pads, and limitations of daily activities [4]. A more objective tool would be to use incontinence-specific quality-of-life scales or validated questionnaires to evaluate the severity and relative contribution of UUI and SUI symptoms and response to their therapies. The test–retest reliability of ICIQ, BFLUTS, I-QOL, SUIQQ, UISS, SEAPI-QMM, ISI, and KHQ questionnaires is good. For other scores, the evidence is weak or absent [3].

P. Reddy, FRCOG
Department of Obstetrics and Gynaecology,
Rainbow Hospital for Women and Children,
Hyderabad, India
e-mail: drpranathireddy@gmail.com

Pelvic floor dysfunction tends to coexist, and patients with UI should be asked about symptoms of pelvic prolapse, such as a sensation of vaginal fullness or pressure or the observation of a bulge in vagina [5]. Bowel problems such as constipation or fecal urgency and/or incontinence can be associated with UI. Bladder pain, urethral pain, and vaginal pain can be associated symptoms in patients with UI.

During clinical assessment, it is important to identify relevant predisposing and precipitating factors and other conditions that might require referral for additional investigations and treatment. A thorough medical and neurologic history should aim to identify conditions, such as diabetes, chronic obstructive airway diseases, connective tissue disorders, and neurologic disorders, such as multiple sclerosis, spinal cord injury, myelodysplasia, stroke, Parkinson's disease, and cardiorespiratory and renal problems which can predispose to UI [4]. The patient should be queried specifically about these conditions as they are known to affect bladder and sphincter function. A list of the patient's current medications and over-the-counter medications should be obtained. Agents that can affect lower urinary tract function include diuretics, caffeine, alcohol, narcotic analgesics, anticholinergic drugs, antihistamines, psychotropic drugs, alpha-adrenergic blockers, alpha-adrenergic agonists, and calcium channel blockers (Table 4.1).

Obstetric history, in particular the parity, mode of delivery, instrumental deliveries, and birth weight, can identify some of the risk factors. Gynecological history such as presence of pelvic mass – fibroids or ovarian cysts – and the menopausal status are relevant. Past surgical history of complex pelvic surgeries, surgery for UI or pelvic organ prolapse, low spinal surgeries, or rectal surgeries can either be inciting or precipitating factors in UI.

The history should be able to categorize the type of incontinence (e.g., stress, urgency, or mixed); however one needs to remember that occasionally urgency incontinence may be triggered by activities such as coughing and can mimic stress incontinence. Mixed incontinence is very common and in these

Table 4.1 Example of medications affecting urinary function

Medication	Effect
Alpha agonist	Urinary retention
Alpha blockers	Urinary leak
Alcohol	Frequency, polyuria
Anticholinergics	Urinary retention/functional incontinence
Caffeine	Frequency, urgency, polyuria
Calcium channel blockers	Urinary retention, nocturnal diuresis
Diuretics	Frequency, polyuria
Narcotic analgesics	Urinary retention/functional incontinence

cases further management should be directed towards the predominant symptom [5].

Physical Examination

The primary purpose of physical examination is to exclude confounding or contributing factors to the incontinence or its management. A complete physical examination should be performed, with emphasis on neurologic assessment and on abdominal, pelvic, and rectal examinations. The general examination should include height and weight, which will allow for objective assessment of body mass index, as obesity is an established risk factor of UI [5]. Assessment of the gait and mobility of the patient can help to rule out a functional etiology for the UI.

The abdominal examination will allow evaluation of scars and palpation for possible distended bladder and pelvic mass. The neurologic examination concentrates on the sacral segments predominantly along with lower lumbar segments. This includes, but not limited to, testing of lower limb tone, sensation, reflexes, perineal sensation, and reflexes such as bulbocavernosus or anal reflex.

Local examination concentrates on demonstration of urinary leak, presence of prolapse, atrophic vaginal changes and pelvic mass. Evidence of pelvic organ prolapse (POP) beyond the hymen is consistent with complicated SUI because the prolapse can produce a relative obstruction of urethra that can impair bladder emptying.

Therefore, it is recommended that all pelvic compartments (anterior, posterior, and apical) be assessed individually. When POP is reduced with a nonobstructing pessary or large cotton swabs, SUI may become apparent or worsen [6].

Stress urinary incontinence should be objectively demonstrated before any anti-incontinence surgery is performed. Visualization of fluid loss from the urethra simultaneous with a cough is diagnostic of SUI. Delayed fluid loss is considered a negative cough stress test result and suggests cough-induced detrusor overactivity [5]. The cough stress test can be performed with the patient in the supine position during the physical examination. However, if urine leakage is not observed, the cough stress test needs to be repeated with the patient standing and with a full bladder (or a minimum bladder volume of 300 mL) to maximize test sensitivity [7].

