Phytotherapy for Recurrent Kidney Stones

Introduction
There is some debate as to whether commonly used herbs can help the passage of pre-existing large kidney stones. Given the advances with modern techniques of stone removal, this is probably now a hypothetical issue in most clinical situations. What is probably more relevant is whether herbs can help prevent stone formation or assist in the dissolution (or passage) of small stones. This article will focus on the approaches to diet, lifestyle and use of herbs which can credibly prevent the recurrence of renal calculi. The relevant herbs have been selected from both traditional and scientific perspectives.

Dietary and Lifestyle Issues
In industrialized countries, about 80% of stones which form in kidneys are composed of calcium salts and usually occur as calcium oxalate and less commonly calcium phosphate. The remaining 20% of stones are largely composed of uric acid, struvite or cystine and will not be discussed further here.

Because urine is supersaturated with calcium, crystal formation occurs readily if urine calcium rises, as when there is fluid depletion or increased calcium excretion. Calcium is also less soluble as the urine becomes more alkaline. Factors in urine which inhibit crystallisation include:
1. magnesium, which complexes oxalate
2. citrate, which complexes calcium
3. pyrophosphate which impairs crystallisation of calcium oxalate.

About 50% of patients with calcium stones have excessive calcium in their urine. The most common cause of this is a genetically-determined increased calcium absorption in the intestine. Excessive urinary calcium can also be caused by a diet rich in sodium or animal protein. Low levels of citrate in the urine is another factor, which affects between 20% to 60% of patients. Factors involved here can include urinary tract infection, a high sodium intake, chronic diarrhoea, potassium loss, excessive physical exercise and an excessively acid-forming diet (rich in high protein foods). High excretion of oxalate in the urine is largely of dietary or genetic origin.

Ironically the dietary factor most often responsible for oxalate stones is a low calcium intake. However, reducing the intake of oxalates is probably a safer option than increasing dietary calcium beyond normal levels.

Lifestyle and diet are best aimed at preventing stone formation and since the recurrence rate of stones is 75% over 20 years, the following guidelines could be followed by patients with a history of kidney stones.1

Regular weight bearing exercise will help store calcium in bones, which would otherwise be excreted in the urine. However, exercise should not be excessive since this increases dehydration and can cause lactic acidosis, both factors in stone formation. Fluid intake should be adequate, especially in warm climates, but commercial drinks are to be avoided (these are sometimes loaded with phosphate and sugar).

The diet should be based on fruit, vegetables and unrefined carbohydrates. Animal protein (including cheese) intake should not be excessive and dietary salt should be restricted.3 Fruit, which is rich in potassium and citrate, should be emphasized, together with foods rich in magnesium such as fermented soya products, legumes, nuts and green leafy vegetables. Calcium intake, specifically dairy foods, should be moderate, but should also not be restricted unless there are other reasons for this such as dairy protein allergy. Restriction of calcium can lead to excessive oxalate absorption.4

If there is a history of oxalate stones, then foods rich in oxalate are to be avoided. These include rhubarb, spinach, strawberries, ginger, almonds, cashews and beetroot.

Treatment Strategy: Goals, Actions and Herbs
Herbal treatment can augment the above measures designed to prevent kidney stones and can also be used to treat existing stones. The regime is largely the same for these two treatment scenarios. In the case of managing existing stones, treatment is aimed at passing small stones and/or gradually weakening or dissolving larger stones.

- A key herb is Crataegus, which research has shown can assist the passage of small stones and prevent the formation of new stones (see the detailed information below). Other antilithic herbs such as horsetail and golden rod are indicated, as are aquaretics (see below) which will render the urine more dilute (as will copious fluid intake). Dandelion leaf is also useful given that it is rich in potassium.

- Anthraquinone-containing herbs such as cascara and yellow dock can help by binding calcium in the urine and making it less likely to precipitate. The herb madder (Rubia tinctorum) was particularly used for this effect in Europe, but has now been banned due to concerns over carcinogenicity.
Infection can provide a focus for stone formation, hence the treatment strategies for cystitis should also be followed if infection is thought to play a role. This includes immune supporting herbs such as Echinacea root and antibacterial herbs such as cranberry and buchu. However there is some clinical evidence to suggest that cranberry may slightly increase the risk of oxalate stone formation.\(^\text{9}\) 

If a stone is lodged and causing pain then urinary tract demulcens and spasmylic herbs such as cramp bark and wild yam are additionally indicated. The prescription-only spasmylic *Ammi visnaga* was traditionally used in Egypt to aid the passage of urinary stones. While stones are causing damage to the urinary tract mucosa, immune enhancing herbs and urinary tract antiseptics will lower the risk of infection. A species of oak *Quercus salicina* (Q. *stenophylla*) has been used to treat urinary stones in Japan since 1969. Clinical trials have demonstrated efficacy in assisting the passage of both renal and ureteral stones.\(^\text{6,7}\)

**Diuretics and Aquaretic Herbs**

Although the term diuretic denotes all substances which increase urine flow (and in this sense water itself is a diuretic agent), modern diuretic drugs are designed to increase sodium excretion, since cardiac edema largely results through sodium retention. In contrast, in herbal texts the term diuretic is often loosely or inaccurately applied.

In particular, when a herb was taken as a decoction or infusion, as it often was traditionally, the water consumed in conjunction with the herb would have produced an observable diuresis which might have had little to do with any diuretic action of the herb itself. Hence, many herbs have been mistakenly classified as diuretics. Those herbs which did exhibit a mild diuretic activity might have done so because of their mineral (electrolyte) content (see below).

