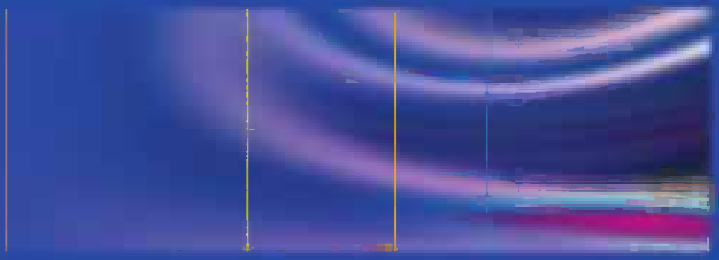
Kate H. Moore



Urogynecology: Evidence-Based Clinical Practice

Second Edition

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Contents

Chapter 1
Taking the History

This chapter deals first with incontinence/voiding dysfunction, then prolapse and fecal incontinence. Detailed history taking for bacterial cystitis and interstitial cystitis is included in the relevant chapters, but the basic features are given here.

Many urogynecology patients have multiple symptoms, for example, mixed stress and urge leak along with prolapse or postoperative voiding difficulty with recurrent cystitis and dyspareunia. It is important to untangle or dissect the different problems and then tackle them one by one (although the total picture must fit together at the end).

To help you manage the patient, ask, "What is your main problem. What bothers you the most?" Only after you have sorted this question out fully should a systematic review be undertaken. Let the patient tell you her story.

History Taking for Incontinent Women

Incontinence Symptoms

Stress Incontinence (leakage with cough, sneeze, lifting heavy objects; see Fig. 1.1a). Note that stress incontinence is a symptom. Stress incontinence is a physical sign (see Chap. 2). Urodynamic stress incontinence means that on urodynamic testing the patient leaks with a rise in intra-abdominal pressure, in the absence of a detrusor contraction (see Fig. 1.1b and Chap. 4).

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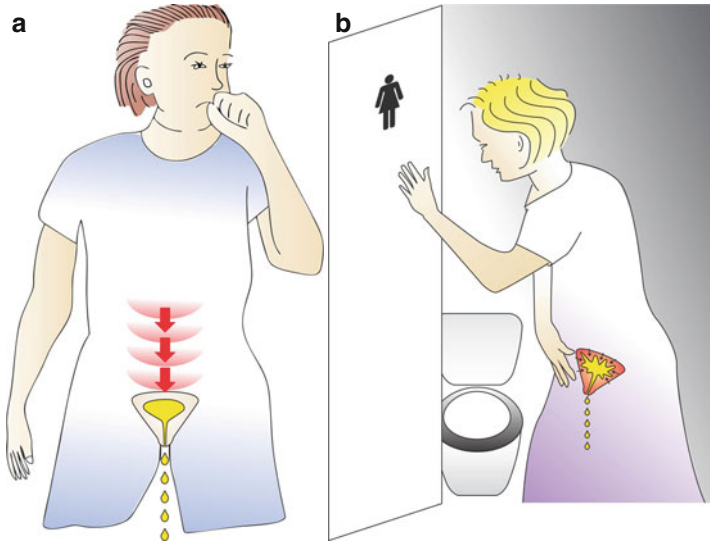

FIGURE 1.1 (**a**) Stress incontinence, leakage associated with raised intra-abdominal pressure. (**b**) Urge incontinence, leakage associated with a detrusor contraction

Urge incontinence (leakage with the desperate desire to void) is a symptom that is difficult to elicit on physical examination (see Chap. 2).

On urodynamic testing, if the patient leaks when a detrusor contraction occurs, associated with the symptom of urgency, the condition is termed detrusor overactivity (see Chap. 4).

Many patients will have mixed stress and urge incontinence but can tell you which one bothers them the most or makes them leak the most.

Take the time to ask the patient, because this guides initial therapy and helps you to interpret urodynamic tests.

Nonincontinent Symptoms of Storage Disorders: Frequency, Urgency, and Nocturia

Frequency of micturition is defined as eight or more voids per day.

The normal adult with an average fluid intake of 1.5–2 l/day will void five to six times per day.

If a woman has increased frequency, ask whether she voids "just in case": before going shopping and so on, because many women with stress incontinence do this to avoid having a full bladder when they lift shopping bags and the like. The difference is important.

The woman with an overactive detrusor muscle will rush to the toilet frequently because she has an urgent desire to void, caused by the bladder spasm, and she is afraid she will leak if she does not make the toilet on time. The urgent desire to void for fear of leakage is defined as "urgency."

Nocturia is defined as the regular need to pass urine once or more per night in women aged 60 or less. One episode of nocturia is allowed per decade thereafter, for example, twice per night in the 70-year-old is not considered abnormal (as renal perfusion in the elderly improves at night when the patient lies down and blood flow to the kidneys increases).

The overactive bladder (OAB) is a clinical syndrome, not a urodynamic diagnosis. It comprises frequency, urgency, and nocturia, with or without urge incontinence (in the absence of bacterial cystitis or hematuria). It was defined by the International Continence Society in order to help general practitioners to identify patients likely to have detrusor overactivity, so that they could be treated in the general practice setting without recourse to urodynamic testing.

The Frequency–Volume Chart (FVC)

This chart (Fig. 1.2) is especially helpful in assessing whether the patient suffers from daytime frequency or nocturia and how much urine she generally can store (her functional bladder capacity). The average patient has difficulty remembering exactly how often she voids and of course has no idea of the volume she can store.

Most urogynecologists send out a blank FVC to patients prior to the first visit, so she can complete it before the first

Please fill in this chart before coming to the Unit; it gives your doctor important information and can help you to understand your condition.

Please fill in the approximate time and amount of how much fluid you drink, as illustrated in the example below.

Please fill in the correct time and amount of how much water (urine) you passed: either millilitres or ounces. Please mark with a star * when you leak/when pad is damp. Fill in the chart for 3 days (e.g. 3 x 24 hours = 72 hours) in a row.

Date/ Time	Fluids taken in	Amount of urine passed mls or ounces	*= wet	Date/ Time	Fluids taken in	Amount of urine passed mls or ounces	*= wet
EXAMPLE / ILLUSTRATION:				31.7.05			
1.6.99 2am	–	150 mls		0720		550 ml	*
7am	–	250 mls	*	0720	Cup Orange		
8am	Mug coffee	–		0745	Cup tea		
8.20	–	60 mls	*	0830		160 ml	
9.30	Cup orange	–		1015	Cup Coffee		
10.00	–	100 mls		1030	Cup Coffee		
12.00	2 mugs coffee	–		1130		380 ml	*
14.00		360 mls	*	1245	Glass Water		
AND	SO ON FOR 3	DAYS		2pm		260 ml	
				400	Cup of tea		
30.6.05				450		180 ml	
0715		580 ml	*	6pm	Soda Water		
0730	Cup Orange			730		310 ml	
0745	Cup tea			930	Cup of Tea		
0830		190 ml		1015		230 ml	
10am	Cup tea			2.7.05			
1015		350 ml		715		590 ml	*
12	Glass water			730	Cup Orange		
330		410 ml	*	745	Cup tea	175 ml	
400	Cup tea			0830		175 ml	
450		170 ml		10am	Cup tea		
6pm	Glass beer			11am	Cup tea	"	
730		360	*	1245		420 ml	*
945	Cup tea						
1015		200					

FIGURE 1.2 Frequency–volume chart, showing a patient with good bladder volumes, adequate fluid intake, and typical stress leak. Note the "just in case" voiding before going to work (08:30) and coming home (4:50 P.M.) on the train

visit. See Chap. 5 (Outcome Measures) for more detail. This is a crucial part of starting bladder training for patients with overactive bladder (see Chap. 7).

Other Types of Leakage

These may denote a more complex situation.

Leakage when rising from the sitting position can be due to stress incontinence (relative rise in abdominal pressure when standing) or due to urge incontinence (gravitational receptors in the wall of the bladder trigger a detrusor contraction upon standing).

"Leakage without warning" is a nonspecific but important symptom. It may indicate detrusor overactivity, when a patient reaches her threshold bladder volume triggering a detrusor contraction. It may also indicate stress incontinence that the patient cannot verbalize; for example, she leaks with the slightest movement.

Leakage when arising from bed at night to go to the toilet is also nonspecific but important. Nocturia usually is associated with an overactive bladder. However, some patients with a very weak sphincter and other causes for nocturia (such as night sweats, obstructive sleep apnea, or a snoring husband) may leak as soon as they get up to go to the toilet. Leakage during intercourse is seldom volunteered. Ask this question tactfully. Coital incontinence that occurs during penetration is most likely due to stress incontinence, whereas leakage during orgasm is more likely due to detrusor overactivity.

How Bad Is the Problem?

Some patients use only a damp panty liner once daily, but their mother was grossly incontinent in her old age, and they do not wish to become like her. Other patients use many large pads fully soaked per day but have put up with it for years owing to embarrassment. It is important to assess severity because evidence indicates that mild incontinence is more readily cured by conservative measures. Severe stress incontinence is more likely to need surgery. Severe urge incontinence is logically more likely to require anticholinergic drugs.

Many units now quantitate the severity of leakage by asking three standardized questions, which have a set range of answers, in a format defined by the World Health Organization. For illustration, see Chap. 5, but the questions are as follows:

How often do you leak urine? (All the time, daily, two to three times weekly, weekly, or less)
How much urine do you leak? (A little bit, a moderate amount, a large amount)
How much does it affect your daily life? (On a scale of 1–10)

We also try to find out what sort of pad the patient is using, for example, see Fig. 1.3.

History Taking for Voiding Difficulty

Although difficulty in emptying the bladder as a primary complaint occurs in only about 4 % of females presenting with lower urinary tract symptoms, voiding difficulty does commonly accompany other urogynecological problems such as prolapse and can be a lifelong problem in women who have previously had continence surgery.

The classic complaints are:

Needing to strain to void, for example, the urine does not come away without a Valsalva strain to start the flow (this is never normal).
The flow is intermittent: "stop—start."
The flow is prolonged (the patient takes much longer to void than her friends or others in a public bathroom at the movies).
Post-void dribble: The patient gets up from the toilet thinking she is empty, but urine trickles out as she walks away.
Need to revoid: The patient gets up from the toilet thinking she has finished but has to go back to the toilet within a few minutes.
Recurrent episodes of bacterial cystitis.

Figure 1.3 Adult diapers, medium and small pad, with panty liner on far right

All such patients need free uroflowmetry with post-void residual and voiding cystometry if these are abnormal (see Chap. 4).

The underlying causes may be:

Prolapse with urine trapping
Postsurgical urethral obstruction

Underactive detrusor (more common in the older woman)
Urethral diverticulum

History Taking for Prolapse

"Something coming down in the vagina" is the classic statement. The patient may have a wide range of severity of symptoms. It is important to define how badly she is affected.

In mild cases, she may sometimes feel a lump the size of a small egg at the introitus when she is washing herself in the shower after standing up all day at work (not every day).
In more severe cases, she feels an obvious lump there every time she washes and sometimes feels that there is a lump protruding when she sits down, so that she is uncomfortable. She may find the lump uncomfortable during intercourse or too embarrassing so that she refuses to have intercourse.
In very severe cases, the lump is there in her underwear all the time, associated with a low backache or nagging discomfort.
In the worst-case scenario, the lump rubs on her underwear and causes staining either brown or red (due to dependant edema with trauma), and she may experience an unpleasant abdominal pain if there is a low-lying enterocele with traction on the nerves to the small bowel.

History Taking for Fecal Incontinence

Fecal incontinence is really the wrong term to use. We should be asking about anal incontinence, which includes incontinence to flatus and feces. Incontinence of flatus from the anus is very socially debilitating and should not be ignored.

Flatus incontinence is defined as regular passage of noisy or foul-smelling gas which the patient is attempting to inhibit

or which seeps out without any warning sensation. Even if this occurs once per month during an important business meeting, it can be disastrous.

Fecal incontinence is usually broken down into the following: only when the stool is liquid (with diarrhea). Note whether patient has inflammatory bowel disease or malabsorption symptoms; treating the underlying disease may cure the problem. Incontinence when the stool is solid usually indicates a more severe problem and can have a devastating impact on the patient's life.

Assessing severity: Does the patient need to wear a pad for the leakage or an anal plug? Does the patient need to take constipating medicine to stop leakage of watery stool? Ask about fecal urgency, defined as unable to defer the call to stool for 15 min.

All these aspects of severity are included in the Wexner score (see Chap. 5).

Symptoms of Obstructive Defecation

Constipation, roughly defined as straining to pass hard stool and not able to defecate daily (less than three motions per week).

The easiest way to ask a patient about whether their stool is hard, like "rabbit pellets," is to show them a picture of the Bristol stool chart (Fig. 1.4) and ask them to pick out which types of stool they usually pass. Type I stool is not good, as it usually means the patient must strain to evacuate, which weakens the pelvic floor. Urogynecologists have become increasingly aware of this problem.

Needing to digitate the vagina in order to expel hard stool—the patient often has to put her fingers in the vagina to express the stool out manually.

Post-defecation soiling with need to re-evacuate—patient feels defecation is complete, stands up to leave toilet, feels stool coming onto underpants, or else feels more stool present in anal canal and has to sit down again.

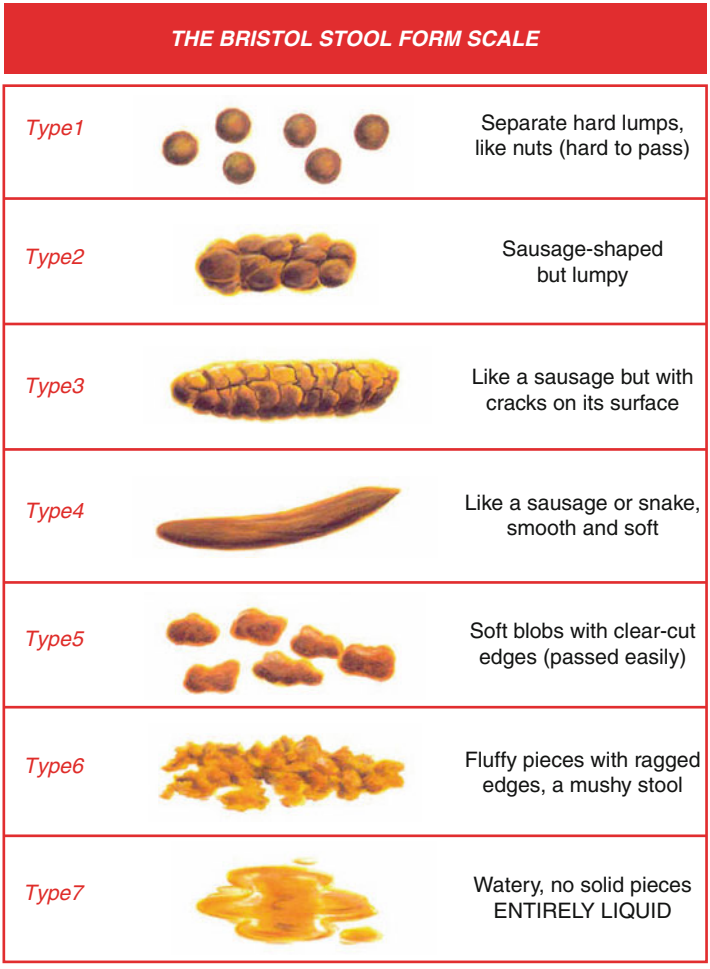

FIGURE 1.4 The Bristol stool form scale

Assessing Previous Surgical History in Relation to Urinary Incontinence

If patient had previous continence surgery with persistent or recurrent leakage, there is a need to find out exactly what procedure she had (get notes or write to surgeon).

- If it was a previous anterior repair for incontinence, failure is not surprising.
- If it was a previous Pfannenstiel incision, patient may not know whether this was Marshall–Marchetti procedure (failure is common) or a colposuspension (failure is less common; suspect detrusor overactivity).
- If it was a previous "sling," there is a need to know whether this was a true abdomino-vaginal sling—if so, whether autologous fascia (sheath or fascia lata from patient; failure uncommon) or whether synthetic mesh (may be undergoing rejection)—or whether the "sling" was a Raz, Peyeyra, or Gittes type (failure very common; see Chap. 9) or a previous midurethral sling, TVT or Monarch; failure is less likely.

If it was a previous failed continence surgery, also check whether patient had voiding difficulty:

May have been kept in hospital for catheterization longer than usual

May have been sent home with suprapubic catheter in situ

May have been trained to perform clean intermittent self-catheterization

If any of these problems occurred, one should suspect that:

Patient could have subacute retention with overflow incontinence.

Further surgery in these cases is generally more likely to provoke voiding difficulty again; in order to achieve continence, self-catheterization is more likely in such cases.

History Taking for Dyspareunia

Any patient with urogynecology problems who also has dyspareunia needs this problem treated. The common features seen in urogynecology are as follows:

Postoperative scarring from overtight posterior repair

Postoperative scarring from overtight episiotomy repair

Post-colposuspension changes in the shape of the anterior vaginal wall
Atrophic vaginal changes (dryness, pruritus, coital discomfort)

General gynecological causes for superficial and deep dyspareunia should also be considered. For example, deep dyspareunia arising from endometriosis may coexist, and laparoscopic treatment should be carried out (especially if surgery will be needed for the urogynecological complaint).

History Taking for Recurrent Bacterial Cystitis

This is covered in detail in Chap. 11, but the basics are as follows:

Has patient had >3 proven episodes of cystitis in the last 5 years?
Has patient had renal ultrasound to exclude calculi?
Has patient had ultrasound to measure post-void residual?
Has patient had cystoscopy to investigate cystitis (need to get findings)?
Is cystitis often postcoital?
Are there postmenopausal atrophic vaginitis symptoms?
Has there been any hematuria, either during cystitis or at other times?

History Taking for Painful Bladder Syndrome/ Interstitial Cystitis (IC)

This is covered in Chap. 12, but the basics include the following:

- The main complaint is suprapubic pain.
  - Pain may be constant or worse with a full bladder.
  - Pain may be relieved by voiding.
  - Pain may wax and wane over time.

- Relentless frequency of micturition is typical, ten to twenty times daily.
- Severe nocturia is common but not present in all patients and can be as severe as five to ten nocturia episodes per night.
- Bacterial cystitis should be excluded.
  - The finding of proven recurrent bacterial cystitis generally precludes a diagnosis of IC.

History of Drug Therapy That May Facilitate Urinary Incontinence

The most common culprit is the alpha-adrenergic antagonist prazosin (Minipress), which relaxes the innervation to the bladder neck and provokes stress incontinence. Always check exactly which antihypertensive the patient is using.

The next most common problem is use of diuretic therapy to treat hypertension. Although this may be good medical practice, it can be enough to tip the balance in a patient with a weak urethral sphincter or an overactive bladder into incontinence. Ask the patient's doctor whether another antihypertensive can be used.

A further common problem is the chronic dry cough seen with ACE inhibitors (especially Renitec, enalapril), which can provoke stress incontinence.

Many psychotropic drugs have anticholinergic effects that can precipitate chronic retention of urine with overflow incontinence. Lithium can be a common culprit: it also is associated with increased thirst so patients accommodate increasingly large bladder volumes; eventually they cannot cope. The selective serotonin reuptake inhibitors such as paroxetine that also have some alpha-adrenergic blockade effect are also recently reported to cause chronic retention in some cases, more likely if the patient is also receiving a beta-adrenergic agonist such as imipramine.

General Assessment of the Patient in Relation to Urogynecology

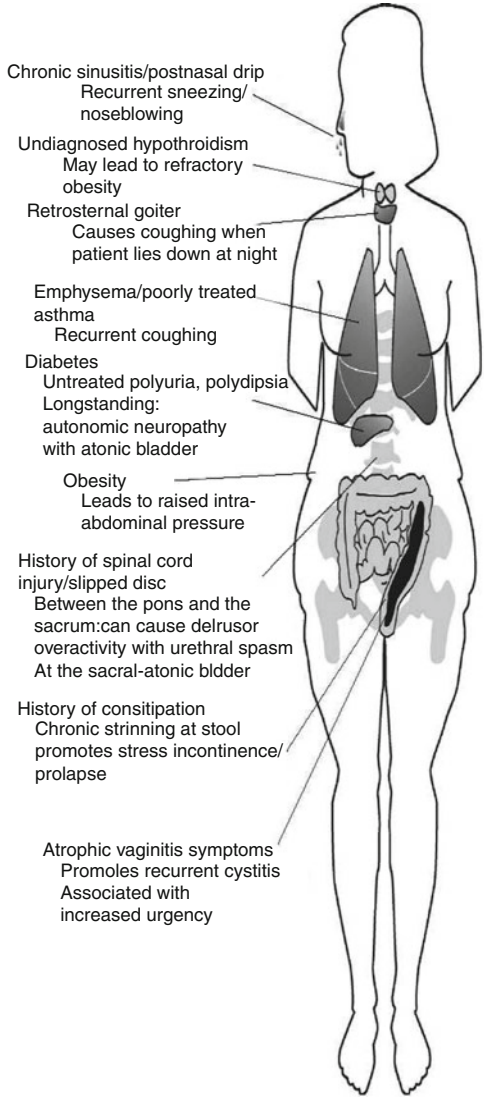

FIGURE 1.5 General factors contributing to the pathogenesis of incontinence or prolapse

Chapter 2
Physical Examination

When examining a patient with urinary incontinence or prolapse, more care may need to be taken to avoid embarrassment than with the usual gynecology patient.

For example, a patient with menorrhagia is often fed up with her symptoms and just seeks your help to get rid of a practical problem that has little social stigma. On the other hand, a patient with incontinence often feels that she is "dirty" and "cannot control herself." A patient with prolapse is often horrified about the lump appearing at her vaginal opening and may have ceased intercourse because of embarrassment.

Therefore, always make sure that the patient's abdomen and genitalia are covered with a sheet, and only expose that part which you are about to examine. Establish a sympathetic rapport *before* you begin the examination.

Examine the Abdomen

Before starting the examination, a urine specimen should be taken for culture, and if foul smelling, it should undergo a rapid dipstick test to screen for infection. The patient's height and weight should be measured, so that BMI can be determined and obesity discussed if present.

Many patients attending the gynecologist for a first visit lie on the couch with their knees drawn up, assuming that only the vagina and pelvis will be examined. This is not appropriate in urogynecology: the abdomen must be examined first, so ask

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the patient to drop her knees down so that a relaxed abdominal exam can be performed. Check that you know the nature of all her abdominal scars; she may have forgotten some during the history!

Any mass that raises intra-abdominal pressure may cause incontinence.

In our unit, we see one to two patients per annum presenting with incontinence or urgency/frequency who in fact have an ovarian cyst (benign or malignant), or an enlarged uterus that has previously been undetected.

Also, patients may present with frequency and urgency but in fact have subacute retention, so it is important to percuss the abdomen to exclude an enlarged bladder. Shifting dullness needs to be elicited if ascites is suspected, which may accompany an ovarian cancer that provokes stress incontinence.

Check the renal angles for tenderness, for example, calculi.

Inspect the Vulva

First, look for evidence of postmenopausal atrophy. Initially, this appears as thin, shiny, glistening red epithelium that appears fragile, rather than the healthy pink "skin"-like appearance of the premenopausal women. Later changes include patchy whitish areas of cornification with some "cracks" or fissure-like lesions often between the labia majora and minora. In end stage, the labia minora may be fused at the midline. Urethral caruncle, a red rosebud appearance at the urethral meatus, also indicates estrogen deprivation (see Fig. 2.1).

Do not be lulled into a sense of security because the patient is on systemic HRT. A percentage of these patients do not achieve adequate blood levels in the vagina and vulva and may still get atrophic changes, which also affect the urethra.

Next, look at the introitus at rest; a cystocele or rectocele may be evident even without cough. Inspect the perineum for signs of post-obstetric perineal deficiency.

FIGURE 2.1 Classic atrophic vagina with urethral caruncle

Elicit a "Stress Leak"

Part the labia, and ask the patient to cough. In order to save embarrassment, explain to the woman that you will place a piece of tissue/paper towel at the urethra, so that if she leaks, nothing will spill onto the linen. Patients are often terrified that they will leak urine in front of the doctor, yet this is exactly what we are trying to get them to do. You should have a tissue ready in any case, because a strong projectile spurt of urine may reach your clothing and embarrass the women even further (she will know if the spurt has been large enough to do this!).

Typically, a stress leak involves a short spurt of urine that occurs during the height of the cough effort. An urge leak

typically occurs an instant after the cough, but a large prolonged urine leak is seen due to the detrusor contraction.

In practice, patients with urge incontinence will not get up onto your examining couch with a full bladder; they will always request to visit the toilet first.

Assess hypermobility of the anterior vaginal wall. When the patient coughs, there may not be a proper cystocele "bulge," but the whole anterior wall may move down with the cough.

Speculum Examination

Pass a Bivalve Speculum

Always check that the cervix is healthy, and take a Pap smear if due. As you withdraw the speculum, check for normal vaginal epithelium as in any gynecological exam.

Pass a Sims Speculum

Traditional advice is to ask the patient to assume the left lateral position for a Sims speculum exam. In fact, if they are obese, this may not be necessary; the bottom of the Sims may not hit the couch if the buttocks are sufficiently plump. If equipment is in short supply, the two leaves of a bivalve speculum can be unscrewed, and the anterior leaf used as a Sims speculum.

Cystocele (prolapse of the bladder into the vagina) and rectocele (prolapse of the rectum into the vagina) are traditionally graded (during Valsalva or cough) as the following:

Mild: The prolapse descends more than halfway down the vagina but not to the introitus.

Moderate: The prolapse descends to the level of the introitus.

Severe: The prolapse descends well beyond the introitus and is outside of the vagina.

FIGURE 2.2 Complete procidentia

Uterine descent follows the same classification, but if the majority of the organ is outside the vagina, the term procidentia is used. See Fig. 2.2.

In highly parous women, the uterus may be well supported, but the cervix may be very bulky and protuberant (worth noting when considering surgical options).

Enterocele (prolapse of the small bowel into the vagina) is not a common major finding unless the patient has had a hysterectomy, when it is called a "vault enterocele" (the top of the post-hysterectomy vagina is called the vault). This prolapse is also graded mild/moderate/severe as above.

This "mild/moderate/severe" terminology has been used for many decades and is called the Baden Walker system of classification.

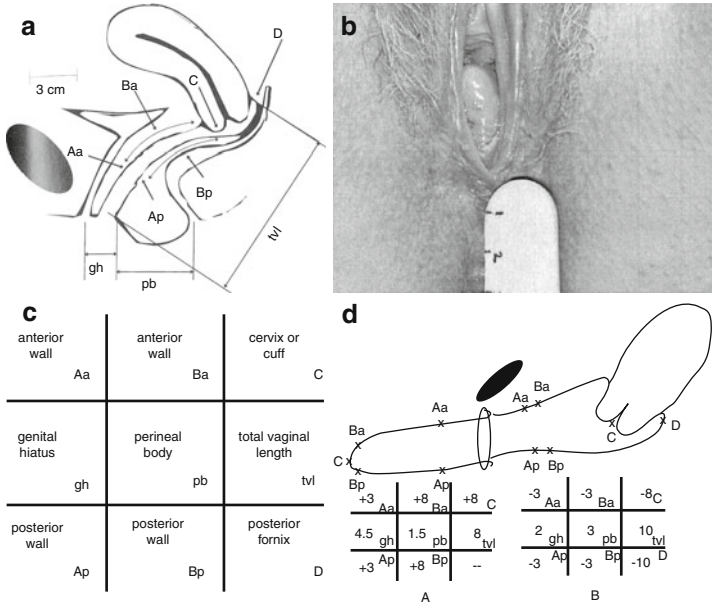

FIGURE 2.3 (**a**) Six sites (*Aa*, *Ba*, *Ap*, *Bp*, *C*, and *D*) used to quantitate POP. (**b**) Rectocele at the introitus with POPQ measuring device, perineum = 2.8 cm. (**c**) POPQ definitions. (**d**) Complete eversion vagina POPQ (*A*, *C*, and *D* are reprinted, with permission from Bump et al. [1]; Copyright 1996, Elsevier)

POPQ Scoring System of Prolapse

Prior to the 1990s, the Baden Walker system of classification, as described above, was used, but it was realized that there is considerable subjectivity in defining "mild," "moderate," and "severe" under this system. Therefore, urogynecologists devised a new system of measuring the degree of prolapse of the anterior and posterior walls of the vagina in centimeters, called pelvic organ prolapse quantification or POPQ (see Fig. 2.3a).

First, the reference point of the introitus (the hymenal remnant) is taken as 0 cm. Then using the normal vagina, a

reference point of 3 cm inside the introitus is called "–3 cm," for both the anterior and posterior walls. When asking the patient to strain or cough, the distance that the cystocele or rectocele descends is measured.

When a normal woman coughs, the vaginal walls do not move, so the –3 point remains 3 cm inside the introitus. In a woman with cystocele, say, for example, that with cough, the anterior wall (at the –3 point) protrudes out to 2 cm beyond the introitus. This is measured and recorded as +2 cm (meaning that the anterior wall at the reference point moves down by 5 cm with strain).

Next, the total vaginal length is measured, at the posterior fornix (as shown in Fig. 2.3b) at point D. Then the width of the perineal body is measured as shown in Fig. 2.2b, from the fourchette to the mid-anal opening. The length of the genital hiatus, from the lower margin of the urethra to the inner aspect of the fourchette, is also measured.

These dimensions are recorded in the grid shown in Fig. 2.3c.

Although the POPQ system may seem a little cumbersome to begin with, it is easy to pick up after a few practice attempts. Over the next decade, most gynecologists and all urogynecologists will inevitably take it up, because it is objective and allows for scientific research as to the outcome of prolapse surgery that has never been possible before (as shown in Chap. 9). The normal values, with an example of complete vault eversion, are shown in Fig. 2.3d.

Perform a Bimanual Examination

Again, examine for pelvic masses that may press on the bladder to cause frequency, urgency, or incontinence. If a patient with incontinence comes to surgery, any other gynecological disorders such as menorrhagia with a large fibroid uterus, ovarian cysts, etc., should be corrected at the same time; hence, the term "urogynecology," that is, "one-stop shopping," should be provided!

At the time of bimanual exam, if patient has had colposuspension, put the fingers into the retropubic space to feel for the typical "dimples" of the vagina adherent to the back of the pubic bone. If they are "rock solid" behind the bone, the operation is probably still anatomically intact. If not, the sutures may have come loose.

Also, palpate the urethra to feel for a cystic swelling, suggesting a urethral diverticulum.

Assess the Pelvic Floor Muscle Contraction Strength: Oxford Score

Several studies have shown that when asked to contract their pelvic floor muscles during examination, about 50–60 % of women will mistakenly contract their gluteal muscles (lifting their buttocks off the couch slightly) or contract their abdominal muscles (which increases the intra-abdominal pressure, the opposite of what is needed).

It is important to place one finger partly in the vagina and exert very gentle downward traction on the pelvic floor muscles about 2 cm inside the introitus, then explain that this is the muscle we want to contract. We find it helpful to ask the patient to pretend that she is in a public place (church or movie theater) and feels wind building up in the rectum and to tighten the muscles around the rectum to stop the wind escaping. Most patients have a rough idea of what you are

Table 2.1 Pelvic floor assessment grading

0 = Nil
1 = muscle on stretch — flicker
2 = weak squeeze with 2-s hold
3 = fair squeeze and 5-s hold with lift
4 = good squeeze and 7-s hold and lift, repeats ×5
5 = strong squeeze and 10-s hold with lift, repeats ×10

talking about and give a small contraction. You then encourage them by explaining that this is the correct muscle, with gentle digital traction on the muscle, and explain that now you are going to ask them to contract the muscle as hard as possible and count the number of seconds that they can hold on. The strength of the contraction and the duration are recorded as the modified Oxford score (Table 2.1).

Once you have assessed the strength and duration of the pelvic floor contraction, you can start the patient on a pelvic floor muscle training program (see Chap. 6).

Do All Urogynecology Patients Need a Rectal Examination?

Patients with a fairly simple history of stress and/or urge incontinence do not really require a rectal examination, which is uncomfortable and embarrassing. If you suspect neurological disease (which can affect anal function), or the patient has anal incontinence, a rectal exam to assess the tone and quality of the external anal sphincter is often useful. Fecal impaction is often palpable as hard lumps of feces impinging on the posterior wall of the vagina during the assessment of the pelvic floor muscles vaginally.

Screening Neurological Examination

If a patient has a history of trauma to the lumbosacral region or neurological symptoms that have not been investigated, a basic neurological exam is important. The lumbosacral region is of most interest.

The power of the lower limbs, the deep tendon reflexes at the heels, and the sensation of the perineal skin (S4), the skin over the inner lower thigh (S3), or the mid-inner thigh (S2) should be checked. Inspect and palpate the lumbosacral spine (sacral dimple may suggest spinal dysraphism; sacral lipoma may be seen). Lightly stroking the skin just beside the anus

should provoke a slight contraction of the anus. After explanation, lightly tapping the clitoris should also cause the anus to contract (the bulbocavernosus reflex). After clothing is replaced, observe the patient's gait. If these simple tests are abnormal, a full exam by a neurologist is worthwhile. For a good overview, see Rushton [2].

References

1. Bump RC, Mattiasson A, Bo K, et al. The standardization of terminology of female pelvic organ prolapse and pelvic floor dysfunction. Am J Obstet Gynecol. 1996;175:10–1.
2. Rushton D. Neurological disorders. In: Cardozo L, editor. Urogynaecology. New York: Churchill Livingston; 1997. p. 481–502.

Chapter 3
How to Manage the Patient After History and Examination

First, Treat Precipitating Factors

The complete management of incontinence and prolapse is not just a surgical exercise! You need to think about the patient's medical problems as they relate to their pelvic floor problem. Collaboration with physicians and other surgeons may be needed. From a medical point of view, referral to a respiratory physician, endocrinologist (for hypothyroid-related obesity, diabetes), dietician, or neurologist may be required. If the patient has truncal obesity and cannot lose weight, order tests for serum insulin levels at 0, 1, and 2 h after 75 g glucose load; if she has insulin resistance, metformin therapy is likely to help her lose weight. From a surgical point of view, referral to an ENT surgeon, thyroid surgeon, or colorectal surgeon may be needed. The urogynecologist should treat constipation and atrophic vaginal symptoms.

As mentioned, if midstream urine dipstick suggests cystitis, this should be treated, as bacterial endotoxins may weaken urethral sphincter strength or exacerbate detrusor contractions; thus, cystitis may worsen incontinence (see Chap. 11).

Second, Obtain All Relevant Old Notes

Previous continence surgery needs to be precisely documented, so that you can assess the likelihood of "natural

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failure" of the procedure or the risk of postoperative voiding difficulty that may not be symptomatic.

Any previous major abdominal surgery needs to be clarified, especially radical surgery for malignancy, as this may disturb the local innervation or relays between the sympathetic and parasympathetic nerves in the pelvis, leading to complex incontinence.

Third, Begin a Basic Management Program for Urinary Incontinence

If the condition is mild, this may be curative (see Chap. 5 for definition of mild, moderate, severe.). If the condition is severe or complex, urodynamic tests will be required, but there may be a waiting time for this, hence the need to start basic continence therapy.

If mild stress incontinence and good PFM strength, give home PFM training program, and refer for two to three physiotherapy visits (Chap. 6).

If mild stress incontinence but weak PFM strength, refer to physiotherapist for electrostimulation; see patients after 12-week therapy; book urodynamics then if no cure.

If severe primary stress incontinence (wants surgery), book urodynamic testing; discuss tension-free vaginal tape or TVT-O briefly (see Chap. 9).

If mild urge incontinence (or just OAB syndrome, not wet), start bladder training program (Chap. 7), and consider referral to nurse continence advisor for detailed training.

If severe urge incontinence and if long wait for urodynamics tests, give therapeutic trial of anticholinergic drugs, with bladder training (patient to stop drugs 1–3 weeks before test, see Chap. 9). Check whether nocturia is a problem; if so, check the FVC for nocturnal polyuria and/or a history of snoring, which may indicate sleep apnea; if so, refer for sleep studies. Give some anticholinergics at night to start with.

Fourth, if Anal Incontinence Is Present

Consider referral to appropriate physiotherapist if mild (Chap. 8). If severe, consider referral to colorectal surgeon for anorectal testing.

