Imaging postoperative complications after radical cystectomy with ileal conduit urinary diversion

High-grade fever, generalised malaise, and laboratory finding of elevated acute phase reactants following recent hospital discharge after radical cystoprostatectomy with iliac-obturator lymphadenectomy and incontinent ureterocutaneostomy (Bricker urinary diversion) for pT2N0 transitional cell carcinoma of the urinary bladder. Renal function within normal limits despite raising serum creatinine compared to preoperative status.

Compared to usual postoperative appearances after radical cystectomy with Bricker diversion (Fig. 1), CT-urography (Fig. 2) showed the left kidney with preserved parenchymal thickness compared to the contralateral; delayed, attenuated nephrogram and poor urinary opacification; moderately dilated excretory system with urothelial hyperenhancement indicating pyeloureteritis. The enteroenteric stapled anastomosis indicated site of ileal resection for conduit creation. The patient improved after intensive antibiotics eradicated urinary infection.

Four months later, ultrasound (Fig. 3) showed worsening left-sided hydronephrosis with initial parenchymal loss. One year after surgery, follow-up CT-urography (Fig. 4) confirmed severe hydronephrosis with urothelial hyperenhancement from recurrent urinary infections, progressive parenchymal loss with attenuated nephrogram. The unopacified left ureter tapered towards the ureteroileal anastomosis, without appreciable tumour tissue. Despite normal right side appearances, normal functioning of urostomy and conduit, and the absence of local, nodal or distant neoplastic recurrence, the patient had a non-functioning left kidney at renal scintigraphy. Antegrade stenting could not relieve the tight fibrotic ureteroileal anastomotic stricture.

Radical cystectomy (RC) represents the standard treatment for T2-T4 urothelial bladder carcinoma (UBC) in selected patients with non-muscle-invasive UBC and intractable neurogenic or inflammatory vesical disorders, and represents a complex, daunting operation associated with considerable morbidity and 1-3% perioperative mortality. Urinary reconstruction is obtained with either continent (catheterizable cutaneous reservoir or orthotopic neobladder) or incontinent diversions such as ureterocutaneostomy and ileal conduit (IC). Initially described by Bricker, IC remains an established option for patients that are not candidates for continent diversion, and includes creation of
bilateral ureteroenteric anastomoses draining urine into a detached 15-20 cm ileal segment, which is brought out through an abdominal wall stoma [1-3].

After RC, cross-sectional imaging is needed to investigate postoperative complications and detect recurrent cancer and metachronous urothelial tumours. Multidetector CT-urography is the technique of choice to visualize the postoperative anatomy and correctable problems, aiming to prevent renal impairment. The IC is seen extending to the urostomy, and the collecting systems and ureters (typically wider due to prior obstruction or reflux) up to the ureteroileal anastomosis [4-7].

In nearly 50% of patients, early postoperative complications (within 30 days from surgery) may include bowel problems (ileus, obstruction, anastomotic leak, and ischaemia), postsurgical collections in the site of the excised bladder or nodal dissection (haematomas, urinoma, lymphocele), ureteroileal anastomotic leakage or stricture. Furthermore, common postoperative events such as pneumonia and deep venous thrombosis may be diagnosed [1-5].

Infections occur, either as early or late recurrent complications of urinary diversion, due to impaired defence mechanisms. Bacteriuria is extremely common (78-85%); clinically evident urinary infection and urosepsis occur in 15-23% and 3.8-8% of patients, respectively. CT-urography findings include pyeloureteral thickening and hyperenhancement, pyelonephritis, renal or perirenal abscesses [4-6]. Reported in 39-51% of patients with RC+IC, late complications mostly include stone formation, recurrent infections and obstruction. Often clinically silent, obstructive complications are diagnosed by imaging or suggested by rising serum creatinine, and may lead to deterioration of renal function. Conduit and stomal strictures manifest as dilated reservoir with bilateral hydronephrosis. More commonly, late postoperative stricture occurs at the ureteroileal anastomosis within 1-2 years, resulting from fibrosis triggered by ischaemia. CT-urography findings include delayed nephrogram, hydronephrosis and ureteral wall thickening. Heralded by enhancing soft tissue, recurrent or metachronous urothelial neoplasms should be differentiated by fibrotic stricture: the latter is a critical issue, which requires endoscopic treatment and often ureteral reimplantation to avoid renal damage [4-6, 8].

**Differential Diagnosis List:** Urinary infection, ureteral stricture after radical cystectomy with ileal conduit, Pyelonephritis, Renal / perirenal abscess, Postoperative urine leakage - urinoma, Postoperative haematoma, Lymphocele, Recurrent urothelial carcinoma, Metachronous urothelial carcinoma

