

Ureteral Dissection is a Transient Process Before Ureteral Rupture: A Case Report

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Case report

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Abstract

Background: Ureteral dissection (UD) is a rare condition which occurs when injury through the intima and occasionally the media allows entry of urine and separation of the inner and medial ureteral layer just like the formation of aortic dissection. Ureteral rupture (UR) is generally caused by ureteral calculus, operation of ureteral endoscope, trauma, tumors, iatrogenic injury and easy to cause peritonitis, so patients usually show symptoms of peritonitis prior to signs of urinary tract. Ureteral rupture caused by ureteral dissection is rarely reported.

Case presentation: 21-year-old male and 43-year-old female were both admitted into hospital because of abdominal pain. Enhanced CT and retrograde pyelography showed “double lumen sign” in the right proximal ureter and contrast extravasation in the perinephric gap. The male is dead due to serious condition but the female is in good condition without complication after correct and timely therapy.

Conclusions: UD is a transient process viewed by enhanced CT or retrograde pyelography offering a warning sign of UR in order to improve prognosis.

Background

Ureteral dissection (UD) is a rare case when urine goes through the injured lamina and separates the inner and middle ureteral layers forming a potential cavity. Ureteral rupture (UR) is fatal because it leads to serious consequences, including urinoma, perinephric or retroperitoneal abscess formation and urosepsis, so it is important to early diagnose by radiology images to avoid severe complication [1, 3]. UR is classified into spontaneous and non-spontaneous. The latter is reported with the traumatic cause and ureter itself lesions, whereas the definition of spontaneous rupture is not well established [1, 2, 3]. Regular CT manifests fluid accumulates in perinephric or retroperitoneal space and contrast extravasation found in enhanced CT and retrograde pyelography with or without sign of peritonitis [4, 5]. Consequently, rapid action should be taken as soon as radiology images show sign of UD, which is a warning sign and transient process before UR.

Case Presentation

Case 1

A 21-year-old man was admitted to nephrology department with symptoms of left lumbago for one month. Physical examination revealed slight tenderness of full belly and tender point extended along both renal and ureteral regions. Immediate ultrasound showed bilateral upper ureteral dilation and both hydronephrosis in a local hospital. Laboratory tests showed obvious increases in CA125(270.70KU/L) and slight increase in creatinine (142.9 umol/ L). He denied any medical background except transfusion history. However, after transfusion the above mentioned symptoms did not alleviate but even deteriorated instead. Then, CT and MRI hereupon proved that the result was the same as that from ultrasound, but there was no obvious sign of tumors in the peritoneal cavity in our hospital. Several days later, the patient

cannot bear the constant acute pain in the right middle lower region of abdomen and the pain was more serious at night. Retrograde pyelography images showed that the right upper ureter dilated like a double tube, i.e. “double-lumen sign”, the lower intensity linear spread along the urinary tract to the middle part which make the entire sign of ureter resembling to radiologic findings of aortic dissection. The bigger cavity locates in the posterior, the little cavity situating at the anterior, and contrast medium leaked into surrounding cavity [Fig. 1]. An hour later, the abdominal CT scan was performed and clearly found the “double-lumen sign” in the right upper ureter. Meanwhile, a gap was found at the of right proximal ureter with strip and cast-shaped high intensity filling in the perirenal cavity mixing with low intensity of fluid [Fig. 2]. In order to better treatment, the patient transferred into another hospital and contrast-enhanced abdominal CT images showed that the thickened wall of sigmoid and rectum, with heterogeneous reinforcement; and the right ureteral wall entirely thicken with slightly heterogeneous reinforcement with rupture of the ureteral wall. Finally, pathology clarified rectal carcinoma and the operation found rupture of right proximal ureter [Fig. 3]. After one month, the patient died at just 21 years old.

Case 2

Another 43-year-old female was admitted to urology department with complaint of right waist and abdominal discontinuous colic followed by fever for two days. Physical examination found that the tenderness lied in the right renal and ureteral extending district. Laboratory test showed that there was a slight rise of creatinine (90.6 $\mu\text{mol/L}$), whereas others were within the normal range. The patient had a history of subtotal hysterectomy three days ago due to uterine leiomyoma and denied history of drugs and family history. Precontrast CT indicated that free liquid in the peritoneal cavity and right perirenal fascial capsule region, and contrast enhanced CT found that right upper dilated part has two tubes and they are like double-lumen sign in the transverse view with different intensity, the big one lying behind with relative high intensity, and the little one located in the front like filling-defect during early stage of scanning but reversal in the late period; the low-intensity divide between them along ureteral spreading meanwhile rupture was found at the middle of ureter, and contrast medium was full of adjacent cavity where we could discover sudation of shape of strip or tablet viewed as a symbol of peritonitis forming as well as disappearance of distal ureter (from 4th sacral vertebrae to inner segment of bladder wall). There was no abnormal finding in the left all ureteral tract. [Fig. 4]. Instant operation verified the imaging result and right distal ureter was ligated. Finally the patient discharged asymptotically after suitable treatment.

