Evaluation of Lower Urinary Tract Symptoms (LUTS)

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Urine: Storage and Voiding

Controlled by the micturition centre in the midbrain and the sacral reflex centre
Both autonomic and somatic systems are involved

Autonomic

- Parasympathetic:
  The sacral reflex centre is situated in S2-S4
  Excitation stimulates the release of acetylcholine, which acts on muscarenic receptors to cause detrusor contraction

- Sympathetic: "Hypogastric nerve"
  Acts on β-receptors causing relaxation of the detrusor muscle
  and on α-adrenergic receptors causing contraction of the bladder neck and proximal urethra

Somatic:

Pudendal nerve excitation causes contraction of the external urethral sphincter

Urine: Storage and Voiding

During bladder filling

- Inhibitory impulses from the brain micturition centre are transmitted to the sacral micturition centre to prevent excitation of the pelvic nerves and suppress detrusor contraction
- Excitation of the Pudendal nerve causes contraction of the external urethral sphincter

Voiding

- Depends on coordinated excitation of the sacral parasympathetic nerves and relaxation of the external urethral sphincter
- A detrusor contraction is initiated by acetylcholine release at the neuromuscular junction acting on muscarinic receptors

Storage symptoms

- Urinary incontinence

  The complaint of any involuntary leakage of urine

- Urgency

  Sudden compelling desire to pass urine, which is difficult to defer

- Increased daytime frequency

  The complaint by the patient that he/she voids too often by day

- Nocturia

  The complaint that the patient has to wake up at night one or more times to void

- Nocturnal enuresis

  The complaint of loss of urine occurring during sleep

Storage symptoms

- Urge urinary incontinence (UUI)

  Involuntary leakage accompanied by or immediately preceded by urgency

- Stress urinary incontinence (SUI)

  Observation of involuntary leakage from the urethra, synchronous with exertion effort, sneezing or coughing

- Mixed urinary incontinence (MUI)

  Involuntary leakage associated with urgency and also with exertion, effort, sneezing or coughing

Storage symptoms

- Continuous urinary incontinence

  Complaint of continuous leakage day and night

- Other types of incontinence

  Incontinence during sexual intercourse

  Giggle incontinence

Voiding symptoms

- Slow stream

  Perception of reduced urine flow, usually compared to previous performance or in comparison to others

- Intermittent stream (intermittency)

  Describes urine flow which stops and starts, on one or more occasions, during micturition

- Hesitancy

  Difficulty in initiating micturition resulting in a delay in the onset of voiding after the individual is ready to pass urine

- Straining to void

  Describes the muscular effort used to initiate, maintain or improve the urinary stream

Post-micturition symptoms

Experienced immediately after micturition

- **Feeling of incomplete emptying**

  Self-explanatory term for a feeling experienced by the individual after passing urine

- **Post-micturition dribble**

  Describes the involuntary loss of urine immediately after finishing passing urine, usually after rising from the toilet

Overactive Bladder (OAB)

Urgency, with or without urge incontinence, usually with frequency and nocturia

Also known as:

- Overactive bladder syndrome
- Urge syndrome
- Urgency-frequency syndrome

Urinary Incontinence, epidemiology

- **Age**
- **Race**
- **Pregnancy - frequency/nocturia/urgency/stress & urge incontinence**
- **Childbirth**
- **Menopause**

Causes of Urinary Incontinence

- USI
- DO
- Overflow incontinence
- Fistulae(vesicovaginal, urethrovaginal)
- Congenital (e.g. ectopic ureter)
- Urethral diverticulum
- Other (e.g. UTI, faecal impaction, medication)
- Functional (e.g. immobility)

Assessment of LUTS

Clinical evaluation (History)

Abdominal and Pelvic examination

- Neurological exam
- Patient’s mobility and mental state
- Incontinence associated dermatitis
- Vulval and vaginal atrophy

Imaging

Investigations

Basic

- Urine test
- Bladder diary
- Pad test

Advanced

- Conventional subtracted cystometry
- Videocystourethrography
- Ambulatory Urodynamics Monitoring
- Urethral pressure profilometry
- Imaging studies
- Cystourethroscopy

Basic investigations

Urine test

Bladder diary

The Pad Test

Urine test

The Bladder Diary

Voiding diary, Frequency–Volume chart

- **Objective information on the number of voids and their distribution between day and night**
- **Records fluid intake, voided volumes, incontinence episodes**
- **Used to measure changes in response to Rx**

Time	Bathroom trips		Leaks	What you were doing (sneezing, standing up, sleeping)	Urge? (S)trong (N)ormal	Drinks and Food	
	Number	How much				Drink	Food
6a	x	6oz			n		
7a							
8a			x	sneeze			
9a							
10a	x	1oz			s		
11a							
12p			x	gym			
1p							
2p							
3p	x	1oz	x	urge			
4p							
5p							
6p							
7p							
8p							
9p	x						
10p							

The Pad Test

- Objective
- Non-invasive
- 1hr, 4hr, 12hr, 24hr and 48hr

The 1 Hour Standardized Test

- Pre-weigh pad
- Drink 500mls
- Rest 15 mins
- Moderate exercise 30 mins
- 15 mins provocative exercises
- Positive test >2g increase
- Severe incontinence >10g increase

Urodynamic Studies (UDS)

Definition

Studies of lower urinary tract function and dysfunction

Why urodynamics?