Fifth, if Prolapse Symptoms Are Present

If mild symptoms and mild on examination, consider referral to physiotherapist. Treatment of precipitating factors can make cure much more likely. If there is a moderate or severe prolapse, assess suitability for surgery and patient's wishes (see Chap. 10). Discuss vaginal ring pessary or surgery as indicated. Ensure postmenopausal women are given topical estrogens prior to ring or surgery.

If Associated Recurrent Bacterial Cystitis (Urinary Tract Infection, UTI) Is Present

Obtain old MSU results where possible to check for proven UTI. Order renal ultrasound and post-void residual measurement (Chap. 11). Consider booking uroflowmetry for next visit, if urodynamic tests are not needed. Make *sure* postmenopausal lady with recurrent UTI is on Ovestin.

If Suprapubic Pain, with Severe Frequency, Urgency, and Nocturia, Is Present

Consider diagnosis of interstitial cystitis (Chap. 12). Make sure the urine is sterile. Check that the frequency volume chart documents the severity of symptoms. Consider booking a cystoscopy with refill examination ± biopsy.

A Few Words About Explaining the Situation to the Patient

Urinary Incontinence

Most patients have little idea that there are different kinds of leakage. We find it helpful to give out a short booklet explaining this at the end of the first visit,[1] which describes the symptoms, underlying causes, and treatments of stress, urge, and overflow incontinence. It is very helpful to explain that, using a step-by-step approach, most urinary incontinence is largely curable, but that it will not happen overnight. You need to be very sympathetic during this explanation, emphasizing how common the problem is (10 % of all women under age 65, 25 % of women over age 65, and 30 % of women who have recently delivered a baby), so that the patient realizes she is not alone in her problem.

Anal Incontinence

Almost all patients with this problem are deeply embarrassed. Again, it is helpful to explain that there are different causes for this condition; treatment needs to be according to the cause, and thus, investigation is very helpful. Although cure is not as uniformly guaranteed, major improvement is generally likely to occur.

Explanations of UTI and IC are given in Chaps. 11 and 12.

Prolapse

Many patients have little idea of their anatomy, which walls/organs may be involved in prolapse, and that severity of each one does vary. We find it extremely helpful to draw a diagram

[1] www.pelvicfloorunit.com.au

for the patient, illustrating her particular problem and showing her degree of severity. If surgery is indicated/desired, the relevant procedures should also be sketched simply on the diagram (see Chap. 10).

Chapter 4
How to Conduct Urodynamic Studies: Essentials of a Good Urodynamic Report

Who Needs Urodynamic Testing?

Urodynamic testing is an invasive procedure. At the minimum, a urethral catheter and a rectal balloon must be inserted. The risk of iatrogenic bacterial cystitis is about 2 %. Studies show that urodynamic testing is not cost effective in *all* patients with urinary leakage, because it does not *always* affect management. For example, women with mild stress incontinence may be rapidly cured by physiotherapy and never need urodynamic testing.

On the other hand, it is fair to say that performing incontinence surgery without having a urodynamic diagnosis of stress incontinence, excluding detrusor overactivity, and checking for voiding difficulty is not good medical practice at all. Several studies have shown that simply having a main complaint of stress incontinence does not equate to the patient having urodynamic stress incontinence (USI).

As is explained further in Chap. 9 (surgery for USI), the fact that a cough can provoke a detrusor contraction was a major stimulus for the establishment of urogynecology as a subspecialty. Gynecologists realized that simply operating on patients who leak when they cough is fraught with difficulty.

So one needs to take a stance midway between "urodynamics for everyone" (not warranted because of the invasiveness of the procedure) and urodynamics only for those who are surgical candidates. In practice, the real problem is that so many patients have mixed symptoms. Urodynamic results

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do help to dissect out the relative severity of the different components in patients with mixed incontinence and thus guide you as to the main thrust of treatment. This is described in the case history at the end of this chapter.

In general, urodynamics are very worthwhile in the following cases (in descending order):

- Patients with *failed continence surgery* need detailed urodynamic studies.
- Patients with symptoms or a past history of *voiding difficulty* (previous prolonged catheter or self-catheterization post-op or postpartum) need voiding cystometry.
- Patients with *mixed symptoms and cystocele* who are considering surgery should have detailed urodynamics, possibly with ring pessary in situ (see "Occult" Stress Incontinence).
- Patients with *mixed stress and urge leak* need cystometry at least, to determine the relative severity of the two problems.
- Patients with *pure stress incontinence symptoms who have failed physiotherapy* should have cystometry with some form of imaging, to check whether there is undiagnosed detrusor overactivity or incomplete emptying.
- Patients with *pure urge symptoms who have failed bladder training and anticholinergic therapy* should also have cystometry with imaging, to look for an undiagnosed stress incontinence component or incomplete emptying (the latter may be worsened by the anticholinergic drugs).

Different Forms of Urodynamic Studies

The term "urodynamics" is a general phrase, used to describe a group of tests that assess the filling and voiding phase of the micturition reflex, to determine specific abnormalities.

Some of these tests are not "physiological." For example, inserting catheters into the urethra and a pressure balloon into the rectum, then expecting the patient to fill and empty

as she normally does, may not give a "true" picture of that woman's micturition cycle. Nevertheless, the tests have been standardized over the last 40 years, in accordance with the Standardization Committee of the International Continence Society (ICS), and are performed in a similar fashion across the world. Therefore, abnormalities are interpreted in a standard way and have a common meaning in clinical practice.

The tests that are generally used include the following:

Uroflowmetry: Measuring the patient's flow rate when voiding in private, onto a commode that is connected to a collecting device that measures the rate of fall of urine upon the device.

Simple cystometry: Inserting a single catheter into the bladder that measures pressure, with no correction for abdominal pressure, during a filling cycle, not widely used in the Western world.

Twin channel subtracted cystometry: Inserting a pressure recording line into the bladder as well as a filling catheter, along with an abdominal pressure recording line (rectal balloon), that records a filling cycle. The abdominal pressure is subtracted from the bladder pressure to give the detrusor pressure (see Fig. 4.1 and later figures).

Voiding cystometry: The same as twin channel cystometry above, but the patient is asked to void into a uroflow commode while the pressure lines are in situ, so that the contractility of the detrusor muscle during the voiding phase is measured.

Videourodynamics: The same as voiding cystometry above, but radiopaque X-ray contrast dye is used to fill the bladder. The test is done in the X-ray department, and the bladder/urethra is filmed during cough and other provocation. In males, filming is continued during the voiding phase, but 60 % of women are not able to void in these public conditions. Post-void films are taken to check residual.

Voiding cystometry with ultrasound: The same as voiding cystometry, but ultrasound imaging is undertaken during cough and other provocation, and post-void image is taken.

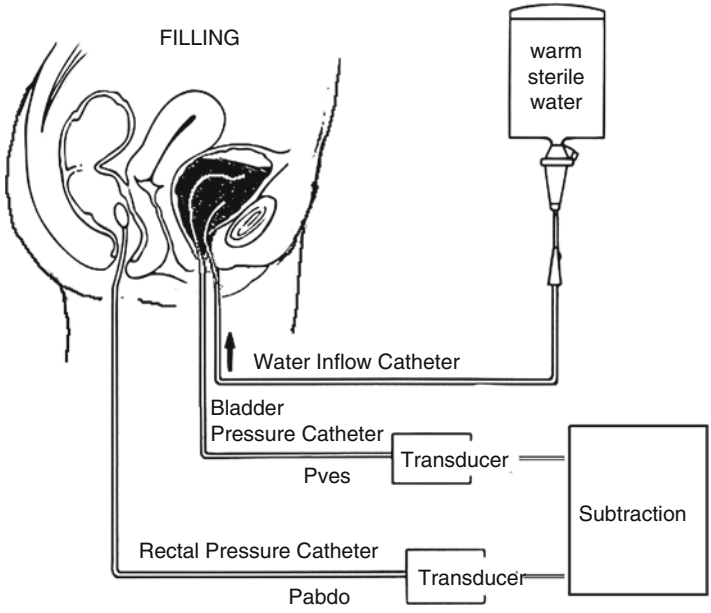

FIGURE 4.1 Schematic diagram of twin channel cystometry

Urethral pressure profile: Tests the function of the external urethral sphincter, performed in selected cases. Similar information is available from *leak point pressure* testing.

The frequency volume chart and the pad test are also part of urodynamic assessment, but these are discussed in Chap. 5 (Outcome Measures).

Practical Advice About How to Perform Urodynamic Studies

This section gives practical advice for a registrar or resident/house officer who is newly attached to a urogynecology department. For information about the medical physics of the tests, books by Abrams [1] or Cardozo and Staskin [4] are recommended.

Calibration of the Equipment

In essence, one must check that the equipment is correctly functioning and measures what it is supposed to measure.

Calibration of the urine flow machine involves pouring a known quantity of fluid into the uroflow equipment at a reasonably slow rate and then checking that the volume poured in equals the volume measured and that the computer calculated the flow rate correctly.

Calibration of the cystometry equipment involves checking that a column of fluid 100 cm high yields a pressure reading of 100 cmH_2O water pressure, then zeroing the transducers to atmospheric pressure (room air) so that zero pressure gives a zero reading. For detailed discussion, see suggested further reading.

General Clinical Guidelines

When a patient presents for urodynamics studies, you need to "troubleshoot" to make sure that the test can be correctly performed on the day.

If she has symptoms of acute urinary tract infection (dysuria, foul-smelling urine, excessive frequency, strangury, or hematuria), then the test should be postponed, a midstream urine culture taken, and antibiotics prescribed. This is because instrumentation of the lower urinary tract in the presence of infection can cause septicemia.

In many units, there is a substantial delay between the first visit date and the date of the urodynamic test. In these cases, you should review the patient's status quickly before starting the test.

If the patient was given a therapeutic trial of anticholinergic therapy at the first visit but was not given clear instructions to stop them 1–3 weeks before the test (and is still taking them), then cystometry may not diagnose detrusor overactivity, so the test may need to be postponed so anticholinergic tablets can be stopped.

If the patient had mild symptoms and has been attending a physiotherapist or nurse continence advisor in the meantime, she may be cured of her incontinence and no longer need the test.

Explaining the Test to the Patient

This is best done by the urodynamics nurse, who must form a trusting relationship with the patient. In our unit, that same nurse may have been involved in taking her initial history or will often be involved in following up the patient's response to treatment subsequently.

Urodynamic testing does involve some minor discomfort with passage of urethral and rectal catheters, but if performed in a dignified and sympathetic manner, most patients say that it was just slightly uncomfortable. In a teaching unit, only one medical student should "watch" the procedure. Actually, we ask the student to position the lamp, type in data on the computer, and help the patient off the couch, so they do not "watch" the patient but are actively involved. Patients do not like to feel like a goldfish in a bowl, especially when they are being asked to leak.

Before starting to fill, the nurse or doctor also explains the concepts of first desire to void, strong desire to void, and maximum cystometric capacity (see below). It is important for patients to know we will stop filling if they have too much discomfort.

Uroflowmetry

Ideally, the patient should come to the urodynamics test with a comfortably full bladder, then pass urine in a private uroflowmetry cubicle. Because many patients empty their bladder just before seeing a doctor, this is not always possible (no matter what letter you send beforehand).

A normal urine flow rate (shown in Fig. 4.2) looks like a bell-shaped tracing. The maximum flow rate should be at least

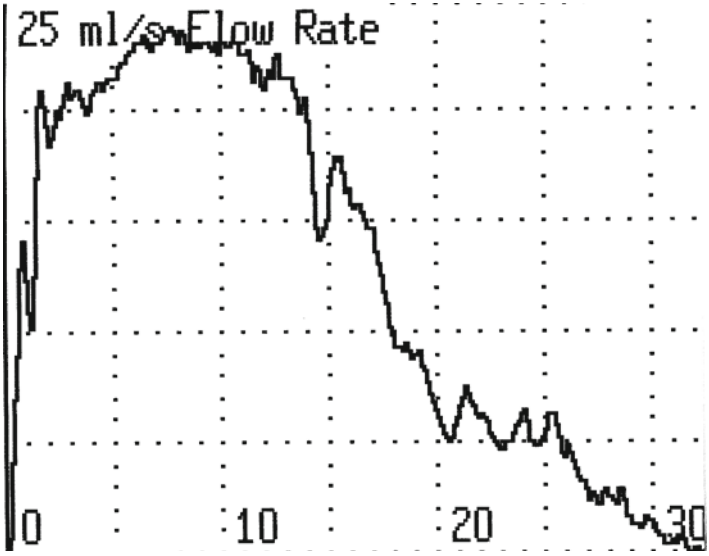

FIGURE 4.2 Normal uroflow curve. Maximum flow rate 23 ml/s, average 14 ml/s, voided volume 410 ml/s, flow time 31 s

15 ml/s, but this cannot be judged unless the voided volume is at least 150–200 ml. This is because flow rate depends on the volume in the bladder. For example, if you drink several pints of beer, you will pass urine rapidly. If you only drink the occasional small cup of tea, your flow rate will trickle out.

Other parameters that are measured include the total duration of flow time to empty the bladder and the average flow rate (i.e., the volume voided divided by the flow time).

Typical abnormalities of flow rate in women include intermittent prolonged flow rate with evidence of abdominal straining, suggestive of outflow obstruction. This most commonly occurs after surgery for stress incontinence that has overcompensated the urethral support. It is also seen in women with a cystourethrocele, in which the urethra may be kinked during voiding.

Normal values for flow rate in relation to volume voided have been derived from a study of several hundred normal women (Haylen et al. [7]; see Fig. 4.3). These “nomograms”

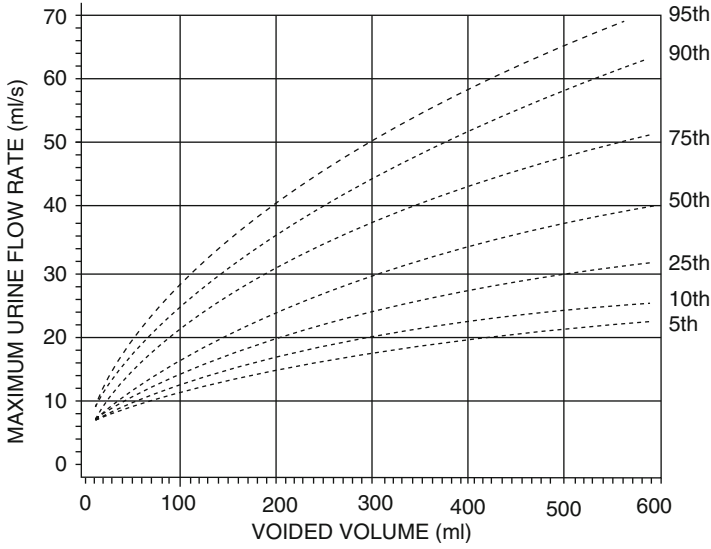

FIGURE 4.3 Liverpool nomogram for maximum urine flow rate in women

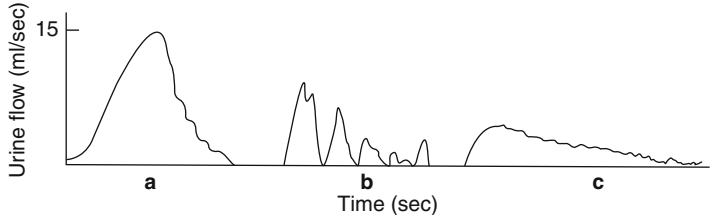

FIGURE 4.4 (**a**) Normal. (**b**) Abdominal straining. (**c**) Underactive detrusor (Reprinted with permission from Prolapse and urinary incontinence. Leader [12]; Reproduced by permissions of Edward Arnold)

allow you to determine what centile of the population a patient's flow rate represents. Flow rates below the tenth centile are considered abnormal.

The other common abnormality in elderly women is an underactive detrusor; see Fig. 4.4c. The peak flow rate is poor;

the average flow rate is poor, but there is no evidence of abdominal straining. The detrusor contraction is intrinsically weak, but this needs to be proven by voiding cystometry.

Less common voiding abnormalities are described in the section on voiding cystometry (detrusor hyperactivity with impaired contractility, DHIC, seen in the elderly with mild neurological dysfunction and detrusor sphincter dyssynergia, seen only in neuropathic disease such as multiple sclerosis).

After uroflowmetry, residual urine volume is measured either by catheterization, if the patient is about to undergo cystometry, or by ultrasound. A simple "bladder scan" (Bard) may be used, which automatically calculates the residual volume. Alternatively, standard transabdominal or trans-vaginal ultrasound is used to measure the residual volume, and formulae that calculate the volume of a sphere are then used by the clinician to calculate the residual amount (e.g., width × depth × height × 0.7).

Performance of Cystometry

To pass the bladder catheters, the urethra is cleansed with sterile saline; a sterile drape is placed around the urethra; Lignocaine gel is applied to the urethra, then the filling line and the pressure recording line (similar to a central venous pressure manometry line) are inserted into the urethra. Usually, the manometry line is inserted into the distal catheter hole, so the patient only feels one line going into the urethra, then the manometry line is disconnected from the filling line by pulling it backward slightly once it is in the bladder. The vesical pressure line is then attached to the domed transducer unit, which feeds into the software of the urodynamic equipment. See Fig. 4.5.

Some units employ a catheter that has a micro-tip pressure transducer embedded into the distal end, so that an external transducer is not needed and the slight artifactual delay encountered in the fluid-filled system is avoided. Such micro-tip transducer catheters are quite costly (1,500–1,800 Euros per catheter) and are quite delicate, so they may last roughly

FIGURE 4.5 Bladder filling line, vesical pressure line, and rectal balloon

6 months to 2 years of normal use. The fluid-filled pressure recording lines are single-use items, costing a few Euros per set. Each unit makes its own decision about which catheter type to use, generally on the basis of cost.

Passing the Rectal Catheter

The very small rectal balloon/transducer catheter is attached to the abdominal pressure recording line (usually prepackaged by the manufacturer). The balloon is coated in sterile lubricant, then placed into the rectum. One should not push the finger into the patient's rectum; this is unpleasant and unnecessary. Just gently insert the balloon about 3 cm into the rectal ampulla. As an alternative, a vaginal balloon may also be used to record intravaginal

pressure which is equivalent, but this is usually not successful in parous women as the balloon slips out in the erect position.

Twin Channel Cystometry

After connecting the bladder pressure recording line and the abdominal pressure recording line to the transducer domes, insert fluid into the line to exclude air bubbles, then zero the recording pressure using the software of the urodynamic program. The software program will subtract the abdominal pressure (Pabdo) from the vesical pressure (Pves) to yield the true detrusor pressure (Pdet).

The bladder is then filled with warm sterile water. Medium filling rate (10–100 ml) is advised in nonneuropathic patients. Generally a rate of 50–75 ml is used, via a peristaltic pump to prevent backflow into the bladder during a rise in detrusor pressure. The following parameters are important in a full urodynamic report:

Results of free uroflowmetry if available.

Initial residual urine volume (after the patient has performed free uroflowmetry)—normal residual = less than 50 ml.

Whether *pain or resistance* to catheterization is noted (may suggest urethral stenosis).

The *first desire to void*, when patient first notes that she would look for a toilet—normal FDV = 150–200 ml.

Normal desire, when patient would normally stop work and go to toilet—normal desire usually = 350–400 ml.

Maximum cystometric capacity, when patient would not tolerate any more fluid. Although the patient should not be pushed to the point of bladder pain, we use the example that if she were driving in the country, she would get out of her car and go behind the bushes to void—normal MCC = 450–500 ml.

The filling line is then removed (because it has a diameter sufficient to obstruct the outflow of urine during the next steps).

A supine cough is performed, while the urethra is visually inspected to look for a *stress leak*. Reassure the patient that there is only sterile water in the bladder and that all linen is discarded after each test, so her leaking will not spoil the linen. At this point, a *cough-provoked detrusor contraction* may be seen.

Supine tap water provocation is performed, while asking if urgency is increased by the sound of running water (and rise in detrusor pressure is checked for).

The patient then stands erect.

The transducer levels are readjusted so that they remain at the level of the symphysis pubis (e.g., raise them for a tall patient).

Erect tap water stimulus is performed (as for supine).

Erect cough is performed, with the legs widely apart. Reassure the patient *again* that if any fluid escapes, it is only sterile water; there is no urine in the bladder, and this is an important part of the test.

The patient then sits down on the uroflow commode; the transducers are lowered so they remain at the symphysis pubis, and *voiding cystometry* commences.

Urodynamic Diagnoses Available from the Filling Phase

The diagnoses that may be made during the filling phase Abrams et al. [2] are as follows:

Urodynamic stress incontinence (USI) is the involuntary leakage of fluid during increased abdominal pressure, in the absence of a detrusor contraction (Fig. 4.6).

Detrusor overactivity is a urodynamics observation characterized by involuntary detrusor contractions during the filling phase which may be spontaneous or provoked. The most common picture is that of systolic detrusor pressure waves, seen during the filling phase (Fig. 4.7). The same picture is seen when the sound of running tap water provokes a detrusor contraction.

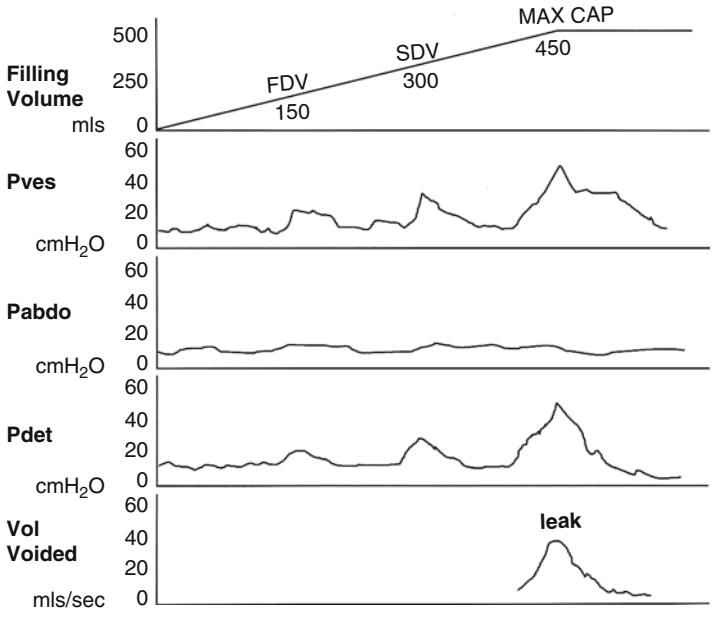

FIGURE 4.6 Urodynamic stress incontinence, with a normal FDV, SDV, and MCC, no detrusor contractions (Pves and Pdet remain flat) but obvious leak of fluid with cough

A less well-understood phenomenon is detrusor overactivity seen as a gradual linear rise in bladder pressure (Fig. 4.8) that persists after filling stops, in association with urgency. This is often termed "*low compliance DO.*"

Finally, two less common but important variants of systolic overactivity are cough-provoked DO and erect-provoked DO. Cough-provoked DO is usually quite clearly seen on the tracing (Fig. 4.9).

But erect-provoked DO often needs careful scrutiny to exclude artifact. A common problem is that the abdominal pressure transducer is not readjusted when the patient stands up (it is not repositioned to the level of the pubic symphysis). If a short patient stands up from the table, her pubic bone may drop to well below its original site when she was lying on

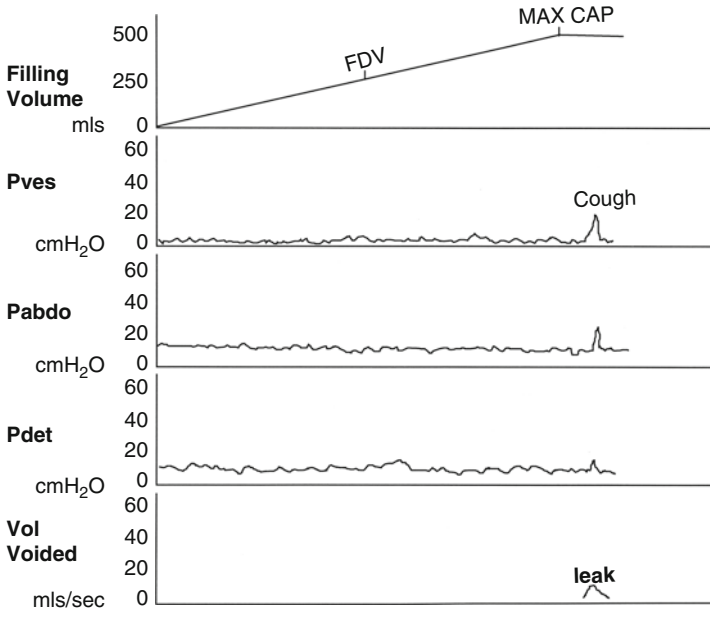

FIGURE 4.7 Detrusor overactivity with systolic waves of detrusor contractions, seen at FDV and at MCC. Stress leak does not occur

the couch; Pabdo then becomes negative. Because Pves minus Pabdo equals Pdet, if you subtract a falsely negative Pabdo, you will get a falsely positive Pdet when the patient stands (see Fig. 4.18 given as part of the case history at end of this chapter).

What Is Sensory Urgency, Now Termed Bladder Oversensitivity?

For many years, patients who suffered from frequency, urgency, and nocturia, in whom urodynamic testing revealed a stable bladder but a very early first desire to void (less than 100–150 ml) and a small maximum cystometric capacity (less than 400 ml), were diagnosed as having sensory urgency Jarvis [10]. These patients often found bladder filling unduly

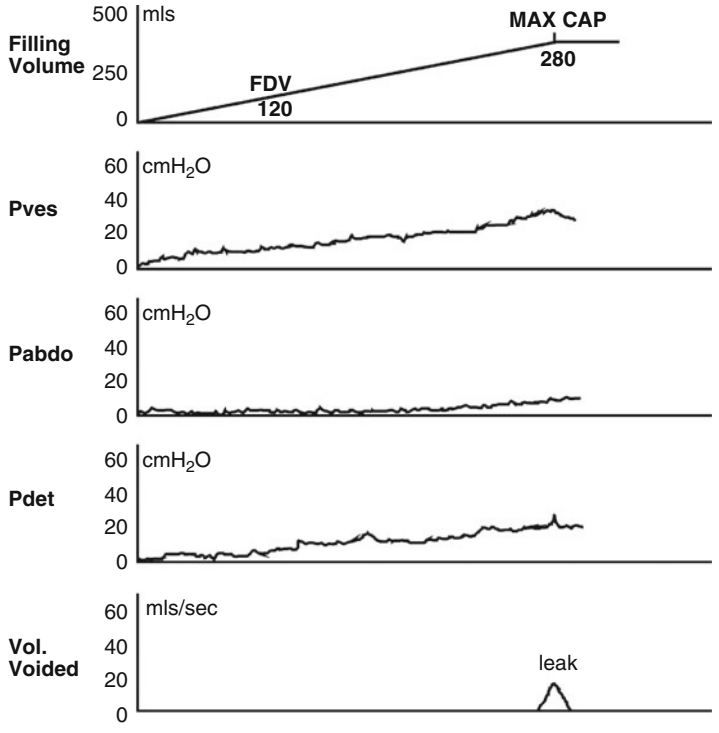

FIGURE 4.8 Low compliance detrusor overactivity

uncomfortable. More recently, the International Continence Society has termed such patients as being on the mild end of the spectrum of "bladder pain syndrome." The severe end of the spectrum is frank interstitial cystitis (see Chap. 12, these patients mainly complain of suprapubic pain). The milder end of the spectrum is now called bladder oversensitivity.

A problem arises in that repeat twin channel cystometry (and ambulatory cystometry, a research tool) will reveal detrusor overactivity in at least one third of cases of "sensory urgency."

The management of patients with a small capacity stable bladder is therefore usually empirical. One starts out treating as for detrusor overactivity, because they do meet the clinical

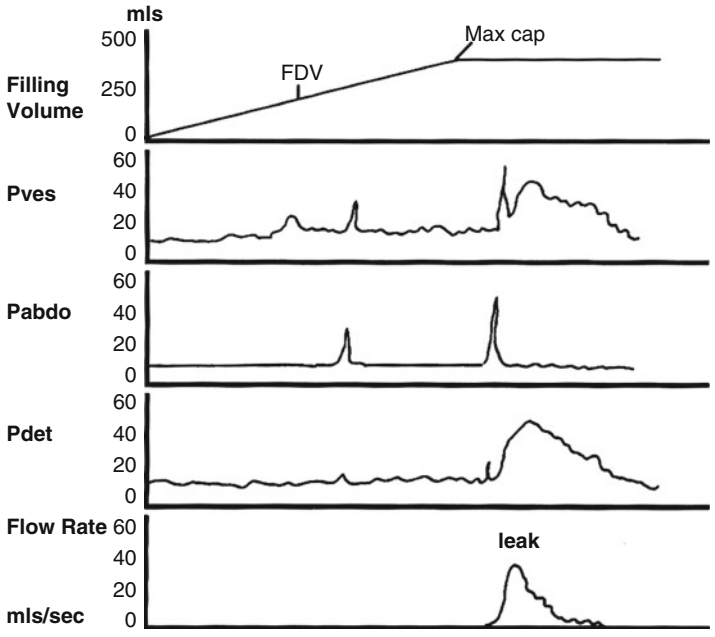

FIGURE 4.9 Cough-provoked detrusor overactivity

criteria for the symptom complex of overactive bladder. If the patient does not respond, then cystoscopy to look for features of interstitial cystitis is reasonable. This area is controversial.

Features of the Atonic Bladder During the Filling Phase

Patients with a very late FDV (more than 400–500 ml) and a very large MCC (more than 650–750 ml) have characteristics of an atonic bladder, but this condition should not really be diagnosed until voiding cystometry has been performed, to prove that the detrusor is underactive.

Before going on to describe voiding cystometry, a summary of *videourodynamic testing* and twin channel cystometry with *ultrasound imaging* is given.

FIGURE 4.10 Patient in erect position during screening on videocystourethrography

Videourodynamics

Videourodynamic Testing

This involves installation of a radiopaque dye (e.g., Hypaque) dissolved in warm water, while screening intermittently using a fluoroscopy unit with image intensifier in the radiology department. A fluoroscopy table that rises to the erect position is needed, with a platform on the bottom of the table, so that the erect patient can turn to the side for filming of the lateral view of the bladder neck and urethra (see Fig. 4.10). This study is termed *videocystourethrography (VCU)* where a videotape can be made of the screening images that most software packages can superimpose upon the cystometry tracing and store for later review.

Because VCU involves exposure to X-ray and installation of iodine-containing medium which patients may be allergic to, not to mention the costs of using the fluoroscopy unit, it is only needed in selected cases.

VCU was the initial "gold-standard" urodynamics test and is still important for male patients in whom prostatic outflow obstruction needs to be delineated from simple detrusor overactivity. In men, the voiding phase is always screened. Also, in men with neurogenic incontinence, VCU allows clearer definition of any contribution from prostatic outflow obstruction. Finally, VCU allows detection of vesicoureteric reflux which may threaten the upper urinary tract.

In the female, studies have shown that about 60 % of women cannot void in the upright position on a screening table with a collecting funnel between their legs.

During a cough, the bladder neck may be slightly open, forming the shape of a bird's beak, with fluid entering the proximal urethra (called "beaking"; see Fig. 4.11). In more severe cases, the urethra may open widely in the shape of a funnel during cough (called "funneling"). In the worst-case scenario, as soon as the patient stands, the bladder funnels open widely, and fluid pours out onto the floor. These

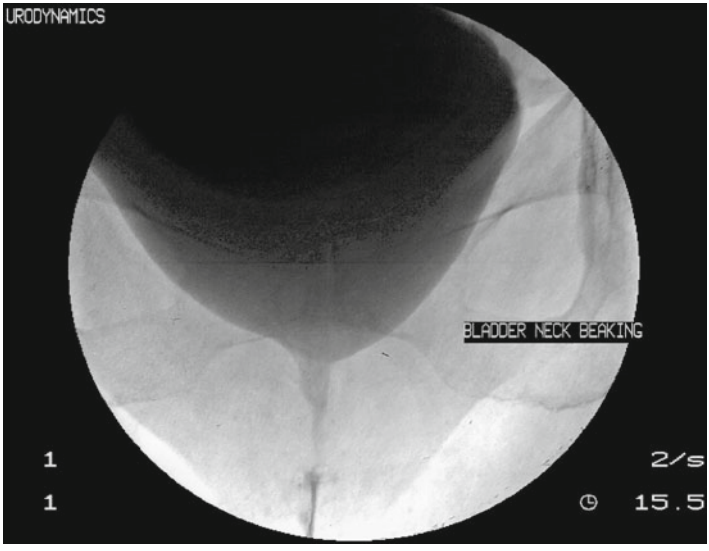

Figure 4.11 "Beaking" on VCU

findings have been classified using various grading systems Herschorn [8].

VCU is very helpful in women with failed previous continence surgery. In the anteroposterior view, typical features of previous colposuspension or sling can be seen, with slightly "dog-ear"-shaped indentation just lateral to the bladder neck. Sometimes although these lateral indentations are partly evident, the urethrovesical junction may still be hypermobile on the lateral view, suggesting that the sutures are no longer effective.

The patient in Fig. 4.11 had undergone Macroplastique injections to the midurethra, which explains the slightly asymmetrical picture of the "beak."

In other cases, the sutures are very evident; the bladder neck does not open appreciably, but fluid still leaks out. This is typically suggestive of *intrinsic sphincteric deficiency*; that is, the urethral musculature is intrinsically weak. Many clinicians would seek to quantify this by performing an abdominal leak point pressure or a urethral pressure profile (see below).

Value of VCU in Cystocele

In patients symptomatic of cystocele (often worse at the end of the day, not when you examine them in the morning clinic), a cystocele may be very evident in the erect position with a full bladder that was not clearly seen when examined in the supine position. At the end of the voiding phase, you may also see urine trapping in the cystocele (when screening in the erect position to check post-void residual; see Fig. 4.12).

"Occult" Stress Incontinence

One problem in urogynecology is that a patient with cystocele but no appreciable incontinence may begin leaking *after* an anterior repair. This is because the cystocele may involve

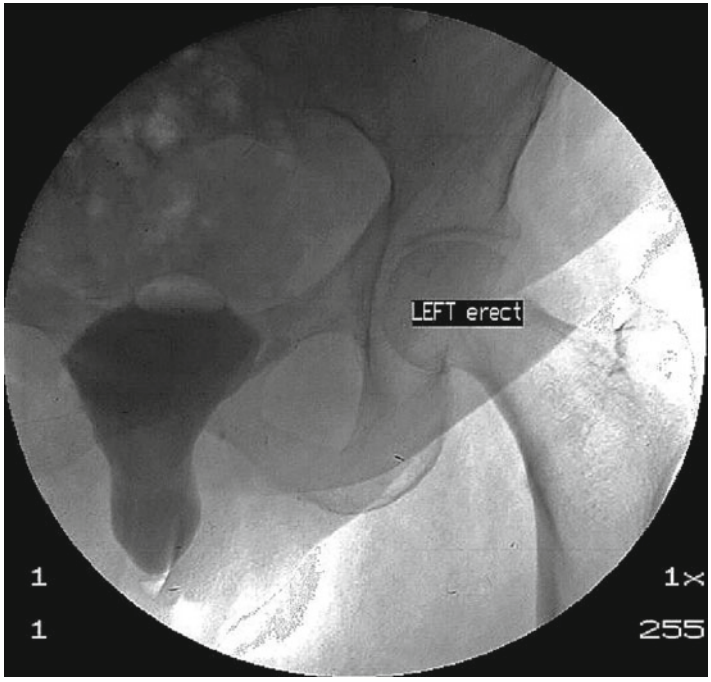

FIGURE 4.12 Urine trapping in a dependant cystocele after voiding

the upper portion of the urethra, so when the cystocele descends during cough, the urethra is kinked off, masking the incipient incontinence. It is very disturbing when the patient comes to the postoperative visit complaining of stress incontinence for the first time. This is known as "occult" stress incontinence. The likelihood of this occurring ranges from 7 to 28 %, depending upon the publication (for review, see Haessler et al. [6]).