Discussion And Conclusions

Ureteral dissection(UD) is a rare condition which occurs when urine through the injured intima formed a urine-filled compartment separating intima and tunica media. Ureteral rupture will happen when the pressure in the UD is over than the bearable pressure range of the extima. UR is generally caused under the premise of ureteral obstruction, as found in the two cases originating from extrinsic malignant oppression and ligation of distal ureter. The male patient is obvious that ureteral wall was intruded by the malignant tumor form a precondition and urine flows through injured intima to form UD. With increasing

pressure over normal load, urine-filled dissection bursts, consequently urine mixing contrast diffuse around periureteral space with illuminous hyper-density in enhanced CT scan [4].

The female patient might be spontaneous UR because most reported spontaneous UR occurs after surgical operation like hysterectomy. Unfortunately, there is no relative mechanism about the process of UD during spontaneous UR reports, so this notion was based on speculation of molecular mechanism of smooth muscle cell. Morphologically, ureter is a tube surrounded by loose mesenchymal cells more easy to change shape when encountering to outer force, but lasting stimulation from high pressure of obstructive ureteral cavity makes its flexibility reduce, so more damage to the wall of ureter, injured intima always occurring in the relatively weak religion (proximal ureter with two-layer mucosa however distal segment has three) [6].

In order to better identify the UD through radiology imaging, we should distinguish between ureteral double lumens and UD. Ureteral double lumens are a rare kind of ureteral duplication that normal ureteral lumen partially or completely separates into two pieces but it was fused at end of the split [6]. So it is a clear discrimination between the two diseases through signs of concentric circles and rupture in the enhanced CT with contrast extravasation.

In conclusion, UD can be easily diagnosed by enhanced CT and/or retrograde pyelography with obvious double-lumen sign, concentric circle and low intensity line-shaping intima along with extension of ureter. UR caused by UD is fewly reported. UR is rare but fatal, mostly due to ureteral stones and iatrogenic injury, however no specific cause found in almost a quarter of patients [5]. So here two cases add another specific cause for UR, giving a method to prevent UR especially in patients with acute abdominal or flank pain prior to urinary tract symptom. Ureteral dissection is a transient process before ureteral rupture happens, it is just the short time that worthy considering diagnosis of UR so that proper treatment can be taken in expeditious manner.

Abbreviations

UD ureteral dissection

UR ureteral rupture

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor of this journal.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

KX and ZyS is responsible for writing and searching for documents, RpW is responsible for revising manuscript and communicating with editor or reviewers; XcZ offered advices and relative documents, ZxZ responsible for supporting pathological image and explain the result.

