








## Female SUI & POP

**Hashim Hashim**  
 MD, FEBU, FRCS(Urol)  
 Consultant Urological Surgeon  
 Honorary Professor of Urology  
 Director of the Urodynamics Unit

Email: [h.hashim@gmail.com](mailto:h.hashim@gmail.com)  
 @Urohash  
 @Urohash  
 @BristolUrologySurgeon


## Outline

- Stress urinary incontinence
  - Risk factors
  - Anatomy and applied clinical relevance
  - History and physical examination
  - Investigations
  - Urodynamic evaluation
  - Controversy
  - Urethral function studies
  - Conservative management
  - Medical and surgical treatment
- Pelvic organ prolapse
  - Assessment
  - Urodynamic evaluation
  - Treatment options
- Urinary retention





## Risk factors for stress urinary incontinence

- Age, menopause
- Obesity
- Vaginal delivery
- Pregnancy
  
- Radiation



## Pelvic floor anatomy





## Pelvic floor anatomy

- Fascio-ligamentous support: Petros integral theory





1: Rectum, 2: Anal canal, 3: Uterus, 4: Vagina, 5: Bladder, 6: Urethra, 7: Pub bone, 8: Coccygium, 9: Sacrospinous ligament, 10: Uterosacral ligament, 11: Pubourethral ligament, 12: Cervical ring, 13: Puboconical fascia, 14: Levator ani muscle, 15: Internal obturator muscle, 16: Ischial spine, 17: Perineal membrane, 18: ATFP, 19: ATLA, 20: Endopelvic fascia



## Pelvic floor anatomy

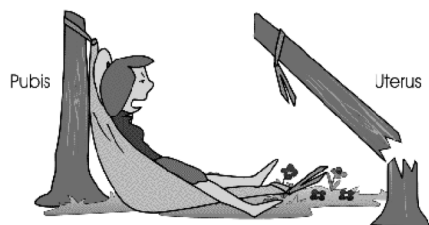
- Compartments: Delancey's hammock theory





## Pelvic floor anatomy

- Compartments: Delancey's hammock theory



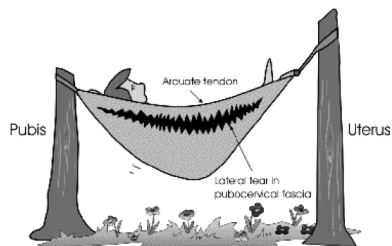
## Pelvic floor anatomy

- Compartments: Delancey's hammock theory



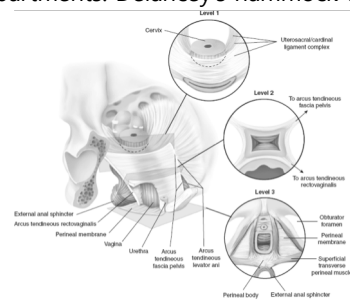
## Pelvic floor anatomy

- Compartments: Delancey's hammock theory



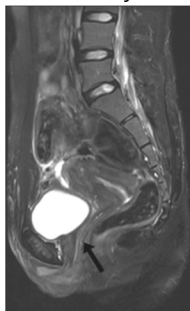
## Pelvic floor anatomy

- Compartments: Delancey's hammock theory



## Pelvic floor anatomy

- Compartments: Delancey's hammock theory



## History taking


- Rule out other pathology: infection / malignancy
- Differentiate storage / voiding symptoms
- Obstetric history / surgical history
- Risk factors
- Bowel function / sexual function
- Expectation
- Bother



