Ureterostomy, Suprapubic Catheter, Nephrostomy, Neobladder and Ileal Conduit

Urinary tract anatomy
The urinary tract consists of two kidneys, two ureters, a urinary bladder, and a urethra. The kidneys filter blood and removes water and waste through the urine. The urine travels from the kidney to the bladder through tubes called ureters. The urine is stored in the bladder, and then moves through the urethra to be passed out of the body during urination.

Cutaneous Ureterostomy
A cutaneous ureterostomy, also called ureterocutaneostomy, detaches one or both ureters from the bladder, and brings them to the surface of the abdomen with the formation of an opening (stoma) to divert the flow of urine away from the bladder when the bladder is not functioning or has been removed. The following conditions may result in a need for ureterostomy:

- Birth defects, such as spina bifida
- Malfunction of the bladder
- Spinal cord injury
- Bladder cancer

There are four common types of ureterostomies:

- Single ureterostomy. This procedure brings only one ureter to the surface of the abdomen.
- Bilateral ureterostomy. This procedure brings the two ureters to the surface of the abdomen, one on each side.
• Double-barrel ureterostomy. In this approach, both ureters are brought to the same side of the abdominal surface.
• Transuretero ureterostomy (TUU). This procedure brings both ureters to the same side of the abdomen, through the same stoma.

The pre-surgery evaluation also includes an assessment of overall patient stability. The quality, character, and usable length of the ureters are usually assessed using any of the following tests:
• Intravenous pyelogram (IVP)
• Retrograde pyelogram (RPG)
• Antegrade nephrostogram
• CT scan
• MRI with intravenous gadolinium

Postoperative Care
Following ureterostomy, urine needs to be collected in bags. Several designs and varieties of bags are available. One type features an open bag fitted with an anti-reflux valve, which prevents the urine from flowing back toward the stoma. A urostomy bag connects to a larger collection bag that may be attached to the bed at night. Urostomy bags are available as one- and two-piece bags:
• One-piece bags: The adhesive and the bag are welded together. The advantage of using a one-piece appliance is that it is easy to apply, and the bag is flexible and soft.
• Two-piece bags: The bag and the adhesive are two separate components. The adhesive does not need to be removed frequently from the skin, and can remain in place for several days while the bag is changed as required.

After surgery, the condition of the ureters is monitored by IVP testing, typically repeated postoperatively at six months, one year, and then yearly.
Risks
The complication rate associated with ureterostomy procedures is less than 5–10%. Risks related to the urinary tract during surgery include injury to adjacent structures, such as bowel or vascular entities. Inadequate ureteral length may also be encountered, leading to ureteral kinking and subsequent obstruction. If plastic tubes need inserting, their malposition can lead to obstruction and eventual breakdown of the opening (anastomosis). Anastomotic leak is the most frequently encountered complication.

Alternatives
There are several alternative to the Ureterostomy procedure:

• Suprapubic Catheter
• Vescicostomy (described in another Clinical Topic)
• Nephrostomy
• Neobladder
• Ileal conduit urostomy
• Indiana pouch

Suprapubic Catheter
Suprapubic catheters are inserted surgically into the bladder through the lower abdomen above the symphysis pubis. They are placed on a temporary or long-term basis to drain urine from the bladder. Indications for the use of a suprapubic catheter include urethral strictures, urethral trauma, and gynecologic, urethral or bladder surgery. The catheter allows the urinary system to recover while healing from trauma or surgery. The catheter tip has a small balloon that helps to hold it in place inside of the bladder. An outside stitch may also secure the catheter. There are advantages to the suprapubic catheter; the patient may void naturally when the catheter is clamped, and it is more comfortable than the indwelling catheter. However, the suprapubic catheter can cause bladder spasms and cramps. These symptoms can be lessened with increased hydration or analgesia. Daily care will depend on the prescriber’s orders, but the cleaning and dressing of the catheter site is similar to that for any surgical drain.

Suprapubic Catheter in place
**Nephrostomy**

A nephrostomy is created when the flow of urine is diverted directly from the kidneys to the abdominal wall. Tubes are placed within the kidney to collect the urine as it is generated, and transport it to the abdominal wall. This procedure is usually temporary; however, it may be permanent for cancer patients.

The nephrostomy has multiple functions but is used most frequently to provide urinary drainage when the ureter is obstructed and retrograde access is inadvisable or impossible. A nephrostomy can also be used to gain access to the upper urinary tract for various antegrade endourologic procedures, such as intracorporeal lithotripsy, chemical stone dissolution, antegrade radiologic studies of the ureter, and double-J stent placement. Nephrostomy has several other functions, including the following:

- To remove or dissolve renal calculi
- To obtain direct access to the upper urinary tract for various endourologic procedures
- To diagnose ureteral obstruction, filling defects, and anomalies via antegrade radiography
- To deliver chemotherapeutic agents to the renal collecting system
- To provide prophylaxis after resection for local chemotherapy in patients with tumors of the renal pelvis

An assessment of blood serum creatinine can be used to help evaluate obstruction and dilatation of the renal pelvis. Elevated levels indicate that the renal pelvis obstruction is related to kidney function. A renal scan is helpful in borderline cases (ie, when the renal pelvis is normal or minimally dilated and the creatinine level is slightly elevated).

To determine whether an obstruction is new or old, the patient's history is essential. Old radiographs or sonograms can also be helpful. Most commonly, acute obstruction is caused by renal stones, whereas chronic obstruction is caused by renal or ureteral tumors and postoperative and radiation strictures of the ureter. A prior instance of renal failure was usually due to chronic obstruction.

