



Right Total Ureterectomy

with Right Transurethral Resection of Ureteral Orifice

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A Case Study

Five years prior, a 67-year-old male had his right kidney removed due to the presence of a large renal mass. With no evidence of pathological involvement, the right ureter was left in situ. However, more recently, the patient was diagnosed with Stage 1 TCC of the trigone of the urinary bladder, which was resolved due to surgical intervention. Chronic hypertension has led to end stage renal disease in his left kidney and he currently undergoes hemodialysis. Now the patient has presented with hematuria and right flank pain. After diagnostic testing, it was determined that there has been a recurrence of TCC, this time in the right ureter. The surgeon opted for a total right ureterectomy and transurethral resection of the right ureteral orifice.

PATHOPHYSIOLOGY

Malignant ureteral neoplasm and the potentially resulting tumor can disrupt a number of urological processes in the otherwise healthy patient. Stricture or occlusion of the ureter caused by a filling defect can lead to reflux nephropathy, a diseased state where the urine backflow damages the kidney tissue.⁶ Metastasis to the urinary bladder is common, occurring in 30%-75% of all ureteral cancer patients. Cancer cell seeding through the blood also may involve the liver, lungs or bone surrounding bone.⁴

If the patient has not had a previous nephrectomy, reflux nephropathy is not a concern; however, antegrade metastasis is a possibility. Comorbid conditions may include a history of transitional cell carcinoma of the bladder, benign renal neoplasm resulting in a right nephrectomy, hypertension, end stage renal disease (ESRD) and hemodialysis to compensate for kidney failure.

LEARNING OBJECTIVES

- ▲ Examine the anatomy of the urinary system
- ▲ Review the pathophysiology affected by the patient's condition
- ▲ Recall the stages of surgical intervention performed during this case
- ▲ Discuss why this case had multiple procedures performed
- ▲ List the multiple equipment sets needed for this procedure

Transitional cell carcinoma, or TCC, is a type of malignant cancer found in the flexible transitional tissue of the renal pelvis and ureter. While rare, it is most often found in people with a genetic predisposition, smokers, analgesic abusers or people employed in the chemical processing or coal industries. Men are more likely to develop TCC than women as are Caucasians over other races. Common symptoms include hematuria, flank or back pain, weight loss, fatigue and dysuria.²

There are multiple types of non-metastatic tumors that can affect the kidneys, including oncocytoma. Predominantly found in men older than 60, oncocytoma typically presents as a single large tumor in one kidney.

Hypertension is a disease state where the force of the blood through the arteries is increased due to arteriostenosis and/or increased blood volume, causing damage to the blood vessels. High blood pressure can weaken the blood vessels in the kidneys, resulting in the compromised water excretion and fluid exchange. Extra fluid in the system can increase blood pressure, leading to greater kidney damage. This cycle can continue until the kidneys can no longer keep up with the filtration demands of the body, which results in renal failure.⁵

End stage renal disease, or ESRD, occurs when the kidneys are unable to keep up with the filtration and excretion needs of the body. Without intervention, ESRD is fatal. Treatment options are kidney transplant or hemodialysis.¹

DIAGNOSTIC TESTING

To diagnose ureteral TCC, the physician will use a combination of exam and history data, radiographic imaging, urinalysis and indirect visualization via cystoscopy/ureteroscopy. Radiographic imaging can include a CT scan, intravenous (IV) or retrograde urography and/or ultrasonography. CT scans are useful for distinguishing renal calculi from soft tissue masses. Urography, whether administered through the circulatory system or transurethral, uses contrast medium and fluoroscopy to map the path of the urine through the urinary tract. It is especially useful in highlighting strictures or dilatation of urinary structures. If the patient only has one kidney, IV urography is contraindicated. A urinalysis is used to confirm the presence of hematuria and to test for a urinary tract infection. Cytological examination of urine samples for shed TCC cells is not a reliable diagnostic test for ureteral cancer unless or until it becomes a high stage cancer.⁴

PREPARATION FOR SURGICAL INTERVENTION

For this case, in order to successfully complete the right total ureterectomy and transurethral resection of the right ureteral orifice, a series of smaller procedures were required. The surgeon and team prepared for a cystoscopy, ureteroscopy, retrograde urography, ureteral catheter insertion, ureteral dilatation and bladder biopsy. The procedure progressed in two stages: the first stage included all of the transurethral procedures while the second stage included abdominal procedures. Two setups were required to prevent cross-contamination. Repositioning and redraping also occurred between stages one and two.

