

FIRST EXPERIENCE IN VIDEOURODYNAMIC STUDY AT CIPTO MANGUNKUSUMO HOSPITAL IN 2012-2014

¹Nicholas Tambunan, ¹Harrina E. Rahardjo.

¹Department of Urology, Faculty of Medicine/Universitas Indonesia, Cipto Mangunkusumo General Hospital, Jakarta.

ABSTRACT

Objective: Accuracy of diagnosis is a fundamental thing in terms of plan of treatment. Nowadays, symptoms from lower urinary tract can be diagnosed accurately with videourodynamic study (VUDS). Videourodynamic combines a fluoroscopic voiding cystourethrogram with multichannel urodynamics, allowing anatomic and functional assessment of the bladder and outlet. **Material & Methods:** This research is a descriptive retrospective. Data was taken from the patients who underwent VUDS at Department of Urology Cipto Mangunkusumo Hospital from 2012 to 2014. Patient's characteristics were gender, age, chief complaint, working diagnosis pre investigation, and diagnosis after VUDS was performed. Then, data was analyzed in a descriptive fashion and presented using tables and narrative form. **Results:** There were 8 male patients (67%) and 4 female (33%) who underwent VUDS. Most of the patients were children (75%). Five patients (42%) complained about incontinence with or without other LUTS, only 1 patient (8%) had LUTS and disuria. Overall, working diagnosis pre investigation was neurogenic bladder with various causes. We found a variable diagnoses after VUDS. At filling phase, we found 7 patients (58%) with small bladder capacity, 5 patients (42%) with low bladder compliance then followed respectively by overflow incontinence (33%), detrusor overactivity (17%) and urethral sphincter incompetence (8%). At voiding phase, the most common abnormality detected were detrusor underactivity (42%), followed by infravesical obstruction (8%). VUR was found both at filling phase (42%) and voiding phase (33%). **Conclusion:** VUDS could be the first choice of modality for diagnosing dysfunction of lower and upper urinary tract especially in neurogenic cases.

Key words: Videourodynamic study, lower urinary tract symptoms.

ABSTRAK

Tujuan: Diagnosis yang akurat merupakan hal yang sangat penting dalam menentukan terapi yang tepat terhadap suatu penyakit atau gangguan fungsi organ tubuh. Dalam hal menilai disfungsi saluran kemih bawah, pemeriksaan penunjang videourodinamik dapat menjadi pemeriksaan yang paling akurat. Videourodinamik adalah kombinasi pemeriksaan urodinamik dengan fluoroskopi yang dapat menilai kelainan secara fungsional maupun secara anatomi saluran kemih bawah dan atas. **Bahan & Cara:** Penelitian ini merupakan deskriptif retrospektif. Data diambil dari pasien-pasien yang menjalani pemeriksaan videourodinamik di Departemen Urologi RSUPN Cipto Mangunkusumo dari tahun 2012-2014. Karakteristik pasien yaitu jenis kelamin, usia, keluhan utama, diagnosis kerja awal, dan hasil interpretasi pemeriksaan videourodinamik. Data dianalisis secara deskriptif kemudian disajikan dalam bentuk tabel dan naratif. **Hasil:** Kami mendapatkan 8 pasien (67%) laki-laki dan 4 pasien (33%) wanita yang menjalani pemeriksaan videourodinamik. Pasien terbanyak adalah usia anak (75%). Lima pasien (42%) menunjukkan keluhan inkontinensia dengan atau tanpa LUTS. Hanya 1 pasien (8%) yang mengalami LUTS dengan disuria. Secara keseluruhan diagnosis kerja awal adalah neurogenic bladder dengan etiologi yang berbeda. Didapatkan diagnosis akhir yang beragam sesuai temuan pemeriksaan. Pada kelainan fase pengisian didapat 7 pasien (58%) memiliki kapasitas buli kecil, 5 pasien (42%) dengan compliance buli menurun diikuti dengan overflow incontinence (33%), detrusor overactivity (17%) dan sfingter uretra inkompeten (8%). Kelainan fase miksi terbanyak adalah detrusor underactivity (42%) diikuti dengan obstruksi infravesika (8%). Kelainan refluks vesikoureter didapatkan pada fase pengisian (42%) maupun fase miksi (33%). **Simpulan:** Videourodinamik dapat menjadi pilihan utama dalam menentukan kelainan atau disfungsi saluran kemih bawah bahkan sekaligus memberikan gambaran disfungsi saluran kemih atas.

