Ureteral Stents: *To Stent or Not to Stent, That Is a Great Question*!

22

David A. Schulsinger

Simple Stent Facts

- Unlike cardiac stents that are permanent, straight and metallic, ureteral stents are temporary, curled on both ends and usually made of plastic.
- The purpose of a stent is to provide urinary drainage and dilation of the ureter.
- Stents come in different material and sizes and are used in a variety of circumstances.
- One of the potential consequences of stent placement is stent colic. Patients may experience significant irritative voiding symptoms including urinary frequency, urgency, nocturia and dysuria.

Some stones will move from the kidney and lodge within the ureter causing a blockage, referred to as ureteral obstruction. The back up of urine that ensues will cause the kidney to swell, known as hydronephrosis. This hydronephrosis may translate in significant flank pain, which can eventually bring a patient to the ER. To unblock the ureter, a ureteral stent is placed. The purpose of this chapter is to discuss conditions for which stent placement is indicated and what to anticipate while you have a stent.

D.A. Schulsinger, MD
Department of Urology,
Stony Brook Medicine, Stony Brook, NY, USA
e-mail: endourology@yahoo.com

What Is a Stent?

A ureteral stent is a specially designed hollow tube, made of a flexible material that is easily placed in the ureter. Small perforations along the outside of the stent (Fig. 22.1) allow urine to travel in and out of the tube the same way fish can move in and out of coral reef. Most ureteral stents are referred to as double J stents (i.e., DJ or JJ stent) as demonstrated by the J-shaped curls in the upper and lower portions of the tube (see Fig. 22.2). Unlike a cardiac stent placed in the coronary blood vessels, ureteral stents are temporary, bridging the kidney to the bladder with a tube within the ureter.

Stents are designed in a variety of different materials, different rigidity, different lengths, and different diameters to provide various benefits depending on the situation. Most stents are made of a polyethylene plastic-like material, which is used for ureteral stone or stricture treatment procedures. Some stents are also made of titanium that can withstand obstruction or blockage of the ureter. These stents are used in cancer patients that may experience obstruction or blockage of the tube.

The length of the stents used in adult patients varies between 22 and 30 cm. For children and shorter patients, there are smaller length and diameter stents. These tubes are also used in transplant patients where the stent bridges a short segment of ureter connecting the transplanted kidney to the native bladder.

D.A. Schulsinger (ed.), *Kidney Stone Disease: Say NO to Stones!*,
DOI 10.1007/978-3-319-12105-5_22,

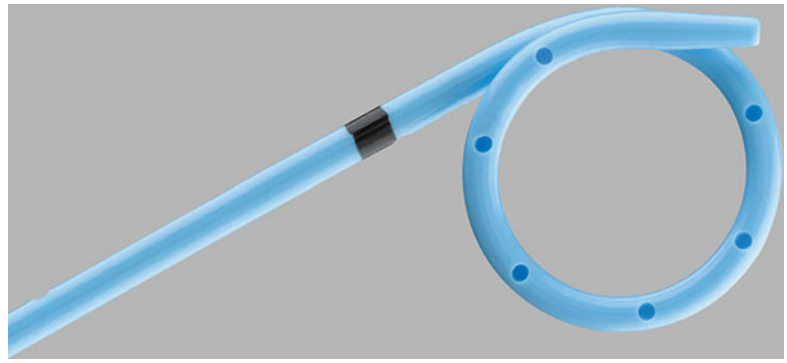

Fig. 22.1 Small openings in the stent allow urine to drain in and out of the stent

Fig. 22.2 Ureteral stent demonstrating the curls on each end

What Are the Advantages of Having a Ureteral Stent?

A Urologist will place a ureteral stent in a patient for several reasons. These include:

- **Obstruction:** If there is a blockage in the ureter, called an obstruction, this may result in hydronephrosis. A ureteral stent will allow urine to flow from the kidney to the bladder even when the ureter is blocked due to a stone, ureteral stricture, etc. In this situation, the ureteral stent keeps the ureter patent and allows urine produced by the kidney to drain, avoiding potential renal damage, called acute kidney injury (AKI). Severe pain is avoided with the ureteral stent in place, as the kidney is able to drain properly.
- **Infection:** The risk of infection in the urinary tract is reduced with the stent in place.
- **Injury:** On occasion, there can be an injury to the ureter. This may result from blunt (motor vehicle accident) or penetrating trauma (gunshot wound). Ureteral injuries can occur due to a surgical procedure, called an iatrogenic injury during a urological procedure (i.e., ureteroscopy) or non-urological procedure (i.e., hysterectomy or colon surgery). In this situation, a ureteral stent is inserted to protect the ureter and to insure proper healing. Without the placement of a stent, a severe narrowing of the ureter, referred to as a stricture, may develop resulting in poor drainage of the kidney and possible kidney injury.
- **Swollen ureter:** The irritation of a stone against the walls of the ureter can result in edema and narrowing of the ureter. Likewise, multiple trips with a ureteroscope to remove stone fragments, called ureteral manipulation, may result in irritation and swelling of the ureter, resulting in a smaller lumen. The presence of a ureteral stent allows the swelling to resolve and the ureter to open up to it's normal diameter which may take up to 1–2 weeks.
- **Narrowed ureter:** If a stone is severely obstructing the ureter or the ureter is naturally small, it may be too tight for a ureteroscope or