Such patients may have to replace their cystocele manually before they can have a good stream of urine. If they do not digitate the cystocele, they can have initial hesitancy, need to strain to start, and have terminal dribble. In such cases, it is

worthwhile to conduct VCU (or twin channel cystometry) with a ring pessary in situ, as this is likely to unmask the occult incontinence. This allows one to incorporate a specific procedure for incontinence into the repair operation (for example see Schierlitz et al. [15]).

Ultrasound

Because of the costs and X-ray exposure involved with VCU, ultrasound imaging has become popular as part of urodynamic testing.

Initially, ultrasound imaging of the pelvis used transabdominal scanning which gave poor definition of the bladder neck. The next step was to use trans-vaginal scanning, which allowed better definition of the bladder neck but could not be performed during a stress provocation test (because the vaginal probe interfered with urethral leakage). In the last decade, trans-perineal scanning has allowed good visualization of the bladder neck. See Fig. 4.13. Using this technique, one can assess the following:

Hypermobility of the bladder neck region
Fluid in the proximal urethra (Fig. 4.13)
Beaking and funneling of the urethra
The main difficulties are that:

Ultrasound scanning is not easy to perform in the erect position.
Trans-perineal scanning does not easily yield a lateral view that is helpful in previous failed continence surgery.

Therefore, trans-perineal scanning occupies an intermediate position in terms of accurate anatomical assessment of complex incontinence (somewhere between simple "eyeballing" of leakage on twin channel cystometry and full radiological imaging with VCU).

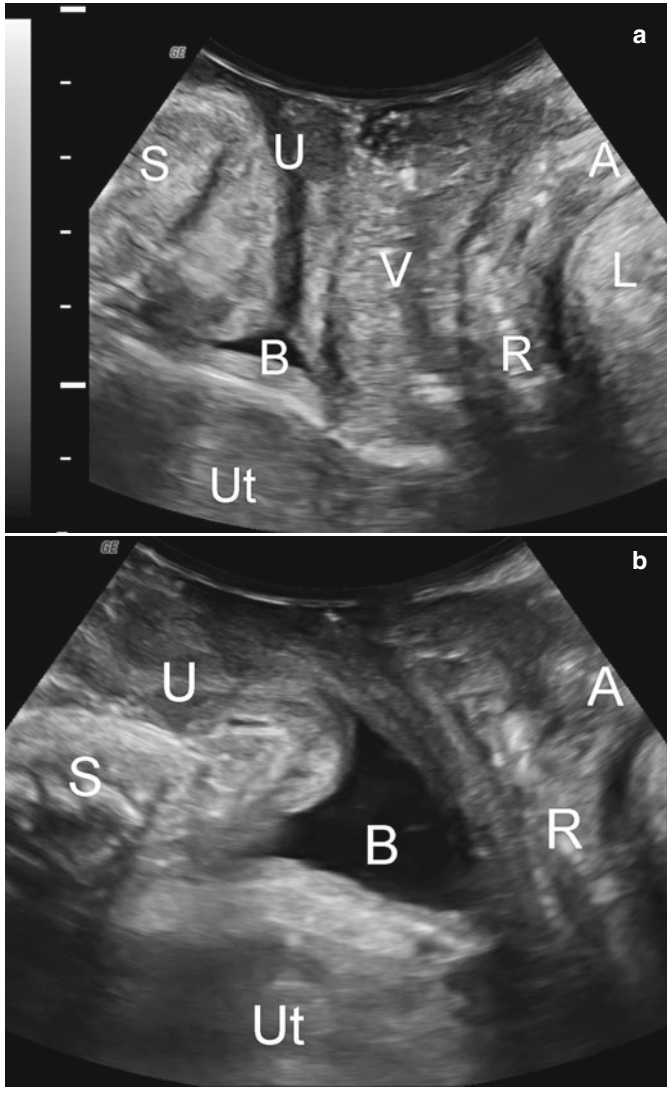

Figure 4.13 Determination of bladder neck descent and retrovesical angle: ultrasound images show the midsagittal plane at rest (**a**) and on Valsalva (**b**). *S* symphysis pubis, *U* urethra, *B* bladder, *Ut* uterus, *V* vagina, *A* anal canal, *R* rectal ampulla, *L* levator ani (From: Dietz [5], with permission)

Voiding Cystometry

During voiding cystometry, the patient sits on the uroflow commode with the pressure transducers in situ. All staff leave the room while she voids in private (Fig. 4.14). The maximum and average flow rates (Q Max and Q Ave) are measured, as in a free uroflow, but the maximum detrusor pressure at the point of maximum flow (Pdet at Q Max) is also measured. The findings may be as follows.

Figure 4.14 Voiding cystometry

In outflow obstruction, Q Max and Q Ave are low, but the detrusor pressure is high (the detrusor is trying to overcome the obstruction, so Pdet at Q Max is high, called "high pressure, low flow").

Also in outflow obstruction, abdominal straining may be seen on Pabdo channel.

In an underactive detrusor, the Q Max and Q Ave are low, but the detrusor pressure at Q Max is also low (called "low pressure, low flow"), which is a feature of the atonic bladder.

Diagnoses Made After Voiding Cystometry

Outflow Obstruction

In women, the most common cause of obstruction is previous continence surgery or prolapse kinking the urethra (see Fig. 4.15). The high detrusor pressure with the low flow rate is typical. If sufficient voiding efficiency can be generated (often with abdominal straining, giving an intermittent pattern), then the residual may be minimal.

Atonic Bladder

As mentioned, some features of bladder atony (large volume at FDV and MCC) are seen during filling, but during voiding, the most important feature emerges, of low detrusor pressure with low flow rate. Generally, there is a substantial residual. In women, this may be seen with diabetic autonomic neuropathy, or it may be a marker of a neurological lesion at the level of the sacral cord.

Detrusor Hyperactivity with Impaired Contractility (DHIC)

This is another cause of an underactive detrusor in elderly women. During the filling phase, there may be mild detrusor overactivity (see Fig. 4.16). During voiding, there is an initial

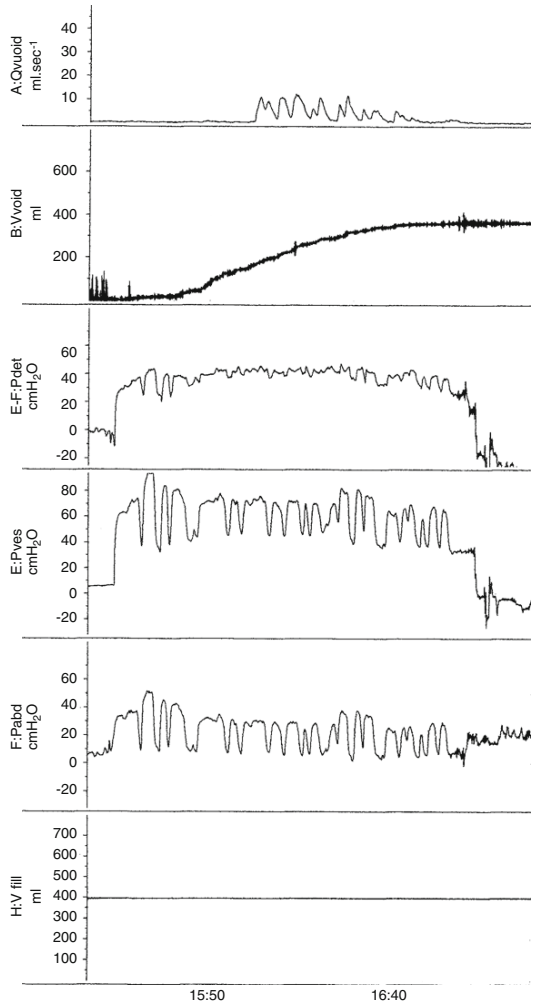

FIGURE 4.15 Obstructed voiding pattern on voiding cystometry. Note detrusor contracting vigorously, then abdominal straining added, to achieve bladder emptying. Although flow was intermittent and prolonged, the residual was 90 ml (Qvoid = flow rate, ml/s)

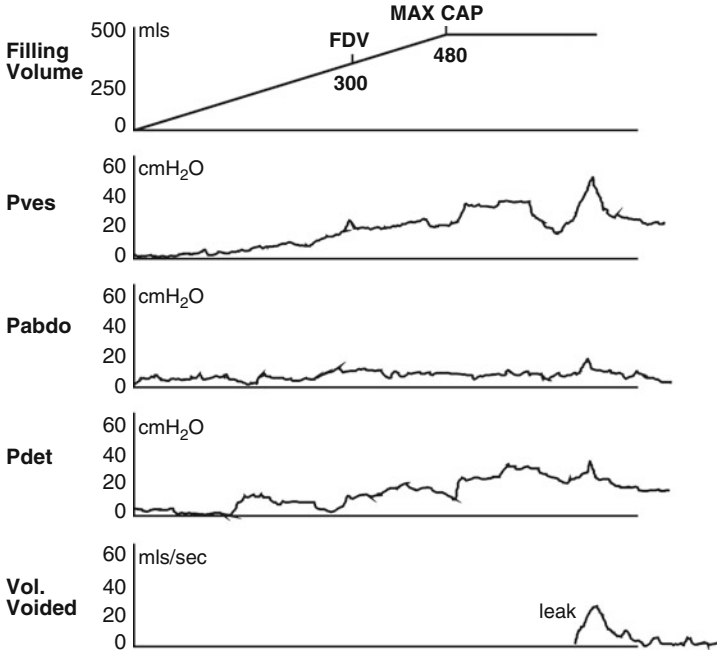

FIGURE 4.16 Detrusor hyperactivity with impaired contractility. Note detrusor overactivity during filling phase, but poorly sustained contractility during voiding. Q Max 8 ml/s, Q Ave 3.5 ml/s, and residual volume was 120 ml

burst of detrusor activity at the start of flow (detrusor hyperactivity), but it is not sustained through the whole flow (impaired contractility). This condition is thought to be due to atherosclerotic changes of the blood vessels supplying the spinal cord, so that there is relative impairment of the coordination of the micturition reflex Resnick and Yalla [14].

Detrusor Sphincter Dyssynergia (DSD)

In women with multiple sclerosis or spinal cord injury, you may see severe detrusor overactivity during the filling phase, then during voiding, very high detrusor pressures and an intermittent flow rate without abdominal straining, due to intermittent spasm of the urethra. It is due to poor coordination of the spinal relays

of the impulses that signal the command to void. These should evoke synchronous relaxation of the urethra with contraction of the detrusor, but in DSD the synchrony is impaired due to spinal cord pathology (for review, see Jung and Chancellor [11]).

Special Urodynamic Tests

Urethral Pressure Profilometry

With about 200 ml fluid in the bladder, a double lumen fluid-filled manometry catheter or a flexible micro-tipped pressure recording catheter with one transducer mounted at the end and one 6 cm along is withdrawn from the bladder into the urethra. A mechanical puller device is used so that withdrawal occurs at about 5–10 cm/min. First, a *resting urethral pressure profile (UPP)* is made, to record the rise in pressure as the catheter at the 6 cm position passes through the urethral sphincter area. See Fig. 4.17. The urethral closure pressure equals urethral pressure (Pura) minus the bladder pressure (Pves). In a continent woman, Pura exceeds Pves. In most continent women, the urethral closure pressure is greater than 60 cmH_2O pressure (although the UPP has been criticized because there is no absolute cutoff between continence and incontinence for this test). A resting closure pressure of less than 20 cmH_2O is considered very low and is one indicator of *intrinsic sphincteric deficiency (ISD)*.

Next, the catheter is reinserted into the bladder and withdrawn through the urethra while the patient gives a series of short hard coughs (a *stress UPP*). Even while coughing, Pura should exceed Pves. In the incontinent woman, the Pves repeatedly exceeds the Pura during the cough, yielding a "negative stress profile."

Abdominal or Valsalva Leak Point Pressure Test

At a volume of 200–250 ml, with a simple manometry line in the bladder (as for cystometry setup), the patient is

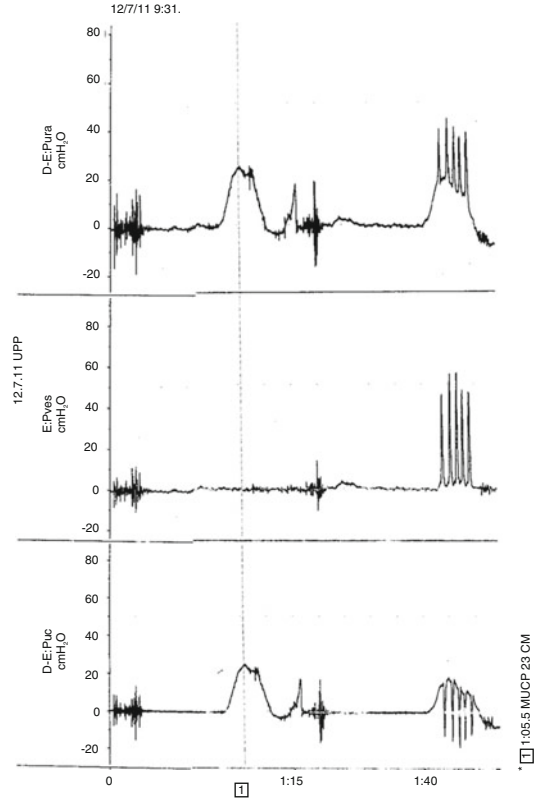

FIGURE 4.17 Urethral pressure profile test in stress incontinence

asked to give a series of progressively harder coughs or Valsalva maneuvers. The intravesical pressure required to produce leakage from the external meatus (in the absence of a detrusor contraction) is called the leak point pressure (LPP). An LPP of less than 60 cm is thought to indicate *intrinsic sphincteric deficiency:* 60–100 cmH_2O is equivocal, and a pressure of more than 100 cm is often taken to indicate that the leak is due to urethral hypermobility. The test

is controversial because test–retest reliability has been difficult to document and correlation with other measures of incontinence severity is not high.

Triple Lumen (Trantner) Catheter Test for Urethral Diverticulum, Now Replaced by MRI

The triple lumen catheter test, with radiological screening, was previously the standard test for diagnosis of urethral diverticulum. The catheter had two balloons; the smaller balloon was filled with 8 ml water and compressed gently against the internal urethral meatus. The larger balloon was filled with 20 ml of water and compressed against the external urethral meatus, so that fluid could not escape the urethra. Radiopaque dye injected into the urethra would be forced into the urethral diverticulum, thus delineating it on X-ray screening.

In the last 5 years, urogynecological MRI and ultrasound imaging have improved, so that these are the preferred diagnostic test for detection of urethral diverticulum. See Fig. 4.18, for ultrasound image of diverticulum.

Although excluding the diagnosis of urethral diverticulum is an important part of urogynecology investigation, the condition is not commonly encountered (about 3 % of women with recurrent UTI and post-micturition dribbling). Therefore, it is not further discussed in this "practical" text (but see Nichols and Randall [13] or Cardozo [3] for full review).

Note Regarding Diagnostic Tests for Vesicovaginal Fistulae

Because vesicovaginal fistulae are not common in the Western world, details of diagnosis and management are outside the scope of this text. For full review, see Hilton [9].

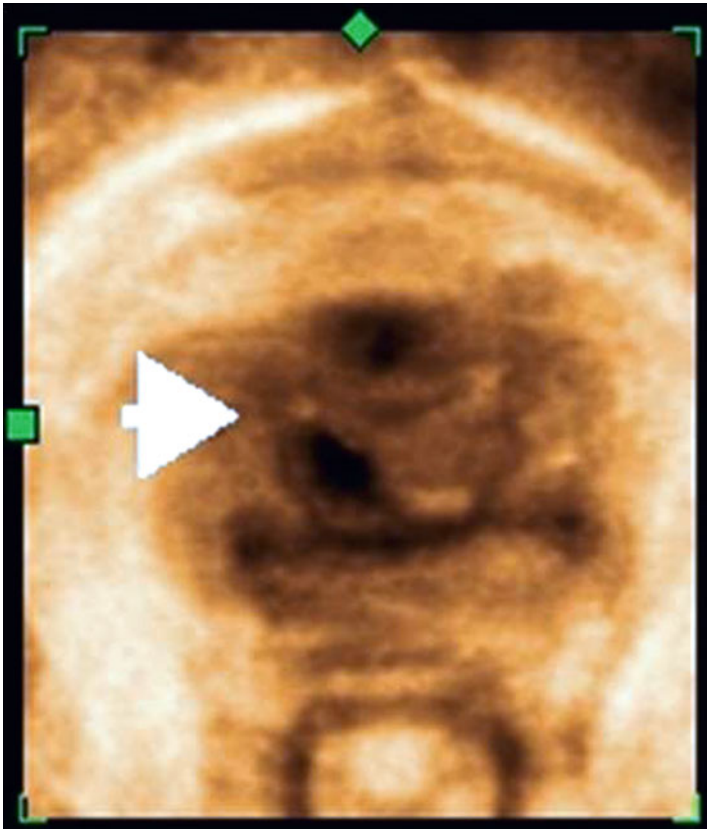

FIGURE 4.18 MRI of urethral diverticulum (*arrow*)

Example of Report

Case History, with Example of a Full Urodynamic Report, Illustrating Contribution of Urodynamic Studies to Management

Mrs. Brown is a 47-year-old para 2+0 lady. Twelve years ago, after her second delivery (Kielland's forceps), she noted leakage with standing up from the sitting position, with mixed

stress and urge incontinence. She had twin channel cystometry elsewhere; results are lost. Afterward, she was given 6 weeks of Ditropan 5 mg TDS, which she did not tolerate because of dry mouth. Pelvic floor physiotherapy was not performed. She told the doctor she did not want any more tablets but would like an operation. She underwent a colposuspension and went home with a suprapubic catheter for 10 days.

She was dry for about 2 years but did notice persistent daytime urge with nocturia. Since then, she has had gradually increasing leakage when arising from a sitting position. She often has to go back to the toilet to revoid.

On examination, with bladder partly full, stress leak is not seen. The anterior vaginal wall is not hypermobile. The retropubic area is rather fixed to the back of the pubic bone, more so on the left than the right. She had a weak 2-s pelvic floor contraction.

Summary, provisional diagnosis: This patient may have failed continence surgery with recurrent stress leak, or she may have an overactive bladder, or she may have both. Obstruction is also a possibility to explain her need to revoid. Clearly, careful urodynamics are essential.

Urodynamic Result

Initial Residual: 90 ml. First desire to void = 190 ml. Strong desire to void = 230 ml. Maximum capacity = 380 ml.

During filling phase, systolic detrusor contractions were seen, Max P det of 21 cm. Supine tap water = increase in Pdet to 28 cmH_2O. Supine cough = no stress leak. Erect provocation = increased detrusor pressure to Pdet 35 cmH_2O with leak.

During multiple erect coughs, the patient leaked a small amount of fluid; on screening, asymmetrical beaking of the bladder neck was seen, with fluid leak.

In lateral view, the bladder neck did not descend.

Voiding cystometry—Q Max 25 ml/s; Q Ave 9 ml/s. Flow rate was intermittent and prolonged, with abdominal straining. Pdet at Q Max was 45 cmH_2O; final residual was 110 ml.

See Fig. 4.19

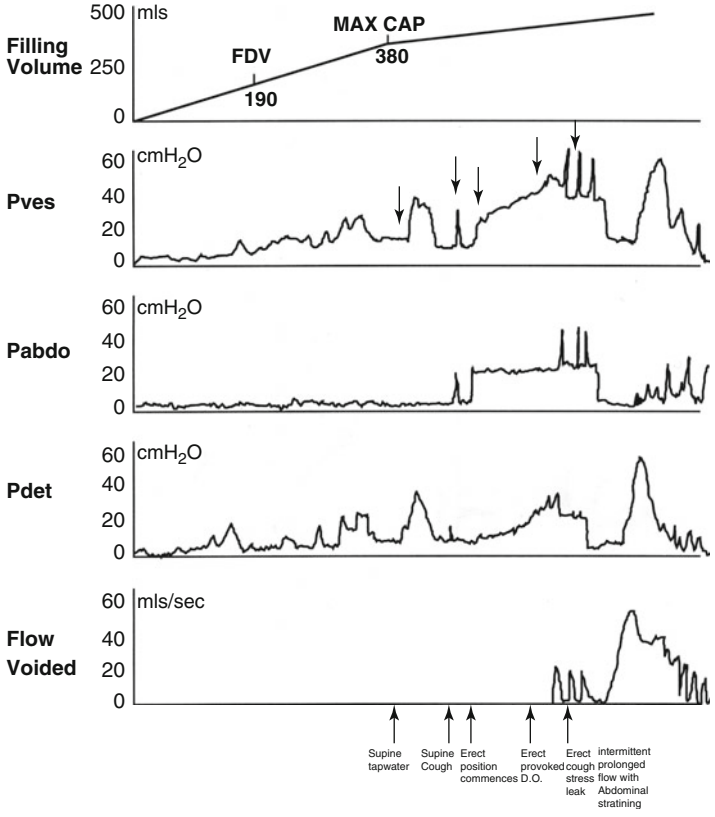

FIGURE 4.19 Urodynamic study of Mrs. Brown

Comments

Mrs. Brown has a reduced bladder capacity (380 ml), with detrusor contractions provoked by filling, supine tap water, and erect provocation to a maximum of 38. She does have some stress incontinence with an asymmetrical appearance of the urethra, in keeping with findings on examining the retropubic vagina. Her maximum flow rate is fine, but her average flow rate is poor, with abdominal straining suggesting relative outflow obstruction, in keeping with initial and final residuals of 90 ml/110 ml.

Diagnosis: Marked Detrusor Overactivity (DO) with Mild Degree of Obstruction; Mild Stress Incontinence Management

Treat the DO with bladder training, including pelvic floor muscle physiotherapy. Teach double emptying techniques. At 6 weeks, start anticholinergics, for example, tolterodine (less dry mouth), but recheck post-void residual 6 weeks later. If increased, you may need to consider clean intermittent self-catheterization. After this therapy, if stress incontinence persists, consider collagen/Macroplastique.

Note: If this patient had undergone pelvic floor training initially, with alternative anticholinergic therapy, the current situation may not have arisen.

Conclusions

Urodynamic testing requires careful attention to detail, both in the selection and counseling of the patient during the test, in performance of the provocation maneuvers, and in analysis of the results, to obtain precise diagnoses of the components of the continence disorder. Unlike an ECG that can be performed by a technician, this test requires a trained clinician in order to yield the maximum information.

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Chapter 5
Outcome Measures Used to Assess Response

Introduction

In the past, doctors recommended a particular treatment because, in their experience, most patients said that they were "better" after receiving it. In the last two decades, we have realized that this is not good enough. We need objective measures by which we can determine what percentage of patients are "cured" (normal) or at least have greater than 50% reduction in symptoms, after any given treatment.

In this century, outcome measures are going to become even more important, because there is not enough money to fund all health care. Doctors (and administrators) must assess whether one treatment is more effective than another, so that money can be spent on that which is most effective. This is loosely termed "health economics."

In the 1980s, continence clinicians began to realize the importance of outcome measures. It was a time of great creation. Many different outcome measures were created but not necessarily fully "validated." The process of validation involves the following steps:

Establish the validity of the test that it measures what it is supposed to—includes three subsets: content validity, construct validity, and criterion validity.

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DOI 10.1007/978-1-4471-4291-1_5,

Establish the reliability of the test. For questionnaires, measure internal consistency of different parts of test. For questionnaires and other physical tests, the reproducibility, or test–retest reliability, needs to be proven.
Establish the responsiveness to change of the test, before and after treatment.

This chapter provides a brief overview of outcome measures that have been validated. Most are used in this book to describe the effectiveness of different treatments.

The Standardization Committee of the International Continence Society (ICS) is the main body that has governed terminology and outcome measures in the field of urinary incontinence since 1978 [8]. The urodynamic measures described in the previous chapter and the pelvic floor assessments (Oxford score and POPQ) described in Chap. 2 are also used as outcome measures. The tests described in this chapter do not require physical examination or invasive procedures. More recently, the International Urogynecology Society (IUGA) has also created a joint ICS and IUGA standardization of terminology document which also fully covers the terminology for prolapse conditions. The IUGA website is http://www.iuga.org/.

The World Health Organization has recently acknowledged the global importance of incontinence, by holding a regular International Consultation on Incontinence (ICI) Abrams et al. [1–3]. These publications also consider which treatments are the most effective, as judged by standardized outcome measures. Finally, the Cochrane Collaboration performs meta-analyses of randomized controlled trials in the field of incontinence, which also use the outcome measures described in this text.

The ICS recommends that there should be five main groups, or "domains," of outcome measures [9].

1. Patient's observations (symptoms)
2. Quantification of symptoms (e.g., urine loss on diary or pad test)
3. Physician's observations (anatomical and functional)
4. Quality of life measures
5. Socioeconomic evaluations

Tests That Measure Patient's Symptoms

The ICIQ-SF was validated under the auspices of the ICI. It records incontinence symptoms and severity, with a simple quality of life question. The final ICIQ comprises three scored items (Fig. 5.1, maximum score 21) and an unscored self-diagnostic item.

The Wexner Score for Fecal Incontinence

This was originally a 20-point score concerning three types of incontinence with one question for impact upon lifestyle (italic bold in Table 5.1). Later, a score for wearing pads, taking constipating medication, or suffering from fecal urgency was added (ordinary typeface in Table 5.1). The Wexner score has been fully validated [15] and is used worldwide.

Tests That Quantify Patients' Symptoms

Rather than giving the patient a questionnaire about her symptoms, the following tests actually measure symptoms such as stress leak, urge leak, frequency, or nocturia.

Bladder Chart

The bladder chart is a generic term used to indicate several types of records.

- The *micturition chart* only asks patients to record times of voiding and incontinence episodes; only output is considered, roughly.
- The *frequency–volume chart (FVC)* also asks patients to record their fluid intake and the volume they void and when they change pads, usually over 3 days.
- The *urinary diary* includes the details of the FVC but also includes symptoms and activities at leakage episodes, including urgency, coughing, lifting, and others.

☐☐☐☐☐☐☐ Initial number

ICIQ-SF
CONFIDENTIAL

☐☐ ☐☐ ☐☐ DAY MONTH YEAR
Today's date

Many people leak urine some of the time. We are trying to find out how many people leak urine, and how much this bothers them. We would be grateful if you could answer the following questions, thinking about how you have been, on average, over the PAST FOUR WEEKS.

1 Please write in your date of birth: ☐☐ ☐☐ ☐☐ DAY MONTH YEAR

2 Are you *(tick one)***:** Female ☐ Male ☐

3 How often do you leak urine? *(Tick one box)*

never ☐	0
about once a week or less often ☐	1
two or three times a week ☐	2
about once a day ☐	3
several times a day ☐	4
all the time ☐	5

4 We would like to know much urine <u>you think</u> leaks.
How much urine do you <u>usually</u> leak (whether you wear protetion or nor)?
(Tick one box)

none ☐	0
a small amount ☐	2
a moderate amount ☐	4
a large amount ☐	6

5 Overall, how much does leaking urine interfere with your everyday life?
Please ring a number between 0 (not at all) and 10 (a great deal)

0 1 2 3 4 5 6 7 8 9 **10**
not at all — a great deal

ICIQ scor: sum scores 3+4+5 ☐☐

6 When does urine leak? *(Please tick all that apply to you)*

never–urine does not leak	☐
leaks before you can get to the toilet	☐
leaks when you cough or sneeze	☐
leaks when you are asleep	☐
leaks when you are physically active/exercising	☐
leaks when you have finished urinating and are dressed	☐
leaks for no obvious reason	☐
leaks all the time	☐

Thank you very much for answering these questions.

FIGURE 5.1 The ICIQ-SF questionnaire

Table 5.1 Modified Wexner fecal incontinence score

	Never	Rarely	Sometimes	Weekly	Daily
Incontinent solid stool	***0***	***1***	***2***	***3***	***4***
Incontinent liquid stool	***0***	***1***	***2***	***3***	***4***
Incontinent to gas	***0***	***1***	***2***	***3***	***4***
Alters lifestyle	***0***	***1***	***2***	***3***	***4***
				No	Yes
Need to wear pad/plug				0	2
Take constipating meds				0	2
Unable to defer 15 min				0	2

The micturition chart tells nothing about people who drink too much (>3 l/day) or too little (<1.5 l/day). Most clinicians use the frequency–volume chart. Although the bladder diary (Fig. 5.2) provides even more detail about the type of leakage, patients often object to the detail required, depending on how many days of charting you require.

The FVC is a useful outcome measure. It tells you:

- The number of leakage episodes per 24 h (in mild cases, convert to leaks per week by taking an average of the 3 days)
- The number of voids per day ("frequency")
- The episodes of nocturia
- Whether patients are fluid restricting for fear of urge leak or drinking more than 2 l/day (over-drinking)

The ideal duration of the FVC is controversial. The 7-day diary is the most sensitive and accurate, but patients dislike this burden, so compliance is poor. Because the first 3 days and the last 4 days of a 7-day test correlate well ($r = 0.9$), most clinicians use a 3-day FVC, at least at the first visit. The ICI Committee for Research Methodology found that in most cases, a single 24-h diary is sufficient. In our unit, we

BLADDER CHART – 1 day (24 Hours)

TIME	AMOUNT & TYPE OF FLUID IN	TIME	AMOUNT OF URINE PASSED	COMMENTS Eg leakage, urge, pain, burning etc.
7:30am	–	7:30 am	290 ml	Leaked on way to toilet ++ urge
7:40	150ml black Coffee			
		8:45	75 ml	urge
9:15	250ml coke			
		9:30	160 ml	Leaked on way to toilet urge ++
		10:05	75 ml	urge
		10:40	90 ml	urge
11:00	Capuccino 200ml			
		11:20	110 ml	urge
12:30pm	300ml Soup			
		1:15pm	220 ml	Leak with laughing
		3:30pm	60ml	Leak at photocopyer
3:40	75ml espresso			
		4:45pm	50 ml	urge
		6:30pm	85 ml	
7:00	90ml sherry			
		8:05pm	100	Leak with washing dishes → bed
		11:30pm	120	woken from sleep.
		02:30	65	

FIGURE 5.2 A urinary diary from a patient with urge incontinence. Patient drinks little (1.065 l/day), has marked frequency (11 voids per day), nocturia ×2, and a small bladder capacity (average of 12 voids = 108 ml). Note that diary gives the extra details that she leaks with urge, laughing, running water. Note the caffeine intake

use a 3-day FVC for the first visit and a 24-h urinary diary for follow-up visits (see discussion of bladder training in Chap. 7).

The Pad Test

The One-Hour Pad Test

This was initially the "industry standard" after its introduction in 1983 and ICS recommendation in 1988. This test involves:

Patients attend with a comfortably full bladder.
Are given a pre-weighed continence pad.
Then drink 500 ml of water over 15 min.
Then perform a standard series of activities to provoke leakage.
The voided volume is then measured, and the wet pad is re-weighed.

Unfortunately, the 1-h pad test fails to correlate with other measures of severity (poor criterion validity) and has poor sensitivity (up to 40 % false negative rate). For many years, the 1-h pad test was the only objective method that could be used to define mild (1–10 g leakage per 1 h), moderate (11–50 g/h), and severe (>50 g/h) incontinence; thus, it is used in many publications quoted in this text.

The 24-Hour Pad Test

Because of the problems with the 1-h test, the 24-h home pad test was developed in the late 1980s. This test involves the following.

Women are given a set of pre-weighed pads in sealed bags. The pads are worn at home for 24 h. Ordinary provocative activities are carried out.
They return pads in a sealed plastic bag, personally or by post, to be re-weighed.

There is no loss of accuracy by evaporation from the sealed plastic bag for durations of 72 h to 2 weeks. Thus, wet pads can be returned via post. The 24-h pad test is more sensitive than the 1-h test (10% false negative rate).

Normal ranges for the 24-h pad test have been controversial. Studies from 1989 to 1996 in small samples of women ($n = 23–78$), using simple kitchen scales, gave normal values of 3–8 g. This seems a lot of fluid on the underwear to be tolerated by an asymptomatic woman. However, this definition of "continent" (up to 8 g) is used throughout most studies in this book.

Recently [6], the normal values were redefined ($n = 120$) using scales accurate to 0.1 g. A median value of 0.3 g (95th centile 1.3 g) was obtained. The test correlates with the ICIQ [7].

The definition of mild, moderate, and severe is important. Because conservative therapy is more likely to cure patients with mild incontinence and surgery is often offered to patients with severe leakage, a pad test should be able to define severity. Recently mild, moderate, and severe were characterized as 1.3–20, 21–74, and >75 g on the 24-h test [10].

Tests That Measure Anatomical and Functional Observations by Doctors

The Oxford score for measuring pelvic floor muscle strength and the POPQ scoring system for measuring prolapse were shown in Chap. 2.

The standard urodynamic test measurements were shown in Chap. 4.

Quality of Life for Incontinence

A large array of quality of life (QOL) tests are available urogynecology.

Generic tests that just measure overall QOL are often used to provide a comparison with other medical therapies (e.g., cardiac surgery). The SF36 is the most common.

For incontinence, the two most common are the urogenital distress inventory (UDI) and the incontinence impact questionnaire (IIQ), from the United States. Both come in a short form and have been fully validated. The King's health questionnaire is also often used (from the United Kingdom, available in many languages). For full review, see Abrams [1–3].

In order to perform a health economic analysis, a QOL test that scales from 1 to 100 needs to be used, such as the York questionnaire or the AQOL (for review, see Moore et al. [8]).

Quality of Life Tests for Prolapse and Sexual Function

Why Do We Need QOL Tests for Prolapse?

Up until the last decade, gynecologists judged the "success" of their surgery for prolapse on the anatomical findings after the operation. As will be seen in Chap. 10 on Prolapse Management, it now appears that we may have focused too heavily on getting a perfect "vaginal reconstruction," without asking the patient whether she is still bothered by any prolapse *symptoms.*

Therefore, we needed to have outcome measures that could reliably define the severity of "prolapse bother symptoms." These outcome measures are still undergoing refinement, but the most useful ones are listed here:

- The pelvic floor distress inventory
- The pelvic floor impact questionnaire

These questionnaires mainly focus upon "bother" of urinary, bowel, vaginal prolapse, and sexual symptoms [4] but do not measure the frequency or severity of the symptoms. They were based on the UDI and the IIQ (that are long-standing validated measures of *QOL* impairment due to leakage, see earlier this chapter).

In 2006, the International Consultation on Incontinence (ICI) expanded the ICIQ into a series of modules that could be added onto the ICIQ, to encompass prolapse symptoms [11].

A copy of ICIQ–VS is available on their website: www.iciq.net.

Why Do We Need QOL Tests for Sexual Function?

For many years, women over the age of 60–70 (the peak ages for prolapse) were not thought to desire sexual activity any more. Now that the median lifespan for women is 83 years in most Western countries, gynecologists have learned that many women (and/or their partners) *do* wish to continue normal sexual activity well into later life. Thus, we have become aware that simply restoring normal vaginal anatomy is not necessarily sufficient. If the surgery required to do this causes scarring and fibrosis with dyspareunia, then the woman, if asked, may not consider this operation a functional success.

As a result, QOL tests that measure sexual function have been developed:

- The "PISQ"—prolapse and sexual function questionnaire—was published in 2001 [12].
- The GRISS test of sexual function was published in 1986 [13] and includes 28 questions about overall sexual function without any items that focus on prolapse symptoms, but it has been used as an outcome measure for prolapse surgery.

Socioeconomic Evaluation

A standard test for measuring the personal and treatment costs of incontinence is the Dowell Bryant incontinence cost index (DBICI), which is validated [5]. Another

common test is the willingness to pay questionnaire, usually tailor made for the particular condition.

Conclusions

In later chapters in this text, studies that employ validated outcome measures are emphasized, but in the absence of objective data, some studies presenting mainly subjective data are mentioned.

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Chapter 6
Conservative Therapy of Urodynamic Stress Incontinence

Managing Chronic Cough and Obesity

When starting a patient on a conservative treatment program for stress incontinence, you must check whether there are uncorrected precipitating factors.

It is demoralizing for the patient to work hard on a pelvic floor muscle training program if she has uncorrected chronic cough. We often see patients with chronic sinusitis, nasal polyps, postnasal drip, or asthma/chronic bronchitis, who have never seen an ENT surgeon or had optimal asthma therapy and so on.

Many general practitioners have had no training in managing incontinence during their undergraduate years. They may not realize that in the last 20 years, major advances have been made in conservative continence therapy, but we cannot achieve cure in the presence of an unrelenting cough. Hence, the urogynecologist may need to refer such patients to the appropriate ENT surgeon or respiratory physician.