Kata Kunci: Videourodinamik, lower urinary tract symptoms.

Correspondence: Nicholas Tambunan; c/o: Department of Urology, Faculty of Medicine/Universitas Indonesia, Cipto Mangunkusumo General Hospital. Jl. Diponegoro No.71, Jakarta Pusat, DKI Jakarta 10430, Indonesia. Phone: +62213152892, Fax: +62213145592. Mobile Phone: +6281314671222. Email: drnicholas84@gmail.com.

INTRODUCTION

Accuracy of diagnosis is very important to determine therapies for diseases or organ malfunctions, including diseases or problem regarding lower urinary tract. The lower urinary tract is consist of urinary bladder and urethra. These two organs form an integrated functional unit working on collecting and excreting urine. Malfunctioning of that unit could disrupt the storage or voiding function,^{1,2} and these could be found in all ranges of age: children, adults, or even the elders. The etiology of lower urinary tract malfunction could be congenital, acquired or degenerative. The impacts of urinary tract malfunction range from lowering patients' qualities of life to creating morbidity. One of confirmatory examination that is able to diagnose the problem is urodynamic examination.¹⁻⁴

Urodynamic is a study to evaluate the dynamics of urinating physiology. This study has been used in many countries for more than a decade and it has become the main confirmatory test to diagnose the malfunctioning of lower urinary tract. It has been modified by combining it with imaging, which is popularly known as videourodynamic.^{1,5,6}

The videourodynamic test is a sophisticated test being able to assessing the etiology of difficult cases such as malfunctioning of lower urinary tract due to neurogenic causes, or primary obstruction of urinary bladder neck. This test is able to assess the physiology and anatomical visualization of lower urinary tract and detect upper urinary tract reflux simultaneously.^{1,7,8} Unfortunately, the test remain uncommon to be conducted in Indonesia, and Cipto Mangunkusumo General Hospital has performed only few such tests.

OBJECTIVE

This study aimed to report a first experience of conducting video urodynamic test.

MATERIAL & METHOD

This retrospectively descriptive study was conducted in Cipto Mangunkusumo General Hospital and included all patients undergone videourodynamic examination between 2012 and 2014. Data were collected by searching all register numbers of patients undergone videourodynamic test in Urology Department Cipto Mangunkusumo General Hospital to get patients' identity, chief

complains, clinical diagnosis, and video-urethrogram test interpretation. Diagnostic criteria were consist of urinary bladder capacity (small, normal, or large), abnormality of storing phase or micurition phase. The data then were analyzed descriptively and presented into tables and narrations.

RESULTS

Between 2012 and 2014, there were 12 patients who were undergone videourodynamic examinations in Urology Department Cipto Mangunkusumo General Hospital. The profile of subjects is presented in Table 1.

Subjects were characterized based on gender, age, chief complains, clinical diagnosis and urodynamics after videourodynamic examination performed. Among 12 patients undergone videourodynamic examination, there were 8 male patients (67%) and 4 female patients (33%). According to age, 9 patients (75%) were classified as children and the 3 others were adults. 5 patients (42%) had urinary incontinence as their only chief complain, whereas 5 others (42%) had urinary incontinence with lower urinary tract symptoms (LUTS), 1 patients (8%) had LUTS, and 1 (8%) had dysuria.

Prior to undergoing videourodynamic examination, clinical diagnosis has been determined from all patients involved in the test. All patients had specific indication of neurogenic bladder for undergoing videourodynamic examination. Spina bifida is the most common etiology (58%), followed by meningocele, lumbosacral agenesis, and other unknown etiologies. Hydronefrosis, both unilaterally and bilaterally have been found on 7 patients (58%). One patient (8%) previously had been diagnosed as VUR by MCU (micturating cystourethrogram).

Urodynamic diagnosis from videourodynamic examination was determined by findings from storage and micturition phase. During storage phase, urinary bladder capacity was evaluated. Most of subject (58%) had their urinary bladder capacity classified as small. VURs were found during storage phase (42%) or micturition phase (33%). The most common storage phase abnormality was lowering urinary bladder compliance (42%), followed by detrusor overactivity and urethral sphincter incompetence. The most common micturition phase abnormality was detrusor underactivity (33%), followed by overflow incontinence and intravesical obstruction.

