Diet and Cystinuria

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Dietary Advice

- Increase fluid intake – reduces the concentration of cystine in the urine
- Reduce salt intake – higher sodium intake correlates with higher cystine excretion
- Increase fruit and vegetable intake – can aid alkalinisation of the urine
- Reduce animal protein intake – contains methionine (which is broken down to cystine in the body) so this should help limit the amount of cystine passing through the kidneys
Dietary Advice

- General healthy eating advice – to achieve / maintain a healthy weight. Being overweight / obese increases risk of stone formation
- Adequate calcium intake – inadequate / excessive calcium intake increases risk of stone formation
Fluid intake

- High fluid intake is one of the main measures a patient can take to help prevent stone formation (Dent et al., 1965)
- The aim is to decrease urine cystine concentration to less than 250mg/L (Goldfarb and Mattoo, 2008)
- Patients are advised on achieving / maintaining a fluid intake of 3-4 litres per day and strategies are discussed to help them with this
Fluid

- If patients can drink at bedtime this will help decrease nocturnal aggregation of crystals.
- Worcester et al. (2006) reported that in their experience patients found it very difficult to maintain a high fluid intake, however, this improved with the frequent monitoring and feedback they received in their 6 monthly clinics.
Fluid

- We have encouraged our patients to maintain high fluid intakes
- 58% have increased their fluid intake since attending our clinic
- 66% are maintaining a fluid intake of greater than 3 litres daily
- 13% are managing a daily intake of 4 litres and above
Fluid – what to drink?

- Cola can acidify the urine (phosphoric acid)
- Excessive intake of wine and beer is associated with an reduced urine pH and although alcoholic drinks increase the urine flow temporarily, this effect is followed by a period of reduced urine flow
- Orange juice and other citrus fruit juices alkalinise the urine (citric acid)
- Water with a high bicarbonate content helps alkalinise the urine
Fluid – what to drink?

- Drinks which are high in sugar can bring about excessive calcium excretion
- All in all, the most sensible advice would be anything in moderation, providing it is in liquid form and the majority of which is a fluid such as water, which does not dehydrate
Salt

- There is plenty evidence to show that decreased sodium intake reduces the amount of cystine excreted in the urine (Rodriguez et al., Goldfarb et al., Lindell et al.)
- In the UK, the average salt intake per day is 8.6 g (3.4g sodium)
- 75% of this salt intake comes from processed foods
Patients are encouraged to restrict their salt intake to 6g per day or less.

They are advised on eating more fresh foods and checking the labels of processed foods so that they know how to choose the lower salt options.

Patients are also advised to stop adding salt to their food and to experiment with alternative seasonings.
Animal Protein Restriction

- A reduced animal protein intake is recommended, this consequently reduces methionine (a precursor to cystine) and cystine intake
- Reducing animal protein intake has been shown to decrease cystine excretion (Rodman et al.)
- Kolb et. al reported on a case where a patient who followed a strict low methionine diet for 10 years found that his cystinuria effectively disappeared
Animal Protein Restriction

- Also, an extremely low protein diet (20g/day) was found to reduce urinary cystine excretion by 34% (Dent and Senior, 1955) However, this level of protein restriction is not advisable as it may be harmful to patients.
- The efficacy of dietary protein restriction to prevent actual stone recurrence has never been shown in a randomised controlled trial.
Animal Protein Restriction

- Guideline – limit animal protein to no more than 60% of total protein requirements per day (Meschi et al.)
- Animal protein foods – meat, fish, chicken, eggs, cheese, milk, yoghurt
- Vegetable protein foods – pulses (beans, lentils, peas), quorn, tofu
- Protein exchange system used to help patients achieve this
Protein Exchange System

- Animal protein exchanges and vegetable protein exchanges provide 7g of protein each.
- The animal protein exchange list is subdivided into two groups: meat & fish and milk & milk based protein.
- Aim - no more than 60% of protein requirements from animal sources.

Animal protein exchanges

Meat & fish
- 25g (1oz) red meat (cooked weight)
- 1 egg
Protein exchange System

Milk & milk based protein
• 25g (1oz) hard cheese
• 200ml (1/3 pint) milk

Vegetable protein exchanges
• 100g (4oz) cooked pulses (such as, lentils, peas, kidney beans, haricot beans)
• 50g (2oz) quorn
Vegetable protein intake

- Traditional British diet – limited in vegetable protein, high in animal protein
- Cookbook produced to help patients change their dietary habits
- New cookbook currently in production – can be ordered today
Protein

- However, some patients who try the vegetable protein foods do not like them and do not include them in their diet
- It is important that these patients get adequate amounts of protein from animal protein sources but should avoid excessive amounts
Alkalisation of the Urine

- Dent et al. showed that solubility of cystine in the urine is approx. 250mg/L up to a pH level of 7.0 but solubility of cystine increases to 500mg/L or more with a pH level of 7.5 or greater
- Reduction of animal protein intake increases urine pH
- Increase in fruit and vegetable intake increases urine pH
Achieving a Healthy Weight

- Urinary pH is also inversely related to body weight, overweight patients, therefore, have a lower urine pH, which is conducive to stone formation.
- 30% of our patients were overweight when first seen in clinic (defined as a BMI 25.1–30 kg/m²) and 28% were clinically obese (BMI >30kg/m²).
- With the regular dietetic support, 12.5% of patients in the overweight group and 34.8% of patients in the obese group lost weight.
Anthropometry

- Weight
- Height
- BMI
- Waist circumference
- MUAC
- Grip strength – values that are 85% of normal may indicate protein malnutrition.
Dietary Changes made by our Patients

- 72% of patients increased their fruit and vegetable intake
- 68% patients reduced their animal protein intake
- 68% of patients reduced their salt intake
- 62% of patients increased their vegetable protein intake
- 58% of patients increased their fluid intake
References

- Dent CE, Friedman M, Green H et al. Treatment of Cystinuria. BMJ. 1965; 5432:403-8
References

References

- Worcester EM, Coe FL, Evan AP and Parks JH. Reduced renal function and benefits of treatment in cystinuria vs other forms of nephrolithiasis. BJU International 2006; 97,1286-1290