

4th Edition of the Clinical Cases Competition related to the non-surgical clinical management of non-surgical clinical management of renal lithiasis

Official template

Title: Alkalinisation as a medical treatment for chorionic uric acid lithiasis.

Keywords: Lithiasis, alkalinisation, uric acid, pharmacological treatment

1. Abstract

Patient diagnosed with bilateral choriform lithiasis incidentally (study due to analytical findings of elevated PSA and creatinine, also presenting hyperuricaemia). The diagnosis was initially made by ultrasound, and the lithiasis was radiolucent on X-ray, so alkalinisation with potassium citrate and allopurinol was decided. During follow-up, blood, urine and scintigraphy tests were performed, confirming improvement in analytical parameters and involvement of both kidneys, which showed signs of lithiasic nephropathy, with the left kidney being the most affected, showing pyelocaliceal ectasia with moderate obstructive behaviour. After 6 months of alkalinising treatment with dose optimisation according to urine pH, almost complete resolution of left chorionic lithiasis and a significant reduction in right chorionic lithiasis was achieved. In addition, during this process he was diagnosed with prostate cancer and received radiotherapy treatment.

2. Introduction

Urinary lithiasis has an estimated prevalence in the Spanish population of 15.5% in patients aged 40-65 years (1), being more frequent in men than in women. Over the last four decades, prevalence has increased considerably in developed countries (2). Unless the underlying aetiology is adequately addressed, kidney stones may recur in up to 50% of cases within ten years of initial presentation.

Evaluation of a kidney stone-forming patient requires an extensive medical history (to identify environmental problems, metabolic and/or genetic factors contributing to stone formation), imaging studies and laboratory studies (serum and urine biochemistry, stone composition analysis) to guide lifestyle and drug therapy.

Pure uric acid stones account for 8-10% of all stones, although their prevalence is significantly higher in stone formers with type 2 diabetes and/or metabolic syndrome. Hyperuricosuria may be the result of diet, endogenous overproduction (enzyme defects), myeloproliferative disorders, chemotherapy drugs, gout or catabolism. Such lithiasis form in patients presenting with low pH urine, this may be caused by decreased urinary ammonium excretion (insulin resistance or gout), increased endogenous acid production (insulin resistance, metabolic syndrome or exercise-induced lactic acidosis), increased acid intake (high animal protein intake) or losses of basic medium (diarrhoea) (3). This is why urinary alkalinisation with drugs such as potassium citrate can help dissolve uric acid stones and prevent recurrent uric acid nephrolithiasis (4).

3. Description of the clinical case:

a. Relevant background

A 73-year-old male patient, with no personal history of interest except obesity, was referred to Urology and assessed on 30/08/2022 due to an incidental finding of elevated PSA and altered renal function. No urinary symptoms.

b. Diagnostic support studies and results

Analysis (15/5/2022): Cr 1.9 mg/dL; uric acid 10.2 mg/dL; GFR 35ml/min; PSA 10.51ng/mL.

Urine system: pH 6. Sediment: positive formal elements, haematuria and leucocytes 10-20.

Ultrasound scan performed in consultation: bilateral chorioriform lithiasis was observed.

X-ray: no radio-opaque images were observed.

UroTC (27/09/2022): kidneys of preserved size with good contrast concentration and minimally thinned cortical cortex. Gross coralliform lithiasis in both pelvises and renal calyces, which are also dilated; however, there is no problem in the excretion of contrast as both ureters are replete and of normal calibre and without lithiasis. Prostatic hypertrophy.



c. Diagnosis

Bilateral chorioriform lithiasis.

Elevated PSA to be studied.

d. Treatment

Potassium citrate 20 mEq/8 h and allopurinol 100 mg/24h are prescribed.

e. Evolution and follow-up

- CBC (20/09/2022): Cr 1.6mg/dL; Uric acid 9.6 mg/dL; PSA 12.42 ng/mL.

- Urine system: pH: 6.5.

