

## LATE PRESENTATION OF URETERAL INJURY FOLLOWING LAPAROSCOPIC COLORECTAL SURGERY

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**Iatrogenic ureteral injury is an uncommon but dangerous complication of abdominal and pelvic surgery. When recognized and promptly treated, most ureteral lesions heal without sequelae. Instead, undetected injuries may last for a prolonged period of time since symptoms and signs are usually subtle and nonspecific, even if evolution may be life threatening. In doubtful cases the diagnostic role of modern multiphase helical computed tomography is crucial. We describe the late presentation in the Emergency Department of a case of double left ureteral injury after abdominal surgery, and illustrate the appearance of the lesions at computerized tomography.**

**Key-word:** Ureter, injuries.

### Case report

A 53-year-old man presented to our emergency department (ED) complaining of acute flank pain and fever progressively increasing for 3-days. His recent medical history included laparoscopic resection of a sigmoid colon carcinoma performed two weeks before. On physical examination the abdomen was mildly distended with slight contracture of the lower abdominal wall muscles, while regular bowel sounds were heard during auscultation. Laboratory blood tests were within the normal range, except for a white blood cell count of  $16 \times 10^9/L$  and a slight increase of C-reactive protein. Abdomen emergency ultrasound was unremarkable, ruling-out peritoneal fluids and free air. Multiphase helical computed tomography (CT) demonstrated a left retroperitoneal urinoma and hyperdense suture material along the transition between the middle and the lower third of the left ureter (Fig. 1A-C). CT images were consistent with incidental ureteral stapler ligation and laceration/section. Multiple intestinal air-fluid levels with bowel distension were detected, suggesting paralytic ileus due to peritoneal irritation (Fig. 1D). Endoscopic ureteral stenting was primarily attempted, but the manoeuvre was unsuccessful thus suggesting a complete obstruction of the ureter. This first endoscopic attempt was then followed by open surgery for complete ureteral reconstruction. Exploration during open surgery confirmed the double injury of the left ureter, due to longitudinal laceration and fully circumferential

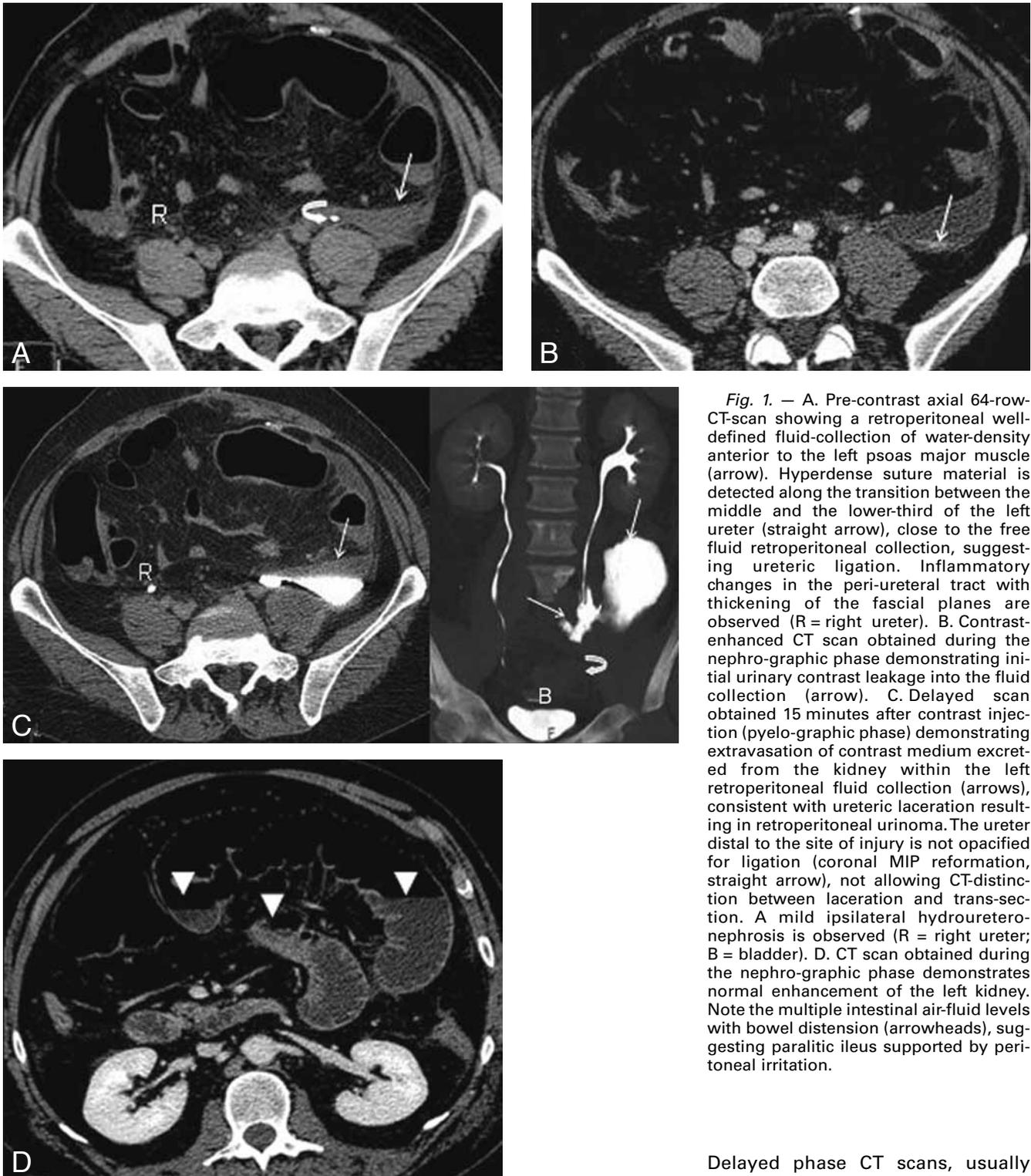
ligation few millimetres apart. The lesions were repaired and a ureteral stent was placed and then removed few weeks later, without any complication at follow-up.

