

# Urodynamics made easy

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## What is urodynamics?

It's basically testing how the bladder and urethra are doing their job in terms of storing and releasing urine.

## What are the types of cystometry?

The battery of tests that measure bladder function are called cystometrics.

There are 2 types – 1. Simple and 2. Multichannel

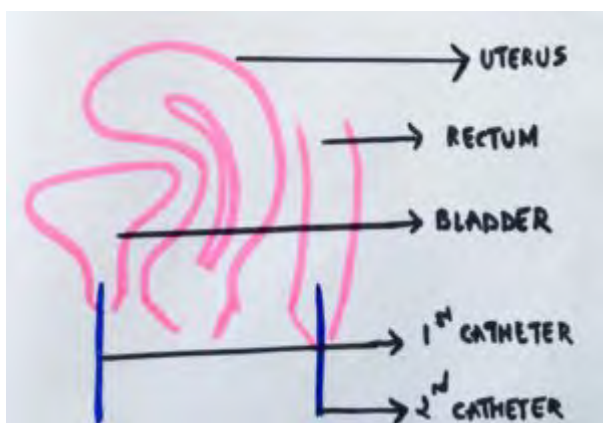
Simple – it is inexpensive and helps to determine SUI and DO. It also determines measurement of first sensation, desire to void, and bladder capacity. But it will NOT measure ISD (intrinsic sphincter defect).

Multichannel– in addition to all that simple cystometrics determines it also helps to diagnose ISD.

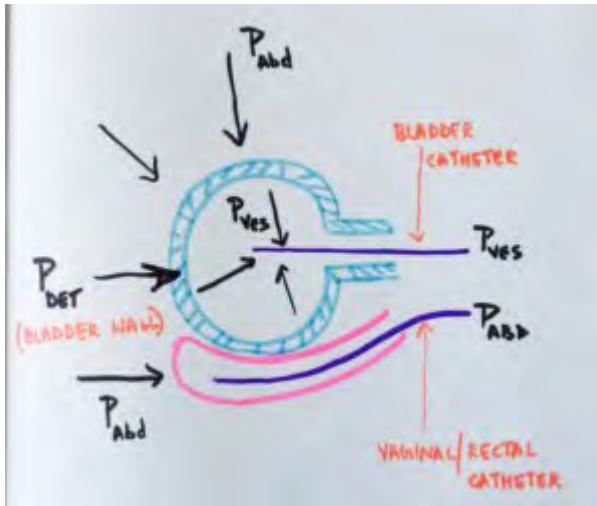
Procedure– testing is performed with the woman standing or sitting on a specialised chair. Initially women are asked to empty their bladder into a commode connected to a flowmeter (uroflowmetry). After a maximal flow rate is recorded, the patient is catheterised to measure post void residual volume.

Then two catheters are used one placed in bladder and one in the rectum. The bladder is filled with room-temperature sterile normal saline, and the patient is asked to cough and to perform a valsalva manoeuvre at regular intervals.

Additionally, during filling, the volumes at which a first desire to void and maximal bladder capacity is reached are noted. These two catheters give us the following measurements



- 1) intra abdominal pressure,
- (2) vesicular pressure,
- (3) calculated detrusor pressure,
- (4) bladder volume, and
- (5) saline-infusion flow rate.

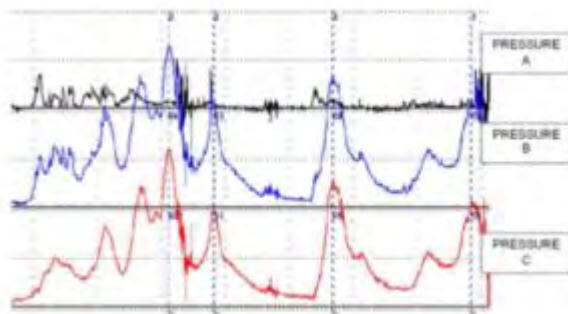


$$P_{ves} = P_{abd} + P_{det}$$

$$\therefore P_{det} = P_{ves} - P_{abd}$$

### How to interpret the data?

In the graph there are three lines given.

