

Urinary Incontinence in Women

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INTRODUCTION

The adult bladder and urethra acting as a unit allow for the voluntary dual function of urine collection and evacuation. Urinary continence is an acquired, "learned" state, and normal anatomy and function of the nervous and genitourinary systems are necessary to maintain it. Urinary incontinence is defined as "a condition where involuntary loss of urine is a social or hygienic problem and is objectively demonstrable."¹

This definition takes into account both sociocultural aspects and the need for objective clinical assessment of urinary leakage. Marked individual variations in physical activity, occupation and hygienic standards call for appropriate clinical judgment when evaluating this condition. Although excessive vaginal discharge may be confused with urine loss, incontinence is often evoked to obtain psychologic or socioeconomic secondary gains. The element of the reproducibility is therefore of marked clinical importance. Eleven percent of patients evaluated in our urodynamic unit at the Medical College of Virginia had no objective evidence of urinary leakage during their evaluation.

TYPES, INCIDENCE, AND PATHOPHYSIOLOGY

The types and incidence of urinary incontinence in females seen in our unit are shown in Table 1.

Extraurethral incontinence such as fistulae and congenital anomalies, or incontinence due to neurologic conditions will not be included in the following discussion.

"Stress Urinary Incontinence" (SUI)

Stress urinary incontinence accounts for approximately 56% of the cases referred to our unit. This is a *condition* in which "involuntary loss of urine occurs when the intravesical pressure exceeds the maximal urethral pressure in the absence of detrusor activity." It should be differentiated from the *symptom* of SUI, which refers to data obtained from the history, and the *sign* of SUI, which indicates the physician's observation of the leaking episode.¹

It is not uncommon for otherwise healthy women to have occasional episodes of SUI.² Conditions such as acute respiratory infections or asthmatic attacks can also precipitate episodes of SUI, which disappear after the acute situation subsides.

A sudden increase in intra-abdominal pressure causes urine to flow from the bladder through the urethra to the exterior. The most common single cause for this condition is an extra-abdominal location of the proximal urethra or bladder neck below the pelvic diaphragm because of loss of support or inadequate support to the retrosymphysis pubis. Atrophic and/or traumatic destruction of the puboprostatic ligaments (Zacharin) is responsible for this anatomic pathology. As a result of this anatomic situation any sudden increase in intra-abdominal pressure is transmitted unequally to both bladder and proximal urethra and results in urinary leakage.

Other factors which may contribute to or be of primary importance in, depending on individual cases, may increase intravesical pressure and/or decrease urethral resistance in the absence of detrusor activity (Table 2). It is important to determine in each patient which of these factors contributes and to what extent in the development of the condition of SUI.

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Idiopathic Detrusor Instability (IDI) (Detrusor Dysynergia-Unstable Bladder- Urge Incontinence)

Before "toilet training," infants have no voluntary control of their bladder. It contracts spontaneously upon reaching a certain urinary volume. Adults, through a "learned" process, can suppress this autocontractibility and void only when convenient. Cortically controlled inhibitory impulses affect lower neurologic reflexes rendering the bladder "stable" or "asynergic."³ During bladder filling, the intravesical pressure remains constant and no involuntary detrusor contractions occur.⁴ Increased tension in the bladder wall stimulates proprioceptive receptors which send impulses that reach the cortex, producing the sensation of urinary urge. By voluntarily removing these inhibitory cortical impulses the detrusor muscle contracts and voiding is established.

The detrusor muscle is considered *unstable* when uninhibited detrusor contractions exceeding 15cm/H₂O pressure occur during cystometric evaluation. This intravesical pressure elevation must be independent of any increase in intra-abdominal pressure and must occur while the patient is asked to inhibit.¹

During adulthood, several conditions such as urinary tract infections, tumors and stones of the lower urinary tract and neurologic disorders can alter the normal "stability" of the detrusor muscle. When the instability is severe enough to create intravesical pressure that exceeds the urethral resistance, the patient becomes incontinent. Most commonly the presence of detrusor instability exists in the absence of recognizable urologic or neurologic conditions. A patient with detrusor instability may therefore be continent as long as the urethral resistance is sufficient to counteract the increase in intravesical pressure.