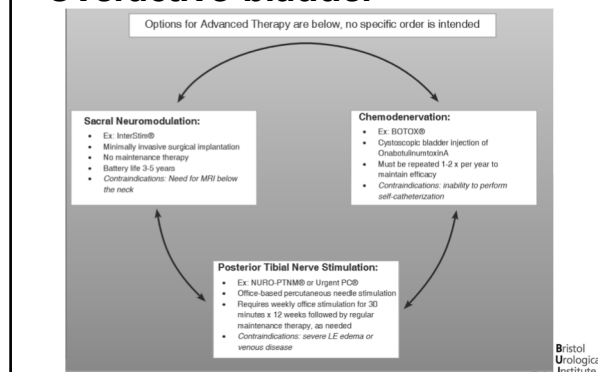
## Overactive bladder

<b>1<sup>st</sup> Line or Initial Treatment</b>	<b>Behavior/Lifestyle:</b> Should be discussed and offered as first line therapy to all patients	<ul style="list-style-type: none"> <li>Urge suppression, PFMT, bladder training</li> <li>Dietary modification</li> <li>Therapies may be instituted at any time and combined with pharmacotherapy</li> <li>Optimal treatment duration/trial 4-8 weeks</li> </ul>	<b>Reassess After 4 - 8 Weeks</b>	If at any point during treatment the patient is satisfied, continue present treatment. If inadequate symptom relief, consider adding medication, dose escalation, change in medication, combination antimuscarinic and Beta-3 agonist medication, consider 3 <sup>rd</sup> line treatments or refer to specialist.
<b>2<sup>nd</sup> Line Treatment (medication)</b>	<b>Pharmacotherapy:</b> Initiate if inadequate improvement with conservative management or at provider's discretion if the symptoms warranted to be bothersome enough	<ul style="list-style-type: none"> <li>Current classes of medications include: Antimuscarinics, Beta-3 agonist</li> <li>Choice of class or medication depends on age, comorbidities, concomitant medications, formulary restriction                             <ul style="list-style-type: none"> <li>Trial of pharmacotherapy should be at least 4-8 weeks</li> <li>Manage side effects (if present)                                     <ul style="list-style-type: none"> <li>Avoid constipation</li> <li>Adjust fluids, dry mouth aids</li> <li>Patent medication aid tool*</li> <li>Medication change or dose adjustment</li> </ul> </li> </ul> </li> </ul>		


\*Caring Score



## Overactive bladder




## Physical examination

- Demonstrate urinary leakage
  - Pelvic organ prolapse
  - Palpate pelvic floor muscles
  - Assess muscle strength
- 


## Questionnaires

Table 1: Summary of the ICUD review 2012\*


	Category A (all 3 criteria fulfilled)*	Category B (2 criteria fulfilled)*	Category C (only 1 criterion fulfilled)*
Symptom measures and health-related QOL measures	ICIQ-LI Short Form, ICIQ/LUTS, ICIQ-M/LUTS (IQ and IQ-7), I-QOL (ICIQ-Ubol), ISS, MHQ, LIS (7-interval), N-QOL, OAB-q SF, OAB-q (ICIQ/OABq), PFI and PFIQ-20, PFIQ and PFIQ-7, PRAFA, UISS	Conlife, EPQ, LUTS tool IQQ, YIPS	ABSSST ISI, ISQ, UHFI, UIQ
Measure of patient satisfaction (patient's measure of treatment satisfaction)	BSW, OAB-S, OABSAT-q, TBS	PFQ	EPI, GPI, PSQ
Goal attainment scales		SAGA	
Screening tools (used to identify patients with UI)	B-SAQ, OAB-SS, OABV8, OAB-V3, OUID	ISQ, USP	3IQ, CLSS, MESA, PUF
<b>Patient symptom scale</b>			
Assessment of symptom bother and overall bother	PPBC, LDI or LDI-6, LUSQ, PGI-I and PGI-S	PFBQ, SSI and SII	PMSES, POSQ, UI-4
Assessment of the impact of urgency	IUSS, U-IQ, UI Scale, U-UI	PPRUS, SUIQ, UPRScore, UPRScale, UQ, USQ-QOL, USQ-S, USS	
Questionnaires to assess sexual function and urinary symptoms		FSFI, ICIQ-VS, PISQ, SQOL-F	SFQ
Treatment adherence Measures		MASRI	



## Other investigations

- Bladder diary
  - Uroflowmetry
  - Urine analysis
  - Imaging (X)
  - Cystoscopy (X)
- 

