BMJ Best Practice

Obstructive uropathy

Straight to the point of care

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Summary

Obstructive uropathy is blockage of urinary flow, which can occur at any level in the urinary tract. It may affect one or both kidneys, depending on the level of obstruction.

A number of underlying conditions can result in obstructive uropathy, most commonly urolithiasis, ureteropelvic junction obstruction, and benign prostatic hyperplasia.

Initial treatment in the acute setting is directed at relieving pressure on the kidneys to prevent irreversible renal damage. This may involve a urethral catheter, ureteric stent, or nephrostomy tube, depending on the level and cause of obstruction.

Subsequent treatment is targeted toward treating the underlying cause.

Infection within an obstructed system must be treated promptly.

Definition

Obstructive uropathy is blockage of urinary flow, which can affect one or both kidneys depending on the level of obstruction. If only one kidney is affected, urinary output may be unchanged and serum creatinine can be normal. When kidney function is affected, this is termed obstructive nephropathy. Hydronephrosis refers to dilation of the renal pelvis and can be present with or without obstruction. A variety of conditions may cause obstructive uropathy.

THEORY

Epidemiology

In adults, the incidence and causes of urinary tract obstruction varies with age and sex.[1] Unilateral obstructive uropathy is most commonly due to ureteral stones. In the US, the prevalence of ureteric stones is estimated to be around 10%.[2] Prevalence varies between geographic locations at between 5% to 9% in Europe, and 5% to 15% in Asia.[3] Men are over 2 times more likely to be affected than women and there is increased prevalence in white populations compared with Hispanic, Asian, and African American populations.[2] [3] [4] The age at peak incidence is seen in adults aged 40 to 50 years.[5] Stones are more common in hot and dry climates.[3] [6]

In older age groups, urinary tract obstruction is common in men due to benign prostatic hyperplasia or malignancy.[1] Autopsy studies show an increasing histologic prevalence of benign prostatic hyperplasia with age: 8% of men in the 4th decade of life and 80% in the 9th decade of life.[7]

Other causes of obstructive uropathy are less common and data on their incidence are sparse.

Etiology

Obstructive uropathy has many causes but all cases involve interruption of the urine flow by a blockage or narrowing of some part of the urinary tract.[1] Common causes in adults include renal stones, benign prostatic hyperplasia, urethral stricture, neurogenic bladder, as well as advanced prostate and bladder cancer. Other less common causes include pelvic organ prolapse, trauma, iatrogenic injury during abdominopelvic surgery, and retroperitoneal malignancy. Congenital anomalies are the most common cause in the pediatric population, these include ureteropelvic junction (UPJ) or ureterovesical junction obstruction, and are often identified on prenatal ultrasound.

- Unilateral obstructive uropathy: acute unilateral uropathy is most commonly due to renal stones. Trauma or iatrogenic injury to a ureter during abdominopelvic surgery, may cause obstructive uropathy if accidentally ligated, clamped, or cauterized.[8] Chronic unilateral obstruction may result from congenital or acquired UPJ obstruction, a neoplastic process causing extrinsic compression, as well as strictures or retroperitoneal fibrosis due to history of radiation therapy with a latency of several years.[8]
- Bilateral obstructive uropathy: benign prostatic hyperplasia (BPH) can cause acute or chronic obstructive uropathy.[9][10] Although BPH is a common cause of obstructive uropathy, most patients with BPH do not go on to develop obstruction. In a study of over 3000 men, 18 (2.4%) of the 737 men in the placebo group went on to develop acute urinary retention with a mean follow-up of 4.5 years. No men in the trial went on to develop renal insufficiency due to BPH.[11] Urethral and meatal strictures can restrict urinary flow and cause obstructive uropathy. This may result from previous instrumentation. Rarer causes include retroperitoneal fibrosis, posterior urethral valves in newborn males, clot retention following hematuria, neurogenic bladder, pelvic organ prolapse, and hydronephrosis of pregnancy due to direct compression from the gravid uterus.

Bowel dysfunction has been described in young women in association with urinary retention, raising the possibility of a common etiology.[12] Constipation may be the triggering factor leading to acute retention in men when there is another underlying risk factor such as BPH. Drugs can also cause urinary retention, particularly anticholinergic agents, alpha receptor agonists and opioid analgesics.[13] [14] Patients with injuries to the spinal cord, or neurologic disorders such as Parkinson disease and multiple sclerosis often have involvement of the bladder and, in many cases, the detrusor muscle fails to function properly, leading to urinary retention and obstructive uropathy.[13]

Pathophysiology

Obstructive uropathy, regardless of the specific cause, can cause back pressure on the kidney by obstructing urinary flow. This can result in decreased renal blood flow, decreased glomerular filtration rate, and up-regulation of the renin-angiotensin system.[15] This can in turn cause atrophy and apoptosis of the renal tubules and interstitial fibrosis with infiltration of the interstitial spaces by macrophages.[15] These changes may lead to decreased reabsorption of solutes and water, inability to concentrate the urine, and impaired excretion of hydrogen and potassium.[1]

Obstruction can ultimately cause tubulointerstitial fibrosis, tubular atrophy, and interstitial inflammation. If left untreated, obstructive nephropathy can cause irreversible renal damage.

Classification

Clinical classification

Obstructive uropathy can be classified as acute or chronic in onset and as affecting one or both sides:

- Acute unilateral
- Acute bilateral
- Chronic unilateral
- Chronic bilateral.

This classification helps to delineate the cause of the obstruction. Unilateral cases are more commonly caused by disorders in the kidney, ureter, retroperitoneum, or portions of the bladder. Bilateral cases are usually due to disorders of the bladder, prostate and urethra, or pelvic malignancy. Less commonly, bilateral cases are due to the simultaneous occurrence of unilateral causes of obstruction on both sides.

Clinical classification: extrinsic or intrinsic

This differentiates obstructive uropathy by whether it is extrinsic or intrinsic to the urinary tract. Extrinsic causes include retroperitoneal masses and cancer from adjacent organs. Intrinsic causes include renal calculi, tumors, and benign prostatic hyperplasia.

Case history

Case history #1

A 68-year-old man presents to the emergency room complaining of an inability to urinate during the previous 12 hours. He has severe lower abdominal pain. Prior to this, he noted a weaker force of urinary stream, difficulty in starting his urinary stream, and frequent episodes of waking at night to pass urine. On examination, he has lower abdominal distention, which is dull to percussion.

Case history #2

A 32-year-old woman presents to the emergency room complaining of severe pain in her left flank. The pain started 6 hours before and varies in intensity, getting worse every 5 to 10 minutes. When the pain

is at its worst, she is unable to get comfortable in any position. She is nauseated and has vomited twice. She is afebrile but has tenderness at the left costovertebral angle.

Other presentations

Unlike acute obstructive uropathy, chronic obstruction often presents with more insidious symptoms. A patient with a chronic unilateral obstruction may present with signs of pyelonephritis and chronic flank or lower abdominal pain. Unless there is disease involving the other kidney, creatinine is typically normal and the patient will still be passing normal amounts of urine. Patients with chronic bilateral obstruction (e.g., benign prostatic hyperplasia) or loss of bladder function (e.g., diabetes mellitus) may present with lower urinary tract symptoms such as urinary frequency, hesitancy, decreased force of stream, or overflow urinary incontinence. Occasionally patients are asymptomatic and may be diagnosed following incidental findings of chronic renal insufficiency or bladder enlargement when ultrasound exam or blood tests are performed for other reasons.