Support to the bladder neck is assessed by evaluating the mobility of the urethrovesical junction. Urethral hypermobility is defined as a 30° or greater displacement of urethra from the horizontal (measured with a cotton tip swab in urethra) with the patient in supine lithotomy position and straining – referred to as the “Q-tip test.” This test is not recommended in the routine evaluation of patients with UI. Other methods of evaluating urethral mobility include measurement of point Aa of the POP Quantification system, visualization (inaccurate method), ultrasonography, and lateral cystourethrogram. Women with stress incontinence who have good urethral mobility have a lesser chance for failure of mid-urethral sling procedures. In women with SUI without urethral hypermobility, where leak can be due to intrinsic sphincter deficiency (ISD), bulking agents were considered to be a more appropriate surgical option [8]. This notion is however being increasingly questioned with use of mid-urethral slings, where cure rate of 78 % is quoted with tension-free vaginal tape (TVT) in patients with ISD [9].

Digital assessment of the pelvic floor muscle contraction and grading it using modified Oxford grading scale (Table 4.2) can be helpful in discussing management options such as pelvic floor exercises for SUI.

Table 4.2 Modified Oxford grading scale for pelvic floor muscles

Grade	Definition
0	No contraction
1	Flicker of contraction
2	Weak muscle activity
3	Moderate muscle contraction
4	Good muscle contraction
5	Strong muscle contraction

Investigations

Bladder Diaries

A reliable method of documenting the frequency of incontinent episodes is essential for outcome assessment in both clinical practice and research studies. Bladder diaries, completed prospectively by the patient, have been widely used for this purpose [10]. Bladder diaries are used to document each cycle of filling and voiding over a number of days and can provide information about urinary frequency, urgency, diurnal and nocturnal cycles, functional bladder capacity, and total urine output. They also record leakage episodes, fluid intake, and pad changes and give an indication of the severity of the problem. They may also be used for monitoring the effects of treatment. Encouraging women to complete a minimum of 3 days of diary, covering variations in their usual activities, such as both working and leisure days is useful [3].

In addition, use of disease-specific questionnaires assessing quality of life is invaluable in clinical evaluation.

Urinalysis

Urinalysis determines any evidence of hematuria, pyuria, glycosuria, or proteinuria. Urinary tract infections can be identified using urinalysis and treated before initiating further investigation or therapeutic intervention for UI [5]. If urinalysis tests positive for both leucocytes and nitrites, a midstream urine specimen is sent for culture and analysis of antibiotic sensitivities. If symptomatic,

these women can be prescribed an appropriate course of antibiotic treatment pending culture results. If women do not have symptoms of UTI but their urine tests positive for both leucocytes and nitrites, do not offer antibiotics without the results of midstream urine culture [3].

A urine specimen is sent for cytology if there is hematuria or irritative voiding symptoms to rule out a malignancy. Microscopic hematuria, is clinically significant when three to five red blood cells per high-power field are visible and warrants further investigation by cystoscopy and imaging.

Assessment of Residual Urine

Presence of an elevated post-void residual urine volume can indicate a bladder-emptying abnormality or incontinence associated with chronic urinary retention (previously referred to as overflow incontinence). It should be assessed using a bladder scan in preference to catheterization on the grounds of acceptability and lower incidence of adverse events [3]. A PVR less than 50 mL is not usually significant; one between 50 and 200 mL can be equivocal, and a PVR greater than 200 mL should be referred for specialist evaluation [4]. A single number may not provide the answer to the etiology of a patient's incontinence; the PVR value needs to be taken into consideration as part of the entire workup. An elevated post-void residual urine volume in the absence of POP is uncommon and should trigger an evaluation of the bladder-emptying mechanism, usually with a pressure-flow urodynamic study [5].

Imaging Studies

Imaging techniques that can be used in the assessment of urinary tract include ultrasonography, X-ray, computed tomography (CT), and magnetic resonance imaging (MRI). Ultrasound has particular value in measuring post-void residual volume. Confirmation of alternative pelvic pathology by ultrasound would be an indication for referral to an appropriate specialist. Studies have focused on measurement of bladder wall thickness by transvaginal, transperineal or abdominal ultrasound for

the diagnosis of detrusor overactivity (DO) [11]. There are reports of significantly greater bladder wall thickness in women with DO than with any other diagnosis and that bladder wall thickness of more than 5 mm had sensitivity of 37 % and specificity of 79 %, for diagnosing DO [12]. Further studies are required to clarify the role of ultrasound in the assessment of overactive bladder.

