НИРКИ KIDNEYS

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Spontaneous retrograde urolithiasis migration in a woman: a case report and possible mechanism

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Abstract. *Urolithiasis is a condition which is commonly encountered in practice, however retrograde migration of a calculus within the ureter has only recently been documented with few cases reported in the literature. We present the case of a 47-year-old woman presenting with symptomatic urolithiasis confirmed by CT who recovered from her symptoms only for it to be discovered that the calculus had undergone retrograde migration into the renal calyx on a follow up CT examination. We theorise that retrograde urolithiasis migration may be an innate safety mechanism that evolved to prevent complications and/or death from urolithiasis impaction by attempting to return a migrated lithiasis to the renal calyx.*
Keywords: *urolithiasis; retrograde migration; calculus; ureteric calculus*

Introduction

Urolithiasis affects 1 of 11 people in the USA, having a slightly higher prevalence in men [1]. The typical presentation is colicky flank pain alongside nausea, vomiting and fever [1]. Most calculi will pass spontaneously though, the likelihood of this occurring decreases with calculus size [1]. However, despite the relatively high prevalence of urolithiasis, few cases of retrograde migration have been reported. We present a rare case of retrograde urolithiasis migration.

Case report

A 47-year-old woman presented with left flank pain to the radiology department following a referral from her general practitioner to exclude urolithiasis. The patient had presented with similar symptoms two years previous, at which point a single non-obstructive kidney stone of 2 mm was found within the left renal calyx during a CT (Computed Tomography) examination (Figure 1).

Upon this occasion, the pain had fluctuated since its first appearance four days prior and was coupled with white blood cells and red blood cells in the urine. A CT-examination demonstrated a 3 mm calculus located in the left proximal ureter with mild hydronephrosis, and no calculus within the kidney (Figure 2).

The patient was treated conservatively before subsequently presenting 11 days later for a follow up CT-exam to verify that the calculus had been eliminated, the pain having subsided in the meantime, leading the clinician to suspect that natural elimination had occurred. Surprisingly, the 3 mm calculus was once again observed, in the inferior renal calyx, with concomitant resolution of the hydronephrosis (Figure 3). We therefore hypothesize upward migration.

An abdominal x-ray was performed three days later, finding that the calculus was radiopaque and remained in the renal calyx.

Discussion

One could hypothesise that the migrating calculus seen in the lumbar ureter had been eliminated and that a second calculus, which had appeared in the meantime, was seen on the follow-up CT examination in the left inferior calix. This would raise two possibilities: first, that we would have missed a 3 mm calculus in the kidney on the first CT examination, or second that a new calculus had formed within the intervening 11 days.

It is improbable that there was a second, missed, kidney stone on the initial CT-exam given that CT technique has a reported sensitivity of up to 99 % with regards to the detection of kidney stones [2]. It is also improbable that a new 3 mm calculus formed within 11 days, as the average recurrence time for new symptomatic urolithiasis is over a year [3]. Furthermore, we know that in this patient the calculus took 2 years to grow from 2 to 3 mm in diameter, making the novel calculus hypothesis yet more improbable [3]. These

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facts make us confident that there was only a single kidney stone in this patient. Due to the improbability of both abovementioned hypotheses, we therefore postulate that the calculus seen in the lumbar ureter had migrated upwards.

Although urolithiasis is a relatively common occurrence, fewer than 10 cases of retrograde urolithiasis migration have been documented once it has entered the ureter. The first documented case in English literature dates from 2015 in Bahrain, with a few cases in the Middle East and India documented afterwards [4–7]. Of the previously reported cases, only Fatallah et al reported relatively little distal migration of the urolithiasis before it was subsequently found to have migrated back into the calyx, whereas the other reports detail the calculus having migrated to the vesicoureteral junction before beginning its retrograde migration [4–7]. The previous papers report intervals of 3 days to around 2 weeks between the onset of pain and its subsequent resolution, at which point it was assumed that the calculus had been spontaneously passed, as was the case in our patient, before it was discovered to have migrated to kidney [4–7].

Previous studies have shown that, once the calculus is within the ureter, the normal anterograde peristalsis of the ureter is disturbed [8]. Interestingly, the peristalsis becomes retrograde in the majority of cases when the calculus is in the proximal ureter, followed by a majority of uncoordinated waves once the calculus is in the distal ureter [8]. Retrograde peristalsis has also been observed in pig models after prolonged stenting, suggesting that foreign bodies, such as an impacted calculus, may be the inducing factor [9]. This theory is backed by evidence from Davenport et al who found that stretch and irritation from calculi resulted in abnormal peristalsis, thus building on a 1973 study which demonstrated abnormal peristalsis following acute or chronic obstruction [10, 11]. Furthermore, retrograde migration of urolithiases have also been recorded in both cats and dogs, lending

