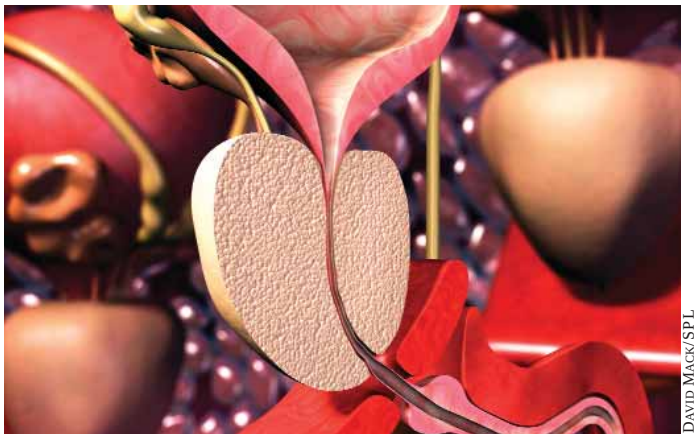
Urological emergencies — causes, symptoms and management

By **Ziad Al Rifai**, MRPharmS, and **Adriece Ayub**, MRPharmS, DipClinPharm

Acute urological emergencies are often serious complaints requiring life-saving treatment. This article describes the most common urological emergencies encountered in hospital and how they are managed



DAVID MACK/SPL

Benign prostatic hyperplasia can cause acute urinary retention

A significant proportion of the urological complaints seen in hospitals are acute urological emergencies. These complaints require immediate, often life-saving treatment — either surgical intervention or pharmacological management. In many cases there is an underlying disease that can trigger a urological complaint.

Panel 1 lists the most common urological emergencies. This article will focus on three of these: acute urinary retention, renal colic and spinal cord compression. The following article (p333) describes the pharmacological treatment of these conditions.

Acute urinary retention

Acute urinary retention (AUR) is the most common urological emergency seen in hospital. It is defined as the sudden inability of an individual to pass urine voluntarily for several hours when the bladder is full.

It is important to distinguish between acute and chronic urinary retention. Both involve the onset of irritative and obstructive symptoms (eg, urinary frequency, hesitancy, urgency and incontinence), however the latter develops insidiously, and in the absence of pain — a characteristic feature of acute retention.

Ziad Al Rifai is a pharmacist and final year medical student at Leicester and Warwick Universities. **Adriece Ayub** is a senior medicines information pharmacist at Birmingham City Hospital.

Epidemiology and risk Patients with AUR are commonly male, over 60 years old and have benign prostatic hyperplasia (BPH).[1] Approximately 10 times more men are affected by AUR than women. According to the Department of Health annual hospital episode statistics (2002–03), 86 per cent of the patients admitted with AUR were men, with an average age of 69 years.[2] Almost one in three men aged over 80 years develop AUR.[3]

Other risk factors include prostatitis, renal calculi and prostate cancer. Women are most at risk when undergoing gynaecological surgery or during pregnancy. Patients suffering recurrent urinary tract infections (UTIs) or with a history of kidney stones are also at risk.

Causes and pathophysiology AUR can be precipitated by any disease that causes bladder outflow obstruction. This is most commonly BPH, although it can also be caused by urinary tract infection, faecal impaction, prostate carcinoma and urethral strictures.

AUR can arise due to nerve damage to either the sensory pathways from the bladder wall or motor pathways to the detrusor muscle. Nerve damage can occur as a result of trauma to the sacral spine, diabetic neuropathy or stroke.

Some sympathomimetic drugs can precipitate AUR by causing the smooth muscle in the neck of the bladder to contract, increasing urinary resistance (see p334).

AUR can also arise as a complication of surgery, because an increase in alpha adrenergic neural tone can occur, which contracts bladder sphincter muscles.[4] Also, AUR is a potential side effect of opioids and anticholinergic agents that may be used as anaesthetics.