Approach

Diagnosis relies on recognizing the different types of presentation. Acute presentations are often painful (e.g., urinary retention or urolithiasis). Chronic presentations may be more insidious and, if unilateral, the patient may have a normal creatinine and normal urine production. The diagnostic approach rests on recognizing the possibility of obstruction within the urinary system, confirming this, and identifying the level of obstruction and ultimately the underlying cause.

Acute urinary retention

In a patient who presents in pain with a tense distended lower abdomen and a history of inability to pass urine for many hours, the diagnosis of retention is usually made clinically. In uncertain cases, a bladder ultrasound can assess bladder volume (>300 mL is indicative of retention; postvoid residual volumes up to 300 mL may indicate incomplete emptying).

If retention is due to benign prostatic hyperplasia (BPH) or a urethral stricture, the patient is likely to have a history of worsening lower urinary tract symptoms. Age and past medical history give the clinician a reasonable idea of which is most likely. Older patients may have a history of lower urinary tract symptoms such as nocturia, urinary frequency, urgency, and weak or intermittent urinary stream, which are all suggestive of BPH. Younger patients with a history of pelvic trauma, STIs, or urethral instrumentation are more likely to have urethral stricture disease.

Diabetes mellitus or multiple sclerosis can cause retention due to nerve dysfunction of the bladder. The use of many medications, such as anticholinergic agents or opioid analgesics, may be a contributing factor.

Digital exam of the prostate may reveal the smooth enlargement of BPH, or a hard, nodular prostate with loss of the median sulcus, which is suspicious for malignancy. Difficulty in placing a catheter to relieve retention may occur due to BPH, meatal stenosis, or urethral stricture disease. If difficulty is encountered, consultation with a urologist is advised. In females, a careful bimanual pelvic exam is performed to look for a cystocele, pelvic malignancy, or other anatomic abnormalities. If no causes are readily identified, a catheter should be placed and further evaluation undertaken by a urologist.

Systemic symptoms such as weight loss and physical findings such as lymphadenopathy may suggest underlying malignancy.

Investigations

- Prostate specific antigen is not generally measured in the acute setting as levels are often falsely elevated. Levels usually return to baseline approximately 3 months after an acute event.

Renal colic

Patients with acute onset of unilateral flank pain should be evaluated for urolithiasis. The pain is usually severe and spasmodic in nature, and may be accompanied by flank tenderness. The patient may be nauseated and unable to lie still. This is usually accompanied by microscopic hematuria, which can be confirmed by a simple bedside urinary dipstick. Absence of microscopic hematuria does not exclude urolithiasis.

Investigations

- If urolithiasis is suspected, a noncontrast computed tomography (CT) scan abdomen and pelvis is the imaging method of choice.[25] Noncontrast CT has 96% specificity and 97% sensitivity for urolithiasis.[26]
- A CT scan abdomen and pelvis without and with contrast is recommended if the cause of pain is not identified by noncontrast CT, or if further distinction is needed (e.g., ureteral stone vs. phleboliths).[25]
- Color Doppler ultrasound kidneys, bladder, and retroperitoneum can be performed with an abdomen and pelvis x-ray (kidney, ureter, bladder [KUB]) as an alternative to CT.
- Additional tests may be considered, but are generally thought to be less helpful than a CT or ultrasound with KUB. The intravenous pyelogram has excellent anatomic detail but is less sensitive than CT and is not recommended if the patient has renal insufficiency or is allergic to contrast. Magnetic resonance urography (MRU) without and with contrast can be considered.[25]
- During pregnancy, ultrasound is the diagnostic procedure of choice for suspected urolithiasis.[25]

Infective symptoms

If a patient is febrile and has flank pain, it is important to exclude an obstructed and infected system. Urinary tract infection (UTI) in a patient with obstruction at any site in the urinary tract is a complicated UTI. Clinical presentation can vary and can include imminent urosepsis.[27]

Investigations

- Basic metabolic profile, complete blood count, and a midstream urine sample are useful to screen for infection.
- Appropriate imaging with either ultrasound and/or noncontrast CT should be considered in patients with pyelonephritis who fail to improve within 24 to 48 hours, those with a history of urologic disease, and those with symptoms of renal colic suggestive of urolithiasis.

In a patient with evidence of infection and urinary obstruction, sepsis should be clinically suspected in those with fever or hypothermia, leukocytosis or leukopenia, tachypnea, and tachycardia. A validated scoring system, such as the quick Sequential [sepsis-related] Organ Failure Assessment (SOFA) score, can identify those at risk of deterioration. Patients with at least two of the following three criteria: respiratory rate of 22 breaths per min or greater, altered mental state (Glasgow Coma Scale score <15), or systolic blood pressure of 100 mmHg or less, are likely to have poor outcomes requiring escalation of therapy as appropriate.[27] [28]

Urine culture and two blood cultures should be obtained, and imaging investigations performed early.[27] Parenteral high dose broad-spectrum antimicrobial therapy should be started within 1 hour of first clinical assumption of sepsis.[27]

Newborn with UTI

Assessment by a pediatric urologist is strongly recommended for newborns presenting with UTIs. Infections may be due to an obstructive cause such as a posterior urethral valve or a nonobstructive cause such as vesico-ureteric reflux. Acutely, catheter placement will relieve obstruction associated with posterior urethral valves.

Many infants are found to have hydronephrosis on routine prenatal ultrasound. The significance of this varies, but follow-up ultrasound imaging after birth is recommended.[29] If abnormalities persist, consultation with a pediatric urologist is recommended.

Investigations

- Newborns with UTI should have a renal ultrasound initially to look for hydronephrosis.[30] [31]
- Following ultrasound, a voiding cystourethrogram may be performed to identify anatomic obstructive causes (e.g., posterior urethral valve) and differentiate these from nonobstructive vesico-ureteric reflux.

Chronic urinary symptoms

Patients may present with chronic renal insufficiency, recurrent UTIs, or overflow urinary incontinence.

Urologic history may reveal symptoms such as frequency, urgency, weak stream, need to strain, difficulty maintaining stream, and incomplete emptying. Any history of previous urologic procedures may also be important. Patients may have recently been using anticholinergic agents, opioid analgesics, or alpha receptor agonists. Many other medications can also cause urinary retention, so the patient's medication list (both prescription and over-the-counter) should be carefully checked. Focused physical exam of the abdomen, external genitalia, vagina, and/or rectum can help guide management in patients with lower urinary tract symptoms.[32] [33]

Investigations

- A urinary dipstick is useful to assess for the presence of infection (chronic retention can predispose to infection due to urinary stasis).
- Renal ultrasound is a useful investigation if there is evidence of renal insufficiency. It may demonstrate obstruction as the underlying cause. A postmicturition bladder ultrasound can measure the residual volume (>300 mL is diagnostic of retention).
- Noncontrast CT is the preferred imaging modality when there is concern for urolithiasis, involving any part of the urinary tract.
- Nuclear renography with a diuretic is useful in patients with hydronephrosis of unknown etiology.[34] It can be used to assess kidney function and drainage.
- Magnetic resonance urography without contrast may also be useful in pregnant women to look for stones or anatomic abnormalities.[35]

Weight loss, change in bowel habits, family history of malignancy

If there is suspicion of an underlying malignant process, further tests will be needed. These will depend on the type of malignancy suspected, but may include measurement of tumor markers such as prostate specific antigen and carcino-embryonic antigen, along with CT imaging of the abdomen and pelvis. Consultation with appropriate specialists is then advised.

