Chapter 4

Patient Assessment

Introduction

The vast majority of patients with lower urinary tract dysfunction present with symptoms. An occasional patient will present “silently”, with a palpable mass in the lower abdomen, due to an enlarged bladder, or perhaps the symptoms of uraemia. Despite our extensive experience of assessing patients with voiding disorders, we remain impressed by the unreliability of symptoms, even when taken by a urodynamically trained and experienced clinician. This is one of the reasons for the use of urodynamic testing. We commend any approach that lends objectivity to diagnosis, and in particular the use of frequency-volume charts (urinary diaries). The frequency-volume chart forms the basis for the interview during which the clinician attempts to reach a diagnosis, evaluate the patient’s most troublesome symptoms, judge the severity of these symptoms, assess the impact of the symptoms on the patient’s life and judge the patient’s expectations in terms of treatment.

During discussion of the patient’s presenting complaints, the clinician should seek information on both the storage and the voiding phases of the micturition cycle. In our unit, history-taking is based on the completion of a proforma (Appendix 3) which leads the interviewer through the phases of bladder function: the storage phase, pre-micturition symptoms, voiding symptoms and post-micturition symptoms. If the symptoms are interpreted in the context of the normal function of the lower urinary tract, then it may be possible to produce a provisional symptomatic diagnosis. Urodynamics and other investigations then become tests of a clinical hypothesis. If these steps are taken consciously then there is feedback from functional urodynamic information which helps to improve symptomatic diagnosis. Although symptoms have been considered individually in this section, they may be grouped together in symptom complexes, which have more diagnostic significance.
Frequency-Volume Charts

The ICS describes three types of charts (ICS 2002)

- **Micturition time chart**: This records only the times of micturition, day and night, for at least 24 hours.
- **Frequency-volume chart**: This records the volumes voided as well as the time of each micturition, day and night, for at least 24 hours.
- **Bladder diary**: This records the times of micturition, voided volumes, incontinence episodes, pad usage, and other information, such as fluid intake, the degree of urgency, and the degree of incontinence.

The clinician has to deal with a range of urinary symptoms, many of which are variable in nature. It may be unnecessary to proceed with urodynamic investigation, because the basic abnormality in many patients may be related not to detrusor or urethral dysfunction, but rather to alterations in renal excretion, circadian rhythms or the psychological control of micturition. In addition, minor abnormalities of bladder dysfunction may be exacerbated by alterations in renal function, and it is important to identify such alterations before instituting major surgical treatment. Over a period of more than thirty years we have obtained considerable experience in the use of frequency-volume charts completed by the patient. We have found these an essential method of investigating the function of the male and female lower urinary tracts. The charts were developed originally as part of a research project evaluating the response to treatment (Torrens 1974). While Fig. 4.1 represents our normal chart,

![Standard frequency-volume chart. The time of voiding and the volume voided are recorded for each micturition. Incontinence episodes are recorded as “W”, pad usage is recorded in the right-hand column and the fluid intake is estimated.](image-url)
it is possible to use more complex charts if more information is required, for example, when evaluating a new treatment (Fig. 4.2, above). 

For a period of seven days prior to an outpatient appointment, the patient is asked to record, as accurately as possible, the time and volume of each micturition. In addition, the chart is used to record episodes of urinary incontinence and can be used to record the degree of urgency at each micturition, as well as the use of incontinence aids, such as pads. The patient is not instructed to “hold on” until the bladder is very full, as suggested by some authorities (Turner Warwick et al. 1979), but told to void as normal. No effort is made to make a precise assessment of the patient’s fluid intake, because this makes the chart too complex. However, the patient is asked to estimate how much he or she drinks per day, in cups. More accurate estimates of intake are difficult, not only because socially it would appear strange to be measuring the volumes of fluids imbibed but also because food is a significant source of fluid. Patients eating large amounts of fruit and vegetables are often mystified by their high urine output when they appear to be drinking relatively little.

We have found that these charts are well accepted, even by elderly patients and, in the majority of cases, are completed with accuracy and enthusiasm. Even when enthusiasm outstrips ability, the patient still provides useful information. The chart facilitates history-taking and avoids exaggeration or minisation of the patient’s symptoms. By examination of the chart the clinician is able to obtain accurate information as to the exact frequency and nocturia, together with the maximum and average volumes of urine passed at each episode of voiding. This method is the only way of obtaining a value for the average voided volume, a parameter which is important when deciding what volume a patient’s bladder should be filled to during cystometry.

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**Fig. 4.2** Frequency-volume chart also recording urgency (1 or 2) and degree of leakage (+ or ++).
From the frequency-volume charts, abnormalities in the circadian rhythm of urine production may be detected, and psychogenic voiding patterns are often identified. In addition, it has been shown that certain patterns suggest particular types of bladder or urethral pathology. Abrams and Klevmark (1996) has classified frequency-volume charts into six basic patterns:

1. Normal volumes, normal frequency: as seen in normal patients with a normal 24-hour urine volume.
2. Normal volumes, increased frequency: such patients have an increased 24 hour urine production (polyuria), indicative of increased fluid intake. Most frequently this is high fluid intake by choice, but occasionally will indicate a significant pathology such as diabetes insipidus or uncontrolled diabetes mellitus.
3a. Reduced fixed volumes, day and night; this pattern is suggestive of an intravesical pathology, such as “interstitial cystitis” or carcinoma in situ.
3b. Reduced variable volumes, day and night. This pattern is often indicative of detrusor overactivity.

We would also add further types.

4. Normal early morning void, reduced variable day volumes. This pattern usually indicates a psychosomatic cause for frequency. The patient sleeps well and voids a normal or even increased volume on rising but passes small, variable amounts during the day.
5. Nocturnal polyuria: these patients void with normal frequency and normal volumes by day, but with increased frequency at night, with more than 33% of the 24-hour urine production being passed during the 8 hours of rest. This pattern is the classical one of nocturnal polyuria which may be due to congestive cardiac failure or abnormalities of antidiuretic hormone or atrial natriuretic hormone secretion, but is often idiopathic.

**Alterations in Fluid Excretion**

The normal daily fluid output from the kidneys varies between 1 litre and 3 litres every 24 hours. It is worth remembering in the context of deciding what filling rate to use during urodynamics that a urine output of 1.4 litres in 24 hours represents a renal excretion of 1 ml of urine per minute. Approximately 80% of this volume is excreted during the waking hours, and therefore in the normal condition it is not necessary to empty the bladder at night. Abnormalities of renal excretion may be induced by sudden increase in the volume of fluid ingested, or by an alteration in the normal circadian rhythm.

Alterations in the quantity of fluid imbibed may occur at times of stress and during periods of social change, for example, at times of redundancy or retirement. An example is shown in Fig. 4.3 (overleaf), where a sudden change in lifestyle has resulted in a dramatic increase in the patient’s fluid intake, leading to frequency and nocturia, with large volumes voided on each occasion: the subject had become the teaboy in a prison! Abnormalities of the normal circadian rhythm may be induced primarily by disease itself, such as renal failure or heart failure, or be secondary to drugs used in the treatment of such conditions, for example, diuretic therapy. It is important to identify abnormalities such as a renal cause at an early stage, as they may exacerbate minor abnormalities of bladder function. Nocturnal polyuria in elderly men appears to be secondary to subclinical cardiac failure which results in increased production by the right atrium of the heart of atrial natriuretic
peptide (ANP), the powerful natural diuretic, which causes urine production to be increased. ANP provides the essential mechanism by which excess fluid is excreted at night. Lastly, alterations in circadian rhythms may be due to a primary defect in posterior pituitary function. Although such abnormalities are easily identified by examination of the frequency-volume charts, they may be resistant to treatment. Antidiuretic hormone (DDAVP) administration may be helpful but must be used with care.

