Endoscopic Placement of Ureteral Stents

George E. Koch, Niels V. Johnsen

Introduction:

Ureteral stent placement is one of the most common procedures performed by urologists worldwide. It is indicated for ureteral obstruction, which can be caused by intraluminal pathology like a kidney stone or ureteral stricture, or extraluminal compression from malignancies or retroperitoneal fibrosis. Stents can also be placed for partial ureteral injuries, especially when they are recognized endoscopically or in a delayed fashion.

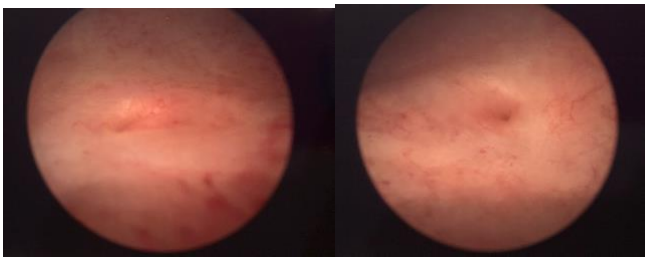
Stents are available in different sizes and can be tailored to the measured length of the ureter, based on CT or plain pyelography. In adults the following values can also be used to estimate the stent length:

Height (adult)	Stent length
<178cm	22cm
179-192cm	24cm
>193cm	26cm

Stents provide temporary relief of obstruction and can remain in place for between 3 and 12 months depending on the stent, after which they should be exchanged, or the ureteral pathology definitively treated. Regardless of the material, stents can cause a great deal of discomfort. Patients should be counseled that flank pain, urinary frequency and urgency are common with indwelling stents. Regardless of the indication for stent placement, fluoroscopy or ultrasound must be available for endoscopic stent placement. Ultrasound allows confirmation of the position of the guidewire and distal curl of the stent: a retrograde pyelogram, as described here, can not be done without fluoroscopy. See Introduction to Ultrasonography.

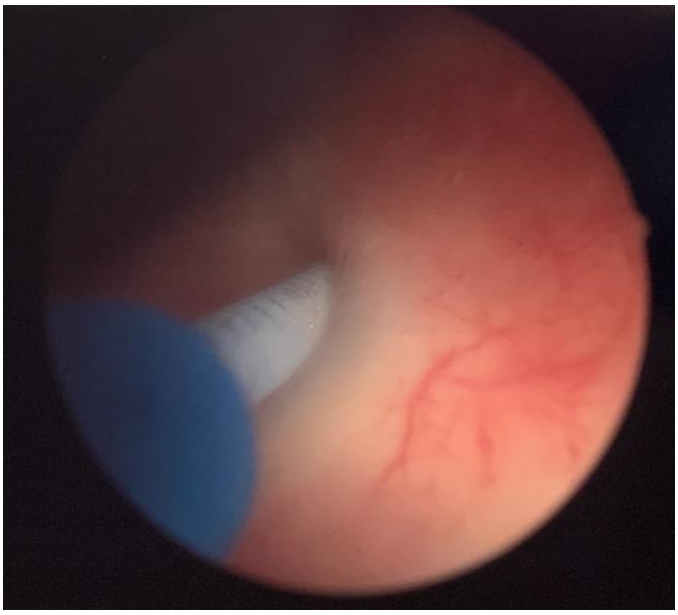
Steps:

1. The patient is positioned in Lithotomy position (See Chapter.)
2. A cystoscope is inserted into the bladder via the urethra (See Chapter, Cystourethroscopy.)
3. After careful inspection of the urethra and bladder, the affected ureteral orifice should be identified.



The ureteral orifice can be subtle (left) or more obvious (right.)