Similarly, marked obesity should be reduced whenever possible. A large randomized controlled trial in 2010 showed that obese women who lost 10 % of their body weight were significantly likely to achieve at least a 70 % reduction in the frequency of incontinence [35]. Increases in body mass index relate directly to increased risk of incontinence [31].

In women with truncal distribution of fat, serum insulin levels may reveal insulin resistance, which warrant referral to an endocrinologist for metformin therapy to enhance weight loss [12].

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By striving for reasonable weight loss, you may convert a patient from someone who needs surgery, with the attendant risks in the obese, into a woman who can achieve cure from a conservative program. In our unit, we do not routinely offer continence surgery to an obese woman without a serious trial of weight loss, because the weight loss may obviate the need for surgery and anesthesia (and the well-known surgical complication of detrusor overactivity or voiding difficulty; see Chap. 9).

Having said this, some obese women are trapped in a vicious circle. They need to exercise in order to lose weight, but whenever they exercise, they leak much more urine than in daily life. In this scenario, we usually strike a deal with the patient. If they can start the process and lose even 5 %, then we will offer surgery if supervised pelvic floor training does not achieve major benefit.

Treatment of Constipation

Uncorrected constipation (with chronic straining to defecate) is an acknowledged risk factor for stress incontinence. Patients need to learn how to manage this problem before they can expect a conservative program to work.

Further information is provided in Chap. 8 on obstructed defecation, but in essence management is as follows:

- Colorectal surgeons recommend the use of bulking agents such as Metamucil, psyllium husks (from which Metamucil is manufactured), or Movicol.
- Normacol granules are better tolerated by some patients.
- A dessert spoon of psyllium husks or Metamucil should be dissolved in 400 ml of water in order to achieve a moist stool that is easily passed. Putting these substances onto the cornflakes in the morning is of no benefit, they must be dissolved in a plentiful amount of water!
- A lubricating substance, such as Agarol or lactulose, can be added, to lubricate the bolus of stool as it moves down the gut.

In cases where the call to stool is felt, but the bolus of feces cannot be evacuated, then rectal glycerin suppositories are inserted to encourage defecation in this circumstance.

Simply getting the patient to eat a large juicy orange with three to four prunes first thing in the morning, with dilute hot tea, then sitting and relaxing on the toilet can be remarkably helpful.

Regular use of Senokot is now considered unwise, although intermittent doses help if all else fails. Studies by colorectal surgeons indicate that this agent stimulates the nerves of the gut to increase peristalsis and may induce a state of dependence. Eventually, the colonic nerves may become refractory.

Treatment of Postmenopausal Urogenital Atrophy

We all know that incontinence is more common as age advances, with a peak at the menopause. Because estrogen receptors are known to occur in the urethra, estrogen therapy should give benefit, by thickening the urethral epithelium, improving mucosal coaptation, and enhancing vascular tone in the periurethral vessels.

The Cochrane meta-analysis on use of estrogens for incontinence in 2002 analyzed both systemic and topical estrogen data. They concluded that topical estrogen has about a 50 % benefit for incontinence compared to a 25 % benefit for patients on placebo [23]. Systemic estrogen therapy (HRT) is no longer recommended, as two large trials have shown that stress incontinence was worsened in those on HRT compared with those on placebo [14, 18]. The most recent Cochrane review [8] concluded that four small trials of vaginal estrogen revealed a significant benefit (RR 0.74, 95 % CI 0.64–0.68) for improvement or cure of incontinence.

The objective benefit of topical vaginal estrogen cream in stress incontinence has received little study. In four small

open (nonrandomized, noncontrolled) studies, three showed significant increase in urethral function tests, and one showed subjective benefit for continence (20 % dry, 55 % major benefit) [10]. A fifth study showed cure or major benefit on pad testing in 12 % of patients versus 0 % of controls (for review see Moore [24]).

Practical Advice for Patients

Many elderly women dislike the vaginal applicator that accompanies oestriol cream (Ovestin). It is cumbersome for those with arthritis, and many do not like inserting the applicator all the way into their vagina and then having to wash it. Some patients stop using it for these reasons (and the first two complaints apply to Vagifem tablets). We encourage patients to put a small amount on their finger and apply it around and just inside the vagina, last thing at night before sleep. Most women find this much more acceptable than using a messy applicator.

Many women ask whether the use of vaginal oestrogens will increase the risk of breast cancer. In general, the blood levels of oestriol are well below the menopausal levels (90 picomol/l) in women on Ovestin cream. However, a small study of women on Vagifem tablets [20] suggested caution in those on aromatase inhibitors to suppress early breast cancer.

Starting a Home-Based Pelvic Floor Muscle Training Program

The first step in starting a pelvic floor muscle (PFM) training program should be done during the physical examination (see Fig. 6.1). That is, palpate the PFM digitally; make sure the patient can contract the correct muscle. Discourage her from:

- Contracting the gluteal muscles (lifting buttocks off the bed)

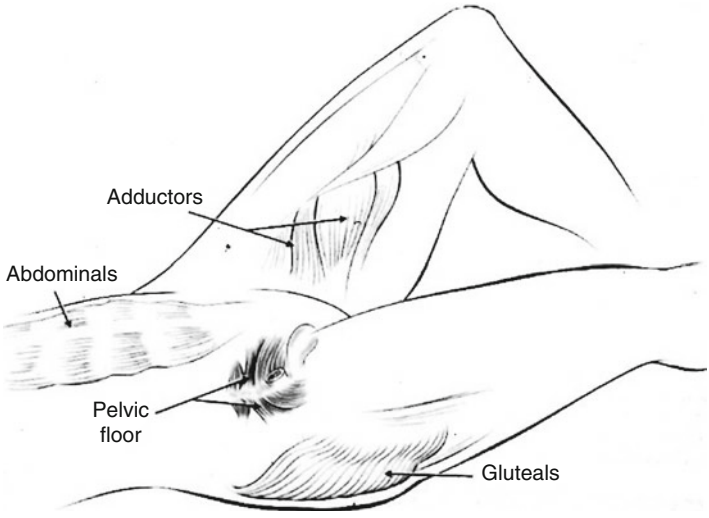

FIGURE 6.1 Assessing the pelvic floor muscles

Contracting the adductor muscles (tightening thighs together)
Contracting the abdominal muscles (bearing down on the pelvic floor)

Contracting these muscles will not help and may make leakage worse.

Once the patient can contract the PFM correctly, ask her to squeeze as hard as she can, then count up to a maximum of 10 s. Observe when the muscle starts to fatigue, and stop the count there, for example, 6 s.

After the patient has gotten dressed, explain to her that the PFM is a muscle running from the pubic bone to the tail bone, with three openings in it (urethra, vagina, anus). We find it helpful to show a diagram such as that shown in Fig. 6.2, inasmuch as many patients do not understand this basic anatomy. Explain that the PFM is a postural muscle, like the erector spinae of the back. Think of the weight lifter who goes to the gymnasium. He usually has a very erect posture because of the strong resting tone of his large back muscles, but he can also lift heavy weights. The woman needs to train her PFM

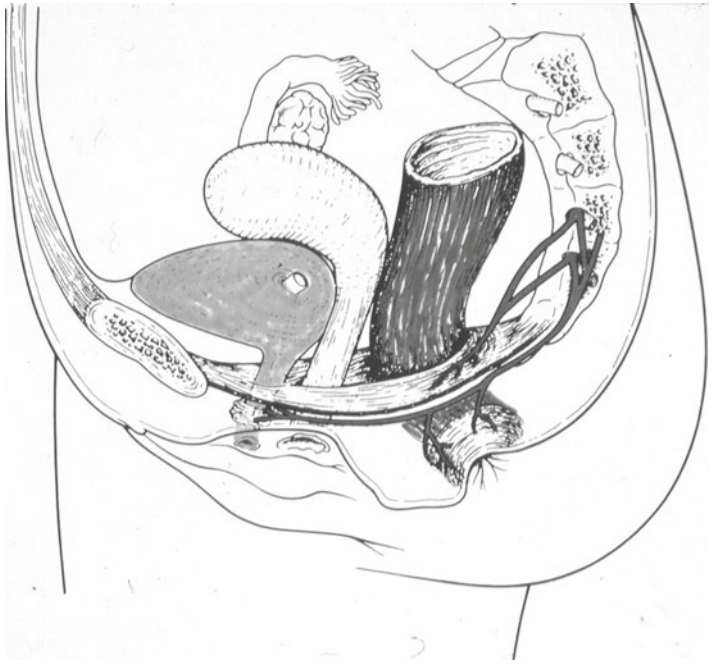

FIGURE 6.2 Diagram of the pelvic floor muscle (Reprinted with permission from Swash [32]. Copyright 1990, John Wiley & Sons Limited)

gradually, over 12–24 weeks, to increase the resting tone of the muscle, and it will also hypertrophy. Then the patient can train to squeeze the muscle against the "load" of coughing or sneezing.

The Role of the Nurse Continence Advisor

The assessment and basic explanation of the PFM (as above) are a task that any registrar or clinician should be able to carry out, as it only takes 1 min during the physical exam and 3 or 4 min of explanation time.

The following description of how to start a PFM training program may be too time consuming within the confines of a busy outpatient clinic. In this case, the patient should be referred to a nurse continence advisor (NCA) for the detailed training given below.

A physiotherapist (physical therapist) will also carry out this type of training program, but in some countries, the NCA is more readily available within a public hospital, with no cost to the patient. Referral to a physiotherapist can therefore be reserved for patients with a weak pelvic floor muscle, who may need electrical stimulation therapy, described later, especially if this incurs a cost.

First, the woman must contract the muscle as hard as possible for as long as she can, up to her maximum when fatigue is noted (e.g., 3 s).

Then rest the muscle for 5 s to let oxygen back into the muscle.

Explain that just squeezing the muscle over and over without this oxygen break will cause it to tire out, not strengthen.

To make it easy to remember, we usually set a program that builds up numerically from her 3-s maximum, for example, 3-s squeeze, 4 squeezes per "set" or group, and 5 sets per day.

In this example, she would perform 20 contractions per day.

The five sets per day should be spread out over the day, not done all at once in the morning (because this causes fatigue also).

To help remember this, we would give five red adhesive dots to be placed around the house in places that are visited at different times of the day (near the toothbrush, kettle, telephone, television remote control, etc.). See Fig. 6.3.

After the patient has strengthened her PFM for 3–4 weeks, she should then learn how to contract the muscle just before a cough or sneeze. This technique, called "the knack," has been shown on pad testing to reduce leakage by up to 60 %/day [22].

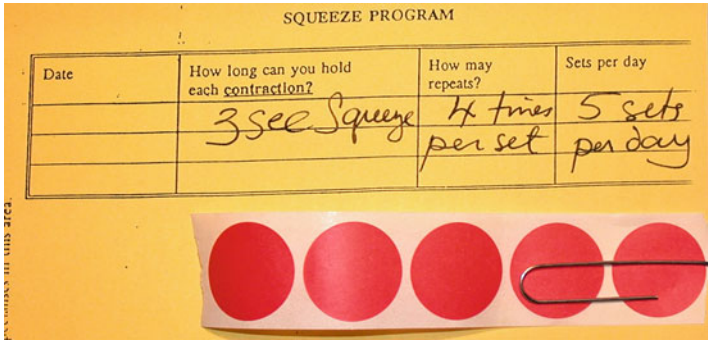

FIGURE 6.3 Written PFM training program for a patient with an initial pelvic floor contraction of only 3-s duration, who is to do four contractions per set and five sets per day (five *red dots* given)

In subsequent visits, the nurse continence advisor reiterates the initial explanation and upgrades the program (makes it harder). If a patient is sent to physiotherapy, the first visit always includes this type of explanation, with upgrading at follow-up. Even if the main complaint is urge incontinence, the PFM is used to defer micturition, so patients need to know how to contract it.

Who Should Be Referred for Physiotherapy?

If a woman cannot contract her PFM at the initial examination (or can only manage a weak flicker) despite your best efforts to help her locate the muscle, then she definitely needs referral to a pelvic floor physiotherapist (a physiotherapist who has undergone subspecialty training). She will assess the patient vaginally, use additional methods to help her identify the muscle, then move on to biofeedback or electrostimulation or both (see below for details).

The question then becomes the following: do women who can contract their muscles need a supervised training program, or can they practice at home with equally good results? This leads into the question, what form of PFM training is most effective?

In the last 30 years, many publications have considered this question. One problem is that the outcome measures used by the different authors varied greatly. Table 6.1 summarizes the results. The term "hospital PFMT" indicates that patients attended a pelvic floor physiotherapist weekly or monthly and had regular supervision of their training program.

The duration of follow-up in these trials also varied a great deal. Nevertheless, it can be seen that supervised PFM training yields generally higher success rates (average about 50 % cure, range 25–75 %), compared to a home-based program (29 % cure).

Another problem with this table of results is that the severity of leakage at baseline was seldom taken into account. Stratified randomization was rare (so that mild and severe patients could be distributed equally into both treatment arms). A study in which only patients with mild to moderate incontinence (on 1-h pad test) were recruited (with stratified randomization) showed that 65 % of those with mild incontinence were cured, compared to a 35 % cure rate for moderate incontinence [25]. In this pragmatic trial, only patients with a weak pelvic floor were referred for subspecialty physiotherapy. In those with a good contraction strength at baseline, a nurse continence advisor supervised their training.

A meta-analysis [2] and the recent Cochrane review [9] both emphasized poor standardization of outcome measures and follow-up duration but concluded that PFM training is clearly superior to no treatment and a supervised program gives better results than a home-based program.

What Does the Physiotherapist Do That Increases Efficacy?

Basically, the pelvic floor physiotherapist has three techniques:

- To act as a personal trainer, just as for an athlete:
  - To reexamine the PFM at regular intervals to check strength and increase the difficulty of the training program

Table 6.1 Objective results after pelvic floor muscle training for stress incontinence

Authors	*N*	**Treatment**	Results
Wilson et al. [34]	15	Home PFME	Pads/24 h 11 % benefit
	45	Hospital PFME	Pads/24 h 54 % benefit
Jolleys [19]	65	Home PFME	48 % subjectively dry
	56	Control	0 % subjectively dry
Henalla et al. [17]	25	Hospital PFME	65 % cure/marked benefit pad test
	24	Control	0 % cure/marked benefit pad test
Burns et al. [6]	38	Hospital PFME	54 % reduction leaks/ week FVC
	40	Control	9 % worse leaks/week FVC
Bo et al. [3]	26	Home PFME	Pad test change NS
	26	Hospital PFME	Pad test 27 g fell to 7.1 g/h
Bo and Talseth [4]	23	Hospital PFME	75 % dry on urodynamic cough test at 5 year
Wells et al. [33]	82	Hospital PFME	27 % dry on wetting diary
	75	Phenylpropanolamine	14 % dry on wetting diary
Mouritsen et al. [27]	100	Hospital PFME	47 % dry pad test at 12 months
Cammu et al. [7]	52	Hospital PFME	25 % dry on FVC
O'Brien et al. [28]	292	Home PFME	29 % no longer using pads
	132	Control	No benefit
Lagro-Janssen et al. [21]	53	Home PFME	Leaks/week 19.6, fell to 7.2/week
	57	Control	Leaks/week 21, worse, to 23/week
Hahn et al. [15]	170	Hospital PFME	35 % dry on stress test
	30	Control	0 % change in controls
Seim et al. [30]	96	Hospital PFME	48-h pad test 28 g fell to 10 g
Bo et al. [5]	25	Hospital PFME	44 % dry, pad test at 6 months
	30	Control	6 % dry, pad test at 6 months

  - To evaluate the frequency volume chart with the patient regularly and see whether leakage is really declining
  - To remind the patient to perform "the knack" as they often forget
  - To increase motivation by positive verbal feedback (as results improve)

- To use some form of "biofeedback" technique such as:
  - A graduated perineometer, to show contraction strength (Fig. 6.4)
  - Verbal biofeedback during digital examination, asking the patient to contract harder or for a longer duration

FIGURE 6.4 Perineometer. Used to measure strength of the PFM contraction

- Vaginal weighted cones that the patient wears in the vagina for 20 min twice daily, with steady increase in the cone weights (Fig. 6.5)
- Mechanical or auditory biofeedback, such as a vaginal pressure transducer that conveys increased pressure by an increased auditory or visual signal

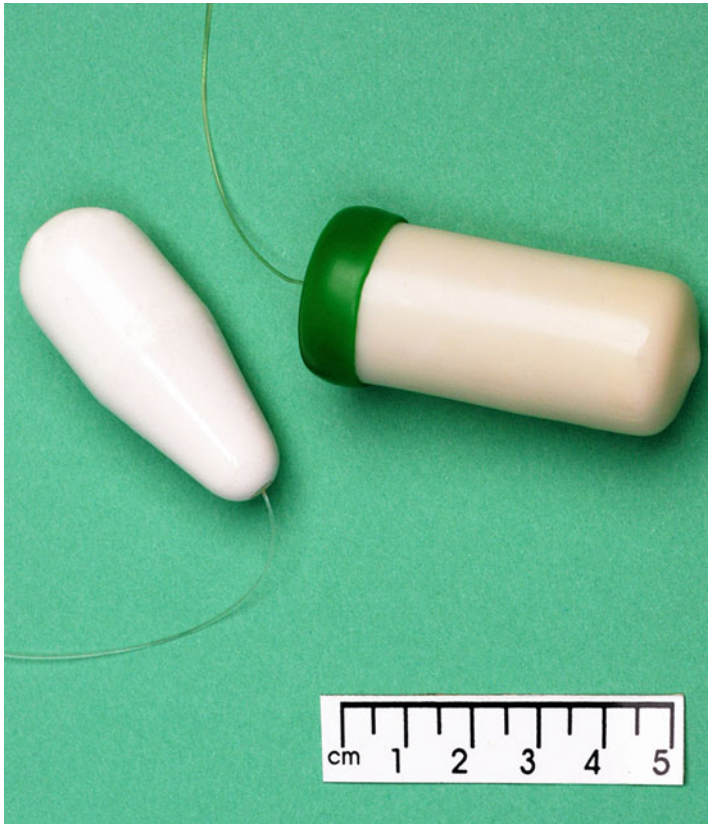

FIGURE 6.5 Vaginal cones. Used to teach patients how to contract the PFM

- To employ electrostimulation therapy when the patient has a weak or absent PFM contraction, which may comprise:
  - Trans-vaginal electrostimulation, also called faradism (Fig. 6.6)
  - Trans-suprapubic electrostimulation, or interferential therapy, now seldom used

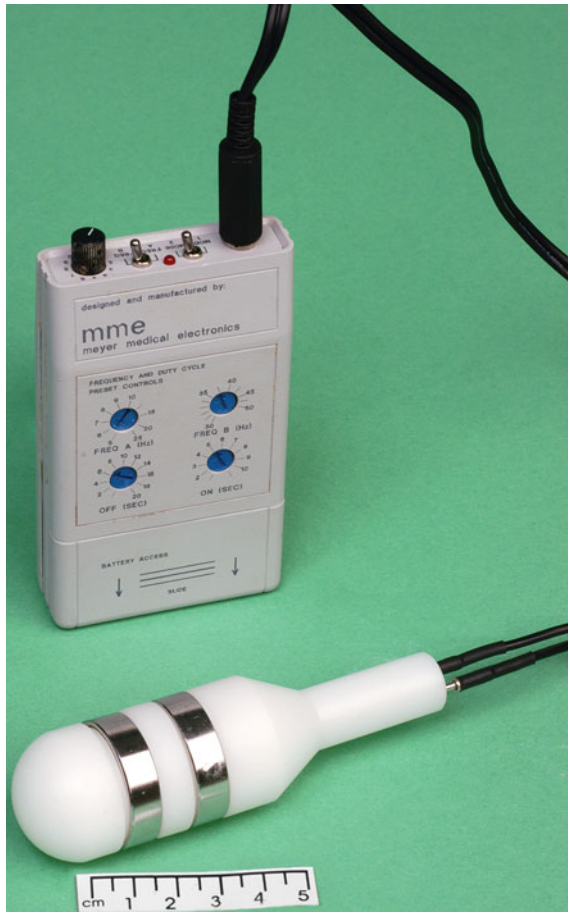

FIGURE 6.6 Intravaginal electrostimulation device

The Efficacy of Physiotherapy Techniques

For a detailed analysis of this issue, the reader should consult a dedicated text, such as *Pelvic Floor Re-education* [29]. Nevertheless, some conclusions can be made. The first item of physiotherapy training above (acting as a personal trainer to enhance performance and gradually increase the difficulty of the training) is clearly efficacious, as shown in Table 6.1 regarding home training versus supervised training.

Biofeedback is quite controversial. The following statements are evidence based. In a compact book such as this, it is not practical to cite all evidence.

Use of the *perineometer* aids the patient by measuring the degree of improvement in pelvic floor muscle strength. This does not always translate into improved continence, unless the patient uses her PFM during cough or other episodes of raised intra-abdominal pressure (the knack).

Use of *vaginal weighted cones* provides a variable degree of enhanced efficacy. In some studies, they give major benefit; in other studies, the benefit over PFM training is not statistically significant. The Cochrane meta-analysis found that cone therapy is better than no treatment and similar to PFMT alone, with no clearly significant benefit gained from adding cones to a PFMT program. We find that a patient's attitude towards a self-inserted vaginal device is very important. Some women find them a useful aid; others cannot accept the idea of inserting a cone into their vagina. They are "another option" for women having difficulty with simple PFM training who do not want surgery.

Use of *auditory or visual biofeedback* techniques to enhance the woman's appreciation of her PFM strength is now known to enhance PFMT. Women who were given biofeedback had a significantly greater likelihood of noting cured or improved continence (risk ratio 0.75, CI 0.66–0.86 [9]). Such devices are often quite expensive. Some physiotherapists use biofeedback at the first visit to help women identify their PFM, but do not always use it at follow-up visits [13].

Use of electrostimulation is physiologically attractive. The skeletal muscle of the PFM is given a regular electrical stimulus,

which causes a tetanic (maximal strength) contraction. In our experience, electrostimulation is very useful for the woman who simply cannot contract her PFM at the first visit. Once she can feel it contracting, she should be given a detailed PFM training program to use between the electrostimulation visits. Unfortunately, most studies of this technique do not specifically select women who are unable to contract the PFM and do not give a PFM training program for use between electrostimulation visits. Many of the studies are very small ($n = 20–30$ in either arm), so that they are "underpowered" to achieve a significant result. Definition of "cure" is variable and not clearly reported.

The International Consultation on Incontinence (ICI) recently concluded that "There is insufficient evidence to judge whether electrical stimulation is better than no treatment for women with urodynamic stress incontinence." [16]

Extracorporeal Electromagnetic Chair Stimulation Therapy

This is an alternative form of electrostimulation therapy that avoids the need for a vaginal probe. Patients sit fully clothed on a chair that contains a magnetic coil under the seat. A randomized controlled trial using a sham chair showed that, in women who were unable to contract their pelvic floor muscle at the first visit, the active chair therapy produced a significant reduction in leakage on pad test ($p<0.05$) compared with sham chair [11].

What to Do if Conservative Therapy Fails but Patient Does Not Want Surgery

Prior to the 1990s, such patients were left with the main option of using continence pads. In the last decade, several bioengineering companies have taken up the challenge to develop mechanical devices that can correct incontinence.

The first of these was the bladder neck support prosthesis (Introl, Fig. 6.7), which is shaped like a prolapse ring pessary

but has two prongs that sit in the retropubic space and cradle the urethra. Clinical trials indicate that 62 % of those who can be fitted become continent (see Moore [24]). The device is difficult to fit in those with multiple previous failed continence surgeries but is well suited to those without previous surgery who mainly leak during sporting activities. It is also useful for patients with coexistent prolapse. Availability is limited at present due to manufacturing problems, but it is likely to return.

The same inventor went on to develop a simpler device, Contiform, that is shaped like a hollow tampon (Fig. 6.7). Initially, this device was only available in three sizes and gave a highly significant reduction in incontinence, but the "cure" rate on pad testing was only 22 % Morris and Moore [26]. Subsequently, a fourth size has been manufactured which yielded improved

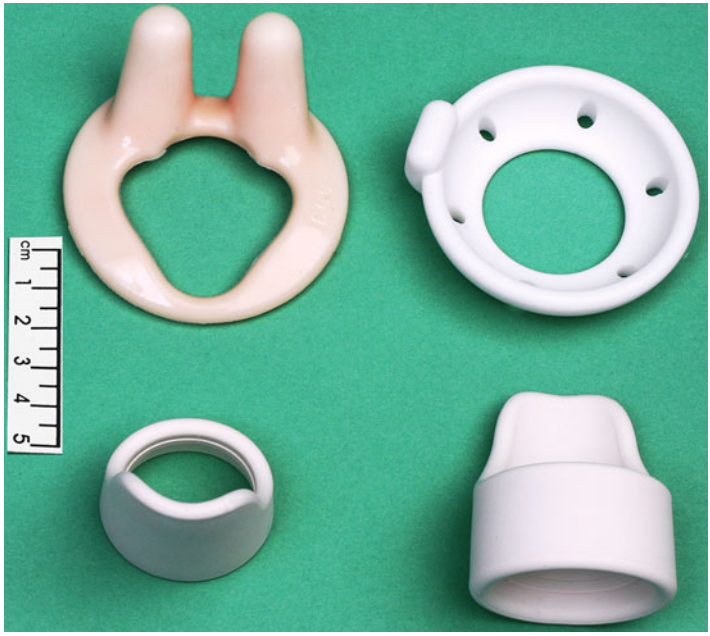

FIGURE 6.7 Introl device (*top left*), continence dish (*top right*), and two sizes of Contiform (*bottom*)

efficacy, 51 % dry on pad testing [1]. This device does not treat prolapse but is useful in patients who mainly leak with sporting activities and do not want surgery. The continence dish is used in a similar way in the USA and Australia.

Conclusions

PFM training needs to be tailored to the individual woman. Stress incontinence is not life threatening, and patients know this. Do not recommend a therapy that the patient feels uncomfortable with, as her compliance will be poor. In order to provide the best results, discuss the options with the patient, and let her select that with which she thinks she can comply.

The caveat to this advice is that patients should also understand the risks of surgery, should they not respond to conservative therapy. If a woman understands that current continence surgery has a 5–6 % risk of developing overactive bladder and a 1–2 % risk of voiding difficulty, then their interest in and compliance with conservative therapy may be enhanced. Urogynecologists must always remember that our first duty is "to do no harm," and PFM training has no complications.

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Chapter 7
Step-by-Step Guide to Treatment of Overactive Bladder (OAB)/Detrusor Overactivity

If a patient has a main complaint of frequency/urgency/nocturia/urge incontinence on history or if urodynamic testing has revealed detrusor overactivity, then bladder training is an essential part of treatment. Most continence clinicians would not prescribe anticholinergic drugs without teaching bladder training first.

Explain the Condition

This is the first step. Many patients with this problem think that they are "neurotic"; often they are an embarrassment to their families as they frequently need to rush to the toilet at social occasions. In fact, during the 1970s and 1980s, several studies suggested that this condition was largely psychosomatic, but conclusive evidence of this was not found.

Since the introduction of quality of life testing in the 1990s, we have learned that patients with detrusor overactivity have a much poorer quality of life than those with stress incontinence and are more anxious and depressed because of the unpredictable nature of their condition.

Recent studies have indicated that:

The subepithelial nerves are overabundant in this condition (increased by about 35% compared to controls [24]; see Fig. 7.1), and neuropeptides involved in conveying "nociceptive" or painful symptoms are increased by 80–90% [32].

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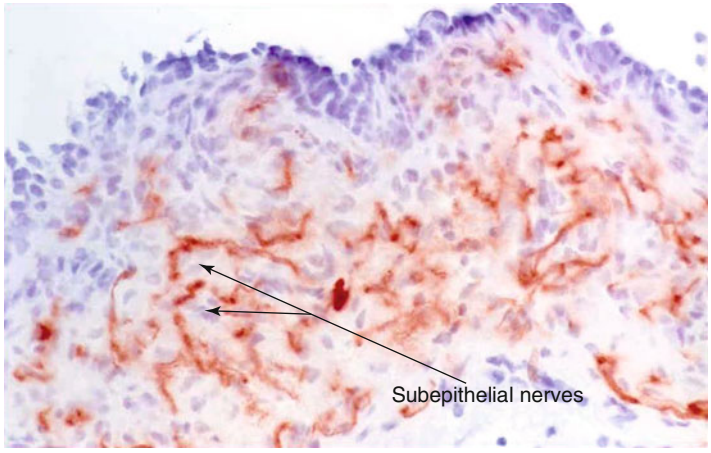


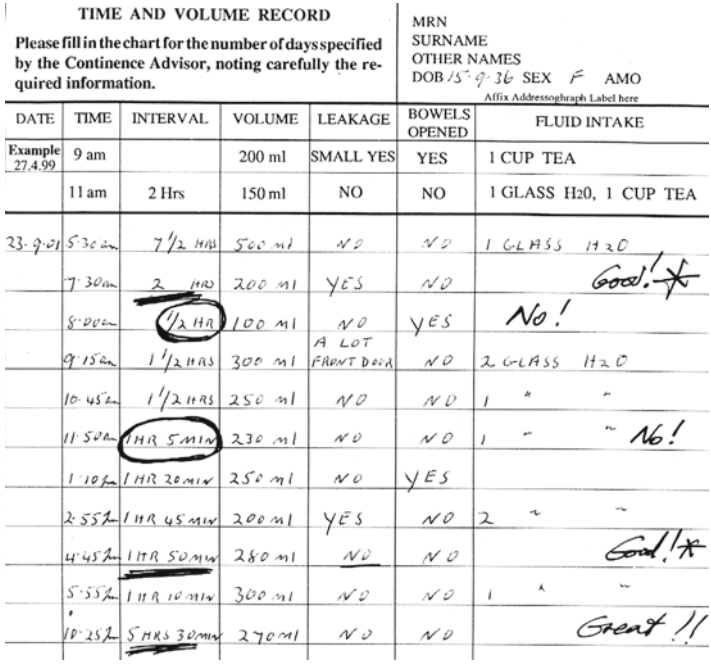
FIGURE 7.1 Increased subepithelial nerves in detrusor overactivity patient

The ability of the cerebral cortex to inhibit the desire to void is reduced in this condition but can be strengthened by training. Functional MRI studies performed during urodynamics show changes in cerebral blood flow in OAB [17].

The detrusor muscle is overly contractile, giving rise to "muscle cramps" in the bladder. Pharmacological studies show that, in the organ bath, the muscle strips from these patients do not relax entirely when atropine is administered (whereas detrusor strips from control patients do relax after atropine is applied). (For review, see Kumar et al. [22]).

Stretch of the bladder causes more rapid release of ATP (a signaling molecule that activates afferent nerves) in patients with OAB compared to controls [10].

Therefore, the patient must understand that she is not neurotic but has an abnormality of the afferent (subepithelial



TIME AND VOLUME RECORD

Please fill in the chart for the number of days specified by the Continence Advisor, noting carefully the required information.

MRN
SURNAME
OTHER NAMES
DOB 15·9·36 SEX F AMO
Affix Addressoghraph Label here

DATE	TIME	INTERVAL	VOLUME	LEAKAGE	BOWELS OPENED	FLUID INTAKE
Example 27.4.99	9 am		200 ml	SMALL YES	YES	1 CUP TEA
	11 am	2 Hrs	150 ml	NO	NO	1 GLASS H20, 1 CUP TEA
23·9·01	5·30am	7 1/2 HRS	500 ml	NO	NO	1 GLASS H20
	7·30am	2 HRS	200 ml	YES	NO	Good! ✱
	8·00am	1/2 HR	100 ml	NO	YES	No!
	9·15am	1 1/2 HRS	300 ml	A LOT FRONT DOOR	NO	2 GLASS H20
	10·45am	1 1/2 HRS	250 ml	NO	NO	1 " "
	11·50am	1HR 5MIN	230 ml	NO	NO	1 " " No!
	1·10pm	1HR 20MIN	250 ml	NO	YES	
	2·55pm	1HR 45MIN	200 ml	YES	NO	2 " "
	4·45pm	1HR 50MIN	280 ml	NO	NO	Good! ✱
	5·55pm	1HR 10MIN	300 ml	NO	NO	1 " "
	10·25pm	5HRS 30MIN	270 ml	NO	NO	Great !!

FIGURE 7.2 A typical example of a patient with OAB, with the usual voiding frequency circled and the "target" voiding interval underlined

nerves) and efferent (detrusor contractility) limbs of the micturition reflex.

The next step in bladder training is to look at the frequency–volume chart with the patient. Because severity of frequency varies in this condition, the therapist needs to find a realistic target "voiding interval" toward which the patient can aim. For example, if the chart shows that the patient usually toilets every hour but sometimes can hold for 2 h, then the target voiding interval should be 2 h (Fig. 7.2).

Once the target (e.g., 2 h) is chosen, the instructions to the patient are as follows.

Step-by-Step Guide to Bladder Training

When you get a desire to go to the toilet, look at your watch.

If it is more than 2 h since you last went to the toilet, just go ahead and pass urine.

If it is less than 2 h since you last went, then you need to do three things:

A. Sit down.
   The reason for this is that the bladder has gravity nerves inside the wall that give you a stronger desire to toilet when you are standing than when you are sitting.

B. Contract your pelvic floor muscle (PFM).
   The reason is that you must stop any drops of urine escaping from your bladder into your urethra. Once the fluid gets into your urethra, there is an automatic reflex that will make you start passing urine onto your pad, so you need to "nip this in the bud."

C. Send a strong message from your brain, down your spinal cord to the level of the tailbone, then out to your bladder, saying, "*No*, I am *not* going to the toilet for 2 minutes." There is a direct pathway from the front of your brain, down the spine, to the bladder, but in your condition, the message signals on this pathway seem to have become "rusty" or weak. These messages can be strengthened by focused concentration.

Sit quietly for 2 min, contracting your PFM. At the end of 2 min, stand up (contracting your PFM as you stand), and walk slowly to the toilet (do not run or you are more likely to leak).

However, if you have waited 2 min, it is likely that you will no longer want to go.

This is because the bladder spasms that cause your leakage are like a muscle cramp; they normally only last 1–2 min, and then the muscle cannot hold the spasm any more; it relaxes.

Therefore, you may be able to hold on for another half an hour or so, until another spasm occurs. If this happens after you have successfully stopped the previous spasm, then you should go ahead and walk to the toilet for this one.

Before the patient can successfully undertake step B, she must be examined to make sure that she can contract her PFM, and if not, undergo a program of pelvic floor muscle training, as described in Chap. 6. Do not disappoint the patient by expecting her to succeed with bladder training until she has learned how to contract the pelvic floor muscle.

The patient needs to understand that bladder training is an essential part of treating the overactive bladder. If drugs are prescribed for this condition, they will help to relax the bladder spasms, but the patient must try to inhibit the premature desire to void.

Also, if a patient suffers from nocturia, the bladder training works to increase her bladder capacity during the day. Gradually, her bladder capacity will also increase at night. She must attempt to inhibit the desire to void at night if she is awakened by a snoring husband or a dog that is barking. She must avoid nocturnal trips to the toilet out of habit.

Is bladder training of proven efficacy? Unfortunately, bladder training was introduced before the era of evidence based medicine. An often quoted paper from 1980 set the stage. In it, 25 women had inpatient bladder drill, and 25 women had drug therapy (with imipramine and an outdated drug flavoxate). Of the bladder drill group, 76 % "were rendered symptom free," versus 48 % of those given drugs [21]. In the same year, outpatient bladder drill was reported to achieve subjective cure in 87% and objective cure in 53% of 90 women [15]. Since then, there has never been an adequately powered trial comparing bladder training with no therapy, but most clinicians find that bladder training is important.

How Do Anticholinergic Drugs Work?

Anticholinergic drugs work through the parasympathetic nervous system; they are antagonists that work at the muscarinic receptor to inhibit (and in some cases abolish) detrusor muscle contractions. For the patient, this can be likened to a muscle relaxant acting on the bladder. There are several types

of anticholinergic drugs, with varying pharmacological properties.