Psychogenic Voiding Patterns

The bladder has often been referred to as “the mirror of the mind”, and it is common for psychological problems to manifest themselves initially as urological symptoms. Such psychogenic voiding patterns are often “diagnoses of exclusion” following persistently negative urological studies. However, the frequency-volume chart may identify such abnormalities at an early stage. Such alterations in voiding patterns are those of frequency and sometimes nocturia, occurring at times of social and mental stress. In Fig. 4.4 it is shown that frequency is occurring during periods at work, but disappears at the weekend. We have also found that patients may be able to interpret these findings themselves and make a self-assessment of their condition if they are given the opportunity to complete a frequency-volume chart. Another characteristic of the psychogenic voiding pattern is the absence of nocturia despite quite marked frequency during the day (Klevmark’s type 4; see above).

Intravesical Pathology

Although serious bladder pathology (e.g., infiltrating carcinoma or carcinoma in situ) is usually associated with other symptoms including haematuria, such individuals may present with the symptoms of frequency and nocturia. These patients’ frequency-volume
charts frequently demonstrate “fixed” voided volumes with relentless frequency and nocturia. For example, Fig. 4.5 (below) is from a patient who exhibited such characteristics and was subsequently shown to have bladder carcinoma. The finding of such a pattern on a frequency-volume chart should indicate the need for further investigations, including urgent cystoscopy.

Fig. 4.4 Frequency-volume chart showing excessive frequency during periods at work. At the weekend daytime frequency becomes normal and nocturia reduces markedly.

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Fig. 4.5 Frequency-volume chart, showing frequency due to fixed bladder capacity in a patient with bladder carcinoma.
**Overactive Bladder and Detrusor Overactivity**

Overactive bladder (OB) is defined as urgency with or without urge incontinence, usually with frequency and nocturia. OAB symptoms are presumed to be due to involuntary detrusor contractions characteristic of detrusor overactivity.

Following the exclusion of the abnormalities described above, there remain a group of patients in whom the basic pathology remains unclear. From the clinician’s point of view the most important factor is to consider whether the patient’s symptoms are related to bladder outlet obstruction or to an abnormality of detrusor function such as detrusor overactivity.

Patients with detrusor overactivity often show reduced but variable volumes of urine during the day. Their night-time volumes and the first void on waking in the morning are often of larger quantity.

**Bladder Outlet Obstruction**

We are not aware of any clear pattern on a frequency-volume chart that will allow the diagnosis of bladder outlet obstruction to be made.

**Analysis of Symptoms**

In this section each symptom is defined and explained in functional terms. The object, as ever, is to provide a pathophysiological understanding of the patient’s complaints. Such an approach requires some conceptual thinking, but allows the clinician to develop a hypothesis as to the patient’s underlying condition as the history is taken.

The interpretation of a patient’s symptoms is modified by many factors, not least by the time the clinician is able to spend with the patient. The limits of normality are not adequately defined, and in an individual case may be what the patient, rather than the doctor, considers to be normal. The adequacy of communication is important, as are many preconceived ideas held by the medical staff. For this reason, for each symptom, a specific wording of the question to the patient about that symptom is suggested.

In the analysis of each individual symptom it is important not only to assess the presence or absence of any symptom, but also to define its frequency and severity; as Fig. 4.6 shows, patient-completed questionnaires now attempt to grade each of the symptoms in terms of frequency and/or severity, and bother. Lower urinary tract symptoms (LUTS) should be divided into the phases of micturition: storage, voiding, post-micturition and others.

**Storage Symptoms**

**Frequency of Micturition**

Increased daytime frequency is defined as the complaint by the patient who considers that he or she voids too often by day.

*Question:* “How often do you pass urine (your water) from the time you wake in the morning until the time you go to sleep at night?”
Abnormality of urinary frequency is a change from that to which any particular patient is accustomed. There is surprisingly little objective data on frequency in the normal population, however three excellent papers by Larsson and Victor (1988), Swithinbank and Abrams (2001) and Carter et al. (1992) give us information on women and men respectively. We would consider normal diurnal frequency to be between 3 and 7 voids per day.

Increased urinary frequency is seldom the patient’s only complaint; it is usually associated with other symptoms – most frequently, urgency of micturition. Frequency of up to 10 to 12 times per day may be tolerated by many patients; above this it is usually socially embarrassing. However this statement must be modified according to the patient’s occupation, and if the patient works on a factory production line, or is a long-distance lorry driver, then it becomes essential that they can hold urine for at least two hours. Patients are notoriously inaccurate in their assessment of urinary frequency, and for this reason an objective means of assessing frequency, such as the frequency-volume chart, is essential.

Mechanisms of Increased Urinary Frequency. It is useful in understanding the mechanisms of frequency if the causes are categorised according to the voided volume.

1. Normal voided volume. We consider the normal voided volume to be 300 ml to 600 ml in the adult. A child’s expected voided volume can be calculated on the basis of 30 ml plus 30 ml for each year of life, so that a child of three can be expected to void 120 ml at a time. In this group, with normal voiding volumes increased frequency must be due to an increased intake, resulting in increased output. This may be secondary to:

- Polydypsia, which may occasionally be psychotic, but is more usually because the patient enjoys a favourite beverage, be it tea, water or beer.
- An osmotic diuresis (e.g., diabetes mellitus).
- An abnormality of anti-diuretic hormone production, e.g. in diabetes insipidus.

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**Patient Assessment**

21. HESITANCY

1 = none  
2 = only on full bladder  
3 = occasional  
4 = usually  
5 = always strains to void urine  
6 = cannot void urine  
X = unknown

if 1, 5, 6 or X in 21 go to 22

FREQUENCY (of hesitancy)

1 = more than x 1/day  
2 = x 1/day  
3 = more than x 1/week  
4 = x 1/week  
5 = less than x 1/week  
X = unknown

**Fig. 4.6** Urodynamic questionnaire: an example of the question format with the presence/absence of the symptom followed by a supplementary question as to its frequency.
2. **Reduced voided volumes.** This term implies that the bladder capacity under general or regional anaesthetic would be normal, but the voided volumes are consistently small – less than 300 ml. The causes of reduced voided volumes include the following:

- Detrusor overactivity.
- A significant residual urine resulting either from bladder outlet obstruction, detrusor underactivity or a combination of the two.
- Non-inflammatory causes of increased bladder sensation, for example, anxiety or the idiopathic hypersensitive bladder.
- Inflammatory bladder conditions (e.g., acute cystitis, carcinoma *in situ* or bladder stone).
- A fear of urinary retention, especially in older male patients who experience increasing hesitancy as the bladder becomes full, and who compensate by voiding frequently.
- Fear of incontinence. Some patients, both with urodynamic stress incontinence and/or with detrusor overactivity, have increased frequency in order to keep their bladder volumes low, and minimise the risk of leakage.