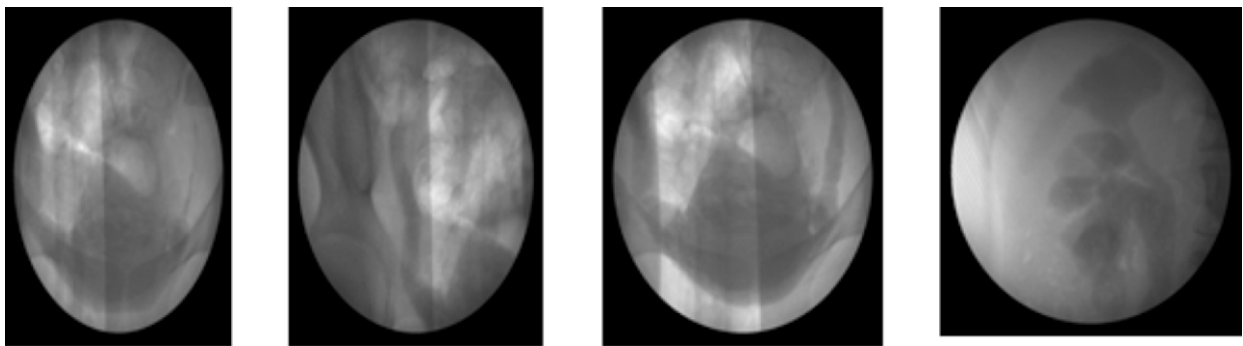
Table 1. Data characteristics profile.

No	Name	Gender	Age	Chief Complain			Clinical Diagnosis	Urodynamic Diagnosis
				I	D	L		
1	Ms. P	F	13	V		V	Neurogenic Bladder Spina Bifida	Normal urinary bladder capacity, Detrusor overactivity, Overflow incontinence
2	Ms. F	F	10	V			Urinary incontinence	Small urinary bladder capacity, Overflow incontinence, Detrusor Underactivity
3	Mr. S	M	39	V		V	Urinary incontinence, Right hydronephrosis and hydroureter on right nephrostomy	Small urinary bladder capacity, lowering urinary bladder compliance, grade 5 right VUR, Overflow Incontinence
4	Ms. S	F	18	V		V	Neurogenic Bladder, Bilateral hydronephroses, Spina Bifida	Small urinary bladder capacity, Detrusor Overactivity, grade 4 right VUR,
5	Mr. M	M	7	V			Urinary incontinence, Spina Bifida, Sacrococcygeal Meningocele	Grade 1 left VUR Small urinary bladder capacity, lowering urinary bladder compliance Detrusor Underactivity
6	Mr. R	M	15		V		Stage 5 CKD due to bilateral VUR	Large urinary bladder capacity, grade 4 right VUR, Grade 2 left VUR
7	Mr. Z	M	3	V			Urinary incontinence, Spina Bifida	Small urinary bladder capacity, intravesical obstruction
8	Mr. L	M	3	V			Neurogenic Bladder, bilateral Hydronephroses and Hydroureter, lumbosacral agenesis, Epilepsy	Small urinary bladder capacity, Detrusor Underactivity, Overflow Incontinence
9	Mr. Y	M	11	V		V	Neurogenic Bladder, Spina Bifida, bilateral hydronephroses Bilateral, urinary incontinence	Normal urinary bladder capacity, grade 4 right VUR, Grade 2 left VUR Urethral Sphincter incompetence
10	Mr. D	M	15	V		V	Neurogenic Bladder, Spina Bifida, bilateral hydronephroses, urinary incontinence	Normal urinary bladder capacity, Lowering urinary bladder compliance Detrusor Underactivity
11	Mr. K	M	4	V			Neurogenic Bladder, Spina Bifida, bilateral hydronephroses, urinary incontinence	Small urinary bladder capacity, lowering urinary bladder compliance, grade 4 left VUR, Overflow Incontinence
12	Ms. M	F	57			V	Neurogenic Bladder, bilateral hydronephrosis, right adrenal tumor cT2NoMo, type 2 DM	Small urinary bladder capacity, lowering urinary bladder compliance, Detrusor Underactivity

F=female, M=male, I=incontinence, D=dysuria, L=LUTS

Table 2. Urodynamic diagnosis characteristics.

