**VOIDING CYSTOURETHROGRAPHY (VCU)**

VCU remains the gold-standard examination for imaging the bladder and the urethra and detecting vesicoureteral reflux.

**Indication and Scheduling**

1. **Detecting vesicoureteral reflux in children** with a history of urinary tract infection or prenatal diagnosis of abnormal dilatation is the primary role for VCU. Alternative techniques are radionuclide cystography and voiding urosonography. Radionuclide cystography delivers less ionizing radiation than VCU, allows permanent recording, and, for this reason, is probably more sensitive to transient reflux. However, the ***anatomic detail provided by radionuclide cystography and voiding urosonography is poor***, and therefore none can be recommended as a first step examination.
2. **First evaluation of children with urinary tract infection is usually made by US and VCU**. Then, if reflux is shown, antibiotic prophylaxis is prescribed, surgery is considered, and follow-up is based on either voiding urosonography or radionuclide cystography. Follow-up VCU should be limited to medical centers where none of these techniques is available.

VCU in **children aged less than 4 years who had a proven urinary tract infection**. In older children, the prevalence of reflux being less important, the decision to perform VCU or not could be taken on an individual basis.

Symptomatic(fever or persistent dysuria) – VCU done as soon as clinical symptoms have

disappeared.

1. Rare indications –
* **Imaging of urethral malformation or trauma,**
* **Cloacal anomalies, ambiguous genitalia, or imperforate anus**
* **Pelvic or bladder tumors**
1. **Neurogenic bladder**
2. **Voiding disturbances**

**Technique**

**Plain AP radiograph Film**

Abnormal calcification, nephrocalcinosis, spinal deformation, bony abnormality, spinal surgery, pubic symphysis abnormality, and the position of prosthesis (VP shunt, JJ tube, bladder catheter, nephrostomy tube or other) all can easily be shown prior to administration of contrast medium. Attention should be paid to extra-urinary anatomy (think of congenital hip dislocation).

**Retrograde or Suprapubic?**

Retrograde access seems to be the most frequently used procedure and has a very low rate of complications; its main risk is post-procedural infection.

The suprapubic approach is mainly used in neonates with posterior urethral valves and in children in whom catheter placement can be difficult or painful (urethral trauma, hypospadias, cloacal malformation).

Suprapubic access requires preliminary bladder US. It can fail when the child voids during

Puncture. The risk of post-procedural infection decreases when using the supra-pubic approach.

**Catheter Risks**

Urinary tract infection -- risk higher in children presenting with a urinary tract malformation predisposing to urine stagnation (high-grade reflux, intrarenal reflux, megacystis-megaureter association, posterior urethral valve, ureteropelvic junction syndrome associated with ipsilateral reflux)

Urethral trauma

**Cyclic VCU**

Cyclic VCU has been shown to be more efficient in detecting reflux.

* three cycles of filling in non-toilet-trained children
* only one in older children

In the cyclic technique, the child voids twice around the catheter. Then, when the third micturition starts, the catheter is removed, and voiding pictures are taken.

**Micturition**

A good micturition study requires sequential filming (two spots/second) or a videotape recording

 in order to detect voiding dysfunction (absence of coordination between bladder contraction and external sphincter opening) or urethral abnormality.

Centered AP views in girls and oblique views in boys are adequate to analyze the urethra.

If reflux is detected during micturition (active reflux), oblique bladder views are useful to completely visualize the refluxing ureter including its retrovesical portion. The relationship

of the refluxing ureter and a bladder diverticulum is analyzed on this film.

AP views of kidneys should be taken to grade reflux, to look for intrarenal reflux, and to analyze the anatomy of the excretory system (reflux into the lower or upper pole of a duplex system, association of reflux, and ureteropelvic junction obstruction in the same renal unit).

A post-voiding film is taken to assess residual urine; it can also be useful to detect a bladder diverticulum.

In case of reflux, a 5-min delayed film is valuable to evaluate its clearance. Reflux associated with prolonged stasis is thought to increase the risk of severe infection