The required instruments, supplies and equipment for both stages had to be ready in the room before the procedure began, which required additional time to gather the

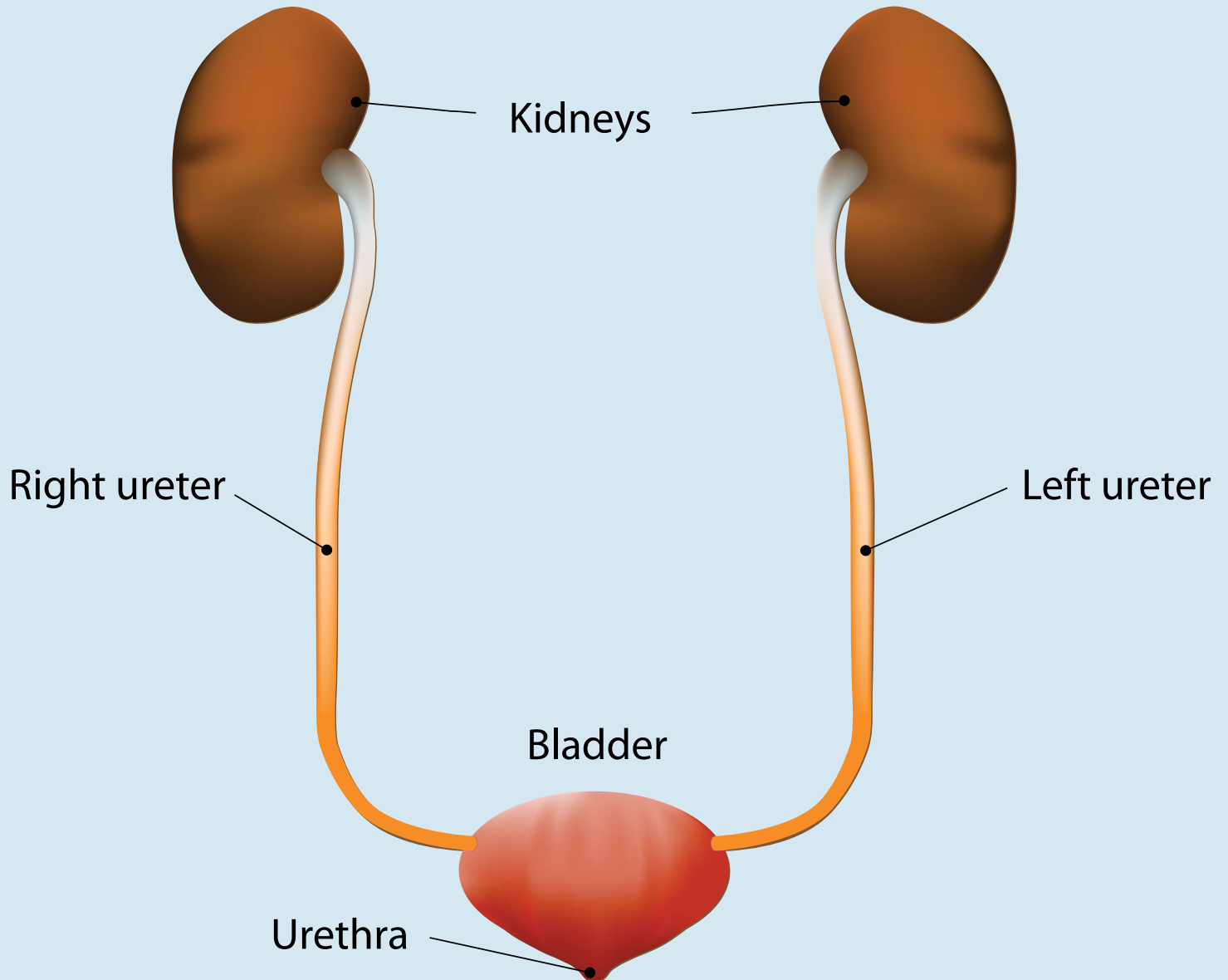
Transitional cell carcinoma, or TCC, is a type of malignant cancer found in the flexible transitional tissue of the renal pelvis and ureter.

needed items and to prepare both setups. Supplies common to both procedures included a suction apparatus and tubing, sterile towels, sterile gowns and gloves, an electro-surgical dispersive pad, sequential compression stockings, positioning devices and prep kits.

