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

Official template

Title: Therapeutic alkalinization in staghorn calculi management: addressing non-surgical cases

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1. Abstract

A 76-year-old male with polymyalgia rheumatica and metabolic syndrome presented with a 3.5 cm staghorn calculus in the right kidney, detected during a routine evaluation. He exhibited macroscopic hematuria and initial investigation ruled out malignancy or structural abnormalities. Imaging revealed a staghorn calculus and a large renal cyst, complicating a potential percutaneous nephrolithotomy. Due to a suspected diagnosis of uric acid lithiasis, the patient was treated with urinary alkalinization using citric acid and potassium citrate. Over two years of follow-up, the patient remained asymptomatic. Subsequent imaging confirmed complete dissolution of the calculus, with no recurrence or complications. This case highlights the effectiveness of medical management for complex kidney stones, particularly in challenging anatomical situations. Urinary alkalinization was pivotal in achieving stone-free outcomes, reducing the need for invasive procedures.

2. Introduction

Nephrolithiasis is a highly prevalent disease worldwide with rates ranging from 5 to 9% in Europe [1]. Due to its high incidence, its management is costly and associated with high morbidity [1]. Treatment modalities for kidney stones include medical treatment (oral chemolysis) and surgery. Stones composed of uric acid can be dissolved by oral chemolysis, an approach based on the alkalinization of urine using alkaline citrate or sodium bicarbonate [2]. However, there are situations where active stone removal is indicated such as stones > 15mm or symptomatic stones [3]. In addition, sones >20 mm should be primarily treated by percutaneous nephrolithotomy (PNL) [3].

We present the case of a patient with a symptomatic staghorn kidney stone measuring around 3 cm without anatomical conditions for PNL, with a complete response to medical treatment.

3. Clinical Case description

a. Patient information / Medical records

A 76-year-old male patient, autonomous in activities of daily living, retired (truck driver), is under follow up at our hospital centre for polymyalgia rheumatica. His medical history is notable for dyslipidemia, hypertension, and obstructive sleep apnea.

As part of routine follow-up for his autoimmune condition, an abdominal CT scan was performed to rule out occult neoplasm. The imaging revealed a 3 cm staghorn calculus involving the middle and lower calyceal groups of the right kidney, with a density of 500 Hounsfield units (HU). Consequently, he was referred for a urology consultation. During evaluation, the patient was asymptomatic except for the presence of macroscopic hematuria.

b. Diagnostic support studies and results

The diagnostic workup ruled out malignancy or structural abnormalities of the urethra and bladder, as confirmed by an unremarkable cystoscopy. Blood tests revealed no significant abnormalities, with normal renal function and no electrolyte imbalances. Urinalysis showed a pH of 5.5, with no abnormal sediment aside from the presence of erythrocytes >100/µL (reference range: 0–3). Abdominal CT scan: "The kidneys are seen in their usual topography with a voluminous cyst in the lower pole on the right with fine calcified septations measuring 92x71mm with longer axes in the axial plane (Bosniak IIF). Staghorn calculus on the right measuring around 35x18mm" (Figure 1).

c. Diagnosis

Staghorn calculus on the right measuring around 35x18mm

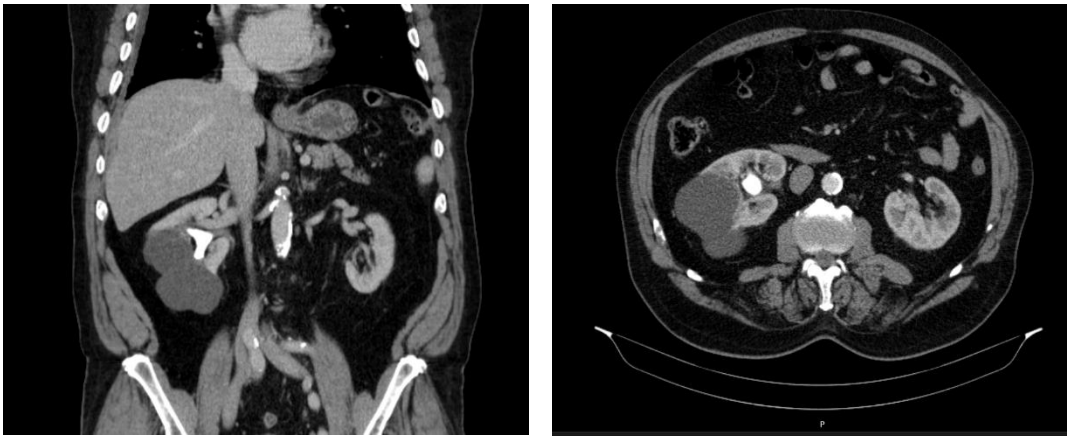

Fig.1 - Abdominal CT scan: A) Coronal view, B) Transversal View

d. Treatment

Due to the large renal cyst in the lower pole of the right kidney, which impeded percutaneous access, the patient was deemed unsuitable for percutaneous nephrolithotomy. Consequently, alkalinization therapy was initiated using a combination of citric acid, potassium citrate, and sodium citrate. In the event of persistent symptoms, simple nephrectomy was considered as a potential treatment option.

