

Spontaneous Formation and Resolution of a Large Steinstrasse Without Renal Parenchymal Loss: A Case Report

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Abstract

Aim: We present a case of large-volume ureteral steinstrasse that formed and passed spontaneously from the ureter without medical expulsive therapy (MET) or ureteral intervention. **Case:** A 36-year-old male patient presented with left flank pain. Non-contrast computed tomography revealed high-density calculi obstructing the left upper ureter, with a total stone burden of 4.5 cm, accompanied by grade 3 hydronephrosis. The patient declined the recommended endoscopic surgery. At the 13-month follow-up, multiple stones with a total length of 5.1 cm were observed in the distal ureter. Within two weeks, four stones (8.4, 7.3, 6.6, and 4.7 mm) passed spontaneously; the remaining large stone (24×11 mm), which became impacted in the prostatic urethra, was managed by endoscopic cystolithotripsy. Throughout follow-up, renal function tests remained within normal limits, and no significant loss of renal parenchyma was detected. **Conclusions:** Large ureteral steinstrasse may pass from the ureter without ureteral intervention or MET.

Keywords: Ureteral calculi; steinstrasse; spontaneous passage; hydronephrosis

1. Introduction

Although renal colic and hematuria are the typical symptoms of ureteral stones, patients may also present with atypical complaints such as urinary urgency, dysuria, abdominal pain, nausea, vomiting, fever, and pain radiating to the penis or testicles.¹ Non-contrast computed tomography (NCCT) is the imaging modality of choice for determining stone localization and the optimal treatment approach. Treatment options vary according to stone size and location and include observation, medical expulsive therapy (MET), extracorporeal shock wave lithotripsy (ESWL), and ureteroscopic lithotripsy (URSL). The probability of spontaneous passage decreases as stone size increases, with reported rates of 87% for 1 mm stones, 76% for 2–4 mm, 60% for 5–7 mm, and 48% for 7–9 mm.² Stones larger than 10 mm rarely pass spontaneously and generally require surgical intervention.³ In some patients, multiple stone fragments may accumulate in the ureter after ESWL and form a steinstrasse; however, spontaneously developing steinstrasse is uncommon. Reports describing spontaneous steinstrasse formation and the spontaneous

passage of stones larger than 10 mm are limited. We aimed to present a case in which a spontaneously formed large ureteral steinstrasse passed spontaneously over a 13-month follow-up period without renal parenchymal loss and without administration of MET.



Figure 1. Initial NCCT at first presentation. Coronal images demonstrate multiple high-density calculi obstructing the left upper ureter. NCCT: non-contrast computed tomography.



Figure 2. Follow-up NCCT obtained six months after the initial presentation, showing spontaneous migration of the stones from the upper ureter to the distal ureter. NCCT: non-contrast computed tomography.

2. Case Presentation

A 36-year-old male patient presented to an outside center in February 2025 with left flank pain. Physical examination was unremarkable except for left costovertebral angle tenderness. Urinalysis revealed pyuria (52 leukocytes/hpf) and microscopic hematuria (31 erythrocytes/hpf). Urine culture showed no growth. Complete blood count and biochemical analyses were within normal limits: hemoglobin 14.3 g/dL, white blood cell count

$7 \times 10^3/\mu\text{L}$, C-reactive protein 0.8 mg/L, creatinine 0.9 mg/dL, serum calcium 9.45 mg/dL, phosphorus 3.7 mg/dL, sodium 137 mmol/L, and potassium 4.16 mmol/L. Urinary ultrasonography demonstrated left-sided hydronephrosis. Subsequent NCCT revealed high-density (1250 HU) calculi obstructing the left upper ureter with a total burden of 4.5 cm, additional left renal calculi, and grade 3 hydronephrosis (according to the SFU classification) (Figure 1).

Endoscopic stone surgery (ureterorenoscopy) was recommended, but the patient declined. He instead pursued herbal/traditional therapy (reportedly using "fish stone") in an attempt to facilitate spontaneous passage. Six months later (August 2025), follow-up NCCT revealed migration of the stones into the distal ureter (Figure 2).

The patient again declined surgical intervention. Thirteen months later (March 2026), he presented with left flank, lower quadrant, inguinal, and scrotal pain; kidney-ureter-bladder (KUB) radiography demonstrated a steinstrasse in the left distal ureter with a total length of 5.1 cm (Figure 3).



Figure 3. KUB radiograph at 13 months of follow-up demonstrating steinstrasse in the left distal ureter. *KUB: kidney-ureter-bladder.*



Figure 4. NCCT image showing a calculus impacted in the prostatic urethra. *NCCT: non-contrast computed tomography.*



Figure 5. Dilatation of the left distal ureter following spontaneous stone passage.

