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V Edition of the Clinical Cases Contest on non-surgical clinical management of Kidney Stones

Official template

Title: Breaking the Cycle: Successful Oral Treatment of Recurrent Uric Acid Stones After Early Post-Surgical Relapse

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1. Abstract

Aim: we present case report of an early uric acid nephrolithiasis recurrence after surgery which is successfully dissolved by oral alkalinisation.

Methods: We collect clinical data, laboratory studies, imaging studies (mostly CT scan) and analysis of the stone composition after surgery. Two treatments were administered sequentially during the patient's management: Percutaneous nephrolithotomy was first performed; then, after an early recurrence, oral chemolysis was performed.

Results: Percutaneous nephrolithotomy was first performed due to high stone burden and obstructive uropathy. Stone composition analysis revealed uric acid as its main component. The patient suffered from early recurrence (6 months later). Oral chemolysis was decided and lithiasis was completely dissolved after alkalinisation of urine with Lit Control Up for 3 months. The patient remains asymptomatic.

Conclusions: oral chemolysis based on oral urinary alkalinisation with potassium citrate or sodium bicarbonate allows the dissolution of uric acid stones when maintaining the urine pH above 7.

2. Introduction

Urolithiasis is one of the most common diseases and a major public health problem concern around the world causing numerous medical visits, emergencies, and hospitalizations, particularly among the working-age population, with high economic impact. Nephrolithiasis prevalence ranges from 1% to 20%, influenced by geographical, climatic, ethnic, dietary, and genetic factors. Consequences of calculi may include severe pain, infections, septic shock, and kidney failure(1) (2).

Calcium oxalate is the most frequent component (70%). However, uric acid stones are becoming more frequent (currently about 10%) due to a higher prevalence of type 2 diabetes, metabolic syndrome and

obesity. They are more frequent in men, peaking at ages 60-65 in both sexes. Uric acid stone formation is mainly due to an acidic urinary pH secondary to an impaired urinary ammonium availability.(3)

Surgical treatment has greatly progressed with the development of extracorporeal shockwave lithotripsy (ESWL), percutaneous nephrolithotomy (PCNL) and retrograde intrarenal surgery (RIRS). However, these techniques are not exempt from risks such as haemorrhagic complications, ureteral lesions or stenosis and urinary tract infection. Fortunately, uric acid stones are accessible to medical treatment by oral chemolysis (alkalinisation of urine) by application of alkaline citrate or sodium bicarbonate. Urine pH should be adjusted to 7.0-7.2(2) (4).

We report a clinical case of an early recurrence after a successful surgical treatment. The patient was managed conservatively with complete resolution of his nephrolithiasis.

3. Clinical Case description

A) Patient information / Medical records:
46-year-old male patient with the following personal background: essential hypertension treated with thiazides.
Four years ago, a possible UPJ stenosis was investigated following a CT scan showing a dilated pelvis without associated right ureteral dilation. However, a renogram confirmed that it was not obstructive.

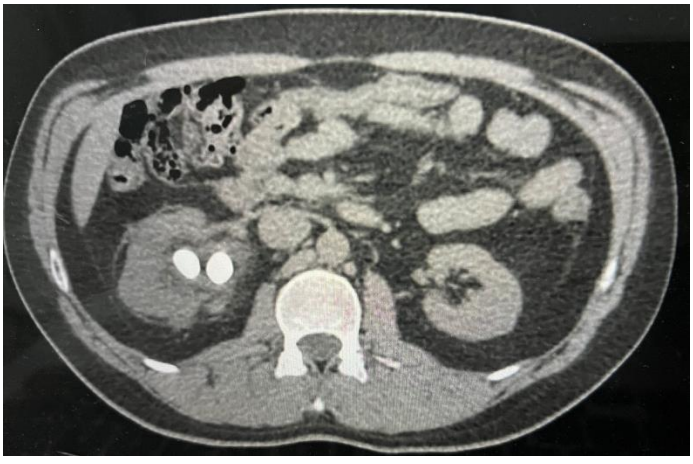
He is now referred to our urology clinic with right lumbar pain for six months, radiating to the right iliac fossa and inguinal region. The patient refers a self-limited episode of haematuria lasting one day, without other urinary symptoms associated.

