



Citrate salts: Preventing kidney stones

Intervention

Citrate salts to inhibit the crystallisation of calcium salt in urine.

Citrate salts include potassium citrate, potassium-sodium citrate and potassium-magnesium citrate.

Indication

Kidney stones are one of the most common disorders of the urinary tract and have a high rate of recurrence

A history of kidney stones containing calcium.

Kidney stones are common, typically affecting people aged between 40 and 60 years. They are more common in men.

Most (60–80%) kidney stones are composed of calcium salts, which occur in two forms: calcium oxalate and calcium phosphate. Additionally, up to 60% of people with kidney stones have hypocitraturia.

Citrate salts can prevent about three-quarters of new stones forming.

Potassium citrate is also used for the prevention of urate stones.

Contraindications

- Citrate salts should be avoided in patients with:
- struvite stones
- urinary tract infections
- bleeding disorders
- kidney impairment (ie reduced GFR <45 mL/min/1.73m²)
- citrate allergy
- Addison's disease
- uncontrolled diabetes
- severe cardiac disease
- gastroparesis and/or ileus
- peptic ulcers
- dehydration.

Citrate salts should also be avoided women who are pregnant or breastfeeding.

Precautions

Patients with hyperkalaemia or who take citrate supplements containing potassium should not take any other medications that either contain this mineral or prevent its loss (eg potassium-sparing diuretics). For drug interactions see [webmd](#).

Patients on potassium-restricted diets should avoid potassium-containing citrate salts.

Adverse effects

Serious adverse effects are uncommon. Potential adverse effects include:

- upper gastrointestinal disturbances (stomach pains, ulceration, bloating, nausea, diarrhoea)
- constipation
- rash
- itching or swelling of face/tongue/throat.

Hyperkalaemia may result in muscle cramps or weakness, dizziness, confusion or restlessness, bradycardia, arrhythmias, tingling of extremities and cold skin.



Availability

Citrate salts (eg potassium citrate K-Citra® tablets) are available over the counter without a prescription.

Each K-Citra® tablet contains 1.08 g of potassium citrate (equivalent to 10 mEq potassium).

Description

The usual dose of potassium citrate is 6–10 g/day (typically 6–10 tablets).

- However, the dose of citrate salts may vary depending on the patient:
- People with mild to moderate hypocitraturia (ie urinary citrate excretion of >150 mg/day) may require doses of 30 mEq of potassium per day (i.e. 3 K-Citra® tablets)
- People with severe hypocitraturia (ie urinary citrate excretion of <150 mg) may require 60 mEq or more of potassium per day (ie ≥6 K-Citra® tablets).

Tips and challenges

Citrate salts have also been used to treat calcium-containing kidney stones. They have been shown to stabilise stone size and to reduce stone size.

Taking citrate salts after meals reduces the likelihood of adverse effects.

An alternative to citrate tablets is 'real lemonade'. Drinking 2–3 glasses of real lemonade (ie 30 mL real lemon juice, 190 mL of water and sweetener to taste) daily may also prevent stone formation.

Patients should also be advised to maintain or increase water intake.

Citrate salts have been used in children with radiolucent kidney stones. At three months, the stone-free rate with dissolution therapy nears that of single session lithotripsy (73% and 82% respectively).

Grading

NHMRC Level I evidence.

References

Phillips R, Hanchanale VS, Myatt A, Somani B, Nabi G, Biyani CS. [Citrate salts for preventing and treating calcium containing kidney stones in adults](#). Cochrane Database Syst Rev 2015;10:CD010057.

Elderwy AA, Kurkar A, Hussein A, Abozeid H, Hammooda HM, Ibraheim AF. [Dissolution therapy versus shock wave lithotripsy for radiolucent renal stones in children: A prospective study](#). J Urol 2014;191(5 Suppl):1491–5.

Koff SG, Paquette EL, Cullen J, Gancarczyk KK, Tucciarone PR, Schenkman NS. [Comparison between lemonade and potassium citrate and impact on urine pH and 24-hour urine parameters in patients with kidney stone formation](#). J Urol 2007;69(6):1013–16.

Consumer resources

PubMed Health – kidney stones www.ncbi.nlm.nih.gov/pubmedhealth/PMH0058580/#conskidstone.s5

WebMD – Potassium citrate www.webmd.com/drugs/2/drug-8836/potassium-citrate-oral/details

NY Times: Health Guide – Kidney stones www.nytimes.com/health/guides/disease/kidney-stones/medications.html

KidneyStoners www.kidneystoners.org