Although he was admitted to the operating room with a plan for endoscopic ureteral stone surgery, he declined the operation at the last moment. Two weeks later (March 2026), he spontaneously passed four stones (stone sizes: 8.4, 7.3, 6.6, and 4.7 mm). The following day, he presented to our clinic with suprapubic pain, inability to void, urinary frequency, and penile pain. On physical examination, the perineal region was painful and tender. NCCT identified a 24×11 mm stone in the prostatic urethra (Figure 4).

The left distal ureter appeared dilated secondary to stone passage (Figure 5).

A 16 Fr urethral catheter was placed in the outpatient setting, and the patient was hospitalized with a plan for endoscopic cystolithotripsy. Under spinal anesthesia and in the lithotomy position, the urethra was entered with a 9.5 Fr rigid ureteroscope (Karl Storz, Tuttlingen, Germany). The prostatic urethra appeared mildly hyperemic and edematous. The stone was visualized within the bladder (Figure 6). A 10 Fr nélaton catheter was introduced into the bladder alongside the ureteroscope, and the stone was fragmented using a pneumatic lithotripter. The fragments were subsequently extracted by irrigation through a 20 Fr cystoscope.



Figure 6. Endoscopic view of the bladder calculus prior to lithotripsy.

During follow-up, no loss of renal parenchyma was detected, and renal function tests were normal. The patient had no known surgical history or accompanying comorbidities. There was a family history of urinary stone disease in his father and siblings. He did not receive medical expulsive therapy during follow-up. Stone analysis was reported as calcium oxalate.

3. Discussion

The salient features of this case are as follows: (1) spontaneous formation of steinstrasse without prior ESWL or endourological surgery; (2) spontaneous passage of a 5.1 cm distal ureteral stone burden without administration of MET; and (3) absence of ipsilateral renal parenchymal loss, infectious complications, and elevation of serum creatinine despite high-grade obstructive uropathy over a 13-month clinical follow-up.

Steinstrasse, most commonly observed after ESWL and less frequently after endoscopic stone surgery, may rarely also develop spontaneously.⁴ Spontaneous steinstrasse has been reported in association with nephrocalcinosis, renal tubular acidosis, and multiple small renal calculi.^{5,6} According to the Coptcoat classification, three types of steinstrasse are described; the present case is consistent with type 3 (multiple fragments ≥ 5 mm).⁷ Although a standardized treatment protocol for these cases is lacking, individualized management decisions can be made on the basis of renal function, infectious status, and degree of hydronephrosis. Parmar et al., reported that all nine of their patients with spontaneous steinstrasse were managed surgically.⁸ In contrast, Tezcan et al., described a 63-year-old male who spontaneously passed 16 stones (2–10 mm in size).⁹ In our case, despite the patient's refusal of surgical intervention over a 13-month follow-up period, spontaneous clearance of the entire ureteral stone burden was achieved.

The term "giant ureteral stone" is applied to stones longer than 5 cm or weighing more than 50 g.¹⁰ Such stones are typically located in the distal ureter and frequently lead to ipsilateral renal dysfunction.¹¹ The vast majority of giant ureteral stones reported in the literature have been managed surgically, either by ureterolithotomy or ureteroscopic lithotripsy.^{11–13} Although the stones described in our case do not meet the strict definition of a giant ureteral stone, they represent one of the rare instances in which stones of this size passed spontaneously from the ureter into the bladder. Beliaev et al., reported a female patient with a left atrophic kidney in whom distal ureteral stones (steinstrasse length 5.3 cm; largest stone 2.9 cm) passed spontaneously after two months without surgical intervention.¹⁴

Medical expulsive therapy (MET) is recommended by the European Association of Urology guidelines, particularly for ureteral stones measuring 5–10 mm.¹⁵ However, randomized controlled trials evaluating the efficacy of MET for stones larger than 10 mm are lacking. In our case, spontaneous passage occurred without MET, suggesting that chronic ureteral dilatation and mechanical factors may have played a determining role.

In a rat model of unilateral partial ureteral obstruction, Stenberg et al., observed no morphological changes or parenchymal loss after 12 months of follow-up; however, a 60% functional decline relative to the contralateral kidney was reported.¹⁶ In our case, despite grade 3 hydronephrosis on imaging, renal function tests remained within normal limits over the 13-month follow-up, and no significant parenchymal loss was identified, suggesting that the obstruction was most likely partial.

The principal limitations of this report are its single-case nature, the inability to perform a metabolic evaluation, and the absence of split renal function assessment.

4. Conclusion

Large spontaneous steinstrasse may pass from the ureter without ureteral intervention or MET, and renal parenchymal loss secondary to partial obstruction may be less pronounced than anticipated. Although surgical management remains the standard approach in such cases, larger case series are needed to better characterize the natural history of spontaneous steinstrasse.

Statement of ethics: Written informed consent was obtained from the patient for publication of this case report and the accompanying images.

GenAI: No artificial intelligence-based tools or generative AI technologies were used in this study. The entire content of the manuscript was originally prepared, reviewed, and approved by all authors.

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