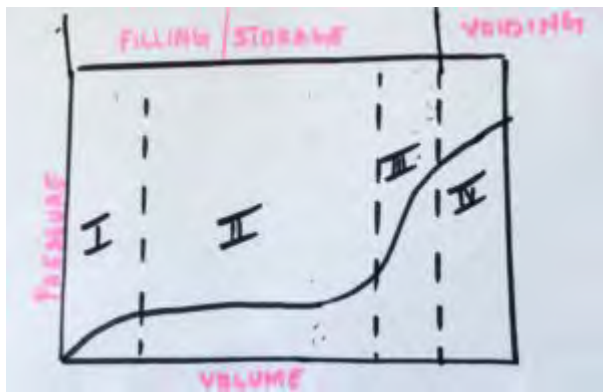


**Trace A** is abdominal pressure. (pressure in the abdomen while coughing / straining etc). Sometimes this can be seen during rectal peristalsis too.

**Trace B** is vesical pressure. (pressure inside the bladder cavity)

**Trace C** is detrusor pressure. (pressure in the wall of the bladder)

The graph also has two parts – first part is the filling /storage phase. The second part is the voiding phase. Based on where the abnormality is noted it is termed as storage defect or voiding defect.



### How to make sense of these lines?

The first line, abdominal pressure is raised when the person coughs or strains. During coughing you need to see other lines too to make complete diagnosis.

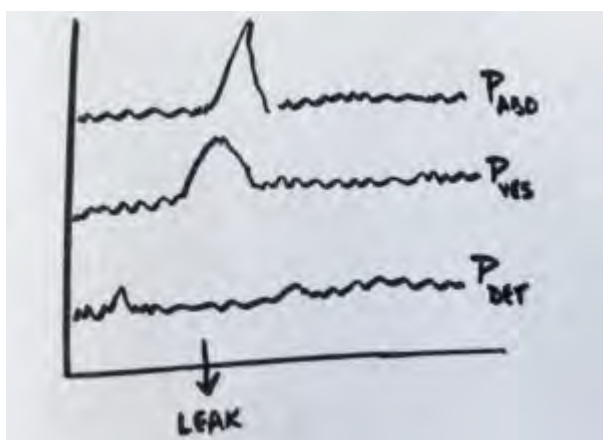
The second line, vesical pressure is usually raised when there is increase in bladder wall / abdominal pressure. This can also raise if there is an outlet obstruction like a urinary stricture, cystocele (kinking urethra) etc as the normal detrusor tries to overcome the obstruction.

The third line, detrusor pressure is usually raised when there is increased tone in the detrusor muscle leading to urge incontinence. The cause may be idiopathic or neurogenic. The increase in pressure can be phasic or continuous.

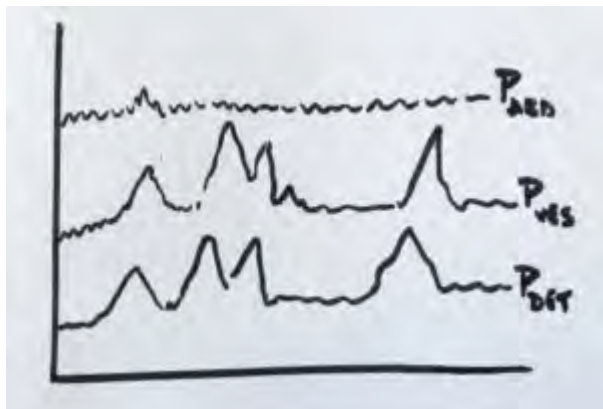
If the detrusor pressure is low it may be because of conditions like neurological problems involving the lumbosacral nerves, diabetes, chronic UTI, anticholinergics etc.