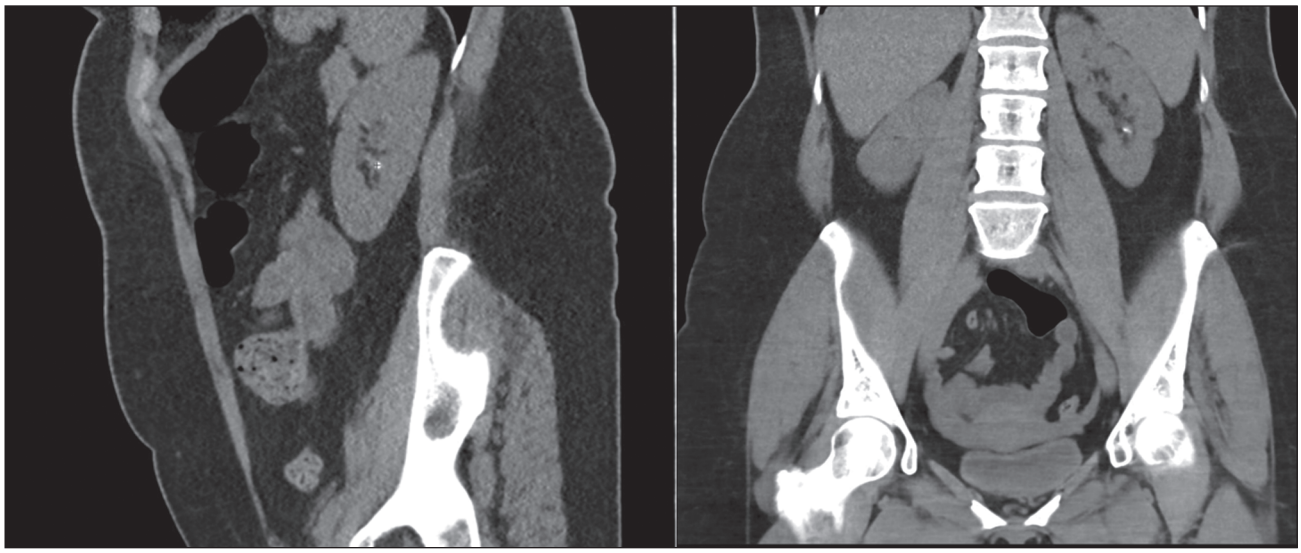

Figure 1. Images obtained 2 years prior showing a single non-obstructive intra-caliceal calculus

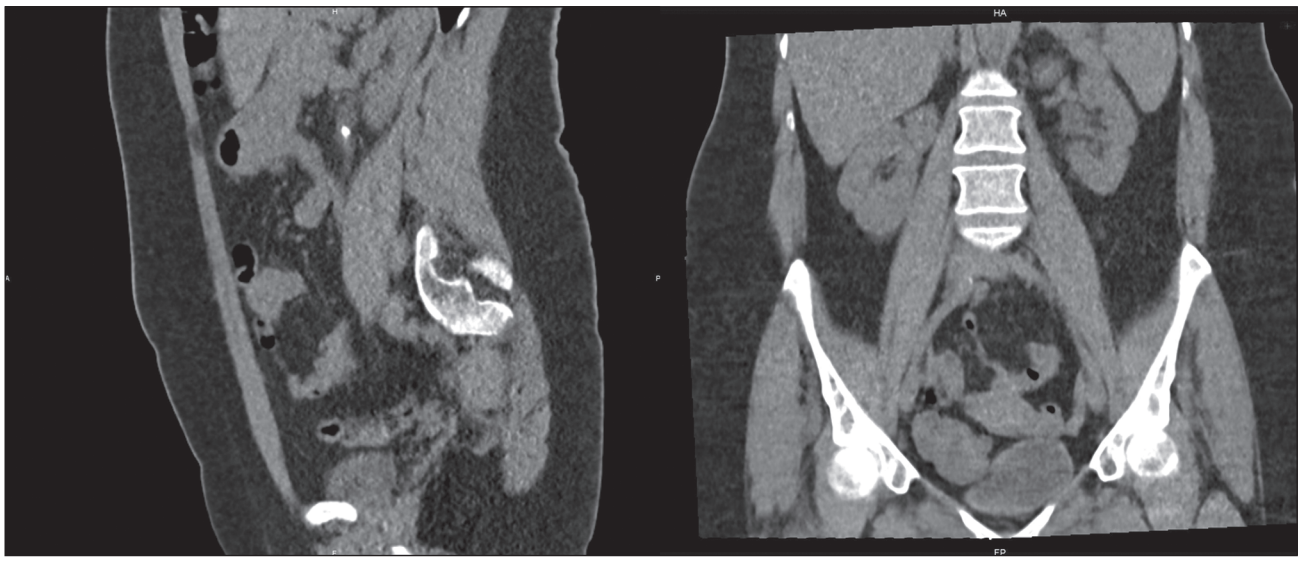

Figure 2. Images obtained during current presentation reconstructed in 5 mm MIP, showing the proximal ureteric calculus

