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Endoscopic Management of Complex Uretero-Ileal Strictures – "Cut-to-the-Light" Technique: A Case Report and Literature Review

Case Report

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Abstract

Background: Radical cystectomy (RC) with urinary diversion is the gold standard treatment for muscle-invasive bladder cancer (MIBC). Late operative complications encompass ureteroenteric stricture, identified as the primary cause of long-term postoperative renal failure. Open surgical repair remains the prevailing approach for managing ureteral strictures.

Objective: To present a case of bilateral ureteroenteric stricture initially anatomized using the Wallas technique and subsequently treated through ante- and retrograde endoscopic manipulation. Additionally, a literature review is included.

Patient and Methods: An 82-year-old male patient, exhibiting significant comorbidities, presented with a gradual rise in creatinine (Cr) levels 15 years post Radial Cystectomy (RC) and Wallace ileo-ureteric anastomosis. Computed Tomography (CT) unveiled severe bilateral hydroureteronephrosis, particularly notable in the relatively small left kidney. The case was managed through staged, integrated percutaneous endoscopic procedures to address complete bilateral uretero-ileal and uretero-ureteral strictures.

Results: Postoperative creatinine (Cr) levels returned to within normal limits. At the 6-month follow-up, the patient remained asymptomatic, with no hydronephrosis observed on CT scans and a stable Cr level. By the 18-month follow-up, the patient remained tubeless, with no recurrence of urological symptoms.

Conclusion: With advancements in minimally invasive surgical techniques, alternative approaches to open reconstructive surgery are increasingly employed in high-risk patients. Minimally invasive endourological procedures should be considered a priority before opting for major definitive reconstructive procedures in high-risk, morbid patients.

Keywords: Cut-to-the-Light, Endourology, Minimal-Invasive, Radical Cystectomy Long Term Complications, Ureteral Strictures

Abbreviations: RC: Radical Cystectomy; MIBC: Muscle-Invasive Bladder Cancer; Cr: Creatinine; RC: Radial Cystectomy; BMI: Body Mass Index; ECOG: Eastern Cooperative Oncology Group score; NCCT: Non-Contrast Computed Tomography; DMSA: Di-Mercapto-Succinic Acid; US: Ultrasound; DJ: Double J; IC: Ileal Conduit

Introduction

Ureteroenteric stricture is a prevalent long-term complication of the urinary diversion procedure [1]. The reported incidence of benign ureteroenteric strictures following open radical cystectomy (RC) is 9.3%, increasing to 11.3% after extracorporeal and 13% after intracorporeal robotic RC [2]. Surgical reimplantation stands as the gold-standard therapy; however, this procedure comes with multiple life-threatening intra- and postoperative complications, necessitating careful patient selection [3]. Endourology is dedicated to minimizing invasiveness while ensuring successful surgical outcomes. Challenging and high-risk surgical cases may demand the integration of various techniques and, at times, innovative approaches. The cut-to-the-light procedure, initially designed for treating urethral strictures, involves a combined antegrade and retrograde endoscopic approach [4]. Nnumerous studies have employed this method to address ureteroenteric strictures following RC with an IC. In this case report, we share our unique experience with staged endoscopic procedures for bilateral uretero-enteric strictures in high-risk surgical candidates, integrating multiple minimally invasive methods.

Case Presentation

An 82-year-old male patient presented with a gradual increase in creatinine levels 15 years post RC and IC with the Wallace ileo-ureteric anastomosing system. His past medical history included Alzheimer's disease, ischemic heart disease, uncontrolled diabetes mellitus, and hypertension. The patient's body mass index (BMI) was 22, and the Eastern Cooperative Oncology Group score (ECOG) was 2. The medical workup revealed a blood creatinine level of 2mg/dL, compared to a baseline of 0.7mg/dL measured 12 months earlier. Non-contrast computed tomography (NCCT) showed bilateral mild-to-moderate hydronephrosis with a relatively small left kidney. Importantly, there was no evidence of gross malignancy on CT, although a comprehensive workup was not completed due to renal failure. A Di-Mercapto-Succinic Acid (DMSA) renal scan indicated a relative renal function of 17% in the left kidney and 83% in the right.

