



LETTER TO EDITOR

Analytical factors and treatment methods of renal parenchyma perforation after ureteral double-J stenting



To the editor,

Ureteral double-J stenting is especially important in the clinical operation of urology, and it is of great help to the diagnosis and treatment of diseases, but there are many complications. Ureteral stenting is the basic operation in urologic endoscopic surgery and has various complications, such as: bladder irritation, ureteral perforation, urinary incontinence, urinary salt scaling, double J tube displacement, urinary tract infection, difficulty in tube removal, and so on. In recent years, various rare postoperative complications have been reported, such as: renal vein perforation,¹ ureteral fistula,² double J tube placed into the pulmonary artery.³ We share two patients with a renal parenchymal perforation caused by a DJ ureteral stenting.

The first patient is a 55-year-old man who presented to our urology clinic with Left back pain with fever for 3 days. The patient has a history of diabetes for 3 years and usually has good glycemic control. The patient developed persistent pain in the left lumbar region 3 days before, accompanied by fever, the highest temperature 39.2 °C, we combined with the patient's symptoms, signs, physical examination and auxiliary examination, it is considered that the urinary tract infection is caused by the left kidney stones. Patients received regular anti-infective treatment in our hospital, and arranged the left ureteral stent placement in time to relieve the obstruction. The equipment we used in the surgery included: F6/6.5 ureteroscope, 0.035-inch hydrophilic guide wire, and F5 double J tube of length 26 cm, etc, the operation was smooth and no accidents were encountered. We checked KUB again after surgery to indicate abnormal position of double J tube (Fig. 1), and then CT examination showed that the double J tube penetrated the kidney, but there was no perirenal hematoma (Fig. 2). The patient underwent re-intubation immediately, and the double J tube was positioned using B-ultrasound during the procedure. KUB check again

indicates that the double J tube position is normal. The patient continued to receive anti-infective treatment. One week later, he underwent ureteral soft-surgery to treat the left kidney stones. The operation used a vacuum suction device and the operation was successful.

Another patient is a 75-year-old woman who came to our hospital for 3 days without urine. The patient has a 10-year history of hypertension and a 4-year history of diabetes. When the patient presented with serum creatinine as high as 730.36 $\mu\text{mol/L}$, the left GFR was 7.7 ml/min, the right GFR was 33 ml/min, and the patient immediately received hemodialysis treatment. Abdominal CT examination of the patient suggests that the left kidney and the upper ureter of the tumor cause left urinary tract obstruction and left renal hydronephrosis, and cause left kidney function loss; on the other hand, swollen pelvic lymph nodes compress the right lower ureter, resulting in right acute renal failure. So, the patient underwent right ureteral stenting to relieve obstruction and save kidney function. In the operation, we chose a double J tube of metal material with a length of 26 cm, and collected urine culture in the right renal pelvis, suggesting that it was infected by *Enterococcus faecium*. After the operation, the double J tube was found to penetrate the kidney (Fig. 3), so the surgery was applied again and the tube was re-intubated. One day after the operation, the patient's urine volume began to increase, and serum creatinine began to decrease. The urine volume returned to normal 1 week after surgery, and serum creatinine was basically normal.

The ureteral stent has been clinically applied for up to 40 years, can be used for the diagnosis and treatment of urinary diseases, more and more widely used in urology. However, the application of double J tube causes various postoperative complications at the same time, literature shows the presence of complications of intraoperative renal perforation. Dundar et al⁴ reported for the first time that indwelling double J tube after isolated renal ureteral

<https://doi.org/10.1016/j.asjsur.2019.02.009>

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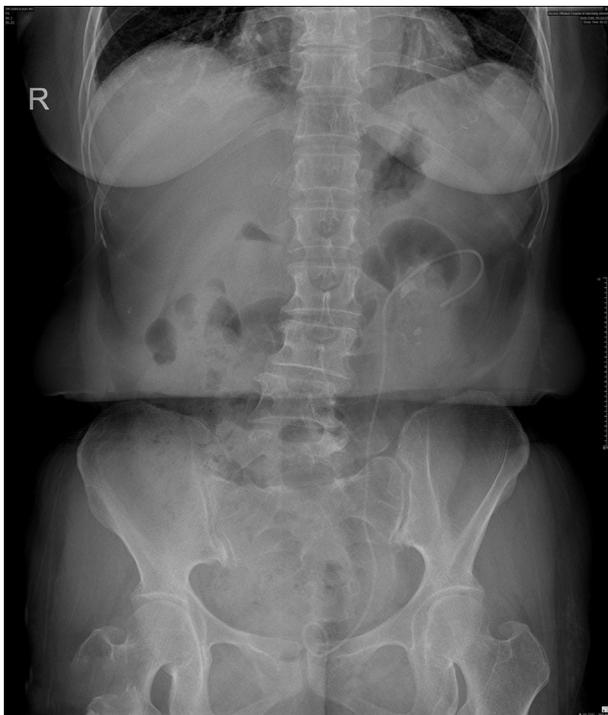