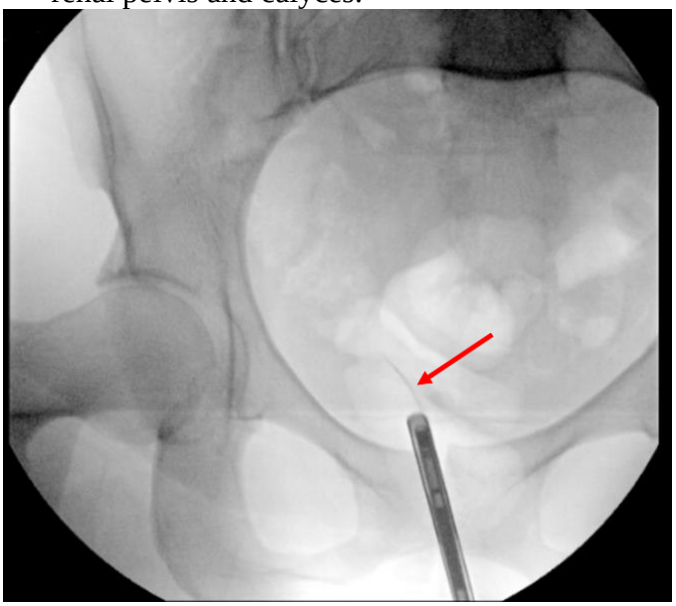
4. A retrograde pyelogram should be performed to characterize the site and severity of the injury or obstruction. This is done by atraumatically placing a hydrophilic-tipped wire into the ureteral orifice about 3-4 cm up the ureter.



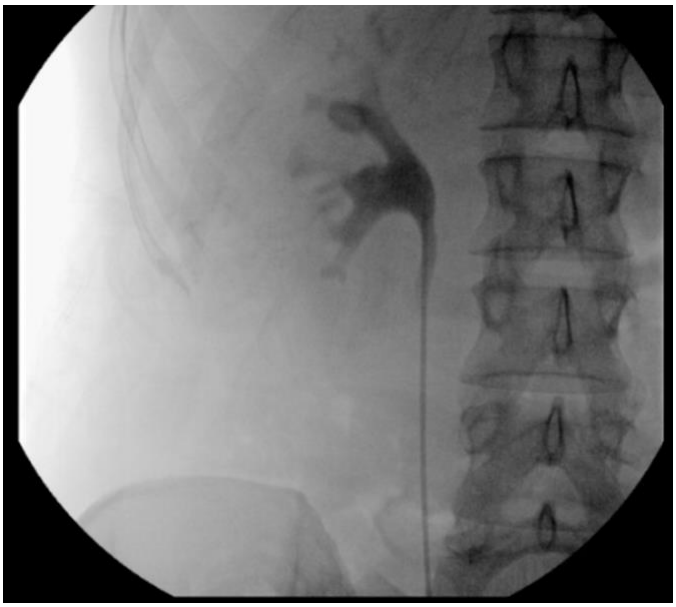
The 5 Fr ureteral catheter can be used to direct the wire into the ureteral orifice.

5. A 5 or 6 Fr open-ended ureteral catheter can then be advanced 2-3 cm up the ureter, over the wire under direct vision.
6. The wire can then be withdrawn leaving the catheter in the distal ureter. Radio-opaque contrast material is instilled into the ureter and kidney while fluoroscopic images are obtained. For a system without hydronephrosis, only 5-8 cc

of contrast should be necessary. For a hydronephrotic system, up to 30 cc of contrast may be needed to fully characterize the ureter, renal pelvis and calyces.

