Urology Overview - Part I
Common Procedures and Terminology
CERTIFIED INSTRUMENT SPECIALIST (CIS) TECHNICIANS MUST have a wide array of knowledge and skills as they undertake their responsibilities in Central Service (CS) departments. Among them are a basic understanding of the surgical procedures for which specific instrumentation is used, and a general vocabulary of surgical procedure terms.

This lesson is the first in a two-part series. It provides an overview of cystoscopy, explains common medical conditions for which it is used, and reviews related urological terminology.

**OBJECTIVE 1: PROVIDE AN OVERVIEW OF CYSTOSCOPY**

Cystoscopy involves a visual examination of the interior walls and contents of the bladder, the body organ (sac) in which urine is collected and held for excretion. This term is used broadly because various urological procedures may be carried out at the same time by using specially-designed instruments inserted through a cystoscope. Note: a cystoscope is an endoscope fitted with a light. It is designed to pass through the urethra to visually examine the bladder and the ureters, the tubes that help urine move from the kidneys to the bladder.

A complete cystoscopy is a surgical procedure that extends beyond the bladder into the ureters. This procedure may be performed for several reasons:

- Drainage of the renal pelvis for diagnosis or to study renal function;
- Insertion of ureteral catheters to allow drainage for one or both kidneys, or to identify the position of the ureters for a difficult pelvic surgical procedure;
- Insertion of a ureteral stent to drain an obstructed ureter;
- Transluminal dilation of a urethral stricture (a procedure to enlarge a narrowed section of a urethra);
- Manipulation and removal of a calculus (stone). Stones can form in the bladder, as well as the kidney.

**OBJECTIVE 2: EXPLAIN COMMON MEDICAL CONDITIONS TREATED WITH COMPLETE CYSTOSCOPY PROCEDURES**

Several urological procedures are commonly performed:

**URETERAL ENDOSCOPY OR URETEROSCOPY PROCEDURES**

These procedures may use both rigid and flexible cystoscopes. Short and long fiberoptic ureteroscopes allow the surgeon to directly visualize ureteral tumors, calculi and strictures. The urologist visualizes the urethral orifice (opening) through which the cystoscope is inserted into the bladder. A radiopaque (something that cannot be penetrated by x-rays) ureteral catheter is inserted through the cystoscope and into the ureter. The catheter has graduated markings in centimeters to enable the urologist to judge the distance the catheter has been inserted. During the surgery the urologist must request the required size and catheter tip that is needed. Note: various sizes and types of ureteral catheters should always be available for use when requested.
URETERAL STENT PLACEMENT
An in-dwelling ureteral stent is inserted into the ureter to permit long-term urine drainage necessitated by a wide variety of benign and malignant diseases that cause ureteral obstruction. Note: these stents are not allowed to remain indefinitely. The recommended maximum time is three months, with exchange of the stents if longer term placement is required.

Stents can be made of durable and biocompatible silicone, polyurethane, or another co-polymer (a molecular construction in which two different types of molecules are joined in the same polymer chain). The stents can have a collar, a double-J configuration, a pigtail, or a coil to minimize displacement up into the renal pelvis or down into the bladder.

A stent is passed through the cystoscope over a guide wire into the ureter. Other stents may be used to identify ureters and provide external drainage during a surgical procedure. It is important to know the patient’s height, as this will determine the length of stent size the surgeon will insert. Stent diameter will be determined by the surgeon and based on condition of the ureter(s) at the time of the procedure. When CIS technicians are responsible for maintaining the supply of ureteral catheters and stents it is vital that they understand the various sizes and styles are not interchangeable.

TRANS-URETHRAL RESECTION OF PROSTATE (TURP)
This procedure is used to treat moderate-to-severe enlargement of the prostate gland. This gland is part of the male reproductive system and secretes a fluid contained in seminal fluid. While the correct term for the procedure is “adenomectomy” (removal of a portion of the prostate), the more common term of “prostatectomy” is often used.