History and exam

Key diagnostic factors

signs of early organ dysfunction (tachypnea, tachycardia, hypotension, altered mental state) in a patient with suspected sepsis (common)

- In patients with fever or hypothermia, leukocytosis or leukopenia, tachypnea, and tachycardia, a validated scoring system such as the quick Sequential [sepsis-related] Organ Failure Assessment

(SOFA) score by the bedside can detect the risk of deterioration due to sepsis.[28] A patient is considered to be at high risk of an adverse outcome if at least two of the following three criteria are present: altered mental state (Glasgow Coma Scale <15), respiratory rate of 22 breaths per min or greater, or systolic blood pressure of 100 mmHg or less.

flank pain (common)

- Patients with acute obstruction will often present with flank pain, especially if the cause is unilateral.
- The most common cause is urolithiasis, but uncommon causes such as cancer or ureteral strictures can also be responsible.
- If a patient has fever, infection within an obstructed system must be excluded.

fever (common)

- Suggestive of urinary tract infection.
- Infection in the setting of obstruction is a strong indicator for urgent intervention.

lower urinary tract symptoms (common)

- Symptoms such as frequency, urgency, decreased force of stream, and incomplete emptying are suggestive of disease at the level of the bladder or bladder outlet.
- The most common cause is benign prostatic hyperplasia; other causes include neurogenic bladder, urethral stricture, and obstruction due to malignancy.

distended abdomen/palpable bladder (common)

- Distended abdomen may be due to an enlarged bladder that can often be palpated in the lower abdomen and is dull to percussion.

inability to urinate (common)

- In combination with a distended abdomen, this is virtually diagnostic of acute urinary retention.

enlarged or hard nodular prostate on rectal exam (common)

- Smooth enlargement with preserved median sulcus is consistent with benign prostatic hyperplasia.
- A hard nodular mass, loss of median sulcus, or asymmetry may suggest prostate cancer.

costovertebral angle tenderness (common)

- Often present in patients with obstruction and infection.

neurologic disease (e.g., spinal cord injury, multiple sclerosis) (uncommon)

- Bladder dysfunction is a common cause of chronic obstructive uropathy.
- May have clinically silent retention.

Other diagnostic factors

hematuria (common)

- Obstructive uropathy does not cause hematuria, but many conditions that lead to obstruction may also cause hematuria (e.g., benign prostatic hyperplasia, urolithiasis, infection, malignancy within the urinary tract).
- Hematuria can also cause clot retention.

increasing age (common)

- Older patients are more likely to have benign prostatic hyperplasia, malignancy, or bladder dysfunction due to neurologic problems.

meatal narrowing (common)

- May be due to urethral mass, phimosis, or meatal stenosis.

pelvic or abdominal malignancy (uncommon)

- Ureteral or bladder outlet obstruction should be suspected in patients with a history of malignancy, especially gynecologic or pelvic cancer.

previous urethral instrumentation (uncommon)

- Urethral stricture disease should be suspected in patients with a history of frequent catheterization, pelvic trauma, or surgery on the lower urinary tract.[8] [22] [23]

urinary tract infection in a child (uncommon)

- In infants, consider posterior urethral valves and other anatomic abnormalities, such as ureterocele, ureteropelvic junction obstruction, and vesicoureteral reflux.

pelvic mass on internal exam (uncommon)

- May suggest malignancy or a pelvic organ prolapse.

weight loss and lymphadenopathy (uncommon)

- May be found in association with obstructive uropathy if there is underlying malignancy.

recurrent urinary tract infections (uncommon)

- This may suggest bladder outlet obstruction or poor detrusor function, resulting in urinary stasis, which can predispose to infection.

urinary incontinence (uncommon)

- Overflow incontinence may result from urinary retention.

Risk factors

Strong

benign prostatic hyperplasia (BPH)

- Can cause both chronic and acute bilateral obstructive uropathy.
- Men with untreated symptomatic BPH have a 2.4% incidence of acute urinary retention.[11] Risk factors for developing urinary retention in men with BPH include prostate volume >31 mL, prostate-specific antigen >1.6 nanogram/mL, flow rate <10.6 mL/second, post-voiding residual volume >39 mL, and age >62 years.[1]
- Similar risk factors exist for developing chronic kidney disease.[16]

constipation

- Bowel dysfunction is often found in patients with urinary retention, particularly young women and children.[12]

- It can worsen urinary retention in patients who already have other risk factors, such as neurogenic bladder from spinal cord injury.

medication (anticholinergic agents, opioid analgesics, alpha receptor agonists)

- Adverse effects of many medications include urinary retention.[14]
- It may be necessary to stop the medication or switch to an alternative drug, depending on the balance of risks and benefits.

urolithiasis (ureteric calculi)

- Passing kidney stones can frequently cause acute unilateral obstructive uropathy. Stones 5 mm or smaller are more likely to pass spontaneously, with immediate resolution of the obstruction.[17] Larger stones are more likely to require intervention.

spinal cord injury, Parkinson disease, or multiple sclerosis

- Patients with injuries to the spinal cord or neurologic disorders such as Parkinson disease and multiple sclerosis often have involvement of the bladder. In many cases, the detrusor muscle fails to function properly, leading to urinary retention and obstructive uropathy. Abnormal detrusor function can also result in elevated storage pressures and subsequent upper tract compromise.
- Progressive damage of the kidneys in multiple sclerosis is associated with duration of multiple sclerosis, presence of an indwelling catheter, high amplitude detrusor contractions, and permanently high detrusor pressure.[18]

malignancy

- Though uncommon, malignancy in many locations may initially present as obstructive uropathy, or it may be a later effect as the disease spreads.[19]
- The most common types of malignancy causing urinary tract obstruction are prostatic, bladder, cervical, and colon.

posterior urethral valves

- A congenital anatomic abnormality occurring in males. The disorder can be diagnosed by characteristic findings on prenatal ultrasound or may be diagnosed after a child develops a urinary tract infection (UTI).
- Newborns with hydronephrosis and UTIs should be evaluated by a urologist.

meatal stenosis

- Patients with meatal stenosis may develop such severe disease that they develop urinary retention. This is diagnosed on physical exam or on attempted catheter placement.

Weak

pregnancy

- Pregnancy can be associated with obstruction of the kidneys. Obstruction in pregnancy is most often unilateral and is thought to be both physiologic (related to the muscle relaxant effect of progesterone) and anatomic (due to uterine compression).[20]
- In most cases, hydronephrosis of pregnancy is benign but may progress to become symptomatic, with associated increased risk of infection in <3% of cases.[20] Pregnant patients can also develop other

disorders such as urolithiasis, and these causes should be considered when evaluating the pregnant patient with hydronephrosis.

hematuria

- Rarely, bleeding from the urinary tract can lead to clot retention, when blood clots block the flow of urine.
- Bleeding may arise from numerous causes including BPH, cancer, papillary necrosis, arteriovenous malformation, and trauma, or may be secondary to anticoagulation therapy.

bladder hernia

- An uncommon cause of urinary tract obstruction is herniation of the bladder into the inguinal canal.[21]

cystocele

- A cystocele may cause an anatomic restriction of the urethral outflow tract and result in obstructive uropathy.

iatrogenic injury

- It is possible for one of the ureters to become damaged during abdominopelvic surgery because of the proximity of structures.[8]

urethral instrumentation

- There is an increased risk of developing urethral strictures or meatal stenosis following urethral instrumentation such as urologic surgery or catheterization.[8] [22] [23]

retroperitoneal fibrosis

- An uncommon condition, but patients may present with bilateral obstructive uropathy due to extrinsic compression of the ureters.[24]