Urodynamic Diagnosis	n (%)
Urinary bladder capacity	
Small	7 (58%)
Normal	4 (33%)
Large	1 (8%)
Abnormalities during storage phase	
Detrusor overactivity	2 (17%)
Lowering compliance (high pressure bladder)	5 (42%)
VUR during storage phase	5 (42%)
Urethral sphincter incompetence	1 (8%)
Overflow incontinence	4 (33%)
Abnormalities during miction phase	
Infravesica obstruction	1 (8%)
Detrusor underactivity	5 (42%)
VUR during miction phase	4 (33%)

**Figure 1.** Videourodynamic result of Ms. S, 18 years old with history of spina bifida. There was grade 4 right VUR and grade 1 left VUR, small urinary bladder capacity, and urinary bladder atony.

DISCUSSION

Videourodynamic testing procedure has been done in various countries for more than a decade and it has become a gold standard for diagnosing lower urinary tract dysfunction. This procedure was able to verify the physiology and anatomy of lower and upper urinary tract at the same time, because this technique combines the standard urodynamic testing with fluoroscopy. As Peng et al., said in one of their journal, videourodynamic could diagnose the etiologies of female patients with bladder neck obstruction anatomically and physiologically. American Urological Association (AUA) and International Continence Society (ICS) have been recommended this method as a gold standard, especially for patients with urinary disorders related to neurological abnormalities.^{1,7,8}

On this research, data showed that children were the most common participants who have been examined using this technique, with neurogenic bladder caused by different etiologies, as a working diagnosis. Several diagnoses have been made, which were concluded from storage phase and emptying phase. On a storage phase, several aspects could be concluded, such as bladder capacity (small, normal, or large), bladder compliance decrease, and detrusor overactivity (DO). On an emptying phase, some abnormalities could be seen, such as detrusor underactivity (DU) and infravesical obstruction. With a support of fluoroscopy, abnormalities could be found at the same time, such as VUR and incompetent urethral sphincter.

Based on the result of videourodynamic, the location of neurological lesion could be determined, and thus an appropriate therapy could be taken.

According to ICS, the neurological lesion from neurogenic bladder could be divided into two groups, upper motor neuron (UMN) lesion and lower motor neuron (LMN) lesion. The sacral spinal nerve 2-4 have been considered as the centre of innervation of lower urinary tract (lower motor neuron). If there were any abnormalities within the videourodynamic test results, such as small bladder capacity and detrusor overactivity, the location of the lesion possibly was in UMN. In an abnormalities of large bladder capacity and detrusor underactivity, the lesion possibly located in LMN.

In a condition of a normal bladder, when the storage phase occurs, bladder is able to manage the accommodation process, which is to increase the volume by maintaining the pressure (Pdet) below 15 cm H₂O, until it reaches the bladder compliance. On this research, the videourodynamic test result showed that most of the patients had a decreasing of bladder compliance and there was a VUR, not only on a storage phase, but also on an emptying phase. These conditions could cause hydronephrosis, upper urinary tract infection (pyelonephritis) and some alteration on renal functions. With this procedure of videourodynamic, those circumstances could be analyzed on the same time.^{1,3,9} Generally, the indication of videourodynamic procedure which been done in RSCM has been relevant. This procedure should definitely become a gold standard for neurogenic bladder cases.

The main principle of handling the neurogenic bladder cases is to preserve the function of renal or upper urinary tract. It could be done by maintaining bladder pressure stays low, prevent the occurrence of VUR, hydronephrosis, and recurrent urinary tract infection. The primary treatment to decrease bladder pressure could be a minimal invasive procedure such as clean intermitten catheterization (CIC).^{9,10,11} From the video-urodynamic testing result, we could estimate the frequencies of CIC per day by measuring the bladder volume when a decrease compliance occurs or when VUR happens. Under those circumstances, additional therapy could be given, oral medicamentous, for example. According to several guidelines, antimuscarinic agents (Oxybutynin, Tolterodine, Solifenacin) still become the primary drugs of choices for neurogenic bladder cases with DO and decrease of bladder compliance. The usage of those antimuscarinic agents could increase bladder capacity, reduce urinary incontinence periods, and reduce the frequency of CIC procedure. In refractory