There is a lack of evidence regarding use of MRI or CT scanning in assessment of women with UI. Intravenous pyelogram (IVP) has been employed in the evaluation of upper urinary tract such as detection of structural abnormalities and strictures and in assessing unexplained hematuria. With increasing use of CT Urogram, use of IVP even for these indications is becoming obsolete.

Role of Urodynamics and Cystoscopy

In patients presenting with UI, at the end of initial assessment by history, physical examination, and above investigations, it is possible to categorize those with SUI, UUI, OAB, and mixed UI. Patients needing specialist referrals and further evaluation can also be identified at this stage, e.g., those with fistulae, neurogenic etiology, or upper tract pathology. In the former group with SUI, UUI, and mixed UI, conservative management in the form of lifestyle intervention, pelvic floor muscle training, bladder retraining, and pharmacotherapy can be commenced without need for further evaluation. Hence, urodynamics and cystoscopy are not essential in the initial evaluation of patients presenting with uncomplicated UI.

Urodynamic Testing

Practical aspects of urodynamic testing are detailed in the next chapter on urodynamics. The principles underlying the procedure are detailed below. The term "urodynamics" encompasses a number of varied physiological tests of bladder and urethral function, which aim to demonstrate an underlying abnormality of storage or voiding.

Uroflowmetry is a noninvasive measurement of the rate of urine flow over time. It can also be used

to assess bladder emptying but cannot be used alone to diagnose the cause of an abnormality [13]. Cystometry, measurement of intravesical pressure, can be carried out through a single recording channel (simple cystometry) or more commonly, by multichannel cystometry, which involves synchronous measurement of both bladder and intra-abdominal pressures by means of catheters inserted into bladder and rectum respectively.

Videourodynamics involves synchronous radiographic screening of bladder with multichannel cystometry and is so called because originally the information was recorded to a videotape. Ambulatory urodynamics involves multichannel cystometry carried out with physiological bladder filling rates and using portable recording devices, which enables the woman to remain ambulant during test.

There are also numerous tests of urethral function, including urethral pressure profilometry and leak point pressure measurement. These are used to derive values that reflect the ability of urethra to resist urine flow, expressed most commonly as maximum urethral closure pressure (MUCP) or as abdominal, cough, or Valsalva leak point pressures (ALPP, CLPP, VLPP).

Urodynamics should be used selectively in women with UI to answer specific functional questions. After undertaking a detailed clinical history and examination, multichannel filling and voiding cystometry are indicated in women who have [3]:

- Symptoms suggestive of voiding dysfunction
- OAB symptoms refractory to pharmacotherapy
- Symptoms of OAB with uncertain etiology or a clinical suspicion of neurogenic detrusor overactivity
- Prior to surgical intervention in women with SUI
- Urinary symptoms following anti-incontinence procedure

The use of urodynamics has been clarified in one specific population, that of women with pure SUI symptoms. In that population, it is considered safe to forego urodynamics preoperatively [14]. However, diagnosis of pure SUI should be definitive based on history and examination, as most patients with UI present with more than one symptom. Most surgeons including the author however do not undertake surgical intervention without urodynamic evaluation even in this group.

Multichannel cystometry, when it reproduces the woman's symptoms, may reveal the underlying pathophysiological explanation of incontinence. Ambulatory monitoring demonstrates functional abnormalities more often than multichannel cystometry, but the significance of this is unclear [15]. Urodynamics is an invasive testing and has to be used judiciously to provide reliable information and to be cost-effective.

Cystoscopy

Cystoscopy involves direct visualization of bladder and urethral lumen using either a rigid or flexible cystoscope. Examination is used to identify areas of inflammation (such as interstitial cystitis), tumors, stones, foreign body and diverticula, all of which are findings that will require management within a different clinical pathway. Cystoscopy should not be used in the initial assessment of women with UI alone. Cystoscopy may be of value in women with pain or recurrent UTI, following previous pelvic surgery, or where fistula is suspected. Its role in recurrent stress UI without these additional features is less clear [3].

The indications for cystoscopy include:

- Gross or microscopic hematuria, in the absence of an infection (sterile hematuria)
- Bladder pain
- Evaluation of urologic fistula
- Evaluation of bladder or urethral diverticula
- In patients with obstructive voiding symptoms
- In patients with recurrent UTI

Cystoscopy is contraindicated in the presence of an acute cystitis and in patients with severe coagulopathy. A flexible cystoscope is preferable to the rigid for diagnostic purpose, as it can obviate the need for anesthesia.

Conclusion

In most cases, evaluation of a patient with urinary incontinence is straightforward with a thorough history and physical examination directing the appropriate investigations. The initial assessment helps to appraise the effect of UI in day-to-day activities, understand the expectations of patient and in planning appropriate treatment.

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