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Footnotes

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Figures

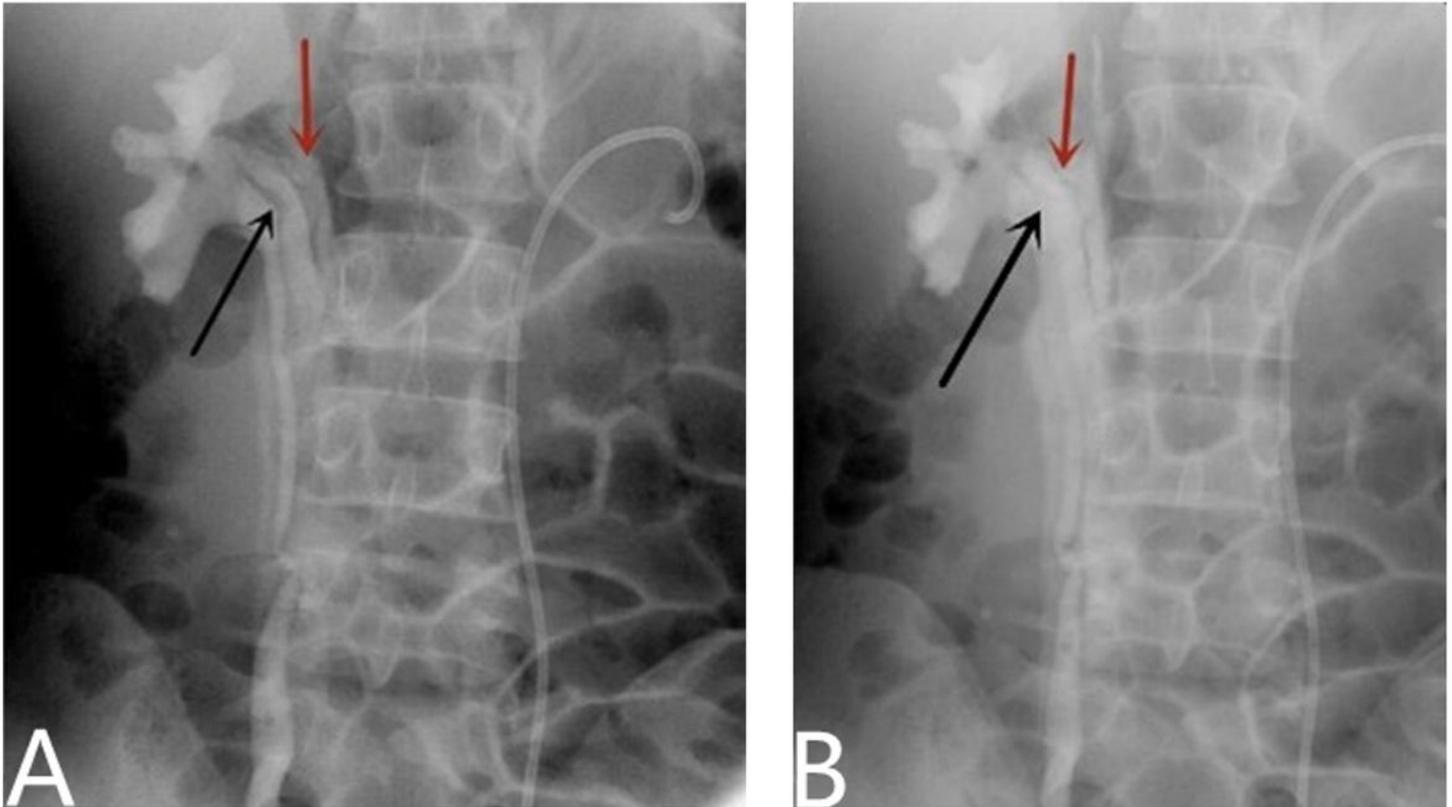


Figure 1

Retrograde pyelography shows right proximal ureter is dilated like two lumens, little one lying in the anterior, bigger one posterior, low intensity divide along ureteral extending and rupture in the divide convex to the bigger one cavity (black arrow); there was also little strip of high intensity filling in the perirenal and peritoneal region (red arrow) from image A. Ten minutes later (B), more contrast medium extravasated from the right ureter (red arrow), and the low intensity is obscure due to the intensity between two cavity is nearly equal making it not so clear like image A (black arrow).