C. Paul Hodgkinson in 1963 first described this condition which represented 8% of incontinent patients evaluated in his service.³ Multiple reports since then indicate incidence varying from 8% to 60%.^{3,5} This wide range may in part be the result of different study populations, the lack of strict diagnostic criteria, and the standardization of evaluating techniques. In our series, 25% to 30% of patients with lower urinary tract symptoms have detrusor instability, and of these 98% are idiopathic in origin.

Detrusor instability may present clinically

TABLE 1
Types and Incidence of Female Urinary Incontinence
Ob-Gyn Urodynamic Unit
1976-1979

	N	%
Stress Urinary Incontinence (SUI)	183	55.96%
Detrusor instability		
a) Idiopathic (IDI) (70)	79	24.16%
b) Secondary to urinary infection (9)		
Mixed (SUI) + (IDI)	15	4.59%
Psychogenic	10	3.06%
Fistulae	3	0.92%
No objective incontinence	37	11.31%
	<hr/>	<hr/>
	327	100.00

with or without incontinence as described above. Often symptoms are associated with it as shown in Table 3.

Detrusor contractions producing incontinence can be preceded by a strong desire to void (Fig 1) or can occur without symptoms (Fig 2). In addition detrusor contractions may coincide with a strong desire to void and not result in incontinence (Fig 3). Basically all three of these cases represent examples of idiopathic detrusor instability and have the same underlying pathophysiology. This is a decrease in or lack of cortical inhibitory impulses to the spinal reflex centers.⁶

It should be noted that in more than 50% of cases in our series, detrusor instability was only observed after "provocative" testing (forceful coughing or heel bouncing). Cystometric techniques useful in the detection of this disorder should allow the patient to perform

TABLE 2
Factors Influencing Intravesical Pressure and Intra Urethral Resistance in the Absence of Detrusor Contractions.

A. FACTORS THAT INCREASE INTRAVESICAL PRESSURE	
Abdominal Pressure Increment	<ul style="list-style-type: none"> 1. Abdominopelvic tumors 2. Obesity 3. Chronic pulmonary obstructive disease
Vesical Tone Increment	<ul style="list-style-type: none"> β-Adrenergic block (propranolol)
Increased Urinary Volume	<ul style="list-style-type: none"> 1. Urinary retention (overflow incontinence) 2. Bad voiding habits
B. FACTORS THAT DECREASE URETHRAL RESISTANCE	
<ul style="list-style-type: none"> 1. Urethral denervation (post-surgical) 2. α-adrenergic block (phenoxybenzamine) 3. β-adrenergic stimulation (isoproterenol-isoxuprine) 4. Urethral fibrosis (post-surgical radiation) 5. Hypoestrogenism 	

TABLE 3
Symptoms Associated with Idiopathic Detrusor Instability

Incontinence	51 +
Urgency-frequency	39 + +
Nocturia	38
Dysuria	3
+ 20 patients with incontinence had no symptoms	
+ + 19 patients with urgency-frequency had no incontinence	

comfortable "provocative" maneuvers while in the erect position. Several cases will remain undiagnosed if these techniques are not used.^{7,8}

Psychogenic Incontinence

This type of incontinence is usually part of a psychological condition. These individuals contract the voluntary muscles of the abdominal wall, producing what is viewed by them as "involuntary urine loss." Cystometric techniques which independently monitor intra-abdominal, (rectal) and intravesical pressures will record the coincidental elevation of both pressures.⁹