Propantheline (Pro-Banthine): 15 mg TDS is a very old antimuscarinic drug. As it is a quaternary amine, it is poorly absorbed from the gut. Side effects of dry mouth and constipation are ubiquitous, but the drug is cheap.

Oxybutynin (Ditropan): Maximum 5 mg TDS has been used since the 1970s. It is an antimuscarinic drug but also has local anesthetic properties (thus, it can be given intravesically) and also a smooth muscle relaxation effect. It is very effective in reducing detrusor contractions, but about 60% of patients will get annoying dry mouth/dryness of the esophagus/difficulty swallowing and stop taking it. It is very cheap. When giving oxybutynin, titrate the dose against the symptoms. For severe nocturia but less daytime leak, give 2.5 mg mane and 5 mg nocte. Some patients are worse in the morning but have no nocturia; give 5 mg mane and 2.5 mg after lunch. The drug works within 1 h and lasts 6–8 h. A long-acting "slow-release" form of oxybutynin has been developed but is not marketed in all countries; this gives less dry mouth (about 25%). A transdermal patch Oxytrol also gives less side effects by avoiding production of a liver metabolite, but pruritus at the patch site occurs in about 7% [27].

Imipramine (Tofranil): 25–50 mg nocte, is also a very old drug. In much larger doses (75–100 mg daily), it is an antidepressant. It has a beta-mimetic action to relax the dome of the bladder but also has anticholinergic effects. Because a common side effect is drowsiness, it is very useful for nocturia. It also lowers the pain threshold by an uncertain mechanism and can be used when the bladder spasms are appreciated as painful (or in painful bladder syndrome; see Chap. 12).

Tolteridine (Detrusitol): 2 mg BD, was developed in the 1990s. It attaches to the bladder muscarinic receptors to a much greater extent than to such receptors in the salivary glands, so it gives less dry mouth than oxybutynin but is just as effective. It also has a slightly longer duration of effect, hence the BD dosage. In some patients, 4 mg BD can be given without dry mouth. A slow-release form has been made

which is somewhat more effective with even less dry mouth but is not available in all countries.

Propiverine (Detrunorm): 15 mg TDS, is an antimuscarinic agent that is also a calcium channel blocker. Dry mouth occurs in about 20% of patients but is not usually distressing. It is not available in many countries.

Trospium (Regurin): 20 mg BD, is a nonselective quaternary amine but does not give as much dry mouth (4%). Its structure also limits blood–brain barrier penetration, thus reducing CNS effects in the elderly (confusion). It is widely used in the United Kingdom.

Darifenacin (Enablex, Emselex): selectively acts at the M3 receptor, which is thought to be most functionally important for mediating detrusor contractions, available in most countries.

Solifenacin (Vesicare): 5–10 mg daily, is also selective for the M3 receptor and also does not attach well to the salivary gland receptors. It was developed in early 2000s and achieved continence in 51% of one trial, with 11% suffering from dry mouth, available in most countries.

Fesoteridine (Toviaz): 4–8 mg daily, is the most recently developed anticholinergic, which was derived from tolteridine. It is available in the UK and Europe.

Duloxetine: This is a recently developed serotonin reuptake inhibitor that also affects Onuf's nucleus in the pelvic nerve plexus. It was designed for the medical treatment of stress incontinence because it enhances the strength of the internal urethral sphincter mechanism. Because it also enhances bladder capacity, it has also been used in overactive bladder. It is licensed in Denmark for use in incontinence.

Desmopressin (Minirin): Consider treating with this if nocturia cannot be helped by other agents. This synthetic vasopressin analogue markedly reduces the production of urine for about 6 h. It is given as 1–2 nasal sprays to each nostril before bedtime; oral tablets are also available. It is useful for patients with debilitating nocturia who are practicing bladder training during the day but have not yet improved their bladder capacity, so they have not yet seen any reduction in nocturia. It is not a good long-term strategy. Particularly in the

elderly, prolonged use is associated with hyponatremia that can be life threatening. Be very careful in patients with nocturnal polyuria, however (defined as passing more than 30% of total urine output at night). This drug is contraindicated in such patients so a frequency volume chart *must* be completed before starting this drug. In children with bedwetting, long-term usage has been shown to be safe.

Are Anticholinergic Drugs Effective?

This is controversial. Most pharmacotherapy trials only consider efficacy at 12 weeks or thereabouts. An initial Cochrane meta-analysis [20] found that, in a review of 6,713 patients in 51 studies, the placebo effect was much higher than expected (about 45 % with respect to control) but that the drugs gave an additional 15% over placebo. Overall, anticholinergic drugs achieved one less leak per 48 h and one less void per 48 h, with respect to placebo. This may seem like a small effect, but most of these trials did not include formal bladder training programs, so they do not reflect ordinary clinical practice. The most recent Cochrane review of 61 trials (11,956 adults) concluded that anticholinergic drugs produce a statistically significant improvement in symptoms of overactive bladder [27].

The natural history of detrusor overactivity has received little attention. Recently, a review of 76 patients with proven DO at a median of 6 years [26] found that symptoms had largely resolved in only about 16 %. Symptoms were no different in 59% of patients and were worse in the remaining 25% (Fig. 7.3). Thus, some form of long-term anticholinergic therapy may be needed in up to three quarters of patients.

Having said that, patients may not have to take the full dose to achieve good symptom control. Many patients have "good days" and "bad days." In a randomized controlled trial, Burton [8] showed that patients who took tablets only on their "bad days" (the "PRN regime") obtained equally good effect as those who took the daily dose.

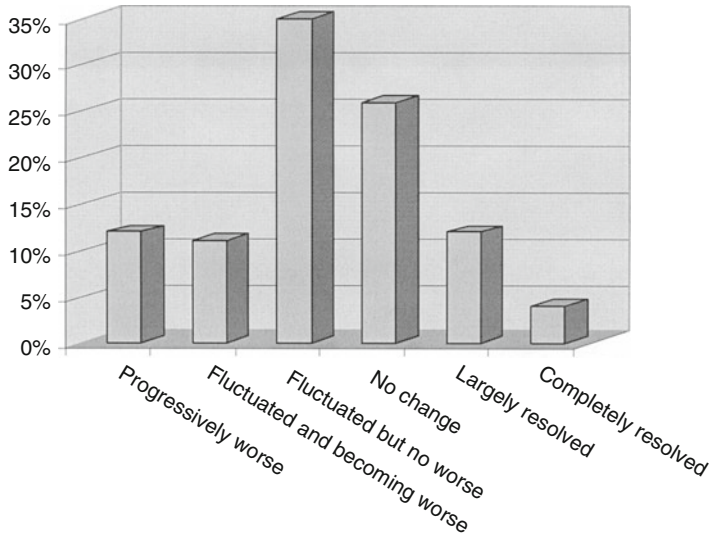


FIGURE 7.3 Histogram showing course of disease in 76 patients with detrusor overactivity at a median follow-up of 6 years (Data from Morris et al. [26])

Role of Topical Estrogens

Theoretically, the effect of vaginal estrogen upon the bladder base/trigone should promote tissue elasticity and enhance bladder capacity. Also the effects of estrogen seen in patients with stress incontinence (thickening the urethral mucosa to prevent leakage of urine) should also help to reduce leakage in women with OAB.

Unfortunately, few studies have investigated this. Small studies from the early 1980s showed significant improvement in urge incontinence symptoms, but no objective outcome parameters were employed. A large RCT of topical estrogen versus placebo showed no significant benefit for urge symptoms, but the dose of estrogen was found to be insufficient when the effect of estrogen upon the cytopathology of urethral epithelial swabs was fully evaluated [3].

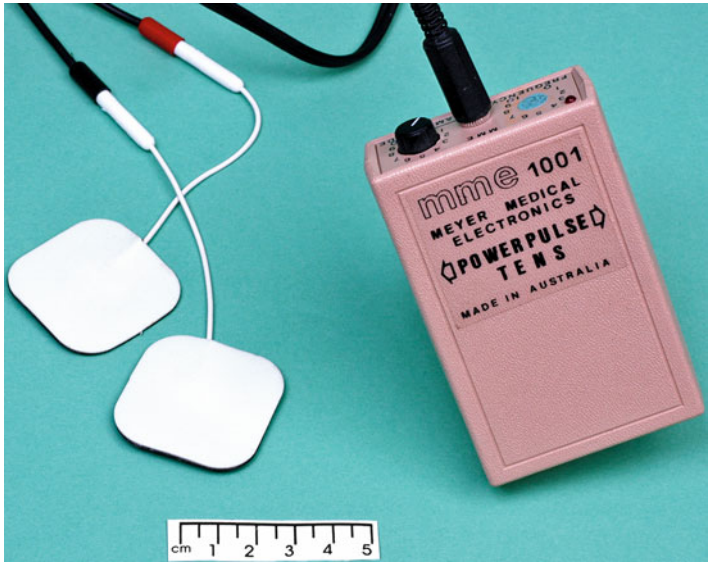


FIGURE 7.4 TENS machine for the treatment of detrusor overactivity

Alternative Therapies for Detrusor Overactivity

TENS (Transcutaneous Electrostimulation Therapy)

TENS has been used for many years in the labor ward, to inhibit the sensation of pain during uterine contractions. TENS (Fig. 7.4) has been applied with some success in patients who feel the urge to void as a painful spasm. It works by modifying sensory input, by interrupting the relay of afferent impulses to the cerebral cortex (called the gateway theory of pain control).

The electrodes are applied over the pubic bone or over the sacrum, and the patient self-regulates the electrical impulses coming from the stimulator (worn attached to her belt) until

she feels a strong buzzing or throbbing sensation over the application site. Small clinical trials have shown promising results [5, 18]. The device costs about 50 Euros.

Acupuncture

Acupuncture has also been helpful for detrusor overactivity. Initially, it was thought to work via the gateway theory of pain control, but later it was found that acupuncture increases the levels of endogenous opioids (beta-endorphin and met-enkephalin) in the patient's cerebrospinal fluid. Pharmacological experiments show that enkephalins inhibit detrusor contractions.

The traditional bladder points are documented in the literature; in one small study [28] ($n=16$), acupuncture abolished detrusor overactivity incontinence in 63%. In a larger study ($n=26$ patients on active acupuncture, 24 sham therapy), symptom improvement occurred in 85%, with 75% becoming urodynamically stable [9].

SANS Electro-Acupuncture (Stoller Afferent Nerve Stimulator)

This is a device that mimics acupuncture but adds an electrical stimulus to the needle that is inserted into a bladder point over the medial malleolus of the ankle (near the posterior tibial nerve). This device can be employed by trained nurse continence advisors, because the relevant bladder point is easily identified from surface anatomy (Fig. 7.5) Acute administration of SANS during cystometry significantly increased the volume at first detrusor contraction and the maximum cystometric capacity [1]. After 12 weeks of SANS in 53 patients, a 25% reduction in frequency, 21% reduction in nocturia, and a 35% benefit for urge incontinence were noted [16]. Maintenance therapy with repeated treatments may be necessary however [34].

FIGURE 7.5 SANS device, applied to the bladder acupuncture point at the medial malleolus

Hypnotherapy

Hypnotherapy has also been helpful [14]. After 1 month of 12 sessions, 58% of 63 patients became symptom free; 14% were unchanged. Cystometry showed that 50% had become stable, with 36% improved. Of 30 patients reviewed at 2 years, 33% remained symptom-free. The author commented that patients

required an audiocassette tape to be used in their own homes at regular intervals in order to maintain symptomatic benefit, so this therapy requires a motivated user.

The Cochrane Collaboration has not evaluated hypnotherapy or acupuncture for detrusor overactivity.

Electrostimulation

As discussed in Chap. 6, electrostimulation is a recognized technique for strengthening the pelvic floor muscle, by inducing repetitive tetanic muscle contractions. It can also be used for patients with detrusor overactivity (DO). Electrostimulation of the nerves of the perineum or anus is known to cause reflex inhibition of detrusor contractions. In the 1970s, electrostimulation was usually delivered via an anal electrode, which was not popular among middle-aged women. In the largest sham-controlled RCT, Brubaker et al. [6] showed that intra-vaginal electrostimulation resulted in a urodynamically stable bladder in 49% of patients with DO (no significant change in the sham group).

Extracorporeal Electromagnetic Stimulation Therapy

As mentioned in Chap. 6, this is a form of electrostimulation therapy that avoids the need for a vaginal probe. "On-chair" cystometry studies show that the magnetic stimulus abolishes detrusor overactivity in the majority of cases, but a sham-controlled study (using a sham chair that delivered no current) showed no benefit for active treatment over sham [25].

Cystodistention

Originally, Helmstein's cystodistention was undertaken for 5–7 h (under epidural anesthesia) in order to produce necrosis

of superficial bladder tumors. Later studies showed that this degree of distension produced tissue anoxia, which was thought to reduce detrusor contractility. Studies in the 1970s showed subjective response for DO in 70%, with 65–80% of bladders becoming urodynamically stable [29]. Later studies showed symptomatic response in 32%, with a stable bladder in 19% [12]. These days, it is difficult to justify epidural anesthesia and day-only admission for such a response rate.

However, in patients over age 50 with refractory detrusor overactivity (defined as failure to respond to two anticholinergic drugs with bladder training for more than 12 months [24]), it is reasonable to offer cystoscopy to exclude carcinoma in situ (which may cause chronic irritative symptoms, e.g., frequency, urgency, and nocturia) and at the same time perform a simple cystodistention. This involves distending the bladder to capacity under general anesthetic, then allowing the total fluid volume to remain in the bladder for 3–5 min (with the infusion bag at a height of 1 m above the bladder). A refill examination can then be performed in patients who also complain of suprapubic pain (see Chap. 12) to exclude interstitial cystitis.

Botox Therapy (Botulinum Toxin A Injections)

Since 2004, Botox injections to the detrusor muscle have been widely used in neuropathic DO (especially multiple sclerosis); limited trials have been performed in idiopathic DO. The neurotoxin binds to cholinergic terminals locally to inhibit acetylcholine release and to some extent ATP resulting in reduced detrusor contractions at the injected muscle site. It also blocks the release of some afferent neuropeptides involved in transmission of noxious stimuli. About 30 injections of 200–300 units are usually given, via cystoscopy. One ampoule of 100 U costs about 800 $US. Symptom benefit lasts

6–9 months. Three RCTs of Botox versus placebo injection for idiopathic detrusor overactivity have shown significant reductions in urge incontinence and a variety of other OAB symptoms. The largest RCT showed that 72% of patients had 75% or greater reduction in leakage at 1 month but benefits fall over time [7]. Up to 45% of patients needed to self-catheterize (Cochrane review [13]).

Intravesical Resiniferatoxin (RTX) Installation

This has been used for several years for neuropathic DO, with considerable success. This agent acts to desensitize the vanilloid receptors in the bladder lining, which normally convey the sense of urgency. Small trials undertaken in idiopathic DO showed early promise, but later studies including RCT showed no benefit. For review, see Cruz [11].

Clam Cystoplasty

This was popular in the 1980s. In patients with completely refractory disease, the bladder was opened transversely (in the manner of opening a clam), and a segment of flattened bowel was inserted into the bladder opening, then the bladder was closed with its interposed bowel segment in continuity. The idea was to increase the bladder capacity and interpose an autologous tissue that would impair detrusor muscle contractility.

This procedure has a 1% mortality rate. The initial 90 % subjective response was not sustained over time. The bladder becomes stable in about 60% of cases. At a mean of 6 years [2], 53% of 51 patients were continent, but 40% needed to self-catheterize and suffered recurrent UTI. Mucous plugs from the bowel segment caused urinary retention in 20%.

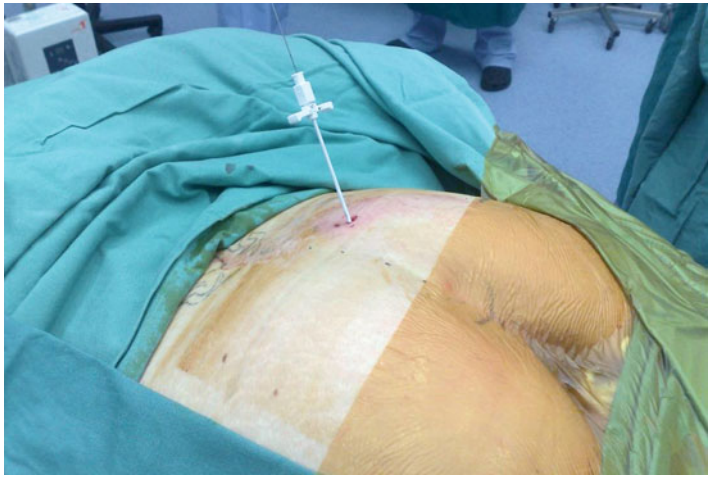


FIGURE 7.6 Insertion of sacral nerve stimulation lead at S3

Partial Detrusor Myomectomy

The concerns about risks versus benefits for the clam cystoplasty procedure led to its development [23, 33]. It yields better results with less morbidity but is still a major surgical undertaking.

Implantation of S3 Sacral Nerve Root Stimulator

A two-stage procedure is can be effective for refractory DO, it is expensive (approx. US$10,000) and requires careful follow-up of the patient. The first stage involves peripheral nerve evaluation (PNE). With the patient lying prone, the S3 foramen is located; a spinal needle is used to test that the nerve root has been located by electrical stimulation, and then a temporary stimulation wire is inserted and taped securely, see Fig. 7.6. This is attached to a temporary pulse generator device that the patient wears externally. The patient goes home for 5–7 days and records the impact of the

S3 stimulation upon their DO symptoms. If the symptomatic benefit after PNE is greater than 50–70%, a permanent electrode is implanted into the S3 foramen. The pulse generator is then implanted below the posterior superior iliac crest. Early results [4] and long-term follow-up [30, 31] indicate that the frequency and severity of urge incontinence episodes are substantially reduced (see Cochrane [19] review).

Because S3 sacral stimulation has no appreciable mortality, it has essentially replaced clam cystoplasty and detrusor myomectomy in patients with severe refractory detrusor overactivity.

Conclusions

Idiopathic detrusor overactivity is often very distressing for patients, because they cannot predict when they will leak. It is also rather frustrating for the clinician, because we do not yet understand the cause of the condition and we have no "cure." Patients need to be treated as sympathetically as possible, with careful bladder training and attempts to find the best therapy for each woman. Sacral nerve stimulation has recently superseded open surgery such as clam cystoplasty for severe cases. The patient should be told that a great deal of research is ongoing, to discover the cause and find better treatments for this problem.

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Chapter 8
Anal Incontinence and Disorders of Obstructive Defecation

Before moving on to surgical treatment of stress incontinence, or management of prolapse, we must briefly consider the disorders of defecation.

Many patients with urinary incontinence or prolapse have anal incontinence, recurrent straining with constipation, or other aspects of obstructive defecation. Because surgery may be considered for the defecation disorder, and in some pelvic floor units, these surgeries are performed simultaneously with bladder/prolapse procedures; such conditions are dealt with here.

Basic Physiology of Anal Continence and Defecation for the Gynecologist

Because the anal continence mechanism and the physiology of defecation are not part of normal registrar training in gynecology, the doctor who works in a urogynecology unit needs a basic outline before the treatment of defecation disorders can be understood.

Anal continence depends upon the following:

1. Stool consistency (watery diarrhea alone can cause incontinence)
2. The ability of the rectum to distend up to normal volumes

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3. The sensory input from the anal canal and rectum
4. The strength and innervation of the internal and external anal sphincters

The first problem is unique to the bowel (although infected urine can cause bladder incontinence). The second and third problems are rather like those seen in an overactive bladder, where the bladder wall may be noncompliant and the subepithelial nerves are dysfunctional. The fourth problem is rather like that of stress incontinence (weak sphincters), except that the anal sphincters are more complex.

Several theories exist as to the mechanism of anal continence. In the 1970s, the main theory was that the normal puborectalis muscle caused an acute anorectal angle so that during rises in intra-abdominal pressure, the rectum was forced down upon the anal canal, with a "kink" at the puborectalis muscle so that feces were denied access to the anal canal. Arising from this concept, the operation of postanal repair was developed, to restore the anorectal angle and improve continence. This operation is still performed today, although success rates are very variable (see below).

Later studies showed that continence was really dependent upon the sphincters and the puborectalis muscle acting together. When the pressure in the rectum rises, the contractility of the anal sphincters increases, by neurological mechanisms. Thus, operations to repair the anal sphincter, which do not increase the anorectal angle, also improve continence.

Even later, it was realized that continence also depends on awareness of rectal filling. This gives one the ability to distinguish whether the rectal contents are gas (when they could be passed in a private location, not necessarily a toilet) or feces, in which case the external sphincter can be contracted voluntarily while looking for a toilet. The anal canal is highly able to discriminate light touch, pain, and temperature. In contrast, the rectum is not very sensitive to these impulses. Instead, rectal sensation is conveyed by stretch receptors within the pelvic floor muscles that respond to the bulk phenomenon of rectal distension.

Distension of the rectum (by feces or flatus) causes relaxation of the internal anal sphincter, along with contraction of the external anal sphincter. This allows the contents of the rectum to enter the sensitive anal canal (but prevents escape of the contents from the anus). Once the contents enter the anal canal, the nerves sense whether gas or feces are present. This is called the anal sampling reflex.

The sensitivity of the anal mucosa declines with age and menopause, partly explaining the increasing prevalence of anal incontinence in older women. Obviously, there is no surgical cure for denervation/declining sensitivity of the anal mucosa.

Filling of the rectum is normally first sensed at volumes of 10–70 ml. Maximum capacity is about 300 ml. Rectal distension initiates contractions of smooth muscle in the rectal wall, which cause the desire to defecate at "fullness." This normal compliance of the rectal wall is reduced after pelvic irradiation, with inflammatory bowel disease, and sometimes after denervation following radical pelvic surgery.

Finally, strength and innervation of the sphincters are a vital component of continence. The internal anal sphincter (IAS) is continuous with the circular muscle in the wall of the rectum (see Fig. 8.1). It is in a constant state of tonic contraction, to promote continence. This provides the so-called high-pressure zone in the resting state, about 2 cm from the anal verge.

The high-pressure zone also receives a 15% contribution from the three "anal cushions" that have a rich arterial supply and behave like erectile tissue. They are engorged with blood when the IAS is relaxed and form a seal. Their pressure is higher in those with hemorrhoids and can be damaged by vigorous hemorrhoidectomy. Inadvertent division, or marked thinning, of the IAS (i.e., after some vaginal deliveries) is associated with fecal soiling in up to 40% of cases.

The external anal sphincter (EAS) is continuous with the puborectalis muscle (see Fig. 8.2). Although the EAS is striated muscle and is under voluntary control, it is also in a constant state of contraction to promote continence. During cough, the EAS tightens reflexively. Ultrasound studies of the EAS have shown that about 35% of women who delivered by forceps have

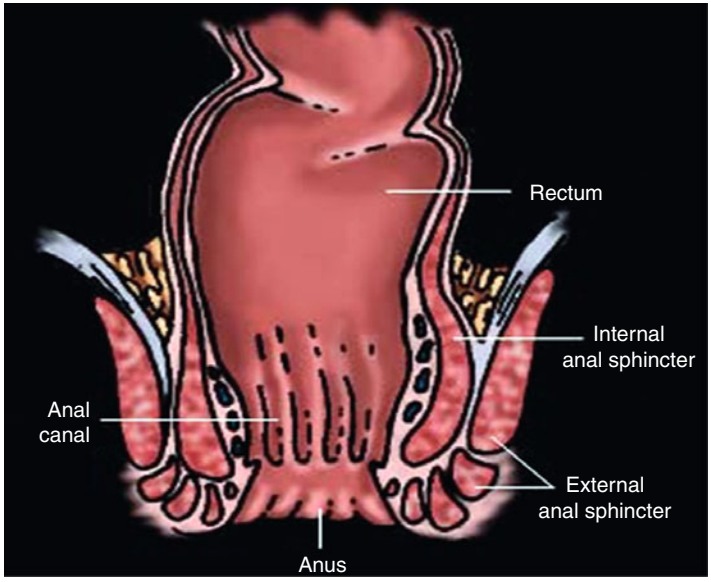

FIGURE 8.1 Anterior–posterior view of anorectal musculature

a partial or complete laceration of the EAS, which generally does not recover and also contributes to anal incontinence.

The motor innervation to the EAS is via the pudendal nerve. Prolonged bearing down in the second stage of labor is associated with a traction neurapraxia of the pudendal nerve, which may not recover. This partly explains the association between prolonged second stage and anal incontinence.

If rectal sensation is poor, and rectal compliance is reduced, and if the sphincters are also weak, then patients can experience anal incontinence before they even get the desire to defecate.

The Act of Defecation

The defecation mechanism is still not completely understood, despite extensive research:

Stool comes down from the sigmoid colon to the rectum, by peristalsis.

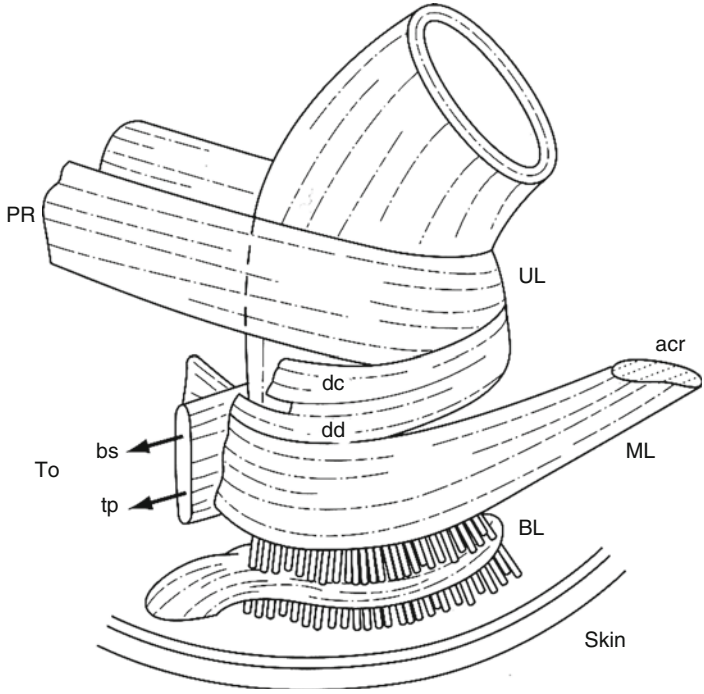

FIGURE 8.2 Lateral view of anorectal muscles. *PR* puborectalis, *UL* upper loop, *DC* decussating fibers of puborectalis that blend with the longitudinal muscle of the rectum, *DD* decussating fibers that join the perineal body, *ML* middle loop, *ACR* anococcygeal raphe, *BS* bulbospongiosus, *TP* deep transverse perinei, *BL* basal loop, perforated by fibers of the conjoint longitudinal layer (Reprinted with permission from Bogduk [2], Blackwell Publishing)

Stretch receptors in the pelvic floor detect the stool in the rectum, giving the urge to defecate.

The anal sampling reflex (internal sphincter relaxes, external sphincter stays closed) occurs; the anal mucosa senses whether stool or gas is present and conveys this to the brain.

If defecation is not socially convenient, the pelvic floor muscles and the puborectalis contract. This propels feces back

up into the sigmoid colon, and the internal sphincter contracts again.

Once the toilet is reached, the pelvic floor muscles are relaxed while sitting on the toilet, allowing the perineum to descend.

Both sphincters are relaxed. Puborectalis opens.

The patient gives a Valsalva maneuver to raise intra-abdominal pressure.

The bolus of feces is expelled. Upon completion, a closing reflex tightens the external sphincter.

Overview of Anal Incontinence

Anal incontinence is really "the last taboo." Patients are deeply ashamed if they soil themselves and usually consider it far worse than urinary incontinence. Questions must be phrased very tactfully; for example, do you ever lose bowel material on your underwear?

Anal incontinence is actually not uncommon. Large prevalence studies of community-dwelling women indicate that about 2–14% of women have anal incontinence, with up to 47% of those in nursing homes [13]. The most recent study indicates that 8.9% of noninstitutionalized women suffer from accidental loss of solid, liquid, or mucus incontinence in the month before questioning [13]. As can be seen from the discussion of the physiology of defecation, the pathophysiology of anal incontinence is often multifactorial. Full details about assessment of such patients are available in the text by Pemberton et al. [14]. The history assessment has been described in Chap. 1. The Wexner score should be used to measure severity of anal incontinence (shown in Chap. 5). Considerable detail about previous colorectal surgery, previous radiation, inflammatory bowel disease, etc., is needed. Physical examination requires attention to anal sphincter tone, perineal descent, pelvic innervation, etc.

We encourage any patient with regular fecal incontinence to be fully assessed by a dedicated colorectal surgeon. Such

a surgeon is part of our unit so that case notes and nursing staff are shared. On the other hand, patients with minor incontinence to flatus or rare incontinence to liquid stool may benefit from conservative pelvic floor muscle training [5].

The common tests of anorectal function for patients with anal incontinence comprise the following:

Anorectal manometry tests the magnitude of the resting anal pressure at the high-pressure zone (85% comes from IAS rhythmic slow wave contractions, 15% from tonic contraction of EAS). The most common method is a water-perfused catheter containing four recording channels, to detect pressure at various points along the rectum/anal canal, with a balloon at the end. After testing baseline resting pressures, the patient is asked to cough (pressures should rise briefly, to prevent incontinence) and then to squeeze the EAS, which gives the voluntary "squeeze pressure." The rectal balloon is then distended with fluid to elicit a brief drop in anal pressure, showing competency of the "sampling reflex."

Pudendal nerve conduction studies test the innervation of the sphincters, by measuring whether the time taken to conduct a stimulus is delayed (the conduction latency). A stimulating electrode, mounted on a gloved finger, is inserted into the rectum; the fingertip is placed on the ischial spine (near the pudendal nerve), with a recording electrode at the external anal sphincter. The latency is the time taken for the electrical stimulus to reach the recording electrode. The test requires an experienced person to produce reliable measurements, and thus some units have discarded it, although it was a standard test for many years. Allen et al. [1]. used this test to provide the first evidence of intrapartum damage to the pudendal nerve, although long-term follow-up showed that most patients' nerve conduction recovered over time. Prolonged straining at stool is also associated with prolonged pudendal nerve conduction times.

Single-fiber electromyography is another way of detecting nerve damage. Because denervation of a skeletal muscle is accompanied by reinnervation from neighboring axons, a single-fiber EMG electrode can detect multiple axons firing

within a small area of the muscle, to indicate that it has been damaged and then reinnervation has occurred.

Anal mucosal sensitivity testing tests the adequacy of anal sensation (that is needed for the anorectal sampling reflex). A ring electrode mounted on a Foley catheter is placed in the anal canal. A tiny current (up to 0.1 mA) is delivered: the patient states when she can feel a tingling sensation. Standard normal values have been derived.

Endo-anal ultrasound is now the best way to measure whether the sphincters are intact, using a rotating probe or a linear probe. Defects of the EAS are detected very accurately. This technique was used by Sultan et al. in a classic paper [16] to show that about 35% of parous women have defects of the EAS. This does not necessarily mean that they will respond to surgery.

Treatment of Anal Incontinence

Management involves a large range of conservative and surgical treatments. A short summary is provided; for details, see Norton et al. [13].

Pelvic floor muscle training is done to teach the patient to contract the external anal sphincter, similar to that in urinary incontinence [15]. Biofeedback is often used, by a rectal EMG sensing device, to enhance patients' awareness of their ability to contract [7]. Electrical stimulation of the muscle has also been used (as for stress incontinence). Success ranges from 12 to 90 % cure/major benefit for anal incontinence [5].

Regulation of diet to avoid watery stool is often successful for patients who only leak when they have liquid feces. Also, 2–3 dessert spoons of Metamucil or psyllium husks are dissolved in a small amount of water (100–150 ml) to thicken the stool.

The drug Imodium (loperamide) is also used to thicken the stool; it also increases the resting tone of the anal sphincters to promote continence.

Anal sphincter repair (sphincteroplasty) involves dissecting the damaged ends of the external sphincter, freeing them

up enough to be laid across each other and sutured, in an "overlap repair," although recent evidence indicates that the overlapping repair is not significantly better than the end-to-end repair [6]. When performed for obstetric lacerations of the sphincter, continence is achieved in about 80%. Success is best when the pudendal nerve to the sphincter is intact and the internal sphincter is not damaged.

Postanal repair involves plication of the puborectalis muscle posterior to the anorectal junction. The posterior aspect of the external sphincter is usually reinforced with sutures as well. The operation is designed to increase the anorectal angle (originally thought to be very important to the continence mechanism). Audit in the mid-1990s showed that less than 50% of patients have improved continence at 2 years, so the procedure is less commonly performed now.

The dynamic graciloplasty procedure involves taking a segment of gracilis muscle from the inner aspect of the thigh and then tunneling it under the pubic bone to wrap it around the anal sphincter. Because the gracilis is mainly a "fast-twitch" type II muscle that cannot maintain a contraction over time, an implanted electrical stimulator is applied to the muscle, to convert it to a slow-twitch postural-type muscle over 6 months. The patient uses a control device to turn off the stimulus in order to defecate. Initial data from 1999 indicated a 66% success rate [4].

Unfortunately, the "long-term" data at 2 years showed that only 15 % were continent 100% of the time and 42% had a >50% improvement. In the first large series of 121 patients, there were 211 adverse events, half of which required rehospitalization or repeat surgery [11]. The device has been withdrawn in the USA.

In the last decade, sacral nerve stimulation has become widely used for fecal incontinence. The procedure is as described for patients with detrusor overactivity in Chap. 7, except that after inserting the temporary stimulator (see Fig. 8.3), patients should keep a diary for at least 2–4 weeks because fecal incontinence is often erratic; thus, more time is needed to judge whether >50% benefit is occurring.

FIGURE 8.3 Sacral nerve stimulation

Implantation of the permanent device is identical [8]. Few long-term studies with objective data have been published, but in patients with a good response to the temporary stimulator who have the permanent implant, the Wexner score improves markedly, down from baseline 14–16 to a median of 1–3 [17].

Overview of the Disorders of Obstructive Defecation

In the urogynecology patient, the main problems comprise constipation, incomplete evacuation with a need to digitate the vagina, and post-defecation soiling. These symptoms often coexist with rectocele, but such patients are often referred to the colorectal surgeon rather than the urogynecologist.

Debate exists about who should manage rectocele. In our unit, such patients are often assessed jointly by the urogynecology team and the colorectal team, and then

a decision is made as to who should manage the patient. The colorectal perspective is given here, derived from experience in our unit.

Constipation

When patients complain of constipation, only about a third of them are actually concerned about infrequent defecation; the rest are worried about straining at stool or passing hard stools.

The definition of constipation has recently been standardized, now called the "Rome definition," as a patient who has two or more of the following, for at least 12 months, when not taking laxatives [3]:

Straining during >25% of bowel movements (BM)
Sensation of incomplete evacuation in >25 % of BM
Hard or pellety stools on >25% of BM
Less than three stools passed per week

It is useful to employ the Bristol Stool Chart to define what type of stool the patient passes (Fig. 8.4).

Other symptoms such as need to digitate to defecate, abdominal cramps, bloating, and so on do not feature in the Rome definition but help one to assess the severity of the constipation. Depending upon the definition used, constipation affects about 4% of the population but about 17% of those aged 30–64 and 40% of those over age 65. It is common in urogynecological patients.