- Bladder is a poor witness (Poor correlation between symptoms and clinical diagnoses)
- Correct diagnoses = Correct treatment
- Consequences of inappropriate treatment

The UDS

- Free flow study
- Filling Cystometry
- Voiding cystometry

Urodynamics

Uroflowmetry

- Simple
- Non-invasive
- Voided volume and flow rate

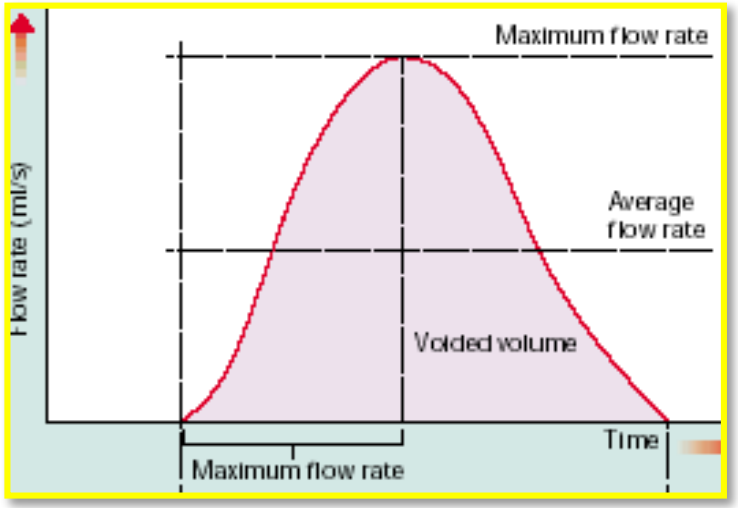
Normal study

- Peak flow rate >15ml/sec
- Voided volume >150ml
- PVRV <100 mls

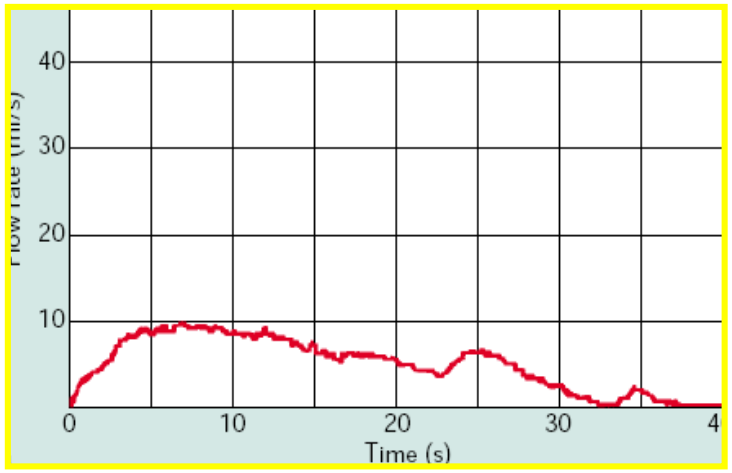
Filling Cystometry

- Retrograde filling of the bladder
- Filling medium is usually Fluid
- Filling rate: ? 100ml/min
- Performed in : supine, sitting or standing
- Pressures measured via microtip or external transducers