Symptoms and investigations In addition to the inability to urinate (despite having a full bladder), most patients present with lower suprapubic pain and a distended abdomen. A number of tests are useful in the diagnosis of AUR, although the main diagnosis is based on the onset of symptoms, history and physical examination of the patient. Other tests may include:

- Catheter stream urine analysis and white blood cell count to detect infection
- Urea and electrolytes levels to assess metabolic and electrolyte derangement (eg, uraemia and

Panel 1: Common urological emergencies

- Renal colic
- Acute urinary retention
- Priapism
- Spinal cord compression
- Testicular torsion
- Paraphimosis
- Ruptured urethra

hyperkalaemia), which can be a complication of AUR
- Creatinine levels to assess the degree of renal impairment
- Prostate specific antigen (PSA) in the bloodstream, which is an indicator of prostatic disease (although this can give a "false positive" in older males)
- Renal ultrasound to detect hydronephrosis — a condition where distension of the kidney, caused by back pressure from a urinary tract blockage, can destroy renal tissue (performed on patients showing renal impairment)

Management Initial treatment of AUR is urgent catheterisation via the urethra. This is usually carried out by junior doctors in the accident and emergency department or acute medical unit. Qualified nurses may also carry out urethral catheterisation.

The most common urethral catheter is a Foley catheter. The procedure must be carried out under strict aseptic conditions to minimise the risk of infection. The catheter has a balloon near its tip which is inflated once it enters the bladder, to prevent the catheter from being dislodged.

An alternative to a urethral catheter is a suprapubic catheter.[5] This is inserted directly into the bladder through the abdominal wall. It may be considered in patients that are difficult to catheterise via the urethra (eg, in patients that have urethral trauma, strictures or an enlarged prostate). At this stage, patients are usually referred to a urologist for more specialised management. All types of catheterisation carry risks of complication, as summarised in Panel 2.

The initial volume drained via a catheter should be measured accurately and is known as the residual volume. This provides an indication of prognosis — a volume less than 1,000ml will indicate that the patient is likely to succeed a "trial without a catheter" (TWOC).[6] This is proven to have a good success rate in uncomplicated cases, particularly when predisposing factors such as constipation or a UTI have been treated.[8]

A national survey of practising consultant urologists concluded that urethral catheterisation remains the initial treatment of choice in 98 per cent of all AUR cases.[7] If the patient fails a TWOC, this is considered an indication for a transurethral resection of the prostate (TURP), a surgical procedure that reduces the size of the prostate.

Subsequent management depends on patient presentation, residual volume drained and fitness for medical or surgical intervention. Once initial management goals have been addressed, the cause of retention must be identified, to prevent recurrence and complications.

Treatment of BPH In the UK most men with BPH who have failed a TWOC following AUR will be sent home with training for self-catheterisation, to await surgery. Surgery usually takes place within three months.[6] Primary prevention should be focused on patients at high risk of AUR, such as elderly patients with severe symptoms of BPH and a high PSA level.[8]

Panel 2: Risks associated with catheterisation

- Infection
- Hypotension and dehydration — fluid balance should be monitored and suitable rehydration with normal saline administered
- Post obstructive diuresis — high urine output, thought to be due to a transient state of nephrogenic diabetes insipidus

Panel 3: Risk factors for developing renal colic

Metabolic abnormalities
- Idiopathic hypercalciuria
- Renal tubular acidosis
- Primary hyperparathyroidism
- Cystinuria
- Hyperoxaluria
- High dietary intake of oxalate
- Gout and high plasma urate levels

Structural abnormalities
- Nephrocalcinosis (deposition of calcium and oxalate or phosphate in renal tubules)
- Polycystic kidney disease
- Horseshoe kidney
- Reflux nephropathy

Other causes
- Chronic dehydration
- Alkali loss from gut (ie, from ileostomy)
- Sjögren's syndrome
- Drugs (eg, anticonvulsants, decongestants, diuretics, guaifenesin, magnesium-containing antacids)

Renal colic

Renal colic refers to pain associated with kidney stones (also known as nephrolithiasis). Stones (calculi) form in the collecting ducts of the kidney and can settle anywhere from the renal pelvis to the urethra. There may be a single stone or numerous stones present.

