Editorial

Advancements in minimally invasive bilateral ileal ureter replacement: a promising approach for complex long-segment ureteric strictures

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Long-segment ureteric strictures, characterised by a substantial length of ureteric defect, pose a significant challenge in urologic practice (1). Whilst rare, these strictures can arise from various etiologies; more commonly iatrogenic injuries from urological, gynaecological or colorectal procedures, radiation, malignant or retroperitoneal fibrosis (2). The underlying pathophysiology of these strictures is ischaemia. Radiation-induced strictures are more common bilaterally due to the mechanism of pathology, and repair is required to overcome the underlying ischaemic insult (1). Ureteric strictures are increasingly encountered in upper-tract endo-urology and management of these complex strictures necessitates a thorough understanding of the underlying etiology, stricture length, and anatomical location (3).

Given the underlying pathology and length of long-segment ureteric strictures, intestinal interposition has become a popular technique in surgical treatment. This technique involves the replacement of the damaged ureter with a segment of the intestines, usually ileum although modified colon and the appendix can be utilised, which acts as a conduit for the flow of urine (3). The aim of this procedure is to recreate a non-refluxing, non-obstructive peristalsing conduit to allow appropriate urinary flow from kidney to bladder. The major outcome is the preservation or improvement of renal function in these patients (4). Secondary outcomes are the minimisation of strictures, metabolic derangement, hydronephrosis and infection.

Appendiceal interposition, whilst beneficial due to its anatomical similarity to the ureter, is limited in long segment ureteric strictures as it can only be utilised in right sided ureteric strictures that are less than three centimetres. Because of this, appendiceal interposition is largely utilised in the paediatric population, with strong evidence for preservation of renal function, good functional outcomes and limited long-term complications (5). Large bowel can be utilised for long segment ureteric replacement when ileum is not available, either through previous resections (with risks of short gut syndrome), small bowel inflammatory conditions or pelvic radiation. Benefits of modified colon include the requirement for a short segment, decreased mucosal obstruction, decreased metabolic complications and similar outcomes demonstrated within the literature (5). However, the gold standard for intestinal interposition is

the use of small bowel.

There are different approaches to the implementation of this technique, including end-to-side anastomosis of whole ileum, demucosalised ileum, tapering, Yang-Monti and anti-refluxing techniques such as nipple valve, tunnelling, iso-peristalsis or 7 configuration. These techniques can be achieved through open, laparoscopic or robotic modalities (5,6). Surgical techniques that manipulate the intestinal graft further can lead to increased stricture and stenosis rate (5). However, leaving the whole bowel, including mucosa, intact results in mucous production and malabsorption of urine resulting in urinary stasis, obstruction, electrolyte derangement, metabolic acidosis and urolithiasis (2). A balance is required between the two to achieve an optimum outcome. Without anti-reflux mechanisms increased pressures can cause hydronephrosis, infections and renal function deterioration, although there is variable data demonstrating the effectiveness of these mechanisms (7).

Within minimally invasive modalities, outcomes can be achieved both intra- or extra-corporeal. The indications for this procedure vary, but it is usually recommended for patients with complex ureteral strictures that cannot be treated or have failed treatment with endourologic methods or open repair (3). Laparoscopic ileal ureter replacement has become increasingly popular in recent years due to the minimally invasive nature of the procedure. Several studies have shown that laparoscopic ileal ureter replacement can be performed safely and effectively (1,8,9). The procedure is particularly beneficial for patients who have had previous failed repairs or who have complex ureteral strictures (10).

The robotic-assisted laparoscopic ileal ureter replacement with extracorporeal ileal segment preparation is another variation of this technique that has been used with success (6). The benefit of the robotic approach is the technical abilities gained that are unavailable with the laparoscopic modality. However, robotic operative times are longer, and there is a requirement to undock and re-dock the unit, either to change positions to access different abdominal compartments or perform extracorporeal ileal harvest/reconstruction (11). Recently, a technique has been developed for a transperitoneal approach that does not require repeated docking and undocking of the robot to reduce to operative time in extracorporeal robotic surgery although this technique requires a high technical robotic proficiency (12). There are multiple benefits to an extracorporeal approach. Accurate measurement of required ileum reduces the redundant length and therefore the incidence of metabolic acidosis. Easier refashioning of the ileum allowing for more complex techniques to be employed as described previously. A watertight bowel re-anastomosis is more easily achieved and reduces the risk of post-operative anastomotic leak. It reduces intra-peritoneal faecal contamination reducing post-operative infection and the ability for anti-septic lavage of ileum to reduce post-operative urinary tract infection (6). Additionally, the extracorporeal approach can serve as a bridge to reduce the learning curve before transitions to total intracorporeal ileal replacement. The benefit of the totally intracorporeal approach reduces surgical time as there is no requirement for repeated docking/undocking however the learning curve is steep as the technical difficulty is much higher (12). This can result in higher rates of complications especially in the early phases of practice. The requirements to perform intracorporeal ileal replacement as described by Chopra *et al.* are that of high robotic technical skill, tertiary centre care and time, given the procedures can take up to 7 hours (11).

