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Urinary bowel stone: calculus formation in a repurposed small intestine - a case report

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Abstract

Background Urinary diversion with an ileal conduit is associated with an increased risk of urinary tract calculi, driven by metabolic disturbances, recurrent infections, urinary stasis, and foreign bodies. Although stone formation is a known complication, calculi developing around migrated surgical material remain infrequently reported.

Case presentation An 81-year-old male patient with a history of radical cystectomy and ileal conduit formation for invasive urothelial carcinoma presented with flank pain and urinary tract infection four years after surgery. Morphological analysis of two spontaneously expelled urinary stones retrieved from the conduit drainage bag classified both calculi as type IVc, with a central nucleus composed of surgical staples. Fourier-transform infrared spectroscopy revealed a mixed composition of struvite (80%) and sodium hydrogenurate (20%), consistent with infection-related lithiasis. The findings supported stone formation around migrated foreign material in the context of chronic bacteriuria.

Conclusion Surgical staple migration can act as a nidus for infection-related stone formation in patients with ileal conduits, even several years after cystectomy. Stone analysis plays a crucial role in identifying foreign-body–associated calculi and possible underlying mechanisms. Clinicians should maintain a high index of suspicion for urolithiasis in patients with urinary diversions presenting with flank pain or recurrent infections.

Clinical trial registration Not applicable.

Keywords Ileal conduit, Urolithiasis, Surgical staple migration, Struvite stones, Case report

Introduction

Urinary diversion via an ileal conduit is a frequently performed procedure following cystectomy. However, patients with ileal conduits are at an increased risk for developing urinary tract calculi. Nephrolithiasis occurs in up to 12% of patients with ileal conduits, and the overall incidence of stones after any urinary diversion approaches 32% when upper-tract calculi are included [1, 2]. Potential contributing factors include metabolic disturbances, recurrent urinary tract infections, urinary stasis due to anatomical alterations, and the presence of foreign bodies within the conduit. We present a case of urinary stone formation within an ileal conduit, with the calculus developing around a migrated surgical staple.

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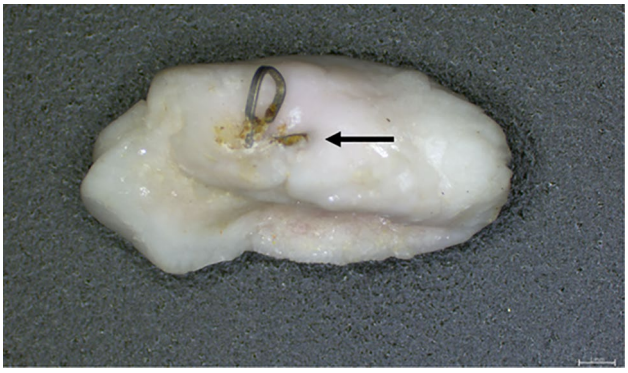

Fig. 1 Urinary stone with a surgical staple serving as the central nucleus. The staple is surrounded by a smooth, white, lustrous stone matrix composed predominantly of struvite. Adjacent to the staple, a brownish powdery material corresponds to sodium hydrogenurate deposits (arrow)

Case description

An 81-year-old male with a history of invasive urothelial carcinoma underwent radical cystectomy with ileal conduit formation in 2020. He has been followed by nephrology since 2022 for chronic kidney disease, without known history of nephrolithiasis. The patient presented with a several-month history of flank pain, leading to the diagnosis of a urinary tract infection and initiation of empiric antibiotic therapy. Two urine cultures were obtained; however, both were considered contaminated and did not yield an identifiable microorganism.

During a subsequent nephrology evaluation, he brought two expelled urinary stones collected from the drainage bag. No imaging studies were performed before or after stone passage, as symptoms resolved with treatment.

Morphological examination of the calculi at our department, performed in accordance with established guidelines [3], revealed that both calculi were classified as Type IVc, formed around a nucleus of surgical staples (Fig. 1). Further analysis using Fourier-transform infrared spectroscopy (FTIR) confirmed the presence of struvite 80%, along with 20% sodium hydrogenurate.

