

# Stress Urinary Incontinence Diagnosis and Management

Wan Mokhzani Wan Mokhter  
Urology Unit, Hospital USM  
20<sup>th</sup> April 2014

# Urinary Incontinence

- Definition : Complaint of any involuntary leakage of urine(1). Results from a failure to store urine during the filling phase. Due to dysfunction of the detrusor, urethral sphincter, or anatomical abnormalities. Urine loss is either urethral or extraurethral.
- Classification:
  - 1) Stress urinary incontinence
  - 2) Urgency urinary incontinence
  - 3) Mixed urinary incontinence
  - 4) Overflow incontinence
  - 5) Nocturnal enuresis
  - 6) Post-micturition dribble

# Incontinence : Causes and Pathophysiology

- Predisposing factors : Female, Caucasian, Neurological disorders, Anatomical disorders (vesicovaginal fistula, ectopic ureter, urethral fistula), Childbirth & pregnancy, Pelvic/perineal/prostate surgery, Radical pelvic radiotherapy, Diabetes.
- Promoting factors : Smoking, Obesity, Infection, Medications, Poor nutrition, Ageing, Cognitive deficits, Poor mobility, Oestrogen deficiency.

# Incontinence : Causes and Pathophysiology

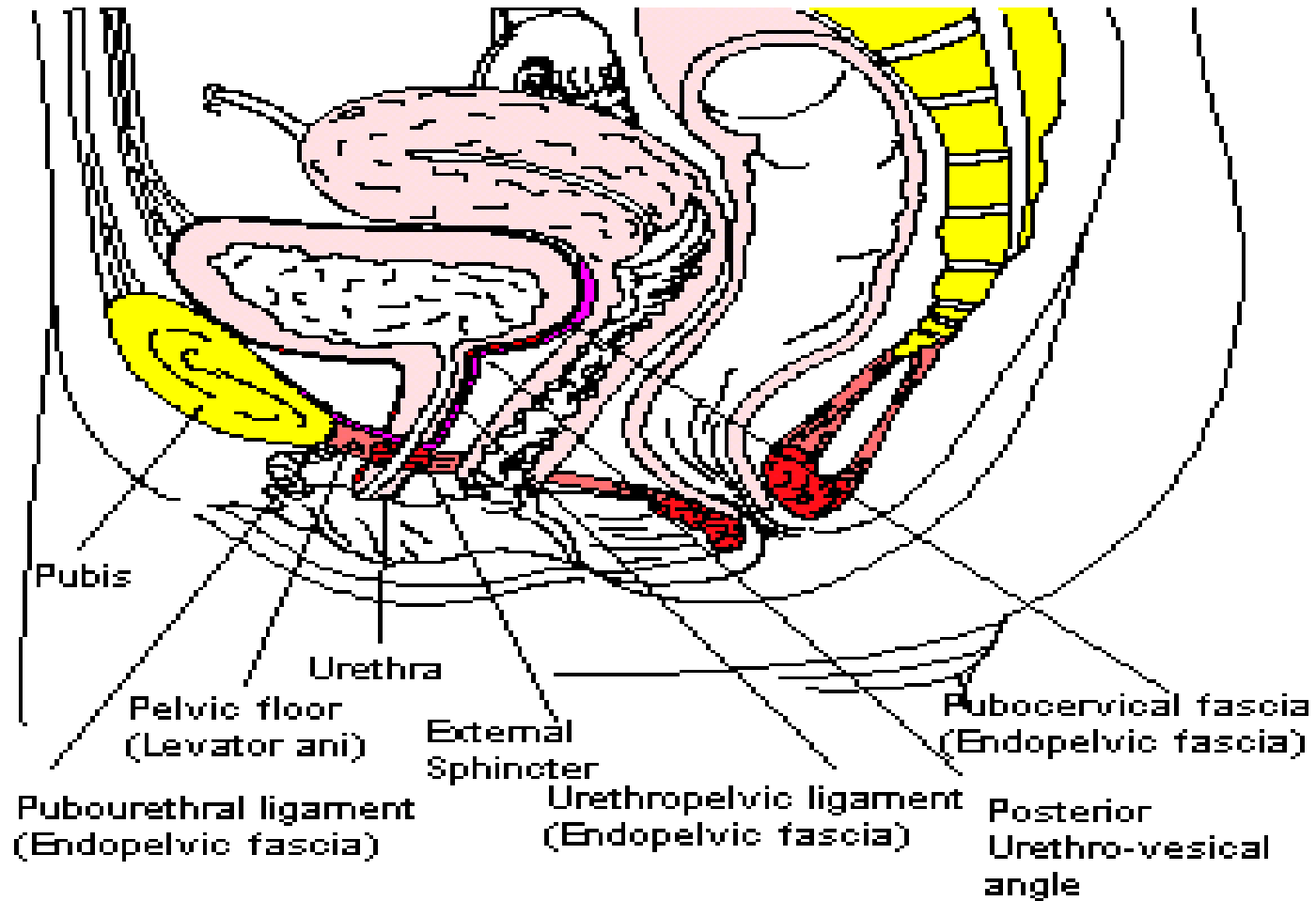
- Bladder abnormalities (20%)
  - i) Detrusor overactivity. Due to myogenic hypothesis(1), neurogenic hypothesis(2) and integrative hypothesis(3).
  - ii) Low bladder compliance.
  