B) Diagnostic support studies and results:
The patient provides normal blood tests and a normal urinalysis and negative urine culture.
In this visit, an echography scan and cytology were requested, as it had an episode of haematuria.

-Ultrasound: Right kidney in normal position with preserved parenchyma. Mild pyelectasia and a calculus measuring 1.63 cm in the lower calyx group.

-Urine Cytology: Negative for malignant tumor cells.

-Abdominopelvic CT scan: Right kidney of normal size and morphology, with two large adjacent calculi identified, though not impacted, located in the pelvis: one measuring 15 mm (closest to the lower calyceal group) and the other 16 mm (situated directly in the pelvis). These calculi cause dilation of the upper and middle calyceal groups. Left kidney of normal size and morphology, with no evidence of calculi or signs of obstructive uropathy.



C) Diagnosis: right pelvic nephrolithiasis which cause dilation of the upper and middle calyceal groups

D) Treatment: We discussed the options, which include two or more sessions of ESWL and/or RIRS and/or a single session of PCNL. Considering the anatomy and the total stone burden, which amounts to 3 cm, we believe that percutaneous lithotomy is the most appropriate approach to resolve the condition in a single

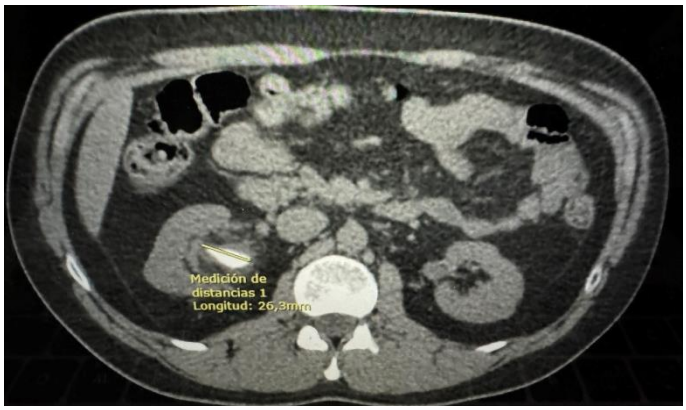
procedure.

E) Evolution and progress: Right PCNL performed with no complications. The JJ stent was removed without issues.

- **Stone analysis**: 10% ammonium magnesium phosphate, 30% calcium oxalate, 60% uric acid.
- **Control CT-scan**: Both kidneys are of normal size, morphology, and density. Millimetric residual calculi are identified in the right renal pelvis, with no impact on the excretory pathway. The previously observed large calculi are no longer visible, although mild pyelocaliectasis, likely chronic, persists. No pyelocaliectasis is observed on the left side.
- **Laboratory:**
  - **Serum blood sample** (noteworthy results): Normal renal function, normal sodium and potassium levels. Normal calcium. Normal uric acid.
  - **Spot urine sample (noteworthy results):** pH 5, uric acid crystals.
  - **24h Urine**: Volume 1800cc, normal ions in 24h urine.
- **Clinical decision**: Given that the majority of the stones are composed of uric acid and considering the findings in the urine, we will start treatment with potassium citrate (Acalka ®: 2 tablets of 1080mg every 12h). For hypertension, the patient is being treated with hydrochlorothiazide 25 mg 0.5tablet/24h. Control in 6 months with blood test and CT.

Follow-up 6 months after surgery: An episode of right lumbar pain during this period.

- **Control CT scan**: Both kidneys are of normal size, morphology, and density. In the right kidney, there is an image consistent with a calculus up to 27 mm in the renal pelvis, with no associated dilation. Additionally, two more calculi are observed in the lower pole of the same kidney, approximately 8 mm and 7 mm, respectively, with no impact on the excretory pathway. The ureteral passages have normal diameter and morphology, with no clear evidence of calculi.
- We do not have control of the pH.