## Urodynamic evaluation

- Controversy
  - Value of leak point pressures
  - Value of urethral function evaluation
  - Techniques
- 

## “SHOULD ALL WOMEN HAVE URODYNAMIC EVALUATION BEFORE UNDERGOING CONTINENCE SURGERY?”



## Aims of urodynamic evaluation

- To **define**: bladder function and urethral function
- To **reproduce**: identify the pathophysiology behind the symptoms
- To **diagnose**
- To **select**: appropriate management option
- To **predict**: worse outcomes (detrusor overactivity / voiding dysfunction)



## “Urodynamic study identifies incontinence mechanism”

- Able to differentiate USI, DOI, MUI, etc
- SUI diagnosed by visualising urine leakage on bedside cough tests
- Careful history taking able to reveal cough-induced detrusor overactivity
- Urodynamic study sometimes fail to reproduce symptoms



## “identifying DO can predict worse outcome”

- Detrusor overactivity may worsen after surgery
- Doesn't affect the management (surgery plus medical treatment)
- Several studies suggest DO may improve after surgery



## “identifying voiding dysfunction predicts worse outcome”

- Provide better counselling before surgery
- Diagnosis of voiding dysfunction is uncertain, As there is no agreed definition
- Normal voiding function cannot preclude voiding dysfunction after surgery



## WHAT DO THE GUIDELINES SAY?



## NICE 2013

- Do not perform urodynamic evaluation in the small group of women where pure SUI is diagnosed based on detailed clinical history and examination



## AUA 2017

- Physicians may omit urodynamic evaluation for the index patient desiring treatment when SUI is clearly demonstrated
- "Index patient" : otherwise healthy female considering surgical treatment for the correction of SUI



## EAU 2017

- Perform urodynamic evaluation if findings may change the choice of invasive management



## "SHOULD ALL WOMEN HAVE URODYNAMIC EVALUATION BEFORE UNDERGOING CONTINENCE SURGERY?"



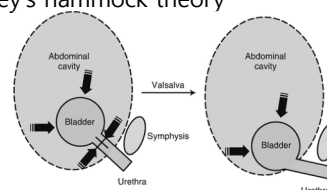
## Mechanism of stress urinary incontinence

Urethral hypermobility  
vs  
Intrinsic sphincter deficiency



## Urethral hypermobility

- Downward displacement of bladder neck and / urethra during an increase in abdominal pressure
- Decreases pressure transmission to urethra
- Delancey's hammock theory



## Intrinsic sphincter deficiency

- Inability of urethra to generate enough outlet resistance to keep it closed
- Nerve, muscle, mucosa, scarring etc



## Blaivas classification of USI

Classification	Findings	Fluoroscopic Image	
Type 0	A. Rest: flat bladder base above symphysis pubis B. Cough: rotational descent of urethra and bladder base; no leakage		
Type I	A. Rest: flat bladder base above symphysis pubis B. Cough: bladder base descends; vesical neck and urethra open with leakage		Type I: < 2cm descent
Type IA	A. Rest: flat bladder base above pubis B. Cough: marked descent and rotation of bladder and urethra below pubis; urethra opens widely with leakage		Type II: rotational descent (cystocele) (IB = abnormally low resting position)
Type IIB	A. Rest: flat bladder base below pubis B. Cough: further descent and rotation of bladder and urethra below pubis; urethra opens widely with leakage		Type III: Intrinsic sphincter deficiency (Blais and Olson, 1988)
Type III	A. Rest: bladder base above pubis; vesical neck and urethra are open B. Cough: bladder base above pubis; vesical neck and urethra are open		

Adapted, with permission, from Blaivas JG, Olsson CA. *J Urol*. 1988;139:727-731.