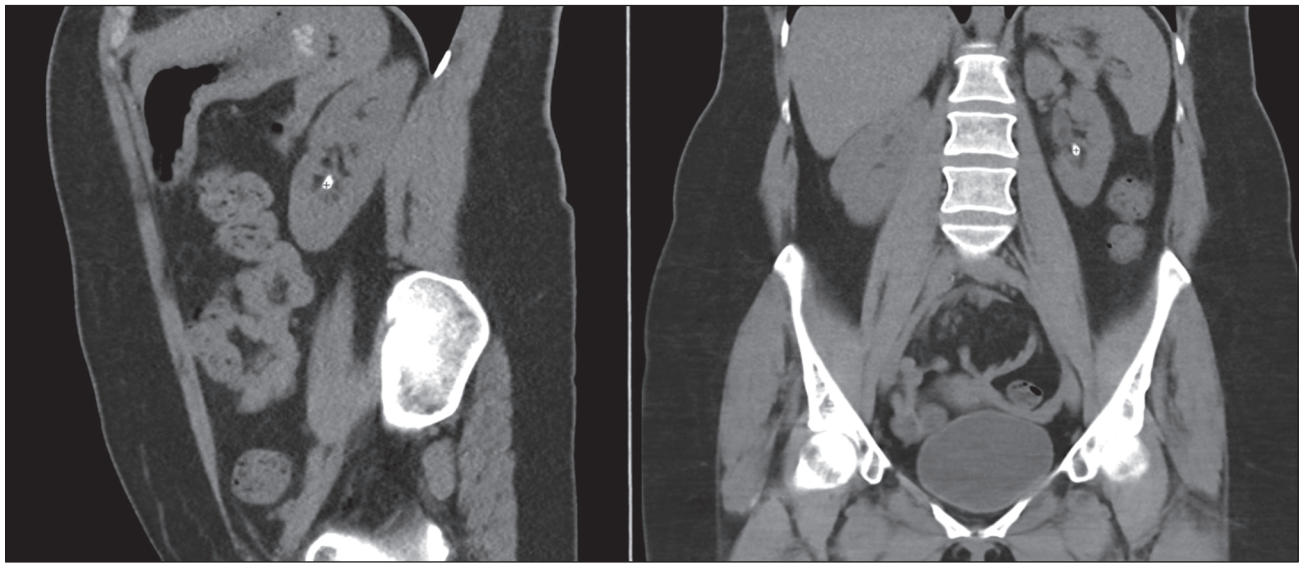

Figure 3. Images obtained 11 days post initial exam, after retrograde migration, showing the intra-caliceal calculus

further credence to the supposition that this is a natural phenomenon present across multiple species [12].

To summarise, there are many reports in the literature of ureter peristalsis being disturbed by a foreign object, with a propensity for retrograde peristalsis if the object is in the proximal ureter. Additionally, the retrograde peristalsis has been documented multiple times in vivo in both human and animal models. It therefore seems highly likely that, since the in vivo observations correlate with the expected outcome of the laboratory findings, that retrograde urolithiasis migration is due to a coordinated physiological response and not merely coincidence.

With regard to the evolutionary reason for the development of such a physiological response, one could theorise that, given the resultant morbidity and mortality in untreated urolithiasis cases, this mechanism might exist to move the calculi back into the kidney where they can remain asymptomatic [13, 14]. However, in the absence of further evidence to prove the evolutionary pressure for this to develop, this remains merely conjecture.

Given the relatively high incidence of urolithiasis it therefore seems unlikely that retrograde migration is so rare, even though it has only been documented a handful of times. We therefore speculate that ureteric calculi, which subsequently spontaneously undergoes retrograde migration, may be an explanation for relatively short-lived flank pain in patients who are found to have nephrolithiasis later but who did not undergo immediate imaging during the painful episode, resulting in the phenomenon going undocumented.

Conclusion

Retrograde urolithiasis migration as in this case is a rare, but probably underreported, phenomenon where a calculus that has begun its migration within the ureter undergoes retropulsion back into the renal calyx. Building on the previous reports and studies, we suggest that this may be a natural phenomenon aiming to protect the patient from potentially deadly impaction of the urolithiasis by returning it to the relative safety of the renal calyx.

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Спонтанна ретроградна міграція ниркового каменя в жінки: опис випадку і можливий механізм

Резюме. Сечокам'яна хвороба є станом, що часто зустрічається на практиці, однак ретроградна міграція конкрементів у сечоводі була задокументована лише нещодавно, у літературі описано кілька випадків. Ми наводимо випадок симптоматичної сечокам'яної хвороби в 47-річної жінки, що була підтверджена комп'ютерною томографією (КТ). Пацієнтка одужала лише після того, як конкремент зазнав ретроградної міграції в ниркову чашечку, що було виявлено під час подальшого КТ-обстеження. Ми припускаємо, що ретроградна міграція при сечокам'яній хворобі може бути вродженим механізмом безпеки, який розвинувся для запобігання ускладненням і/або смерті від уролітіазу шляхом спроби повернути камінь, що мігрував, до ниркової чашечки.

Ключові слова: сечокам'яна хвороба; ретроградна міграція; конкремент; камінь у сечоводі