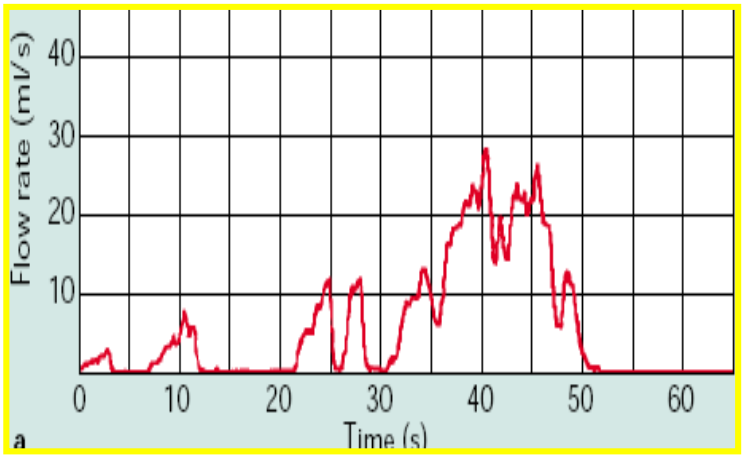
Normal Uroflowmetry



Abnormal Uroflowmetry

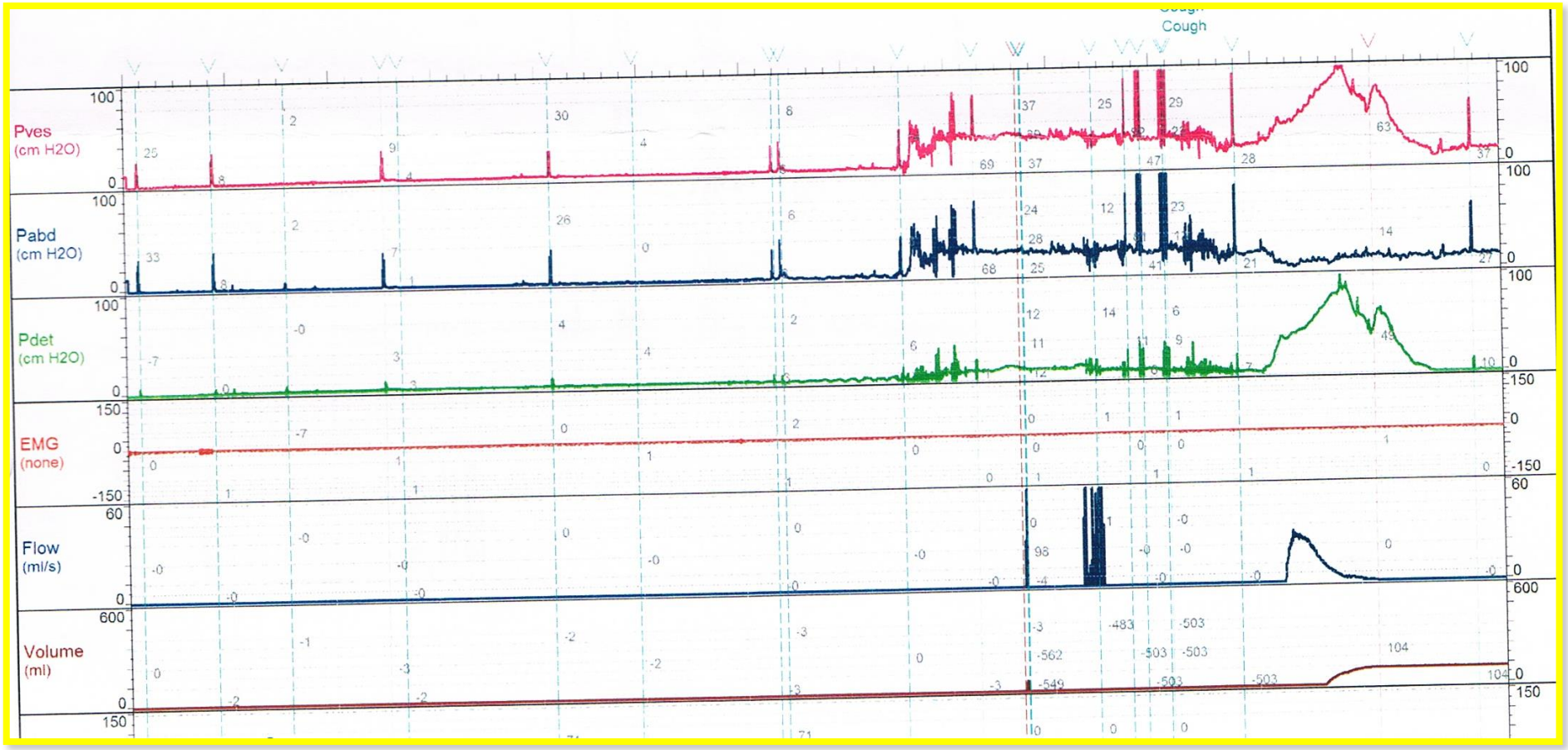


Detrusor under-activity



Straining

Normal Urodynamics



Detrusor overactivity (DO)