- Urethral and sphincter abnormalities (80%).
  - i) Urethral hypermobility.
  - ii) Intrinsic sphincter deficiency.

1- Brading AF (1997)

2- De Groat WC (1997)

3- Drake MJ, et al (2001)

# Female pelvic anatomy

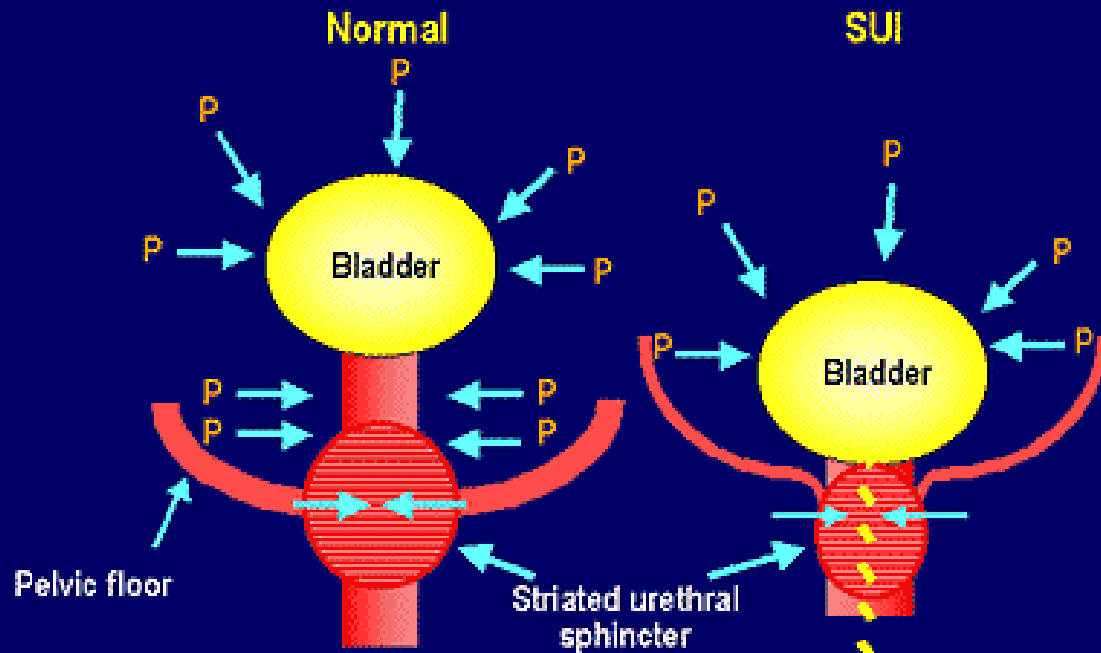


# Urethral hypermobility

- Proximal urethra remains in abdominal cavity.
- Proximal urethra and bladder subjected to same pressure.
- Therefore no urine loss.
  
- Proximal urethra moves out of the abdominal cavity.
- Displacement of urethra during sudden increase in intraabdominal pressure.
- Intra abdominal pressure overrides urethral resistance.

# Urethral hypermobility

## Bladder Pressure Exceeds Urethral Pressure



P = abdominal pressure.

# Stress Urinary Incontinence

- Involuntary urine leakage on effort, exertion, sneezing, or coughing(1).
- Due to hypermobility of bladder base, pelvic floor and/or intrinsic urethral sphincter deficiency.
- Type 0 : reports of urinary incontinence, but without clinical signs(2).
- Type 1 : Leakage during stress with <2cm descent of bladder base below upper border of symphysis pubis(2).
- Type 2 : >2cm bladder base descent(2).
- Type 3 : Bladder neck and proximal urethra already open at rest. Intrinsic sphincter deficiency(2).