Tests

1st test to order

Test	Result
urinary dipstick • The positive predictive value for a urinary tract infection in patients with nitrites and either blood or leukocyte esterase on urinary dipstick is 92%.[36] • Infection in the setting of obstruction requires prompt intervention.	**normal or positive nitrites, leukocyte esterase, and/or blood in presence of infection; microscopic hematuria in renal colic**
renal ultrasound • Useful in renal insufficiency or failure to determine whether cause is due to obstructive uropathy.[37] However, in acute obstruction, hydronephrosis may not have had time to develop.[25] • Color Doppler ultrasound kidneys, bladder, and retroperitoneum can be performed with an abdomen and pelvis x-ray (kidney, ureter, bladder [KUB]) as an alternative to CT. Color Doppler ultrasound allows assessment of twinkling artifact.[38] • During pregnancy, ultrasound is the diagnostic procedure of choice for suspected urolithiasis.[25] • Ultrasound is the initial test for neonates with urinary tract infections to look for hydronephrosis.[30] [31]	**hydronephrosis affecting the upper urinary tract**
serum BUN and creatinine • Elevated creatinine indicates renal damage, but can be reversible. Usually seen with bilateral obstruction or in patients with unilateral obstruction and underlying renal disease.	**normal or elevated**
CBC • Useful in patients suspected of having infection or in patients with significant hematuria.	**normal or elevated WBC if infection present; low hemoglobin and hematocrit if bleeding**
CT abdomen and pelvis without contrast • Noncontrast CT abdomen and pelvis is the imaging method of choice in patients with suspected stones.[25]	**stones in the urinary tract identified as causing obstruction**

Other tests to consider

Test	Result
urine culture • If urosepsis is suspected (fever or hypothermia, leukocytosis or leukopenia, tachypnea and tachycardia), urine culture should be taken before starting antimicrobial treatment.	**may be positive for infection-causing organism**
blood culture • If urosepsis is suspected (fever or hypothermia, leukocytosis or leukopenia, tachypnea and tachycardia), two sets of blood cultures should be taken before starting antimicrobial treatment.	**any bacterial growth is considered abnormal**
CT scan abdomen and pelvis without and with contrast • A CT scan without and with contrast is recommended if noncontrast CT fails to clearly determine the cause of pain.[25] • Useful for patients with hydronephrosis of unknown cause. • For evaluation of malignancy, oral and intravenous contrast is helpful. Avoid if patient has elevated BUN and creatinine levels.	**hydronephrosis if upper tract obstruction is present; mass in ureter, pelvis, or bladder may be seen**
magnetic resonance urography (MRU) • MRU without and with contrast can be considered as an additional test in patients with suspected urolithiasis.[25] • MRU without contrast may be useful in pregnant women as it avoids radiation exposure.[25]	**may show obstruction and anatomic abnormalities such as stones or tumors**
intravenous pyelogram (excretory urography) • Less sensitive and specific than CT, but excellent anatomic detail. Not recommended if patient has renal insufficiency or contrast allergy.	**delayed nephrogram and drainage if obstruction present**
nuclear renography (triple renal/MAG3 scan) • Useful for patients with hydronephrosis but unclear diagnosis of obstruction, particularly if asymptomatic or for triaging patients with small stones.	**prolonged T1/2 demonstrates obstruction**
voiding cystourethrogram • Useful in children with hydronephrosis to look for posterior urethral valves or ureteroceles. • Also demonstrates vesico-ureteral reflux, a common cause of nonobstructive hydronephrosis.	**demonstrates anatomic abnormalities**
bladder ultrasound • Shows evidence of incomplete bladder emptying. If mildly elevated (100-300 mL), suggests poor bladder emptying. If greater than 300 mL, and symptomatic, raises concern for urinary retention.	**may be elevated (>100 mL)**
prostate specific antigen • Avoid checking in acute retention setting as artificial elevation is common. Check in chronic settings or 3 months after resolution of acute issue.	**elevation indicative of prostatic disease**
tumor markers (e.g., serum carcinoembryonic antigen [CEA], CA125) • Not routinely performed, but if there is suspicion of underlying malignancy, tumor markers such as CEA can be measured.	**normal or elevated if underlying malignancy is present**

Differentials

Condition	Differentiating signs / symptoms	Differentiating tests
Parapelvic cyst	• Usually asymptomatic. May appear similar to hydronephrosis but there is no obstruction present.	• If a radiologist cannot differentiate on ultrasound, MRI/CT scan with intravenous contrast can define the anatomy and rule out obstruction.
Hydronephrosis of pregnancy	• Hydronephrosis is found in 43% to 100% of pregnant women and tends to progress throughout gestation; most patients are clinically asymptomatic.[20]	• If a patient is asymptomatic, no further testing is indicated. • Renal ultrasonography is indicated if a patient has flank pain, pyelonephritis, or renal failure. Hydronephrosis beyond the level of the pelvic brim is a sign that obstruction from another cause may be present. • Magnetic resonance urography is an option to evaluate the level of obstruction.
Abdominal aortic aneurysm	• Hemodynamic instability, personal or family history of abdominal aneurysm, bilateral loin pain; pulsatile mass in the abdomen.	• CT abdomen/pelvis with contrast will demonstrate aneurysm sac and extravasation of contrast if leaking.
Appendicitis	• Focal tenderness over McBurney point. Patient often prefers to lie still to avoid pain on movement. Gradual onset of symptoms.	• Diagnosis usually clinical. • CT scan can identify an inflamed appendix. • WBC and CRP often elevated.
Testicular torsion	• May present with abdominal pain with associated nausea and vomiting, especially in children or adolescents.	• Diagnosis usually clinical, can use a clinical risk score; for example, Testicular Workup for Ischemia and Suspected Torsion. Trans-scrotal ultrasound can confirm diagnosis.
Gynecologic disorders (e.g., ovarian torsion, cyst)	• No hematuria, pain may be associated with menses.	• Perform urine pregnancy test in all females of reproductive age before imaging. • CT scan of the abdomen and pelvis may demonstrate ovarian pathology. • Transvaginal ultrasound is first-choice investigation if a gynecologic cause is more

Condition	Differentiating signs / symptoms	Differentiating tests
		likely than renal colic: may demonstrate ovarian torsion.
Ectopic pregnancy	• May be hemodynamically unstable; unilateral abdominal pain more pronounced than loin pain; may have features of peritonitis (e.g., guarding and rebound tenderness).	• Positive pregnancy test and gestation of about 6 weeks with ectopic pregnancy. • Transvaginal ultrasound reveals ectopic pregnancy, dilation of fallopian tube and free fluid if present.
Renal failure	• No lower abdominal pain, no bladder distention; may be pruritic, have nausea or anorexia; may have other systemic illness or recent history of dehydration or fluid loss (e.g., post surgery).	• Catheterization: minimal urine. • BUN and creatinine: elevated urea and creatinine.
Bowel obstruction	• Bilious vomiting typically associated with small bowel obstruction; severe constipation; previous abdominal surgery or obstructed hernia present. May have concurrent dehydration and acute renal failure.	• Abdominal x-ray may demonstrate dilated bowel loops. • CT abdomen may show dilated loops of bowel and transition point if mechanical obstruction present.

Approach

Patients who present with signs and symptoms of obstructive uropathy often need prompt treatment. The approach depends on the clinical presentation and suspected etiology. Treatment options can generally be grouped according to whether there is unilateral obstructive uropathy or bilateral obstructive uropathy, and whether ureteric calculi are the cause.

Urinary tract obstruction with evidence of infection

Urinary tract infection (UTI) in a patient with obstruction at any site in the urinary tract is a complicated UTI. Clinical presentation can vary and can include imminent urosepsis.[27] It is advisable to seek the advice of a urologist if infection exists in the setting of urinary tract obstruction, and to consult local guidelines on the use of antimicrobial therapy.