Figure 1 KUB inspection prompts the position shift of the upper section of the double J tube. KUB: kidney ureter bladder.

calculi caused renal perforation and subcapsular hematoma, and use conservative treatment methods such as blood transfusion, hemodialysis and re-intubation to solve. Nomikos et al⁵ reported that 1 case of indwelling double J tube caused renal perforation and perirenal massive hematoma after ureteroscopic lithotripsy, and telled the

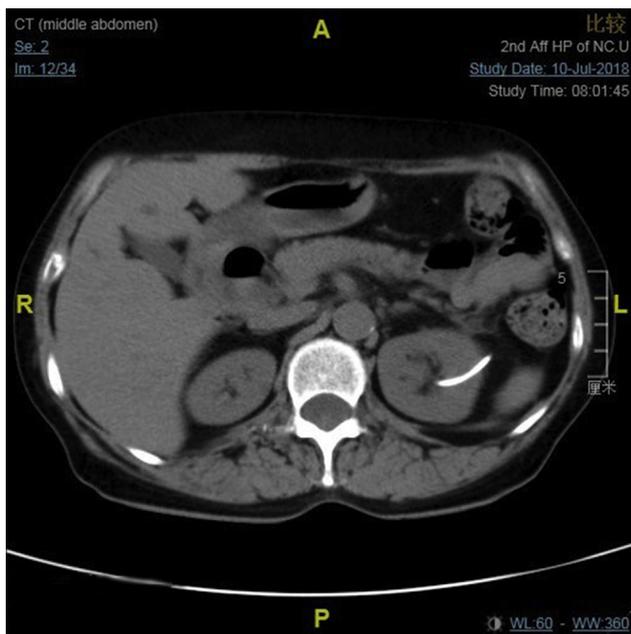


Figure 2 On the CT image, the upper double J tube is permeated through the kidney, but without perirenal hematoma. CT: computed tomography.

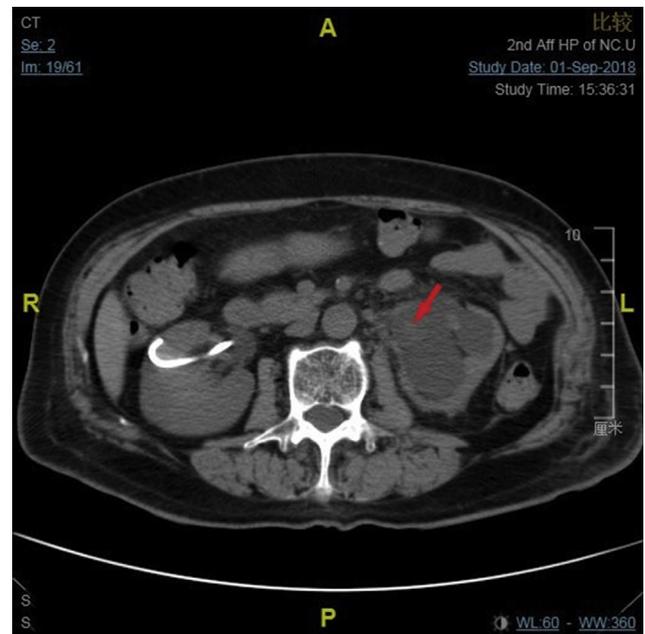


Figure 3 The red arrow marks the location of the left renal pelvis tumor, and the left kidney severe hydronephrosis, right renal parenchymal perforation by the proximal end of a double-J stent.

patient to rest in bed, blood transfusion and re-intubation for the patient, no other complications occurred after. Gönülalan et al⁶ shared a patient with ureteral stricture after pyeloplasty and returned to the hospital for Ureteral balloon dilatation and Ureteral double-J stenting, appeared renal perforation and perirenal hematoma complications, treated by conservative treatment. Altay et al⁷ reported 1 case of ureteral soft calculi after indwelling double J tube, renal perforation was found after surgery, but fortunately there was no perirenal hematoma, just adjust the position of the double J tube.