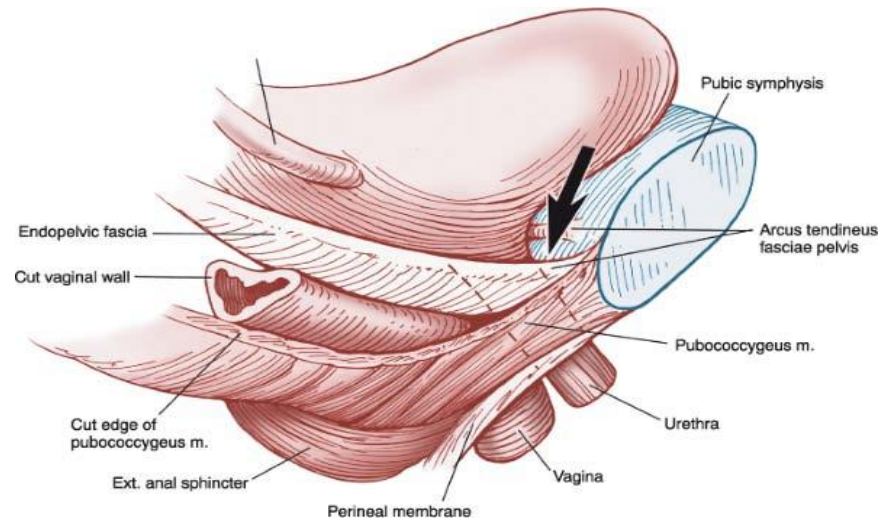
1 – Abrams P, et al (2002)

2 – Blaivas JG (1988)



# Stress Urinary Incontinence

- Integral theory : Laxity of anterior vaginal wall and pubourethral ligaments, causing bladder neck hypermobility(1).
- Hammock hypothesis : Failure of support of urethra by the endopelvic fascia and vaginal wall(2).



1- Petros PE (1990)

2- DeLancey JO (1994)

# Incontinence : Evaluation

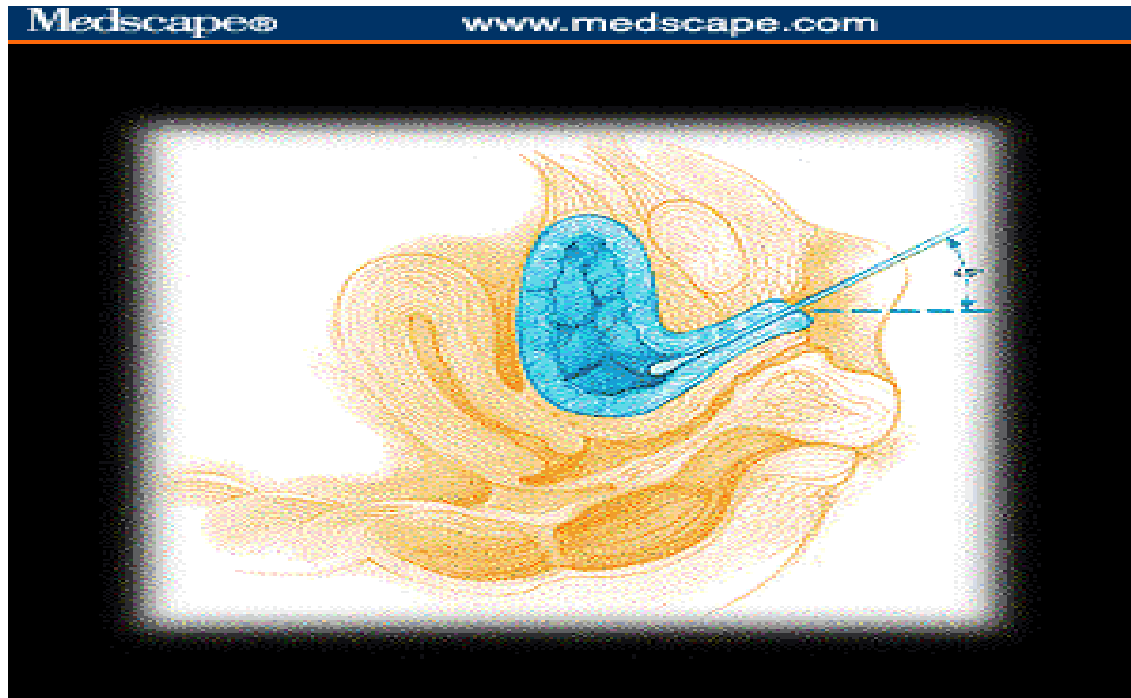
- History
  - Storage or voiding symptoms.
  - Triggers for incontinence (cough, sneezing, exercise, urgency).
  - Frequency, severity and degree of bother of symptoms.
  - Establish risk factors.
  - ICIQ-UI questionnaire(1).
  - Medication history : Sympathomolytics (clonidine, terazosin) and sympathomimetics (ephedrine, imipramine).
  - 'Red flag' symptoms : associated pain, hematuria, recurrent UTI, previous history of pelvic surgery/ radiotherapy.

