1 Urological evaluation

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Urological complaints

The most common urological complaints that trigger the need for referral to a primary care doctor or urological surgeon can be divided into those referable to the lower urinary tract and those referable to the upper urinary tract. Although a careful history may be diagnostic in patients with, for example, renal colic or testicular torsion, very often non-specific features are more difficult to unravel.

Differentiation between urological and non-urological causes of non-specific symptoms can be made only after basic urological investigation

Symptoms

The bladder has been described as an unreliable witness. Sensory innervation is mediated largely through parasymapathetic nerves, with pain from overdistension mediated through the sympathetic nervous system. The precision with which the site and cause of symptoms in the lower and upper urinary tracts can be identified from this autonomic innervation is limited. Similar symptoms may occur as the result of different pathology. The art of urological evaluation on the basis of symptoms depends on understanding how much reliance can be placed on the patient's account of different symptoms and symptom complexes. This also depends on the ability of the doctor to phrase questions so that the patient is clear about their meaning.

Urological symptoms

- Obstructive symptoms
- Irritative symptoms
- Erectile dysfunction and sexual problems
- Urinary incontinence
- Pain
- Renal colic
- Fever
- Haematuria

Obstructive symptoms

Hesitancy of micturition can be a reliable symptom. The patient can quantify accurately a delay in initiation of the urinary stream. Using quite crude analogies, most men can describe whether their urinary stream is fast or slow—that is, strong or weak. A man's ability to write his initials with his urine on the wall behind a urinal indicates a strong stream, whereas a stream that dribbles onto his toes obviously is weak. Patients can confirm if their urinary stream is intermittent, and this is a good indicator of obstruction. A feeling of incomplete bladder emptying correlates poorly with objective findings on ultrasound.

Obstructive symptoms

- Hesitancy
- Poor stream
- Intermittent stream
- Terminal dribbling

Irritative symptoms

A burning sensation on micturition is common in patients with a lower urinary tract infection. A similar sensation can occur in the absence of infection, however, and infection can occur in the absence of any discomfort.

The term "dysuria" is often applied to a burning sensation on micturition, but it means different things to different people and is best avoided. Urgency of micturition may be sensory or motor in origin, but when a history is taken, it is hard to distinguish between the two—although the underlying pathologies are very different. Patients with urgency feel as if they may leak urine if they are not able to reach a lavatory imminently. The sensation of needing to pass urine again just after micturition—strangury—is the urological equivalent of tenesmus. In the urinary tract, the symptom is not diagnostic for any one pathology.

Irritative symptoms

- Burning on micturition
- Urgency
- Daytime frequency
- Nocturia
- Urge incontinence

Frequency of micturition

When patients are asked to describe their urinary frequency, they have every opportunity for an unhelpful and lengthy reply. The number of times a patient wakes to pass urine at night is a value that most people can identify accurately. A single episode

Input/Output Chart

Name.....

Date.....

Input		Output	
Time	Volume and type of fluid	Time	Volume

Recording frequency of micturition on a "time and volume" chart can be useful

of nocturia is within normal limits. More than this number becomes increasingly important.

Daytime urinary frequency is subject to so many variables that it almost is unhelpful—except to know whether such frequency provokes an adverse effect on the patient's lifestyle.

Urinary incontinence

To establish the circumstances under which urine loss occurs is important. Neither men nor women are entirely continent. In men, a small urinary leakage at the end of the stream (also known as "post-micturition dribble") is so common that it does not constitute an abnormality. Many women—young and old—leak a little urine on coughing. The degree of a patient's fastidiousness will dictate their response to minor degrees of urinary loss of this kind.

The single most important question to follow a complaint of urinary incontinence is "What protection do you need to cope with the leakage?" If the loss of urine needs no more than a change of underwear, further investigation is unlikely to be worthwhile, but referral for consideration of pelvic floor exercises may be beneficial to the patient.

Renal and ureteric colic

The pain from a stone that is moving within the urinary tract is among the most severe pains that patients may experience. Stones may move within the renal collecting system, and, in such cases, the pain is likely to be felt mainly in the loin. When a stone moves into the ureter, the pain may radiate into the iliac fossa and the scrotum or labia. The site of the pain, however, is not a very reliable indicator of the site of the stone.

Fever

Lower urinary tract infections do not cause a fever, which occurs only when a urinary infection is in a solid organ (kidney, prostate, or testis) or if the patient has an obstructed and infected urinary tract. The latter is an emergency that needs immediate nephrostomy drainage (under local anaesthesia). If an infected and obstructed kidney is suspected, urgent ultrasound (to confirm hydronephrosis) should be followed by percutaneous nephrostomy.

