EAU GUIDELINES ON BLADDER STONES

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Prevalence and stratification

The prevalence of bladder stones is higher in males (male:female ratio between 10:1 and 4:1). The age distribution is bimodal: incidence peaks at three years in children in developing countries and 60 years in adulthood.

Primary or endemic bladder stones occur in the absence of other urinary tract pathology, typically seen in children in areas with a diet deficient in animal protein, poor hydration and recurrent diarrhoea.

Secondary bladder stones occur in the presence of other urinary tract abnormalities, which include bladder outlet obstruction (BOO), neurogenic bladder dysfunction, chronic bacteriuria, foreign bodies including catheters, bladder diverticula, and bladder augmentation or urinary diversion.

Migratory bladder stones are those which have passed from the upper urinary tract where they formed and may then serve as a nidus for bladder stone growth.

Diagnostic imaging

There is a paucity of evidence for the investigation of bladder stones, particularly in children. Ultrasound (US) of the (filled) bladder has a reported sensitivity and specificity for detecting

bladder stones between 20-83% and 98-100%, respectively. Plain X-ray of kidney ureter bladder (KUB) has a sensitivity of 21-78% in adults and this increases for stones ≥ 2.0 cm. In adults, besides US, computed tomography and/or cystoscopy are the benchmark diagnostic investigations.

Disease management

Asymptomatic migratory bladder stones in adults may be left untreated. Primary and secondary bladder stones are usually symptomatic and are unlikely to pass spontaneously; active treatment is usually indicated.

Uric acid stones can be dissolved by oral urinary alkalinisation when a pH > 6.5 is consistently achieved. Irrigation chemolysis is possible for struvite or uric acid stones. For further details see chapter 3.4.4 in the full EAU Guidelines on Urolithiasis.

Bladder stones can be removed with open, laparoscopic or robotic assisted laparoscopic or endoscopic (transurethral or percutaneous) surgery, or extracorporeal shock wave lithotripsy (SWL).

Summary of evidence	**LE**
The incidence of bladder stones peaks at three years in children (endemic/primary stones in developing countries) and 60 years in adults.	2c
The aetiology of bladder stones is typically multi-factorial. Bladder stones can be classified as primary (endemic), secondary (associated with lower urinary tract abnormalities e.g. BPO, neuropathic bladder, foreign body, chronic bactiuria) or migratory (having formed in the upper tract).	4
In adults, BOO is the most common predisposing factor for bladder stone formation.	2c

Of men undergoing surgery for BPO, 3-4.7% form bladder stones.	2b
Metabolic abnormalities are also likely to contribute to bladder stone formation in patients with secondary bladder stones.	2b
Primary (endemic) bladder stones typically occur in children in areas with poor hydration, recurrent diarrhoea and a diet deficient in animal protein. The following measures are proposed to reduce their incidence: maintenance of hydration, avoidance of diarrhoea, and a mixed cereal diet with milk and Vitamins A and B supplements; with the addition of eggs, meat and boiled cows' milk after one year of age.	5
In adults, US has a sensitivity of 20-83% for diagnosing bladder stones.	2b
In adults, XR-KUB has a sensitivity of 21-78%; sensitivity increases with stone size.	2b
Computed tomography has a higher sensitivity than US for the detection of bladder stones.	2b
Cystoscopy has a higher sensitivity than XR-KUB or US for the detection of bladder stones.	2b
Endoscopic bladder stone treatments are associated with comparable stone-free rates (SFRs), but a shorter length of hospital stay, duration of procedure and duration of catheterisation, compared to open cystolithotomy in adults.	1a
Stone-free rates are lower in patients treated with SWL than those treated with open or endoscopic procedures in both adults and children.	2a
Transurethral cystolithotripsy is associated with a shorter length of hospital stay, less pain and a shorter convalescence period than percutaneous cystolithotripsy in adults.	1b

