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Laparoscopic uretero-ileal substitution preserving the natural anti-reflux mechanism: A case report

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ABSTRACT

Ureteral strictures constitute one of the most common sequelae of impacted ureteral stones. Uretero-ileal substitution is an established treatment for long benign ureteral strictures, measuring more than 2 cm, which are incurable by other less invasive treatment options. One of the common drawbacks of this procedure is its extensive nature and the urine reflux into the newly constructed ileal segment, resulting in urine stagnation and precipitation of urinary tract infections.

We report a case of a minimally invasive laparoscopic uretero-ileal substitution for a long mid ureteral stricture, utilizing the natural anti-reflux mechanism.

1. Introduction

Ureters provide low pressure for urinary drainage, which prevents urinary stasis and reflux, rendering its integrity essential for normal renal function. Disruptions in ureteral continuity are most commonly due to strictures which can arise from various etiologies and potentially lead to hydronephrosis and loss of renal function. One of the most common causes of strictures is ureteral stones. The clinical course of a patient with a slowly progressive ureteral stricture can develop in an asymptomatic manner. However, flank pain, fever, and hematuria occur depending on the underlying disease, its severity, and duration of obstruction. The diagnosis involves a variety of imaging modalities where computed tomography urography (CTU) can be utilized to identify the etiology of the ureteral stricture. To date, variable minimally invasive surgical options have been implemented for the management of ureteral strictures, where treatment is tailored depending on the extent and localization of the stricture. Uretero-ileal substitution is considered for long ureteral strictures, incurable by other less invasive options.

2. Case presentation

A 70-year-old male presented with a two-year history of a 4 cm left mid ureteric stricture from an impacted large mid ureteric stone that was initially treated by ureteroscopy, laser lithotripsy, and JJ stenting. Computed Tomography (CT) scan for ongoing pain revealed a left ureteric stricture. No calculus was seen. Retrograde studies confirmed the same.

The resultant stricture was initially treated with balloon dilatation and subsequent JJ stents due to recurrence. As the patient could not tolerate the JJ stents, he opted for Memokath stent insertion. A year later, he presented with significant encrustation and blockage of the Memokath stent necessitating a nephrostomy tube and a lengthy endoscopic procedure to remove the Memokath. A dimercaptosuccinic acid (DMSA) scan confirmed a reasonably maintained differential renal function of 35% [Fig. 1]. A left nephrostogram was later performed, revealing abrupt-cut-off of the contrast beyond L4/5 level, confirming complete obstruction, presumably by a stricture [Fig. 2].

The patient opted for a permanent solution. Therefore, laparoscopic ileal ureteral reconstruction was proposed.

The procedure was carried out laparoscopically via transperitoneal approach. The patient was placed in a right lateral position under general anesthesia. The descending colon was visualized and rotated medially to expose the retroperitoneum, some difficulties were faced due to gross intraperitoneal adhesions, which were released. The left gonadal vessels were later visualized, dissected, and preserved.

Subsequently, the left ureter was identified and mobilized using blunt and sharp dissection; it was found to be surrounded by gross

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retroperitoneal desmoplastic reactions. A long ureteric stricture was identified, stretching from the upper ureter down to the level of the pelvic brim - it was excised, with the two ureteric ends spatulated. Consecutively, the tapered ileal segment was marked with stay stitches and harvested for ureteric substitution, using bowel endo-staplers. Suturing of the bowel anastomosis was used to reinforce the joint. Via a mesenteric hole, the ileal segment was brought laterally and anastomosed to both ureteric ends over a 6 × 26 JJ stent. Anastomosis was carried out using a 3/0 PDS continuous suture. Hemostasis was secured, and a drain was inserted.

The long mid ureteric stricture was excised and replaced with an ileal segment, anastomosing it to the upper lower healthy parts of the ureter, after tapering both ends of the ileal segment and preserving the natural anti-reflux uretero-vesical junction. The patient made good recovery and was discharged after three days with a nephrostomy and JJ stent in-situ. A nephrostogram four weeks later confirmed no leakage, the stent was subsequently removed, and nephrostomy clamped [Fig. 3]. The latter was removed soon after.

At 6 months follow up, symptoms resolved, and no urinary tract infections were documented.

3. Discussion

Uretero-ileal substitution is traditionally a major procedure considered for long ureteral strictures, measuring more than 2 cm, which are incurable by other less invasive options. A ubiquitous complication of this procedure is hypokalemic hyperchloremic metabolic acidosis. This metabolic derangement arises as when urine contacts the bowel wall, other electrolytes such as ammonia, hydrogen, and chloride also become reabsorbed, resulting in a chronic acid load. This complication can be diminished by using an appendiceal segment due to its small surface area. Additionally, the metabolic consequences can be eliminated via an ileal segment given a shorter segment of bowel is adequate for reconstruction, as reported by Ali-el-Dein and Ghoneim.[1]

Using the ileum is favorable due to its constant blood supply, mobility, and small diameter. Pamecha et al. demonstrated better results compared to other studies, which is either due to a more meticulous selection of patients or due to preoperative stabilization of renal functions using a ureteric stent or nephrostomy tube.[2] Launer et al. documented an 83% success rate with ileal ureteral replacement where no further open procedures were required.[3] The use of gastrointestinal tract in urinary reconstruction increases the risk of subsequent carcinogenesis in the gastrointestinal tract segment. It is believed to be due to prolonged exposure of the intestinal epithelium to urine, inducing an inflammatory reaction, and ultimately triggering carcinogenesis.[4] Xiong S et al. reported that enhancing peristalsis via tapering the cross-sectional diameter of the ileal segment prevents carcinogenesis, as it smoothens the passage of urine in the ileal segment.[5] Open approach has gradually been replaced by minimally invasive surgery. The latter is superior as it is less traumatic, leads to reduced narcotic need, and shorter recovery

Fig. 2. Left nephrostogram through nephrostomy in situ revealing obstructed left ureter at L4/L5 level.