### Discussion

Iatrogenic ureteral injury (IUI) is an uncommon but severe complication of any abdominal and pelvic open or laparoscopic surgery, whose incidence ranges from 0.5% to 1% depending on the surgical pathology and surgeon's experience (1). The predominant risk factor contributing to incidental ureteral injuries is the excessive intra-operative bleeding with difficult haemostasis, owing to blind clamping and suturing (1). IUI is more frequent during gynaecological procedures, mostly radical hysterectomy, that account for 50% of all injuries. Other procedures at risk are urological open and endoscopic surgery (30%) and vascular and general abdominal surgery (5-15%), mostly aortic and colorectal. Spinal surgery may also cause ureteral injuries, although these are very rare (1). Most cases of IUI are one-side section of the lower half of the ureter, usually identified and repaired during the same surgery session (2). Bilateral ureteral injuries, although rare, can also be iatrogenic (2). When the lesion is intra-operatively recognized and promptly treated, most lesions heal without sequelae and rarely require additional surgery. In case of misdiagnosis, IUI may remain undetected for a prolonged period of time, ranging from several weeks to months after surgery, because symptoms

and signs are usually mild and non-specific. Occasionally, IUI may complicate and even become life threatening (1). The postoperative clinical presentation of IUI may include abdominal and flank or back pain, fever, peritonitis, urinary leakage from the vagina, cutaneous fistula, haematuria and anuria (2). Symptoms are often chronic and slowly progressive. Physical examination may reveal a tender, distended abdomen and sometimes signs of peritoneal irritation. Cases of IUI recognized later are usually associated with serious morbidity, especially sepsis and severe renal failure, and unfavourable outcome (1). Emergency CT scan plays a crucial role in the diagnosis of postoperatively IUI. Multidetector-row-helical CT scanners allow single breath-hold acquisitions of the abdomen and pelvis with narrow collimation using a slice thickness and increment of 1 to 1.25 mm (3). Thin-section axial CT images obtained during the excretory phase of enhancement are then evaluated with two-dimensional multiplanar reformation (MPR) and three-dimensional (3-D) reconstruction images generated on workstations from axial source images. MPR and 3-D reformation images provide orthogonal, coronal or oblique planes, which help to define the location and extent of the lesions previously shown by axial CT images (3). The delayed phase (excretory or urographic phase) useful to evaluate renal collecting system and ureters, begins at least 10 minutes after the first injection of contrast medium and is crucial for visualizing the exact location of the injury, at the level of the collecting system, the pelvic junction or the ureter. The injury is usually evidenced by the extravasation of excreted contrast (4). CT images are also useful to specify the type of