In patients with urinary tract obstruction and suspected infection, the first priority is to decompress the obstruction. This can be done with a ureteric stent or nephrostomy tube.[40] [42] A nephrostomy tube may be preferred as it can provide better drainage of the kidney.[43] [44] [45]

Obstruction in the urinary tract is the most frequent urologic source of urosepsis.[27] Sepsis should be clinically suspected in those with fever or hypothermia, leukocytosis or leukopenia, tachypnea, and tachycardia. A validated scoring system such as the quick Sequential [sepsis-related] Organ Failure Assessment (SOFA) score can identify those at risk of deterioration due to sepsis. Patients with at least two of the following three criteria: respiratory rate of 22 breaths per min or greater, altered mental state (Glasgow Coma Scale score <15), or systolic blood pressure of 100 mmHg or less, are likely to have poor outcomes and require initiation or escalation of therapy as appropriate.[27] [28]

Parenteral broad-spectrum antimicrobials should be given within 1 hour of the suspicion of sepsis. Examples of suitable first-line empiric antibiotics include a third-generation cephalosporin (e.g., cefotaxime, ceftriaxone), piperacillin/tazobactam, or a carbapenem (e.g., meropenem).[27]

Definitive treatment, such as lithotripsy to remove obstructing stones, can be carried out with the nephrostomy or stent in situ once infection has resolved. This may be days, weeks, or months later.

Unilateral or bilateral obstruction due to ureteric calculi

Patients who present with acute renal colic will require analgesia as soon as possible in order to facilitate further exam. Once the diagnosis is confirmed, further treatment depends on the size and location of the calculus and clinical condition. Patients who have evidence of infections, a solitary kidney, or renal insufficiency, all require immediate intervention.

The options for treatment are a trial of conservative management to allow the stone to pass or active stone removal.

- Conservative management. Most stones <5 mm will pass without intervention and patients are managed conservatively with rehydration (either oral or intravenous) and analgesia.[17] [42] If the stone is collected, it should be sent for composition analysis. Urine can be strained in order to catch the stone as it passes. The American Urological Association guidelines on the management of ureteral calculi recommend that patients with uncomplicated ureteral stones smaller than or equal to 10 mm be offered medical expulsive therapy with alpha-blockers.[42] [46] [Evidence C] The European Urological Association guidelines recommend consideration of alpha-blockers

as medical expulsive therapy for (distal) ureteral stones >5 mm.[40] If the stone does not pass within 4 to 6 weeks, definitive intervention is recommended. During observation, regular imaging to delineate stone position and degree of hydronephrosis is recommended. If the stone is visible on plain film, an abdomen and pelvis x-ray (kidneys, ureter, bladder) can be used for monitoring. If not, an intravenous pyelogram or computed tomography scan may be used. The frequency of monitoring can be weekly or biweekly, depending on the patient's symptoms and the size of the stone. Routine prophylactic antibiotics are not recommended if there is no evidence of infection.

- Active stone removal. Options for removal of stones that are not able to pass spontaneously include extracorporeal shock wave lithotripsy, ureteroscopy with laser lithotripsy, and percutaneous nephrolithotomy.[42] [47] Active stone removal is usually required for stones >10 mm. This may be done with lithotripsy or initial placement of a nephrostomy tube or stent (to decompress the kidney) followed by lithotripsy at a later date. Stones between 5 mm and 10 mm frequently require treatment but may warrant a trial of conservative management. Stones <5 mm usually pass spontaneously but lithotripsy may be required if they fail to do so. The decision on which treatment to use depends on stone location, stone size, and patient preferences. Stone removal is not recommended in the acute setting if the patient has evidence of a urinary tract infection or sepsis.

Unilateral obstruction not due to ureteric calculi

When a patient is found to have unilateral obstruction but no evidence of a ureteric calculus, definitive management will depend on the underlying cause. The urgency of intervention will be greater if the patient is in acute distress or has evidence of infection, a solitary kidney, or renal insufficiency.

In most cases, the first-line intervention is placement of a ureteric stent. In some cases, a stent cannot be technically placed, and a nephrostomy is necessary.

Once the cause of obstruction is identified, treatment plans are tailored to the individual. If a patient has underlying malignancy, a multidisciplinary approach is usually required to determine the optimal treatment strategy. Advanced malignancy causing ureteral obstruction carries a poor prognosis. However, many options are available for palliative relief of symptoms such as pain, uremia, and urinary tract infections. The benefits of these treatments often far outweigh the risks.[48] For example, in obstruction caused by advanced prostate cancer, a nephrostomy tube may be considered to relieve the obstruction; however, the decision on whether to proceed must be made on an individual basis, considering the patient's overall clinical status and wishes.[49] Options also include ureteric stents or no intervention.[50] If obstruction is thought to be due to a ureteral stricture, evaluation by a urologist is required, as surgical intervention is likely to be needed. In the event of severe loss of renal function, a nephrectomy may be indicated. This is a complex decision requiring the input of specialists.

Bilateral obstruction not due to ureteric calculi

Immediate treatment will usually involve placement of a catheter to relieve acute or chronic obstruction or a posterior urethral valve. Alpha-blocker therapy is recommended to improve urinary flow if benign prostatic hyperplasia (BPH) is thought to be the cause.[39] If difficulty catheterizing occurs, the catheter should never be forced. If the catheter cannot be passed due to meatal stenosis, it may be necessary to dilate the meatus or place a suprapubic tube. If the blockage is within the penile urethra, it is most likely due to urethral stricture disease. A smaller silicone catheter may pass more easily, or a suprapubic tube may be required. Resistance near the level of the prostate is a sign of BPH. A Coude tip (curved) catheter can often be inserted successfully in these patients.

In the absence of sepsis, a trial without catheter can be attempted after at least 3 days of alpha-blocker therapy; if unsuccessful, the catheter may need to be reinserted and left in situ pending definitive intervention. BPH may treated with medication or surgical intervention.[39][51] Combination therapy of doxazosin and finasteride has been shown to significantly decrease the progression in symptoms and the development of acute urinary retention in patients with BPH, more than either drug alone.[11] Based on this evidence, 5-alpha-reductase inhibitors such as finasteride may be considered as adjunctive therapy for men whose prostate is thought to be >40 grams on digital rectal exam or transrectal ultrasound.

Treatment algorithm overview

Please note that formulations/routes and doses may differ between drug names and brands, drug formularies, or locations. Treatment recommendations are specific to patient groups: see disclaimer

Initial		(summary)
unilateral or bilateral obstruction with signs of infection		
	1st	**nephrostomy tube or ureteric stent**
	plus	**antibiotics**

Acute (summary)		
unilateral or bilateral obstruction due to calculi without signs of infection		
	1st	
■ small stones (<10 mm)	1st	trial of passage with analgesia and rehydration
	plus	alpha-blockers
	2nd	active stone removal
■ large stones (≥10 mm)	1st	analgesia and rehydration
	plus	nephrostomy tube or ureteric stent or active stone removal
unilateral obstruction not due to calculi without signs of infection		
	1st	nephrostomy tube or ureteric stent
	adjunct	analgesia
	adjunct	treatment of underlying cause
bilateral obstruction not due to calculi without signs of infection		
	1st	urethral catheter
	adjunct	treatment of underlying cause
■ due to benign prostatic hyperplasia	plus	alpha-blockers
	adjunct	5-alpha-reductase inhibitor

Treatment algorithm

Please note that formulations/routes and doses may differ between drug names and brands, drug formularies, or locations. Treatment recommendations are specific to patient groups: see disclaimer

Initial

unilateral or bilateral obstruction with signs of infection

1st **nephrostomy tube or ureteric stent**

» An obstructed and infected kidney requires urgent intervention to prevent renal damage and overwhelming sepsis.[27][40] [42]