SURGICAL INTERVENTION

The patient is intubated and general anesthesia is given. The transurethral portion of the procedure is carried out with the patient in the lithotomy position with slight Trendelenburg (to shift the abdominal organs away from the bladder) using padded Allen stirrups. A foam headrest is used and the arms are secured to the arm boards and positioned at an angle of less than 90 degrees. The pads are used to protect the ulnar nerves bilaterally. For the abdominal portion of the procedure, the patient is placed in the

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supine position and secured with a safety strap. Heel, ulnar and lumbar pads also are used.

For the transurethral approach, the circulator preps the perineum with a povidone iodine solution using a concentric circle motion from the penis outward, always discarding the sponge after passing over the anus. The prep extends laterally and inferiorly as far as possible and superiorly to just above the umbilicus. The bladder is drained using a rubber catheter. The abdominal approach uses a second povidone iodine prep beginning at the midline just inferior of the umbilicus and radiating outward in concentric circles to end superiorly at the intermammary line, laterally as far as possible and the symphysis pubis inferiorly.

Drapes for the transurethral approach begin with placement of an under-buttocks drape with an attached drainage pouch and suction port, leggings for each leg and a fenestrated cystoscopy drape. For the abdominal procedure, a towel is placed under the penis to isolate it from the anus. Four towels are then placed around the incision site, and a laparoscopic-assisted vaginal hysterectomy drape is placed. This drape allows the surgeon to access the Foley catheter and the ability to manipulate the bladder as needed.

For this case, no incision was made for the transurethral approach. For the abdominal approach, a ventral paramedian incision, about four inches long, is made over the bladder.

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ANATOMY AND PHYSIOLOGY OF THE URINARY SYSTEM

The normal urinary tract anatomy from proximal to distal is as follows: two kidneys, one located on each side of the spinal gutter in the retroperitoneal space. The kidneys filter waste and excess fluid from and return nutrients to the bloodstream. Descending from each kidney is a tubular structure called a ureter. The ureter is a muscular tube that proximally attaches to the hilum of the kidney and distally to the trigone of the urinary bladder. It transports urine from the renal pelvis to a storage location in the bladder. The single urinary bladder is a muscular structure located in the pelvis. The bladder outflows into the urethra, and in males, it passes through the prostate and then terminates at the urethral meatus.

CYSTOSCOPY, URETERAL DILATION AND CATHETERIZATION

The 30° scope was attached to the single bridge. Light, power and suction/irrigation lines are attached to the scope, and the scope is inserted into bladder through the urethra. In this case, the surgeon noted the significant scar tissue resulting from the previous bladder cancer resection and used the electro-surgical loop to remove a tissue specimen from the bladder to be sent for frozen section. The surgeon then will attempt to locate the right ureteral outlet by probing with the 5 Fr ureteral catheter. For this case, this step proved ineffective, and the surgeon was forced to switch to the .035-mm angled guidewire, which also failed to find the ureteral orifice so a .035-mm straight wire was attempted. After approximately an hour and a half of probing and resection with the electro-surgical loop, the ureteral orifice was revealed. The ureteral catheter was then reintroduced, but could only be inserted 4 cm into the right ureter due to stenosis.

Contrast medium was injected through the urethral catheter, and a fluoroscopic imaging using the C-arm tracked the path of the medium. The imaging showed a distal filling defect blocking the path of the ureteral catheter so the ureteroscopy and further ureteral catheterization were abandoned.

URETERECTOMY

A #20 blade is used to make the skin incision. Using a combination of blunt finger dissection and electrosurgical dissection, the surgeon will work down to the peritoneum while an Army Navy retractor is used. Once the peritoneum is entered, a Balfour self-retaining retractor is placed to expose the surgical site. The surgeon then uses curved Mayo scissors and 0 polyglactin 910 to resect and tag the proximal end of the ureter. The ureter is grasped with Babcock forceps while it is dissected from the retroperitoneal space. A clip applier is used to apply two clips distally and one clip proximally to the ureter, which is then cut between the second and third clip, freeing it from the patient. The ureteral section is sent to pathology for frozen section.

Ringed sponge forceps are used to grasp the serosa of the bladder and manipulate it to access the right ureteral orifice. A combination of ring sponge forceps, Kocher's forceps and 6-inch Rochester-Pean forceps are used to grasp the bladder and ureter while the electrosurgical unit with an extended tip is used to circumscribe the ureteral orifice, creating a cuff of bladder. A medium malleable retractor is used to assist with manipulation. The bladder is then closed with 2-0 polyglactin 910 suture. The ureteral orifice also is sent to pathology for biopsy. With sutures placed in the abdominal muscles and again subcutaneously, the peritoneum is exited.