A diuretic renogram was requested to assess surgical options if necessary.

- Diuretic renogram (21/10/2022): both kidneys with irregular and decreased uptake, with hypocaptant areas more noticeable in the left kidney. Relative function 56% for the right kidney and 44% for the left kidney. Right kidney without significant ectasia. The left kidney shows pyelocaliceal ectasia that clears slowly and incompletely despite diuretic and ambulation/miction manoeuvres.

Conclusion: kidneys with signs of lithiasic nephropathy. Left kidney with pyelocaliceal ectasia with moderate obstructive behaviour.

After checking good tolerance, the dose of potassium citrate was increased to 30 mEq -20 mEq -20 mEq /day. In addition, a CT scan without contrast was requested for control and new analyses for review.

A prostate biopsy was requested.

f. Clinical results

- Prostate biopsy: adenocarcinoma of the prostate Gleason 6 (3+3) for which he was referred to radiation oncology to assess treatment.

- CT scan without contrast (06/02/2023): Resolution of left chorioriform lithiasis, with only a 6 mm lithiasis persisting in the GCl. Obvious decrease in right chorioriform lithiasis, currently fragmented, the largest being 24 mm in the renal pelvis.

- Laboratory tests (27/06/2023): Cr 1.9mg/dL; Uric acid 6.9mg/dL; PSA 0.07ng/mL.

- Urine system: pH 6.5.



Given the good response to medical treatment, this treatment is maintained and closely monitored.

4. Discussion

Uric acid stones are the predominant stone composition among people with overweight, metabolic syndrome and diabetes, and may be part of the continuing increase in the prevalence of kidney stones (5). In fact, the patient in the case in question has obesity as his only personal history.

As discussed, spontaneous precipitation of pH-dependent species, i.e. uric acid and calcium orthophosphates, is strongly influenced by urinary pH value (6). This makes it an important target in the management of urolithiasis and its measurement is currently recommended for the monitoring and treatment of patients with urolithiasis (7).

In our case, given the clinical suspicion of uric acid lithiasis (he had radiolucent lithiasis and hyperuricaemia), it was decided to opt for pharmacological treatment by alkalinisation and close monitoring to assess changes in urinary pH by means of systematic urine tests.

Potassium citrate can increase urinary pH in these patients. The effect of citrate on lithogenesis can be attributed to a combination of three different aspects. In this case we highlight its effectiveness in increasing urinary pH, this occurs because citrate leads to the formation of bicarbonate ion which, as a consequence of its basic characteristics, consumes protons (H⁺) at plasma level, leading to a decrease in the excretion of these and therefore to an elevation of urinary pH. Uric acid is insolubilised at urinary pH below 5.5. Thus, elevation of urinary pH can prevent the formation or dissolve uric acid stones and also prevent the formation of uric acid crystals that could act as very effective heterogeneous nuclei of calcium oxalate, inducing the formation of uric acid stones.

However, this elevation of urinary pH must be carefully monitored because it can lead to values close to 7, where different calcium phosphates (brushite, hydroxyapatite) can become insolubilised, which could form stones by themselves or also act as heterogeneous nuclei of calcium oxalate (8).

Urinary pH measurement is a very useful tool, but test strips are not suitable for pH measurement and medical decision making. Currently, several studies have evaluated a new electronic device to achieve effective and patient-friendly urinary pH measurement, maintaining urinary pH in non-lithogenic ranges with the association of medical and non-medical treatments, and with good patient acceptability (9)(10).

In our case, we found that by increasing the urine pH, lithiasis decreased considerably and we were able to avoid invasive treatment for the time being, thus avoiding possible complications.

5. Conclusions and recommendations

In conclusion, we affirm that medical treatment by alkalinisation is a valid and effective tool in some types of lithiasis, regardless of its size, and we therefore recommend its use in cases of uric acid lithiasis, reducing the possible complications that could be caused by an invasive procedure, as well as preventing new recurrences.

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