Ureteral Dissection Is a Risky Factor for Ureteral Rupture, the First 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 outer ureteral layers. Ureteral rupture (UR) is an urgent disease when ureter wall injures through entire layers, generally caused by ureteral calculus, frequent application of ureteral endoscope, trauma, oppression of tumors, iatrogenic injury and with urine flowing into peripheral space easily causes peritonitis, so patients usually present features of peritonitis prior to signs of urinary tract. Ureteral dissection found in ureteral rupture is the first report.

Case presentation

21-year-old male and 43-year-old female complained of left and right lumbago respectively with no obvious predisposing cause. Bilateral ureter dilation and contrast agent extravasation observed in imageological examination was the same point between the two patients. Delayed computed tomography (CT) and retrograde pyelography both show double lumen sign and damaged intima. All imaging results throw light on the nature of this disease, like formation of aortic dissection (AD).

Conclusion

The emphasis of this study lies in imaging manifestations of UD to enable radiologist to find it accurately and rapidly, and also demonstrates that delayed CT and retrograde pyelography can effectively diagnose ureteral dissection with very high accuracy.

Background

However, little information about the disease has done to explain its relevant mechanism [1]. There are some terminologies such as ureteral laceration, ureteral avulsion and ureteral tear, ureteral stripping. UD can't be classified into anyone of them, in that the ureter wall has not been completely destroyed. Ureteral dissection 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 outer layers. UR is always a scarce and worthy exploring case which is most reported with the spontaneous style; the non-spontaneous style is reported with the traumatic cause and ureter itself lesions, up to now, the definition of spontaneous rupture is not well established [2]. UR can result in a multitude of serious consequences, including urinoma, perinephric or retroperitoneal abscess formation and urosepsis, so early diagnosis with aid of radiology methods can avoid severe complications [3]. Radiology images always show double lumens sign and destroyed linear inner layer; contrast extravasation in abdominal cavity with or without sign of peritonitis when UR happens. Aortic dissection (AD) cause aortoclasia, but UD secondary to UR in the two cases. we here introduce imaging manifestations of UD to enable radiologists accurately diagnose it.

Case Presentation

Case 1

A 21-year-old man was hospitalized due to left lumbago and the pain was persistent blunt one, radiating to back and abdomen, more serious during night for one month. Physical examination revealed full belly slight tenderness and pain point extending along renal and ureteral regions. Immediate ultrasound showed bilateral upper ureteral dilation and hydronephrosis in local hospital. Laboratory tests showed obvious increase in CA125 (270.70 KU/L) and slight increase in creatinine (142.9 $\mu\text{mol/L}$).

Then, ureteroscopy examination was performed and showed right posterior wall of bladder rising a mass (4 cm × 3 cm × 2.5 cm) but vesicle surface is smooth, as well as right inferior ureter was narrow but there was no any calculus and neoplasm, which illustrated a large possibility of compression outside. CT hereupon proved the result same as the ultrasound, no obvious sign of tumors in the peritoneal cavity in our hospital. Several days later, retrograde pyelography images showed that the right upper ureter dilated like a double tube, lower intensity linear divides spreading along the urinary tract to the middle, entire sign of ureter resembling to radiologic findings of AD, the bigger one locating in the posterior, the little one anterior, and contrast medium leaking into surrounding cavity [Fig. 1]. An hour later, the abdominal CT clearly found the two cavities signs, meanwhile a gap in the low intensity divide and the chasm of right proximal ureter with strip and cast-shaped high intensity filling in the perirenal cavity mixing with low intensity of fluid—intensity of urine. After biopsy through colonoscopy referring to carcinoma of sigmoid and rectum, laparotomy clarified the metastases in abdominal cavity, and entire right ureter and partial left ureter wall thickened with heterogeneous reinforcement implying metastatic tumor invasion is the main culprit [Fig. 2]. After several months, the patient died just 21 years old.

Case 2

43-year-old female was admitted to urology department with complaint of right waist and abdominal discontinuous colic following with fever for two days. Physical examination found that the tenderness lied in the right renal and ureteral extending district. Laboratory tests showed that slight rise of creatinine. The patient has a history of subtotal hysterectomy three days ago due to uterine leiomyoma and denied history of drugs and family history. CT urography (CTU) were performed in local hospital and indicated that free liquid in the peritoneal cavity, right perirenal region was full of high intensity of contrast medium as well as disappearance of inferior ureteral tract [Fig. 3]. But in our hospital showed that the right upper dilated part has two tubes and they are like double ring in the traverse layer with different intensity, big one lying behind with relative high intensity, 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 sudation of strip or tablet symbols peritonitis [Fig. 4]. Instant operation clarified imaging result. Finally, the patient discharged asymptotically for suitable treatment.