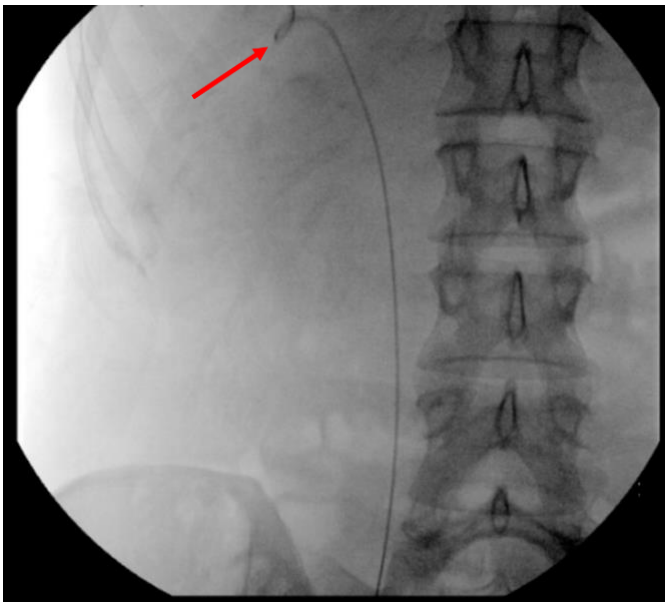


Endoscopic placement of a 5 Fr ureteral catheter (Red arrow) into the right ureteral orifice.



Right retrograde pyelogram showing a mildly dilated renal pelvis.

7. The wire can then be passed via the ureteral catheter to the renal pelvis under fluoroscopic guidance. If fluoroscopy is not available, ultrasound can be used to confirm that the wire reaches the renal pelvis; a pyelogram is not done in this circumstance.



A hydrophilic-tipped wire placed into the right renal pelvis- note that the tip of the wire is coiled (Red arrow,) indicating that it has reached the pelvis.