Confounding the issue, the term diuretic is often used in quite a different context in herbal writings. Herbs which are said to enhance the excretion of metabolic waste from the kidneys are also often described as diuretics. However, a more accurate description is encompassed by the terminology “diuretic depurative.” Examples of diuretic depuratives include celery and clivers. Any frank diuretic action of these herbs is probably variable, depending on the individual, and unlikely to be outside normal physiological limits.

In Europe, phytotherapists have proposed that the term aquaretic might more accurately describe some herbs which genuinely do increase urine output. The thinking here is that these herbs act on the glomerulus (unlike conventional diuretic drugs which act further along the nephron) to increase water excretion from the body, but their effect on electrolytes such as sodium and potassium is largely neutral. In other words, aquaretics act by increasing fluid loss from the body in a physiological manner, by increasing the formation of primary urine.\(^\text{8}\) The herb combination which has been most studied in this context is asparagus root (*Asparagus officinalis*) with parsley herb (*Petroselinum crispum*).\(^\text{9}\) In uncontrolled trials, this combination caused significant weight loss in overweight patients and significantly lowered blood pressure in patients with hypertension, without changing other biochemical parameters.\(^\text{9}\) Aquaretics have potential for the treatment of excessive weight, hypertension, congestive heart failure, kidney stones and premenstrual syndrome.

The mineral (electrolyte) content of herbs can often underpin any observed diuretic activity. The ratio of potassium to sodium was found to be higher in decoctions of herbs which are traditionally regarded as diuretics, compared to other herbs.\(^\text{10}\) A pharmacological study concluded that the high potassium content of dandelion is the agent responsible for any diuretic activity.\(^\text{11}\)

Juniper is a well-known herbal diuretic, which probably has this property because of its essential oil, although other compounds in the berries could enhance the diuretic effect. The infusion and essential oil of juniper berries, as well as terpinen-4-ol, were tested for diuresis response in rats.\(^\text{12}\) On initial dosing, all three test substances exhibited an anti-diuretic effect. However, a significant diuretic effect was established on repeated doses, with the infusion having the strongest effect. The ‘irritant’ effect of juniper oil on the kidneys was investigated in another study, since there are concerns in the literature about its long-term use. No nephrotoxic effects were observed in an animal study and the authors suggested that provided high quality oil is used (distilled from the ripe berries), concerns about the kidney irritant effects of juniper are unfounded.\(^\text{13}\)

The rationale for using diuretic herbs is sometimes misguided in herbal texts. In particular, herbs with a reputation for acting as diuretics are often recommended for the treatment of cystitis. The obvious basis for this approach is to flush the infecting bacteria from the bladder. However, in this context, the cheapest, safest, best and most certain flushing agent is water. Any action of herbal diuretics will be marginal compared to the flushing effect of a copious intake of water and cannot be justified.

Key diuretic or aquaretic herbs include dandelion (especially the leaf), asparagus root, parsley, juniper and horsetail. Other diuretic herbs used in Europe which appear to be effective include Java tea (*Orthosiphon spp*) which has been the subject of an ESCOP (European Scientific Cooperative on Phytotherapy) monograph and the spiny rest-harrow (*Ononis spinosa*)

**Crateaeva**

In Ayurveda, *Crateaeva nurvala* is highly acclaimed for its use in the management of urinary tract disorders,\(^\text{14}\) especially kidney stones.\(^\text{15}\) Texts dating from the 8th century BC record its application in urological diseases, with stronger emphasis on its use for kidney stones being recorded around 1100 AD.\(^\text{15}\) Its ancient status as the main Ayurvedic herb in urinary disorders is now supported by pharmacological and clinical research.

*Crateaeva* significantly inhibited bladder stone formation in an experimental model in rats.\(^\text{14}\) The bladders of treated animals showed less edema, ulceration and cellular infiltration when compared to controls.\(^\text{14}\)

The effect of oral administration of *Crateaeva* on calcium oxalate kidney stone formation was studied in rats.\(^\text{16}\) There was a decreased tendency to stone formation when compared to controls due to a number of identified factors. Endogenous
oxalate synthesis was decreased. There was also a reduction in the deposition of stone-forming constituents in the kidneys and a decrease in urinary excretion of crystalline components. One of the components responsible for this effect was identified as the phytochemical lupeol.\(^\text{17}\)

After treatment with a Crataeva decoction, the urine of patients became less lithogenic.\(^\text{14}\) Urinary calcium was reduced and urinary sodium and magnesium increased significantly.\(^\text{14}\) A pharmacological study found that Crataeva influenced small intestinal Na,K-ATPase which may in turn influence the transport of minerals.\(^\text{16}\)

An uncontrolled clinical study of the effects of Crataeva decoction on 46 patients with kidney, ureter or bladder stones not requiring surgery found 26 patients passed the stones within 10 weeks of treatment and the majority of the remaining patients experienced symptom relief.\(^\text{14}\)

### References

3. Curhan, G.C., Willet, W.C., Rimm, E.B. & Stampfer, M.J. 1993, 'An uncontrolled clinical study of the effects of Crataeva decoction on 46 patients with kidney, ureter or bladder stones not requiring surgery found 26 patients passed the stones within 10 weeks of treatment and the majority of the remaining patients experienced symptom relief.'

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