3. **Reduced structural bladder capacity.** In this case the bladder capacity is smaller than normal under regional or deep general anaesthesia, resulting in consistently small voided volumes. The reduction in capacity may be due to:

- Post-infective fibrosis (e.g., tuberculosis).
- Non-infective cystitis (e.g., interstitial cystitis (Hunner’s ulceration)).
- Post-pelvic irradiation fibrosis (e.g., after radiotherapy for bladder or cervical cancer).
- After surgery (e.g., partial cystectomy).

**Mechanism of Decreased Urinary Frequency.** Infrequent voids of large volumes of urine usually provoke admiration rather than complaints. Decreased frequency may be due to the profession of the patient, for example, “check-out girls” working in supermarkets may develop the ability to hold their urine for long periods of time. Similarly lorry drivers working on the motorways may void infrequently. Reduced detrusor contractility and impaired bladder sensation may be factors that can lead to decreased frequency, or indeed may result from the habit of holding large volumes.

When faced with patients, usually women, with recurrent urinary infections, it is important to ask the patient’s voiding habits between infections, because quite often they can be discovered to be “infrequent voiders”. Part of their management then consists of advising them to void at least four-hourly.

**Nocturia**

Nocturia is the complaint that the individual has to wake one or more times to void.

*Question: “How many times, on average, are you woken from your sleep because you need to pass urine?”*
Unless the clinician’s definition of nocturia is made clear, the patient may include a void before going to sleep, or the first void in the morning. Furthermore the frequency of nocturnal voiding, in relation to age, needs to be considered when judging the significance of the symptom.

This complaint is dependent on age in both sexes. We have defined nocturia as being woken from sleep each night by the need to urinate. It is usual for men over 65 and women over 75 to awaken once at night in this way.

Other patients will attempt to include all voids during the hours of darkness, giving the paradox of increased nocturia during the winter, compared with during the summer. It is also important to ask whether the patient sleeps well, and whether he or she drinks during the night. Some patients sleep poorly for no apparent reason, and some because of a restless partner or chronic painful conditions such as arthritis. These patients, once awake, are often unable to settle until they have emptied their bladders, thus producing apparent nocturia. However most such patients have no increase in daytime frequency.

Mechanisms of Nocturia

Most causes of nocturia are the same as those described for increased diurnal frequency. However, in addition, nocturnal production of urine may increase (nocturnal polyuria). Often this is due to the reabsorption of oedema fluid in patients with mild congestive cardiac failure: it is therefore important to examine the ankles and sacrum of all elderly patients for oedema fluid. However increased nocturnal urine production is often seen in the absence of demonstrable oedema, although oedema does not become clinically detectable until there is at least 1 litre of fluid lying in the interstitium. When the patient goes to bed, oedema fluid is reabsorbed into the circulation and the venous pressure increases. In the right atrium an increase in venous pressure results in the secretion of atrial natriuretic peptide. Nocturia may also be due to loss or reduction of antidiuretic hormone production at night: a reversal of the diurnal pituitary rhythm. If there is diurnal frequency and urgency then nocturia is most likely to be due to detrusor overactivity. Other causes of nocturia include habitual poor sleep patterns, a partner who disturbs the patient, pain for any reason (e.g., arthritis), and sleep apnea (van Kerrebroeck et al. 2002)

Urgency

Urgency is the complaint of a sudden compelling desire to pass urine which is difficult to defer (because of fear of leakage)

Question: “When you get the feeling of wanting to pass your water, can you hold on or do you have to go immediately?”

If the patient appears to have urgency then the following two supplementary questions may be useful:

“If you are watching your favourite TV programme, and get the feeling of wanting to pass urine, can you delay it until the programme has finished, or do you have to leave the room more or less immediately?”

“How much time does your bladder give you from the time you first feel you want to go until you think you are desperate and likely to leak – five minutes, ten minutes, half an hour?”
Mechanisms of Urgency

Urgency is usually due to detrusor overactivity, when urgency frequently results in urgency incontinence. Urgency is felt lower down than either bladder pain or a normal strong desire to void, as felt when voiding is delayed.

Bladder Pain

Question: “When your bladder fills do you have any pain in your bladder?”

Bladder pain is felt suprapubically and increases slowly and gradually with bladder filling. The pain leads to frequency, not because of fear of incontinence, but due to increasing discomfort and fear of pain. Bladder pain, although often relieved by micturition, may persist after voiding, most classically in interstitial cystitis.

Mechanisms of Bladder Pain

Bladder pain may be due to:
- Inflammatory conditions of the bladder, e.g. acute cystitis or interstitial cystitis.
- Increased bladder sensation without inflammation but due to irritation by intravesical pathology such as bladder carcinoma (“malignant cystitis”) or bladder stone.

Urinary Incontinence

Urinary Incontinence is the complaint of any involuntary leakage of urine.

Question: “Do you ever leak urine or wet yourself?”

The original ICS definition, “incontinence is a condition in which involuntary loss of urine is a social or hygienic problem, and is objectively demonstrated” remains useful as it encompasses the concept of quality of life (Appendix 1, Part 5). Loss of urine through channels other than the urethra is defined as extraurethral incontinence, for example when due to a vesico-vaginal fistula. Strenuous effort should be made on history-taking to decide which type of incontinence is suffered by the patient.

It is unwise to ask patients if they are incontinent, because they will often answer “no”, either through embarrassment or because they imagine that incontinence means being wet all the time.

Stress Incontinence

Stress urinary incontinence is the complaint of involuntary leakage on effort or exertion, or on sneezing or coughing.

Question: “Do you ever leak urine when you cough, sneeze, exercise, lift heavy objects or walk on rough ground or down hill?”
Stress incontinence denotes a symptom, a sign or a condition. The symptom of stress incontinence indicates the patient’s statement of involuntary urine loss during physical exertion. The sign of stress incontinence denotes the observation of urine loss from the urethra, synchronous with a physical exertion such as coughing. The condition “urodynamic stress incontinence” has been defined by the ICS as “the involuntary loss of urine occurring when, in the absence of a detrusor contraction, the intravesical pressure exceeds the maximum urethral pressure”. Clearly, it is important that abdominal pressure is measured during urodynamic studies in order to satisfy the needs of this definition.

Mechanisms of Stress Incontinence. The first line of continence is normal closure of the bladder neck throughout filling. The second line is a competent distal urethral sphincter mechanism. It follows that stress incontinence must involve a degree of inadequacy of both these mechanisms. The physiology of urethral incompetence has been discussed in Chapter 2.

The clinical situations in which bladder neck and urethral incompetence occur include:

- A weakened pelvic floor, especially in the obese and multiparous.
- A paralysed pelvic floor in lower motor-neurone lesions.
- Abnormally high pressures in a distended bladder where distension tends to open the bladder neck.
- Iatrogenic damage to the sphincter mechanisms, for example, following transurethral resection of the prostate.
- Congenital short urethra.

One important differential diagnosis is between urodynamic stress incontinence and stress-induced detrusor overactivity (see Chapter 3). It is important to ask the patient whether they have any sensation of urgency prior to leakage which occurs when detrusor overactivity follows coughing or change of posture.