8. A double-J ureteral stent should then be advanced over the wire to the renal pelvis under direct vision. This is done on most stents by advancing the stent until a thick black marker is visible at the ureteral orifice. Once all of the stent is within the scope, you will need to use the stent pushing catheter, along the guidewire, to continue to advance the stent into position.

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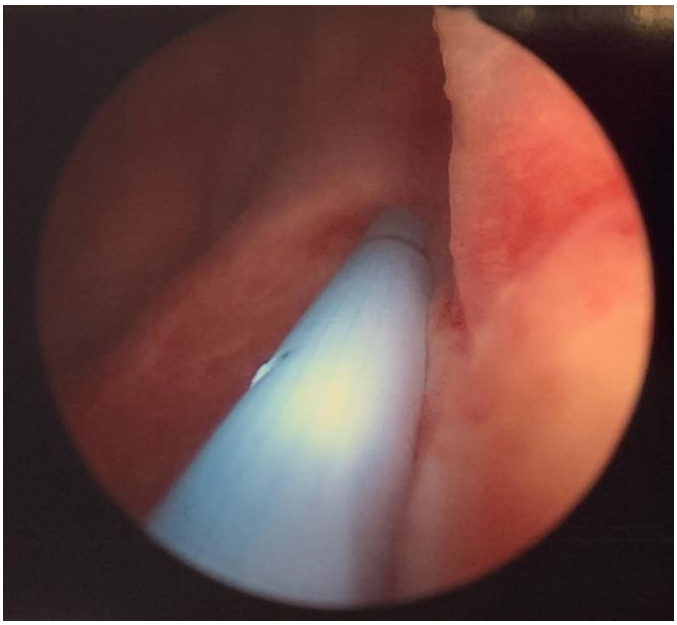
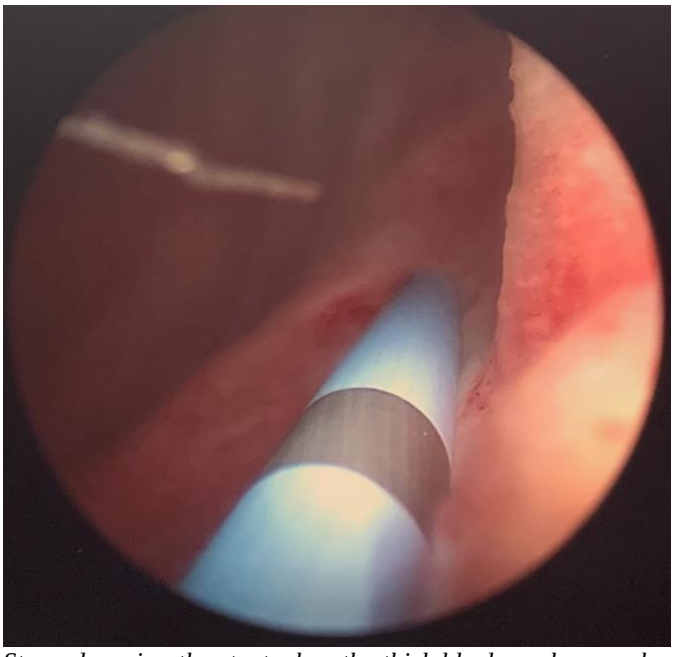
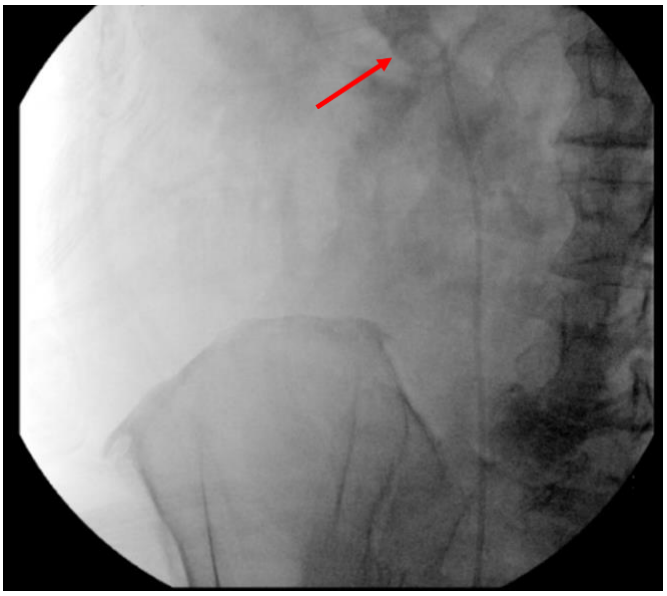