Assessing the Causes of Constipation

Before one treats constipation, one must seek nonbowel (secondary) causes. Some can be reversed. Others indicate that management may be difficult. These include:

Endocrine causes: hypothyroidism, hypercalcemia, diabetic autonomic neuropathy
Neurological disorders: Parkinson's disease, multiple sclerosis, autonomic neuropathy

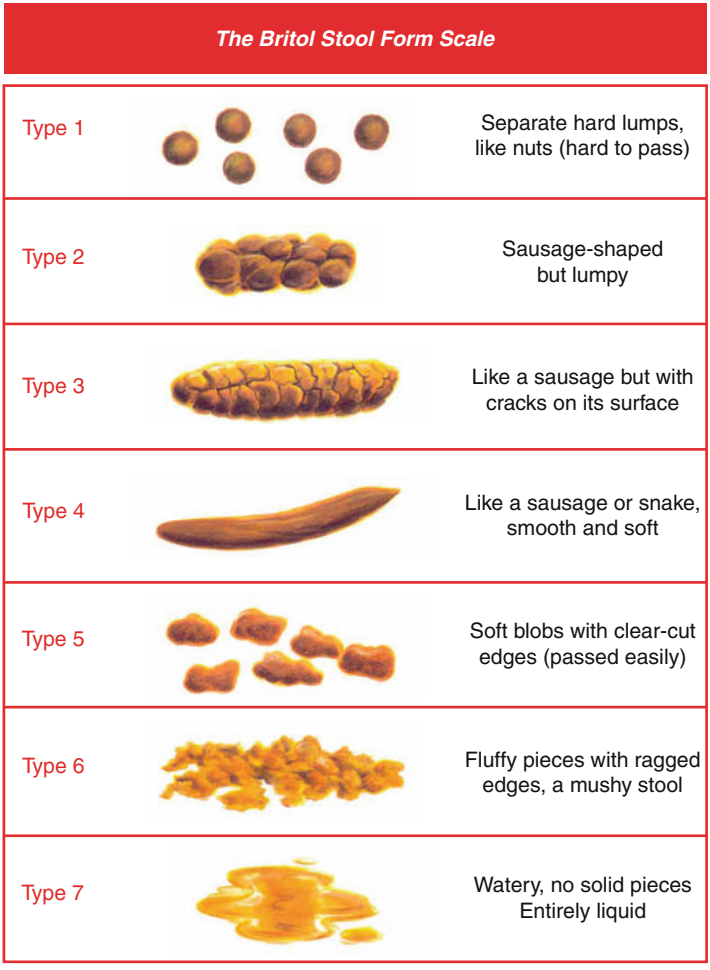

FIGURE 8.4 The Bristol Stool Chart (Reprinted by kind permission of Dr. K.W. Heaton, Reader in Medicine at the University of Bristol, Copyright 2000 Norgine Ltd.)

Psychiatric causes: depression, anorexia, sexual abuse
Narcotic analgesic drugs
Cardiac drugs (nifedipine, verapamil, disopyramide, amiodarone, flecainide)

Antidepressants (clomipramine, fluoxetine, venlafaxine, sertraline, paroxetine)
Tranquilizers (alprazolam, olanzapine, risperidone)
Lipid-lowering drugs (lovastatin, pravachol, cholestyramine)
Miscellaneous drugs: bromocriptine, valproic acid, ondansetron

Once secondary causes are excluded, other bowel disorders that can manifest as constipation should be considered, such as diverticulosis, polyps, stricture, ischemia/bowel obstruction, and malignancy. One is left with four main types of constipation:

Simple constipation describes patients who have a mild to moderate degree of difficult or infrequent passage of stool, which responds quickly to increased fluid/fiber intake.

Constipation–predominant irritable bowel syndrome includes such patients mainly complaining of abdominal pain, who are commonly young women, and is not considered further here.

Idiopathic slow-transit constipation is a rare disorder, generally affecting young to middle-aged women who seldom feel the urge to defecate and have a very poor response to laxatives or bulking agents.

Outlet obstruction/evacuation disorders comprise the following: *Rectal mucosal prolapse* is a surgical problem and not considered further here. *Intussusception* is a prolapse of the anorectal mucosa down into the anal canal; the functional significance of this radiological finding is controversial. *Anismus* is a condition in which patients have trouble emptying the rectum because they experience involuntary spasm of the striated pelvic floor muscles or of the puborectalis muscle (see below, under biofeedback therapy). *Rectocele* is a prolapse of the anterior wall of the rectum into the vagina.

The basic investigations that are used to distinguish these four types of primary constipation are as follows:

Anorectal manometry studies (as per fecal incontinence) but with the addition of a balloon expulsion test to elicit spasm of the striated muscles seen in anismus.

A colonic transit study involves the ingestion of radiopaque markers over 3 days; then, an abdominal X-ray is taken on day 4 (or later if markers still present). In normal patients, the gut

transit time is 36 h, so all markers should be expelled by day 4; a prolonged test suggests idiopathic slow-transit constipation.

A defecating proctogram (Fig. 8.5) is an X-ray test of the act of defecating a radiopaque porridge-like mixture. It identifies the site and size of rectocele (as well as other defects). If contrast material is trapped in the rectocele after defecation, this can also lead to post-defecation soiling (as the feces slowly seep out from the pocket).

Colorectal surgeons classify rectocele as low, middle, and high. Middle and high defects are more likely to be associated with enterocele and thus referred for gynecological repair.

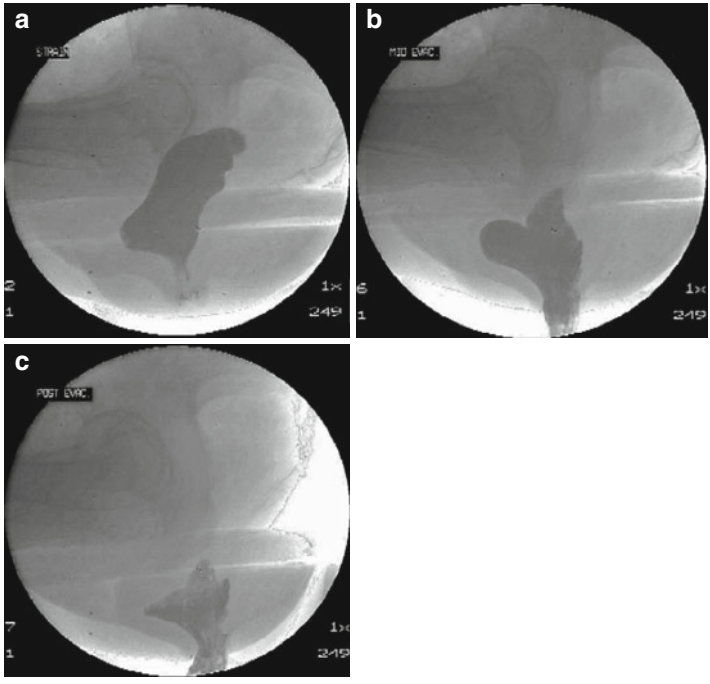

FIGURE 8.5 Defecating proctogram. (**a**) The bulging of the rectocele anteriorly into the vagina. (**b**) Defecation, with "holdup" in the rectocele. (**c**) Post-defecation film, with contrast trapped in the anterior rectocele

A low rectocele is more likely to be associated with scarring and shortening of the perineal body and anal sphincter; thus, colorectal surgeons commonly repair these defects.

Overview of Treatment of Disorders of Defecation

Simple constipation is treated as discussed in Chapter 2. A dedicated nurse continence advisor or continence physiotherapist can also help such patients to learn the correct position for defecation (feet elevated to accentuate relaxation of the anorectal angle) and modify their lifestyle so they have enough time to relax and defecate properly as soon as they have the call to stool. Postponement of the defecation impulse because of a busy schedule is a major factor in constipated individuals. See [12].

Constipation–predominant IBS is difficult to treat (not within the remit of this chapter).

Idiopathic slow-transit constipation, once suspected on the basic tests, requires a more complex study of colonic motility to elicit a reduction in myoelectrical activity as well as serious effort with laxative therapy. If this fails, surgical removal of the colon with ileorectal anastomosis may be indicated, although diarrhea may result. Sacral nerve stimulation is also showing promising results for this type of constipation [10].

Anismus is treated by biofeedback. Similar intrarectal EMG devices are used to help patients to relax their anal sphincters and puborectalis during the act of defecation.

Rectocele may be treated by transrectal repair; see Fig. 8.6. The advantage of the colorectal approach is that any associated anal sphincter defect can be repaired at the same time as the transanal repair. However, if the anal sphincter is intact, controversy exists about transanal repair because this approach requires the use of anal retractors, which may stretch the sphincters. Anal incontinence after transanal repair of rectocele can occur in up to 30% of patients, although 92–97% of

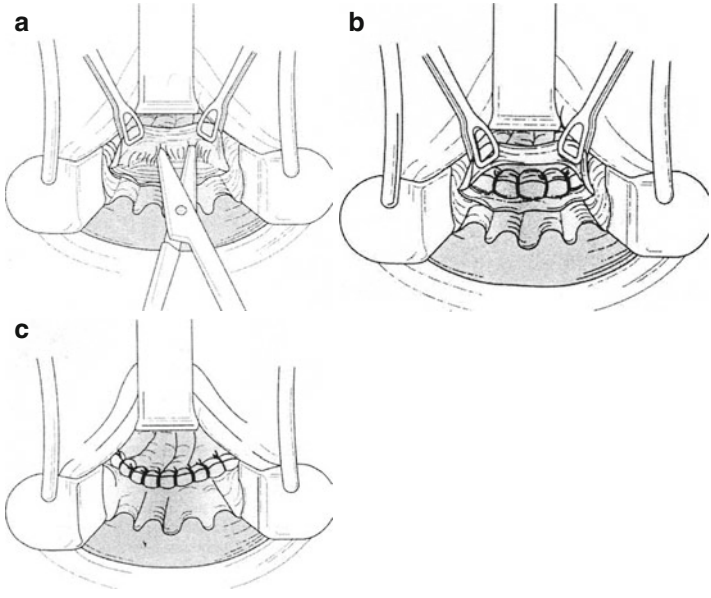

FIGURE 8.6 Transanal repair of rectocele. (**a**) A mucosal flap is raised around the anterior half of the anal canal. (**b**) The anterior rectal wall muscle is folded down to the distal anal canal and imbricated so as to abolish the rectocele sac. (**c**) The now redundant mucosa is excised; the new mucocutaneous function is restored across the anterior lumen of the anal canal (Reprinted with permission from Lawler and Fleshman [9]. Copyright 2002, Elsevier.)

patients will have complete resolution of the hernia defect, with resolution of the need to digitate in order to evacuate.

Conclusions

Anal incontinence and disorders of defecation are more common than is generally appreciated. Such problems need to be elicited carefully in urogynecology patients. If minor and rare, conservative therapy may help, but if the problem gives rise to major symptoms, full investigation is needed. Treatment may be carried out in conjunction with the urogynecological condition in certain cases.

A Note Regarding Obstetric Trauma as a Cause of Anal Incontinence

In the last 15 years, colorectal surgeons and obstetricians have become increasingly aware that the management of the second stage of labor has tremendous impact upon the likelihood of anal incontinence developing during a woman's life.

This subject is vast and controversial. It cannot be adequately dealt with in a short practical text. This does not mean it is not important. Registrars are strongly advised to read the classic text on this subject: Sultan AH, Thakar R Fenner DE, editors. Perineal and anal sphincter trauma. London: Springer; 2009.

The following is a list of some landmark papers that give an overview of the subject:

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Chapter 9
Surgery for Urodynamic Stress Incontinence

Introduction

Prior to the late 1960s, patients who leaked when they coughed usually underwent an anterior colporrhaphy (anterior repair) with a bladder neck buttress. Urodynamic testing was not commonplace until the late 1970s.

Once urodynamic studies were introduced, it was realized that coughing can provoke a detrusor contraction. Thus, many women who underwent anterior repair did not obtain cure (because they had an element of detrusor overactivity). This poor success rate was one of the reasons that gynecologists became interested in performing urodynamic tests (to improve their surgical cure rates) and was one stimulus to the establishment of urogynecology as a subspecialty.

Once a diagnosis of urodynamics stress incontinence has been made, without substantial voiding difficulty, any detrusor overactivity has been thoroughly treated; then this chapter describes the surgical options available.

Bladder Neck Buttress

This procedure is still used in highly selected cases. For example, if a woman mainly complains of prolapse due to cystocele but is found to have a minor element of stress incontinence on urodynamic testing, then it may be reasonable to perform this procedure. This is particularly true if an

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elderly woman with prolapse and stress incontinence is found to have an underactive detrusor at urodynamics; one may counsel her that a simple repair with buttress for her stress incontinence is not likely to cause voiding difficulty. The evidence for this comes from retrospective case series, rather than randomized controlled trial [13].

The bladder neck buttress involves the following (see Fig. 9.1):

- Inject local anesthetic with adrenaline into subcutaneous plane.
- Insert urethral catheter with 5 ml balloon (to delineate urethrovesical junction).
- Dissect vaginal epithelium off the bladder and proximal urethra.
- Use a small needle with 1 Vicryl or nonabsorbable suture.
- Place three mattress sutures at the bladder neck and proximal urethra to plicate (or buttress) the periurethral fascia that borders the levator hiatus.

The goal is to assist closure of an open bladder neck, but if done correctly, it will also elevate the urethrovesical junction in the retropubic space. This procedure was first described by Kelly in 1913, who reported an initial subjective success rate of 90 %, but this decreased to 60 % subjectively continent over 5 years.

For further details of associated anterior repair for cystocele, see Chap. 10 (prolapse). For postoperative management of voiding function, see "Colposuspension" below.

Colposuspension

From about 1970 until the late 1990s, the most common procedure for USI was the colposuspension. This is still a very useful procedure if the patient requires an abdominal procedure for some other reason.

The procedure is mainly indicated for USI in the presence of urethral hypermobility. If previous surgery has created a fixed, nonmobile urethra, consideration should be given to

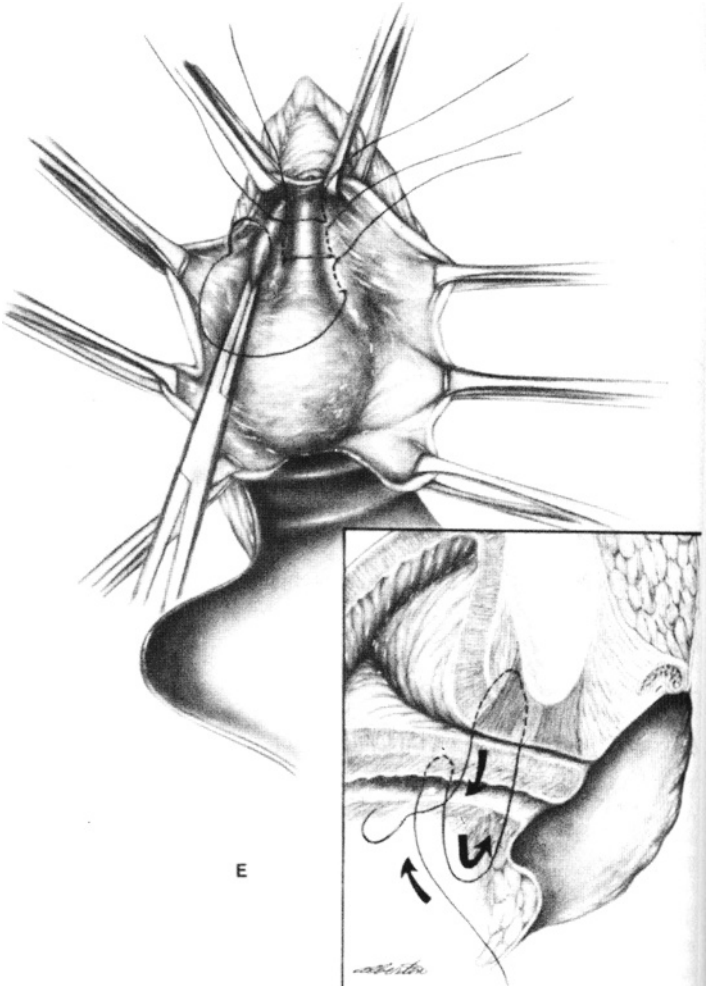

FIGURE 9.1 Bladder neck buttress procedure. The sutures pass deeply through the periurethral endopelvic fascia on the posterior aspect of the symphysis pubis (*arrow*) (Reprinted with permission from Thompson and Rock [28])

performing an abdomino-vaginal sling or injecting collagen (but see discussion of TVT). The colposuspension is also highly effective in correcting cystocele.

Preoperative Consent Discussion

Before consenting a patient for colposuspension, ensure that she understands fully the 5–15 % risk of developing de novo detrusor overactivity. Patients can be very distressed if they have an operation because they leak when they play tennis but afterward have to void frequently and leak with unpredictable urge, not to mention nocturia. Such angry patients are commonly referred to a tertiary urogynecology unit!

Also, ensure that the patient understands the 2–5 % risk of longer-term voiding dysfunction (with approximately 0.5 % risk of clean intermittent self-catheterization, CISC). Some urogynecologists ask the patient to meet with a nurse continence advisor to explain CISC before carrying out the operation.

Postoperative Convalescence

This is similar to abdominal hysterectomy, for example, the first week at home should be spent in quiet leisure (reading books, watching TV, etc.). The next 5 weeks are "light duties" (including driving locally, ordinary shopping, with regular rest periods). At 6 weeks, normal activity resumes (including intercourse, swimming, light gym exercise) but with no heavy lifting for a further 6 weeks.

Patients want to know the chance of failure. Objective success rates depend very much on the outcome measure chosen. The original series by Burch [5] revealed a cure rate of 93 % ($n = 143$) at approximately 2 years, as judged by a stress test at 250 ml and a lateral X-ray with a metal bead chain in the urethra (to look for stress leak or an open bladder neck). The cure rate at a mean of 14 years follow-up (range 10–20 years, $n = 109$) was 80 % on 1-h pad testing [2].

The Technique of Colposuspension

This involves the following (see Fig. 9.2):

Place a 14–16-gauge catheter (easy to feel vaginally) in the urethra.

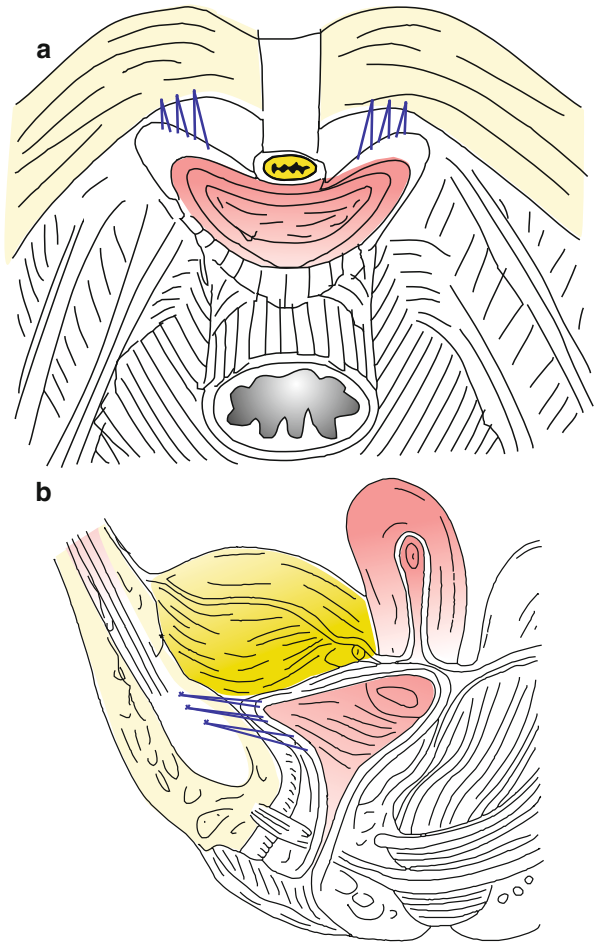

FIGURE 9.2 Three permanent sutures are (**a**) placed through the endopelvic fascia on each side of the urethra and (**b**) passed through the iliopectineal ligament of Cooper

Inflate 5-ml balloon (30-ml balloon is too big, will get in the way).
Make a Pfannenstiel incision.
Access the retropubic space (the Cave of Retzius).

By careful dissection (to avoid large veins in this region), expose the back of the pubic bone and the lateral aspects of the urethra.
The right-handed operator double gloves and places the left hand in the vagina.
With fingers on either side of the catheter in the vagina, define the urethrovesical junction (at the balloon).
Place three Ethibond J-shaped sutures on either side of the urethrovesical junction.
Attach each suture to the iliopectineal ligament at the back of the pubic bone.
With the surgeon's left hand lifting up the vagina, the assistant ties the sutures onto the iliopectineal ligament.
The surgeon dictates the degree of tension so as not to overcorrect (tissue should not be taut, just comfortably elevated).
Insert a drain to the retropubic space.
Insert suprapubic catheter and empty the bladder (no vaginal pack).

Immediate Complications of Colposuspension

- Hemorrhage into the retropubic space, with a transfusion risk of about 0.5 %
- Trauma to the bladder (inadvertent cystotomy) requiring repair and subsequent urethral catheter for 7–10 days, approximately 2–3 %

Long-Term Complications of Colposuspension

Enterocele or rectocele (7–17 %) (but 25 % at 14 years [1])
Dyspareunia (4 %) because of acute retropubic angle of the anterior vaginal wall
Detrusor overactivity (5–15 %) (but note 22 % incidence in Langer et al. [16])

Recurrent bacterial cystitis (1–2 %) (but 5 % at 12 years, Langer et al. [16], and at 14 years [2])
Voiding difficulty (2–5 %)

Postoperative Management for Colposuspension

Free drainage of SPC for 36–48 h; patient unlikely to void due to pain of incision over this time frame.
Commence trial of void at approximately 36 h, if patient is ambulant.
Once residual volumes is less than 100 ml on three consecutive occasions, usually by day 5 post-op, remove suprapubic catheter.

Double Voiding Technique

- If residuals are gradually getting lower but still not <100 ml at day 4–5, teach patient to:
  - Void the first time in normal position.
  - Stand up and rotate the pelvis a few times to stimulate the afferent nerves.
  - Sit down and lean forward with elbows on knees.
  - "Drop" or purposefully relax the pelvic floor muscles.
  - Remain so for 2–3 m, perhaps read a magazine, and await further flow.

This often will produce another 50–100 ml, sufficient to give residual <100.

How to Manage Short-Term Voiding Difficulty

Note that the literature often does not define what is meant by "voiding difficulty." In this text, "short-term voiding difficulty" means the management of a temporary suprapubic catheter

(SPC), or self-catheterization, for up to 4 weeks. "Long-term voiding dysfunction" means that the temporary SPC required removal, and thus CISC was instigated, from 4 weeks to permanently.

If patient is not voiding to completion by fifth postoperative day and not suffering from persistent wound pain (hematoma/ infection), able to defecate fully (no impacted feces or perineal pain from other repair), urine is not infected, double-emptying technique is being used, but otherwise well and ready to plan discharge from hospital:

Discard the drainage bag.

Attach a Staubli valve or Flip Flow valve (Fig. 9.3) to the SPC.

Teach patient to record own voided volumes and residual volumes on chart.

After training for 12–24 h, using a "witches' hat" graduated collecting device placed in the toilet (Fig. 9.3).

FIGURE 9.3 Witches' hat urine collection device and Staubli/Flip Flow valves

Send her home for 3 or 4 days to continue trial of void in home toilet.
Review back in clinic in 3 or 4 days with her residual volume chart.
Majority of patients will void well with this method.

How to Manage Long-Term Voiding Dysfunction

- If unable to void after 2–3 weeks of home trial of void, the SPC site will become inflamed and painful.
- If patient is almost voiding normally, flucloxacillin 500 mg TDS may help to preserve the SPC for a few more days.
- After this, patient should be trained in clean intermittent self-catheterization (CISC), by a specialist nurse continence advisor because the SPC site will become inflamed.
- Follow-up with a voided volume and residual chart, kept for 24 h prior to each visit, should be every 2 weeks thereafter. If the bladder is kept well emptied by CISC, spontaneous resolution of the voiding dysfunction often occurs over 3 months.
- Bad prognostic features are:
  - Patients with previous pelvic radiotherapy
  - Patients taking psychotropic drugs with anticholinergic properties
  - Patients who have undergone radical bowel resection with denervation of pelvic nerves

The Abdomino-Vaginal Sling

Also known as the pubovaginal sling, this procedure is the time-honored operation for patients with previous failed continence surgery, particularly if:

There is persistent hypermobility on vaginal examination and videourodynamics (VCU).
If the urethra is fixed in the retropubic space (on VE and VCU) but the urethra closure pressure is low (below

20 cm) or the Valsalva leak point pressure is low (below 60 cm), then the abdomino-vaginal sling is worthwhile.

Note that if the urethra is fixed in the retropubic space but the urethral closure pressure or Valsalva leak point pressure is normal, then collagen/Macroplastique injections may be worthwhile; see later section this chapter.

Preoperative Consent Discussion

This discussion is similar to that for the colposuspension, except that risk of voiding difficulty/dysfunction is probably higher, mean of 12.5 % (range 3–32 %); risk of de novo detrusor overactivity is similar (mean risk 10 %, range 4–18 %). The objective success rate after previous failed procedures is 86 % (all data from Jarvis [13]).

After a procedure involving a Pfannenstiel incision and a vaginal incision, the first "quiet" week of the convalescence period should probably increase to 2 weeks, but light duties should still be appropriate at 6 weeks.

The abdomino-vaginal sling procedure entails the following (see Fig. 9.4):

Insert 16-G Foley catheter into bladder with 5 ml balloon.

Make a wide Pfannenstiel incision.

Harvest a strip of rectus abdominus fascia 13 × 2 cm; wrap in moist gauze.

Dissect down to the retropubic space as for a colposuspension.

From below, incise the anterior vaginal wall as for an anterior repair but should only need to dissect about 3 cm below the urethrovesical junction.

Working on a flat sterile surface; insert nylon 1.0 sutures to the four corners of the rectus sheath strip.

Insert a long narrow Bosman's packing forcep downward from the retropubic space into the vagina, emerging at

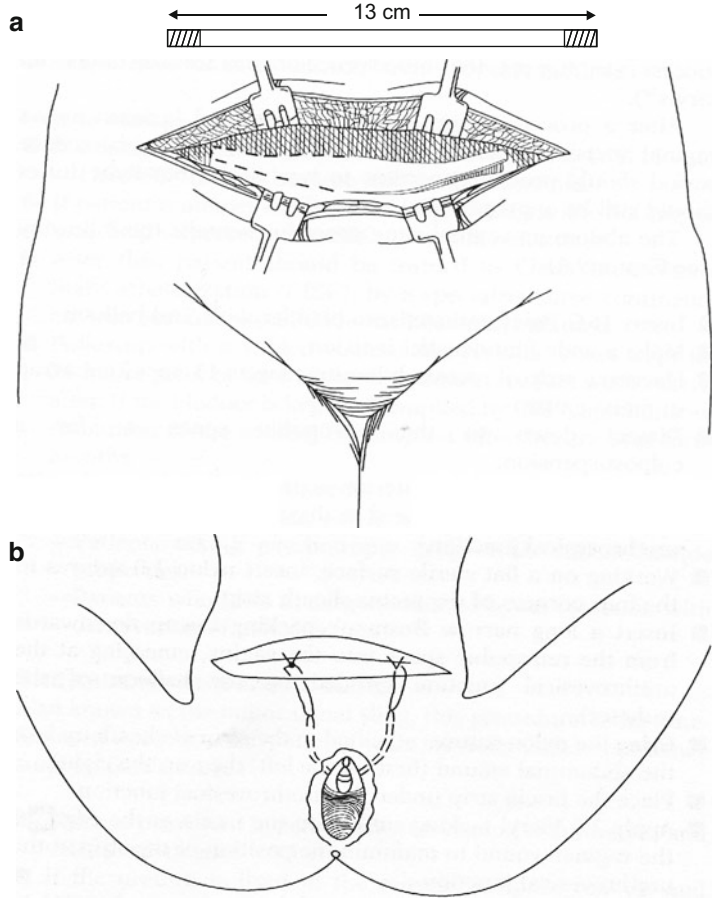

FIGURE 9.4 (**a**) Harvesting a strip of rectus abdominus fascia 13×2.5 cm. (**b**) Placement of autologous sling under urethra and then attachment to rectus abdominus under minimal tension

the urethrovesical junction (guided by the balloon of the catheter).

Bring the nylon sutures attached to the strip of sheath up into the abdominal wound (first on the left, then on the right).

Place the fascia strip under the urethrovesical junction.

Apply 2.0 Vicryl tacking sutures to the fascia at the edges of the vaginal wound to maintain the position of the strip at the urethrovesical junction.
Lift the nylon sutures into the abdominal wound so as to place the fascial strip just under the urethra, with absolutely no tension.
Tie the nylon sutures at the four corners of the strip to the rectus abdominus fascia.
Close the abdominal and vaginal wounds in the traditional fashion.
Insert SPC. Insert drain to the retropubic space. Pack is not mandatory.

Postoperative management is as for a colposuspension. Some surgeons perform this sling procedure using artificial mesh, but most prefer to harvest the patient's own (autologous) fascia. The relative risk of mesh erosion using artificial mesh has not been well published; there are no randomized trials.

Historical Note: Stamey Needle Suspension and Raz/Pereyra/Gittes Procedures

In 1973, Stamey described a minimally invasive procedure to correct stress incontinence. This involved two passages of a long needle behind the pubic bone; after the first pass, a polypropylene suture was threaded through the needle. An arterial graft pledget was threaded onto the vaginal end of this suture (Fig. 9.5). A second pass of the needle brought the suture back up behind the pubic bone, capturing a thick bridge of periurethral tissue; the suture was tied over the rectus sheath (then repeated on other side). The Raz, Pereyra, and Gittes modifications did not use the nonabsorbable pledget.

Initially, the results of these procedures showed great promise, with 2-year objective cure rates of 70–86 % in the early 1990s Jarvis [13]. However, over time, these cure rates were not sustained. For example, 130 patients reviewed at 5.5 years revealed a cure rate of 50 %, but 11.5 % had never

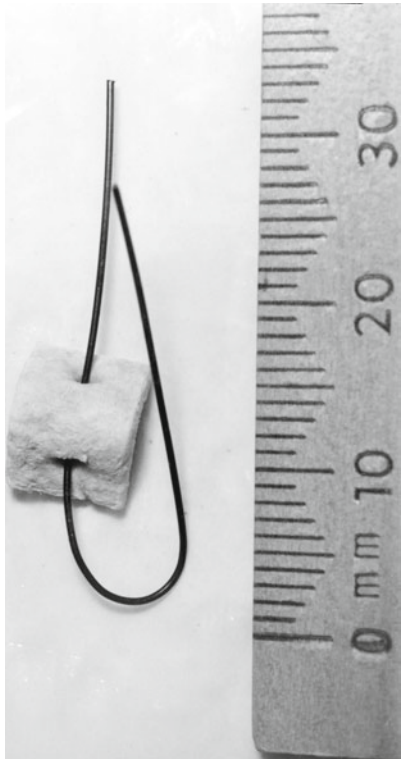

FIGURE 9.5 Stamey bladder neck suspension pledget removed from the vagina of a patient 3 years after the procedure

become continent, and 38.5 % had recurrence 6–90 months after the procedure Conrad et al. [7]. Of 30 patients (interviewed and 1-h pad test) at 10 years, only 30 % remained both subjectively and objectively dry Mills et al. [19]. It was thought that the pledgets/sutures had pulled through the periurethral tissue. Postoperative weight gain was associated with a higher failure rate. In a small percentage of cases, the pledget later eroded through the periurethral tissue and migrated into the vagina (Fig. 9.5).

These procedures are not considered further in this text but illustrate the importance of long-term scrutiny of the efficacy of any new surgical procedure. Beware rapid introductions of new operations!

Paravaginal Repair

The paravaginal repair is regarded as an alternative method for repair of cystocele but has also been used to treat USI—see Chap. 10 on prolapse. As regards USI, a single report showed a 97 % subjective cure of stress incontinence at 3–4 years follow-up. Objective tests were not performed Shull and Baden [25].

Laparoscopic Colposuspension

The laparoscopic colposuspension was first described in 1991. A review of 27 studies of the procedure between 1991 and 1998 ($n = 1{,}024$) showed that only four studies used objective outcome measures, yielding a cure rate of 75 % (range 60–89 %) at a mean follow-up of 19 months (range 6–36 months, Chaliha and Stanton [6]). Ten randomized controlled trials have now compared this operation with the open colposuspension. Overall, the objective cure rate (cough stress test or pad test) at 18 months was significantly lower for the laparoscopic operation (RR 0.91, 95 % CI, 0.86–0.96), which was also shown in the studies that judged success on urodynamic testing. The risk of bladder injury for laparoscopic cases was 3 % (0–10 %). Since the advent of the TVT, use of this operation when no other laparoscopic procedures are to be performed is not recommended by the Cochrane Review or the International Consultation on Incontinence [26] and is hard to justify, considering the expense of the equipment/disposable items and questionable/unknown long-term success rates.

The TVT and Transobturator Tape

The tension-free vaginal tape procedure has changed the management of USI. As originally designed, it is performed under local anesthetic, and most cases can be performed as an outpatient procedure. For a registrar training in "the TVT era," it may be hard to understand just what a revolution has

taken place. For 30 years (late 1960s to late 1990s), the colposuspension was the "gold standard" continence procedure. Although highly effective, it involved a 5-day stay in the hospital, a 10–15 % chance of detrusor overactivity, and a 2–5 % chance of voiding difficulty (as above), not to mention the usual 6 weeks postoperative convalescence.

As outlined, the arrival of the Raz/Stamey/Pereyra/Gittes procedure brought the prospect of freedom from the Pfannenstiel incision and avoidance of prolonged convalescence. Unfortunately, these operations did not stand the test of time.

As will be shown, we now have 11-year objective data for the TVT, revealing similar efficacy to the colposuspension.

Preoperative Consent Advice

The TVT confers a 5–6 % risk of detrusor overactivity and a 1–2 % risk of short-term voiding difficulty, with a 0.5 % risk of long-term voiding dysfunction. Postoperatively, patients should rest for 1 week or until comfortable, then light duties for 3 weeks.

The TVT under local anesthesia (LA) involves the following (see Fig. 9.6):

- Prepare 100 ml of LA solution, for example, prilocaine 0.25 % or Naropin 0.2 % with 1 ml of 1/1,000 adrenaline.
- Anesthetist to give antibiotic prophylaxis against the insertion of a mesh into vaginal environment and administer midazolam or propofol IV infusion for sedation.
- Empty the bladder.
- Inject LA above the pubic bone, into the retropubic space (21-gauge spinal needle), then underneath the pubic bone, then into the anterior vaginal wall, 2 cm below the urethra.
- Vertically incise the anterior vaginal wall, 2 cm below the urethra, for about 1.5 cm.
- Dissect under the vaginal skin, toward the pubic bone, left and right.

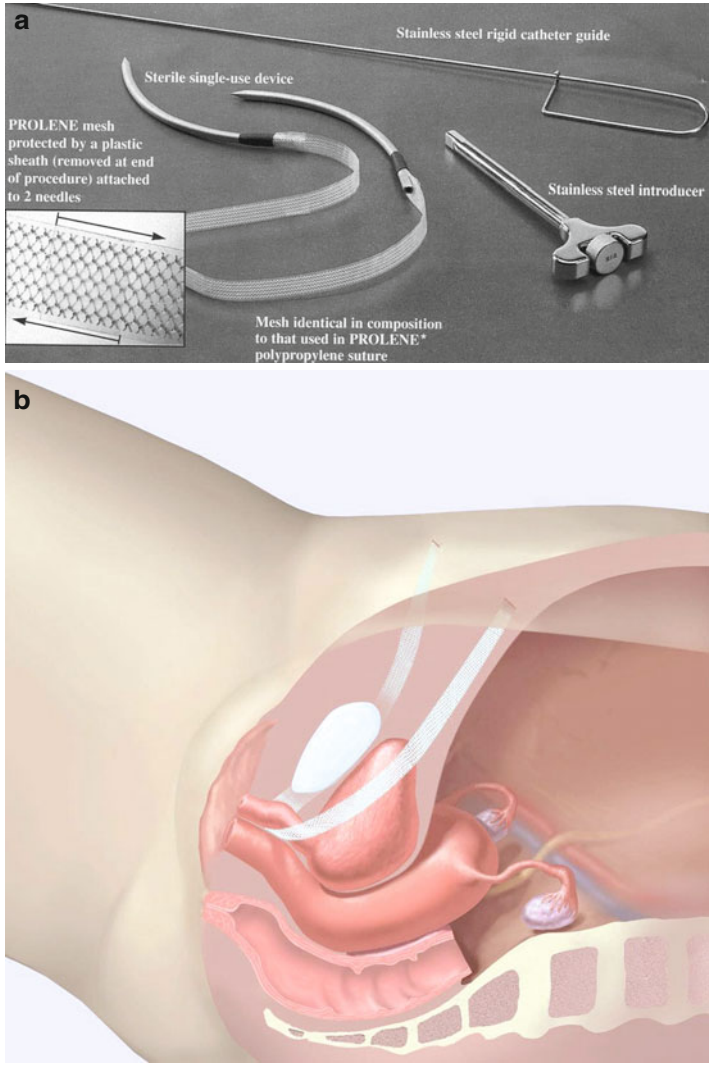

FIGURE 9.6 (**a**) TVT tape, guide wire, and introducer device. (**b**) Lateral view of TVT tape under the urethra (Reprinted with permission from Gynecare)

Make a 1-cm incision at the suprapubic LA insertion sites, bilaterally.
Insert guide wire into 16-G Foley catheter and pass into bladder.
Assistant holds the guide/catheter to the ipsilateral side for insertion of TVT tape, to move the urethrovesical junction out of the way.
Assemble the TVT introducer (Fig. 9.6a).
Hold edge of vaginal incision with fine Gillies forceps; insert TVT needle into incision.
Direct needle about 30° to the lateral; aim upward toward the abdominal wound.
Push needle firmly through the urogenital diaphragm, under strict control.
Drop the handle of the introducer so the needle is felt to be running up the back of the pubic bone. Very gradually advance the needle up in the retropubic space until it emerges at the abdominal wound.
Perform cystoscopy to ensure no needle puncture of bladder; empty bladder.
Repeat procedure for the other side.
After second cystoscopy, do not empty bladder.
Stop IV sedation; prepare patient to cough.
Elevate tape so it lies just under urethra (Fig. 9.6b), but insert fine scissors between tape and urethra.
Patient coughs repeatedly; gradually elevate the tape so that only a few drops of fluid spill over the edge of the meatus at the height of the cough (no projectile spurt).
Assistant removes plastic covers of the tape while surgeon holds scissors to maintain tape position under the urethra (otherwise, removal of the plastic tape covers can cause further elevation of the tape itself).
Empty the bladder; close all incisions. No pack. No catheter.