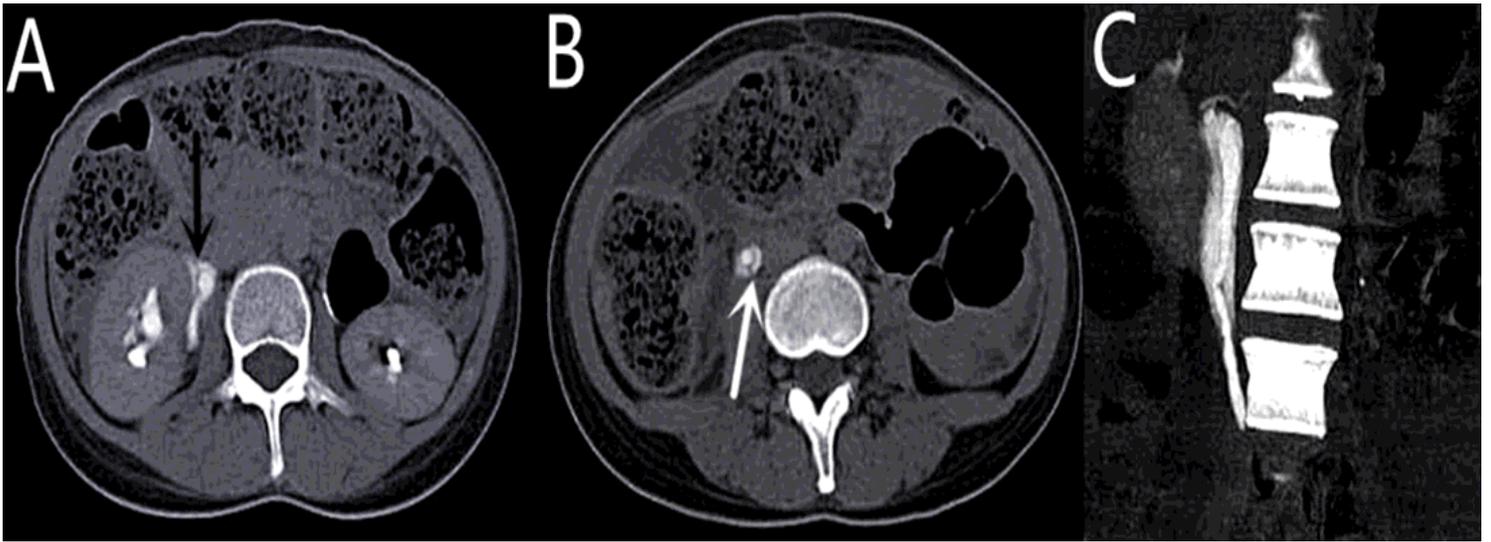


Figure 2

CT scan after 60 minutes of retrograde pyelography. Axial view clearly shows the sign of two lumens like concentric round and gap in the ureteral wall and contrast medium extravasates in the surrounding cavity (A, black arrow) together with rupture in the low intensity divide (B, white arrow). Coronal plane maximum intensity projection (C) clearly shows sign of UD like AD.

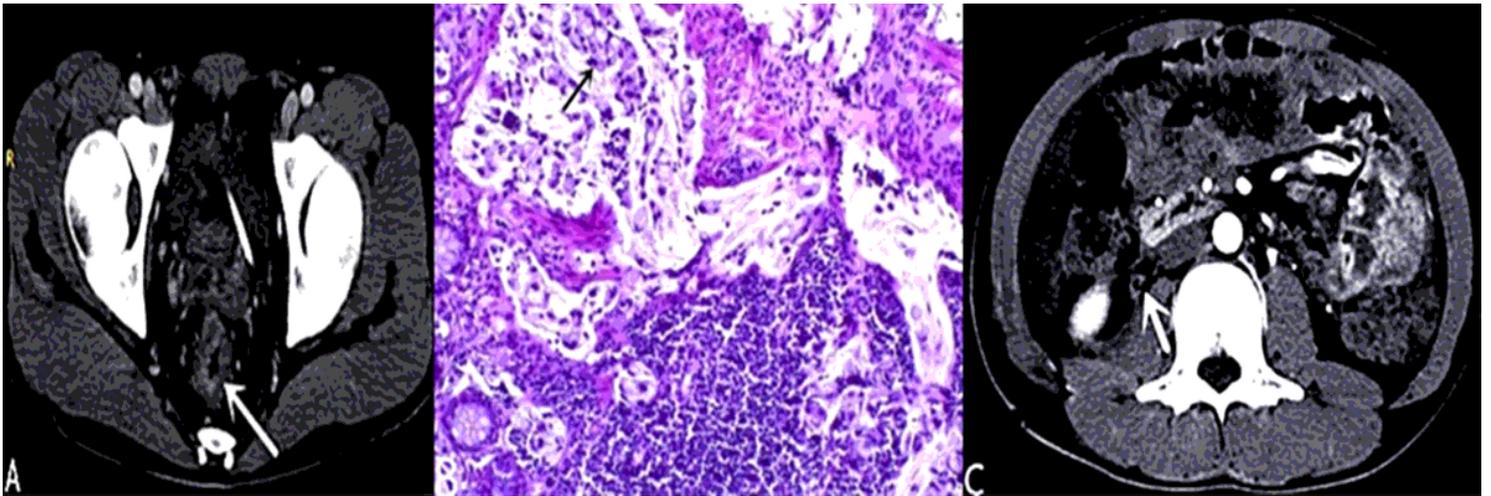


Figure 3

Contrast-enhanced CT images (A) show that the thickened wall of rectum, heterogeneous reinforcement (white arrow); Pathological image shows lamina propria of rectum is full of mucoid cells which is characterized with atypia (B, black arrow) referring to carcinoma; the right ureteral wall entirely and left wall partially thicken with slightly heterogeneous reinforcement with rupture of the ureteral wall (C, white arrow).