Surgical-Intervention

The intraoperative approach involved right percutaneous ultrasound (US)-guided antegrade renal access, leading to an antegrade pyelogram. The imaging revealed severe uretero-hydronephrosis with a complete obstruction at the iliac vessel level. Gentle endoluminal manipulation with angled-tip ureteric catheters and wires unveiled bilateral renal communication and a complete uretero-ileal block (Figure 1). Subsequently, a 65cm Kumpe catheter was advanced into the left kidney, draining a substantial amount of pus. The ureter underwent balloon dilation up to 15Fr towards the contralateral ureter, followed by flexible ureteroscopy. A comprehensive inspection of the entire upper tract bilaterally was performed through the single right flank percutaneous access, ruling out any suspicious lesions.

Considering the unusual anatomy and the high potential for urosepsis, the surgical trial concluded with the placement of a nephro-ureteral- nephrostomy. The proximal pigtail was positioned in the right renal pelvis, and the distal pigtail in the left, achieving urine diversion from the left kidney to the right, bypassing the conduit. The patient was discharged on postoperative day 1 with a single nephrostomy tube draining both kidneys simultaneously. Following the procedure, creatinine levels dropped to 1.4mg/dL. The patient's preoperative medical condition, as indicated by the provided medical history, presented challenges, limiting the allowable anesthetic time. Given these concerns, and considering the risk factors involved, ureteral reimplantation surgery was not recommended. Instead, a minimally invasive endourological procedure was considered as a more suitable alternative. This approach provided a temporary solution with a relatively lower intraoperative risk (Figure 2).

Figure 1: Left kidney pyelography demonstarting sever hydrouretronephrosis.

Due to the ongoing COVID-19 pandemic, there was a six-month delay before the second admission. The subsequent preliminary antegrade pyelography revealed chronic ectasia up to the ileo-ureteral anastomosis point. Notably, no progression of contrast material from the ureters into the conduit was observed, and a complete block was again recorded. Ileal-looposcopy did not reveal any ureteral orifices despite the injection of Indigo-Carmine through the nephrostomy tube. Following anatomical configuration, a 16FR percutaneous tract was inserted to replace the right nephrostent, serving as a ureteroscope access sheath. Two operators utilized an antegrade flexible ureteroscope and a retrograde ileo-flexible cystoscope. The cystoscopy light beam was turned off, and room lights were used to improve visualization of the ureteroscope illumination. Once the ureteroscope light source was clearly observed via retrograde cystoscopy, a 1.5cm long 'cut-to-the-light' was made using a 365µm Holmium Laser fiber. After completion of the dissection, the common ureteral sheath was exposed.

Right ureteral catheterization was performed using a 5Fr ureter-catheter, with the insertion of a guidewire, followed by balloon dilatation of the right ureteral opening up to 21FR. Although the dilatation was successful, an attempted left ureteral orifice catheterization with the help of flexible-ureteroscopy failed due to extreme ureteral angular bending. Subsequently, uretero-ureteric catheterization between the right and left ureters was performed using an 8.5FR nephro-stent (Figure 3). To preserve the patency of the right ureteral orifice while ensuring drainage through the conduit, an additional 6FR/26cm Double J (DJ) ureteral stent was placed in the right ureter. The patient was discharged with a clamped nephrostent on the right and no need for

external drainage except from the conduit bag. In a third procedure a few weeks later, the left kidney was accessed percutaneously under US guidance, and the ureteral orifice was antegradely balloon-dilated to 21FR followed by placement of bilateral 6Fr 26cm stents, instead of the right nephro-ureteral stent (Figure 4).