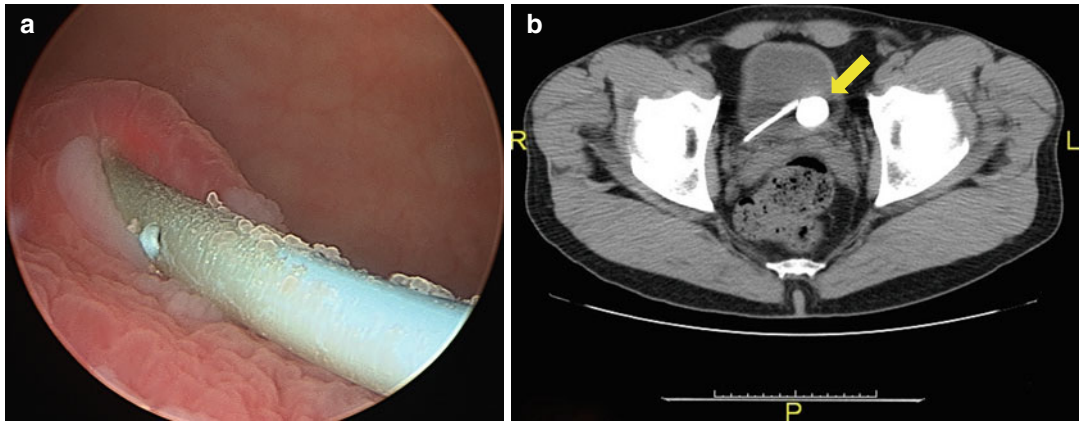

Fig. 22.3 (**a**) Cystoscopic view from the bladder demonstrating calcifications along the outside of a stent protruding through the ureteral opening (orifice); (**b**) Axial CT scan image of a calcified stent (*yellow arrow*) within the bladder from a different patient

other instruments to pass. If passing a ureteroscope is unsuccessful, a stent is placed to aid in the stretching of the ureter. This dilation may allow the stone to pass. Otherwise, the distention of the ureter over time may aid the urologist to successfully pass a ureteroscope and remove the stone during a future procedure.

- **Prophylaxis:** A patient may undergo a stone procedure (ureteroscopy, ESWL or PCNL) where there are multiple stones in the kidney, referred to as high stone burden. During this procedure, the stone fragments that are generated can get stuck in the ureter forming a column of stones, called steinstrasse (German for street of stone). In anticipation of stone fragments resulting in steinstrasse, a stent can be placed to avoid a future obstruction.

What Are the Disadvantages of Having a Ureteral Stent?

Most patients will do fine with the inserted stent, some however, may have some symptoms related to the stent. Most individuals are able to endure the ureteral stent without any event. Some patients are unable to accept the stent. It is not possible to forecast which individuals will have side effects from the stent and those that will not. Some of the issues secondary to the stents include:

- **Blood:** Stents can cause **blood** to appear in the urine intermittently or continuously. During physical exertion, the movement of the stent and rubbing of the stent against the bladder can produce blood in the urine.
- **Pain:** Individuals may experience pain in the back (loin), bladder area, groin, penis or testicles in men or urethra in women. This discomfort or pain may be more noticeable after physical exertion and after voiding. This can occur when urine refluxes up to the kidney when passing urine.
- **Irritative voiding symptoms:** The stent can cause irritation to the base of the bladder resulting in irritative voiding symptoms. This includes greater frequency, urgency and getting up at night to void. These symptoms can sometimes be improved by medication.
- **Calcified Stents:** Most ureteral stents can stay in for up to a year. Rarely, do stents become calcified in this period of time. If a stent stays in longer than that, referred to as the "retained" or the "forgotten stent", the consequence of which is it may become encrusted (Fig. 22.3) and difficult to remove, requiring additional procedure(s) to decalcify and remove the stent.
- **Displaced Stents:** Stents can move from their initially placed position. When this movement occurs, the stent usually migrates into the

bladder causing irritative voiding symptoms (i.e., frequency, urgency), pressure in the bladder and/or blood in the urine.

- **Stent colic:** Typically, the ureter is a one-way street with the flow of urine going in a forward direction from the kidney to the bladder. Occasionally, stents may irritate the bladder generating spasm and causing symptoms of frequency and urgency to urinate. As a result, urine can reflux within the tube to the level of the kidney. This retrograde flow of urine may result in colic of the kidney, or stent colic. Medication can be given to alleviate these symptoms, including narcotic analgesics, NSAID's, phenazopyridine, anticholinergics, beta-agonists and alpha blockers (see Chap. 23).

It is important to re-emphasize that these problems with the stent occur in some patients. Like a prescribed medication, most patients who take a drug are getting the favorable benefits of the medication. Some, however, will have a reaction. This is similar to the stent. Such issues may be short lived only after the stent is first placed and resolve several days later. Rarely, individuals may experience persistent symptoms throughout the treatment course and until the stent is removed.