e. Evolution and progress

The patient was followed for approximately two years in the outpatient clinic, during which he remained completely asymptomatic, with no complications or hospitalizations.

A repeat abdominal CT scan at the end of this period showed no evidence of urinary lithiasis (Figure 2).

Figure 2 – Revaluation abdominal CT scan, transversal view: "Kidneys in their usual topography of lobulated contours, with globally preserved parenchymal thickness. No ectasia of the collecting structures, bilaterally. The lower third of the right kidney showed a large cystic formation measuring 11.2 x 5.6 cm with longer axes. No radiodense lithiasis or lithiasis of the collecting structures, bilaterally. Bladder moderately full, regular wall, no endoluminal images with spontaneous translation

f. Clinical results

The lithiasis was successfully resolved with alkalinization therapy, leading to the patient's discharge from specialized care. As part of the follow-up plan, annual ultrasound monitoring was recommended through the family doctor. Should the lithiasis recur, a three-month course of urinary alkalinization was advised, followed by a repeat imaging study to reassess the condition.

4. Discussion

Nephrolithiasis is a prevalent condition worldwide, with a rising prevalence and incidence over the last decades [4].

The standard evaluation of patients with kidney stones involves a comprehensive medical history, a thorough physical examination, and a biochemical analysis of urine and blood [5]. Additionally, diagnostic imaging plays a central role in the assessment of stone disease, with non-contrast computed tomography (CT) regarded as the gold standard for its diagnostic accuracy [5]. CT images provide useful information regarding stone composition, for instance, uric acid stones exhibit lower Hounsfield units (HU) compared to other stones [6].

The majority of kidney stones are made up of calcium (calcium oxalate and/or calcium phosphate), either pure or in combination with uric acid. Pure uric acid stones account for 8-10% of all stones, with their prevalence higher in individuals with metabolic syndrome. Uric acid stones are primarily caused by hyperuricosuria (a result of dietary excess, enzyme defects, myeloproliferative disorders …) or low urinary pH (a result of insulin resistance, gout, autosomal dominant polycystic kidney disease [ADPKD] …) [7]. In this kind of stones urinary alkalinization can be effective in dissolving and preventing recurrent nephrolithiasis [8].

The treatment of urolithiasis is individualised, taking into account factors such as the size, number, location, and composition of the stones. Additionally, patient-specific factors, including the anatomy and compliance of the pelvic-calyceal system, play a crucial role in determining the most appropriate approach. In this case, given the patient's ongoing symptoms and the stone's size (>20 mm), percutaneous nephrolithotomy would typically be indicated (the endoscopic retrograde route, due to its location in the renal topography and the size of the stone, was not a viable option) [3]. However, given the anatomical limitation caused by the renal cyst, the percutaneous route was not feasible. In lieu of the laboratory and imaging findings, uric acid lithiasis was suspected. Medical treatment through urinary alkalinization was therefore attempted, and more invasive procedures were postponed.

Throughout the follow-up the patient remained asymptomatic and after imaging reassessment, complete chemodissolution was confirmed.

There is no direct evidence in the scientific literature reviewed that specifically links polymyalgia rheumatica (PR) to nephrolithiasis. In this case, the most likely etiology of nephrolithiasis will be a decrease in urinary pH due to the underlying metabolic syndrome.

In short, this is a paradigmatic example of the importance of medical treatment, even in patients with complex and bulky lithiasis and, above all, in anatomically challenging patients. It was possible to avoid more invasive techniques without compromising the stone-free results.

5. Conclusions and recommendations

Urinary alkalinization plays a crucial role in the treatment of staghorn calculi, especially in stones made up of uric acid crystals. By raising the urinary pH, it is possible to reduce the formation of new stones and promote the dissolution of existing ones, reducing the crystal load in the urine. This approach can also minimize the recurrence of the disease, relieving symptoms, preventing serious kidney complications and optimizing the results of other treatments. In situations where the anatomy makes the surgical approach difficult, it becomes even more relevant

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