Urinary Tract Obstruction

Urinary obstruction is the result of impairment of the urinary flow along the urinary tract. This can have a number of causes. It may occur at any point in the urinary tract from the renal calyces to the external urethral meatus. It can cause:

- Proximal distention of the urinary tract - effects will depend on the exact location and severity of the blockage:
  - Obstruction in the urethra causes bladder dilation, secondary hypertrophy and diverticulae formation.
  - Obstruction in a ureter causes dilation of the ureter (megaureter) and renal pelvicalyeal system (hydronephrosis).
- Pain, particularly when the urinary obstruction is acute.
- Decreased renal function due to back pressure causing renal tubular atrophy, glomerular hyalinisation and fibrosis.
- Increased risk of urinary tract infection (UTI), sepsis and stone formation due to urinary stasis.

Certain points along the urinary tract are more susceptible to obstruction:

- Pelvi-ureteric junction (PUJ).
- Where the ureters cross the pelvic brim, at the level of the iliac vessels.
- Vesico-ureteric junction (VUJ).

Obstruction can be unilateral or bilateral:

- Unilateral - the most common causes are calculi and neuromuscular malfunction at the junction of the renal pelvis and ureter.
- Bilateral - usually with lesions in the bladder base or retroperitoneal tissues.

### Causes of urinary tract obstruction

<table>
<thead>
<tr>
<th>Site of obstruction</th>
<th>Possible causes</th>
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| Within the lumen          | • Blood clot.  
• Calculi.  
• Sloughed papillae.  
• Tumour of renal pelvis or ureter. |
| Within the wall           | • Ureteric, urethral or ureterovesical stricture.  
• Congenital megaureter.  
• Bladder neck obstruction.  
• Congenital urethral valves.  
• Pinhole meatus.  
• Neurogenic bladder.  
• Functional failure due to denervation (eg, following spinal trauma, multiple sclerosis). |
| Pressure from outside tract | • PUJ compression from bands or aberrant vessels.  
• Tumours and benign prostatic hyperplasia (BPH).  
• Retropitoneal fibrosis - ureteric 'strangling' due to surrounding fibrotic process.  
• Pancreatitis.  
• Retrocaval ureter.  
• Crohn's disease.  
• Chronic granulomatous disease.  
• Phimosis. |

### Epidemiology

#### Age

Urinary tract obstruction occurs most commonly in the young and the old:

- In older men, this is a relatively common condition due to prostatic enlargement:
  - Incidence of lower urinary tract symptoms (LUTs)/BPH averages 15 per 1,000 man-years.
  - In the age range 45-49, it is 3 per 1,000 man-years but increases to 38 per 1,000 man-years by age 75-79. [1]
  - Acute urinary retention (AUR) is a relatively uncommon sequela, with a cumulative incidence of 2% over almost five years in men with symptomatic BPH. [2, 2]
Hydronephrosis due to a congenital abnormality is relatively common:
- Prenatally, 1 in 100 fetuses are found to have hydronephrosis on ultrasound - most resolve.
- An analysis of children presenting incidentally after renal tract trauma found an incidence of congenital renal tract abnormalities of 8.3% - most commonly, PUJ obstruction.[9]

Sex
In men, urinary tract obstruction is most commonly a consequence of BPH or urethral stricture. In women, it tends to be related to pelvic tumours (particularly gynaecological malignancies), prolapse of pelvic structures, or pregnancy. Congenital urethral tract obstructions are more common in boys/male fetuses, particularly posterior urethral valves.

Presentation[4]

Acute upper tract obstruction
- Flank pain:
  - Dull, sharp or colicky; intermittent or persistent but usually of varying intensity (to severe).
  - The patient is often restless and unable to lie still.
  - Often radiates to the iliac fossa, inguinal area, testis or labium.
  - May be provoked by alcohol, diuretics or high fluid intake.
  - May be associated with ipsilateral back pain.
- On palpation, loin tenderness and, occasionally, enlarged kidney. Clinical presentation may be dominated by symptoms of UTI and signs of sepsicaemia.
- Nausea and vomiting are common with acute obstruction.
- Anuria suggests bilateral complete obstruction.