Epidemiology and risk Renal colic is relatively common, affecting around 3 per cent of the UK population. It has an annual incidence of two new cases for every 1,000 people. It typically occurs in those aged 20–50 years, and is more common in men. The risk of recurrence is 35–75 per cent over 10 years.[9]

The risk factors for developing renal colic are outlined in Panel 3.

Causes and pathophysiology Up to 80 per cent of kidney stones are calcium-based. Other composite materials include struvite, uric acid, cysteine and xanthine. Most stones occur as a result of super saturation of urine with salts that form solid crystals. The types of stone vary in hardness and radio-opacity. The underlying cause should be treated to prevent recurrence.

Symptoms and investigations The pain of renal colic is often described as sharp, colicky and extremely severe. Pain tends to radiate from the loin to the groin; in male patients to the testes and in females to the labium. Pain is accompanied by restlessness.

The type and degree of pain is related to the quantity and location of calculi. Those that form before they reach the bladder tend to pass in the urine without any symptoms. Calculi forming in the urethra cause severe pain due to urethral spasm.

Clinicians should remain cautious when treating older patients with the above symptoms for the first time, because a ruptured aortic aneurysm can easily mimic the symptoms of renal calculi, and a missed diagnosis could have severe consequences.

The following imaging techniques are employed to confirm the presence and position of potential calculi:

- X-ray imaging (of the kidney, ureters and bladder) can detect a calcification along the outline of the ureters. This test has a sensitivity of about 80 per cent
- Intravenous urogram (IVU) confirms the presence, size and location of a stone. IVU should be avoided in patients with severely impaired renal function
- Computed tomography (CT) scans are more sensitive than x-ray imaging for the detection of stones
- Renal ultrasound is used to exclude hydronephrosis

Identification of the cause of renal colic is essential in order to prevent its recurrence. Metabolic studies are recommended, (although carried out at a later stage) to assess risk of recurrence and identify precipitants of stone formation. This includes measuring pH, citrate, oxalate and phosphate levels in the urine, and a repeating 24-hour urinalysis.

Management Management of renal colic depends on the size of the stone and the chances of it passing spontaneously. Studies have shown that calculi measuring less than

4mm in diameter have approximately a 90 per cent chance of passing spontaneously.[10] A conservative approach of pain relief and hydration should be adopted. Any stones greater than 6mm have only 10–20 per cent chance of passing spontaneously, so intervention is deemed necessary. Stones measuring 4–6mm have 20–90 per cent chance of passing spontaneously, so the physician's decision on whether to intervene is not clear-cut. A decision will be made based on the patient's co-morbidities and the exact size of the stone.

Interventions have evolved to be minimally invasive, and include:

- Extracorporeal shock wave lithotripsy is a common procedure uses sound waves to break down stones. However, there are a number of potential long-term side effects such as hypertension, renal injury and diabetes. It is typically used for large stones in the ureter[11]
- Ureteroscopy is reserved for pregnant women, morbidly obese patients or where lithotripsy has failed. A ureteroscope is passed through the urethra and bladder into the ureter, allowing the stone to be removed in a small basket or broken down by a laser
- Nephrolithotomy is a procedure to remove the stones, often percutaneously by keyhole surgery. This is beneficial for patients with multiple stones or those with suspected or confirmed urosepsis
- Open surgery (eg, nephrectomy or open nephrolithomy) tends to be rarely required, due to the above techniques being highly successful and carrying a lower risk of bleeding and infection

Regardless of the size of the calculi, all patients should receive adequate fluid hydration and pain relief. A review of the pharmacological management to treat pain and prevent recurrence can be found in the second part of this feature (p333).

Prevention Patients are encouraged to increase their fluid intake to more than 2.5L per day to maintain a high urine flow and low urine osmolality.

Drug treatment using thiazide diuretics (eg, chlorthalidone) increases calcium reabsorption by the renal tubules in patients with hypercalciuria. This reduces the likelihood of super saturation of urine with calcium, preventing calculi from forming. Similarly, citrate can be beneficial in treating calcium oxalate stones, and allopurinol is licensed for their prophylaxis.