**Final Diagnosis:** Urinary infection, ureteral stricture after radical cystectomy with ileal conduit

**References:**


**Figure 1**

*Description:* Compared to normal right-sided appearance, the left kidney showed slightly delayed and attenuated nephrogram, moderately dilated collecting system and ureter with urothelial hyperenhancement consistent with pyeloureteritis. *Origin:* Tonolini Massimo, Department of Radiology, “Luigi Sacco” University Hospital – Milan (Italy)
Description: Compared to normal right-sided appearance, the left kidney showed slightly delayed and attenuated nephrogram, moderately dilated collecting system and ureter with urothelial hyperenhancement consistent with pyeloureteritis. Origin: Tonolini Massimo, Department of Radiology, “Luigi Sacco” University Hospital – Milan (Italy)
Description: Compared to normal right-sided appearance, the left kidney showed slightly delayed and attenuated nephrogram, moderately dilated collecting system and ureter with urothelial hyperenhancement consistent with pyeloureteritis. **Origin:** Tonolini Massimo, Department of Radiology, "Luigi Sacco" University Hospital – Milan (Italy)
Description: Pelvic images allowed identification of the enteroenteric mechanical "stapled" anastomosis (arrowheads) in the site of ileal segment detachment for creation of the ileal conduit (arrows). Origin: Tonolini Massimo, Department of Radiology, "Luigi Sacco" University Hospital – Milan (Italy)
Description: Excretory phase acquisition showed normal appearance of the right kidney and collecting system; delayed and reduced urinary opacification on the left side with urothelial hyperenhancement (thin arrows) and preserved parenchymal thickness. Origin: Tonolini Massimo, Department of Radiology, “Luigi Sacco” University Hospital – Milan (Italy)
**Description:** Excretory phase acquisition showed normal appearance of the right kidney and collecting system; delayed and reduced urinary opacification on the left side with urothelial hyperenhancement (thin arrows) and preserved parenchymal thickness. **Origin:** Tonolini Massimo, Department of Radiology, “Luigi Sacco” University Hospital – Milan (Italy)
Description: Excretory phase acquisition showed normal opacification of the right collecting system and ureter; delayed and reduced urinary opacification on the left side with urothelial hyperenhancement (thin arrows). Origin: Tonolini Massimo, Department of Radiology, “Luigi Sacco” University Hospital – Milan (Italy)
**Description:** Maximum intensity projection (MIP) reconstructions showed the well-opacified right collecting system and ureter, ileal conduit (arrow), and stapled enteroenteric anastomosis (arrowhead). Poor contrast excretion on the left side. **Origin:** Tonolini Massimo, Department of Radiology, "Luigi Sacco" University Hospital – Milan (Italy)
Description: Maximum intensity projection (MIP) reconstructions showed the opacified ileal conduit (arrow) extending to the cutaneous urostomy. Origin: Tonolini Massimo, Department of Radiology, “Luigi Sacco” University Hospital – Milan (Italy)
Figure 2

**Description:** Four months later, ultrasound showed persistently normal findings on the right side (a), progression of left-sided hydronephrosis (b) with initial parenchymal loss. **Origin:** Tonolini Massimo, Department of Radiology, “Luigi Sacco” University Hospital – Milan (Italy)
Description: Follow-up CT-urography using a double bolus technique confirmed severe left-sided hydronephrosis with urothelial hyperenhancement (thin arrows), parenchymal loss with attenuated nephrogram. **Origin:** Tonolini Massimo, Department of Radiology, “Luigi Sacco” University Hospital – Milan (Italy)
Description: Follow-up CT-urography using a double bolus technique confirmed severe left-sided hydronephrosis with urothelial hyperenhancement (thin arrows), parenchymal loss with attenuated nephrogram. Origin: Tonolini Massimo, Department of Radiology, “Luigi Sacco” University Hospital – Milan (Italy)
Description: Left-sided hydronephrosis with urothelial hyperenhancement and tapering of the unopacified ureter towards the ureteroileal anastomosis (thin arrow) without appreciable tumour tissue.

Origin: Tonolini Massimo, Department of Radiology, “Luigi Sacco” University Hospital – Milan (Italy)
Description: The right ureter and ileal conduit (arrow) appeared well-opacified. Conversely, the left ureter appeared moderately dilated and unopacified with urothelial hyperenhancement (thin arrows).

Origin: Tonolini Massimo, Department of Radiology, “Luigi Sacco“ University Hospital – Milan (Italy)
Description: The ileal conduit (arrows) appeared well-opacified. Again, the stapled entero-enteric anastomosis was easily visible. No adenopathies or signs of local neoplastic recurrence were detected.

Origin: Tonolini Massimo, Department of Radiology, “Luigi Sacco” University Hospital – Milan (Italy)
Description: The ileal conduit (arrows) appeared normally distended and well-opacified. Origin: Tonolini Massimo, Department of Radiology, “Luigi Sacco” University Hospital – Milan (Italy)
Figure 4

Description: In another patient, 3D volume rendering CT-urography reconstructions show the usual postoperative anatomy after radical cystectomy with Bricker diversion, including slightly wide, well opacified collecting systems and ureters. Origin: Tonolini Massimo, Department of Radiology, "Luigi Sacco" University Hospital – Milan (Italy)
Description: 3D volume rendering CT-urography reconstructions show the usual postoperative anatomy after radical cystectomy. The collecting systems and ureters are well depicted and slightly wide. In the pelvis, the ileal conduit is distended and fully opacified. Origin: Tonolini Massimo, Department of Radiology, ‘Luigi Sacco’ University Hospital – Milan (Italy)
Description: Focused 3D volume rendering reconstructions show the opacified ileal conduit and the ureteroileal anastomoses (arrows). Origin: Tonolini Massimo, Department of Radiology, "Luigi Sacco" University Hospital – Milan (Italy)
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