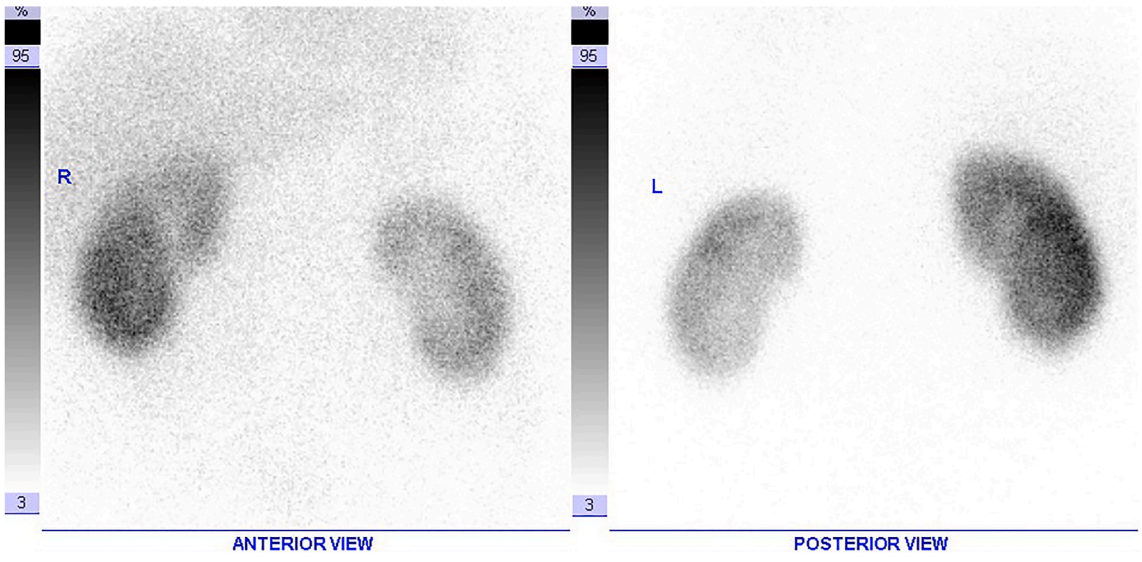

Fig. 1. DMSA scan revealing relatively lower uptake at left kidney with no convincing features of scarring.

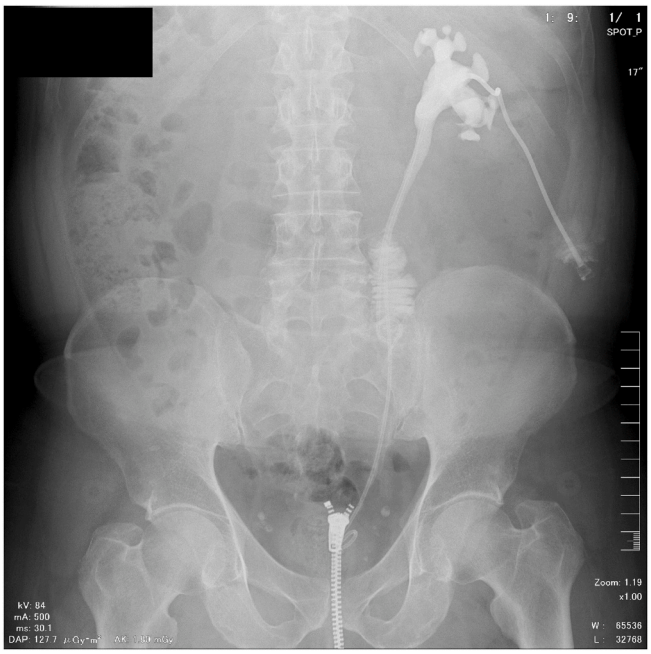

Fig. 3. Post operative nephrostogram revealing a patent left ureter.

time. In our case, laparoscopic ileal ureteral replacement was performed through direct anastomosis of the tapered distal side of the ileal segment to the bladder, preserving the natural anti-reflux system. Though our technique maintains the anti-reflux mechanism, it carries the potential risk of distal ureteric obstruction from mucus production by the ileal segment. However, it did not occur in this report. Further studies and a longer follow-up period would be of vital importance to assess the feasibility of this technique.

4. Conclusion

Laparoscopic ileal ureteral reconstruction using a tapered anti-reflux mechanism is an attainable treatment option for upper to middle ureteral strictures. However, it is critical to conduct further studies to establish long-term outcomes.

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Ethical approval

IRB approval was not required as this is a case report. Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Author contributions

HN: Contributed to the conception and design of the study, drafted the article and critically revised it for important intellectual content, final approval of the version to be submitted.

HM: Contributed to the conception and design of the study, drafted the article.

KB: Contributed to the conception and design of the study, drafted the article.

ASP: Contributed to the conception and design of the study.

FI: Contributed to the conception and design of the study.

AT: Critically revised the manuscript for important intellectual content, gave final approval for the study to be submitted.

Declaration of competing interest

No conflict of interest.

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