## Incontinence : Evaluation

- Stress test : urine leak from urethra on cough.
- Pelvic exam : Pelvic organ prolapse. Vaginal atrophy in oestrogen deficiency.
- Q-tip test : Q-tip angle a measure of urethral mobility.
- Urethral pressure profile : Urethral closure pressure.
  
- Palpable bladder.
- External genitalia.
- DRE.
- Flow rate and post-voiding residual volume.
- Upper tracts imaging.

# Q-tip test

- Cotton swab test to diagnose urethral hypermobility.
- Tip movement  $>30$  degree from horizontal while straining.



# Basic Investigation

- Bladder diaries : fluid intake, frequency and volume voided, incontinent episodes, pad usage, and degree of urgency over a 3-day period.
- Urinalysis and culture.
- Flow rate and post-void residual volume : 150ml, PVR <50ml, >200ml, transabdominal US.
- Pad testing : Full bladder, pad weight gain >1g for 1 hour and >4g for 24 hours.
- Patient adherence to home pad testing protocols is poor.
- Use a pad test when quantification of urinary incontinence is required. (C)

## Basic investigation – EAU March 2013

- Use a frequency volume chart to evaluate co-existing storage and voiding dysfunction in patients with urinary incontinence.
- Use a diary duration of between 3 to 7 days. (B)
- Do urinalysis as part of the initial assessment of a patient with urinary incontinence.
- In a patient with urinary incontinence, treat a symptomatic UTI appropriately.
- Use ultrasound to measure post-voiding residual.

## Further investigation

- Urodynamics
  - Abdominal leak point pressure.
  - Between 90 to 100cmH<sub>2</sub>O suggests hypermobility.
  - <60cmH<sub>2</sub>O suggests ISD.
- Sphincter EMG
  - Measures electrical activity from urethral muscles or perineal floor.
  - Synchronization between detrusor and external urethral sphincter.

## Basic investigation – EAU March 2013

- Do not routinely carry out urodynamics when offering conservative treatment for urinary incontinence. (B)
- Perform urodynamics if the findings may change choice of invasive treatment. (B)
- Do not routinely carry out urethral pressure profilometry.(C)



# Conservative Treatment

- Pelvic floor muscle training.
  - minimum of 3 months.
  - At least 8 contractions , 3 times per day.
  - Symptoms improve in 30% women with mild SUI.
- Lifestyle modification.
  - Weight loss.
  - Quit smoking.
  - Avoid constipation.
  - Modify fluid intake.

## Lifestyle interventions – EAU March 2013

- Encourage obese women suffering from any urinary continence to lose weight (>5%). (A)
- Patients with urinary incontinence who smoke should be given smoking cessation advice in line with good medical practice although there is no definite effect on urinary incontinence. (A)
- Offer supervised PFMT, lasting at least 3 months, as a first-line therapy to women with stress urinary incontinence or mixed urinary incontinence. (A)

# Conservative treatment

- Biofeedback
  - Strength of pelvic floor muscle contraction as visual, auditory or tactile signal.
- Medication
  - Duloxetine inhibits serotonin and noradrenaline uptake.
  - 20 to 40mg bd, acts to increase sphincter activity.
  - Recommended as alternative to surgery rather than first line treatment(1).
  - Side effects include nausea, dry mouth, constipation, diarrhea and dizziness.
- Local estrogen therapy as pessaries, rings or creams.