Urgency Incontinence

Whilst deliberating the new ICS definition, and later when discussing the difficulties of measuring the symptom urgency, a semantic discussion arose over the meanings of the words “urge” and “urgency”. “Urge”, in the English language denotes ‘wish’ or need”. On the other hand urgency is defined by Webster’s as “immediate action, insistent”, as in the ICS definition of urgency: a sudden compelling desire to pass urine which is difficult to defer. Perhaps the phrase, “because of fear of leakage” should have been added to the definition. Given this discussion it would be more consistent to call “urge incontinence”, urgency incontinence. Unfortunately this thought never occurred to the terminology committee when they met through 2000 and 2001: it was suggested by Michael Craggs.

Urgency incontinence is defined as “the complaint of involuntary leakage accompanied by or immediately preceded by urgency

Question: “When you want to pass urine, do you ever leak before you can get to the toilet because you can’t hang on long enough?”
Most frequently there is no specific trigger for urgency incontinence, but some patients do report certain provoking factors such as hand washing, answering the telephone or putting the key in the front door when returning home.

**Mechanisms of Urgency Incontinence.** Urgency incontinence may, as in the case of urgency, be associated with

- Detrusor overactivity, when it is known as detrusor overactivity incontinence.
- Urethral relaxation incontinence, which is defined as leakage due to urethral relaxation in the absence of raised abdominal pressure or detrusor overactivity. It is an unusual cause of urgency incontinence.

**Giggle Incontinence**

This type of incontinence is usually a complaint of younger women. The history is clear and usually not associated with other urinary disturbance. Because of the problem of reproducing this symptom in the urodynamic laboratory the mechanism is not clearly understood. The definition is implicit in the name. Suggested mechanisms for giggle incontinence include urethral relaxation, detrusor overactivity and congenital urethral weakness.

**Nocturnal Enuresis**

*Question: “Do you ever wet the bed or your pyjamas (nightgown) when you are asleep, either at night or during the day?”*

Strictly speaking, enuresis can refer to any incontinence, day or night. However the term is most often used to mean a normal act of micturition occurring during sleep, that is nocturnal enuresis. Enuresis may be divided into primary, when the patient has never been dry at night, and secondary, when enuresis follows a period of nighttime continence. Nocturnal enuresis is often a significant factor in the past history of young adults with nocturia. A family history should be sought and the presence or absence of concurrent diurnal symptoms noted. When talking to children it is useful to assess diurnal symptoms by asking the questions, “Do you have to leave the classroom in the middle of a lesson in order to pass urine?” and “Do you have to get up to pass urine when you are watching your favourite TV programme?”

**Mechanisms of Enuresis.** Enuresis is fundamentally a disturbance of brain function whereby bladder distension, for one reason or another, does not elicit normal cortical arousal. Various other factors may contribute to the situation, including:

- Increased nocturnal secretion of urine due to an inappropriately low level of ADH secretion at night.
- Reduced bladder or urethral sensation, such as in neuropathic patients.
- Detrusor overactivity.
- Inappropriate cerebral sedation, for example, by drugs or alcohol.
- Reduced bladder capacity.
It is very common to hear from parents that the enuretic child sleeps much more deeply than all the other children.

**Incontinence Without Obvious Cause**

Incontinence in the absence of sensation, without an associated desire to micturate and in the absence of raised abdominal pressure, is seen only in patients with neurogenic bladder.

**Continuous Incontinence**

Patients not infrequently complain of being “continuously incontinent”. However, true continuous incontinence can only be due either to a fistula between the ureter, bladder or urethra above the distal sphincter mechanism, and the vagina, or to an ectopic ureter entering into the urethra below the distal mechanism or into the vagina in the female. Patients with severe sphincter weakness may be more or less continuously incontinent during the day, but when they lie down in bed they are usually dry for considerable periods of time.

When assessing incontinence it is essential to document the frequency and severity of incontinence. Figure 4.7 shows how we ask about severity and the measures the patient takes to cope with leakage. In addition, if the patient uses pads then the type of pad, the proportion which are wet and the degree of wetness all need to be ascertained.

**Incontinence During Sexual Intercourse**

Incontinence may be related specifically to sexual activity. Penetration may precipitate involuntary detrusor contractions. Leakage during intercourse may also occur in women

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**Fig. 4.7 Urodynamic questionnaire: the section enquiring as to the degree of incontinence and the measures taken to control leakage.**

<table>
<thead>
<tr>
<th>27. DEGREE OF INCONTINENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 = drops, wets underclothes</td>
</tr>
<tr>
<td>2 = ‘floods’, wets outer clothes</td>
</tr>
<tr>
<td>3 = ‘floods’, on floor</td>
</tr>
<tr>
<td>X = not known</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>28. MANAGEMENT OF INCONTINENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 = no protective measures, no clothes change</td>
</tr>
<tr>
<td>2 = changes underwear/clothes</td>
</tr>
<tr>
<td>3 = pads for safety</td>
</tr>
<tr>
<td>4 = pads for necessity</td>
</tr>
<tr>
<td>5 = appliance</td>
</tr>
<tr>
<td>6 = catheter</td>
</tr>
<tr>
<td>7 = urinary diversion</td>
</tr>
<tr>
<td>8 = other</td>
</tr>
<tr>
<td>X = unknown</td>
</tr>
</tbody>
</table>

*complete ONLY if 3 or 4 in 28*

**PADS PER DAY**

**PADS PER NIGHT**
with stress incontinence. Leakage at orgasm in the woman may be secondary either to urethral sphincter weakness, or perhaps to inappropriate urethral relaxation. In the man, occasional ejaculation of urine with semen may occur, and this is most frequently seen in patients with a neurological disease such as spina bifida.

It must also be recognised that incontinence can have a profound effect on the sexual activity of patients and may be a cause of marital disharmony. Because of the considerable psychological repercussions this can have, it is particularly important that the sexual history is taken in detail so that proper practical advice can be given. As patients are often embarrassed it is important to ask directly about leakage during intercourse.

**Voiding Symptoms**

**Hesitancy**

*Question:* “After you have had the feeling that you want to pass water, and you are in the toilet and ready to urinate, does your urine come immediately or do you have to wait?”

If the patient has hesitancy ask a supplementary question:

*“How long do you have to wait, 10 seconds, 30 seconds, 1 minute or more than 1 minute?”*

This symptom is defined as difficulty in initiating micturition resulting in a delay in the onset of voiding after the patient is ready to pass urine. The complaint of hesitancy should be assessed in terms of the volume voided. It may be normal for any individual to have hesitancy when trying to void with less than 100 ml in the bladder. Conversely, a patient may complain of hesitancy only with a full bladder; this is often taken as a sign of impending urinary retention. However, even a normal person may have problems initiating voiding if the bladder gets exceptionally full.

**Mechanisms of Hesitancy.** Hesitancy may be due to:

- Bladder outlet obstruction. Here the patient has to wait for the detrusor contraction to generate sufficient pressure to overcome increased outlet pressure
- Detrusor factors. These include detrusor underactivity, and either over- or underdystension of the bladder.
- Urethral factors. For neurological reasons, or in some instances without obvious cause, the urethra may fail to relax, as in detrusor-sphincter dys-synergia (see p.00). In neurologically normal patients it is difficult to know whether failure of urethral relaxation is the primary problem rather than an inability to initiate a detrusor contraction.
- "Psychological" factors. Many normal male patients are unable to void except when alone. Two patients spring to mind. The first was a man who could only void when locked in his toilet at home, having made sure that there was nobody else in the house. This man was impossible to investigate! The second man had sea fishing, as his hobby, which involved many hours at sea in an open boat. All his colleagues were able to micturate over the side of the boat, but he went into urinary retention, as he was too inhibited to "perform".
Penile erection is an unusual but frustrating problem for some elderly men who, woken from their sleep, find that they have an erection due to a full bladder, and are then unable to void until the erection dies away.

