The role of Voiding Cystourethrography in detection of urological diseases in pediatrics

Thesis

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Presented by:

Samy Salim Mostafa Abdallah
M.B.B.Ch.

Supervised by:

Dr. Shaimaa Abdelsattar Mohammad, MD
Assistant Professor of Radio-diagnosis
Faculty of Medicine - Ain Shams University

Dr. Samar Ramzy Ragheb, MD
Lecturer of Radio-diagnosis
Faculty of Medicine - Ain Shams University

Faculty of Medicine,
Ain Shams University
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Samy Salim Mostafa Abdalla

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ANH	**Antenatally detected hydronephrosis**
AP	**Antero-posterior**
APD	**Antero-posterior diameter**
ASUH	**Ain Shams university hospital**
IQR	**Interquartile range**
IVC	**Inferior vena cava**
IVU	**Intravenous urography**
LV	**Lumber vertebra**
MRI	**Magnetic resonant image**
mSV	**milli-Sievert**
PBS	**Prune Belly Syndrome**
PUJO	**Pelvi-ureteric junction obstruction**
PUV	**Posterior urethral valves**
RUG	**Retrograde urethrogram**
S.D	**Standard deviation**
T12	**Thoracic vertebra 12**
UB	**Urinary bladder**
US	**Ultrasound**
UTI	**Urinary tract infection**
VCUG	**Voiding cystourethrography**
VUR	**Vesico-ureteric reflux**

INTRODUCTION

Voiding cystourethrography (VCUG) is considered one of the most important tools in the assessment of the different urologic conditions in pediatrics as vesico-ureteral reflux and urinary tract infection **(Ngo et al., 2013)**.

The pediatric genitourinary tract may be affected by many disorders, most of which are congenital as a posterior urethral valve (PUV) or acquired as urinary tract infection (UTI), bladder neck trauma, urolithiasis as well as unstable bladder **(Chan et al., 2008)**.

Patients presenting with signs and symptoms related to the genitourinary tract often need imaging for diagnosis and management. To diagnose these different conditions, a lot of imaging modalities are used as ultrasonography, Voiding cystourethrography (VCUG) and MRI.VCUG is the reference investigation for the study of vesico-ureteric reflux (VUR) **(Lee et al., 2018)**.

Moreover, the American Academy of Pediatrics recommended VCUG in conjunction with sonography as one part of the imaging workup of a febrile infant or child with a urinary tract infection (UTI) **(Finnell et al., 2011)**.

The VCUG is the most stressful urological investigation

performed on children so, up to a third of a large cohort of children with grade I, II or III reflux were lost to follow up, presumably in large part because of the need for repeated VCUG **(Johnin et al., 2018)**.

Familiarity with the anomalies and abnormalities that may occur in this patient population and the use of techniques that improve visualization of disease allow detection of most common pathologic conditions with very low radiation exposure **(Charron, 1995)**.

AIM OF THE WORK

To study the spectrum of different urinary tract abnormalities that could be detected in patients who underwent VCUG in pediatric radiology unit ASUH, and to correlate the imaging findings to their clinical presentation as well as revising the technical factors of VCUG employed in our unit that may result in excessive radiation exposure and affect disease depiction.

VOIDING CYSTOURETHROGRAPHY

Definition:

Voiding cystourethrography is defined as a test done to examine the bladder and urethra while the bladder fills and empties. The voiding cystourethrography (VCUG) is one of the most commonly performed fluoroscopic investigations in pediatric radiology departments as it is the investigation of choice for evaluation of the anatomy and the function of the lower urogenital tract **(Agrawalla et al., 2004, Beverley N et al, 2018)**.

Indications:

Voiding cystourethrography is used to patients with a wide variety of clinical conditions listed as following: **(Johnin et al., 2018, Kobayashi et al., 2019)**

1- Urinary tract infections (UTIs).
2- Vesicoureteric reflux (VUR).
3- Antenatal renal hydronephrosis.
4- Congenital urological anomalies as posterior urethral valves (PUV), bladder diverticula, hypospadias, cloacal abnormalities and Mullerian duct remnants.
5- Urine incontinence.
6- Bladder neck trauma and hematuria.

7- Incidental urolithiasis.
8- Renal transplantation as well as in the assessment of an unstable bladder.

Contraindications:

There is no absolute contraindication of VCUG. However, cautions should be taken during the procedure in the following circumstances: **(Beverley N et al, 2018)**

- The child has had a significant reaction to iodinated contrast media or suspected latex allergy **(Zerin et al., 1996)**.
- Child presented by acute UTI.
- Recent urethral or bladder surgery.
- Potential urethral trauma or high spinal injury (risk of autonomic dysreflexia).

Patient preparation:

VCUG can be performed without sedation when parents and children receive adequate preparation and support. When available, child-life specialists may provide education, distraction and relaxation techniques that are useful in facilitating catheterization as well as patient cooperation during the examination **(Rao et al., 2012)**. The warmed contrast material may be used to decrease patient distress **(Goodman et al., 2003)**.

When clinically indicated in select patients, sedation may alleviate distress and can be performed safely, without negatively affecting the examination **(Herd et al., 2006)**. If sedation is used, the child must undergo a pre-sedation evaluation and must be monitored both during and after the examination **(Beverley N et al, 2018)**.

The Technique:

1- Preliminary image:

Preliminary abdominal imaging is obtained before catheterization to exclude bone abnormalities, calcifications, foreign bodies, or other disease processes. If an abdominal radiograph or other stored image obtained within the past 3-6 months is available, a scout image may be unnecessary **(Fernbach et al., 2000)**.

2- Catheterization:

Under an aseptic technique, a small Foley's catheter (8 French for newborns, 10 French for infants) is inserted through the urethra till the bladder after retrograde injection of 2% lidocaine jelly into the urethra, in boys, to diminish sensation. The external portion of the tube is taped to the inner thigh in girls **(Fernbach et al., 2000, Gupta et al., 2017)**. In boys, once the catheter is inserted, a strip of tape may be placed on the catheter extending longitudinally along the dorsum of the penis to the