Chronic upper tract obstruction
- Presents with flank or abdominal pain and/or chronic kidney disease.
- Polyuria may be a feature.

Acute lower tract obstruction
- Often follows a history of symptoms of obstruction of bladder outflow (see below).
- Usually severe suprapubic pain (but not if superimposed on chronic retention or underlying neuropathy).
- Look for evidence of a distended bladder - eg, abdominal distention, suprapubic dullness on percussion.

Chronic lower tract obstruction
- Usual signs and symptoms include:
  - Urinary hesitancy.
  - Narrow and weak urine stream.
  - Dribbling at end of micturition.
  - Feeling of incompletely emptied bladder.
- With a large volume of residual urine in the bladder, it may present with frequent passage of small volumes, possibly with incontinence.
- May be complicated by acute retention associated with a UTI.
- Again, look for evidence of a distended bladder.
- Rectal examination may reveal reduced anal tone, prostatic enlargement/abnormality or tenderness (in prostatitis).

Idiopathic retroperitoneal fibrosis
See separate Retroperitoneal Fibrosis (Periaortitis) article for a fuller discussion of potential presentations of this uncommon condition.
- Most patients present with nonspecific symptoms, including dull abdominal pain, of less than 12 months’ duration but patients can present with the complications of the fibrosis.
- Can have girdle-like distribution of pain from the low back to the lower abdomen.
- 50% have hypertension.
- Anaemia, raised erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) are typical findings.

Investigations

Blood and urine tests
- Check U&Es and estimated glomerular filtration rate:
  - After relieving chronic obstruction there may be sodium and potassium loss, so Na⁺ and K⁺ levels should be checked subsequently.
  - Consider checking creatinine clearance by 24-hour urine collection after the acute phase.
- Where stones are suspected, check serum calcium, phosphate, and urate levels. Encourage patients to sieve their urine (a tea strainer is a suitably fine sieve) to collect any passed stones which can also be sent for analysis.
- Serum PSA in cases of suspected prostatic enlargement.
• FBC - looking for anaemia of chronic kidney disease and evidence of infection.
• Urinalysis to screen for infection, with subsequent urine microscopy and culture as appropriate. Red blood cells in the urine can indicate infection, stones, or tumour. Where not due to infection or contamination (eg, from menstruation), urine cytology and further work-up for haematuria is required (ie cystoscopy and upper urinary tract imaging).
• Blood cultures if there are septic symptoms/signs.

Imaging[5]
• Ultrasound is the usual initial choice for imaging in suspected obstruction. It can reveal renal parenchymal masses, hydronephrosis, a distended bladder, enlarged prostate and renal calculi. Where there is abnormality, further imaging (CT scan or plain X-ray of the kidneys, ureters, and bladder (KUB)) is indicated. Transrectal ultrasound provides the best means of imaging the prostate and guiding biopsies. Post-void ultrasound also enables an assessment of residual bladder volume.
• Non-contrast helical CT scans are the gold standard imaging assessment for suspected calculi whilst a CT scan with contrast is needed to investigate renal pathology. 3D reconstructions from delayed contrast images (CT urography) can be used to visualise the entire upper urinary tract.
• Intravenous urography (IVU) involves the use of IV contrast with a series of KUB X-rays over time to visualise the upper urinary tract. It has been widely used in cases of suspected obstruction to provide anatomical and functional information and may be better than CT at revealing small urothelial upper tract lesions. Retrograde urography can be also be performed to visualise the renal pelvis or ureter more fully.
• Other imaging techniques that may be used include:
  • Renal scintigraphy - isotopes are used to show differential function of the two kidneys, as well as excretion and drainage of the urinary tract.
  • Retrograde urethrography - contrast is injected directly into the distal urethra to demonstrate strictures and other abnormalities of the lower urinary tract.
  • Nephrostography - where contrast is injected via a nephrostomy tube allowing any abnormalities or filling defects in the renal pelvis or ureter to be seen.
  • Urodynamic studies - to investigate flow rates and detrusor function.