NHS
North Hampshire Hospital
UroGynaecology
Mr. T. Sayer

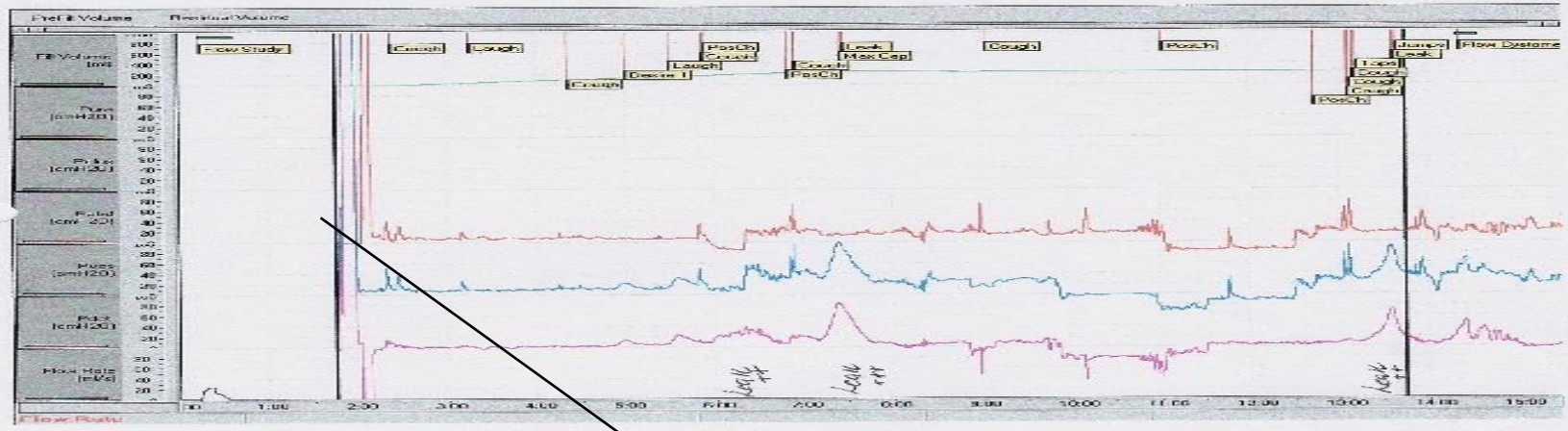
SE→DIA

Cole Margaret F
0366895 04.05.1942

Urodynamics

24.01.2011 14:24

L. Rush



	Fill Volume	Flow Rate	Pdet	Pves	Pabd	Pclos	Pura	EMG
Cough	0	0	10	19	9	-19	0	0
Laugh	42	0	2	10	8	-10	0	0
Cough	97	0	2	13	11	-13	0	1
Desire 1	128	0	14	23	9	-23	0	0
Laugh	153	0	8	14	6	-14	0	0
Cough	171	0	10	29	19	-29	0	0
PosCh	172	0	10	26	16	-26	0	1
PosCh	219	0	8	32	24	-32	0	1
Cough	223	0	22	95	73	-95	0	0
Max Cap	247	0	83	98	15	-98	0	0
Leak	249	0	79	92	13	-92	0	0
Cough	233	0	-5	16	21	-16	0	0
PosCh	236	0	-34	-18	16	18	0	0
PosCh	236	0	4	9	5	-9	0	0
Cough	236	0	9	47	38	-47	0	0
Cough	236	0	11	35	24	-35	0	1
Cough	236	0	9	39	30	-39	0	0
Taps	236	0	9	31	22	-31	0	0
Leak	236	0	69	89	20	-89	0	0
Jumps	236	0	59	79	20	-79	0	1

Urodynamics (DOI)

North Hampshire Hospital
UroGynaecology
Mr. T. Sayer

SE➔DIA

Nye Amber
0168677

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23.11.1976

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L. Rush

Urodynamics

	Fill Volume	Flow Rate	Pdet	Pves	Pabd	Pclos	Pura	EMG
Cough	0	0	-6	12	18	-12	0	0
Cough	2	0	-7	11	18	-11	0	1
Desire 1	105	0	3	15	12	-15	0	1
Desire 2	148	0	5	22	17	-22	0	1
Cough	157	0	4	21	17	-21	0	2
PosCh	158	0	5	29	24	-29	0	0
Urgency	182	0	9	35	26	-35	0	0
Max Cap	191	0	52	75	23	-75	0	0
Leak	193	0	45	71	26	-71	0	0
Leak	198	0	81	99	18	-99	0	0
Laugh	200	0	70	84	14	-84	0	0
Cough	181	0	5	27	22	-27	0	2
Cough	182	0	5	32	27	-32	0	0
Cough	182	0	7	27	20	-27	0	1
Taps	182	0	7	28	21	-28	0	0
Leak	183	0	95	111	16	-111	0	0
Jumps	184	0	37	60	23	-60	0	1
Jumps	184	0	3	19	16	-19	0	1

Voiding Cystometry (Pressure flow studies)

- **The relationship between detrusor pressure and flow rate**

- **Obstruction**
  - **High detrusor pressure (>50cmH_20)**
  - **Poor flow (<15mls/sec)**

- **Under-active detrusor function**
  - **Low detrusor pressure (<20cmH_20)**
  - **Poor flow**

Urodynamic diagnoses

- Detrusor overactivity (DO)

  A urodynamic observation characterised by involuntary detrusor contractions during the filling phase which may be spontaneous or provoked

- Detrusor overactivity incontinence (DOI)

  DO associated with urine leakage

- Urodynamic stress incontinence (USI)

