

2014 KUA Urologic Nurses Forum

Uroflowmetry and Postvoid Residual Urine

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전북의대

COMPONENTS OF THE URODYNAMIC STUDY

Before discussing the details of the UDS test itself, it is useful to be familiar with its different components. These tests within the test can be used individually or in combination depending on the information desired. For the purposes of this chapter we discuss each component as part of the entire multichannel UDS or video UDS study. Uroflow and postvoid residual (PVR) determination are two simple, noninvasive tests that can be used to evaluate voiding function and perhaps prompt further testing. In addition, both are part of a multichannel UDS study.

PVR is an excellent assessment of bladder emptying. It can be performed by ultrasound (bladder scan) or catheterization. Elevation of PVR indicates a problem with emptying but does not tell why. An elevated PVR may prompt further testing.

Uroflowmetry is measurement of the rate of urine flow over time. It is also an assessment of bladder emptying. Normal uroflow is a bell-shaped curve. When the flow rate is reduced or the pattern is altered, this could indicate bladder (underactive) or bladder outlet (obstruction) dysfunction (Fig. 62-1).

Cystometrogram (CMG): Cystometry or, more appropriately, "filling cystometry" is the method by which the pressure/volume relationship of the bladder is measured during bladder filling. The filling phase starts when filling commences and ends when the patient and urodynamicist decide that "permission to void" has been given. CMG can be performed by the single measurement of

bladder pressure via a bladder catheter (urethral or suprapubic); however, changes in bladder pressure can represent a change in detrusor pressure (Pdet) or a change in abdominal pressure (Pabd) (see later). Therefore it is recommended that CMG be performed by measuring both the total vesical pressure (Pves) and Pabd (measured by a catheter placed in the rectum or vagina). To calculate Pdet, the following equation is used: $Pdet = Pves - Pabd$ (Fig. 62-2).

Electromyography (EMG) is the study of the electronic potentials produced by the depolarization of muscle membranes. In the case of UDS, EMG measurement of the striated sphincteric muscles of the perineum is done to evaluate possible abnormalities of perineal muscle function, which are often associated with lower urinary tract symptoms and dysfunction. EMG activity is measured during both filling and emptying. EMG is obtained via electrodes placed in or near the muscle to be measured.

Urethral pressure profile (UPP) is a graph indicating the intraluminal pressure along the length of the urethra. Urethral pressure is defined as the fluid pressure needed to just open a closed urethra. UPP is obtained by the withdrawal of a pressure sensor (catheter) along the length of the urethra.

Pressure-flow studies (PFS) of voiding are the method by which the relationship between pressure in the bladder and urine flow rate is measured during bladder emptying. Detrusor pressure is measured as explained earlier with the simultaneous measurement of flow rate by a uroflowmeter. The voiding phase starts when "permission to void" is given, or when uncontrollable voiding begins, and ends when the patient considers voiding has finished.