## Lifestyle interventions – EAU March 2013

- Consider using biofeedback as an adjunct in women with SUI. (A)
- Duloxetine should be initiated using dose titration because of high adverse effect rates. (A)
- Duloxetine can be offered for temporary improvement in incontinence symptoms. (A)
- Offer post menopausal women with urinary incontinence local estrogen therapy, the ideal duration and best delivery method are unknown. (A)

## Conservative treatment

- Extracorporeal magnetic innervation
  - Pulsed magnetic field to stimulate nerves of the sphincter and pelvic floor.
  - Possible benefit in mixed incontinence.
- High-frequency electrical stimulation,
  - 35 to 50Hz to contract pelvic floor.
  - No proven therapeutic benefits in SUI.

## Conservative treatment – EAU March 2013

- Do not offer magnetic stimulation for the treatment of incontinence or overactive bladder in adult women. (B)
- Do not offer percutaneous tibial nerve stimulation (PTNS) to women or men seeking cure for urge urinary incontinence. (A)
- Offer, if available, PTNS as an option for improvement of urge urinary incontinence in women, but not men, who have not benefitted from antimuscarinic medication. (B)

# Surgery for Incontinence

- Urethral bulking agents.
- Retropubic suspension.
- Suburethral slings.
- Artificial urinary sphincters.

# Injection therapy

- Injection of bulking materials into bladder neck and periurethral muscles.
- Increase outlet resistance.
- Main indication : female stress incontinence due to demonstrable ISD with normal bladder muscle function.
- May be beneficial in urethral hypermobility.
  
- Contraindications : active UTI, untreated bladder overactivity, bladder neck stenosis.



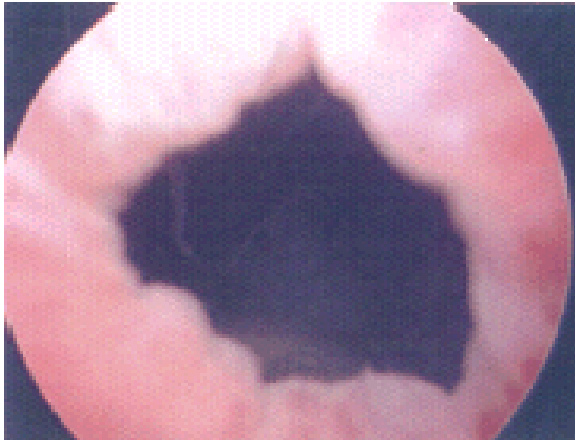
# Injection therapy

- Materials : silicone, polyacrylamide hydrogel, carbon-coated zirconium beads, PTFE paste, calcium hydroxylapatite, autologous fat.
- Aim : urethral mucosal apposition and lumen closure.
- May require 2-4 injections.
- Overall success rates variable at 50-80%(1,2).

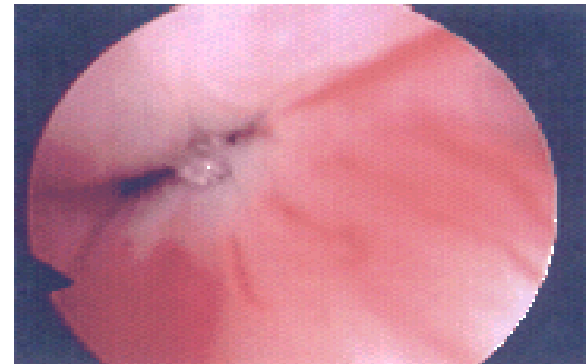
1 – Koebel H, et al (1998)

2 – Appell RA (1994)

# Injection therapy



Bladder neck Incompetence



Bladder neck after  
Macroplastique injection

## Injection therapy – EAU March 2013

- Periurethral injection of bulking agent may provide short-term improvement in symptoms (3 months), but not cure, in women with SUI.
- There is no evidence that one type of bulking agent is better than another type.
- Do not offer bulking agents to women who are seeking a permanent cure for stress urinary incontinence. (A)

# Injection therapy

- Complications
  - Temporary urinary retention (2-15%)
  - De novo urgency incontinence (6-12%)
  - Uncomplicated UTI (5%)
  - Hematuria (5%)
  - Distant migration and risk of granuloma formation with PTFE paste.
- Results deteriorate with time(1).
- Not commonly used as first-line treatment.

# Retropubic suspension

- Indication : female SUI predominantly caused by urethral hypermobility.
- Aim : Elevate and fix the bladder neck and proximal urethra in a retropubic position > support bladder neck > regain continence.
- Lower chance of benefit with significant ISD.