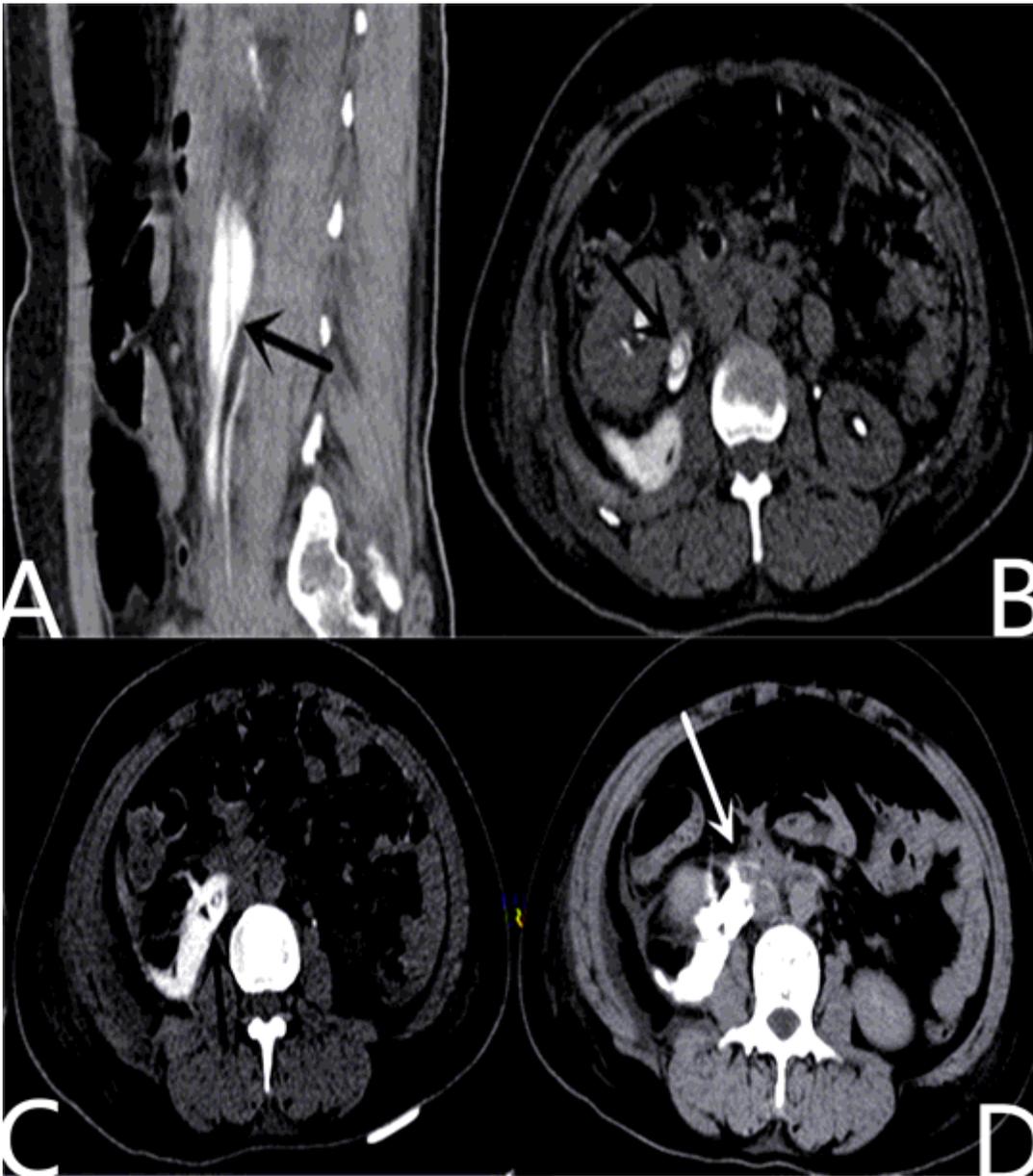


Figure 4

The excretory phase images, Sagittal (A) and axial view enhanced CT (B) scanning images show that the original and inferior to middle segment of ureter is obvious sign of double lumens like the image character of aortic dissection (black arrow). The rupture of ureter is lying in the middle segment with sign of strip contrast medium extravasation into adjacent peritoneal cavity (C: black arrow) and obvious sign of peritonitis (D: white arrow).