» In any situation where obstructive uropathy is present with signs of infection, a stent or nephrostomy tube is usually indicated regardless of underlying etiology. A nephrostomy tube may be preferred as it can provide better drainage of the kidney, but choice will depend on local resources and expertise.[43] [44] [45]

» It is advisable to seek the advice of a urologist if infection exists in the setting of urinary tract obstruction.

plus **antibiotics**

Treatment recommended for ALL patients in selected patient group

Primary options

» cefotaxime: 2 g intravenously every 8 hours

OR

» ceftriaxone: 1-2 g intravenously every 24 hours

OR

» piperacillin/tazobactam: 4.5 g intravenously every 8 hours.
Dose consists of 4 g of piperacillin plus 0.5 g of tazobactam

OR

» meropenem: 1 g intravenously every 8 hours

» Urinary tract infection (UTI) in a patient with obstruction at any site in the urinary tract is a complicated UTI. Clinical presentation can vary and can include imminent urosepsis.[27]

Initial

» Sepsis should be clinically suspected in those with fever or hypothermia, leukocytosis or leukopenia, tachypnea, and tachycardia. A validated scoring system such as the quick Sequential [sepsis-related] Organ Failure Assessment (SOFA) score can identify those at risk of deterioration due to sepsis. Patients with at least two of the following three criteria: respiratory rate of 22 breaths per min or greater, altered mental state (Glasgow Coma Scale score <15), or systolic blood pressure of 100 mmHg or less, are likely to have poor outcomes requiring escalation of therapy as appropriate.[27][28]

» Parenteral broad-spectrum antimicrobials should be initiated within 1 hour of the suspicion of sepsis. Empiric antibiotic therapy should be started pending sensitivity results based on urinalysis cultures. Examples of suitable first-line empiric antibiotics include a third-generation cephalosporin (e.g., cefotaxime, ceftriaxone), piperacillin/tazobactam, or a carbapenem (e.g., meropenem).[27]

» Definitive treatment, such as lithotripsy to remove obstructing stones, can be carried out with the nephrostomy or stent in situ once infection has resolved. This may be days, weeks, or months later.

Acute

unilateral or bilateral obstruction due to calculi without signs of infection

unilateral or bilateral obstruction due to calculi without signs of infection — **1st**

- **small stones (<10 mm)** — **1st** — **trial of passage with analgesia and rehydration**

Primary options

» acetaminophen: 325-1000 mg orally every 4-6 hours when required, maximum 4000 mg/day

OR

» diclofenac potassium: 50 mg orally (immediate-release) three times daily when required

Secondary options

» ketorolac: 30 mg intravenously/intramuscularly every 6 hours when required for up to 5 days, maximum 120 mg/day
Lower doses are required in patients ≥65 years of age or patients <50 kg body weight.
May switch to oral therapy.

Tertiary options

» morphine sulfate: 2.5 to 10 mg subcutaneously/intramuscularly/intravenously every 2-6 hours when required; 10-30 mg orally (immediate-release) every 4 hours when required initially, adjust dose according to response

» All patients with ureteric calculi will initially require analgesia and rehydration (either oral or intravenous). Often a full assessment is difficult without adequate pain relief.

» Stones less than 5 mm will usually pass without intervention.[17] Stones between 5 mm and 10 mm frequently require treatment but may warrant a trial of conservative management. Stones larger than 10 mm require intervention.[42] Ideally, urine should be strained in order to collect the stone as it passes allowing it to be sent for composition analysis.

» Patients with unrelenting pain, bilateral obstruction, renal failure, and/or a solitary kidney

Acute

should be considered for immediate treatment regardless of size of the stone. If the stone does not pass within 4 to 6 weeks, definitive intervention is also recommended.

» During observation, regular imaging to delineate stone position and degree of hydronephrosis is recommended. If the stone is visible on plain film, abdomen and pelvis x-ray (kidneys, ureter, bladder) can be used for monitoring. If not, intravenous pyelogram or computed tomography scan may be used.

» Start with simple analgesics such as acetaminophen and progress to nonsteroidal anti-inflammatory drugs such as diclofenac or ketorolac, or opioids such as morphine, if required.

plus **alpha-blockers**

Treatment recommended for ALL patients in selected patient group

Primary options

» tamsulosin: 0.4 mg orally once daily

OR

» alfuzosin: 10 mg orally once daily

» Patients with uncomplicated ureteral stones smaller than or equal to 10 mm should be offered medical expulsive therapy with alpha-blockers.[42] [46] [Evidence C]

2nd **active stone removal**

» Options for the removal of urinary stones that are not able to pass spontaneously include extracorporeal shock wave lithotripsy, ureteroscopy with laser lithotripsy, and percutaneous nephrolithotomy.[42] [47] Removal is usually required for stones larger than 10 mm. Stones between 5 mm and 10 mm frequently require treatment as well.

» The decision on which treatment to use depends on stone location, stone size, and patient preference. Patients with unrelenting pain, bilateral obstruction, renal failure, and/or a solitary kidney should be considered for immediate treatment regardless of size of the stone. If the stone does not pass within 4 to 6 weeks, definitive intervention is also recommended.

» During observation, regular imaging to delineate stone position and degree of

Acute

hydronephrosis is recommended. If the stone is visible on plain film, abdomen and pelvis x-ray (kidneys, ureter, bladder) can be used for monitoring. If not, intravenous pyelogram or computed tomography scan may be used.

large stones (≥10 mm) **1st**

analgesia and rehydration

Primary options

» acetaminophen: 325-1000 mg orally every 4-6 hours when required, maximum 4000 mg/day

OR

» diclofenac potassium: 50 mg orally (immediate-release) three times daily when required

Secondary options

» ketorolac: 30 mg intravenously/intramuscularly every 6 hours when required for up to 5 days, maximum 120 mg/day

Lower doses are required in patients ≥65 years of age or patients <50 kg body weight.

May switch to oral therapy.

Tertiary options

» morphine sulfate: 2.5 to 10 mg subcutaneously/intramuscularly/intravenously every 2-6 hours when required; 10-30 mg orally (immediate-release) every 4 hours when required initially, adjust dose according to response

» All patients with ureteric calculi will initially require analgesia and rehydration (either oral or intravenous). Often a full assessment is difficult without adequate pain relief. Start with simple analgesics such as acetaminophen and progress to nonsteroidal anti-inflammatory drugs such as diclofenac or ketorolac, or opioids such as morphine, if required.

» Patients with unrelenting pain should be considered for immediate treatment regardless of size of the stone. Stones less than 5 mm will usually pass without intervention.[17] Stones between 5 mm and 10 mm frequently require treatment but may warrant a trial of conservative management. Stones larger than 10 mm require intervention.[42] Ideally, urine should be strained in order to collect the stone as it passes allowing it to be sent for composition analysis.

Acute

» Patients with unrelenting pain, bilateral obstruction, renal failure, and/or a solitary kidney should be considered for immediate treatment regardless of size of the stone.

plus **nephrostomy tube or ureteric stent or active stone removal**

Treatment recommended for ALL patients in selected patient group

» If there is no evidence of sepsis but the stone is larger than 10 mm, definitive intervention will be required.

» Initial options include a nephrostomy or stent to decompress the kidney or urgent active stone removal with lithotripsy. If a nephrostomy tube or stent is inserted, then lithotripsy will usually be required subsequently. The choice of initial procedure will depend on the patient and resources available.

unilateral obstruction not due to calculi without signs of infection

1st **nephrostomy tube or ureteric stent**

» A ureteric stent is usually the first choice of intervention to relieve unilateral obstruction. This is particularly important if there is evidence of infection, a solitary kidney, or renal insufficiency.