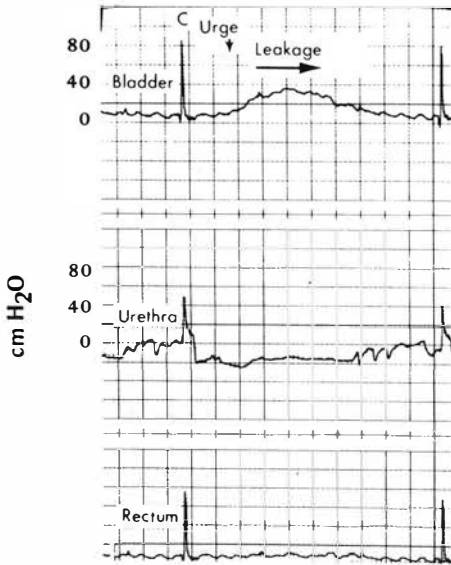


Fig. 1.—In this case an automatic detrusor contraction occurred ten seconds after a cough (C). There was no evidence of pressure increment in either the urethral or rectal leads. There was a strong desire to void prior to the detrusor contraction, and there was evidence of urine leakage.

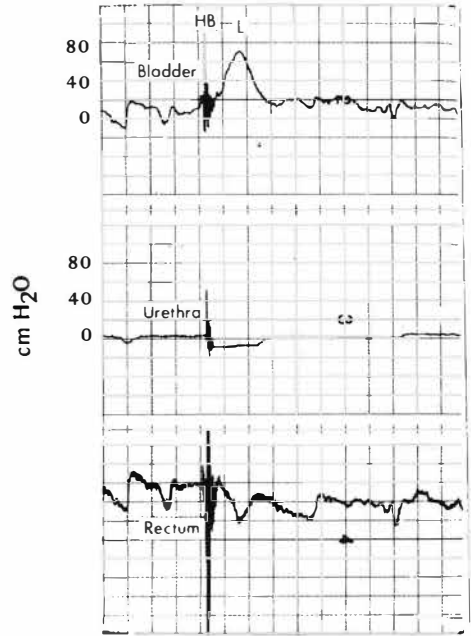


Fig. 2.—In this case an automatic detrusor contraction occurred six seconds after a heel bounce (HB) and showed only in the bladder lead. There was incontinence of urine (leakage = L) and no urge sensation.

DIFFERENTIAL DIAGNOSIS

History

The time of onset and the circumstances surrounding it may be of help in establishing the diagnosis. Incontinence since childhood can indicate congenital anomalies such as ectopic ureter or if it follows surgery and/or radiation therapy, it may be related to genitourinary fistulae.

The majority (96%) of patients with urinary incontinence have SUI or IDI, or a combination of both. Table 4 compares the most common symptoms of patients with SUI and IDI.

Physical Examination

A comprehensive examination with special attention to the genitourinary system is mandatory. Special aspects of the pelvic examination should include:

- a) Assessment of the bulbocavernosus reflex. This is done with the patient in the lithotomy position by gently com-

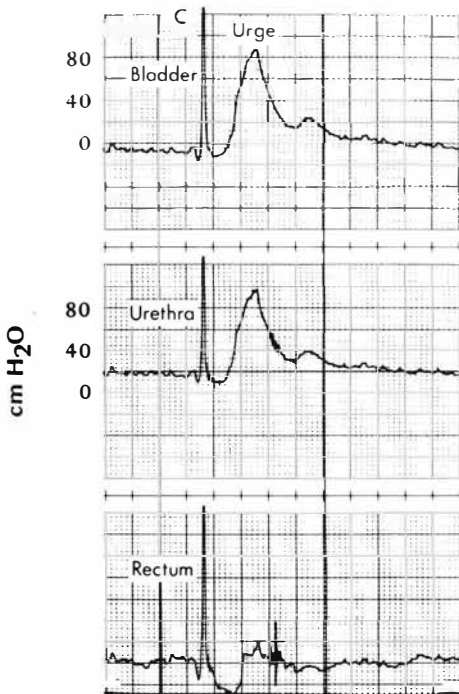


Fig. 3—This case shows an automatic detrusor contraction occurring five seconds after a cough (C). There was a pressure increment in the urethral lead but none in the rectal lead. The detrusor contraction did not produce leakage of urine. There was a strong desire to void simultaneous with the detrusor contraction.

pressing or touching the clitoral glands. If the lower spinal cord reflex (S_1 to S_4) is intact, contraction of the anal sphincter is observed.