Diet and nutrition advice is crucial in reducing recurrence. For uric acid stones, a decrease in salt and red meat is can reduce urate levels. For oxalate stones, reducing dietary oxalate, present in tea, spinach, strawberries and chocolate, has shown to be beneficial. However a reduced calcium intake has not shown to reduce the risk of developing calcium stones, and can cause a negative calcium balance.[12]

Spinal cord compression

Spinal cord compression (SCC) is probably one of the most feared emergencies in clinical practice and can affect up to 5 per cent of cancer patients.[13] It is not exclusively a urological emergency and may present to other specialties such as oncology or orthopaedics.

SCC is defined as "pressure placed on the spinal cord usually caused by a tumour or a bony fragment". Initial presentation can be subtle, with patients only complaining of vague symptoms, but a rapid progression over a few hours is not uncommon. If left untreated, irreversible loss of power and sensation to the lower limbs can occur, depending on the site of SCC. Permanent bowel or bladder incontinence may follow, which has huge implications on the patient's quality of life.

A high degree of caution should be maintained in all patients with a history of prostate cancer, because it has a high tendency for metastasis to the vertebral column. Other solid tumours with a high tendency to metastasise to the bone include lung, breast, thyroid and renal cancers.

Epidemiology and risk Metastatic bone disease is the most common cause of SCC. Bone metastasis secondary to prostate cancer can occur in 5–7 per cent of all patients with advanced disease. However, many causes can precipitate cord compression (see Panel 4) and it is beyond the scope of this article to discuss each one. This article will address prostate cancer as a causative factor of this condition.

Approximately 85 per cent of prostate cancer metastasis invades the vertebral column, leading to SCC. Of these vertebral metastases, the region most commonly affected is the thoracic spine (68 per cent) followed by the lumbar spine (20 per cent).[14]

Symptoms and investigation Patients may progress through the following symptoms in a matter of hours:

Panel 4: Potential causes of cord compression

- Inflammation (eg, rheumatoid arthritis)
- Infection (eg, tuberculosis)
- Vascular problems (eg, subdural haematoma)
- Degenerative (eg, prolapsed disc)
- Tumours (eg, astrocytomas)
- Trauma (eg, vertebral fractures)
- Secondary metastasis from primary tumour (eg, prostate cancer)

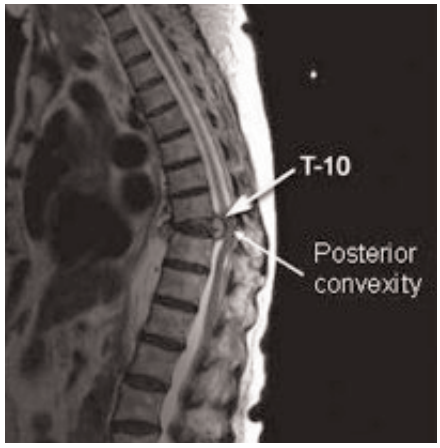


Figure 1: Magnetic resonance image of spinal cord compression at the level of the tenth thoracic vertebra (T-10)

- Back pain, worsening on movement
- Weakness in lower limbs and/or difficulty in walking
- Reduced limb sensation
- Urinary or faecal incontinence
- Paraplegia

In some cases, paraplegia is complete and irreversible, so early and accurate diagnosis is essential.

Magnetic resonance imaging (MRI) is the definitive technique for diagnosing SCC. When suspected, an MRI should be requested urgently in cases of rapid clinical deterioration. MRI has a sensitivity of 93 per cent, specificity of 97 per cent and an overall accuracy of 95 per cent.[15] Figure 1 shows an MRI scan identifying SCC .

Management Treatment should be started as soon as diagnosis is confirmed. Prompt treatment maintains ambulatory function and reduces the risk of motor dysfunction and urinary or bowel incontinence. Treatment choices include:

- Corticosteroids (eg, dexamethasone) to reduce inflammation of the cord (see p336)
- Radiotherapy
- Surgical decompression

Patients often receive a combination of therapies (eg, dexamethasone with palliative radiotherapy). Pain relief is an essential component of acute management and opioids are typically first choice.

Conclusion

Urological emergencies are relatively common. Early medical or surgical intervention reduces the likelihood of complications occurring, thereby improving patient outcome. Management of underlying conditions is a key element in minimising recurrence in susceptible patients.

