






Paediatrics
Urodynamics
小兒尿動力學

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Urodynamic Studies

- Urodynamic investigations study the pressure, volume & flow relationships in the lower urinary tract
- 3 investigations form the basis of urodynamic studies :
 - Urinary flow rate
 - Cystometry (CMG)
 - Urethral pressure profile (UPP)



Urinary Flow Rate

- The rate of urinary flow during micturition measured by flow meter
- Unit of measurement: ml of urine passed per second (ml/s)
- A flow rate is interpreted by rate and pattern:
 - normal bell shape
 - Static
 - Staccato



Cystometry (CMG)

- The performance of a cystometrogram (CMG) – the key investigation in urodynamics
- **Double lumen suprapubic catheter:** one lumen will be used to fill the bladder; the other lumen for pressure transducer to measure bladder (intravesical) pressure
- **Rectal catheter:** for pressure transducer to measure abdominal pressure



Cystometry (CMG)

Detrusor Pressure (Pdet):

- Bladder is an intra-abdominal organ, the pressure inside it reflects both actual bladder activity & general abdominal pressure changes
- Detrusor pressure (bladder activity alone)
= total bladder pressure minus rectal pressure



Cystometry (CMG)

Lists of symbols:

- Bladder – ves
- Detrusor – det
- Urethra – ura
- Ureter – ure
- Abdomen – abd
- Pressure – P
- Volume – V
- Flow rate – Q
- Time – t
- Infusion – infus
- Residual urine - RU
- First desire to void - FD
- Strong desire to void -SD
- Leak pt. pressure - LPP



Units of measurement:

- Volume – ml
- Time – s
- Flow rate – ml/s
- Pressure – cmH₂O
- Emptying efficiency:
(voided V./vol.V +RU) - %

Examples:

- Pves; Pdet; Pabd
- Pdet.max = Max. detrusor pressure
- Endfill Pdet.max=Max.Pdet at endfill phase
- Qmax = Max. uroflow rate
- Vinfus = Total volume infused



Cystometry (CMG)

Common Paediatric Abnormalities:

- **Detrusor overactivity** – unable to inhibit contractions during filling, bladder capacity is usu. lowered, incontinence may occur if unstable contractions are high
- **Acontractile detrusor**
- **Underactive bladder with large RU** – delayed or absent sensation, voiding is achieved by abdominal effort
- **Dysfunctional voiding**
- **Outflow obstruction** – voiding pressure is high in attempt to overcome outflow resistance, but the uroflow is poor



Urethral Pressure Profile (UPP)

- Intra-urethral pressure can be measured by using water filled or micro-transducer catheter, which is withdrawn slowly along the urethra with the patient in supine or semi-recumbent position
- A recording is obtained of urethral pressure from the bladder neck to the external meatus as the catheter is gradually withdrawn
- Research tool



Electromyography (EMG)

- EMG studies the electrical potentials generated by the depolarisation of the striated muscle of the urethral sphincter
- Needle or skin surface electrodes may be used
- Results need skilled interpretation



Paediatric Urodynamics

- Natural fill cystometry
- Conventional fill cystometry with warm normal saline
- Ambulatory urodynamics
- Real time ambulatory urodynamics with infra-red telemetry
- Video urodynamics study / cystourethrography



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Paediatric Urodynamics

Ambulatory urodynamics:

- To continually monitor detrusor pressure over a period of hours, even in a mobile patient
- Unstable detrusor which is not manifest on static CMG, but which will be revealed by ambulatory monitoring over a longer period



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Video urodynamics study / cystourethrography

- Cystometry performed under X-ray control
- The bladder is filled with X-ray contrast instead of saline, and may be visualised during filling, coughing & voiding
- Useful in distinguishing bladder neck abnormalities & in locating the site of an obstruction
- Bladder diverticula, VUR may also be revealed



Thank You