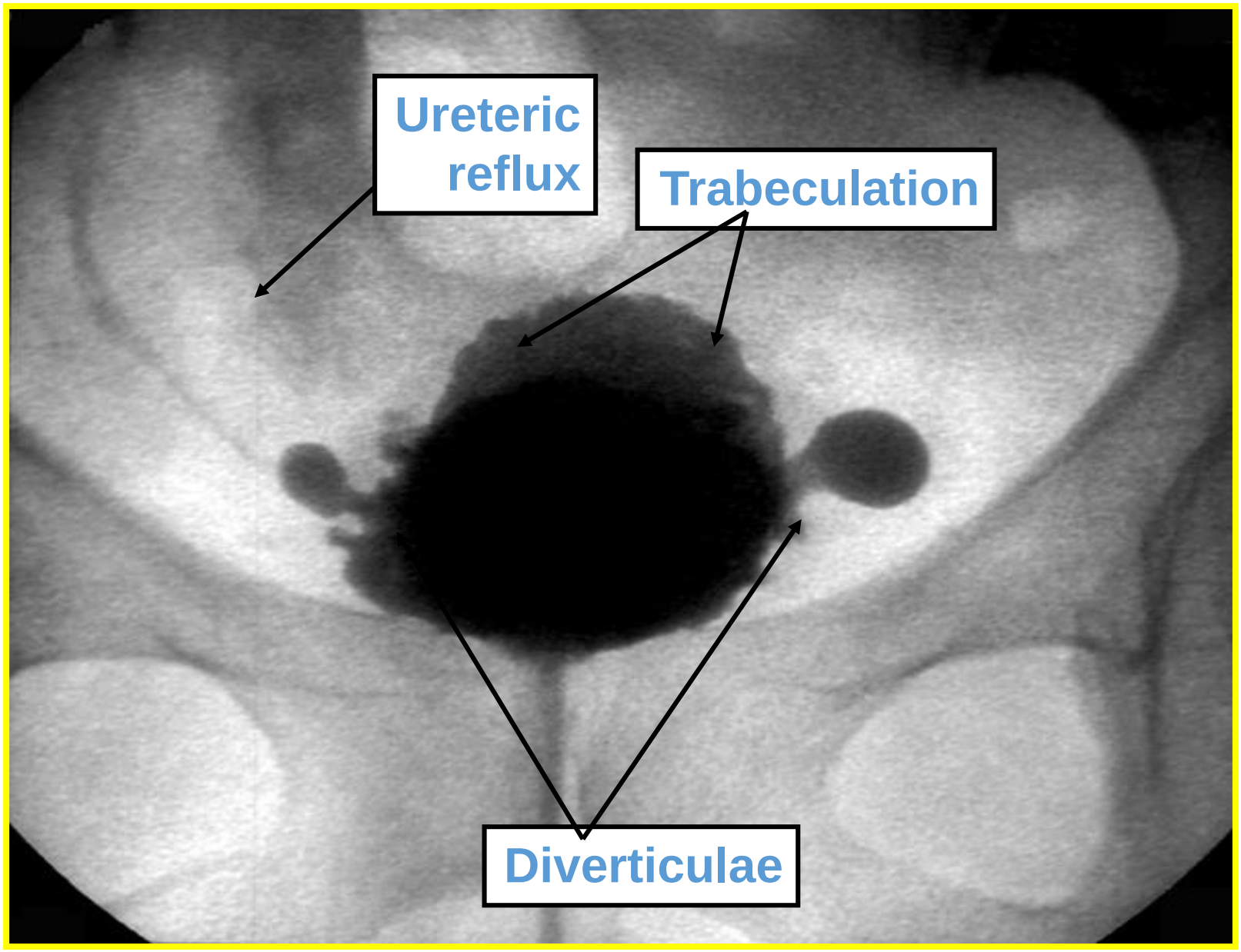
  Involuntary leakage of urine during increased abdominal pressure, in the absence of a detrusor contraction

- Mixed urodynamic incontinence

  DO and /or DOI + USI

Complex investigations

- **Videocystourethrography (VCU)**
- **Ambulatory Urodynamic Monitoring (AUM)**
- **Urethral Pressure Profilometry (UPP)**
- **Imaging studies**
  - **Bladder Wall Thickness (BWT)**
  - **Magnetic Resonance Imaging**
  - **Voiding Cystourethrography**
- **Cystourethroscopy**