Is the Cough Test Necessary?

The very name of the operation, "tension-free vaginal tape" was based on meticulous attention to placing the tape so that

a drop of urine was just seen at the meatus during the cough test. However, an RCT of 93 women with 2-year follow-up revealed that not using a cough test did not affect any of the objective outcome measures [20].

Postoperative Instructions

The patient should drink as much as she desires but not force fluids. She should void whenever she feels the desire, not at a set time. If she has not voided within 4 h, bladder scan to check volume.

After each void, check residual. If two residuals are less than 100 ml and patient is comfortable, discharge home. If residuals are greater than 200, insert Foley catheter overnight; remove 6 A.M.; restart.

If residuals >100 ml but <200 ml, ask patient to double void and rescan; generally residuals will be less than 100 after a double void. Patient should be taught this technique.

Once patient voids completely and is comfortable, discharge. Review at 6 weeks: repeat uroflowmetry/post-void ultrasound residual to check for asymptomatic voiding difficulty.

Outcome Data for the TVT

The first objective report of medium-term follow-up (3 years) showed a dry rate on pad test of 93 % Ulmsten et al. [29]. Five-year follow-up showed 85 % objective cure rate Nilsson et al. [21], with the same authors finding a 91 % objective cure rate on pad test at a mean of 11 years (subjective cure 77 %) [22]. In this report, the de novo rate of OAB symptoms was 4.7 %. Tape exposure occurred in 3.1 %, requiring resection/ closure in 1.6 % due to discomfort. A recent abstract of 11-year data showed similar results. The largest RCT [30] showed no significant difference between the TVT and the colposuspension at 6 months and at 2 years [Ward and Hilton, 31].

Controversy still exists about the importance of performing the procedure under local anesthetic. As mentioned, the

cough test was shown on RCT not to affect continence outcomes or risk of voiding dysfunction. The efficacy of TVT in the low-pressure urethra appears to be lower than in primary procedures (37–86 % cure versus 88–94 % cure in primary cases). For full review, see Atherton and Stanton [4].

The risks of TVT include:

Intraoperative perforation of bladder (4–6 %)
Retropubic hematoma (2.4 %)
De novo detrusor overactivity (5–6 %)
Urinary tract infection (4–17 %)
Short-term voiding difficulty (2–3 %)
Long-term voiding dysfunction (<0.5 %)
Tape exposure (3.1 %)
Tape resection due to discomfort (1.6 %)

From manufacturer's log of rare complications in 260,000 cases:

- Bowel perforation 0.007 % (three deaths worldwide)
- Major vascular injuries 0.012 % (two deaths worldwide)
- Urethral penetration 0.007 %

Some surgeons manage short-term voiding difficulty by cutting the tape; the optimum time for performing this is controversial. Continence is often preserved because the lateral arms of the tape have already become enmeshed in the periurethral tissue, providing residual support.

The Transobturator Tape

Because the TVT involves penetration of the retropubic space "blindly" (without direct vision), the above small but important risks of bowel/vascular injury are not unexpected. The transobturator tape was developed partly to avoid these risks and partly to avoid the risk of penetrating the bladder in the retropubic space (thus, cystoscopy was thought to not be required, and operating time is shorter).

In 2001, Delorme [9] introduced the transobturator tape (TOT) in which a spiral-shaped needle applicator penetrates the upper margin of the obturator foramen and then is passed to the suburethral space (see Fig. 9.7, the so-called "outside

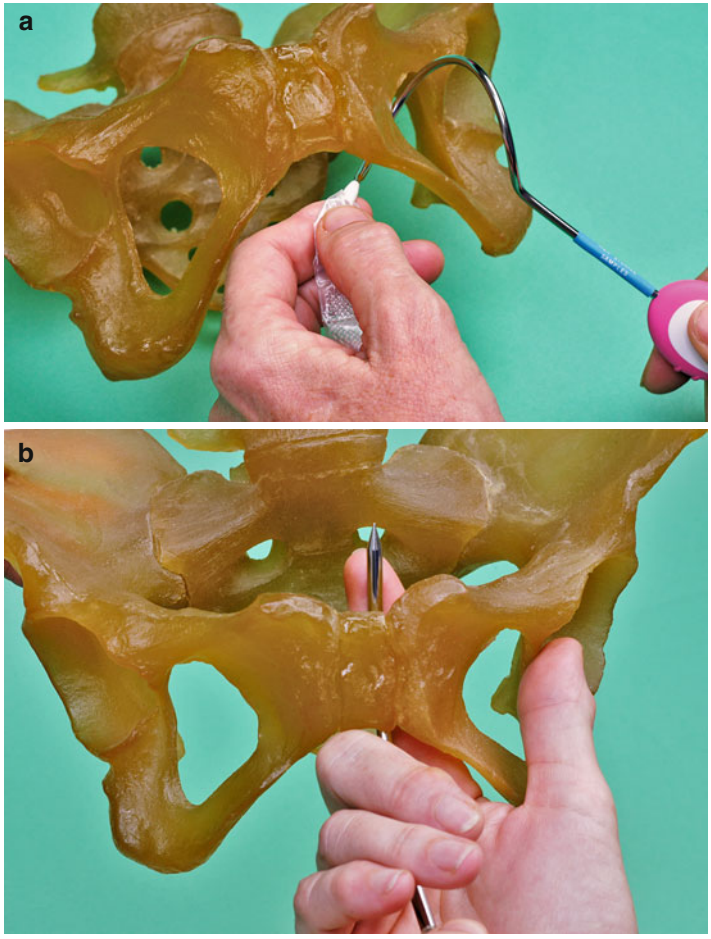

FIGURE 9.7 (**a**) Insertion of transobturator (Monarch) tape into the obturation foramen ("outside in"). (**b**) Comparison of insertion of TVT into retropubic space

in" approach). De Leval then modified the procedure in 2003 [8] to be an "inside out" approach called the TVT-O, whereby the inner aspect of the obturator foramen is penetrated from within the vagina.

Both the TOT and the TVT have been the subject of numerous RCTs comparing the new procedure with the TVT (see Smith et al. [26]). In many trials the outcomes are not significantly different. Only Araco et al. [3], who performed stratified randomization between mild and severe incontinence, showed 100 % cure for the TVT versus 66 % cure for TVT-O in those with severe incontinence. The most recent example of this is Laurikainen et al. (2011) [17] , a 5-year study of TVT versus TVT-O, comprising 273 patients reviewed at 5 years in which the pad test was negative in 89 and 93 % of TVT and TVT-O, respectively.

As regards the issue of severe stress incontinence versus mild, Schierlitz et al. [24] recently performed an RCT of women with a low-pressure urethra (MUCP < 20 cm), comprising 164 women at 3 years. The primary outcome was symptomatic stress incontinence requiring repeat surgery, which occurred in 20 % of the women who had a Monarc TOT versus 1.4 % in the TVT group. They concluded that tests seeking a low urethral closure pressure should be used to determine the correct minimally invasive sling. Other considerations are that pain at the site of the adductor longus insertion on the inferior ramus of the pubic bone is problematic in the transobturator procedures, and the risk of mesh erosion is also greater than TVT at 6.2 % Duval et al. [10].

A Word About the New "Mini-slings"

In the last 3–4 years, a variety of new "mini-slings" have been introduced, which do not require passage into either the retropubic space or the obturator foramen. Rather, the short mesh tape is inserted into the suburothelial fascia on either side of the urethra. It was hoped that these new procedures would be outpatient procedures with absolutely no risk of

voiding dysfunction. Unfortunately, a systematic review of 9 studies of these slings has shown a much higher failure rate with a relative risk of repeat surgery of 6.72, CI 2.39–18.89, so they have shown no useful benefit, [1] and most urogynecologists do not employ these new devices.

The Use of Bulking Agents for USI

Bulking agents such as GAX collagen, Macroplastique, and Durasphere are attractive because they can be performed as a day-only or outpatient procedure, have minimal risk of provoking voiding difficulty, and can be performed under local anesthesia with sedation. Unfortunately the cure rate for this procedure is variable, depending upon the agent used, the type of stress incontinence, and the number of repeat injections.

Controversy exists as to whether bulking agents should be reserved for patients with a relatively fixed bladder neck, mostly after previous continence surgery. This is probably the "standard teaching," although several trials demonstrate reasonable improvement rates in patients with a hypermobile bladder neck.

A further controversy concerns whether patients with a low urethral closure pressure (<20 cm) should be offered bulking agents. Gorton et al. [11] showed clearly that the success rate over 5 years was significantly poorer when GAX collagen was used in women with a low urethral closure pressure. The median duration of continence for those with a low-pressure urethra was 15 months, compared to 72 months in the remainder. On Cox regression analysis, a low-pressure urethra was strongly predictive of failure ($p = 0.03$). Such data are not known for the other agents.

The procedure involves injecting approximately 4–6 ml of the bulking agent into the midurethra, under the mucosa, via cystoscopic needle, either transurethrally or periurethrally so as to "bulk up" the midurethra (Fig. 9.8).

The main features of each bulking agent are as follows.

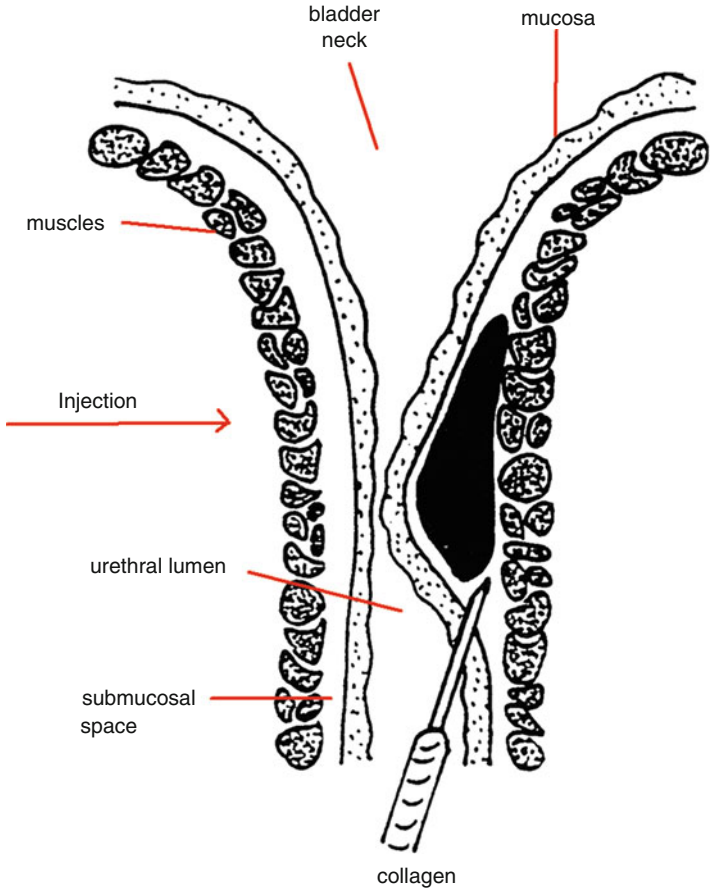

FIGURE 9.8 Bulking agent injected into the submucosa

GAX Collagen (Contigen)

This is made of bovine dermal collagen, cross-linked with glutaraldehyde, to reduce antigenicity, first described in 1989.

- Allergic reactions to the bovine material do occur so that skin testing is required 30 days beforehand to exclude allergic response in each patient.

- Collagen is inserted under cystoscopic control—either via a trans-perineal approach, using a spinal needle, to inject periurethrally, or using a specialized cystoscopic needle, to inject transurethrally.
- Most surgeons inject at 6 o'clock, then 9–10 o'clock, then 2–3 o'clock.
- Each ampoule contains 2.5 ml of GAX collagen and costs approximately 1,200 euros.
- Because bovine collagen is degraded over time, incontinence often recurs at about 2 years; thus, "top-up" doses are commonly performed.
- Most reports of efficacy do not use objective measure.
- Khullar et al. [14] showed that (on 1-h pad test) in a group of 28 elderly women (age >62, mean 76), 76 % were cured at 1 month, falling to 48 % at 2 years. The effect of urethral closure pressure upon success was not discussed; 16/28 had undergone previous continence surgery.

Macroplastique

This is a hydrogel-suspended cross-linked polydimethylsiloxane elastomer (silicone rubber particles), first described in 1991.

Because the particles are 100–450 μm in diameter, they do not migrate and are quickly encapsulated in fibrin.

It is not known to produce allergic reaction.

Initially, injection was via cystoscopic needle, transurethrally or trans-perineally, at 2, 6, and 10 o'clock. Each vial costs 320 lb; two are normally used.

In 2000, a simple applicator with specialized needle was described (see Henalla et al. [12]) which avoids the need for cystoscopic visualization of the injection site (Fig. 9.9). A specialized injection gun is also provided.

On subjective score, 74 % of 40 women were dry at 3 months Henalla et al. [12].

Using objective urodynamic measures, 59 % of 32 women were dry at 12 months; 28 of these had undergone previous continence surgery Koelbl et al. [15].

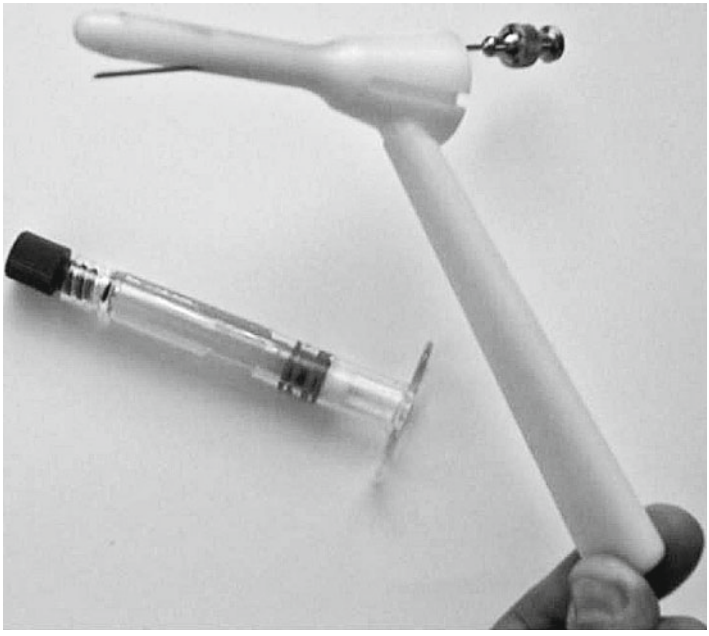

FIGURE 9.9 Macroplastique application device

Postoperative short-term voiding difficulty and detrusor overactivity do occur with this procedure, although less commonly than for other procedures. For full review, see ter Meulen et al. [27]

Durasphere

This is a suspension of carbon-coated zirconium beads, first reported in 2001.

It is not known to be allergenic.

Using the Stamey score to grade incontinence (a nonvalidated measure), 80 % of 176 women had "improvement" of at least one Stamey grade at 12 months

(versus 69 % of 188 women given GAX collagen; difference not significant) Lightner et al. [18]. Long-term studies involving objective outcome measures are awaited.

The Cochrane Review of periurethral injection therapy for urinary incontinence [Pickard et al. 23] found insufficient evidence to recommend this as a first-line therapy (implying that it should be reserved for those with previous continence surgery). The current Cochrane Review Web site does not give an overview of the efficacy of injectables as a whole; only small reviews about technical matters are given. Overall, none of the comparative trials revealed significant differences between the different agents in terms of efficacy. In a patient with comorbidity that precludes anesthesia, bulking agents "may represent a useful option for relief of symptoms for a 12 month period although repeat injections are likely to be required to achieve a satisfactory result." [23]

Conclusions

The surgical management of USI has advanced tremendously in the last two decades. Each procedure still has risks, requiring meticulous preoperative counseling. The most appropriate procedure must be chosen for each patient, considering her previous surgical history, her willingness to undergo minimally invasive versus major surgery, and her perioperative risk factors. Careful and sympathetic management of postoperative detrusor overactivity, voiding dysfunction, and rarer complications, is vitally important.

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Chapter 10
Management of Prolapse

Uterovaginal prolapse is very common. The largest epidemiological study to date ($n = 1{,}547$ women interviewed, age 15–79) showed that 8.8 % had symptomatic prolapse and a further 23 % had undergone some form of prolapse surgery MacLennan et al. [12].

Nonsurgical Management Options

Until recently, the treatment of symptomatic prolapse has been considered to be largely surgical, with vaginal rings offered to those who were unfit for anesthetic. However, the *median* lifespan of women in developed countries is now around 83 years old, so many women live well into their 90s. Thus, prolapse is becoming more common. Patients with mild symptoms and mild–moderate prolapse often ask whether they "need" surgery.

There are few data to guide such patients. If a patient has mild asymptomatic prolapse, dealing with the precipitating factors (as per Chap. 1), along with a pelvic floor training program (Chap. 6), may be sufficient. One long-term study of women with asymptomatic rectocele who had no treatment over a median of 8 years found that only new-onset constipation provoked worsening of the prolapse on physical exam [26].

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As regards the use of physiotherapy, a large RCT of pelvic floor training versus a leaflet about lifestyle advice has just been concluded in 447 women with mild to moderate prolapse (POPQ stage II 74 %, remainder stage III or stage I). In the active group (4–5 physiotherapy visits over 12 weeks) assessed at 6 months, there were highly significant improvements in symptom severity, quality of life test, and desire for further treatment, compared to control. The change in POPQ was moderate ($p = 0.052$) [8].

Use of Ring Pessary

In patients with symptomatic prolapse, who decline to have or are totally unfit for surgery, a vaginal ring pessary is very useful in selected cases. The main reasons for which patients are totally unfit for surgery are as follows:

- Severe respiratory embarrassment, unable to lie flat without dyspnea
- Transplant patients with pelvic kidney, on immunosuppressive drugs
- Severe Alzheimer's disease, unable to tolerate hospitalization
- Morbid obesity, poor surgical access to the vagina
- Unstable heart disease
- Recurrent thromboembolic events, multiple previous stroke

Patients may decline surgery if they are an elderly sole caregiver for an ill husband or if they are sole caregiver for a disabled relative with no suitable respite care. Some women have had unpleasant surgical or anesthetic experiences and do not want another surgical episode. These reasons should be respected, especially if a ring pessary can be easily fitted.

Traditional vaginal ring pessaries (Portex) come in a range of sizes, from 56 to 100 mm diameter. Fitting a ring pessary is like assessing cervical dilatation in labor ward. Insert two

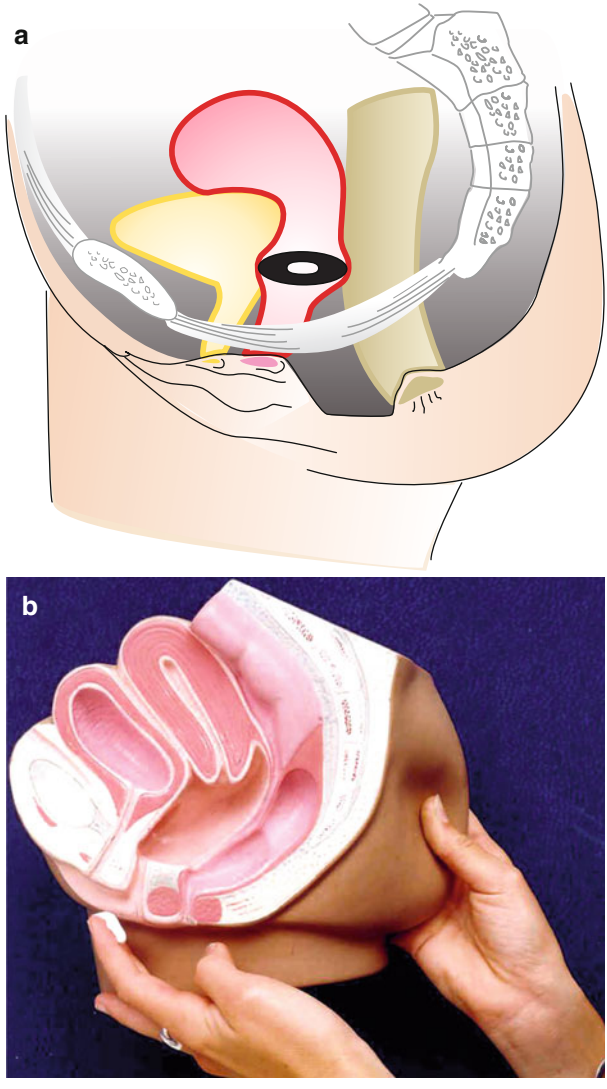


FIGURE 10.1 (**a**) Portex ring pessary sits anteriorly behind the pubic bone and posteriorly rests on the perineal body. (**b**) Information diagram about applying Ovestin cream for prolapse

fingers into the vagina, spread them apart, and mentally measure the vaginal diameter. In the United States and Australia, Gellhorn pessaries are used for large prolapse, and in the United Kingdom, shelf pessaries are also used. The ring pessary sits anteriorly behind the pubic bone and posteriorly rests on the perineal body.

Hence, if the perineum is very deficient, a ring pessary may not "sit" properly and be extruded during defecation. In a series of 100 patients with prolapse in the United States, 73 % could be fitted satisfactorily [Clemens et al. 5]. A deficient perineum with large introitus was often associated with failure.

In some cases, it may be possible to overcome this by fitting a "double ring," using the largest ring possible in the upper vagina and the next smaller ring beneath it. This will not solve the problem if the patient has had multiple previous surgeries with scarring/thickening of the walls and vaginal shortening—such women are often very difficult to fit.

Topical vaginal estrogen cream (e.g., Ovestin) should be used three times weekly because the ring pessary is a foreign body which may increase desquamation of the vaginal epithelium, leading to a watery creamy discharge (see Fig. 10.1b). It is traditional to change the ring every 4–5 months, to inspect the vagina to ensure no major vaginal inflammation is occurring. In a snugly fitting pessary, when Ovestin is not used, or when the pessary is not changed regularly, there is a recognized incidence of vaginal bleeding. If this occurs, remove the ring, ask the patient to cleanse the vagina with salt baths twice daily for 5–7 days, and apply Ovestin nightly for 3 weeks. If there is an associated purulent discharge, metronidazole 400 mg TDS for 7 days will resolve this.

A recent long-term study of 167 women using vaginal ring pessaries up to a median of 7 years showed that over time about 45 % of women may experience bleeding, infection, or both. These women were having the ring changed four monthly; we now teach women to self-insert and remove more often [18].

Surgery for Cystocele

The opening paragraph of the relevant chapter in a World Health Organization monograph on incontinence states that "experts and the majority of published literature suggest the anterior wall is probably the most challenging part of prolapse to cure" Brubaker et al. [4]. This is largely because there are few structures to "anchor" on to. Unlike repair of posterior wall prolapse, in which one can suture onto the sacrospinous ligament or the presacral ligament on the sacral promontory, the pubourethral/pubocervical fascia and paravesical fascia on the undersurface of the pubic rami may be thin and weak. The main surgical options for repair of the anterior wall (also known as the "anterior compartment") comprise:

- Anterior colporrhaphy with plication of the pubourethral and vaginal fascia
- Anterior colporrhaphy with more vigorous plication of subpubic fascia
- Paravaginal repair (either vaginal or abdominal approach)
- Use of mesh to reinforce the anterior colporrhaphy

Anterior Colporrhaphy

The anterior colporrhaphy for cystocele is performed as follows (see Fig. 10.2a):

- Inject local anesthetic with adrenaline into subcutaneous plane of anterior wall.
- Dissect vaginal epithelium off the bladder and proximal urethra.
- Plicate the paraurethral and paravesical tissue with a sagittal tier of horizontal mattress sutures, without tension.
- Trim the redundant vaginal skin sparingly and close.
- Insert pack and suprapubic catheter.

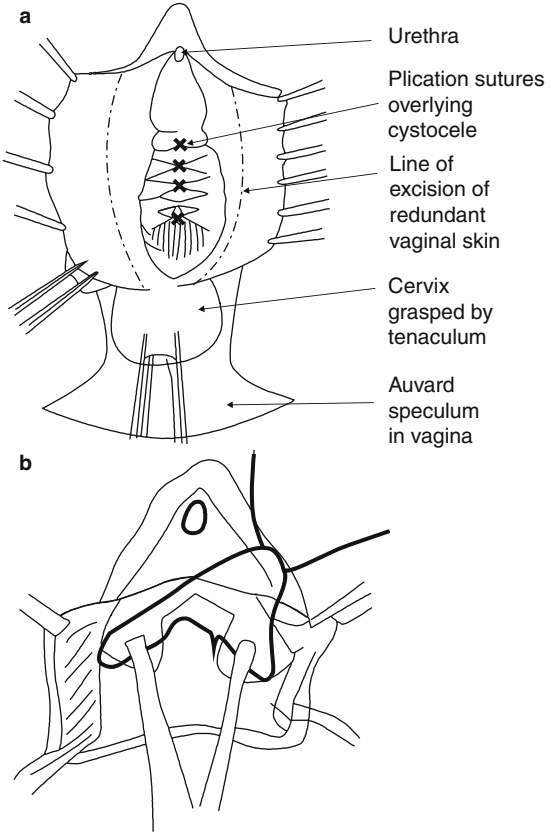


FIGURE 10.2 (**a**) Routine anterior colporrhaphy. (**b**) Ultralateral Anterior Colporrhaphy. (**c**) Four-cornered mesh kit

The Anterior Repair with Extensive Plication (Ultralateral Anterior Colporrhaphy)

The procedure starts with same dissection of vagina from bladder.

In this case, dissect well back into the pelvis; get under the pubic symphysis.

Place delayed absorbable vertical mattress sutures into the pubourethral/pubocervical or paravaginal fascia that borders the levator hiatus (underneath the pubic bone) to plicate this tissue across the midline under moderate tension, thus replacing the bladder into the abdominal cavity.

Closure with trimming of vaginal skin is identical to anterior colporrhaphy.

A similar procedure involving plication of the pubourethral "ligaments" has been recommended by Nichols [16]; see Fig. 10.2b.

The recurrence rate for cystocele after routine anterior colporrhaphy is up to 40 %. Few series of the more vigorous ultralateral approach have been published. The procedure remains popular because of minimal surgical morbidity.

Paravaginal Defect Repair

This has been the subject of several publications in the last two decades, but these often consider it as a treatment for stress incontinence, rather than for cystocele alone. Because effective operations are available for USI, but cystocele remains a difficult area, a long-term follow-up study of paravaginal repair for cystocele alone is needed.

The paravaginal defect can be repaired transabdominally or vaginally. Most gynecologists would be reluctant to perform an abdominal procedure for an isolated cystocele. If cystocele coexists with stress incontinence, then the colposuspension

is highly curative of both. Therefore, transabdominal repair of paravaginal defect is not considered further (but see Shull [19]).

The vaginal approach to paravaginal defect repair is somewhat "challenging," inasmuch as the obturator internus muscle must be identified first by palpation and then by inspection, so the white line of the arcus tendineus fasciae pelvis can be identified. This involves use of specialized illuminated retractors, to deflect the bladder into the midline. To date, no randomized controlled trials have evaluated the vaginal or abdominal paravaginal repair for cystocele.

Use of Mesh for Cystocele Repair

In 1997, Olsen et al. published a widely cited article showing that 30 % of women who had prolapse surgery in northwest USA ended up having repeat prolapse surgery at some stage [17]. If one reads the article carefully, actually many of the subjects had surgery for incontinence, not prolapse. Also, Olsen did not state whether the repeat surgery was necessarily for a recurrence of the same prolapse or a newly developed prolapse in a different vaginal area. Nevertheless, many gynecologist felt that prolapse surgery needed to be made more durable, and mesh was therefore increasingly employed.

Use of mesh to reinforce the anterior wall has been evaluated by several randomized controlled trials recently. The first compared simple anterior repair, versus anterior repair including use of polyglactin (Vicryl) mesh, versus "ultralateral" anterior repair, in 83 patients reviewed at 2 years. Results (using POPQ and symptom score) revealed that 30 % of the anterior repair group, 42 % of the repair plus mesh, and 46 % of the "ultralateral" repair patients achieved normal vaginal anatomy (POPQ stage 0 or 1). This definition of "cure" is quite strict. The authors pointed out that anterior colporrhaphy often simply does not replace the midpoint of

the vagina to a level 3 cm above the introitus. Nevertheless, they concluded that the addition of mesh did not significantly improve cure rates [Weber et al. 25].

An Italian study of polypropylene (Prolene) mesh repair for cystocele in 32 women, at a mean follow-up of 1.5 years, found that dyspareunia was increased by 20 %; 6.5 % of women had mesh erosion. Despite a 94 % anatomical cure rate (using POPQ), the authors concluded that the use of Prolene mesh repair of prolapse should be abandoned because of associated morbidity [Milani et al. 14]. Use of Atrium polypropylene mesh in 64 women with cystocele in Australia yielded 4.7 % erosion rate and recurrence at 2 years in 10 % [Dwyer and O'Reilly 6]. All of these series varied in the selection of patients (primary versus previously failed prolapse surgeries). Over the decade of these published series, the implementation of mesh into a repair had changed. Initially, a square piece of mesh was sutured at the four corners into the vaginal vault, in the manner of Hung et al. [9]. However, a variety of mesh "kits" became available, which are anchored into the vagina by mesh arms protruding from the four corners of the central mesh (See Fig. 10.2c). A high-quality RCT Altman et al. [1] recently showed that in 389 women with primary prolapse, Gynecare Prolift Anterior mesh yielded an 82 % anatomic success compared to 47 % of those having native tissue repair.

These kits were much easier to insert than using the 4-corner suture method; thus, the use of mesh for cystocele repair became increasingly popular. Unfortunately, vaginal mesh is associated with a 5–15 % risk of mesh erosion with a weeping discharge and vaginal discomfort. About 5–10 % of patients experience dyspareunia/apareunia, and some are not able to sit down comfortably. Removal of mesh from the vagina can be quite difficult and sometimes requires more than one operation. In mid-2011, the Food and Drug Administration of the USA issued a product warning regarding the use of vaginal mesh. The FDA was concerned because there had been

1,503 adverse event reports from Jan 2008 to Dec 2010, which was a fivefold increase in such reports over the previous triennium. While this report was perhaps rather strongly worded (see Web site link: http://www.fda.gov), it would seem that use of mesh for primary prolapse repair needs careful discussion with the patient and informed consent must be meticulous. Several authors are currently endeavoring to develop a risk of recurrence score, based upon factors such as a large genital hiatus [23] or a complete avulsion of the subpubic attachment of the levator ani [15], which can be used to select primary prolapse in which mesh would confer a significant advantage. A recent editorial in *International Urogynecology Journal*, entitled "To mesh or not to mesh?," gives an excellent summary of the current situation [21].

What Is the Value of Manchester Repair/Retention of a Nonprolapsed Uterus?

In a patient with a cystocele, in whom the cervix is bulky, protuberant, and somewhat elongated, without evidence of actual uterine descent, a Manchester repair may be useful. This comprises anterior colporrhaphy with amputation of the cervix as well as using sutures from the transverse cervical ligaments to enhance elevation of the upper vagina.

The Manchester repair (Fig. 10.3) was developed in the 1950s, at a time when anesthetic risks were greater than now. Thus, a simple procedure to remove an offending organ (the bulky protuberant cervix) without the prolonged anesthesia of a vaginal hysterectomy was attractive.

As anesthetic agents/morbidity improved, a concept evolved that if any part of the uterus/vagina was prolapsing, it should be removed/repaired. The extra time required for a vaginal hysterectomy was no longer an anesthetic issue.

In the last decade, greater scrutiny has been given to the concept of "If any part of the uterus prolapses, remove it all." A gradually increasing perception of vault prolapse has pervaded the urogynecological community. Laparoscopic procedures to suspend the uterus from the presacral ligament in

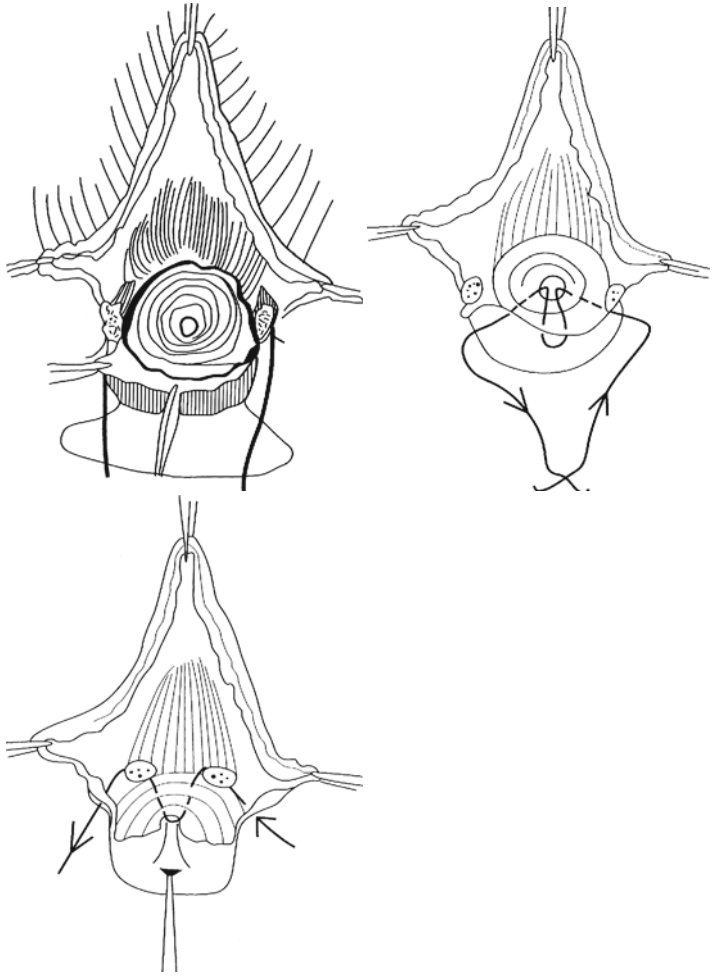


FIGURE 10.3 Posterior Sturmdorf suture in the Manchester repair. After amputation of the cervix, seen in (**a**), then the posterior leaf of the vaginal vault is brought up over the posterior cervix, and the Sturmdorf suture is used to fix the vault to the cervix while leaving the cervical os patent (**b**). The transverse cervical ligaments are then plicated (**c**) to facilitate elevation of the uterine body within the pelvis

cases of prolapse (laparoscopic hysteropexy) have been the subject of sporadic reports. Because no large clinical trials have been reported, this procedure is not further discussed. Nevertheless, gynecologists have perhaps appreciated that women do not want their uterus removed unless the evidence proves this will give the best result. Inasmuch as we do not know how to predict vault prolapse, a "fallback" approach may be to leave the uterus intact unless it is truly prolapsed.