- b) *Inspection and palpation of the anterior vaginal wall.* It is preferable to use a

Sims speculum on the posterior wall for proper visualization. The external urethral meatus should be inspected, and the presence of a urethral diverticulum and sensitivity of the trigonal area should be assessed. Changes in the entire anterior vaginal wall during maximal straining should be noted.

- c) *Assessment of pubococcygeus tone.* This can be performed by placing two fingers over the posterior vaginal wall and asking the patient to elevate or squeeze the examiners fingers. Pubococcygeus tone may be improved with exercises and may help in the management of certain cases of SUI.

Special Diagnostic Studies

Once the preliminary evaluation through a history and physical examination has been completed, special studies may help to confirm the diagnosis.

If a neurologic disease is suspected, further evaluation by a neurologist is indicated prior to completion of the incontinence work-up.

Intravenous pyelography is indicated if any congenital conditions are suspected or if upper urinary tract pathology is suspected.

Determination of residual volume, sediment, and a bacteriologic evaluation for infection should be done prior to further evaluation. Infection can cause detrusor instability and incontinence. Large urinary residuals may be present in obstructive uropathies and atonic bladder dysfunctions because of neurologic disorders.

TABLE 4
Comparison of Common Symptoms and Signs in Patients with SUI and IDI

	SUI	IDI
Onset	Usually gradual	Usually sudden
Remissions	Not usually	Usually
Sensation of incomplete voiding	Not common	Common
Urgency and frequency of urination	No	Yes
Dysuria	No	No
Nocturia	No	Yes
Bed-wetting	No	Occasionally
Characteristic type of leak	"Spurt"	"Stream"
Situations surrounding the leaking episode	At the "acme" of a forceful valsalva maneuver, without concomitant symptoms.	Spontaneously or several seconds after a valsalva maneuver or positional change. Usually with sensation of urge but not always.

Urethroscopy

This procedure should be performed, in our view, on all patients with incontinence, especially those with symptoms of urgency. Specific information obtained during urethroscopy should include:

- a) urethral length and calibration,
- b) inflammatory and trophic changes of the urethra and trigone
- c) presence of urethral lesions, fistulae or diverticulum,
- d) observation of the proximal sphincteric mechanism during retrograde filling and while bearing down, and
- e) observation of the urethral orifices and trigonal area.

Bonney-Read Test or Vesical Elevation Test

Through a red rubber or Foley catheter, body temperature water or saline is instilled into the bladder until the patient expresses desire to void. The volume is noted, and the catheter removed, and the patient asked to cough hard; any leakage is noted. Subsequently, the procedure is repeated while elevating the anterior vaginal wall, being careful not to compress the urethra against the symphysis erect. Care should be taken to use similar volumes every time and the patient should not bend her knees while coughing. This prevents the extrinsic (voluntary) urethral closure mechanism from becoming inadvertently relaxed during maximal stress. Urinary leakage in spurts, occurring simultaneously with the cough, and disappearing while elevating the bladder neck, strongly supports the diagnosis of SUI.

Cystometry

This procedure allows for the evaluation of the detrusor muscle during bladder filling. It is basically a method of which the pressure-volume relationship of the bladder is measured, and the "stability" of the bladder ascertained. The access or route to bladder filling may be transurethral, percutaneous or orthograde. The medium may be liquid or gas, used in continuous or incremental filling rates. The position of the patient can vary from sitting or lying, to standing.

In our unit we use the method which C. P. Hodgkinson published in 1963.⁴ Direct electronic cystometry allows for slow, orthograde

filling of the bladder with the subject's own urine. Small electronic transducer catheters placed in the urethra, bladder, and rectum transmit independent pressure readings and allow this study to be performed in any desirable position with no discomfort.

Stability of the detrusor muscle should specifically be tested in the erect position and after "provocative" maneuvers such as forceful coughing or heel bouncing. As mentioned above, if the chosen method of cystometry does not allow for this provocative testing, 50% or more of cases will remain undiagnosed.^{7,8} In our experience direct electronic cystometry remains the single most important diagnostic technique in the detection of detrusor muscle instability.