INTRODUCTION

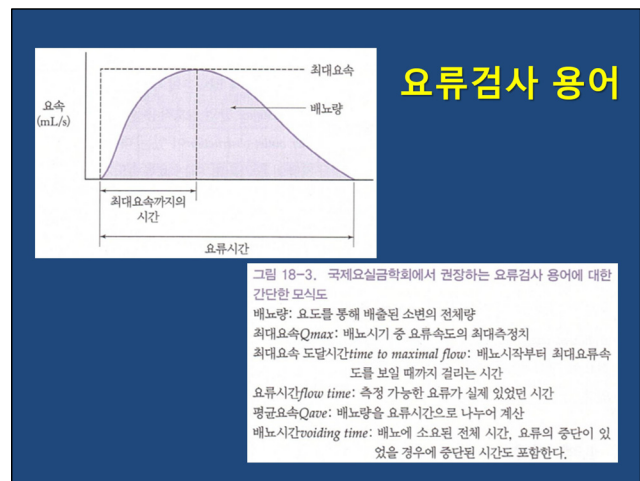
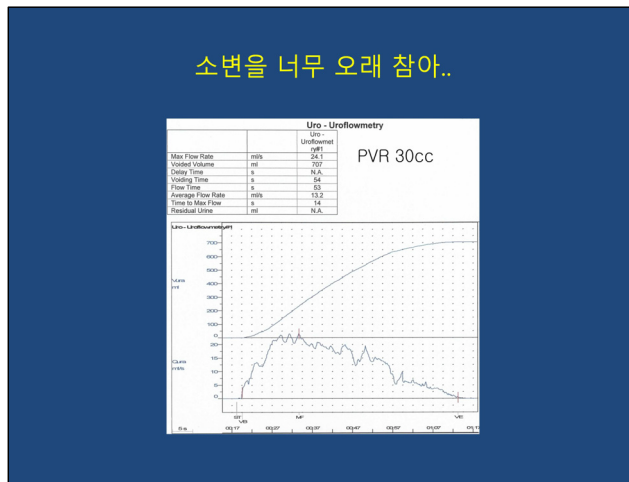
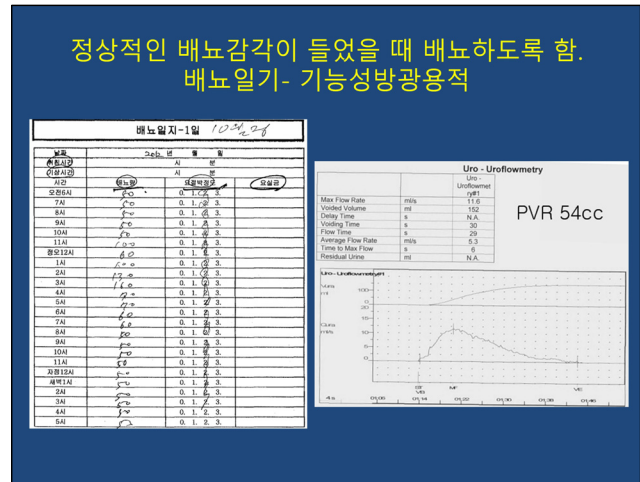
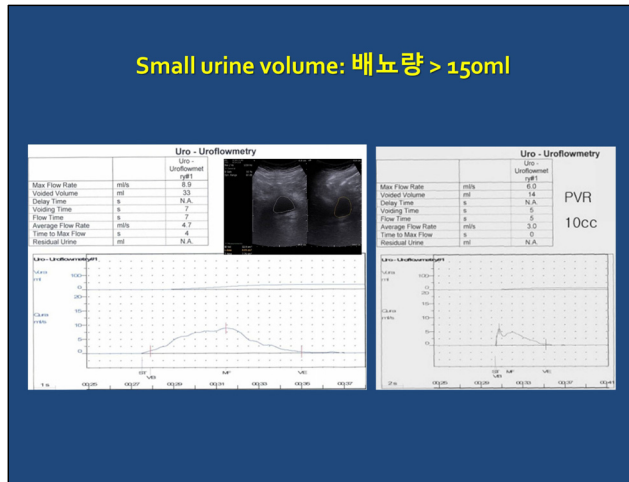
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INTRODUCTION

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- It can be performed by ultrasound (bladder scan) or catheterization.
- Elevation of PVR indicates a problem with emptying but does not tell why.
- An elevated PVR may prompt further testing.

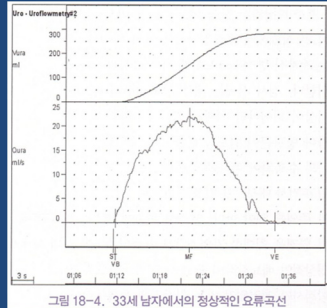
검사방법

- 검사 대상자는 되도록 물을 많이 마시고
- 적당하게 방광이 찬 상태에서 요류검사를 한다.



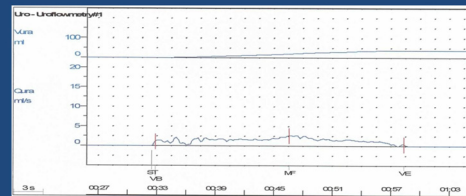
요류의 유형 - 정상

- 지속적인 중모양의 부드러운 곡선 형태이며 빠르게 증가.



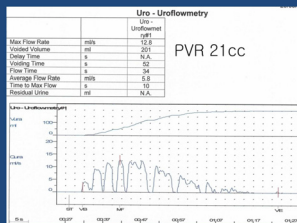
요류의 유형 - 방광출구폐색

- 해부학적 또는 기능적인 원인
- 거의 항상 낮은 요류속도를 보이고 평탄한 곡선을 유지



요류의 유형 - 배힘주기

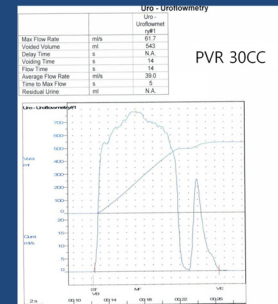
- 요류가 자주 중단되고 요동을 보이는 경우
- 최대요속이 낮고 요류속도가 차츰 낮아지는 규칙적 곡선형



- 장시간의 요저류 후 오는 배뇨근반사가 소실된 무반사방광, 배뇨근 조임근협동장애, 방광지각이 마비된 지각마비성방광 등.