» A nephrostomy tube may be used if a stent cannot be placed due to technical difficulties.

» Definitive management will depend on the underlying cause.

adjunct **analgesia**

Treatment recommended for SOME patients in selected patient group

Primary options

» acetaminophen: 325-1000 mg orally every 4-6 hours when required, maximum 4000 mg/day

OR

» diclofenac potassium: 50 mg orally (immediate-release) three times daily when required

Secondary options

» ketorolac: 30 mg intravenously/intramuscularly every 6 hours when required for up to 5 days, maximum 120 mg/day

Acute

Lower doses are required in patients ≥65 years of age or patients <50 kg body weight. May switch to oral therapy.

Tertiary options

» morphine sulfate: 2.5 to 10 mg subcutaneously/intramuscularly/intravenously every 2-6 hours when required; 10-30 mg orally (immediate-release) every 4 hours when required initially, adjust dose according to response

» Patients are not always in acute distress, as obstructive uropathy may develop slowly, but often analgesia will be required and can be titrated to the level of pain.

» Start with simple analgesics such as acetaminophen and progress to nonsteroidal anti-inflammatory drugs such as diclofenac or ketorolac, or an opioid such as morphine, if required.

adjunct **treatment of underlying cause**

Treatment recommended for SOME patients in selected patient group

» Once the cause of obstruction is identified, treatment plans can be made based on each circumstance.

» If a patient has malignancy, appropriate therapies should be determined by the treating team. Advanced malignancy causing ureteral obstruction carries a poor prognosis. However, many options are available for palliative relief of symptoms such as pain, uremia, and urinary tract infections. The benefits of these treatments often far outweigh the risks.[48]

» If the patient has obstruction due to a ureteral stricture or other urologic cause, an evaluation by a urologist is necessary.

» In the event of severe loss of renal function, nephrectomy may be indicated. This is a complex decision requiring the input of specialists and consideration of the overall clinical scenario.

bilateral obstruction not due to calculi without signs of infection

1st **urethral catheter**

» Catheterization is the first-line treatment for a patient presenting with acute urinary

MANAGEMENT

Acute

retention or in an infant with a posterior urethral valve. Intermittent self catheterization or an indwelling catheter are both options for chronic obstruction, either on a temporary basis while awaiting treatment for underlying cause or on a permanent basis if the underlying condition cannot be corrected.

» If difficulty catheterizing occurs, a catheter should never be forced but attention paid to where the resistance is felt. If the catheter cannot be passed due to meatal stenosis, dilating the meatus or placing a suprapubic tube may be required. If the blockage is within the penile urethra, it is most likely due to urethral stricture disease. A smaller silicone catheter may pass more easily, or a suprapubic tube may be required. Resistance near the level of the prostate is a sign of benign prostatic hyperplasia. A Coude tip (curved) catheter can often be inserted successfully in these patients. If urethral catheterization is unsuccessful, a urologist may try to insert a urethral catheter with an introducer or perform suprapubic catheterization. If both are unsuccessful or contraindicated, direct placement using a cystoscope may be possible.

adjunct **treatment of underlying cause**

Treatment recommended for SOME patients in selected patient group

» The treatment of bilateral obstruction varies depending on the etiology.

» Benign prostatic hyperplasia may be treated with medication or surgical intervention.[39][51]

» Obstructive disorders such as meatal stenosis, a posterior urethral valve, or urethral stricture may require surgical correction.

» Long-term management is necessary if obstruction is due to bladder dysfunction (e.g., due to spinal cord injury). This may include urodynamic flow tests.

due to benign prostatic hyperplasia

plus **alpha-blockers**

Treatment recommended for ALL patients in selected patient group

Primary options

» tamsulosin: 0.4 mg orally once daily

OR

» alfuzosin: 10 mg orally once daily

Acute

» Alpha-blockers can be started at the time of catheterization.[52]

adjunct **5-alpha-reductase inhibitor**

Treatment recommended for SOME patients in selected patient group

Primary options

» finasteride: 5 mg orally once daily

» Combination therapy of doxazosin and finasteride has been shown to significantly decrease the progression in symptoms and the development of acute urinary retention more than either drug alone.[11]

» Based on this evidence, 5-alpha-reductase inhibitors such as finasteride may be considered as adjunctive therapy for men whose prostate is thought to be larger than 40 grams on digital rectal exam or transrectal ultrasound.

Primary prevention

Obstructive uropathy is caused by a wide variety of conditions. There is no general preventative strategy but avoiding concomitant risk factors is advisable in patients already at risk (e.g., medications known to cause urinary retention should be avoided if possible in patients with preexisting prostatic hyperplasia).

Secondary prevention

Patients with urinary retention are advised to avoid medications that can cause urinary retention, such as over-the-counter decongestants, anticholinergics, and opioids.[14]

Patients who form stones may decrease the recurrence rate with dietary measures such as increasing intake of water and decreasing the intake of protein and salt.[54] [55] Further recommendations will depend on the type of stone formed and results of a metabolic evaluation.

Patient discussions

Patients undergoing treatment of obstructive uropathy need to be alert to signs such as worsening flank pain, fever, dysuria, increasing weakness, or decrease in urine output. If patients have a catheter or nephrostomy tube, they will need to be taught routine care of these appliances. It is critical that patients understand when the condition has not been completely treated and that appropriate follow-up is arranged. [American Urological Association patient education handouts] (http://urologyhealth.org/educational-materials)

Monitoring

Monitoring

The frequency and type of monitoring depends on the illness the patient has and what has been done. In chronic illness (e.g., in a patient with obstructive uropathy undergoing chemotherapy) routine stent or nephrostomy tube changes are needed every few weeks or months.

Patients who have undergone definitive treatment such as a transurethral resection of the prostate and whose renal function is normal may not require further follow-up after an initial check.

For ureteric stones, follow-up is needed until the stone passes or is surgically removed. A metabolic evaluation to look for an underlying reason for stone formation is advised in certain patient groups (children and those who have a strong family history of ureteric calculi or previous personal history). Follow-up for unilateral obstruction not due to stones is focused on the underlying condition and usually involves a multidisciplinary team approach.

FOLLOW UP

Complications

Complications	Timeframe	Likelihood
urethral trauma	**short term**	**medium**
This may occur during catheterization if the catheter is forced when it meets resistance. This may create a false passage and hematuria. Suprapubic catheterization or cystoscopy may then be indicated. This can be avoided by taking care not to force the catheter and seeking the advice of a urologist in difficult cases.		
ureteric stent displacement or occlusion	**short term**	**medium**
It is possible for stents to become dislodged or occluded, particularly if there is underlying malignancy. If suspected, imaging is helpful and replacement ureteric stent or nephrostomy tube may be required.		
postobstructive diuresis	**short term**	**low**
May be seen in any patient, but most commonly after relief of bilateral obstruction or obstruction of a solitary kidney, especially after relief of urinary retention. Usually seen in patients with signs of fluid overload. Occurs as a physiologic response to volume expansion and accumulation of solutes in the obstructed kidneys. Diuresis as much as 200 mL/hour may be seen. It typically resolves once homeostasis is achieved but may progress to a pathologic form. Encourage oral rehydration and avoid intravenous fluids if patient is able to drink.		
severe sepsis and septic shock	**short term**	**low**
An obstructed and infected urinary system can result in severe sepsis and cardiovascular collapse if left untreated. Sepsis may also develop after the obstruction is relieved, especially in patients who have fevers and other signs of infection prior to decompression.		
chronic kidney disease	**long term**	**low**
Untreated obstructive uropathy can lead to obstructive nephropathy. Unless obstruction is relieved, back pressure on the kidney can result in tubulo-interstitial fibrosis, tubular atrophy, and interstitial inflammation resulting in renal failure. The risk of this is low if treated promptly. A community-based study looked at chronic kidney disease and found it to be associated with a post-voiding residual volume of >100 mL, moderate-to-severe lower urinary tract symptoms and decreased peak urinary flow rates, but found no association with prostatic enlargement.[16] In a study of over 3000 men, none went on to develop renal insufficiency due to benign prostatic hyperplasia.[11]		