**Decreased Urinary Stream**

Slow stream is reported by the individual as his or her perception of reduced urine flow, usually compared to previous performance or in comparison to others.

*Question: “When you pass urine, does the flow come out in front of you in a good flow, or does it drop to your feet?” (Brian Peeling’s diagram is a useful way for the patient to visualise this question (Fig. 4.8).)*

Urine flow rate depends on the volume voided, and therefore the patient should be asked about the quantities he voids, although this information should have been available from the frequency-volume chart. In addition to the question already mentioned, the patient should be asked about the characteristics of the stream. For example, is it thin and forceful, as would be seen in a patient who had a meatal stenosis? A patient with meatal stenosis might also notice that during micturition the penis enlarges because the penile urethra becomes distended by urine.

*Mechanisms of Decreased Urinary Stream.* A reduced urine flow may be due to:

- Any cause that reduces the voided volume is usually associated with frequency.
• Bladder outlet obstruction at any level from the bladder neck to the external meatus. Bladder outlet obstruction may be mechanical or functional. The commonest mechanical obstruction is benign prostatic enlargement and the functional obstructions that may be noted are dysfunctional voiding, detrusor sphincter dyssynergia and non-relaxing urethral sphincter obstruction.

• Decreased detrusor contractility, which may be either neurogenic or myopathic. Myopathic abnormalities may be any primary disturbance of bladder muscle, any toxic influence upon bladder muscle, or secondary to overstretching. There are a variety of neurogenic causes affecting both the upper and the lower motor neurones. Most classically, detrusor underactivity would be associated with lower motor neurone damage as, for example, after abdominal perineal resection of the rectum.

Intermittency

Intermittency is the term used when the individual describes urine flow, which stops and starts, on one or more occasions, during micturition.

Question: “Is your urine flow continuous or does it stop and start?”

Figure 3.20 shows intermittency, which has in common many of the same causes as a variable stream when the stream is of varying strength without actual interruption.

Mechanisms of Intermittency. An interrupted or variable flow may be due to:

• Urethral overactivity. Actual closure or narrowing of the urethra during voiding usually occurs at the level of the pelvic floor and is termed dysfunctional voiding in the neurologically intact and detrusor sphincter dyssynergia in those with a neurological disease such as multiple sclerosis.

• Detrusor underactivity. A poorly sustained, wave-like detrusor contraction produces a variable or interrupted trace. Similar patterns are produced if the patient has an acontractile detrusor and has to strain to pass urine.

• Straining during voiding.

Straining

Straining to void describes the muscular effort used to initiate, maintain, or improve the urinary stream.

Question: “Do you strain either to start your stream or to keep it going?”

Patients may strain through habit or necessity. If the bladder contains little urine it often helps to strain a little to initiate a detrusor contraction. Patients without outlet obstruction can increase their flow by straining, although men with BPO cannot. Patients with detrusor underactivity and/or urethral obstruction may rely on straining to achieve adequate bladder emptying.
**Pain on Voiding**

*Question: “Does it hurt when you pass urine?”*

The term dysuria can be confusing: some clinicians, particularly in Europe, use “dysuria” to mean difficulty in voiding. The term “dysuria” has also been used for the urethral pain typically felt in acute cystourethritis. It is better to describe the type and site of pain for example “burning urethral pain” usually indicative of urethritis, prostatitis or cystitis. Some patients with increased bladder sensation, without infection, for example, hyper-sensitive cases and those with the urethral pain syndrome, may also report bladder or urethral pain.

**Terminal Dribble**

*Question: “Does your urine flow end quickly or do you have a dribble before you finish?”*

If the patient says there is a dribble they should be asked how long it lasts. Terminal dribble, can be defined as a prolongation of the final part of micturition, when the flow slows to a trickle/dribble: this may last 30 s to 60 s or more. Terminal dribble is due to a failing detrusor contraction associated with bladder outlet obstruction and must be distinguished from post-micturition dribble.

**Post-Micturition Symptoms**

**Post-Micturition Dribble**

*Question: “After you have passed urine, dressed and left the toilet, do you leak in the next few minutes?”*

It is important to distinguish between terminal dribble and post-micturition dribble. Terminal dribble is continuous with the main flow of urine, whereas post-micturition dribble is defined as the involuntary loss of urine after the individual has finished passing urine, usually after leaving the toilet in men, or rising from the toilet in women. Post-micturition dribble is seldom associated with any demonstrable abnormality. This type of leakage is most commonly seen in men.

**Mechanisms of Post-Micturition Dribble.** This symptom may be due to:

- Failure of the bulbo-cavernosus and bulbo-spongiosus muscles to empty the penile urethra after micturition has ended.
- Failure of the normal “milk-back” mechanism whereby the urine lying between the distal urethral sphincter mechanism and the bladder neck, at the end of micturition, is returned to the bladder: leakage may occur later if the distal sphincter relaxes and the urine passes distally.
In women, post-micturition dribble is due to urine being deflected by the external genitalia into the vagina, so that when the woman stands the urine drips from the vaginal lumen.

**Feeling of Incomplete Emptying**

*Question: “After you have passed your water, does the feeling of wanting to urinate go away, or do you feel that the bladder is still not empty.”*

The normal patient, after micturition, completely loses any awareness of the bladder. Persistence of symptoms is usually felt as incomplete emptying or sometimes as a continued desire to void. These symptoms may often be misleading, as the patient may be shown to have emptied the bladder completely.

**Mechanisms of Sensation of Incomplete Emptying.** The reasons include:

- Increased sensation, e.g. acute cystitis, interstitial cystitis, urethritis and prostatitis.
- Persistent detrusor contraction (after-contraction), in which the bladder contracts after it is empty, producing high post-micturition pressure. This phenomenon is not related to detrusor overactivity, and is not always felt, so that its significance is unknown. However on occasions it does give rise to a persistent desire to void or to a feeling of incomplete emptying after micturition.
- Residual urine; many patients are unaware of the fact that they fail to empty their bladder, but others do have a feeling of incomplete emptying in this situation.

**Post-Micturition Bladder or Urethral Pain**

Pain may also be felt after micturition, and this is often indicative of intravesical or introurethral pathology and is frequently an indication for further investigation.

*Strangury.* Strangury describes a very unpleasant powerful feeling low in the pelvis, penis or urethra after voiding. It is usually indicative of an intravesical pathology such as a bladder stone or acute cystitis.

**Other Symptoms**

**Haematuria**

In almost every instance this symptom is an indication for further urological investigation and should never be ignored. Investigation of haematuria will usually take precedence over the investigation of other lower urinary tract dysfunction.
Loin Pain

It is unusual for the complaint of loin pain to be directly related to lower urinary dysfunction, although it can be secondary to vesico-ureteric reflux, or have an infective origin (pyelonephritis), and these conditions may occur in association with lower urinary tract dysfunction. Similarly calculus obstruction of the lower end of the ureter may present with a combination of upper and lower urinary tract symptoms. In a patient with lower urinary tract symptoms, loin pain is an indication for further investigation, most frequently an intravenous pyelogram or ultrasound.