TURP is the most common surgical procedure to remove part of the prostate, and it accounts for about 90% of all prostate-related surgeries. A resectoscope is used with a cauter loop to remove the interior portion of the prostate gland. When CIS technicians prepare case carts for TURP procedures they must ensure that the correct resecting instruments are matched with the correct cutting loops. These items are brand specific and are not interchangeable. Note: several types of lasers may also be used to desiccate the prostate gland. It is important to know the type of laser listed on the surgery schedule so the correct instrument components are included in the case cart.

GREEN LIGHT LASER THERAPY
This procedure uses a small fiber inserted into the urethra through a cystoscope. The fiber delivers high-powered green wavelength laser energy that quickly heats the prostate tissue, causing it to vaporize. The laser has a wavelength that is easily absorbed by hemoglobin, so tissue with blood in it, including the prostate, is selectively vaporized.

Vaporization will continue as long as the applicable tissue is painted by the laser. Once the prostate’s capsule is reached, vaporization ceases (the prostatic capsule is fibrous and without hemoglobin, and is protected by the laser’s properties), and the procedure is complete. The CIS technician preparing the case cart and instruments must understand that the surgeon will always use the 30-degree cystoscope in the Green Light Laser set. If the 30-degree lens is not available, the procedure cannot be done.

TRANS-URETHRAL RESECTION OF BLADDER TUMOR (TURBT)
This is an endoscopic procedure performed to diagnose and treat benign bladder tumors or cancer. The tumor is cauterized and removed from the bladder with a rigid cystoscope and resectoscope instrumentation. Note: superficial bladder tumors may be simply cauterized or destroyed with a laser.

PERCUTANEOUS NEPHROLITHOTOMY/NEPHROLITHOTRIPSY [PCNL]
First, let’s define some terms:
- “Nephrolithotomy” is formed from two Greek words that mean “kidney” and “removing stones by cutting.”
- “Percutaneous” means through the skin.
- Nephrolithotripsy is a combination of the root word nephro (kidney), litho (stone) and tripsy (crushed).

Renal calculi form when the patient’s urine becomes supersaturated (over-loaded) with mineral compounds that can form stones. This condition may occur because the patient has low urinary output, is excreting too much salt, or has very highly acidic urine. Urolithiasis is the medical term for the formation of kidney stones, and the word is sometimes used to refer to disease conditions associated with kidney stones.

Kidney stones range in size from microscopic groups of crystals to objects as large as golf balls. Most smaller calculi pass through the urinary tract without causing problems or requiring surgical intervention. Calculi are sent to pathology for analysis to determine their composition which, in turn, dictates treatment protocols.

There are several types of kidney stones in terms of chemical composition:
- Calcium oxalate calculi. About 80% of calculi in United States patients are of this type. Some foods such as rhubarb and spinach are high in oxalic acid, which is also formed in the body when Vitamin C is broken down. Oxalic acid is ordinarily excreted in the urine, but it may be absorbed in large amounts due to chronic pancreatic disease or surgery involving the small intestine.
- Uric acid calculi. These stones develop from crystals of uric acid that form in
highly acidic urine and account for about 5% of kidney stones. In addition, some kidney stones form from a combination of calcium oxalate and uric acid crystals.

- Stuvite and cystine calculi represent the remaining 15% of kidney stones. Struvite stones form in response to an infection, such as in the urinary tract. These stones can grow quickly and become quite large, sometimes with few symptoms or little warning. Cystine calculi form in people with a hereditary disorder that causes the kidneys to excrete too much of certain amino acids.

Risk factors for kidney stones include:
- Male gender (although more women are having kidney stones);
- Race. Caucasians are more likely to develop kidney stones than African Americans;
- Family history. Having a first-degree relative with urolithiasis (the process of forming stones in the kidney, bladder, and/or urethra) increases the risk of developing kidney stones;
- Age over 30;
- Diet. People with high protein diets or who eat oxalate-rich foods are more likely to develop kidney stones;
- Dehydration. One must drink enough fluid each day to replace what is lost through perspiration and excretion. If not, urine becomes concentrated, and it is easier for crystals to form in the urine and cause kidney stones;
- Metabolic disorders affecting the body’s excretion of salt or absorption of calcium or oxalate. Most cases of urolithiasis in children relate to metabolic disorders;
- Intestinal bypass surgery and ostomies. People who have had these surgical procedures lose larger-than-average amounts of water from the digestive tract because their electrolytes are not normal.