Prognosis

Obstructive uropathy can result in permanent renal damage, but the majority of patients recover completely if the obstruction is relieved promptly.[19] [53] Although benign prostatic hyperplasia (BPH) is a common cause of obstructive uropathy, most patients with BPH do not go on to develop obstruction. In a study of over 3000 men, 18 (2.4%) of the 737 men in the placebo group went on to develop acute urinary retention with a mean follow-up of 4.5 years. No men in the trial went on to develop renal insufficiency due to BPH.[11]

Diagnostic guidelines

International

ACR appropriateness criteria: acute onset flank pain - suspicion of stone disease (urolithiasis) (http://www.acr.org/Quality-Safety/Appropriateness-Criteria) [25]

Published by: American College of Radiology **Last published:** 2023

ACR appropriateness criteria: hydronephrosis on prior imaging - unknown cause (http://www.acr.org/Quality-Safety/Appropriateness-Criteria) [34]

Published by: American College of Radiology **Last published:** 2023

Urethral stricture disease guideline amendment (https://auanet.org/guidelines) [23]

Published by: American Urological Association **Last published:** 2023

Management of lower urinary tract symptoms attributed to benign prostatic hyperplasia (BPH) (https://auanet.org/guidelines) [39]

Published by: American Urological Association **Last published:** 2021; amended 2023

EAU guidelines on urolithiasis (http://uroweb.org/guidelines) [40]

Published by: European Association of Urology **Last published:** limited update March 2023

EAU guidelines on non-neurogenic male lower urinary tract symptoms (LUTS)# (http://uroweb.org/guidelines) [41]

Published by: European Association of Urology **Last published:** 2024

Treatment guidelines

International

Urethral stricture disease guideline amendment (https://auanet.org/guidelines) [23]

Published by: American Urological Association **Last published:** 2023

ACR appropriateness criteria: radiologic management of urinary tract obstruction (http://www.acr.org/Quality-Safety/Appropriateness-Criteria) [44]

Published by: American College of Radiology **Last published:** 2019

Surgical management of stones (https://auanet.org/guidelines) [42]

Published by: American Urological Association; Endourological Society **Last published:** 2016

Management of lower urinary tract symptoms attributed to benign prostatic hyperplasia (BPH) (https://auanet.org/guidelines) [39]

Published by: American Urological Association **Last published:** 2021; amended 2023

EAU guidelines on non-neurogenic male lower urinary tract symptoms (LUTS) (http://uroweb.org/guidelines) [41]

Published by: European Association of Urology **Last published:** 2024

EAU guidelines on urological infections (https://uroweb.org/guidelines) [27]

Published by: European Association of Urology **Last published:** limited update April 2024

EAU guidelines on urolithiasis (https://uroweb.org/guidelines) [40]

Published by: European Association of Urology **Last published:** limited update April 2024

Online resources

1. American Urological Association patient education handouts (http://urologyhealth.org/educational-materials) *(external link)*

Evidence tables

What are the effects of alpha-blockers as medical expulsive therapy for people with ureteral stones?

This table is a summary of the analysis reported in a Cochrane Clinical Answer that focuses on the above important clinical question.

Cochrane Clinical Answers

View the full source Cochrane Clinical Answer (https://www.cochranelibrary.com/cca/doi/10.1002/cca.2153/full)

Evidence C *	Confidence in the evidence is very low or low where GRADE has been performed and the intervention may be more effective/beneficial than the comparison for key outcomes. However, this is uncertain and new evidence could change this in the future.

Population: Adults (mean age 32-56 years) with distal ureteral or mid and proximal ureteral stones
Intervention: Alpha-blockers
Comparison: Standard therapy or placebo

Outcome	Effectiveness (BMJ rating)†	Confidence in evidence (GRADE)‡
Stone clearance (follow-up: 1-8 weeks)	Favors intervention	Low
Stone expulsion time (follow-up: 1-8 weeks)	Favors intervention	Low
Pain episodes (follow-up: 2-6 weeks)	Favors intervention	Low
Dose of diclofenac (nonsteroidal anti-inflammatory drug)	Favors intervention	Low
Hospitalization (follow-up: 2-4 weeks)	Favors intervention	Moderate
Surgical intervention (follow-up: 10 days-8 weeks)	No statistically significant difference	Low
Major adverse events (follow-up: 10-90 days)	No statistically significant difference	Low

Note

The Cochrane Clinical Answer (CCA) noted that subgroup analyses were carried out by stone size (≤5 mm, 6-10 mm), ureteral position of stones (distal, mid/proximal), and type of alpha-blocker, and that most of the results were similar to the main analysis. However, for stones ≤5 mm there was no statistically significant difference in stone clearance, and for mid or proximal ureteral stones there was no statistically significant difference in expulsion time.

The Cochrane review which underpins this CCA noted that the effectiveness of alpha-blockers is mostly related to stone size. Larger stones (>5mm) benefit the most from alpha-blockers since smaller stones often pass spontaneously. This has implications when considering using alpha-blockers if stone size has been accurately determined.

* Evidence levels

The Evidence level is an internal rating applied by BMJ Best Practice. See the EBM Toolkit (https://bestpractice.bmj.com/info/evidence-tables/) for details.

Confidence in evidence

A - High or moderate to high

B - Moderate or low to moderate

C - Very low or low

† Effectiveness (BMJ rating)

Based on statistical significance, which demonstrates that the results are unlikely to be due to chance, but which does not necessarily translate to a clinical significance.

‡ Grade certainty ratings

High	The authors are very confident that the true effect is similar to the estimated effect.
Moderate	The authors are moderately confident that the true effect is likely to be close to the estimated effect.
Low	The authors have limited confidence in the effect estimate and the true effect may be substantially different.
Very Low	The authors have very little confidence in the effect estimate and the true effect is likely to be substantially different.

BMJ Best Practice EBM Toolkit: What is GRADE? (https://bestpractice.bmj.com/info/toolkit/learn-ebm/what-is-grade/)

Key articles

- Wessells H, Morey A, Souter L, et al. Urethral stricture disease guideline amendment (2023). J Urol. 2023 Jul;210(1):64-71. Full text (https://www.auajournals.org/doi/10.1097/JU.0000000000003482) Abstract (http://www.ncbi.nlm.nih.gov/pubmed/37096574?tool=bestpractice.bmj.com)
- American College of Radiology. ACR appropriateness criteria: acute onset flank pain-suspicion of stone disease (urolithiasis). 2023 [internet publication]. Full text (https://acsearch.acr.org/docs/69362/Narrative)
- Sandhu JS, Bixler BR, Dahm P, et al. Management of lower urinary tract symptoms attributed to benign prostatic hyperplasia (BPH): AUA guideline amendment 2023. J Urol. 2024 Jan;211(1):11-19. Full text (https://www.auajournals.org/doi/10.1097/JU.0000000000003698) Abstract (http://www.ncbi.nlm.nih.gov/pubmed/37706750?tool=bestpractice.bmj.com)
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Figure 1 – BMJ Best Practice Numeral Style

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