Urinary Infections

It is appropriate to note here that there is a need for accuracy in the diagnosis of urinary infection. The condition is often diagnosed from symptoms or an inadequately taken “midstream specimen of urine” (MSU). If there is need for a midstream specimen then it should be properly supervised. If there is any doubt about the validity of an MSU, then either a suprapubic aspiration or a catheter specimen of urine may be taken. A catheter specimen should be sent to the laboratory at the commencement of urodynamic investigations. Alternatively a “Stix” test for nitrites, leukocytes, protein and blood, has been shown to be an excellent and cost-effective alternative to the MSU.

Retention of Urine

The patient should be asked whether they have had any retention episodes. The most common causes of urinary retention are benign prostatic obstruction, pelvic surgery, childbirth, the commencement of drug therapy with agents having effects on the bladder or urethra (see Appendix 4), and acute neurological conditions such as prolapsed intervertebral disc. Hence a history of previous urinary retention should alert the clinician to the possibility of detrusor underactivity, asymptomatic bladder outlet obstruction or an underlying neurological cause.

Sexual History

Sexual function and lower urinary tract function are subserved by similar innervation and therefore sexual function should be discussed with most patients. Men should be asked whether erection is present or absent, whether ejaculation if present is forceful and clonic, or if emission is weak. In addition patients should be asked whether or not they have orgasm and questioned as to its character and acuity.

In the absence of previous surgical intervention, for example, surgery of the rectum, psychogenic factors are the most common cause of impotence. However these symptoms in the male patient may be due to demonstrable neurological disease, for example, after spinal cord injury or in multiple sclerosis. They may also be the first indication of a peripheral neuropathy, as in diabetes mellitus or alcoholism. Each of these pathological processes may also lead to lower urinary tract dysfunction.
Erection may occur as a reflex and is mediated by the sacral roots via the pelvic nerves, whereas a psychogenic erection requires intact cholinergic and sympathetic nerve fibres in the pelvic and hypogastric nerves. Ejaculation depends on the co-ordinated action of the striated musculature of the pelvic floor which is innervated by the pudendal nerves. Orgasmic sensation is a combined afferent bombardment through the sympathetic hypogastric and somatic pudendal nerves.

A sexual history should also be taken from female patients asking about orgasm and any associated urine symptoms such as incontinence.

**Bowel Function**

Bowel function is similarly closely related to lower urinary tract function, and patients should be asked about their frequency of bowel action as well as the mechanics of defecation, that is, do they relax or do they need to strain, or is it essential that they use some artificial means such as manual evacuation, suppositories or enemas to empty their bowel. They should also be asked about their control of bowel function, that is, whether or not they ever soil or have an accident. Faecal incontinence may be passive (equivalent to stress urinary incontinence) or related to urgency (equivalent to urgency urinary incontinence), and patients may be incontinent with respect to gas, loose faeces or solid faeces. In patients both with and without neurological disease, correction of bowel problems may produce a significant improvement in lower urinary tract symptoms.

**Medical History**

**Obstetric History**

The incidence of stress incontinence increases with the number of pregnancies and the difficulties of parturition. Electromyography has shown evidence of pelvic floor denervation that is associated with stress incontinence. This denervation is worsened by factors which affect the pelvic floor: the number of pregnancies, the length of labour, the size of the baby, any episiotomies or tears and the use of forceps during delivery. The use of post-partum exercises designed to improve pelvic floor tone may help to prevent stress incontinence.

**Gynaecological History**

The relationship between the lower urinary tract and the hormonal status of the woman is often significant; for example, patients with urodynamic stress incontinence frequently report that their symptoms are worse in the week before their period begins: this is probably due to increased progesterone levels and relative tissue laxity. Therefore it is important to inquire about not only the patient's menstrual cycle but also her menopausal status. Operations on the uterus may interfere with the innervation of the bladder or may lead to distortion of the lower urinary tract. Denervation, more properly termed decentralisation, is most likely after radical hysterectomy for neoplasia, and may act at both the bladder and urethral levels. Any history of vaginal or suprapubic procedures for prolapse or incontinence
may be relevant, because such procedures can produce urethral or bladder neck distortion, scarring or narrowing.

**Urological History**

The significance of urological symptoms has already been discussed. The patient should be asked about his or her previous urological operations, as such operations have their complications, of which recurrent or persistent obstruction and sphincter damage after prostatectomy are the most common.

**Surgical History**

The operations most relevant to lower urinary tract function are those on the lower large bowel, where dissection at the side wall of the pelvis may result in nerve damage, especially during abdominal-perineal resection of the rectum.

**Trauma History**

Trauma to the urethra resulting in stricture formation and obstruction, or trauma to the spinal cord leading to an upper or lower motor neurone lesion, are the accidents most relevant to the lower urinary tract. Trauma to the urethra may be severe and obvious, as in a fractured pelvis with disruption of the pubic symphysis, but problems may follow an apparently trivial perineal injury from which the patient appears to recover in minutes or hours, only to develop a urethral stricture years later.

**Other Significant Conditions**

Systemic disease processes which influence the lower urinary tract may do so by affecting the innervation. Diabetes mellitus and multiple sclerosis are two such common conditions. Infections such as tuberculosis and schistosomiasis must be remembered. Degenerative disease of the cervical and lumbar spine, spinal tumours and many cerebral conditions may also present as incontinence. Pelvic radiotherapy may produce a post-irradiation cystitis with limitation of the bladder capacity, together with increased frequency and sometimes bladder pain. Mucosal telangiectasia following radiotherapy may occasionally cause haematuria.

**Drug Therapy**

Enquiries should be made as to any drugs the patient is or has been taking, and whether these drugs have any effect on bladder function or produce side-effects. Drugs may be taken intentionally to modify urinary function, or urinary symptoms may be a side effect of a drug taken for another purpose. All drugs with enhancement or blocking effects on cholin-
ergic, alpha-adrenergic or beta-adrenergic receptors and all drugs with calcium channel effects have a potential effect on lower urinary tract function. Most of these drugs are listed in Appendix 4.

**Drugs Enhancing Bladder Emptying**

Bladder emptying may be improved by giving drugs either to increase contractility or to decrease bladder outlet resistance. In theory, cholinergic drugs increase detrusor contractility and may produce frequency, whilst alpha-adrenergic blockers decrease outlet resistance, and may precipitate or exaggerate stress incontinence. Whilst alpha-blockers are thought to be effective, most clinicians have little faith in cholinergic medication designed to improve detrusor contractility.

**Drugs Enhancing Bladder Storage**

Bladder storage may be improved by increasing functional bladder capacity or by increasing bladder outlet resistance.

Antimuscarinic drugs, in patients with detrusor overactivity help to achieve continence and increase bladder capacity. Whilst antimuscarinic drugs are felt to be helpful in patients with detrusor overactivity during storage, their effectiveness is limited by side-effects: it is ironic that the most troublesome of these is dry mouth, which encourages the patient to drink more! Alpha-adrenergic stimulating drugs are used to increase bladder outlet resistance, although they have only a marginal effect.