The causes of renal injury in these two patients with ureteral stenting can be analyzed from four aspects. The first, the common feature of two patient is that they have a history of upper urinary tract infection, urinary tract infection leads to edema of renal pelvis mucosa and renal pelvis mucosa, lead to tissue structure be loose, tissue becomes more fragility, just need a small external force to penetrate kidney tissue. The second, Although the front end of the guide wire used in the operation is a soft part, it can avoid stabbing the tissue to a certain extent. But we use the hydrophilic guide wire to repeatedly pierce and probe to form a small and short tunnel of the renal mucosa in the case of tissue inflammatory edema, then put a hard J-tube through the guide wire, the kidney could be further damaged by the tunnel road in the process of external force push forward, even penetrate the kidneys. The author's research team has done research on the resistance of the kidney puncture path, We found that the resistance on the renal cortex - renal medulla - kidney nipple - pyelone path is minimal (The article has not been published yet, [Chart 1](#)). The third, These two patients used a double J tube with a size of 26 cm, but, according to the formula⁸ ($\text{Length} = 0.125 \times \text{height} + 0.5 \text{ cm}$), the length of the

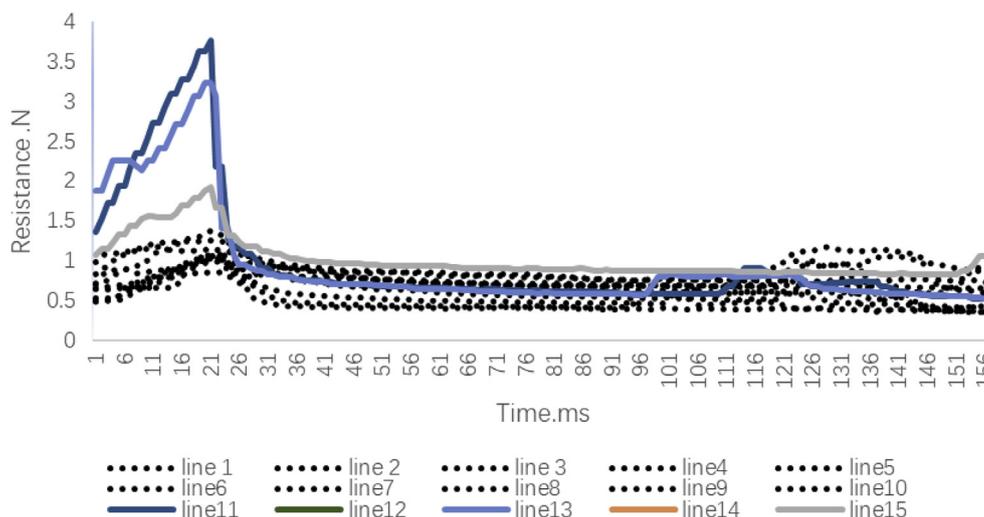


Chart 1 Kidney puncture resistance curve. We use a puncture needle to puncture the isolated pig kidney at a constant rate, the path way from the kidney capsule, renal cortex, renal medulla, kidney nipple to renal pelvis. Resistance is greatest when penetrating the kidney capsule, and resistance is small at other locations and no significant difference.

ureter is approximately 19 cm. The long double J tube is used in short stature patients, it is difficult to determine the length of the double J tube placement during surgery. The combination of a long double J tube and a guide wire can become a hard object, which inevitably increases the risk of kidney damage in the double J tube. The fourth, There was a lack of real-time monitoring during the operation, and the position of the guide wire and the double J tube was not determined by using B-ultrasound or C-arm machine fluoroscopy during the operation.

The principle of treatment of renal perforation caused by double J tube stenting includes early detection, re-intubation, and real-time monitoring. We combine our own treatment methods and related literature experience to arrive at a solution to this type of problem. The first is actively anti-infective treatment for patients with urinary tract infections, it can alleviate renal pelvic mucosal edema. We should be gentle during the operation, avoiding repeated penetrations, and can use an ultrasonic or C-arm machine for real-time positioning to determine the position of the double J tube, if the position of the double J tube is found abnormal during surgery, adjustment can be made. If the patient has symptoms such as low back pain and hematuria after surgery, kidney ureter bladder (KUB) or computerized tomography (CT) examination should be performed in time, If the position of the double J tube is found to be abnormal, we should actively monitor the patient's vital signs and assess the amount of bleeding, to determine whether the need for rehydration, blood transfusion, hemodialysis and other treatments. On the other hand, we should actively prepare for surgery to adjust the position of the double J tube or re-administer. For cases with severe renal damage and difficult to control bleeding, vascular embolization or surgery hemostasis should be considered. When considering the treatment of primary kidney disease, a vacuum suction device can be used, to

avoid infection, air embolism, subsequent blood and other complications.

In general, ureteral double J stenting has a low probability of renal perforation. However, it can also cause various accidental risks such as hemorrhage, perirenal hematoma, and life-threatening after kidney injury, the treatment of renal perforation is mainly based on conservative treatment, such as: fluid replacement, blood transfusion, hemodialysis, and re-intubation.

Conflicts of interest

The authors declare that they have no conflict of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.asjsur.2019.02.009>.

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19 December 2018

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