Stent being advanced over the wire, up the ureter.



Stop advancing the stent when the thick black marker reaches the ureteral orifice.

9. The wire should then be partially withdrawn so that its tip is distal to the ureteropelvic junction, this releases the proximal curl within the renal pelvis, which can be confirmed with fluoroscopy or ultrasound. Note that the wire should remain within the distal stent, which allows you to continue using the stent-pushing catheter.



Double-J stent curl (Red arrow) deployed in the right renal pelvis. Note that the curl is fully open, indicating that it is within the renal pelvis

Ultrasound of the kidney shows the curl of the stent within the renal pelvis. Source: Bardapure M, Sharma A, Hammad A. Saudi J Kidney Dis Transpl [serial online] 2014 [cited 2022 Jun 13];25:109-12. Available from: https://www.sjkdt.org/text.asp?2014/25/1/109/124514

10. The scope should be pulled back to the bladder neck, using the stent-pushing catheter to maintain the stent in position until the stent pushing catheter is just barely visible at the bladder neck. The wire can then be completely withdrawn, which deploys the distal curl of the stent in the bladder.

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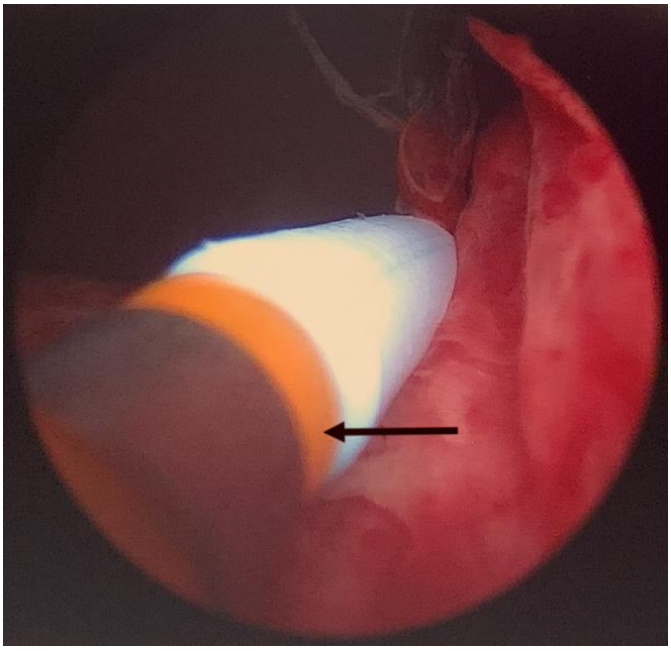
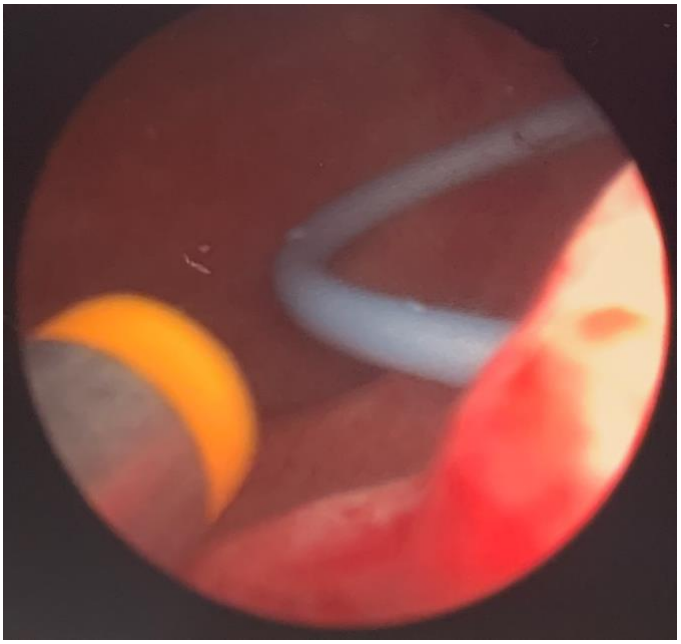


Stent pushing catheter (Black arrow) just visible at the bladder neck.



Once the position of the stent is acceptable, the guidewire is withdrawn. The proximal stent then assumes a curl, as seen here. The stent pusher is still visible at the bladder neck.

Distal stent curl deployed in the bladder.

Pitfalls:

- Real-time imaging is essential for endoscopic management and may be a limitation in some settings. Placement of a stent without imaging can lead to misplaced stents outside of the collecting system and devastating ureteral or renal pelvis injuries. It is possible to use ultrasound to confirm guidewire and stent placement in the renal pelvis, but this adds complexity to the case and requires a skilled ultrasound operator.
- Placing the stent with the distal curl proximal to the ureteral orifice (in the ureter but not in the bladder) leads to very difficult stent removal and may even cause paradoxical obstruction. This should be avoided by careful and methodical stent placement under direct vision as described in Step 10 above.
- Patients must be counseled about stent symptoms. These include flank pain, hematuria, and urinary frequency and urgency. These symptoms can mimic both urinary tract infection and obstruction and are distressing to patients who are not offered appropriate anticipatory guidance. Hematuria is inevitable and generally harmless. Flank pain can be treated with acetaminophen, non-steroidal anti-inflammatory

medications and alpha-adrenergic blockers. Frequency and urgency can be treated with anticholinergics or beta-3 agonists.

- One of the most devastating complications of stent placement is loss to follow-up with an indwelling stent. Stents encrust over time and this can lead to ureteral stricture and obstruction, sometimes requiring lithotripsy or percutaneous surgery for removal. Without intervention, stent encrustation can lead to loss of the renal unit.

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