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IUJ VIDEO

Cystoscopic ureteral stent placement: techniques and tips

Brian J. Linder[1,2] · John A. Occhino[2]

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Abstract

Introduction and hypothesis We present a video demonstrating technical considerations and tips for cystoscopic placement of external, lighted, and internal ureteral stents.

Methods Cystoscopic ureteral stent placement is useful in cases where difficult pelvic periureter dissection is expected or encountered. In this video, we review cystoscopy basics, our approach to various types of retrograde stent placement, and performing retrograde pyelograms. Traditional external ureteral stent and lighted stent placement for prophylactic purposes are discussed, with attention to understanding stent markings, appropriate resistance, and steps for externalization. Internal, double-J ureteral stent placement with the use of fluoroscopy is initiated with placement of a guidewire. An open-ended ureteral catheter is advanced over the wire in the pelvic portion of the ureter, and a retrograde pyelogram is performed. The wire is reintroduced and the stent advanced to the renal pelvis under fluoroscopy. The proximal curl is confirmed to be in the appropriate position with fluoroscopy. The string attached to the stent is then cut and removed, the guidewire is removed, and the stent is deployed with the distal curl in the bladder.

Conclusions This video reviews key steps for cystoscopic ureteral stent placement in a prophylactic setting, cases of challenging anatomy, or ureteral injury.

Keywords Cystoscopy · Ureteral stent · Retrograde pyelogram · Ureteral injury

Introduction

Ureteral injury is a potentially serious complication of pelvic surgery, with an estimated rate of 0.4–2.5% during benign gynecologic surgery [1]. This risk may be increased in cases of large pelvic masses, endometriosis, advanced malignancy, pelvic inflammatory disease, or previous radiation [2]. In cases where difficult periureteral dissection is anticipated, selective preoperative ureteral stent placement may aid in intraoperative ureteral identification, dissection of the ureter, and intraoperative identification of an injury should one occur [2, 3]. The latter is an important consideration, as early identification decreases perioperative morbidity and mortality [4]. Additionally, when minor ureteral injuries or ureteral obstruction is encountered, ureteral stent placement provides decompression, preservation of renal function, and allows for adequate healing [5]. In this setting, performing a retrograde pyelogram to guide stent placement is an important consideration. Blind stent placement in the setting of injury or obstruction can worsen the degree of ureteral injury or lead to ureteral perforation. To familiarize pelvic surgeons with various methods for cystoscopic ureteral stent placement, we present a video highlighting several techniques and tips.

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✉ Brian J. Linder
Linder.Brian@mayo.edu

[1] Department of Urology, Mayo Clinic, 200 First Street SW, Rochester, MN 55905, USA

[2] Department of Obstetrics and Gynecology, Mayo Clinic, Rochester, MN, USA

Materials and methods

We start with a review of basic cystoscopy, including cystoscope assembly. The cystoscope is composed of three components: a lens, a working port, and a sheath. For stent placement, we prefer using a 70° lens, with the working ports

attached to an Albarran bridge to allow deflection of the wire or stent, and a 22-F sheath to accommodate stent passage.

Using a cadaveric specimen, we demonstrate techniques for traditional external stent placement (i.e., ureteral catheters), lighted ureteral stent placement, retrograde pyelography, and double-J ureteral stent placement. For traditional external ureteral stent placement, it is important to be cognizant of stent-length markings, which are visualized cystoscopically during stent placement. There should be minimal resistance during stent placement, before reaching the renal pelvis or an upper-pole calyx. If resistance is encountered before this, stent advancement without fluoroscopy should be stopped, as a mucosal flap or ureteral perforation may occur. In this setting, a retrograde pyelogram should be considered for guiding stent placement (internal or external). The process can then be repeated as needed for bilateral stent placement. Once the stents are in place, the remainder of the stent can be externalized, secured to a Foley catheter, and placed to drainage for monitoring during the case.

Lighted ureteral stents are external stents that emit infrared light in either a continuous or intermittent fashion from a powered filament within the stent lumen. They may be useful in laparoscopic or robotic cases given less tactile feedback. For placement, a 0.035 sensor-tip guidewire is advanced up the ureter until gentle resistance is felt proximally in the kidney, usually an upper-pole calyx. With the wire in place, the transparent open-ended ureteral catheter sheath is placed over the guidewire and advanced, with careful attention to the stent markings. The wire is then removed, and the ureteral catheter sheath is externalized and secured to a Foley catheter in a similar fashion to traditional external ureteral stent placement. Once secured, a light fiber is connected to a power source and advanced through the transparent sheath, and the stent can be illuminated during the pelvic portion of the surgery.

Internal double-J ureteral stent placement can be used prophylactically when one expects distorted pelvic anatomy and there is a need to retain the stent temporarily in the postoperative period or in the event of ureteral obstruction or minor injury. Here, an appropriate indwelling ureteral stent length must be selected, as the position of the distal stent curl (across the midline) has been associated with greater stent-related discomfort and voiding symptoms [6]. Several methods can be used to estimate the appropriate stent length [7–9]. It can be estimated from measuring the distance from renal pelvis to ureteral insertion on the coronal view of a computed tomography (CT) scan, directly measured with a ureteral catheter, or estimated using the patient's height (formula: height in inches minus 42 for adults, or height category: 5 ft. 10 in. to 6 ft. 4 in. predicted to need a 24-cm stent) [7–9]. Stent diameter has not been associated with the degree of stent-related discomfort, and most commonly, a 6- or 7-F stent is used [10].

Internal double-J stent placement typically includes use of fluoroscopy and retrograde pyelography and is initiated with placement of a 0.035 sensor-tip guidewire. After placement of the wire (or before if using a Rutner catheter) a retrograde pyelogram is performed. This allows evaluation of ureteral anatomy, assessment for contrast extravasation (which would be seen in a ureteral injury) and ureteral obstruction, and identifies filling defects (e.g., as would be seen with urolithiasis, urothelial cancer, or other space-occupying pathologies). If using a ureteral catheter for the pyelogram, the catheter is advanced over the wire in the distal pelvic portion of the ureter, the wire removed, contrast instilled through the ureteral catheter, and fluoroscopy used to carry out the retrograde pyelogram. The wire is then reintroduced and advanced to the renal pelvis. Using a push–pull technique, the ureteral catheter is removed while maintaining the wire in the renal pelvis. The stent is then advanced over the wire to the renal pelvis under cystoscopic and fluoroscopic guidance with use of a stent pusher. Cystoscopically, the surgeon can rely on markings on the outside of the stent to determine how far it has been advanced. Once it has been advanced to the renal pelvis, partially withdrawing the guidewire forms the proximal stent curl, which can be confirmed on fluoroscopy. A curl of at least 180° is preferred due to the risk of stent migration. If an inadequate curl is seen, the stent can be manipulated using the string attached to the distal portion and the stent pusher. Once an adequate proximal curl is confirmed, the string is cut and removed while the stent pusher is held to maintain stent position. The guidewire is then completely removed, the cystoscope pointed away from the ureteral orifice, and the pusher advanced to deploy the distal stent curl. The distal curl should also have at least a 180° curl, and, as noted above, should not cross the midline in the bladder [6].

Conclusions

A variety of techniques are available for cystoscopic ureteral stent placement both for prophylactic purposes and in the event of obstruction or injury. It is important that pelvic surgeons be familiar with these techniques, which may be useful when approaching challenging pelvic surgeries or inadvertent ureteral issues.

Compliance with ethical standards

Conflicts of interest None.

Consent Written informed consent was obtained from the patient for publication of this video article and any accompanying images.

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