Of course, the converse argument is that one is leaving a potentially malignant organ (the uterus) in situ. Furthermore, because one cannot guarantee that the cervix is completely removed, Pap smears are still required after Manchester repair.

Nevertheless, the Manchester repair has been used for 60 years and is worth consideration in selected cases.

The Manchester repair is as follows:

Inject local anesthetic into the anterior and posterior walls of the cervix.

Circumferentially incise the cervix, as for the commencement of a vaginal hysterectomy, but simply amputate the cervix (Fig. 10.3a).

Push up the bladder anteriorly.

Use curved Kocher's forceps to clamp the transverse cervical ligaments.

Suture with No. 1 Vicryl and place ties on Kryal's forceps.

Perform a posterior Sturmdorf suture to cover the posterior cervix with vaginal epithelium but leave the os patent (see Fig. 10.3b). Then, plicate the transverse cervical ligaments (Fig. 10.3c).

Carry out anterior colporrhaphy, but when closing the anterior leaves of the vaginal skin, the lower margin of the skin is again used to cover the cervix, to the level of the os.

Preoperative Consent Discussion for Anterior Compartment Repairs

Consent discussion involves routine discussion of mode of anesthesia to be chosen and the risks of hemorrhage, infection,

and vaginal scarring. The risk of voiding difficulty is small. If anterior repair is performed in isolation, a urethral catheter may be sufficient, especially if no bladder neck buttress suture (described in Chap. 10) is needed. For patients having cystocele repair combined with other procedures, a suprapubic catheter is usual; hence, trial of void protocol should be explained. In patients having mesh inserted, risk of erosion must be explained.

Postoperative convalescence depends on whether other procedures are performed: if an isolated anterior repair, patient should rest for 1 week, then have light duties for 4 weeks, and avoid heavy lifting for another 4 weeks.

Surgery for Rectocele/Deficient Perineum

Before embarking upon a "posterior repair," check whether the patient truly has:

- A deficient perineum, requiring perineorrhaphy.
- An isolated rectocele, requiring posterior colporrhaphy, which may just involve the lower third of the rectum or the hernia may include the mid rectum and the upper rectum. The latter is often associated with enterocele.
- Or both of the above.

For example, in Chap. 2 (Fig. 2.2b), a patient with an isolated rectocele was shown. As discussed, depending upon symptoms, she may be better served by a transanal repair, with no disruption of her intact perineum (Chap. 8, Fig. 8.5).

Note that the deficient perineum and low rectocele are usually associated with insufficiently repaired obstetric lacerations, whereas the mid/high rectocele is often associated with constipation.

In the 1950s, the standard repair of low rectocele (posterior colporrhaphy) and deficient perineum (perineorrhaphy) involved plication of the edges of the levator ani, known as "levatorplasty." In 1959, Jeffcoate [10] published a series revealing that 50–60 % of patients undergoing this procedure

experienced dyspareunia, especially when the levatorplasty is extended upward to repair a defect of the middle third of the rectum (pre-rectal fascia).

Subsequent anatomical studies revealed that the rectovaginal septum is a sheet of fibroelastic tissue between the rectum and vagina, which is often torn during parturition or repeated straining at stool. Repair of this layer does help to correct rectocele but does not cause dyspareunia. Much has been written about this subject, which is beyond the scope of this text. See Nichols and Randall [16] for full discussion.

A Repair for Mid–Low Rectocele and Deficient Perineum

- Inject local anesthetic into the subepithelial plane of the posterior vaginal wall.
- Decide the lateral margins of the repair.
- The final opening should admit two or three fingers easily.
- A midline vertical incision is made, up to the apex of the rectocele.
- The vaginal skin is dissected off the rectovaginal septum.
  - If a low rectocele only, and levatorplasty is desired by the surgeon, dissect out as far laterally as possible, to reach the medial margins of the levator ani and the terminal ends of the bulbocavernosus and transverse perineal muscles in the lower vagina/perineum.
  - The fascia of the rectovaginal septum is closed over the low rectocele using mattress sutures laterally from left to right.
  - Interrupted sutures of No. 1 Vicryl are taken deeply through the medial borders of the perirectal fascia and levator ani from left to right, to tighten the muscles and fascia over the defect in the lower rectal wall (Fig. 10.4).

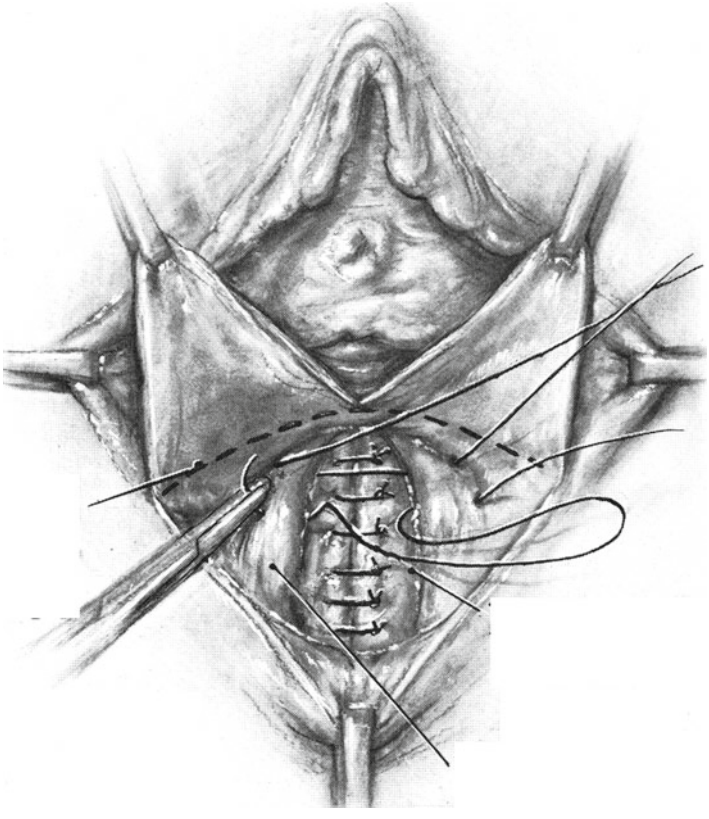


FIGURE. 10.4 Posterior Colporrhaphy

- The perineum is then reconstituted, by placating medial fibers of the pubococcygeus muscles and reuniting torn fibers of the superficial transverse perineal muscles.
- The redundant vaginal mucosa is excised with care.
- The vaginal epithelium is closed.

The concept of site-specific defect repair of the rectovaginal septum has become more widely accepted since its introduction in the early 1990s. In brief, anatomical dissections

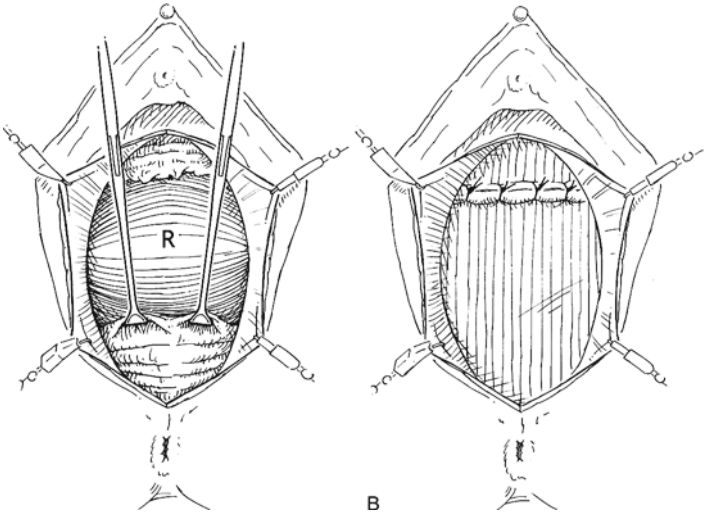


FIGURE. 10.5 Example of site-specific defect repair (Reprinted from Grody [7, p. 969])

have indicated that lateral or "hockey-stick"-shaped tears in the rectovaginal septum (also known as the fascia of Denonvilliers) are important in the genesis of rectocele and that specific reconstitution of this layer is an important part of rectocele repair. The septum should also be re-attached to the perineal body (during its reconstitution). For full details, see Grody [7]. Certainly, in mid and high rectocele, such site-defect repair is important (Fig. 10.5).

Surgery for Enterocele

This is one of the most controversial areas in urogynecology. At the level of the pre-membership registrar, the question is whether to perform:

- A routine posterior colporrhaphy with ligation of the enterocele sac
  A vaginal sacrospinous fixation
  An abdominal sacrocolpopexy using mesh attached to the sacrum.
  The judgment as to which is best depends upon:
  The frailty of the patient
  Whether the patient wishes to be sexually active
  Whether the enterocele is primary or follows previous surgery
- Whether a concomitant vaginal or abdominal procedure is required
- Whether previous vaginal repair has rendered the vaginal introitus firm, so that a vaginal procedure would necessitate reentry into an adequately built-up perineum

In a frail patient who does not wish sexual activity, posterior colporrhaphy with enterocele sac ligation is appropriate, unless this is a recurrent large enterocele, in which case sacrospinous fixation is probably necessary.

In a fit, sexually active woman with a primary enterocele, the vaginal approach via sacrospinous fixation would be chosen by most surgeons. Others would argue that the higher long-term failure rate of the sacrospinous fixation indicates that, especially in younger women, an abdominal sacrocolpopexy should be performed. In our unit, we would not normally undertake an abdominal incision in an active young woman, as a primary procedure. In the case of recurrent enterocele (after previous repairs, but certainly if a sacrospinous fixation has failed), abdominal sacrocolpopexy is generally chosen, unless the woman is quite elderly/frail and prefers to have a repeat vaginal sacrospinous fixation (after appropriate counseling). The other choice in a frail woman is colpocleisis (obliteration of the vagina). Note that vaginal mesh kits are available for use in the posterior vaginal wall

but yield an unacceptably high risk of dyspareunia and are not considered further in this pre-membership textbook.

For details of colpocleisis and enterocele sac ligation, see standard gynecology texts such as Te Linde [22].

Vaginal Sacrospinous Fixation

This involves the following:

- Assess where the apex of the vagina will lie by grasping the apex with an Allis forceps, then reducing it into the vagina, placing it at the level of the ischial spine.
- Leave about 2 cm of vaginal tissue intact at the apex so as to be able to run the two pulley sutures under this segment of intact vagina (this segment will then be fastened to the sacrospinous ligament; see Fig. 10.6).
- Dissect the posterior vaginal wall, as for commencement of posterior colporrhaphy.
- Just to the right of the midline, dissect deep into the perirectal space.
- Gently dissect with the index finger a window in the rectal pillar, allowing one to palpate the ischial spine directly; then, gradually enlarge the window to admit both index and third fingers.
- Insert the two pulley sutures (1 nylon and 1 PDS) onto sacrospinous ligament at a point two fingerbreadths medial to the ischial spine (to avoid the pudendal nerve and vessels).

Older textbooks feature suture placement under direct vision, using a Miya hook. A much simpler technique is to use a Schutt arthroscopic needle holder (also called a Caspari needle holder) shown in Fig. 10.7. The thread is fed through the device and caught between the two fingers as it emerges from the ligament. The Cappio disposable device is similar.

- Before tying down the pulley sutures, commence closure of the apex vaginal skin for about 3 cm (this section will

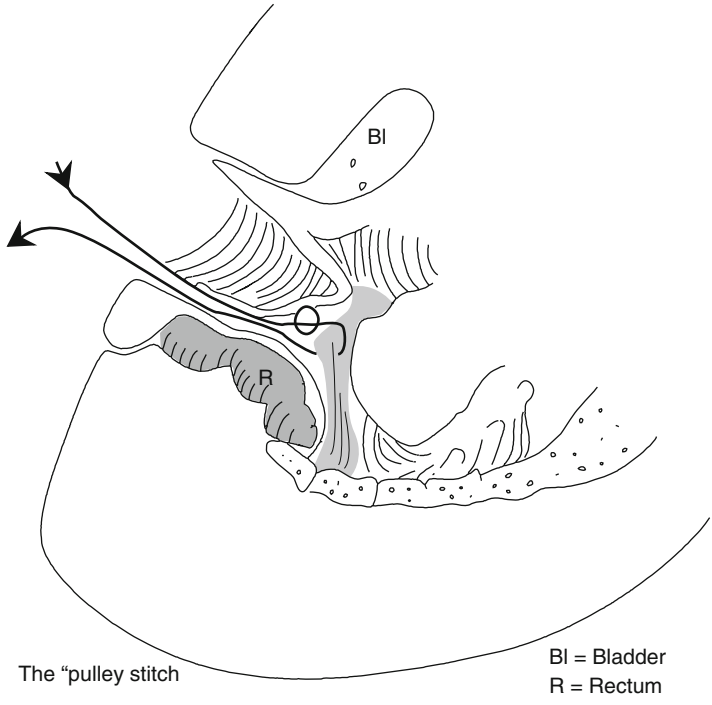


FIGURE. 10.6 Insertion of the pulley stitch to vaginal apex, and attachment to sacrospinous ligament

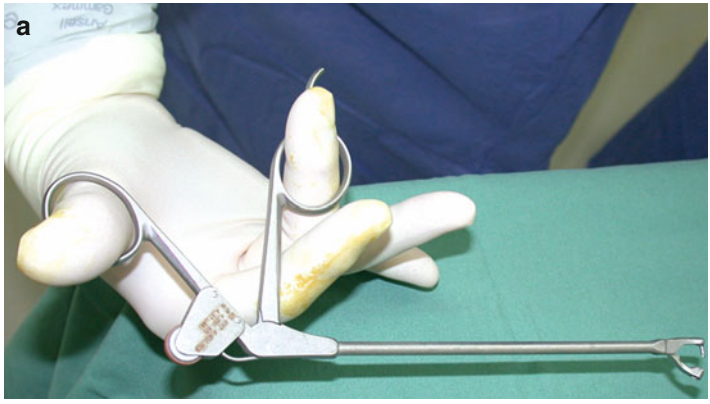
become inaccessible once the pulley sutures are tied down).

Also, ensure that rectovaginal septum repair sutures or levatorplasty sutures have been inserted appropriately and held out of the way of the pulley sutures.

After tying down the pulley sutures, tie off the mid or low rectocele repair sutures, then complete closure of posterior vaginal mucosa.

At the perineum, insert appropriate perineorrhaphy sutures before closing perineal skin.

Insert vaginal pack and suprapubic catheter.



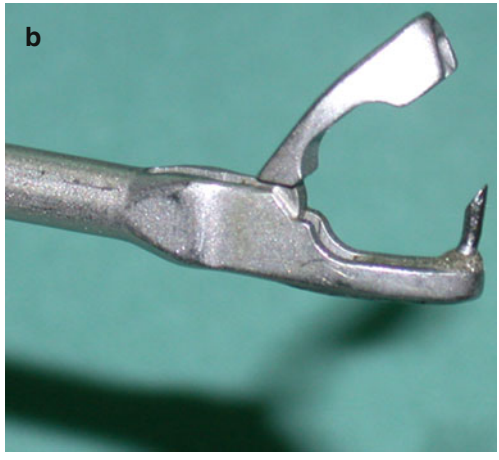


FIGURE 10.7 (**a**) and (**b**) Arthroscopic needle holder (manufactured by Zimmer). With close-up of open jaws that encircle the sacrospinous ligament

Preoperative Consent Discussion for Vaginal Sacrospinous Fixation

Consent discussion involves the following:

Risk of buttock pain (6 %) (chronic 1 %)
Risk of de novo stress incontinence (2.6 %)

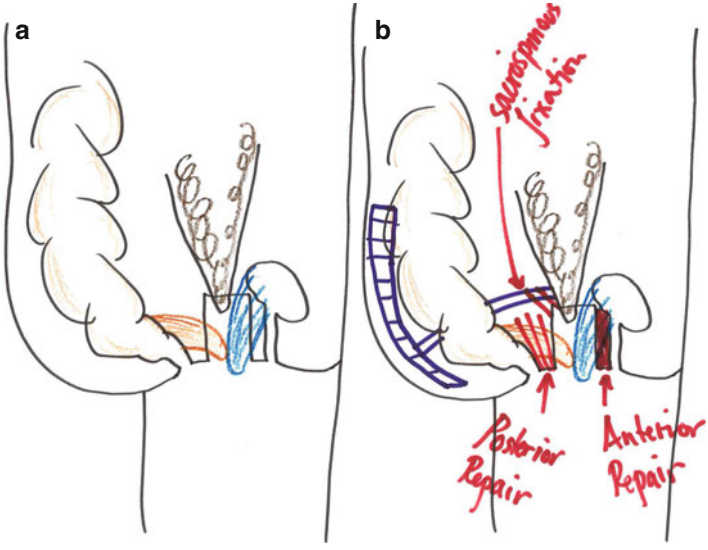


FIGURE 10.8 (**a**) Diagram of the anatomical defects for a patient with enterocele, rectocele, and cystocele. (**b**) Outline of the surgical procedures for a patient undergoing sacrospinous fixation with anterior and posterior repair

Risk of de novo dyspareunia (2.7 %)
Risk of de novo fecal incontinence (4 %)
Risk of de novo cystocele (8 %) (if no concomitant anterior repair)

These risks are derived from 293 cases [Lovatsis and Drutz 11]. The success of the procedure is variable depending upon method of assessment, for example, 88 % success at 6 weeks on strict anatomical criteria (no prolapse below the mid vagina [20]) or 97 % at 1 year (symptomatic prolapse or an asymptomatic prolapse at or beyond the introitus).

Because many patients having a sacrospinous fixation also require other procedures, we find it helpful to draw a diagram of the anatomical defects (see Fig. 10.8a for a patient with enterocele, rectocele, and cystocele) and then superimpose an outline of the surgical procedures on this diagram

(see Fig. 10.8b for a patient undergoing sacrospinous fixation with anterior and posterior repair).

Abdominal Sacrocolpopexy

This involves the following:

- A Pfannenstiel or vertical midline incision (depending on previous scars and obesity).
- The vagina is elevated with a probe wrapped in gauze.
- The peritoneum over the vaginal vault is incised, abdominally.
- The bladder is reflected forward from the anterior vaginal wall.
- The peritoneum is entered in the pouch of Douglas.
- The rectum is deflected to the left so that the peritoneal incision is extended up along the right paracolic gutter toward the sacral promontory.
- The peritoneum over the sacral promontory is carefully incised and spread open, taking care not to injure the presacral vessels.
- A wide-pore mesh such as Vipro-II is fashioned into a Y-shape by the surgeon (Fig. 10.9).
- The bottom of the Y (both leaves) is attached over the apex of the vagina with nonabsorbable sutures.
- The top single leaf of the Y is run laterally up to the presacral ligament over S1.
- It is attached to the ligament by nonabsorbable sutures.
- The peritoneum is closed over the mesh entirely.
- The pouch of Douglas is closed to prevent further enterocele, by a Moscovitch or Halban's procedure:
- The Moscovitch procedure involves a spiral suture around the edges of the pouch of Douglas to close it circumferentially.
- The Halban's procedure involves a series of left to right sutures in the sagittal plane that close the anterior and posterior leaves of the pouch of Douglas.
- The pouch of Douglas is drained.

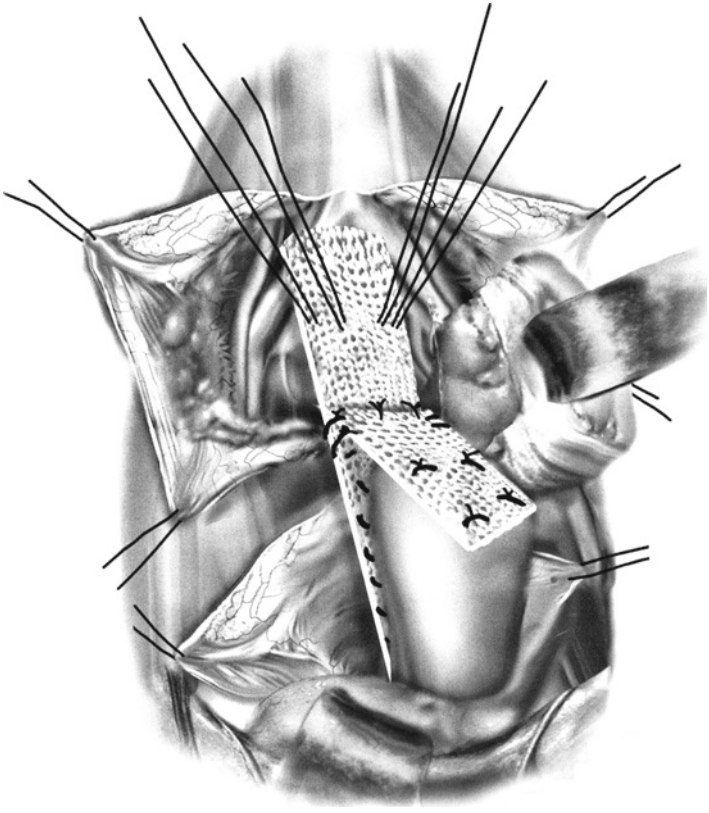


FIGURE. 10.9 Y-shaped mesh inserted over the vaginal vault; the long end of the "Y" is attached to the presacral ligament (Reprinted with permission from Baggish and Karram [3]. Copyright 2001, Elsevier)

- At end of abdominal procedure, assess the lower vagina:
  - A low cystocele may indicate anterior repair.
  - A low rectocele or deficient perineum may indicate colporrhaphy or perineorrhaphy.
  - Vaginal pack and choice of catheter depending upon whether low vaginal procedures were undertaken.

Preoperative Consent Discussion for Abdominal Sacrocolpopexy

Consent discussion involves the following:

- If the patient has a need to digitate to evacuate the stool preoperatively, which may persist in up to half of the cases (Baessler and Schuessler [2], $n = 33$).
- Careful management of constipation (Chaps. 6 and 8) must be undertaken preoperatively.
- Complications (from Valaitis and Stanton [24], $n = 41$) include:
  - New or worsened detrusor overactivity (7 %)
  - New or worsened stress incontinence (12.5 %)
  - Dyspareunia (9.7 %)
- The success rate varies from 88 % at 2 years Valaitis and Stanton [24] to 100 % cure of enterocele at 2 years but persistent rectocele in 48 % (Baessler and Schuessler [2]; this picture is quite complex as not all preoperative rectoceles were corrected).

The Cochrane Review concluded that abdominal sacrocolpopexy conferred a lower rate of recurrent vault prolapse versus vaginal sacrospinous fixation (relative risk 0.23, 95 % CI, 0.07–0.77) and less dyspareunia, but there was no significant increase in reoperation rates between the two operations (i.e., the recurrences must not have been bothersome). Furthermore, the vaginal sacrospinous fixation was quicker, cheaper, and allowed earlier return to activities of daily living [Maher et al. 13].

Note: The subject of uterine prolapse is dealt with in standard gynecological textbooks and is not discussed here. If the uterus prolapses to the mid vagina, then vaginal hysterectomy is generally indicated, which may be a part of any of the procedures in this chapter. Procedures to suspend the vault (McCall's culdoplasty, etc.) should always be considered. If the uterus descends within the upper vagina, the decision for removal should be based upon gynecological considerations

(menorrhagia, etc.), tempered by a discussion of the patient's wishes. The option of Manchester repair has been described.

Conclusions

The median lifespan of women in the Western world is currently about 83 years and is gradually increasing. Hence, prolapse is likely to increase. Although the last two decades have shown improved techniques in the management of prolapse, the Cochrane Collaboration criticizes a serious lack of randomized controlled trials of new interventions. Several procedures have been mentioned only briefly in this chapter because little objective data were available. It is hoped that in the next decade, more objective studies including comparative results will be published. The advent of "mesh kits" for cystocele repair has given better anatomic cure rates at the expense of troublesome mesh erosion/ dyspareunia, so their use in primary cystocele repairs requires careful evaluation and discussion with the individual patient. In the case of *recurrent* cystocele, they are a useful option.

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Chapter 11
Recurrent Bacterial Cystitis in Women

Recurrent bacterial cystitis is defined as recurrent significant bacteriuria (more than 10^5 organisms per ml of a single organism), with significant pyuria (more than ten white blood cells per ml), in the absence of upper tract pathology. "Recurrent" is usually taken to mean more than three proven UTIs in the last 5 years. (Because the abbreviation RBC usually applies to red blood cells, "UTI" is used here.) If upper urinary tract disorders are causing the UTI, then referral to a urologist is required. Also, if there is no upper tract disorder, but the patient has recurrent bouts of hematuria associated with the UTI, then urology referral is also indicated. Recurrent UTI is common in urogynecological patients. About 4 % of women aged 15–65 have significant bacteriuria at any given time (Kass et al. [2]), and the prevalence rises with age. About 25 % of women experience at least one proven recurrence within 6 months of the first attack [1].

Guide to Management of Recurrent UTI

At the first visit, take history of "recurrent" carefully.

Check any previous or family history of renal calculi

Obtain old MSU results from GP if possible.

Check whether the patient has episodes of multiresistant organisms, which may explain why there are "recurrences" (the treatment may have been incorrect).

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Check for unusual bacteria such as *Proteus mirabilis*, *Pseudomonas*, *Streptococcus faecalis*, etc., that may suggest upper tract disease.

Ascertain whether UTI is mainly triggered by intercourse.

Check whether previous colposuspension or TVT may have caused voiding dysfunction/high residual urine volumes.

During Examination

Examine the renal angles for silent calculi.

Percuss the abdomen for an enlarged bladder/subacute retention.

Check for a large cystocele that may harbor a stagnant pool of urine.

Check for atrophic vaginitis, which increases susceptibility to UTI.

Investigations for Recurrent UTI

We find it useful to give the patient three sterile urine culture jars and ask her to give a specimen of urine at the very first symptom of any infection, to check organism type. Although dipstick testing is cost effective in general practice, in the patient with recurrent UTI and incontinence/prolapse, the organisms should be identified on culture. Ask for all organisms to be reported, even if count only 10^2 per ml, with pyuria. Particularly in detrusor overactivity, low-grade UTI may exacerbate the OAB symptoms [7].

Order a renal ultrasound and post-void residual to exclude:

- Renal calculi or pyelonephritis/hydronephrosis
- Large complex renal cysts (small simple cysts seldom warrant concern)
- Narrow-mouthed bladder diverticulum that may collect stagnant pool of urine
- Dilated ureters that may suggest vesicoureteric reflux (if so, order micturating cystourethrogram)

The above conditions also indicate referral to a urologist. Urine flow rate may show a picture of obstruction, suggesting urethral stenosis. Post-void ultrasound may show incomplete emptying, that is, residual greater than 50–100 ml.

Treatment

If postmenopausal, treat with topical vaginal estrogen. A large RCT showed significant reduction in the incidence of UTI after estrogen versus placebo Raz and Stamm [6].

If postcoital UTI, we advise patients to read and practice the self-help regime of Kilmartin [3], which contains many helpful points about pre- and postcoital techniques to reduce the risk of this distressing problem. If these techniques do not prevent recurrence, then postcoital antibiotic therapy with trimethoprim 300 mg stat or nitrofurantoin 100 mg is of proven value.

If associated with large prolapse and residual urine, consider using a vaginal ring pessary to elevate the prolapse. If this eradicates the UTI, then repair of the prolapse should be considered (even if otherwise asymptomatic). If associated with persistent residual urine volumes >50 ml (but no prolapse), teach the technique of double emptying (see Chap. 9, management of voiding difficulty).

In the nonincontinent woman, bacteriuria without pyuria is not usually treated because it spontaneously resolves. In the incontinent woman who has frequency and urgency, we generally treat because bacteriological studies have shown that the endotoxins produced by bacteria can reduce the contractile strength of the urethral sphincter or decrease the contractility threshold of the detrusor, thus promoting incontinence [Moore et al. 4].

At Second Visit

If further proven UTI, consider 3 months of nitrofurantoin, trimethoprim therapy, or cystoscopy. These antibiotics are preferred because they are not well absorbed into the blood

stream, not broad spectrum, and not likely to cause thrush. At least three months of therapy is chosen, to completely eradicate "microbiological communities" [5] that may form within the epithelium and lamina propria of the bladder. If the patient takes 3 months of such therapy and still has "breakthrough" UTI, then cystoscopy is indicated.

What to Look for on Cystoscopy

Exclude narrow-mouthed diverticulum. One also may see small waxy-yellow raised areas of microabscesses, as part of "cystitis cystica" appearance. Diathermy will eradicate these.

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Chapter 12
Interstitial Cystitis

Unlike the other conditions considered in this text which are very common, interstitial cystitis (IC) is quite rare. This chapter is a short summary of a great deal of research and clinical studies that have been directed at this fascinating problem. Appropriate textbooks are recommended.

How to Diagnose It

IC is a chronic pain syndrome characterized by the following:

- Recurrent episodes of suprapubic pain/pelvic pain. Pain is worse when the bladder is full. The symptom of urgency is actually painful (in 92 % of cases).
- Severe frequency (can void 60 times per day or more).
- Generally, severe nocturia (ten times per night or more, in 51 % of cases).
- Leakage of urine is not typical (but can occur).

Less common symptoms include the following:

Chronic pelvic pain or pressure symptoms (64–69 %)
Dysuria (61 %)
Dyspareunia (55 %)
Pain for days after sexual intercourse (37 %)
Hematuria (22 %)
IC is more common in women (ratio 9:1).

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Large studies indicate prevalence of about 18 per 100,000 women Ho et al. [3]. The annual estimated incidence is 2.6 per 100,000 total US population. The average IC patient sees three or four urologists or gynecologists before diagnosis.

The diagnosis of IC is based on:

The classic symptoms of pain with frequency/urgency/ nocturia. The Frequency Volume Chart (FVC) shows severe frequency/ nocturia. FVC usually shows small volumes/small bladder capacity. Urodynamic testing is painful and just shows small bladder capacity (although in some cases detrusor contractions are seen). Voiding function is usually normal (flow rate and residual urine). Urine cultures are generally sterile (by definition must be sterile for 3 months). Cystoscopy must be performed under general anesthesia (GA).

Mucosa often fairly normal during first fill.
Capacity under GA is reduced, for example, 400–600 ml.
Refill exam must be performed: shows petechial hemorrhages and small punctate red dots scattered over the mucosa.
In severe cases, may see Hunner's ulcers—red splits or cracks in the mucosa.

Bladder biopsy is recommended. Biopsy needs special stains for mast cells (see Fig. 12.1). It often but not always reveals excess mast cells in the detrusor muscle.

Etiology

The etiology of IC remains unknown, although several theories have been put forward.

The Defective Epithelial Barrier Theory: The bladder mucosa is lined by a chemical layer of glycosaminoglycans (GAGs) which are thought to render the urothelium impermeable to harmful solutes (such as urea). Early histological studies suggested that the urothelium of IC patients was more readily penetrated, but later functional radioisotope studies showed no significant differences between IC patients and controls.

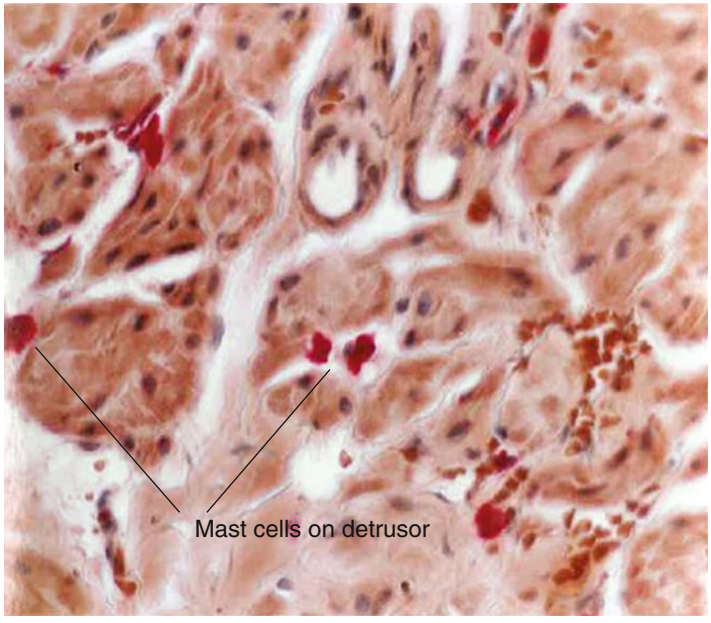

FIGURE 12.1 Mast cells in the detrusor muscle from a biopsy taken from patient with classic features of IC

The Detrusor Mastocytosis Theory: Because mast cells release histamine, which causes pain, hyperemia, and fibrosis, an excess of mast cells in the detrusor muscle could explain the pathophysiology of IC. An early study of 115 IC patients suggested that a finding of >28 mast cells per mm [2] in the detrusor muscle (on biopsy) indicated "true" IC and a lower mast cell count indicated early disease. Although this basic concept is still probably true, high mast cell counts can be seen in patients with prostate cancer, so the finding is not pathognomonic. Later studies showed that high mast cell counts in the lamina propria are also a marker of "classic IC." For review, see Theoharides et al. [6].

The Autoimmune Theory: Several studies have shown that patients with severe IC are more likely to have antinuclear antibodies. Thus, IC has been likened to scleroderma (fibrosis)

but the data are inconsistent. Coexistence of IC with Sjogren's disease, rheumatoid arthritis, SLE, and Hashimoto's thyroiditis has been reported in large prevalence studies.

In the United States, the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), which is part of the National Institutes of Health (NIH), has a major interest in funding research into IC. The NIDDK has established a national database of patients with IC, to study the long-term natural history of the disease. So far as we know at present, IC tends to wax and wane over time, but is not "curable."

Treatment

Cystodistension is often performed as part of the initial cystoscopy. Up to 60 % of patients obtain benefit for 3–6 months. At cystodistension, Hunner's ulcers/mucosal splitting areas should be diathermied.

Dimethyl sulfoxide (DMSO) installation is usually first-line therapy and is the only intravesical treatment approved by the FDA in the United States. After catheterization, a 50 ml solution of DMSO is instilled into the bladder; the patient is encouraged to retain it for 15–30 min. Weekly or biweekly treatments are given for 6–12 weeks. Response is usually noted after 3–4 weeks. An initial worsening of symptoms for 1–2 weeks may occur. A garlic-like taste and skin odor are often noted for up to 3 days. Marked reduction in pain and frequency occur in 50–90 % of patients; relapse occurs in about 40 %, but repeat treatment is usually effective. The drug is cheap and has no major side effects.

Amitriptyline, 25–75 mg daily, is useful in patients who can tolerate its sedative effects, with major benefit in 70–80 % in such cases.

Pentosan polysulfate sodium (Elmiron) is an expensive oral drug, 100 mg TDS, for at least six months. Clinical improvement may not start until after 2–4 months, so therapy is recommended for 6 months. In open trials, up to 80 % of patients note 80 % reduction in pain. In placebo-controlled RCTs, the drug

has about double the effect of placebo (32 % vs. 16 % objective benefit; see Giannantoni [2] and Mahmoud [5] for review).

Transcutaneous nerve stimulation (TENS) has been used successfully to inhibit the perception of suprapubic pain. The electrodes are placed suprapubically; the stimulus is 10 Hz, in keeping with other chronic pain therapy (see Chap. 7 for methodology).

Oxalate-free diet has been used with some success. Patients avoid acidic foods such as tomatoes, strawberries, chilies, citrus fruits, tea, coffee, vinegar, and alcohol. A further modification of this diet involves avoiding foods high in tyrosine, tyramine, tryptophan, aspartate, and phenylalanine. Several studies show substantial benefit Friedlander [1].

Surgical resection of Hunner's ulcers by endoscopic resectoscope was originally practiced, but other treatments have superseded this because of the risk of postoperative scarring, fibrosis, and reduction of bladder capacity.

Clam cystoplasty, as described for refractory detrusor overactivity (Chap. 7), is a useful procedure to enlarge bladder capacity and reduce pain but has major morbidity.

Continent diversion can be used in end-stage disease (for review, see Hohenfellner et al. [4]).

The NIDDK operates a useful Web site for patient information; a very good leaflet can be downloaded: http://www.niddk. nih.gov/health/urolog/pubs/cystitis/cystitis.htm. In the United States, an IC patient support group is run, with a useful newsletter that is available worldwide; details are at www.ichelp.org.

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