Sexual dysfunction

Erectile dysfunction presents as an inability to initiate or sustain an erection sufficient to enable vaginal penetration and subsequent orgasm. The presence of nocturnal or early morning erections makes an organic cause of erectile dysfunction less likely.

Retrograde ejaculation occurs commonly in men after transurethral resection of the prostate and sometimes in those who have taken a adrenergic blockers. Failure of ejaculation may occur after sympathectomy or retroperitoneal surgery, as the sympathetic pathways to the prostate and seminal vesicles are interrupted. Premature ejaculation occurs most often as a functional problem.

Examination

Much of the genitourinary tract is hidden from view. This dictates that many decisions on management are usually possible only at a second outpatient visit, when the results of baseline investigations are available.

External genitalia

If a lax scrotum lies between the thighs, the scrotal contents can be delivered painlessly for examination by taking and

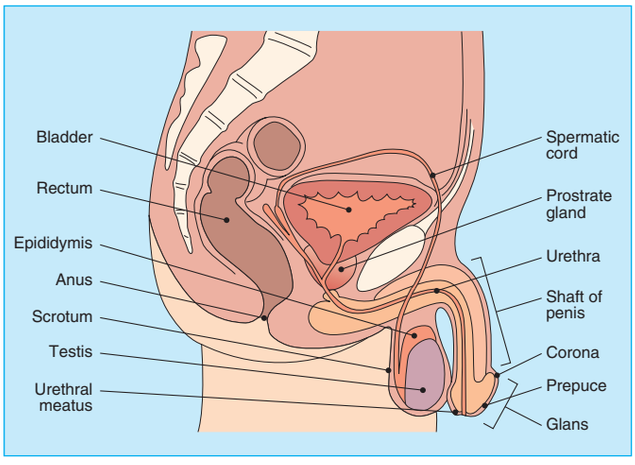
Urinary leakage

- Urinary leakage is more common in women than in men
- A severe degree of urge incontinence will probably cause a larger volume of urine loss than the most severe stress incontinence
- Some women are unable to identify how they leak
- Urinary leakage during sexual intercourse occurs in some women

When a stone enters the intramural ureter, patients often describe strangury, and, in men, discomfort may be felt at the tip of the penis

If a urinary tract infection is suspected the presence of nitrites and red cells on dipstick testing can be useful, although not unequivocal, confirmatory evidence

Ideally, antibiotics should not be prescribed until a urine culture has been taken



Male genitalia including scrotal contents. Reproduced from Adler M, et al. *ABC of sexually transmitted infections*. 5th edition. Oxford: Blackwell Publishing, 2004, and adapted from the *Sexually transmitted infections: history taking and examination* CD published by the Wellcome Trust, 2003.

pulling on a fold of scrotal skin. The testes appear without discomfort. The testes and epididymes can be identified separately.

If epididymal infection is present or testicular torsion is suspected, the examination must be extremely gentle to avoid causing pain. Observation of the colour of the scrotal wall may reveal hyperaemia. The absence of a cremasteric reflex contraction when the scrotum, or the area close to the scrotum, is touched is also an important sign to elicit. The loss of this reflex is not diagnostic of one pathology, but its presence is strongly against a diagnosis of torsion.

Examination of the penis should include assessment of the degree to which the prepuce can be retracted. The external urethral meatus must be identified: in patients with hypospadias and epispadias, the meatus will be sited abnormally. If an attempt is made to pull the sides of the meatus apart, the presence of meatal stenosis can be identified. The shaft of the penis is palpated to identify fibrous plaques of Peyronie's disease, which usually are found dorsally.

The patient's external genitalia should be examined with the patient in the supine and erect positions to identify pathologies such as hernia and varicocele