References

1. Oishi K, Boyle P, Barry MJ, Farah R, Gu FL, Jacobson S et al. Epidemiology and natural history of benign prostatic hyperplasia. In: Denis L, Griffiths K, Khoury S, et al (editors). Fourth International Consultation on BPH, Proceedings. Plymouth: Health Publications;1998. pp23–59.
2. Department of Health. Hospital Episode Statistics 2003–04. London: The department; 2004
3. Jacobsen SJ, Jacobsen DJ, Girman CJ, Roberts RO, Rhodes T, Guess HA, et al. Natural history of prostatism: risk factors for acute urinary retention. The Journal of Urology 1997;158:481–7.
4. Barone JG, Cummings KB. Aetiology of acute urinary retention following benign ano-rectal surgery. Annals of Surgery 1994;60:210–11.
5. Ichsan J, Hunt DR. Suprapubic catheters: a comparison of suprapubic versus urethral catheters in the treatment of acute urinary retention. The Australian and New Zealand Journal of Surgery 1987;57:33–6.
6. McNeill SA, Donat R, Pillai MK, Hargreave TB, Daruwalla P, Goodman CM et al. Prospective multicentre randomised placebo double blind study of the effect of alfuzosin on the outcome of trial removal of catheter following acute urinary retention. The Journal of Urology 1998;159(suppl): 256.
7. Manikandan R, Srirangam SJ, O'Reilly PH, Collins GN. Management of acute urinary retention secondary to benign prostatic hyperplasia in the UK: a national survey. BJU International 1993;1: 84–8.
8. Pickard R, Emberton M, Neal DE. The management of men with acute urinary retention. British Journal of Urology 1998; 81:712–20.
9. Uribarri J, Oh MS, Carroll HJ. The first kidney stone. Annals of Internal Medicine 1989;111:1006–09.
10. Segura JW, Preminger GM, Assimos DG, Dretler SP, Kahn RI, Lingeman. Ureteral stones: clinical guidelines — panel summary report on the management of ureteral calculi. The Journal of Urology 1997;158:1915–21.
11. McAteer JA, Bailey MR, Williams JC Jr, Cleveland RO, Evan AP. Strategies for improved shock wave lithotripsy. Minerva Urologica e Nefrologica 2005;57:271–87.
12. Borghi L, Schianchi T, Meschi T, Guerra A, Allegri F, Maggiore U et al. Comparison of two diets for the prevention of recurrent stones in idiopathic hypercalciuria. New England Journal of Medicine 2002;346:77–84.
13. Maryjo Osowski. Spinal cord compression: An obstructive oncologic emergency. Topics in Advanced Practice Nursing ejournal 2002
14. Rosen P, Barkin R. Emergency medicine: Concepts and clinical practice. 4th edition. St Louis, Missouri: Mosby;1998.
15. Li KC, Ponn K. Sensitivity and specificity of MRI in detecting malignant spinal cord compression and in distinguishing malignant from benign compression fractures of vertebrae. Magnetic Resonance Imaging 1988;6(5):547–6.

Suggestions for future special features

If you would like to suggest a topic for a future special feature in *Hospital Pharmacist*, or if you are a specialist clinical pharmacist interested in writing about your area of practice, please contact Hannah Pike (e-mail hannah.pike@pharmj.org.uk, telephone 020 7572 2425) or Gareth Malson (e-mail gareth.malson@pharmj.org.uk, telephone 020 7572 2419).

Hospital Pharmacist **online**

Hospital Pharmacist is available online at www.pjonline.com/hp The website contains the current issue and an archive of back issues from January 2000 onwards. There are also links to the regular features in *Hospital Pharmacist* (eg, Life-long Learning, meeting reports, careers, focus on technicians, etc) and forthcoming special features. The site also contains advice to contributors to *Hospital Pharmacist*, information about the annual *Hospital Pharmacist* conference, a link to *The Pharmaceutical Journal* careers page and information on subscribing to the journal.

There is a diary page with reunions, branch meetings, courses and health events (www.pjonline.com/diary) and a comprehensive site index (www.pjonline.com/sitemap).