Ureteric reflux
Trabeculation
Diverticulae

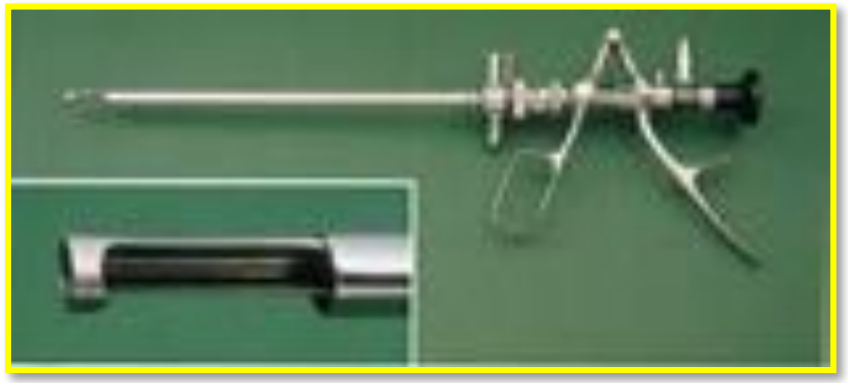
Imaging studies

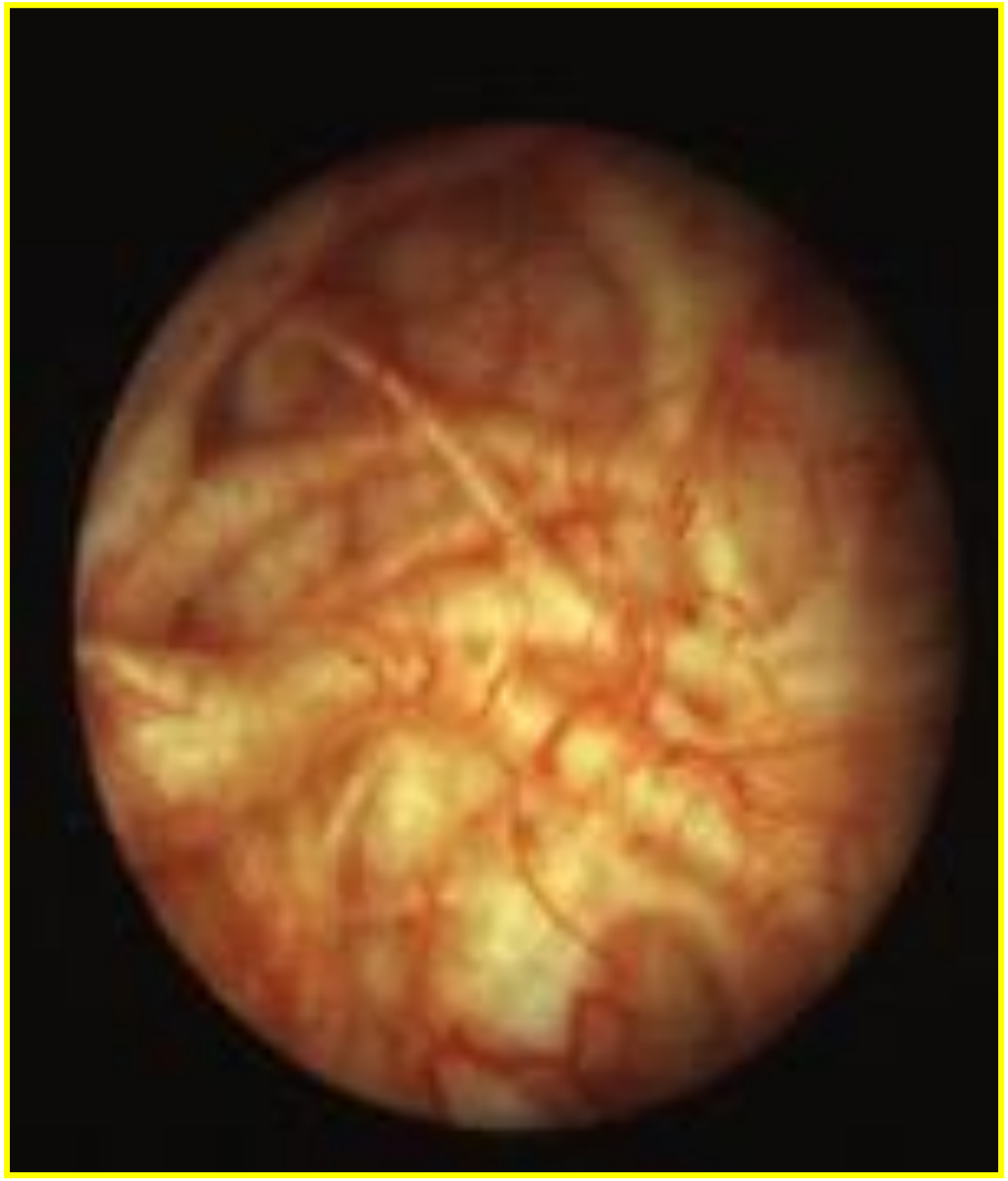
- Bladder wall thickness (BWT)
- Upper renal tracts
- Magnetic resonance imaging (MRI)