Discussion

Surgical staples are designed for permanent fixation, but in some cases, they may become dislodged or migrate due to tissue remodeling, local inflammation, or mechanical forces [4]. In the setting of urinary diversions such as ileal conduits, this phenomenon can lead to unexpected and clinically significant complications. Migration of metallic clips or staples into the urinary tract—though rare—has been documented and may serve as a nidus for renal stone formation. The surgical staple itself likely acted as the nidus for crystallization; although oxidation products of metallic staples could theoretically enhance nucleation, literature indicates that foreign bodies alone are sufficient to initiate stone formation in conduits, particularly in the presence of infection and urinary stasis. Clinicians should maintain a high index of suspicion in post-cystectomy patients presenting with acute flank pain [5].

Surgical staples that become dislodged within ileal conduits can act as a core around which urinary stones form, accounting for approximately 86% of conduit calculi associated with foreign material [6]. Although foreign body–associated stones in ileal conduits have been reported, calculi forming specifically around surgical staples several years after cystectomy are uncommon, emphasizing the unusual nature of this case. In some instances, these staples become completely encapsulated by stone material, making them undetectable on gross visual inspection. Recurrent urinary tract infections—particularly those involving urea-splitting bacteria—can further predispose patients to the formation of such calculi. Although no causative organism was isolated due to contaminated urine cultures, the predominance of struvite strongly supports infection-related stone formation in the setting of chronic bacteriuria.

While stones under 3 cm pass spontaneously in approximately half of cases, larger or symptomatic calculi often require intervention. In patients with complex urinary diversions, antegrade ureterorenoscopy with laser lithotripsy is effective, especially when retrograde access is limited, and preserves the ureteroneovesical anastomosis [2, 7].

Management of this complication must extend beyond stone extraction. Comprehensive preventive strategies include meticulous surgical technique to minimize dislodgement of staples, aggressive hydration, correction of metabolic acidosis, routine conduit irrigation to minimize mucus accumulation, targeted antibiotic prophylaxis for recurrent bacteriuria, and regular follow-up with conduit inspection to detect early signs of stone formation or foreign-body migration [1]. When feasible, the use of metallic clips or staples could be minimized, or absorbable sutures considered, to reduce the potential for foreign-body-associated stone formation, though surgical judgment must guide these decisions.

Early identification and risk factor modification are key to reducing recurrence. When stones develop around migrated surgical material, management should be individualized based on stone size, symptoms, and anatomical accessibility, with options including antegrade ureterorenoscopy, laser lithotripsy, or percutaneous approaches while preserving uretero-ileal anastomoses.

In our case, the first presentation of a conduit stone occurred 48 months after diversion, within the reported range of 3 to 72 months. The stone was predominantly composed of struvite, consistent with formation driven by urinary tract infection with urea-splitting bacteria. In addition, sodium hydrogenurate, a urinary salt derived

from uric acid and sodium, was present. Its precipitation is favored in alkaline urine and under conditions of urinary stasis, both commonly observed in patients with ileal conduit diversions. The coexistence of struvite and sodium hydrogenurate in these calculi reflects the combined contributions of chronic infection and metabolic alterations.

Notably, staple-associated stones have been reported to form earlier, with a mean latency of 22.5 months [6], highlighting the importance of early vigilance in this patient population. In this case, the staples were originally used to secure the ileal segment during conduit formation and the uretero-ileal anastomosis. Migration of these staples into the conduit lumen likely provided the central nidus for stone formation.

Conclusion

Urinary stone formation in ileal conduits remains a clinically significant complication, often driven by a combination of metabolic derangements, chronic infection, and structural factors. This case underscores the potential for surgical staples to act as a nidus for struvite-based calculi, even several years after cystectomy. Clinicians managing patients with urinary diversions should maintain vigilance for signs of urolithiasis and consider the possibility of retained foreign bodies, particularly in the context of recurrent infections or spontaneous stone passage. Preventive strategies—including meticulous surgical technique, regular follow-up, infection control, and metabolic management—are essential to reducing the long-term burden of stone disease in this high-risk population.

Author contributions

DS – literature search, data analysis, and manuscript drafting, editing, and review. DN – concept, study design, clinical data acquisition, manuscript review. CJ – manuscript review. NMF – definition of intellectual content, manuscript editing, manuscript review. All authors read and approved the final manuscript.

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Data availability

All data generated or analyzed during this study are included in this published article. Additional data are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Consent for publication

Written informed consent for publication of this case report and accompanying images was obtained from the patient. The authors confirm responsibility for the integrity and accuracy of the data and for the decision to submit the manuscript for publication.

Competing interests

The authors declare no competing interests.

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