Between seven and ten people per 1,000 US adults are hospitalized each year for treatment of urolithiasis and about 10% of the population will suffer from kidney stones at some point. The percentage of people with kidney stones has been rising in North America since 1980. A person who develops one kidney stone has a 50% chance of developing another one.

The PCNL procedure is performed to remove calculi from the patient’s kidney with a nephroscope. Medium-sized or larger renal calculi are removed to relieve pain, stop bleeding into or obstructions of the urinary tract, treat urinary tract infections resulting from blockages, and/or remove calculi not broken by extracorporeal shock wave therapy. If the calculi are removed through the nephrostomy tube, the procedure is called nephrolithotomy. If the calculi are broken up using high frequency sound waves and then removed, the procedure is a nephrolithotripsy.

The PCNL procedure may begin in the radiographic biplane suite and conclude in the operating room (OR), or it may be done entirely in the OR. First, the surgeon makes a small incision in the lumbar area on the patient’s side overlying the affected kidney. The surgeon then creates a track from the skin surface into the kidney with dilators. A sheath is passed over the
last dilator to hold the track open, and a nephrostomy tube is placed into the renal pelvis for access.

The rigid nephroscope (included in the applicable instrument set) is then placed into the access tunnel. The surgeon may use a basket on the end to grasp and remove smaller kidney stones directly. Larger stones that are unable to pass through the ureters are broken up with a handheld electro-hydro lithotripsy (EHL). A new nephrostomy tube is placed in the access tunnel to drain fluid from the kidney into a drainage bag. A Pollack catheter is also placed in the access tunnel to maintain the integrity and placement of the nephrostomy tube.

The final step in the PCNL procedure is for Holmium laser therapy to remove the remaining calculi. This may be done the same day or at a later time based on the patient’s condition and availability of the holmium laser.

HOLMIUM LASER PROCEDURE

This minimally-invasive ureteroscopic procedure is most commonly used to remove small renal or ureteral calculi. The procedure can be performed with a cystoscope or through the skin after the PCNL has been performed. It involves use of a small laser fiber to break up the calculi with a laser tip that emits an intense light energy. The smaller pieces can then be extracted or flushed with irrigation. The Holmium laser can be used on all types of calculi. Generally, a ureteral stent is inserted at the end of the procedure to help facilitate the passage of stone fragments.

OBJECTIVE 3: REVIEW RELATED UROLOGICAL TERMINOLOGY

Here are some commonly-used urological terms and their definitions:

• Cystectomy – Removal of the bladder for invasive malignant disease.
• Cystoplasty – Repair of a bladder laceration or a rupture caused by trauma or a defect bladder wall.
• Cystotomy – An incision into the urinary bladder through a suprapubic (performed from above the pubis) incision.
• DVIU – Direct Visualization Internal Urethrotomy. A surgical procedure used to repair a narrow segment (stricture) of the urethra.
• Enterocèle – A vaginal hernia which occurs when the bladder and/or small bowel descends into the lower pelvic cavity and pushes on the upper vaginal wall. Note: they most commonly occur after hysterectomy procedures.
• Meato-tomy – Enlargement of the opening of the urinary meatus (initial opening of the urethra).
• Partial cystectomy – Partial removal of the bladder wall performed to remove benign lesions of the bladder wall.
• Radical cystectomy – Performed for invasive or advanced bladder cancer, the bladder and surrounding tissue is removed with a wide margin, including adjacent pelvic organs.
• Simple cystectomy – The removal of the bladder without removal of adjacent structures or organs. The procedure is performed for extensive benign bladder lesions that have made the bladder nonfunctional.
• Testicular torsion – A twisting of one or both testes that creates a urological emergency.
• Urethrotomy – Incision into a urethral stricture.

IN CONCLUSION

CIS technicians must have a basic understanding of the surgical procedures for which the instruments they process are used. Knowledge of urological terminology and procedures is useful because of the numerous surgeries involving the kidneys and bladder that are performed by surgeons in many healthcare facilities.

The second lesson in this two-part series will address basic information about cystoscopes and the procedures to properly process, handle and store them.