### Is it stress incontinence or urge incontinence?

If its stress incontinence – the P<sub>abd</sub> will be raised as she is coughing. Simultaneously you will see the P<sub>ves</sub> pressure raised and a leak noted below. It would look something like this.



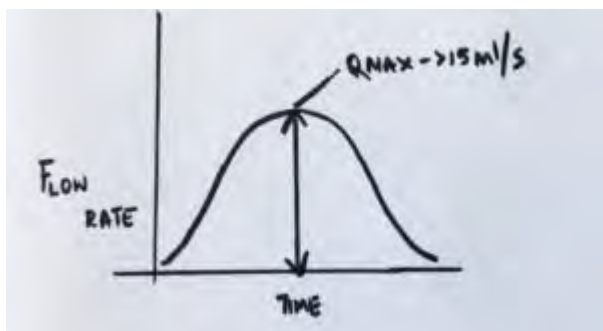
If it's detrusor over activity there would be increase in vesicular and detrusor pressure but abdominal pressure would be normal. Something like this



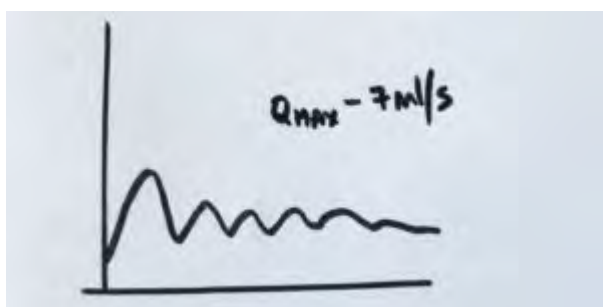
## Flowmetry

Uroflowmetry is the measurement of the speed and volume of urine. This just needs an equipment to catch the urine and measure it while a computer produces the graph.

Normally, it's a bell shaped curve.



If there was an abnormality it would probably look like this



The above graph shows that the urine is unable to flow out normally. This could be because of a bladder outlet obstruction or a hypotonic bladder. How to differentiate between the two you ask?

Just measure **P-det**. If it's high then it's obstruction. If it's low then it's hypotonic bladder

This can be summarised as –

LOW flow rate + LOW P-det + NORMAL P-urethra = hypotonic bladder

LOW flow rate + HIGH P-det + HIGH P-urethra = outlet obstruction

## Urethral pressure

This is measured to help in detailed diagnosis of stress incontinence. There are two reasons for stress incontinence- intrinsic sphincter defect or hypermobility of the urethra.

If stress incontinence is diagnosed and

-If urethral pressure less than 25 mm of H<sub>2</sub>O – its intrinsic sphincter defect

-If urethral pressure more than 25 mm of H<sub>2</sub>O- its hypermobility.

## Normal values

Bladder capacity: 400 – 600 ml

First sensation: 150-250 ml

Detrusor pressure (filling): < 15 cm of H<sub>2</sub>O

Detrusor pressure (voiding) : <70 cm of H<sub>2</sub>O

Peak flow rate : >15 ml/sec

Flow time: 15-30 sec

Q-max: 25 ml/sec

Residual volume: <50 ml

## Urodynamic Terminology

If **stress incontinence** is urodynamically proven it's called **USI (urodynamics stress incontinence)**

If **urge incontinence** is proven through urodynamics it's called **Detrusor overactivity (DO)**

## Abbreviations

SUI- stress urinary incontinence

DO- detrusor overactivity

ISD- intrinsic sphincter defect (of urethra)

Pab- abdominal pressure

Pves- vesical pressure

Pdet- detrusor pressure

## References

1. [https://www.ics.org/publications/ici\\_2/chapters/chap07.pdf](https://www.ics.org/publications/ici_2/chapters/chap07.pdf)
2. [http://www.baus.org.uk/\\_userfiles/pages/files/professionals/surg/TJW-Urodynamics.pdf](http://www.baus.org.uk/_userfiles/pages/files/professionals/surg/TJW-Urodynamics.pdf)