• Cystoscopy allows the direct visualisation and biopsy of any abnormalities in the urethra, prostatic urethra, bladder neck and bladder.

Management

Urological emergencies requiring urgent referral and treatment
• Complete urinary tract obstruction.
• Any type of obstruction in a solitary kidney.
• Obstruction with fever and/or infection.
• Chronic kidney disease.
• Any suspicion of neurological dysfunction*.
• Uncontrolled pain*.
• Nausea and vomiting sufficient to cause dehydration*.

*associated with urinary tract obstruction

General
• Where there is partial urinary tract obstruction without evidence of infection or renal impairment, supportive treatment (analgesics, hydration), sometimes in conjunction with prophylactic antibiotics, can be used whilst further urological investigations are undertaken.
• Where there is complete urinary obstruction, patients require procedures to relieve the blockage urgently. These may include:
  • Urethral or suprapubic catheterisation.
  • Stenting the ureter.
  • Nephrostomy.

• Involve a general/renal physician early on in management if there is evidence of renal impairment in association with urinary tract obstruction.
Acute upper tract obstruction\textsuperscript{[6]}
See also separate Urinary Tract Stones (Nephrolithiasis) article.

- Advise patients that most stones <5 mm in diameter will pass spontaneously, as will 50% of those between 5-10 mm; however, most stones >10 mm in diameter will require intervention:
  - Acute symptoms rarely last for more than 72 hours. Pain and vomiting require management - for severe pain, an anti-inflammatory, usually IM diclofenac 75 mg, repeated after 30 minutes if there is no response or, alternatively, diclofenac suppositories 100 mg PR, or morphine (where NSAIDs are contra-indicated).
  - Patients with renal colic may be managed at home provided they are able to maintain good fluid intake and urinary output, pain is controlled, they have good social support, are not elderly or have significant other co-morbidities and that they fully understand the need to contact a doctor urgently if fever, rigors, or increasing or abrupt recurrence of pain take place. They should also be urgently referred to urology for outpatient investigation.

- Urologists may recommend the use of medical expulsive therapy to increase the chance of passing a stone - typically alpha-blockers but this is an off-licence use.
- With larger stones or those in the upper ureter, lithotripsy (eg, extracorporeal shock-wave lithotripsy) may be undertaken. If there is persistent colic, consider endoscopic investigation.
- If there is clinical evidence of infection with obstruction, it is imperative to establish drainage as soon as possible. Normally, a percutaneous insertion of a needle above the obstruction is performed to provide a nephrostomy. This can be left in place for weeks or even months. A retrograde ureteric catheter will provide drainage for only a few days.
- With causes other than stones - eg, sloughed papillae and blood clots or tumours - there is a need to treat the underlying cause as well as relieve the obstruction as above.

Pelvi-ureteric (PUJ) obstruction
Options for treatment include:

- Pyeloplasty which can be done as an open, laparoscopic or robot-assisted procedure.
- Endopyelotomy (full-thickness incision through the stenosis leaving a stent in situ temporarily) - this may be done via a percutaneous or endoscopic approach. There is evidence supporting its efficacy in the short and medium term but there appears to be a greater risk of recurrence in the longer term compared to pyeloplasty.\textsuperscript{[7]}
- The National Institute for Health and Care Excellence (NICE) cautioned that there is limited evidence for the use of electrocautery to overcome PUJ obstruction at the current time and had safety concerns regarding the increased risk of bleeding.\textsuperscript{[8]}
- Ureteroscopic endoureterotomy is used to treat ureteric strictures. Laser endoureterotomy is an option in selected patients.\textsuperscript{[9]}

Malignant obstruction
In addition to treatment of an underlying condition, ureteric stenting or percutaneous nephrostomy is required to relieve the obstruction.