Metallic Bead-Chain Cystourethrography

This technique was described by C. P. Hodgkinson in 1953.¹⁰

A metallic bead-chain is placed in the urethra and radiopaque medium is instilled in the bladder and vagina. Lateral and anteroposterior radiographic views are obtained, in the erect position at rest and during straining.

Specific observations common to patients with SUI have been described. These include: a) Loss of posterior urethrovesical angle (PUV <) (Fig 4b); b) abnormal inclination of urethra axis in addition to the loss of the PUV <) (Fig 4c)¹¹; c) the urethrovesical junction becomes the most dependent position of the bladder base during strain (Fig 4d).¹⁰

Although these observations are seen in cases of SUI, they are also present in cases of IDI. The overlap impedes the use of this technique for the differential diagnosis between these types of incontinence. In our unit the technique has been useful in the:

- a) preoperative identification of the anatomic relationship between the symphysis pubis, bladder base, urethra and anterior vaginal wall. These can not be satisfactorily assessed by simple observation during pelvic examination.
- b) prognostic assessment, based on degree of descent of the urethrovesical (UV) junction. The lower the UV junction preoperatively, the better the chance to elevate it with surgery.
- c) postoperative evaluation of the surgical technique.

d) reevaluation of the reoccurrence of symptoms of incontinence.

TREATMENT

SUI

It is imperative to evaluate the contributory factors and to what extent they influence the incontinent condition. Weight reduction, change in voiding habits, and discontinuation of adverse medication may cause rapid improvement in the patient. Perineal exercises such as those devised by Kegel can have remarkable success in treating SUI, especially in patients with moderate-to-good pubococcygeus tone.

All the surgical procedures described for the treatment of SUI place the proximal urethra to an intra-abdominal location. This restoration to a location above the pelvic diaphragm can be accomplished either vaginally or suprapubically. There is a tendency to do more suprapubic procedures in view of results showing better long-term follow-up when this route has been chosen. However, it is wise to evaluate each case individually where surgery is indicated rather than establish fixed protocols.

IDI

Anticholinergic Therapy. Several anticholinergic preparations have been used with success. These drugs will block cholinergic preganglionic synapsis of the parasympathetic fibers in the detrusor muscle. The need for constant oral medication and the side effects observed with some of the doses needed make its use clinically unsatisfactory.

Bladder Drills

Bladder retraining techniques have been used with good results.⁶ Patients are instructed to void on predetermined schedules, prolonging progressively the intervals between voidings. This drill reestablishes the cortical inhibition of the bladder reflex by repeating the process of training. Similar programs have been utilized in hospitalized patients and cortical control has been achieved through biofeedback mechanisms. This form of management seems preferable to either drug therapy or drastic bladder denervation through surgical intervention.

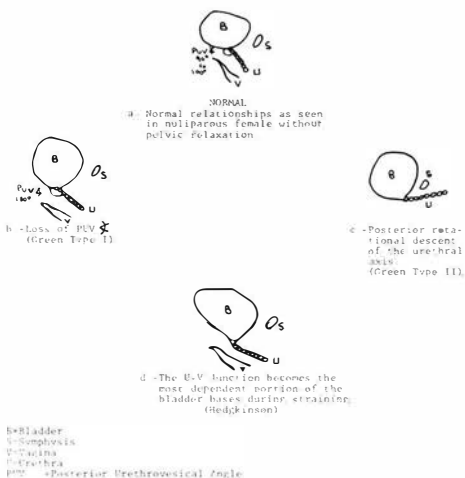


Fig. 4--Specific urethrovesical relationships observed in patients with SUI.

CONCLUSION

Female urinary incontinence is a complex problem. Thorough physical examination together with diagnostic techniques such as urethroscopy and cystometry will avoid unnecessary surgery and diminish treatment failures. If surgery is indicated, the skilful surgeon should assess each patient individually and perform the procedure best suited to that particular patient.

Figures 1, 2 and 3 are reproduced by permission from the *American Journal of Obstetrics and Gynecology* (129:299-000, 1977).

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