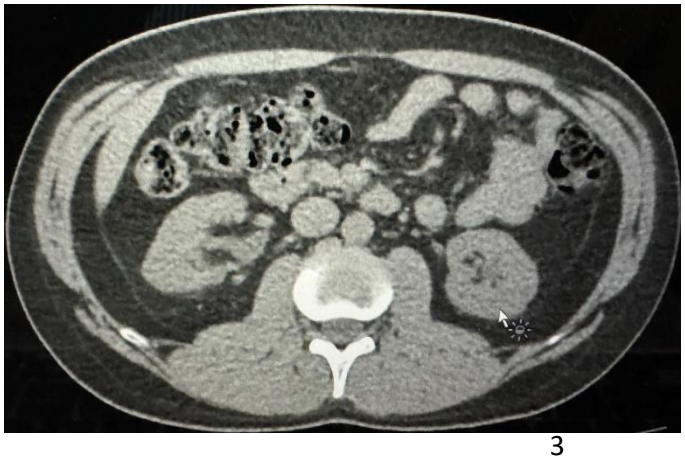


- **Clinical decision**: A very significant recurrence is noted. The patient has not tolerated Acalka® and discontinued it months ago. We will initiate chemolysis assuming uric acid calculi, starting with Lit-Control ® - pH Up (containing potassium citrate, magnesium nitrate, and theobromine), administered as 1 pill every 12 hours during breakfast and dinner. We scheduled follow-up with urine test and CT scan in 3 months.

Follow-up: three months after the start of oral chemolysis:

Good general condition. No renal colic symptoms.

- **Control CT scan**: Both kidneys are of normal size, morphology, and density, with no evidence of the previously observed calculi in the mesorenal and right renal pelvis locations. There is no dilation of the excretory pathway, except for mild pelvic ectasia. Ureteral passages have normal diameter and morphology. The bladder is moderately filled



with no evidence of filling defects, masses, or other significant abnormalities.

- **Urine test:** pH 7, amorphous phosphate crystals.
- **Clinical recommendation**: Chemolysis has been completed. Maintenance prophylaxis with Lit-Control ® - pH Up and use the pH meter DEVICARE® for urinary pH monitoring.

F) Results: The patient is currently asymptomatic and he has not experienced any new episodes of renoureteral colic. The follow-up includes serum blood and spot urine samples every 4 months and an abdominal-pelvic CT scan without contrast every year.

4. Discussion

Complete resolution of urolithiasis is often a challenge, due to the high regrowth and recurrence rate s with its consequent impact on patient's quality of life and a high economic cost for health care systems. A proper diagnosis is essential to guide treatment decisions since different approaches may be decided depending on composition, size, localization and patient desire. Radiological appearance and urinary pH may provide information about the type of calculi. However, the analysis of the stone composition will provide us the exact composition. According to EAU guidelines, It should be performed in all first-time stone formers using a valid method such as X-ray diffraction, infrared spectroscopy or polarisation microscopy (2)

Uric acid crystallization is promoted by acidic urinary pH (pH < 5.4), hyperuricosuria and low urine output. As acidic urine is the main factor for UA formation, alkalizing treatment (with alkacine citrates) was successfully proposed for medical stone dissolution. Bicarbonate or citrate salts are used (3).

It is crucial to select appropriately those patients eligible for active treatment of their urolithiasis, as they can affect kidney function. Gambaro et al in their systematic review focused on identifying risk factors for chronic kidney disease (CKD) in stone formers and the impact of urological surgery. They concluded that the number and complexity of urological treatments, staghorn calculi, stone burden, and advanced CKD prior to treatment appear to be the most relevant risk factors for CKD after urological treatment of stones(5).