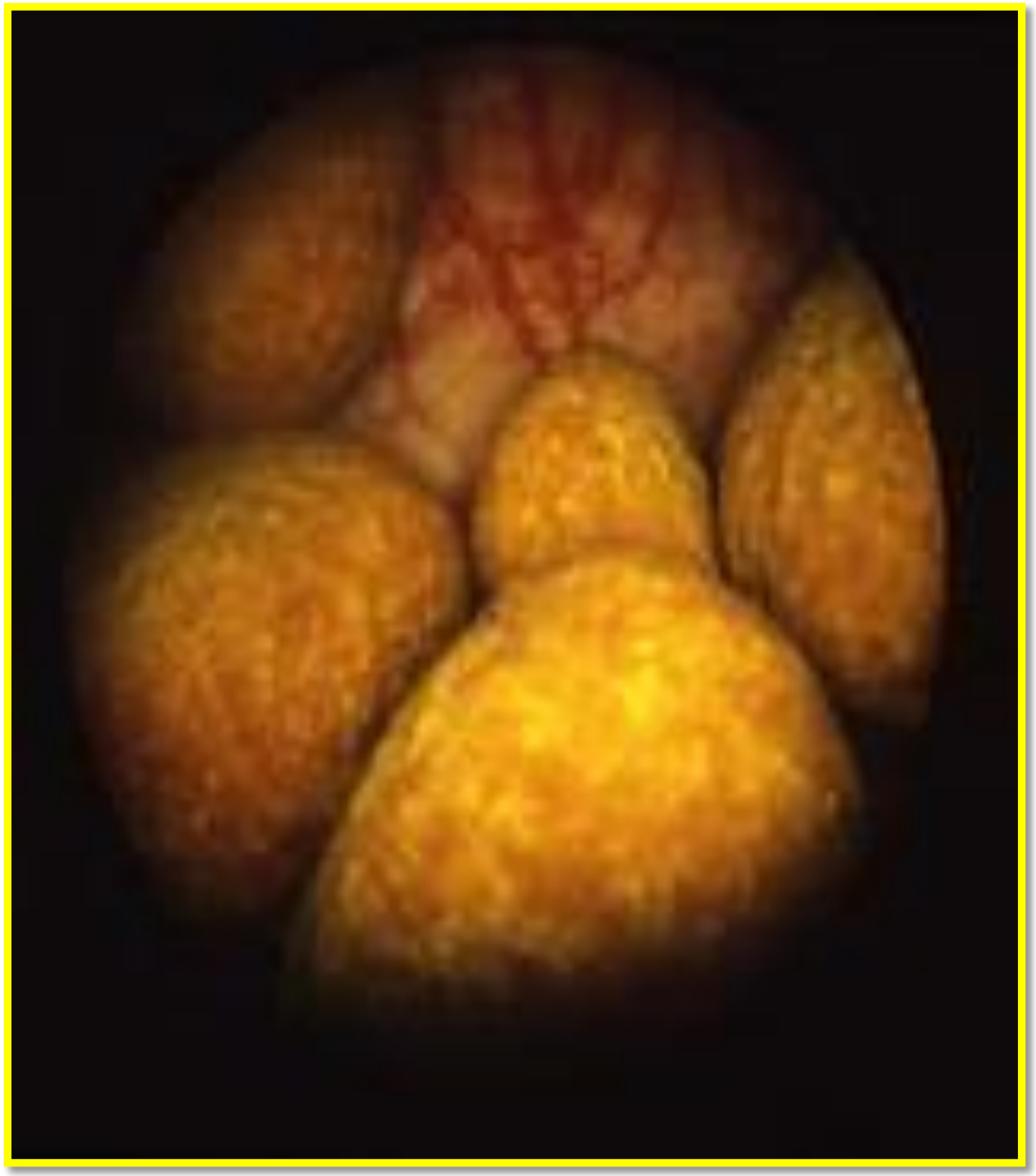
IVP

Cystourethroscopy

- **Rigid or flexible**
- **Confirmation of anatomy**
- **Visualization:**
  - **Calculi**
  - **Tumours**
  - **Diverticulae**
- **Biopsy of urothelium to assess for:**
  - **Chronic inflammation**
  - **Cancer**







Treatment of UI
SUI
OAB

Treatment of UI
General Consideration for all types

- **Lifestyle modification**
  - Fluid intake
  - Caffeine, tea, Coke
  - Wt reduction
  - Smoking

- **Pelvic Floor Muscle Training (PFMT)**

Rx of SUI

- Conservative
- Medical
- surgical

SUI: Conservative Management

- **Effective. Few complications**
- **Does not compromise further surgery**

- **Useful in women who are**
  - Unfit for surgery
  - Have not completed their family
  - Breast feeding
  - Less than six months post-partum

Conservative measures include

- Pelvic Floor Muscle Training (PFMT)
- Biofeedback
- Electrical stimulation
- Vaginal cones
- Urethral devices

Devices

A: Ring
B: Schatz
C, D, F: Gellhorn
E: Ring with support
G: Risser
H: Smith
I: Tandem cube
J: Cube
K: Hodge with knob
L: Hodge
M: Gehrung
N: Incontinence dish with support
O: Donut
P: Incontinence ring
Q: Incontinence dish
R: Hodge with support
S: Inflatoball

USI: Pharmacological management

Duloxetine

- Potent serotonin-noradrenaline reuptake inhibitor
- Enhances urethral striated sphincter activity via a centrally mediated pathway

Efficacy and safety

- Significant decrease in incontinence episodes
- Optimal effect: after 4 weeks of therapy
- Nausea: 25 %
- Useful in women awaiting surgery
- Synergistic effect with PFMT

SUI: Surgical management

- **More than 200 procedures**
- **The first procedure offers the best chance of cure**
- **The 'mid-urethral theory' or 'integral theory':**

The concept:

- **Maximal urethral closure pressure is at mid-urethra**
- **Damage to pubourethral ligaments impairs mid-urethral support**
- **Mid-urethral procedures have largely replaced Colposuspension.**

USI: Surgical management

- **Colposuspension**
- **Sub-urethral tapes (TVT/TOT)**
- **Urethral bulking agents**

Mid-urethral tapes

‘Mid-urethral theory’ / ‘Integral theory’

The concept

Maximal urethral closure pressure is at mid-urethra

Damage to pubourethral ligaments impairs mid-urethral support

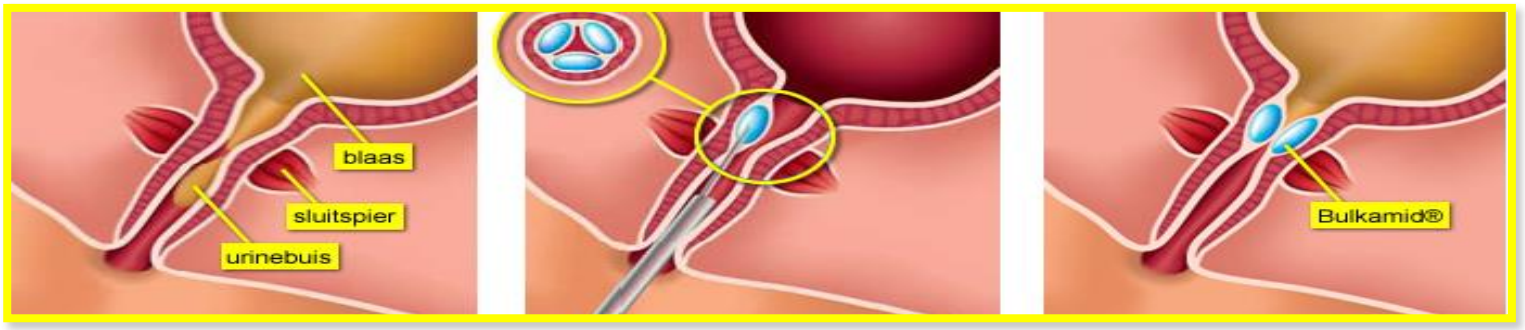
USI: Urethral bulking agents

May be useful in

- The elderly
- Women who have undergone previous operations and have a fixed, scarred fibrosed urethra
- Women who have not completed their families