Are There Any Limitations While I Have a Ureteral Stent?

With a stent in your urinary tract, you are able to do your regular activities. Individuals can go to work and are able to participate in sports with a stent. Individuals may be limited to the extent to which they perform these activities. While there may be greater frequency, urgency and getting up at night to void, this can be curtailed with medications described above.

Individuals are typically concerned about traveling with a stent in place. When an individual with an obstructing ureteral stone, the advantage of traveling with a stent, compared to without, is that the stone in unable to obstruct the ureter and kidney. If a patient has a stone procedure close to the time of travel, my preference is to err on the side of leaving the stent in place until after they return, especially in remote areas where access to a urologist or an emergency room is limited. With regard to sexual activity, there are no restrictions with a stent in place; however, pleasure may be limited due to the adverse events described above. In summary, the best advice is to listen to your body-*it will tell you what you can and cannot do*!

When Should You Contact Your Urologist?

Following your stent placement, you will most likely have a follow up date with your Urologist to have your stent removed or to discuss your staged procedure to have your stone surgery. However, there may be situations that require you to contact your Urologist sooner:

- **Intractable pain:** If there is constant and unbearable pain related to the stent.
- **Symptoms of infection:** If there are symptoms of infected urine, including fever, rigors, and painful urination.
- **Protruding stent:** If the stent has fallen out or seen protruding at the level of the urethra.
- **Bleeding:** If there is a significant amount of blood in the urine with clots or the blood is thick like ketchup.

How Is a Ureteral Stent Inserted?

I always tell the patient that the short answer for how a stent is placed is "carefully!" A ureteral stent is inserted usually under a general anesthesia either by itself (i.e., stent placement for an obstructing stone) or in combination with another procedure. After advancing the cystoscope is through the urethra and into the bladder, a stent is passed through the cystoscope and into the ureter. The placement and positioning of the stent is performed under direct vision and verified with fluoroscopic x-rays.

Is There an Alternative to a Ureteral Stent?

In some circumstances, there may be a ureteral stone that was removed or ureteroscopic procedure that was uneventful, where there is little to

no irritation to the ureter. Under these circumstances, the urologist may decide that it is not necessary to have a stent placed. This is typically the exception rather than the rule. In managing a patient's expectations, the patient should assume that a stent will be placed during their urologic procedure.

There may be circumstances, however, where a tube is required, but it does not necessarily mean it's a stent. There are two other options to consider:

- **Open-ended catheter:** This is a straight catheter, rather than a catheter with a curl, that extends from the kidney and extends through the ureter and bladder like a ureteral stent, but differs by extending out the urethra. This is a tube that is placed, for example, when contrast needs to be injected into the kidney when a stone is difficult to visualize during an ESWL procedure. These tubes can be simply removed by gently pulling them out without the need for a cystoscopic procedure.
- **Nephrostomy tube:** This is a tube that goes directly into the kidney from the back. The nephrostomy tube is typically inserted by an interventional radiologist in the x-ray suite (rather than the operating room) under local anesthesia. This is the preferred means of draining the kidney in a patient with an obstructing stone with signs of sepsis (i.e., fever or elevated white count). While this tube has a larger diameter and drains better, this type of tube is less desirable than a stent as it extends out the back and drains to a leg bag.

How Is a Stent Removed?

A ureteral stent is removed with a cystoscope performed in the office or in the operating room, under local or general anesthesia, respectively. A special flexible telescope, called a cystoscope, is passed through the urethra. A grasper, called a 3 prong grasper, is passed through the scope and the stent is grabbed and removed under vision. The entire procedure is performed in a few minutes.

Alternatively, the stent is manufactured with a string attached to one end. The stent can be placed with a string attached. This string will traverse your urethra and will be taped to the inner thigh in women or glans penis in men. This will allow the individual to avoid a cystoscopic procedure when the stent is removed. Discuss with your Urologist prior to your original procedure if there should be a string or *no strings attached*!

Conclusion

In summary, a stent is tube that can be a friend and a foe! The main objective for ureteral stent placement is to divert the urine that is blocked by the ureter. By unblocking the ureter, urine can drain from the kidney to the bladder. Unfortunately, the stent can sometimes have some less desirable side effects that may irritate your bladder. Your Urologist can work with you and even provide some medication that will help relax your bladder and make it less susceptible to stent colic. The saying, "*no pain*, *no gain*" *need not apply*!

I was 26 years old when I had my first foreign body placed within my body! The doctor told me it was a double-J stent or DJ stent. My urologist told me the tube was to bypass my stone lodged and stuck in my ureter. Well, the "Disc Jockey" of a stent was making much louder music than I could possible stand to hear! It was irritating my bladder so, that I had a constant urgency, frequency and burning to urinate. I also had flank pain, something he called stent colic. I thought colic was something only babies had. Well, I must be a big baby, as these symptoms rushed me straight back to the ER. My urologist put me on a medication, an anticholinergic, which relaxed my bladder so that it will not be irritated by the stent. My symptoms completely resolved. This was music to my ears! Now that DJ stent is playing music I can appreciate!