Transurethral cystolithotripsy with a nephroscope is quicker than when using a cystoscope, with no difference in SFR in adults.	1a
Transurethral cystolithotripsy with a resectoscope is quicker than when using a cystoscope, with no difference in SFR in adults.	2a
Mechanical, pneumatic and laser appear equivalent lithotripsy modalities for use in endoscopic bladder stone treatments in adults and children.	2a
Open cystolithotomy without a retropubic drain or urethral catheter ("tubeless") is associated with a shorter length of hospital stay than traditional cystolithotomy and can be performed safely in children with primary stones and no prior bladder surgery or infections.	2b
Bladder stone removal with concomitant treatment for BOO is associated with no significant difference in major post-operative complications when compared to BOO treatment alone in adults. However, concomitant bladder stone treatment does increase the rates of short-term post-operative incontinence and urinary infection.	2b
The incidence of bladder stone formation in spinal cord injury patients is 15-36% after eight to ten years. The absolute annual risk of stone formation in spinal cord injury patients is significantly higher with an indwelling catheter compared to those voiding with CISC or spontaneously.	2b
The incidence of bladder stone formation after bladder augmentation or vesico-entero-cystostomy is between 2-53% in adults and children.	2b

Urinary diversion including orthotopic ileal neobladders, ileocaecal continent cutaneous urinary diversion and rectosigmoid reservoirs is associated with stone formation in 0-43% of cases.	2b
The risk of bladder stone formation in spinal cord injury, bladder augmentation or continent urinary diversion patients is reduced by performing regular bladder irrigation.	2b

Recommendations	**Strength rating**
Use ultrasound (US) as first-line imaging with symptoms suggestive of a bladder stone.	Strong
Use cystoscopy or computed tomography (CT), kidney ureter bladder X-Ray (KUB) to investigate adults with persistent symptoms suggestive of a bladder stone if US is negative.	Strong
Use X-Ray KUB for adults with confirmed bladder stones to guide treatment options and follow-up.	Weak
All patients with bladder stones should be examined and investigated for the cause of bladder stone formation, including: • uroflowmetry and post-void residual; • urine dipstick, pH, ± culture; • metabolic assessment and stone analysis (see sections 3.3.2.3 and 4.1 of the Urolithiasis guideline for further details). In selected patients, consider: • upper tract imaging (in patients with a history of urolithiasis or loin pain); • cysto-urethroscopy or urethrogram.	Weak

Offer oral chemolitholysis for radiolucent or known uric acid bladder stones in adults.	Weak
Offer adults with bladder stones trans-urethral cystolithoplasty where possible.	Strong
Perform transurethral cystolithotripsy with a continuous flow instrument in adults (e.g. nephroscope or resectoscope) where possible.	Weak
Offer adults percutaneous cystolithotripsy where transurethral cystolithotripsy is not possible or advisable.	Strong
Suggest open cystolithotomy as an option for very large bladder stones in adults and children.	Weak
Offer children with bladder stones trans-urethral cystolithotripsy where possible.	Weak
Offer children percutaneous cystolithotripsy where transurethral cystolithotripsy is not possible or is associated with a high risk of urethral stricture (e.g., young children, previous urethral reconstruction and spinal cord injury).	Weak
Open, laparoscopic and extracorporeal shock wave lithotripsies are alternative treatments where endoscopic treatment is not advisable in adults and children.	Weak
Prefer "tubeless" procedure (without placing a catheter or drain) for children with primary bladder stones and no prior infection, surgery or bladder dysfunction, where open cystolithotomy is indicated in children.	Weak

Perform procedures for the stone and underlying bladder outlet obstruction (BOO) simultaneously in adults with bladder stones secondary to BOO, where possible.	Strong
Individualise imaging follow up for each patient as there is a paucity of evidence. Factors affecting follow up will include: • whether the underlying functional predisposition to stone formation can be treated (e.g., TURP); • metabolic risk.	Weak
Recommend regular irrigation therapy with saline solution to adults and children with bladder augmentation, continent cutaneous urinary reservoir or neuropathic bladder dysfunction, and no history of autonomic dysreflexia to reduce the risk of stone recurrence.	Weak

This short booklet text is based on the more comprehensive EAU Guidelines (ISBN 978-94-92671-13-4) available to all members of the European Association of Urology at their website, http://www.uroweb.org/guidelines/.