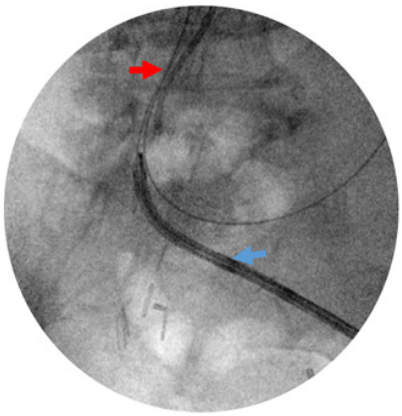

Figure 2: "Cut-to-the-light" procedure performed by antegrade flexible ureteroscope (red arrow) and retrograde ileo-flexible cystoscope (blue arrow).

Figure 3: Uretro-ureteric cathetarization draining left kidney to right kidney.

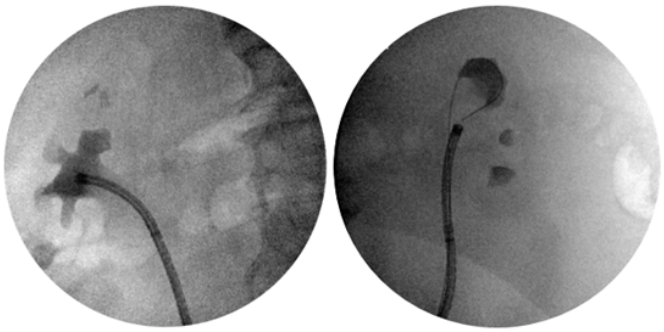

Figure 4: Retrograde ureteroscopy confirming bilateral patent collecting system.

Outcomes and Follow-Up

Six weeks post the last procedure, the patient underwent retrograde pyelography with looposcopy during admission. The results confirmed the patent bilateral ureteral anastomosis, and spontaneous drainage of the contrast material was immediately observed. The patient remained tube-less. During subsequent follow-ups spanning over 18 months after the final procedure, the patient remained asymptomatic, maintaining a stable Cr level of 1.5mg/dL. Importantly, imaging studies (CT and US) showed no evidence of hydronephrosis, and physical examinations were unremarkable.

Discussion

The overall incidence of uretero-enteric strictures following RC is 2.6-13.5% [5-7]. Approximately 75% of cases are diagnosed within the first 12 months post RC [8]. However, available data are limited because of the short follow-up time and potential confounding by ureteral stricture caused by disease recurrence. A recent study based on a large Swedish cohort, including 5,816 patients who underwent RC, reported a cumulative incidence of strictures over 17 years with an intervention rate of 19.7%. Notably, the majority of cases presented within the initial 2 years following cystectomy [9]. Negative factors,

such as postoperative Clavien-Dindo score >III or a high BMI score, were identified as contributors to an increased risk of uretero-enteric strictures [10]. Our patient's post-RC Clavien–Dindo score was I. As previously mentioned, the patient's BMI was 22. Notably, our patient exhibited an atypical presentation, considering the low-risk factor profile for post-cystectomy benign uretero-enteric stricture, which manifested more than a decade after the procedure. It's noteworthy that a comparison of surgical anastomosis methods revealed insignificant differences in the stricture rate between Wallace and Bricker anastomosis [11-13].

The gold standard treatment for ureteroenteric strictures is surgical reimplantation, boasting a success rate ranging from 71% to 93% [14]. However, this procedure is accompanied by profound intraoperative complications, resulting in a perioperative morbidity rate of 48.4%, requiring careful patient selection [15]. Minimally invasive endourological surgery has been proposed as an alternative treatment method and is increasingly favored due to its relatively lower intraoperative complication rate compared to robotic or open procedures [5]. It proves particularly beneficial for addressing ureteral strictures smaller than 1cm, especially when unrelated to enteric anastomosis [16].

Gomez et al. documented 27 cases of post-cystectomy uretero-enteric strictures treated endoscopically. All patients underwent stent removal after six weeks, and a successful procedure was defined as radiological and functional evidence of stricture resolution. Their findings indicated an overall success rate of 71.4%, with a 100% success rate for strictures <1cm and 61.9% for strictures larger than 1cm. In terms of the overall complication rate, 28.6% experienced Clavin-Dindo score II-IIIb complications. Notably, five patients did not show improvement with the endoscopic procedure and required open re-implantation [5].