Outcome (long-term follow-up (> two years))

- Objective cure rate: 50%
- Subjective improvement: 70%



SUI: NICE guidelines

- PFMT of at least three months should be offered as first-line treatment to all women with SUI or MUI

- Retropubic tapes: recommended where conservative management failed

- Colposuspension: recommended alternatives

- Bulking agents: considered for the management of SUI if conservative management has failed

- Anterior repair, needle suspension procedures, paravaginal defect repair and the MMK procedure are NOT recommended

USI: key points

- Conservative Mx should be offered prior to surgery
- Duloxetine may be used in conjunction with PFMT
- Mid-urethral tape: operation of choice in primary continence surgery
- TVT and TOT procedures have similar success rates
- Urethral bulking agents offer an alternative approach to continence surgery

Rx Overactive Bladder (OAB)

OAB: Conservative management

- Advice regarding fluid intake (1 -1.5 L / day)
- Reduce caffeine and alcohol intake
- Bladder retraining (BT):

  Cure rate: 44 - 90 %

- Pelvic Floor Muscle Training (PFMT)

OAB: Pharmacological Rx

No specific drugs that act on the bladder and urethra which do not have systemic effects

- Oxybutynin
- Tolterodine
- Solifenacin
- Darifenacin
- Trospium
- Fesoterodine

Side effects

- Dry mouth
- Constipation
- Blurred vision
- Insomnia

Antimuscarenics

	Advantages	Disadvantages
Oxybutynin IR	Flexible dosing, rapid onset of action, cheap	Persistence limited by dry mouth
Oxybutynin ER	Flexible dosing	Cognitive impairment
Oxybutynin TDS	Placebo rate of side effects	15-20% rate of pruritus
Tolterodine ER	Well tolerated	Single dose
Solifenacin	Superior efficacy to Tolterodine ER	High rate of dry mouth at 10mg dose
Darifenacin	Low rate of cognitive impairment	High rate of constipation
Trospium	Does not cross BBB	
Propiverine	Well tolerated	Efficacious for frequency
Fesoterodine	Flexible dosing	Limited experience

OAB: recent advances
Mirabigron

B3 agonist (not antimuscarinics)

Daily dose

50 mg (OD)

25 mg in hepatic , renal insuffeciency

Bitmega. Myrbetriq

DO: Intravesical therapy
Botulinum Toxin

OAB/DO: Neuromodulation

Sacral neuromodulation

- Stimulation of the dorsal sacral nerve root in the S3 sacral foramen

- Sacral nerves contain autonomic and somatic fibres to pelvic floor muscles

- Invasive and expensive

- A useful alternative to medical and surgical therapies in patients with severe, intractable OAB prior to reconstructive surgery

OAB/DO: Neuromodulation

Peripheral neuromodulation (PTNS)

- Posterior Tibial Nerve (PTN) originates from the same spinal cord segments as the innervation to the bladder and pelvic floor

Outcome of neuromodulation

- > 50 % reduction in urinary symptoms
- 46% completely cured

OAB/DO: Surgical management

10 % remain refractory to medical and behavioural therapy

Different surgical techniques

Augmentation

- Clam cystoplasty
- Auto-augmentation (Detrusor Myomectomy)

Urinary Diversion

OAB/DO: NICE guidelines

- Bladder retraining (BT) for a minimum of 6 wks

- If no satisfactory benefit from BT: antimuscarinics

- First line drug treatment: Immediate-release oxybutynin

- If not tolerated: darifenacin, solifenacin, tolterodine, trospium or an extended-release or trans-dermal oxybutynin

- Women should be counselled regarding the adverse effects of antimuscarinics drugs

OAB/DO: NICE Guidelines

- Systemic HRT should not be recommended

- Intra-vaginal oestrogens are recommended for OAB in postmenopausal women with urogenital atrophy

Overflow Incontinence & VOIDING DIFFICULTIES, causes

- **Neurological**

  MS, Spinal injuries, CVA, brain tumours

  Prolapsed intervertebral disc, cauda equina syndrome,

  herpes zoster

- **Myogenic**

  Ischaemia due to acute retention, e.g. after epidural block

- **Iatrogenic**

  Postoperative retention associated with long operations,

  epidural, PCA, high dose opiates, large volumes of IVF

  Obstructive outflow procedures as continence procedures

.....causes

- Obstructive

  Extrinsic: pregnancy, large fibroid

  Intrinsic: urethral stricture or foreign body

- Inflammatory

  Vulval abscess

  Acute herpetic infections

Diagnosis

- **Clinical suspicion**

- **U/S or catheterization**

Management

- Immediate catheterization, catheter left in for 2 days then trial w/o catheter under strict supervision
- If retention then SPC for 2-6 wks
- Bethanechol 25mg tds
- Surgery, Rx cause
- CISC