## Urethral function studies

- Fluoroscopy during video urodynamic study
- Abdominal leak point pressure
- Urethral pressure profilometry



## Abdominal leak point pressure

- What is it?
- How to measure it?
- How to interpret?
- Limitations
  - Not able to demonstrate in everybody
  - Visualisation of leakage
  - Catheter size and urethral obstruction
  - Variable baseline intravesical pressure
  - Patient position and bladder filling



## Urethral pressure profilometry

- What is it?
- Urethral pressure is the fluid pressure which is required to just open a closed urethra
- Profilometry describes the change in intraluminal pressure along the length of urethra

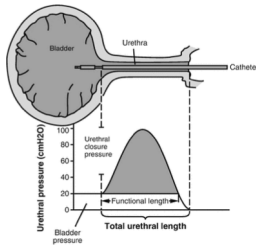


## Urethral pressure profilometry

- How is it measured?
- Brown and Wickham method
- Measures the pressure needed to perfuse a catheter at constant rate, while the bladder catheter is drawn at a steady speed (2mm/sec)
- Perfusion at a constant rate can be achieved by a syringe pump (or sometimes a pressure bag)



## Urethral pressure profilometry



- Interpretation:
- Maximal urethral closure pressure
- Functional urethral length



## Urethral pressure profilometry

- Normal values:
- 92 - age (Edwards 1974)
- >30 (<20 being diagnostic of ISD)
- Highly variable
- Bladder filling
- Patient position
- Method to produce constant rate of filling
- Catheter size



## Urethral function studies

- Fluoroscopy during video urodynamic study
- Abdominal leak point pressure
- Urethral pressure profilometry
- Conclusion:
- No one single study is effective to make a diagnosis of underlying mechanism of urodynamic stress incontinence
- Use in conjunction with standard urodynamic study to give more information to enable better counselling



## Techniques during urodynamic study

- Patient positioning
- Provocative tests
- Role of video urodynamic
- Role of ambulatory urodynamic



## Treatment options for USI

- Pelvic floor muscle exercise
- Medical treatment
- Surgical treatment



## Pelvic floor muscle exercise

- What is the aim?
- supervised better than unsupervised
- Enabling process
- Biofeedback / vaginal cones / training adjuncts / Electromagnetic seats



## Medical treatment for USI

- Duloxetine
- SSRI
- Approved in UK, but not US
- Efficacy is limited
- Side effects is common



## Surgical treatment for USI

- Mid urethral slings: TVT, TOT, TVT-O
- Adjustability
- Considerations in removal
- Recent FDA warning
- Autologous slings: rectus fascia, tensor fascia lata
- Colposuspension
- Bulking agents: Macroplastique / Bulkamid



## Pelvic organ prolapse

- Presentation
- Assessment
- Relationship between Delancey's level and POP
- Terminology
- Association of POP and UI
- Effect on POP on urodynamic parameters
- Clinical decision pathway on POP and UI



## Presentation of POP

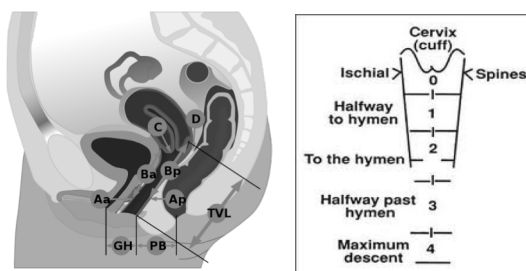
- Asymptomatic
- dragging sensation
- Mass felt / seen
- Urinary incontinence
- Voiding dysfunction
- Pain (uncommon unless associated with mucosal ulceration)



## Assessment of POP



## Assessment of POP





### Assessment of POP

Choose an Example

Exam Date: 11/2/2018

Uterus:  Yes  No

anterior wall	anterior wall	cervix or cuff
-3	-3	-8
Aa	Ba	C
2	3	10
gh	pb	tvf
posterior wall	posterior wall	posterior fornix
-3	-3	-10
Ap	Bp	D