The most dangerous cases of renal obstruction occur in patients who have urosepsis with renal obstruction and elevated creatinine levels. Fast renal access can be lifesaving in these patients. However, as with any procedure, the patient's general situation and prognosis must be evaluated prior to the procedure.
Indications

Percutaneous nephrostomy can be lifesaving in the treatment of acute or chronic upper urinary tract obstruction. It is the first step in obtaining antegrade access to the kidney for various procedures. Specific indications for percutaneous nephrostomy include the following:

- Acute or chronic upper urinary tract obstruction in which access to the kidney is impossible from the lower urinary tract because of stones, infections, tumors, or anatomic anomalies, especially when a double-J stent cannot be placed through the ureter because of above-mentioned circumstances.
- When a patient’s creatinine level is rising above the reference range and the urine cannot be drained through the ureter.
- Renal pelvis disorders (eg, UPJ obstruction, horseshoe kidneys, ureter duplex, ureter fissures, double renal collecting systems)
- Hydronephrosis in renal transplant allografts.
- Treatment of staghorn calculi and large or lower-pole kidney stones when extracorporeal shockwave lithotripsy [ESWL] is less likely to be successful.
- Contraindications to ESWL (ie, size of patient): Most ESWL units have a weight limit of 140 kg (approximately 300 lb).
- Body habitus that prevents ESWL (eg, contractures): Disabled patients occasionally cannot be positioned on an ESWL unit in a prone or supine position.
- Stones or tumors associated with distal obstruction or a foreign body that cannot be removed through the ureter instantly for operative procedures within the renal collecting system.
- Prolonged sequential dilatation.
- When rapid dilation of the nephrostomy tract is required.

Neobladder to Urethra Diversion

This procedure most closely mimics the storage function of a urinary bladder. With this procedure, a small part of the small intestine is made into a reservoir or pouch, which is connected to the urethra. The ureters are repositioned to drain into this pouch. As with the Indiana Pouch, this downward flow of urine from the kidneys into the pouch helps prevent urine back up, which helps protect the kidneys from infection. Urine is able to pass from the kidney, to the ureters, to the pouch, and through the urethra in a manner similar to the normal passing of urine. To be a candidate for this surgical procedure, there must be a low risk of cancer recurrence in the urethra, and patients must be able to pass a catheter into the urethra to empty the pouch if necessary.

Advantages:
• The process of urination most closely matches normal urination.
• No stoma is needed.
• The kidneys are protected from urine back up and infection.

Disadvantages:
• Surgery time is slightly longer than the Ileal Conduit Urinary Diversion procedure.
• Urinary incontinence (leakage of urine) is normal after surgery — while regaining control of urination — but might last up to six months. Also, about 20 percent of patients during the night and 5 percent to 10 percent of patients during the day are incontinent, requiring the wearing of a pad.
• Despite the surgery, some patients might not be able to empty their bladder well and will need to perform occasional catheterization (passing tubing through the urethra into the pouch every four to six hours) for a prolonged period of time after surgery and perhaps permanently.

Neobladder to Urethra Diversion: Intestine is made into a reservoir and connected to the urethra

Ileal Conduit
In this procedure, also known as “Bricker’s Loop”, the ureters are detached from the bladder and joined to a short length of the small intestine (ileum). The ureters drain freely. One end of the ileum piece is sealed off and the other end is brought to the surface of the abdomen to form the stoma. An ostomy bag is worn over the stoma to collect urine. In this procedure, urine and stool remain separate.
Ileal Conduit Urinary Diversion: A segment of the intestine directs urine through a stoma into an external collecting bag.

**Advantages:**
- It is a relatively simple surgery.
- It requires less surgical time (compared with other surgical methods).
- There is no need for occasional catheterization.

**Disadvantages:**
- There is a change in body image.
- It uses an external bag to collect urine, which might leak or have odors.
- Urine could back up into the kidneys, causing infections, stone formation in some patients, and organ damage over time.

**Indiana Pouch Reservoir**
With this type of surgery, a reservoir or pouch is made out of the cecum and a portion of the ileum. A short piece of small intestine is then brought out through a stoma in the abdominal wall. The remaining ileum is first attached to the large intestine to maintain normal digestive flow. The ureters are repositioned to drain into this pouch. The urine flows freely in a downward direction from the kidneys into the pouch. This positioning prevents urine from backing up into the kidneys, which protects the kidneys from infection. Unlike the Ileal Conduit, no external bag is needed, and the stoma is very small and can be covered with an adhesive bandage. Instead, a one-way valve is surgically created to keep the urine inside the pouch. Several times a day, usually every four to six hours, a catheter must be passed through the stoma and into the pouch to empty the urine. Regardless of the surgical method, Ileal Conduit or Indiana Pouch, urine and stool remain completely separate from each other.

**Advantages:**
- Urine is kept inside the reservoir, until it is ready to be emptied.
- No external bag is necessary.
- There is no odor.
- The risk of urine leaking is minimal.
• The small stoma can be covered with an adhesive bandage.
• The risk of reflux of urine into the kidneys is lessened, lowering the risk of infection.

Disadvantages:
• The surgical time is longer compared with the Ileal Conduit.
• There is the need for occasional catheterization, every four to six hours.

Indiana Pouch Reservoir: A pouch made out of portions of intestines stores urine until it is drained via a catheter inserted through the stoma.

Resources

Mosby Skills
Ostomy Appliance: Change (PSA)
Urinary Catheters: Suprapubic Catheter Care (PSA)

Organizations

References

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Nephrostomy  


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