**Other Drugs**

Other drugs of significance include diuretics, which increase urinary frequency in a variable way. The action of diuretics varies in accordance with the patient's age in particular, and the onset of the resulting increased urine output may also vary according to the gastrointestinal absorptive function. Anti-depressants, such as the tricyclic drugs, of which amitryptiline is an example, often have effects on lower urinary tract function; these drugs have anti-cholinergic actions which tend to increase storage and decrease voiding efficiency. Oestrogen therapy may improve lower urinary tract symptoms, decreasing urinary frequency and improving the symptoms of urethral pain/discomfort and urgency.

Full discussion of the actions of drugs on the lower urinary tract is beyond the scope of this book. Some further information is provided in the chapter on anatomy and physiology, or the reader is referred to the excellent chapter edited by, Karl-Eric Andersson in the books from the International Consultations on Incontinence, and the writings of Alan Wein. It is suggested that if the patient is on a drug prescribed to them to influence lower urinary tract function, or on a drug with urinary side-effects, then the investigator should interpret the urodynamic findings in the light of the known drug effects. In certain circumstances the clinician may prefer to withdraw the relevant drug two weeks before urodynamic testing, or before completion of a frequency-volume chart.
General Patient Assessment

Whilst discussing the presenting symptoms with the patient, the clinician will have made a subjective assessment of the patient. It is clear that there is a considerable interaction between the patient's personality and mood on the one hand, and the urinary symptoms on the other. It is a common experience that anxiety leads to urinary frequency and even urgency. Such factors as age, degree of stoicism, degree of neuroticism and mood should be assessed. Some patients are extremely tolerant of symptoms that other patients would refuse to accept, and the presence of nocturia is a good example. Whilst the factors mentioned above cannot be quantified easily, they remain important when the clinician comes to interpret the patient's symptoms and urodynamic findings, particularly with respect to proposals for treatment. It will be necessary occasionally to seek a psychiatric or psychological opinion where the clinician is uneasy about the patient's mental state, but cannot define the abnormality in its relation to urinary symptoms.

In addition to the mental state, the mobility and dexterity of patients can have a profound influence on management. Are they well motivated? Could they manage a urinary appliance? Would they be continent if more mobile and able to reach a toilet? Will they co-operate with follow-up or take drugs reliably? Often the fact that these aspects of assessment are overlooked prevents the subsequent urodynamic diagnosis and efforts at management from achieving the optimal result. The reader is referred to the Scientific Committee report from the 3rd International Consultation on Incontinence (2005) for further details.

Physical Examination

It is assumed that a general examination of the patient has been undertaken already. This section will discuss only aspects of examination that are of special relevance to the lower urinary tract.

Abdominal Examination

It is appropriate that the lower abdomen should be palpated and percussed in an attempt to demonstrate the bladder. In an adult, only a bladder containing in excess of 300 ml is likely to be palpable or can be percussed above the pubic symphysis. Even though a patient is in urinary retention the bladder may be difficult to palpate, although it should be demonstrated readily by percussion. Other enlarged bladders reveal a clearly palpable outline. The poorly defined (“floppy”) bladder is associated with lower intravesical pressures and normal upper tracts, whilst the firm and tense bladder is often associated with high intravesical pressures and upper tract dilatation. In most cases seen in the urodynamic laboratory the patient is unaware of their bladder distension. However, pressing on the suprapubic region, and asking if the patient feels a need to void, if positive, is a good indication of a full or enlarged bladder. Suprapubic examination also reveals the degree of sensitivity of the bladder in some cases where bladder pain is a symptom. The degree of obesity of the patient should be noted.
Examination of the External Genitalia

In the female, abnormalities such as meatal stenosis or fusion of the labia are found occasionally. In male patients, phimosis should be excluded, and the foreskin retracted to reveal the external meatus which should be examined carefully for stenosis. The urethra should be felt for fibrous thickening, which may indicate inflammation or stricture in either sex.

Vaginal Examination

Initially the introitus should be viewed with the patient lying on her back with the legs flexed and abducted.

- Part the labia and inspect the introitus: the position and appearance of the meatus should be noted. The clinician should look to see whether there is evidence of wetness at the introitus, whether the introital mucosa is well oestrogenised, showing a pink, moist and healthy appearance or whether there are signs of oestrogen deficiency when the mucosa appears thin, red and atrophic. If the mucosa is red and there is an offensive discharge it is likely that the patient is suffering an infective vaginitis. The patient should be asked to contract her pelvic floor (as if “holding on”) and the perineum should be seen to lift.

- Test for urine leaking by firstly asking the patient to cough repeatedly and secondly by asking the patient to bear down (strain), observing the meatus for urine leakage.

- Assess prolapse: prolapse can be divided into three categories: I, where the prolapse does not reach the introitus; II, where the prolapse reaches the introitus; III, where the prolapse is through the introitus. The presence and degree of anterior vaginal wall descent and posterior vaginal wall descent should be assessed. Uterine descent and/or enterocele will often be missed in this position.

- Assess vaginal capacity and mobility. This has particular significance in choosing the type of surgery in patients with urodynamic stress incontinence. In order to perform a repositioning procedure (e.g., a colposuspension), it is necessary to evaluate the vagina on both sides of the urethra, and place it in contact with the back of the symphysis pubis. The Bonney test, whereby a finger is put either side of the bladder neck, will successfully assess vaginal mobility, but should not be relied on as a test of continence as the elevating fingers may well compress the bladder neck and urethra.

The woman should now be asked to turn onto the left lateral position and examined using the Sim’s speculum to systematically assess the three possible elements of prolapse: anterior, posterior and middle compartments. Detailed measurements should be made in research studies and prior to prolapse surgery, to be repeated after operation. The details of the methodology can be found in Appendix 1, Part 2.

- Use a Sim’s speculum to retract the posterior vaginal wall, and assess the resting position of the bladder neck/bladder base and the degree of descent of the anterior vaginal wall on straining. It may be easier to demonstrate incontinence on coughing in this position. Any vaginal scarring should be noted.

- Assess posterior vaginal wall by using the Sim’s speculum to retract the anterior vaginal wall (the second blade of the speculum passes over the anterior abdominal wall).
Assessment of uterine descent or vault prolapse (after hysterectomy) can be achieved by retracting both anterior and posterior vaginal wall either using the Sim's speculum plus a long forceps or by using Cuscow’s speculum. Cuscow’s speculum cannot be used to assess anterior or posterior vaginal wall prolapse.

The vaginal examination is an excellent opportunity to assess the voluntary contractile ability of the patient’s perivaginal muscles. These muscles are part of the pelvic floor and the ability to contract them forms the basis of the pelvic floor exercises. The left and right pelvic floor muscles should be palpated in the lateral vaginal walls and their strength assessed (Oxford scale).

Rectal Examination

Rectal examination should also be systematic.

- **Inspection.** Does the anus appear normal? If a hand is placed on the perineal skin either side of the anus and lateral traction exerted then in patients with poor anal function the anus will begin to open.

- **Perineal sensation.** Because the dermatones S₂, S₃, and S₄ serve the perianal and perineal region, intact sensation is likely to mean that the innervation of the bladder and urethra, and indeed the rectum and anal canal is intact.

- **Anal reflex.** If the perineal skin is scratched the anus should “wink” at the investigator. This is best seen in patients with upper motor neurone lesions, for example, high spinal cord injury.

- **Anal tone.** As the examining finger passes into the anal canal the tone of the anal sphincter can be assessed. In lesions such as meningomyelocele anal tone may initially appear good, but after removal of the examining finger the anus may remain open.

