

Introduction

Stones in the urinary tract (kidney, ureter or bladder) are common, affecting 1 in 10 people in their lifetime. Urine contains wastes and mineral salts that are normally kept in balance. When the mineral salts (calcium, oxalate, uric acid, phosphate) become concentrated in the urine, the balance is upset and the salts become solid microscopic particles. These clump together to form crystals, which may grow into hardened mineral deposits.

What causes kidney stones?

The following circumstances are linked to kidney stone formation:

- Male gender, obesity, family history of kidney stone formation
- Dehydration, living in hot and dry environments
- Diets high in vitamin A, D, fat, purine (animal protein) or lacking in calcium
- Large doses of vitamin C (more than 1g per day)
- Recurrent urinary tract infections, blocked kidneys
- Crohn's disease, ulcerative colitis, short gut syndrome, chronic diarrhoea
- Chronic kidney disease, bone disease, gout, parathyroid gland overactivity
- Myeloproliferative or bone marrow disorders, chemotherapy
- Antacids, steroids, acetazolamide, probenecid, thiazide, topiramate

The majority of stones (75%) contain calcium mixed with oxalate and/or phosphate. Other types of stones that can be formed are struvite stones (10-15%) and uric acid stones (10%). Struvite stones are associated with chronic urinary tract infections, and can grow to a large size. Uric acid stones are more common in people who suffer gout and have high animal protein in their diet.

What is the treatment of stones?

Most stones 5mm and below in size will usually pass without any medical treatment. Stones up to 7mm may pass, however stones above 7mm are highly unlikely to pass without surgery. Medications such as Tamsulosin, Indomethacin and Nifedipine may assist in the passage of stones. If the stones are made of uric acid, they can be dissolved using Sodium Bicarbonate or Potassium Citrate to alkalinise the urine.

Getting to the stone

Cystoscopy - fine telescope advanced into the bladder

Ureteroscopy - fine telescope advanced up the ureter

Percutaneous nephroscopy - key-hole tract made through the side into the kidney

Getting rid of the stone

Lasertripsy - using laser energy delivered through a fibre

Lithoclast - breaking stones with kinetic energy through a rod (like a jackhammer)

Shock wave - sound waves targeted on the stone from the outside

Can they recur and how do I prevent them?

Kidney stones recur in more than half of people who have suffered from one attack within 5-10 years.

Your doctor will evaluate the following factors:

- Dietary and medical risk factors for stones
- Blood tests - creatinine, potassium, calcium, phosphate, uric acid, carbon dioxide, parathyroid hormone levels
- Urine microscopy and culture, kidney x-ray
- Stone content (if available)

If this is your first calcium stone and there are no other risk factors, you should:

- Drink 2-3 L of water so that you pass 2L of dilute, colourless urine per day
- If you wish, adding lemon concentrate to your water may help
- Have some dairy product daily, especially when having your main meal
- Limit yourself to no more than 2 servings of meat a day
- Restrict your salt intake to less than 2000mg per day
- Restrict foods high in oxalate - beetroot, soy, nuts, spinach, rhubarb, fig, star fruit, buckwheat, wheat bran, lentils, berries, bran, beans, potato, chocolate, tea, instant coffee, beer

If you have had many stones, non-calcium stones or risk factors for recurrent stones, your doctor will do some extra tests:

- 24 hour urine collections for volume, pH, calcium, oxalate, uric acid, citrate, sodium, potassium, magnesium and cysteine

If these test results are abnormal, your doctor can make specific recommendations about what your diet. You will need to follow your doctor's instructions and have the tests repeated in 3 months to see if it has worked. If the tests remain abnormal, your doctor may recommend medications.

Resources available from your doctor

NIDDK stone prevention sheet

<http://www.kidney.niddk.nih.gov/kudiseases/pubs/kidneystonediet/>

High oxalate food list

<http://www.ohf.org/docs/OxalateContent092003.pdf>

Uric acid stone diet

<http://www.ukgoutsociety.org/docs/2009FinalDietsheet.pdf>