Consideration needs to be made with respect to performing bilateral ureteric interposition as a single procedure. Given the aims of surgery are to preserve or improve renal function, operating on both ureters can increase the risk of a complication leading to renal loss. Due to this risk, most surgeons favour an open approach to maximise outcomes (7). Appropriate counselling for patients is required pre-operatively so that they understand the potential increased risk in operating bilaterally. By selecting the appropriate patient and appropriate technique, this risk can be reduced. Xu *et al.* adopted a laparoscopic approach utilising an extracorporeal ileal harvest and iso-peristaltic, reverse 7 configuration with anti-reflux mechanism reconstruction (1). Given their case series was solely based on bilateral long-segment ureteric strictures, this may be the reason a safer approach was made.

Xu *et al*'s. (1) paper highlighted the intricate nature of the approach to managing long-segment strictures with the requirement to balance the operative modality and the techniques utilised to maximise the outcomes whilst minimising complications. In addition, their approach must take into consideration the impacts of performing bilateral reconstructive surgery. It adds further data to the literature and offers an approach for reconstructive urological surgeons to utilise.

In conclusion, minimally invasive ileal interposition surgery is a promising option for the treatment of long-segment ureter strictures. The use of minimally invasive techniques has been found to reduce morbidity and recovery

time, making it a viable alternative for the treatment of long-segment ureteral strictures. Long-term outcomes of ileal replacement, even between the myriad of different techniques, have been found to be favourable, with success rates of 89.3% to 93.5% in keeping with more traditional methods. Further research is needed to determine the optimal technique for the treatment of long-segment ureter strictures; however, it is clear that minimally invasive ileal interposition is a valuable option for urologic surgeons. As robotic proficiency and availability increases, so too will the ability to perform more complex reconstructive methods of ileal replacement surgery. However, given the rare and complex repair of long-segment ureteric strictures, these procedures would be best served in high volume subspecialty centres to maximise safety and efficiency. Furthermore, consensus on approach and technique could be achieved with the creation of an international database of cases to compare and contrast outcomes. As pointed out by multiple articles, the low case numbers mean limitations to any study and a database may overcome this limitation. It is our opinion that long segment ureteric strictures should be managed in select candidates with ileal replacement surgery. We recommend the use of an intracorporeal robotic approach when available with a non-refluxing, iso-peristaltic technique.

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References

1. Xu Y, Chen S, Li Z, et al. Laparoscopic bilateral ileal ureter replacement for bilateral long-segment ureteral strictures: a case series of nine patients. Transl Androl Urol 2023;12:770-8.
2. Chen S, Jian Y, Tang W, et al. Replacement of long-segment ureteral defect with tapered demucosalized ileum: medium-term outcomes of 4 patients. BMC Urol 2023;23:7.
3. Paffenholz P, Heidenreich A. Modern surgical strategies in the management of complex ureteral strictures. Curr Opin Urol 2021;31:170-6.
4. Zhong W, Hong P, Ding G, et al. Technical considerations and outcomes for ileal ureter replacement: a retrospective study in China. BMC Surg 2019;19:9.
5. Xiong S, Zhu W, Li X, et al. Intestinal interposition for complex ureteral reconstruction: A comprehensive review. Int J Urol 2020;27:377-86.
6. Fan S, Han G, Li Z, et al. Robot-assisted laparoscopic ileal ureter replacement with extracorporeal ileal segment preparation for long ureteral strictures: a case series. BMC Surg 2022;22:435.
7. Stein RJ, Turna B, Patel NS, et al. Laparoscopic assisted ileal ureter: technique, outcomes and comparison to the open procedure. J Urol 2009;182:1032-9.
8. Kochkin A, Tokas T, Gallyamov E, et al. Laparoscopic totally intracorporeal ileal ureter replacement: a multi-institutional study. Minim Invasive Ther Allied Technol 2022;31:119-26.
9. Sim A, Todenhöfer T, Mischinger J, et al. Intracorporeal ileal ureter replacement using laparoscopy and robotics. Cent European J Urol 2014;67:420-3.
10. Park JJ, Yun S, Kim JH. Bilateral ureteral replacement using ileum in bilateral refractory ureteral stricture with renal insufficiency: a case report and review of literature. Transl Androl Urol 2020;9:1466-74.
11. Chopra S, Metcalfe C, Satkunasivam R, et al. Initial Series

of Four-Arm Robotic Completely Intracorporeal Ileal Ureter. J Endourol 2016;30:395-9.
12. Ubrig B, Janusonis J, Paulics L, et al. Functional Outcome of Completely Intracorporeal Robotic Ileal Ureteric Replacement. Urology 2018;114:193-7.

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