Reset Edit

Bristol Urological Institute

### Assessment of POP

Anterior Stage 2

Exam Date: 11/2/2018

Uterus:  Yes  No

anterior wall	anterior wall	cervix or cuff
-1	-1	-5
Aa	Ba	C
3	2	10
gh	pb	tvf
posterior wall	posterior wall	posterior fornix
-1	-1	-7
Ap	Bp	D

Reset Edit

Stage 2  
Leading Edge:  
Anterior/Posterior

Bristol Urological Institute

### Assessment of POP

Anterior Stage 3

Exam Date: 11/2/2018

Uterus:  Yes  No

anterior wall	anterior wall	cervix or cuff
1	2	-5
Aa	Ba	C
4	3	10
gh	pb	tvf
posterior wall	posterior wall	posterior fornix
-1	-1	-7
Ap	Bp	D

Reset Edit

Stage 3  
Leading Edge:  
Anterior Wall

Bristol Urological Institute

### Delancey's level of support

- Anterior Wall Defects :
  - Cystocele - Level 2
  - Urethral hypermobility (SUI) - Level 3
- Posterior Wall Defects :
  - Rectocele - Level 2
- Apical Defects:
  - Uterovaginal Prolapse -Level 1
  - Vaginal Vault Prolapse-Level 1
  - Enterocele - Level 1

Bristol Urological Institute

### Terminology - pelvic floor dysfunction

- Lower urinary tract symptoms: urinary incontinence, voiding dysfunction
- Defecatory dysfunction
- Sexual dysfunction
- Pelvic organ prolapse (anterior wall defect, posterior wall defect)

Bristol Urological Institute

### Association of POP and UI

- In all grade POP, SUI reported in up to 40%
- In grade IV POP, 60% has urinary incontinence

Bristol Urological Institute

'should all women planning for POP repair undergo urodynamic study?'



### Effect of POP on urodynamic parameters

- Qmax & RU are not affected
- Not associated with voiding dysfunction or detrusor overactivity
- DLPP and MUCP decrease with reduction of prolapse
- So how to do a urodynamic study in patients with POP?
- How to reduce the POP at the study



### Clinical decision pathways

'For women with POP and UI, does combined surgery for POP repair and anti-incontinence surgery decrease the rate of UI post operatively?'

- Borstad et al
- a. Anterior repair + TVT
- b. Anterior repair +/- TVT at 3 months
- No difference in rate of UI at 1 year (29% dry)
- 44% never required TVT



### Clinical decision pathways

'For continent women with POP, does combined surgery for POP repair and anti-incontinence surgery decrease the rate of UI post operatively?'

- 2013 Cochrane review
- a. POP repair + anti-incontinence surgery 19% UI
- b. POP repair alone 32% UI
- combined surgery prevented 14% UI in short term results
- However, in long term results, colposuspension resulted in more UI



### Clinical decision pathways

'For women with POP and occult UI, does combined surgery for POP repair and anti-incontinence surgery decrease the rate of UI post operatively?'

- 2013 Cochrane review
- Higher rate of UI in prolapse surgery alone group



### Clinical decision pathways

'Does prolapse surgery improve OAB symptoms?'

- Costantini et al
- 70-75% improvement rate in OAB and incontinence



## Clinical decision pathways

- Incontinent (symptomatic or occult) women with POP:
  - Simultaneous surgery
  - Wait and see
- Continent women with POP:
  - Benefit of prophylactic continence surgery is uncertain



## Treatment options for POP

- Pelvic floor muscle exercise
- Pessaries



- Surgical repair



## Surgical repair options for POP

- Vaginal repair:
  - Anterior colporrhaphy
  - Posterior colporrhaphy
  - Sacrospinous vaginal suspension (Apical repair)
  - Colpocleisis (elderly)
- Abdominal repair:
  - Sacral colpopexy / hysteropexy (apical)
  - Paravaginal repair (anterior)
  - Perineopexy (posterior)



## Urinary retention in women

- What is retention?
- Transient causes
- Causes for persistent urinary retention
- Assessment
- Definition of BOO in women
- Management of urinary retention