Idiopathic retroperitoneal fibrosis\textsuperscript{[10]}
See separate Retroperitoneal Fibrosis (Periaortitis) article for a fuller discussion of management.

- Ureterolysis or stent placement is undertaken to relieve the obstruction.
- Any provoking medication should be stopped and adjunctive corticosteroids and/or immunosuppressive medication (eg, azathioprine, tamoxifen) considered.
- Biopsy (ultrasound-guided or via laparotomy) of periaortic mass to exclude malignancy.
Benign prostatic hyperplasia (BPH)\[11\]

See also separate Benign Prostatic Hyperplasia and Lower Urinary Tract Symptoms in Men articles. In general:

- Acute retention requires urinary catheterisation.
- With mild symptoms (little impact on quality of life and no evidence of complications), watchful waiting is justified. Advice to reduce fluid intake and to avoid caffeine and alcoholic drinks may be appropriate.
- Medical treatment involves the use of alpha-blockers and 5-alpha reductase inhibitors.\[12\]
- Surgery is less frequent now given more effective medical treatment and, increasingly, offers less invasive options compared with the standard transurethral resection of the prostate (TURP), such as transurethral microwave thermotherapy or various laser procedures.

When to refer patients with BPH to secondary care\[11\]

- Suspected complications (haematuria, renal impairment, hydronephrosis, recurrent UTIs).
- Suspected prostate cancer.
- Large residual volumes of urine (>200 ml).
- An unclear diagnosis.
- Failed initial medical treatment.

Congenital obstructive nephropathy\[13\]

See also separate Urinary Tract Infection in Children article.

Since the advent of fetal ultrasound, many cases of hydronephrosis are now found on routine antenatal scanning. About half are due to PUJ obstruction. Fetal obstructive uropathy in the lower urinary tract affects 2.2 per 10,000 live births and is mainly caused by posterior urethral valves (64%) or urethral atresia (36%).\[14\] Depending on the severity of findings - cases are monitored in utero and after birth - some will require corrective surgery but many will resolve spontaneously. Fetal treatments, such as fetal cystoscopy (allowing endoscopic visualisation and obliteration of obstructions such as posterior urethral valves) and vesico-amniotic shunts (a decompression procedure) have been used.\[15, 16\] A systematic review suggests that antenatal bladder drainage for congenital lower urinary tract obstruction improves perinatal survival but a high risk of poor postnatal renal function persists despite intervention.\[17\]

Children with recurrent UTI or possible obstruction (eg, high blood pressure, poor growth, poor urine flow, antenatally diagnosed renal abnormality, a family history of vesico-ureteral reflux or renal disease, an enlarged bladder or abdominal mass or evidence of spinal lesion) should be assessed rapidly to prevent obstructive chronic kidney disease.\[6\]

Complications

Complications of untreated urinary tract obstruction include:

- Infection (cystitis, pyelonephritis, abscess formation and sepsis).
- Urinary extravasation.
- Fistula formation.
- Renal insufficiency or chronic kidney disease.
- Bladder dysfunction.
- Pain.

Prognosis

Prognosis is dependent on the cause, location, degree and duration of obstruction. Bad prognostic factors are longer duration and worse severity of obstruction, together with concomitant infection.

Further reading & references

6. Urinary-Tract Infection - Children: NICE CKS, July 2015 (UK access only)
15. Fetal cystoscopy for diagnosis and treatment of lower urinary outflow tract obstruction; NICE Interventional Procedure Guidance, January 2007
16. Fetal vesico-amniotic shunt for lower urinary tract outflow obstruction; NICE Interventional Procedure Guidance, December 2006

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