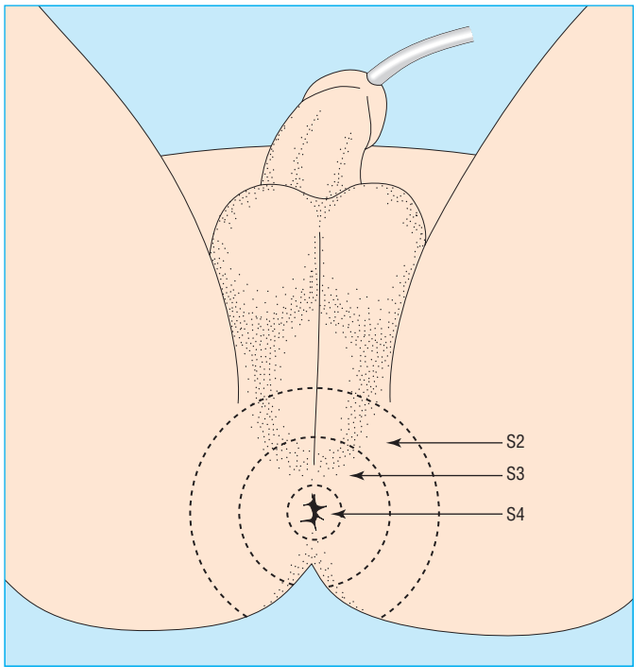
Rectal examination

To avoid causing the patient discomfort, rectal examination is performed best with the patient in the left lateral position. The examiner's finger should be inserted while the patient exhales to encourage maximum relaxation of the anal sphincter. The tone of the anal sphincter is noted, and in patients with incontinence as a result of weakness of the sphincter, it is helpful to ask the patient to contract their anal sphincter. Perianal sensation can be tested in the distribution of the S2, S3, and S4 segments—the spinal segments responsible for the main motor and sensory innervation of the bladder.

Examination of the prostate *per rectum* provides only a rough estimate of the size: the prostate can be categorised as small, medium, or large. The consistency of the prostate can be described as soft, firm, or hard; the surface as smooth or irregular; and the lateral lobes as symmetrical or asymmetrical. Although malignant prostates classically are hard, no precise correlation exists between any of the features described and a specific pathology. Although patients find examination of the prostate uncomfortable, only a bad examination technique, anal pathology, or inflamed prostate will cause significant discomfort or pain.

Rectal examination

- Anal sphincter tone
- Anal sphincter contractility
- Peri-anal sensation
- Prostate—size, surface, symmetry, and consistency



S2, S3, and S4 segments are responsible for the main motor and sensory innervation of the bladder

Initial investigations

Dipstick urine testing

Readily available and frequently used, dipstick testing of urine is a very inaccurate investigation. The presence of white cells and nitrites is only a rough guide to the presence of infection, although the absence of nitrites in the urine normally is enough to rule out an infection and the need for urine microscopy. Microscopic haematuria may be intermittent, but the presence of blood cells in the urine normally should prompt referral for further investigation, and it now is considered unnecessary to confirm the presence of red cells by urine microscopy.

Urine culture

Many laboratories now use an automated method to identify red and white cells in the urine. The numbers of each that can be considered normal are considerably higher than the numbers regarded as normal when urine microscopy is used. These values must be recognised, particularly for red cells, to prevent inappropriate referrals.

Urine cytology

Although some automation is used for the analysis of urine cytology, the final arbiter is microscopy—the accuracy of which

Initial investigations

- Urine culture
- Urine cytology
- Biochemistry
- Ultrasound
- Urodynamics
- Radiology
- Nuclear medicine

Culture of a midstream specimen of urine is the only way to identify patients whose symptoms truly result from infection

depends on the expertise of the cytopathologist. Although alternatives to microscopy to identify malignant cells in urine have been introduced, none can reproduce the accuracy of the expert eye.

Biochemistry

Renal function is measured better by serum creatinine than by blood urea, the latter being influenced by the degree of hydration and rate of metabolism. The extent of reserve renal function means there must be a loss of two thirds of overall renal function before levels of serum creatinine increase. Measurements of sodium, potassium, and chloride electrolytes are the other baseline biochemical tests of relevance.

Ultrasound

Ultrasound examinations are used extensively now in the investigation of renal, ureteric, bladder, prostatic, and scrotal pathology. They may be regarded as an extension of examination. Whether an ultrasound examination is undertaken by an ultrasonographer, radiologist, or urologist, the person who undertakes the examination has the advantage of seeing the images in real time, while the doctor has only a few still images. The report thus is of prime importance, and the skill of the person who undertakes the examination is paramount. Limitations of ultrasound vary in different situations.

Kidney

In the kidney, ultrasound is better than computed tomography at identifying renal cysts, but it may fail to distinguish between parapelvic cysts and hydronephrosis. Although renal stones may give the classic appearance of a bright echo with a black shadow behind, this is not always the case. Ultrasound is a poor way of screening for renal stones. Assessment of the size of a stone using ultrasound is not very accurate. On occasions, if a stone fills the renal pelvis or the entire collecting system, it is possible to miss it on ultrasound. If the patient is obese, ultrasound becomes more difficult.

Bladder

The bladder is seen easily on transabdominal ultrasound, and volume measurements are easy and accurate. Intravesical pathology, such as tumours and stones, can be seen best when the bladder is full.

Prostate

Transrectal ultrasound of the prostate has transformed understanding of prostatic anatomy and pathology. Biopsies of the prostate and placement of radioactive seeds in brachytherapy are always undertaken with ultrasound imaging.

Scrotum

The scrotal contents are one of the few sites in urological practice where examination is easy. Differentiation between the normal epididymis and testis is accurate, and the vas can be palpated. In the presence of a tense hydrocele or inflammation, examination becomes more difficult and ultrasound may be worthwhile.