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*Fig. 1.* — A. Pre-contrast axial 64-row-CT-scan showing a retroperitoneal well-defined fluid-collection of water-density anterior to the left psoas major muscle (arrow). Hyperdense suture material is detected along the transition between the middle and the lower-third of the left ureter (straight arrow), close to the free fluid retroperitoneal collection, suggesting ureteric ligation. Inflammatory changes in the peri-ureteral tract with thickening of the fascial planes are observed (R = right ureter). B. Contrast-enhanced CT scan obtained during the nephro-graphic phase demonstrating initial urinary contrast leakage into the fluid collection (arrow). C. Delayed scan obtained 15 minutes after contrast injection (pyelo-graphic phase) demonstrating extravasation of contrast medium excreted from the kidney within the left retroperitoneal fluid collection (arrows), consistent with ureteric laceration resulting in retroperitoneal urinoma. The ureter distal to the site of injury is not opacified for ligation (coronal MIP reformation, straight arrow), not allowing CT-distinction between laceration and trans-section. A mild ipsilateral hydrouretero-nephrosis is observed (R = right ureter; B = bladder). D. CT scan obtained during the nephro-graphic phase demonstrates normal enhancement of the left kidney. Note the multiple intestinal air-fluid levels with bowel distension (arrowheads), suggesting paralytic ileus supported by peritoneal irritation.

injury (laceration/perforation, section, ligation, stricture), together with extension of the lesion and possible associated complications (retroperitoneal urinomas or urinary ascites) (2). The CT hallmark of ureter injuries is extravasation of urine, which may collect at different sites.

Extra luminal urine may appear as a water-density fluid collection of any size, usually not distinguishable from ascites. On CT images, the fluid collection can be proved to be an urinoma only when it becomes opaque due to leakage of contrast medium excreted by the kidney.

Delayed phase CT scans, usually obtained 10-15 minutes after contrast material injection, are considered optimal for demonstrating ureteral urine leak, with a reported sensitivity of 100% (5). Lack of impregnation of a distal ureter after contrast medium injection, is another CT sign of ureteral rupture. However, if the ureter is only lacerated and not completely interrupted, the ureter distal to the injury may still show some contrast enhancement (5). In the

case of contrast enhancement of the abdominal fluid collection, the differential diagnoses include also other diseases owing to leakage of oral contrast material from the gastrointestinal tract or from ruptured blood vessels (6). The absence of free peritoneal air together with delayed contrast enhancement of a confined fluid collection and some degree of dilation of the upper renal collecting system, are highly indicative of some injury of the urinary tract (2, 6). In some cases, it is not possible to identify the exact site of leakage of contrast material. Misdiagnosis is usually due to the flowing of the urine collection away from the ureteral lesion, often accumulating in the retroperitoneal compartment or even the upper abdomen. These conditions can be achieved when the fascial planes for some reason are discontinuous (7). The differential diagnosis of a postoperative fluid collection includes also other conditions than urinoma, such as lymphocele, hematoma, seroma and abscesses. CT study with acquisition of delayed scans targeted to the visualization of contrast enhancement of the fluid collection, is crucial for ruling out other possible diagnoses and

demonstrate the urine collection (5). Furthermore, CT is useful to plan the correct management (endoscopic or open reconstructive procedures) and to identify complications on follow-up, such as ureteral stricture (2). When non-absorbable suture is used during surgery, postoperatively late detection of ureteric ligation may manifest as chronic hydro-ureteronephrosis with complete loss of renal function, which ultimately requires nephrectomy (8). Accidental ligation performed by absorbable suture has a better prognosis, and may be best treated by proximal drainage alone with the positioning of a percutaneous nephrostomy tube (9). This conservative strategy may be applied only if the continuity of the ureter is preserved.

In our patient the immediate open surgical intervention was mandatory (9). Whether laceration was produced during surgery, with dripping of urine in the retro-peritoneum during the following two weeks, or few days before presentation in the ED, by mechanic pressure due to urine stasis due to ligation, remains unclear. Anyway, laceration presumably allowed a relatively early diagnosis even if postoperative, and preservation of the kidney.

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