cases with medical therapy, the alternative therapy is injection of Botulinum toxin (Botox®) to the detrusor muscle.^{9,11} Botulinum toxin is injected directly with specific dosage into the detrusor muscle, using the assistance of cystoscopy instruments. This toxin will restrain the neurotransmitters, creating muscle paralysis.¹² These drugs have also been proved to increase the capacity and the compliance of the bladder. If patients with conservative therapy failed, the other therapy which is able to choose is surgical procedure of bladder augmentation. According to Helmi and Hafez, the procedure of ureter reimplantation should be done parallelly with bladder augmentation if there were VUR grade 3 or above.¹³ On case findings of incompetent urethral sphincter, the choices of surgical procedures were artificial sphincter placement or bulking agent injection within the periurethral tissue.

Marks and Lee said that, whatever the cases were, the clinicians should receive a complete data of working diagnoses, started from history of the disease and supporting examination. Considering that, clinicians are someone who have major role on a deciding process to conclude the indication of video-urodynamics testing procedure.^{7,14}

CONCLUSION

The accuracy of diagnosing diseases should be supported from the initial examination to the choices of accurate supporting examinations due to the appropriate treatment plan for the next patients. Videourodynamic could be a primary option to decide lower urinary tract abnormalities or dysfunction, evenmore, to give illustration of upper urinary tract dysfunction. The increased emphasis on involving patients more fully in their own care and the development of decision support tools for use in a wide range of clinical areas makes this an important area for further research. Further research to understand variations in patients' preferences for involvement in decision making, and the factors that influence them is desirable.

REFERENCES

1. Nitti VW. Urodynamic and video-urodynamic evaluation of the lower urinary tract. In Kavoussi LR, Novick AC, Partin AW, Peters CA, editors. *Campbell-Walsh Urology*. 10th ed. Philadelphia: WB Saunders Company; 2012. p. 1847-70.

2. Majumdar A, Latthe P, Tooze-Hobson P. Urodynamics prior to treatment as an intervention: A Pilot Study. *Neurourology and Urodynamics*. 2010; 29: 522-6.
3. Rao SG, Walter JS, Jamnia A. Predicting urethral area from video-urodynamics in women with voiding dysfunction. *Neurourology and Urodynamics*. 2003; 22: 277-83.
4. Winters J, Christian. Urodynamics: The need for "Preferred Providers". *Neurourology and Urodynamics*. 2011; 30: 43-46.
5. IUGA. Urodynamics. http://c.ymcdn.com/sites/www.iuga.org/resource/resmgr/brochures/eng_urodynamics.pdf (accessed September 26, 2015).
6. Majumdar A, Latthe P, Tooze-Hobson P. Urodynamics prior to treatment as an intervention: A Pilot Study. *Neurourology and Urodynamics*. 2010; 29: 522-6.
7. Marks BK, Goldman HB. Videourodynamics indications and technique. *Urol Clin N Am*. 2014; 41: 383-91.
8. Peng Z, Yong Y, Zhi-jin W. Video-urodynamics study on female patients with bladder neck obstruction. *Chinese Medical Journal*. 2012; 125(8): 1425-8.
9. Blok B, Pannek J, Diaz DC. Guidelines on Neuro-Urology. *European Association of Urology*; 2015.
10. Wein AJ, Dmochowski R. Neuromuscular dysfunction of the lower urinary tract. In Kavoussi LR, Novick AC, Partin AW, Peters CA, editors. *Campbell-Walsh Urology*. 10th ed. Philadelphia: WB Saunders Company; 2012. p. 1909-46.
11. MacLellan DL, Bauer SB. Neuromuscular dysfunction of the lower urinary tract in children. In Kavoussi LR, Novick AC, Partin AW, Peters CA, editors. *Campbell-Walsh Urology*. 11th ed. Philadelphia: WB Saunders Company; 2016. p. 3272-96.
12. Cameron AP. Medical management of neurogenic bladder with oral therapy. *Translational Andrology and Urology*. 2016; 5(1): 51-62.
13. Helmy TE, Hafez AT. Vesicouretral reflux with neuropathic bladder: Studying the resolution rate after ileocystoplasty. *Urology*. 2013; 82: 425-8.
14. Lee CL, Kuo HC. Videourodynamic analysis in men with lower urinary tract symptoms: Correlation between age and prostate size with lower urinary tract dysfunction. *Urological science*. 2016; 27: 21-5.