Once the cystoscopy is complete, a count of sponges used on the cystoscopy table are counted and removed from the field and bagged. As the closure of the abdominal portion of the procedure begins, a bladder count, peritoneal count and a final (skin) count of all items is performed. The dressings are then applied.

POST-OP

A 10-mm flat Jackson-Pratt drain is placed in the abdominal cavity before closure and the drain line is secured. The abdominal incision is dressed with wound closure strips cut into thirds. A few 4"x4" gauze sponges are placed next, followed by a large abdominal pad and surgical tape. The transurethral procedure was Class II: clean-contaminated because the urinary tract was entered. The abdominal procedure began as Class I: clean until the bladder was entered to circumscribe the ureter orifice, then it became clean-contaminated.

Following this type of procedure, the patient will generally spend as long as week in the hospital before being released. Many patients with this condition usually experience a relapse of TCC.

Transurethral Supplies

Cystoscopy back table pack with associated specimen cups
Irrigation tubing
Drapes
Marking pen
Lubrication
10 ml syringes
Sterile basin
Electrosurgical cord
26 Fr electrosurgical loop
Nonconductive glycine
5 Fr ureteral catheter
Angled guidewire .035 mm x 150 cm
Stiffer straight wire .035 mm x 150 cm
Toomey syringe
24 Fr 3-way Foley catheter with catheter plug and cap
Electrosurgical generator
C-arm for fluoroscopy
Video system
Camera, power and light cables

Abdominal Supplies

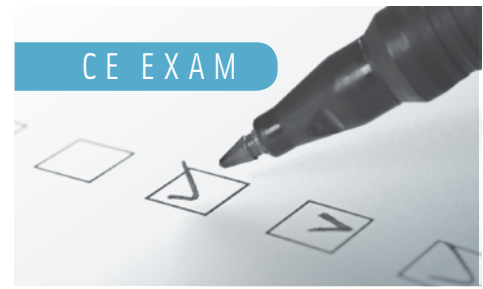
General back table pack with associated materials and drapes
Peanut dissectors
Penrose drain
Flat 10-mm Jackson-Pratt drain with 100 ml reservoir
Laparotomy sponges
Dressings
Sutures: 3-0, 2-0 and 0 polyglactin 910
#20 and #15 blades
Warming system
Medium clip applier and clips

Other Supplies Included for This Case

Basic cystoscopy tray
Cystoscopes
Bridges
Stopcocks
Three instrument sets were prepared: major instruments, major retractors and genitourinary instruments

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Right Total Ureterectomy

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1. Reflux nephropathy is when the urine backflow damages the _____.
 - a. Ureter
 - b. Kidney
 - c. Bladder
 - d. Liver
2. Metastasis to the urinary bladder is common, occurring in as many as ____ of all ureteral cancer patients.
 - a. 40%
 - b. 30%
 - c. 65%
 - d. 75%
3. Hypertension is a diseased state where the force of blood and increased blood volume causes damage to the _____.
 - a. Arteries
 - b. Kidneys
 - c. Blood vessels
 - d. Urinary bladder
4. There were two patient positions for this procedure. What was the second position?
 - a. Trendelenburg
 - b. Lithotomy
 - c. Supine
 - d. Both b and c
5. The peritoneum was entered, and a _____ was placed to expose the surgical site.
 - a. Balfour self-retaining retractor
 - b. Army Navy retractor
 - c. Kocher's forceps
 - d. Babcock retractor
6. Three instrument sets were prepared for this case. They included:
 - a. Major instruments
 - b. Minor retractors
 - c. Genitourinary instruments
 - d. Both a and c
7. Oncocytoma is usually found as a single large tumor in the _____.
 - a. Bladder
 - b. Kidney
 - c. Liver
 - d. Penis
8. TCC is a type of malignant cancer found in the flexible transitional tissue of the ____ and _____.
 - a. Kidney and renal pelvis
 - b. Ureter and kidney
 - c. Penis and renal pelvis
 - d. Renal pelvis and ureter
9. Common symptoms of TCC include:
 - a. Flank pain
 - b. Nausea
 - c. Heart palpitations
 - d. Night sweats
10. During the transurethral approach of the ureterectomy, the skin prep extends just above the _____.
 - a. Intermammary line
 - b. Symphysis pubis
 - c. Umbilicus
 - d. Bladder

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