Albisinni et al. conducted an updated systematic review comprising 41 studies that elucidated the management of benign ureteroenteric strictures following cystectomy. The review affirmed that while open surgery remains the gold standard therapy, the endoscopic procedure demonstrates superiority in terms of a shorter hospital stay, reduced blood loss, fewer perioperative complications, and an overall shorter operation time. However, a notable limitation highlighted was the relatively high rate of recurrence [15].

Analysis of data from the Albisinni systematic review reveals that balloon dilatation alone exhibits a success rate ranging from 17% to 100%, with rare intra- or perioperative complications. However, the recurrence rate stands at 22.2% to 45.8% within 12 to 33 months. The use of metal-stent catheterization following balloon dilatation lowers the recurrence rate to 10% to 76% within 10 to 39 months, albeit with a somewhat higher postoperative stage I-II complication rate. For endo-ureterotomy with a cold knife in treating strictures of 1.71-1.85cm, the success rate ranges from 60.5% to 75%, with no major complications reported. Nonetheless, the recurrence rate is 39.5%, necessitating a second endoscopic intervention, permanent stent, or open surgical correction [15]. Incision with a laser beam alone demonstrates a success rate of 57%, with a recurrence rate of 42%. Combining balloon dilatation with the laser beam technique improves the success rate to 71.4% and reduces the recurrence rate from 42% to 23%. Notably, complications recorded were mostly minor [17-19].

In cases of complete obstruction, unlike partial ureteral block, the priority is to regain through-and-through access [20]. Recognizing and managing blocks can be achieved through the use of illuminated cues, which is considered an acceptable method. Some publications have detailed the utilization of an illuminated light source to address ureteroenteric strictures. Hu et al. collected data from 29 cases who were treated for ureter-enetric strictures with simultaneous antegrade and retrograde endoscopic procedures among these, only 9 cases presented a complete block, necessitating the use of the modified cut-to-the-light technique. The measured stricture in all cases was less than 2cm. The procedure included a laser incision followed by balloon dilatation and a 7Fr stent was left for 3-6 months. The median follow-up duration was 22 months. The overall success rate, defined as radiographic resolution with symptomatic improvement, was 33.3% for complete block (compared to 85% for partial block cases). Notably, stent removal was not recorded and not defined as an endpoint [21].

Sawazaki et al. reported the usage of alternated cystoscope-ureteroscope, where flexible cystoscopy was retrogradely employed via the ileal conduit (IC) with its light illumination distal to the ureteral stricture. Simultaneously, a flexible ureteroscope was placed in an antegrade manner. The procedure involved utilizing a Ho: YAG laser via the cystoscope, where better visualization was achieved, to cut a 4mm stricture, resulting in a successful outcome [22]. In contrast, Hu et al. employed a laser via the ureteroscope, which was placed antegradely [21]. As highlighted in our case report, the minimally invasive management of ureteral strictures following RC may necessitate prolonged follow-up with staged multiple procedures, contrasting with the more definitive reimplantation surgery. Each attempt, however, carries inherent risks for the patient, including general complications of anesthesia, potential renal function impairment, and the risk of urinary tract infections. Notably, endourological procedures typically have shorter durations compared to invasive reimplantation, often eliminating the need for general anesthesia. Furthermore, they involve minimal to no blood loss and mitigate critical complications in the internal abdominal organs.

Conclusion

In urology, particularly within the field of endourology, various intraoperative techniques are available. A deep understanding of each technique empowers the operator to customize the surgical method and approach based on the patient's unique presentation. Ureteral stricture, a common iatrogenic complication, lends itself well to minimally invasive procedures. In rare cases, as exemplified in our scenario, the integration of all available endourological tools becomes instrumental in achieving favorable results while mitigating potential complications and preserving the patient's quality of life. Therefore, meticulous management and an 'out-of-the-box' approach are crucial when dealing with unconventional cases, especially in high-risk patients where the spectrum of feasible treatments is narrow.

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