Discussion And Conclusions

Ureteral injuries account for less than 1% of all injuries to urinary tract. The rarity with which ureteral injuries occurs is due to function of small ureter size and position within the retroperitoneum, where it is well protected by the psoas muscle and the bony pelvis. In fact, this relative infrequency may put the surgeon at a low index of suspicion for ureteral injury when exploring the traumatic abdomen, perhaps leading to missed injury [1]. Therefore, it is vital to explore ureter especially relative history such as abdominal trauma, gynecological operation. Ureteral rupture is fatal because spilled urine into enterocoelia facilitating inflammatory lesions in short time, and concurrent with ureteral dissection have yet to be reported by English literature. A series of research in ureter enclose blood supply, two and three layers in upper ureter and distal ureter respectively; that's why injury or rupture is most commonly found on the upper ureter like the two cases. Surely, there are also some lesions caused by tumor invasion of the ureter like the case 1, and intraoperative injury is case 2. Delayed CTU and retrograde pyelography are most valuable in assessing the ureters and for evaluation of ureteral injuries in particular [3]. Patients with ureteral rupture often have a prerequisite of distal ureteral obstruction, the case 1 due to oppression and intrusion of metastatic tumor, the case 2 due to intraoperative ureteral ligation. Radiographically, there were two lumen signs and torn intima but no probable theories to explain UR in the literature [1]. In view of this, possible corresponding pathological mechanism can be postulated from the previous reported cases. It has been reported that the ureteral fornix is prone to rupture when the pressure in the pelvis exceeds 25-75 mmHg which is the weakest part of the wall, meantime iodine contrast agents are potent osmotic diuretics and their role in accelerating rupture in acute obstruction is evident [4]. Bernardino et al. described patients with acute renal colic positive relationship between intravenous contrast dose and the incidence of peripelvic extravasation [5]. With obstruction of unilateral ureter and intravenous contrast medium injection, the ureter ruptures at an accelerated rate, urine flows into the ureter wall from the incomplete rupture to form a dissection.

In conclusions, ureteral rupture has been described as emergency setting with or without identifiable risky factors [6]. Cases can be flank pain in advance of ureteric symptoms. The ureteral dissection is a rare condition that results from the separation between the outer membrane and the inner membrane of the ureter caused by the inflow of urine through the torn inner membrane. Both are very easily missed diagnosed due to very deep anatomical location in retroperitoneal space. Missed or untreated complications (i.e. large urinoma) can become the focal point of abdominal infection and damage the urinary tract through fibrosis and granuloma formation. With the aid of imaging, manifestations of double cavity sign and torn internal diaphragm, rapid and accurate diagnosis of the disease saves the patient's life. The resolution of interval follow-up imaging through radiation-guided drainage or urological intervention is clinically relevant for monitoring and avoiding sequelae of such infections [6].

Abbreviations

UD = ureteral dissection, UR = ureteral rupture, CT = computed tomography

CTU = computed tomography urography, AD = aortic dissection

Declarations

Ethics approval and consent to participate:

Written consent from patient's parents and patient herself with her husband respectively. The case report has been through ethics committee of Guizhou Provincial People's Hospital.

Consent for publication:

Consent for publication has been obtained from the patient themselves and their kin.

Availability of data and materials

The datasets used 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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Author Contributions:

Kun Xia is responsible for paper writing, and Zhiyan Shen, Zhiyang Xing, Jiangyue Xiang are mainly in charge of literature collecting; corresponding author, Rongping Wang provides the case and overall thinking, controlling direction. All authors read and approved the final manuscript.

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Figures

Figure 1

CT shows right ureteral hydronephrosis (black arrow head). Double cavity sign and contrast agent extravasation is clearly visible in retrograde pyelography (B and C, C ten minutes behind B, more clear and phanerous).

Figure 2

CT urography (CTU) shows more details in double lumens. Axial plane (A, B) find true cavity is smaller and brighter than false one early phase, reversal of delay period. Torn inner diaphragm obviously seen in B than Figure 1. Sagittal view (D) like retrograde pyelography. The right upper ureter wall is inhomogeneous thickened and partially penetrated, which is the site of ureter rupture well found in C.

Figure 3

Renal parenchyma phase (A) demonstrates right perirenal effusion and dilated ureter but not find the crevasse. Absence of distal ureter is found in virtual reconstruction (VR, B).

Figure 4

Luminance of false lumen (yellow arrow head) frequently exceed the true one in excretory phase (B), same period (A) displays site of rupture (red arrow head) which is surrounded by laminar contrast agent leakage. C shows continuation of double cavity sign no damaged inner layer till middle of ureter.