- **Voluntary squeeze.** Patients should be able to increase anal sphincter pressure by voluntarily contracting the levator ani. If a woman has been unable to contract the perivaginal muscles during vaginal examination then the rectal examination may provide more stimulation, allowing her to appreciate which muscles need to be exercised as part of pelvic floor rehabilitation.

- **Faecal impaction.** If the rectum is impacted the subsequent urodynamics will be affected both because of the difficulty of inserting and monitoring the position of a rectal catheter but also because rectal distension inhibits detrusor contraction.

- **Prostate evaluation.** In men the prostate gland should be assessed for size, shape, consistency and abnormal tenderness.

Neurological Examination

All patients must have a simple neurological examination, including a gross assessment of sensation, reflexes and muscle function in the legs. In particular, special attention should be paid to the sensory sacral dermatomes, the motor divisions of which supply the bladder (S₂, S₃, S₄). In patients found to have, or known to have, neurological abnormalities, a full neurological examination should be performed. In injuries to the spinal cord, the level of the lesion and whether or not the lesion is complete should be documented.
Certain reflex responses are described in the assessment of sacral function. The anal reflexes are listed by pricking the perianal skin and watching to see if the anal sphincter contracts reflexly. This is quite easy to do at the time of rectal examination. The second reflex is the bulbo-cavernous reflex, and this involves digital squeezing of the glans penis (or clitoris) and the observation of contraction in the anal sphincter or bulbo-cavernous muscle. In the neurologically intact patient this procedure may provoke a certain amount of discontent and perhaps encourage them to be less co-operative. In any case a positive response is present only in 70% of normal people. If the reflex is considered to be important then it should be demonstrated electrophysiologically.

As a result of neurological examination the patients can be crudely grouped into four:

- Normal.
- Lower motor neurone: with decreased muscle tone, decreased power, decreased reflexes and absent sensation. This picture occurs in low spinal cord injury patients, affecting the conus medullaris.
- Upper motor neurone: upgoing Babinsky responses, increased muscle tone, increased reflexes, muscle spasms and absent sensation. This is typically seen in a high spinal cord injury patient.
- Mixed: lower motor neurone and upper motor neurone such as in spina bifida.

**Investigations**

**Urinalysis**

A catheter specimen of urine should be obtained at each urodynamic investigation. If the urine is obviously infected then urodynamics should not be performed because of the risk of provoking bacteria or septicaemia. It is sensible, in patients who have a past history of infection, to cover the urodynamic investigations by antibiotics. If investigation is essential in a patient who has an infection and has not been treated, then an adequate dose of the correct antibiotic should be given intravenously in order to ensure an adequate blood level at the time of investigation. The urine specimen should be routinely tested. We now routinely use “Stix” testing to detect leucocytes, nitrites, blood and protein. If “Stix” testing is abnormal, the urine should be sent for microscopy and culture.

**Cytology**

Cytological studies of urine, vagina or cervix may be indicated. Patients with widespread in situ bladder carcinoma, which carries a poor prognosis, may present with the symptoms of cystitis or bladder hypersensitivity. In these patients the urine specimen often shows white cells or red cells, and urine for cytology is likely to show malignant cells. In female patients with lower urinary tract symptoms the hormonal status of the patient may be assessed by lateral vaginal wall cytological smear. It has been shown that the urinary symptoms of patients whose vaginal cells show oestrogen deficiency often improve with oestrogen therapy.
Radiology

Non-contrast Radiology

A plain X-ray of the abdomen and pelvis can be useful. The X-ray should be critically examined to look at soft tissue abnormalities such as an enlarged bladder, bony abnormalities such as spondylosis, spina bifida or metastasis, and for opacities such as bladder or ureteric stones. In patients with straightforward LUTS, X-ray is very unlikely to show any abnormality.

Intravenous Urography

Traditionally many patients with lower urinary tract symptoms had an intravenous urogram (IVU) performed, but there is no evidence to show that in patients with lower urinary tract symptoms the IVU gives any useful information. This is because static films give very little idea of function: bladder shape may alter during contraction and diverticula may appear; the evaluation of residual urine is also notoriously inaccurate. Equally the absence of residual urine or of a basal prostatic filling defect does not exclude significant bladder outlet obstruction.

An IVU and/or ultrasound is indicated however, if the patient has blood in the urine or an abnormal plain x-ray. Similarly if the patient reports haematuria or has localised upper tract symptoms imaging is essential. It should also be carried out in patients who have undiagnosed continuous incontinence, as it may reveal a duplex kidney, suggesting an ectopic ureter. In patients with a proteus urinary tract infection, imaging may show an infected “matrix” renal calculus which can be difficult to see on a plain film.

Micturating Cystourethrography

The conventional micturating cystourethrogram (MCUG) consists of visualisation by a radiologist of abnormally fast filling, followed by emptying of the bladder: a number of spot films are taken at appropriate (or inappropriate) occasions. However, this can be a valuable assessment of lower urinary tract structure, because changes may be seen during the micturition cycle. It is appropriate to make the most of the investigation and to provide the maximum amount of clinical information to the radiologist. In order to do this the whole investigation should be recorded on videotape. The MCUG is a “second best” investigation to videourodynamic. However if videourodynamic is not available then MCUG should be performed (see “Videourodynamic” in Chapter 3).

Endoscopy

Endoscopy is not indicated in the assessment of lower urinary tract functions unless there are specific symptoms or signs. Endoscopy is indicated if the patient complains of bladder pain or haematuria or if there is an abnormal MSU or abnormal radiology. Occasionally clinical “desperation” may be an indication for endoscopy.
Endoscopy should always consist of urethroscopy followed by cystoscopy. It is particularly important that urethral inspection is not omitted, as it may give information as to the site of obstruction in patients with obstructed voiding. However, if the obstruction is functional rather than structural, for example, detrusor-bladder-neck dyssynergia or detrusor-sphincter dyssynergia, then the site of obstruction will not be demonstrated by endoscopy. Bladder neck and/or bladder wall hypertrophy does not indicate obstruction, nor does trabeculation of the bladder: these features are more strongly associated with detrusor overactivity. If urethroscopy is normal and the urodynamic assessment has shown obstructed voiding, videourodyynamics is the investigation of choice to determine the site of obstruction. The correlation between endoscopy and urodynamic findings is discussed Chapter 5 under “Urodynamics in Men”.

Ultrasound

Considerable progress has been made in the level of sophistication in ultrasound technology. In assessing patients with lower urinary tract problems, ultrasound can be used in several ways:

- As basic screening test in place of the plain abdominal X-ray.
- To assess bladder emptying. Simple hand-held machines are now available which can be used during urodynamics, in the outpatient clinic, on the ward and even in the patient’s home (Fig. 3.24).
- To exclude upper tract problems. It is useful to be able to scan the kidneys as in some situations vesico-urethral dysfunction can result in upper tract dilatation (see “Neuropathic Bladders” in Chapter 5). However renal ultrasound is probably best left to the radiologists.
- Vaginal ultrasound. Ultrasound can be used as an alternative to X-rays in videourodyynamics (see Chapter 3). A vector scanner placed at the introitus is preferred as an intravaginal probe may distort lower urinary tract anatomy.
- Rectal ultrasound: this can be used to visualise the prostate in men, and the lower urinary tract in both men and women.

References