## Urinary retention

- Complete retention
- Incomplete emptying / elevated post void residue
- Symptomatic / asymptomatic
- Acute / chronic
- Bladder dysfunction / bladder outlet dysfunction



## Transient causes

- Immobility (esp post operation)
- Fecal impaction
- Urinary tract infection
- Delirium
- Post partum urinary retention
- ~30% no identifiable cause
- ~50% void normally without treatment



## Bladder dysfunction

- Acontractile detrusor
- Detrusor underactivity
- Neurogenic: lower motor neuron
- Myogenic: chronic distension / diabetes
- Aging



## Bladder outlet dysfunction

- Anatomical
- Stricture: iatrogenic (catheterization, surgery, radiation, pelvic fracture)
- Post continence surgery
- POP
- Urethral diverticulum
- Ureterocele
- Functional
- Dysfunctional voiding
- Primary bladder neck obstruction
- Detrusor external sphincter dyssynergia



## Dysfunctional voiding

- Intermittent or fluctuating flow rate due to involuntary intermittent contractions of the peri-urethral striated muscle during voiding, in neurologically normal individuals (Allen 1972)
- Exact cause is not known
- Learned dysfunctional voiding: Hinman's syndrome, non-neurogenic neurogenic bladder (Hinman 1986)



## Primary bladder neck obstruction

- Marion 1933
- Cause unknown
- Failure of dissolution of mesenchymal tissue at bladder neck
- inclusion of abnormal connective tissue
- Smooth muscle hypertrophy & inflammatory process (Leadbetter 1959)



## Fowler's syndrome

- Young post menarche women
- 40% polycystic ovary
- High volume painless retention (1L)
- All endoscopic and imaging examinations normal
- Associated with high urethral closure pressure on UPP
- Sphincteric needle EMG: helicopter / cough / whale
- Intolerable to catheterisation especially catheter withdrawal



## Assessment

- Transient causes
- Focal neurological examination (no urological evaluation can tell neurogenic or not)
- Uroflowmetry and post void bladder scan
- Urodynamic study (surface EMG not always helpful)



## Problems of urodynamic study

- Many women cannot void at CMG suite
- Unnatural environment
- Women empty their bladders by relaxing pelvic floor, sometimes with aid of abdominal muscles, without generating a strong detrusor contraction
- BOOI & BCI formulae don't apply
- Difficult to diagnose detrusor underactivity
- Small changes in Pdet may define BOO

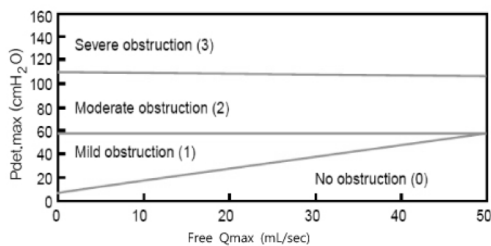


## Definition of BOO in women

- Massey & Abrams: 2 out of 3
  - $Q_{max} < 12$
  - $P_{det} > 50$
  - Urethral resistance ( $P_{det} / Q_{max}$ )  $> 0.2$
- Axelrod & Blaivas:  $Q_{max} < 12$  &  $P_{det} > 20$
- Chassagne et al:  $Q_{max} < 15$  &  $P_{det} > 20$
- Lemack & Zimmern:  $Q_{max} < 11$  &  $P_{det} > 21$
- Groutz et al:  $Q_{max} < 12$  &  $P_{det} > 20$



## Definition of BOO in women



- Blaivas & Groutz N&U (2000) 19:553-564



## Management

- Conservative
- Behavioral: timed voiding, double voiding, ? straining
- Pelvic floor muscle relaxation exercise
- Catheterization
- Medical treatment: no effective pharmacotherapy available for detrusor underactivity or acontractile detrusor



## Management

- Sacral neuromodulation: effective in small studies in highly selective patients, possibly in Fowler's syndrome
- Surgical options (rarely performed)
  - Intrasphincteric Botox injection
  - Reduction cystoplasty
  - Detrusor myoplasty