요류의 유형 - 초배뇨자형태

- 최대요속이 40ml/sec 이상이면서 요류형태는 정상적인 경우
- 흔히 여성, 내인성요도 조임근기능상실 시 흔함.



최대요속

- 요류검사의 여러 지수 중 가장 중요한 인자로 비정상적인 배뇨를 발견하는데 가장 믿을만한 변수.
- 요류검사는 배뇨근의 수축력과 여러 가지 인자에 의해 영향을 받을 수 있는데, 특히 배뇨량과 나이에 직접적으로 영향을 받는 것으로 알려져 있다.
- 남 20~25ml/sec, 여 25~30ml/sec

최대요속

표 18-3 배뇨량이 150mL 이상일 때 연령에 따른 요류검사의 정상치

성별	연령(세)	최대요속(ml/sec)
남성	<40	> 22
	40~60	> 18
	> 60	> 13
여성	<50	> 25
	> 50	> 18
소아, 청소년기	<10	> 15
	10~20	> 20

- 배뇨근 이상이 없는 정상 성인에서 150ml 이상의 배뇨량으로 최대요속이 15ml/sec 이하일 때는 하부요로폐색을 의심할 수 있고, 10ml/sec 이하라면 명백한 폐색이 있다고 생각할 수 있다.

ICS Guidelines

Urodynamic Equipment Performance

Core Version, May 2014.

Urodynamic Equipment Working Group:

A. Gammie, M.J. Drake
B. Clarkson, C. Constantinou, M. Damaser,
M. Drinnan, G. Geleijnse, D. Griffiths, P.
Rosier, W. Schaefer, R. van Mastrigt

Uroflowmetry And Voided Volume

The load cell flowmeter
Load cell (or gravimetric) flow meter technology is used by the majority of commercial flow meter, and measures the weight of the fluid during voiding. Knowing the density of the fluid enables volume to be calculated, while flow is rate of change of volume.

to calculate volume flow, Volume voided is calculated by integration of flow rate.

Verifying calibration
The calibration of the flow measurement system should be verified regularly, e.g. once every 10 urodynamic measurements. This may be done by pouring a known volume of water into the empty flowmeter, and verifying the volume reading is accurate. If the reading is more than 20 ml different from the

The spinning disk flowmeter
In a spinning disk or momentum-flow flowmeter, the urine stream falls on a rapidly spinning disk and the flow rate is measured by the power needed to keep the rotation speed constant. The spinning disk flowmeter thus measures mass flow; as with the load cell, the density of the fluid is required in order poured volume, recalibration of the system is recommended.

An alternative, easy method to verify calibration is to pour the urine that is collected in the flowmeter into a measuring beaker and check the volume.

Artefacts affecting flow and volume measurements are described in the full guideline. These include liquid density errors, momentum artefacts, low flow errors and time delays.

Table 1: Requirements for uroflowmetry

Parameter	Guideline Value
Accuracy for flow rate	± 1ml/s
Accuracy for voided volume	The greater of ± 3% of true value or ± 2 ml
Range for flow rate	0 – 50 ml/s
Range for voided volume	0 – 1000 ml
Maximum duration of flow recordable	≥ 120 s
Minimum flow recordable	≤ 1 ml/s
Bandwidth of flow measurement	0 to between 1 and 5 Hz

POSTVOID RESIDUAL URINE VOLUME

- 요류검사 직 후 잔뇨 측정
- Portable ultrasonic device
- Diagnostic ultrasound device
- Catheterisation

POSTVOID RESIDUAL URINE VOLUME

- >200~300ml, 기능성방광용적의 1/3 이상
- 재검사 시 큰 가변성
- Bladder outlet obstruction
- Poor detrusor function

SUMMARY

- 방광출구폐색을 임상적으로 평가하는데 있어서 요류검사가 압력요류검사를 완전히 대체할 수는 없으나 많은 경우에서 단독으로 사용이 가능하고 비침습적인 면에서는 훨씬 유용하다.
- 외래와 검사실에서 배뇨와 관련된 증상이 있는 환자를 평가하는 가장 가치 있는 초기 검사이다.