In addition, is crucial to identify those patients at high risk for recurrence. Primary prevention by public health interventions is advisable to reduce prevalence of stones in the general population. Renal stone formers at "high-risk" for recurrence need early diagnosis to start specific treatment. Stone analysis allows the identification of most "high-risk" patients forming non-calcium stones: infection stones (struvite), uric acid and urates, cystine and other rare stones (dihydroxyadenine, xanthine). Patients at "high-risk" require a metabolic evaluation(2)(4). Our patient, who has an early recurrence and uric acid stones, is clearly in "high risk" group for urinary lithiasis recurrence.

A comprehensive and accurate study of our patient, first treated by surgery, allowed us to determine the lithiasis composition. As the composition was mostly uric acid, oral chemolysis was possible. In addition, given the early recurrence, the patient did not want invasive treatments again and preferred a conservative approach to continue working.

Conservative treatment of uric acid stones has been based on alkalinisation of urine (primarily through oral agents) along with adequate hydration, dietary adjustments, and control of urinary tract infections (4). While alkalinisation of urine has been used for decades, there are no randomized clinical trials to support its efficacy.

EAU guidelines recommend maintaining urine pH around 6.2-6.5 through the use of oral alkalinisation agents for prevention and 6.5-7.2pH for chemolysis (2). It should be noted that the duration of alkalinisation of urine is not established.

Elsawey et al prospectively evaluated the effectiveness and predictive factors of success of oral alkalinisation therapy in patients with radiotransparent kidney stones. The treatment approach included a combination of daily intake of 3 liters of fluids, dietary modifications and 60 mEq/d of potassium citrate to maintain urine pH

between 6.2 and 6.8. In patients with hyperuricemia, allopurinol 300 mg/d was added to the treatment regimen. The dissolution of the stones was assessed using non-contrast CT scans. After 3 months, among the 182 patients, complete dissolution was achieved in 53.3%, partial response in 35.7%, and no response in 11%. Poor glycemic control and stone density were independent predictors of non-dissolution of the stones after 3 months of treatment. Initial response (at 3 months) to oral alkalinisation, lower stone density and higher urine pH at 12 weeks of treatment were independent predictors of stone dissolution after 6 months of treatment (6)

Based on scientific evidence, our patient was treated with abundant fluid intake and alkalinisation of urine resulting in excellent outcomes.

5. Conclusions and recommendations

- Consider oral chemolysis (alkalinisation of urine) as an effective therapeutic option for uric acid calculi, manteining pH adjusted to 7.0-7.2, especially when surgical approaches may not be feasible or patient prefers conservative approach.
- Conduct a comprehensive evaluation of the metabolic profile and lithiasis composition before choosing the optimal treatment for each patient.
- Educate patients about the importance of maintaining adequate fluid intake and following medical advice to prevent urolithiasis recurrences as well as strict treatment compliance
- Although there are no randomized clinical trials on which oral chemolysis is based, prospective trials support its use in urinary lithiasis composed of uric acid.

6. Bibliographic references

1. Kachkoul R, Touimi GB, El Mouhri G, El Habbani R, Mohim M, Lahrichi A. Urolithiasis: History, epidemiology, aetiologic factors and management. Malays J Pathol. 2023;45(3):333-52.
2. Skolarikos A, Jung H, Neisius A, et al. EAU Guidelines 2024 on Urolithiasis. Edn. presented at the EAU Annual Congress Paris 2024. En.
3. Normand M, Haymann JP, Daudon M. Medical treatment of uric acid kidney stones. Can Urol Assoc J. noviembre de 2024;18(1):39-45.
4. Papatsoris A, Alba AB, Galán Llopis JA, et al. Management of urinary stones: state of the art and future perspectives by experts in stone disease. Arch Ital Urol Androl. 2024;96(2):12703.
5. Gambaro G, Croppi E, Bushinsky D, Jaeger P et al. The Risk of Chronic Kidney Disease Associated with Urolithiasis and its Urological Treatments: A Review.2017;198(2):268-273. J Urol. 2017;198(2):268-73.
6. Elsawy AA, Elshal AM, El-Nahas AR, Elbaset MA et al. Can We Predict the Outcome of Oral Dissolution Therapy for Radiolucent Renal Calculi? A Prospective Study. J Urol. 2019;201(2):350-7.