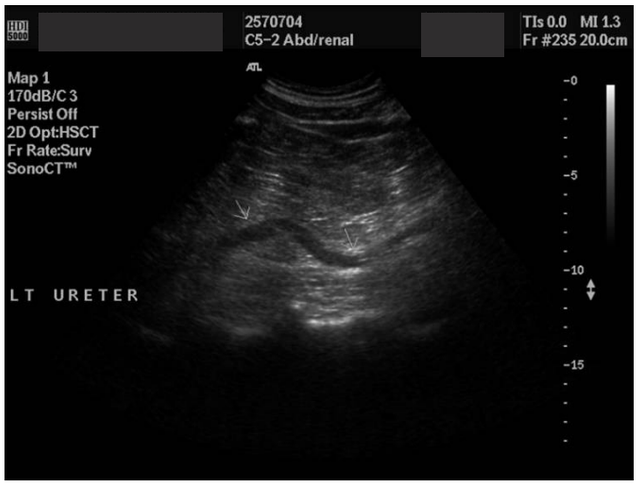
Ureter

Ureteric dilatation can be identified, but the cause is much more difficult to define. A stone at the lower end of the ureter may be identified by using the full bladder as an acoustic window.

Urological ultrasound

- Kidneys
- Ureters
- Bladder
- Prostate
- Scrotum

Renal ultrasound showing pelvi-caliceal and upper ureteric dilatation



Ultrasound showing dilatated ureter

Urodynamics

Urodynamic investigations of the upper urinary tract are not commonly performed. Assessment of the function of the lower urinary tract can be made by a number of investigations:

- Urinary flow rate is a basic measurement that is obtained easily and non-invasively
- Assessment of bladder capacity and the size of the residual urine volume is made readily by cheap bladder scanners or more expensive ultrasound machines
- To add sophistication to a urodynamic assessment, bladder pressures can be measured with a urethral catheter during bladder filling and emptying
- Further information is afforded by performing a pressure or flow assessment under fluoroscopic imaging.

Radiological investigations

- Plain abdominal x ray
- Intravenous urogram
- Urethrogram
- Retrograde ureterogram
- Antegrade ureterogram
- Computed tomography
- Magnetic resonance imaging
- Isotope renogram
- Isotopic glomerular filtration rate
- Isotope bone scan

Radiological investigation

Intravenous urography

Intravenous urography (combined with renal ultrasound) remains the investigation of choice in patients with painless haematuria. New low osmolarity contrast media cause severe allergic reactions in less than 0.02% of patients.

Debate continues over whether intravenous urography is better than computed tomography for the investigation of patients with renal colic

Computed tomography

The use of computed tomography has increased in urological practice—often at the expense of increased doses of radiation. Computed tomography remains the investigation of choice for identification of renal masses. The rapid speed of the investigation offers advantages, but interpretation of images may need considerable investment of time at a sophisticated workstation that can format images in a wide variety of ways.

Magnetic resonance imaging

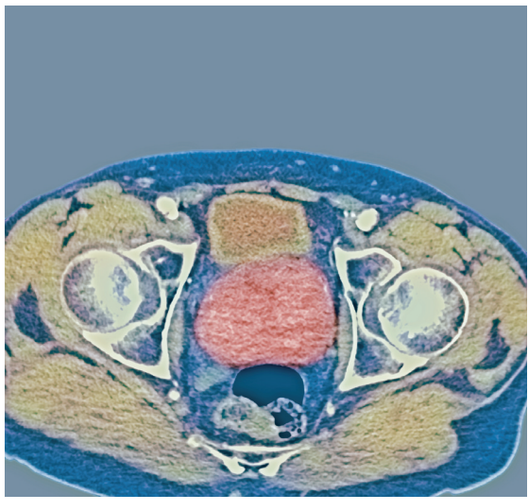
Magnetic resonance imaging has been adopted as the investigation of choice in the staging of prostate cancer. The same investigation can be helpful if used on bone settings to interpret areas of increased isotope uptake on a bone scan.

Positron emission tomography

Positron emission tomography is not available widely. It is not used routinely yet in urology.

Nuclear medicine

Dynamic isotope renography that uses mercaptoacetylglycine (MAG3) as the radiopharmaceutical is the most accurate method of identifying upper urinary tract obstruction and also shows differential renal function. Static renography with dimercaptosuccinic acid (DMSA) will identify renal scarring and differential renal function. The most accurate measurement of glomerular filtration rate is obtained by using an ethylenediaminetetraacetic acid (EDTA) clearance technique. Isotope bone scans are used in uro-oncology to identify bony metastatic disease.



Axial coloured magnetic resonance image scan of a patient with prostate cancer. With permission from Du Cane Medical Imaging Ltd/ Science Photo Library