## Retropubic suspension

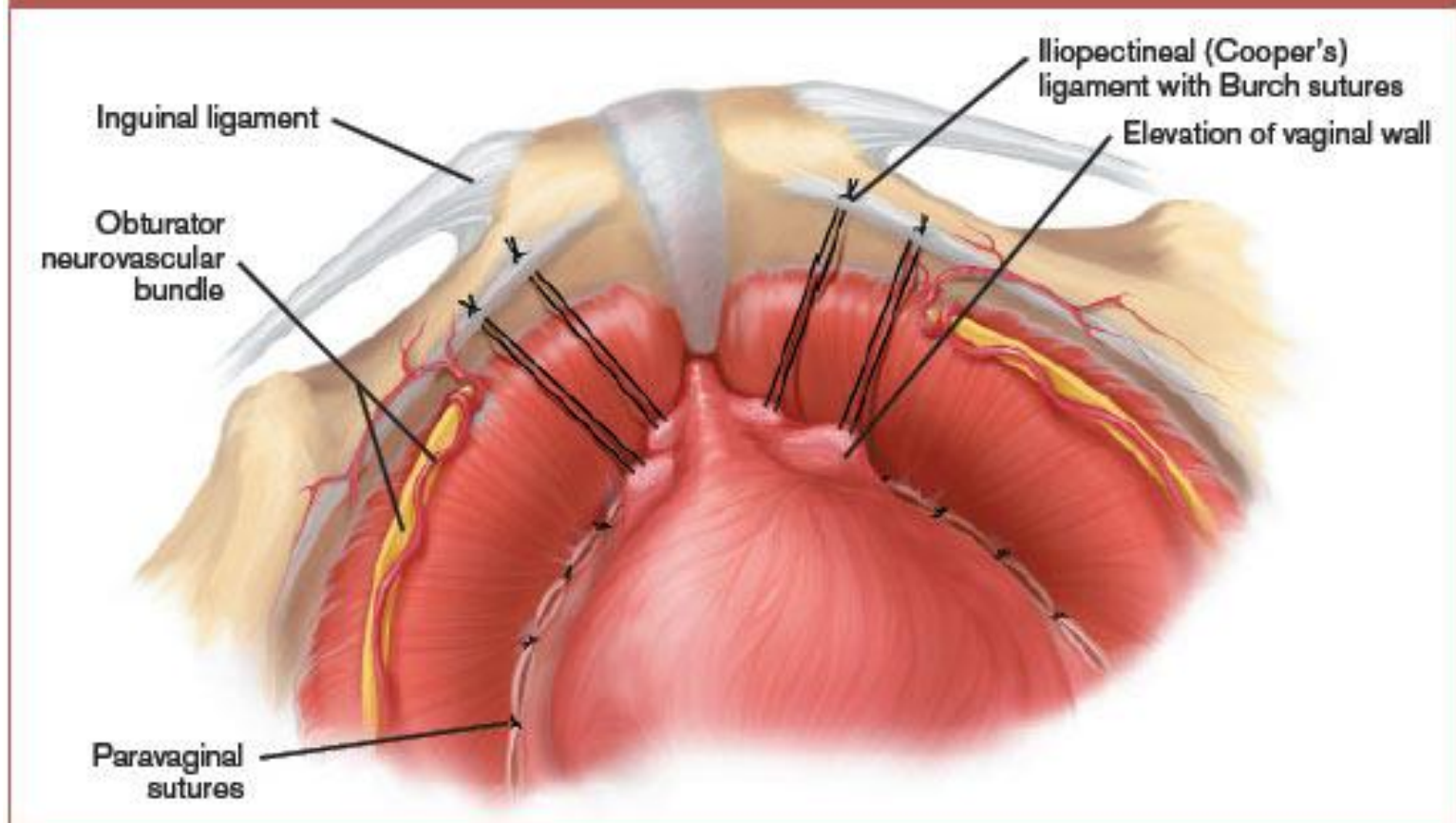
- Consider surgery after failed conservative methods.
- Burch colposuspension.
- Vagino-obturator shelf / paravaginal repair.
- Marshall-Marchetti-Krantz (MMK) procedure.

# Retropubic suspension – Burch colposuspension

- Most widely used technique with best durability.
- Open or laparoscopic.
- Exposes the paravaginal fascia and approximating it to the iliopectineal ligament of the superior pubic rami.
- Vaginal wall is elevated and attached to the lateral pelvic wall.
- Adhesions over time secure its position.
- Good option for concurrent SUI and anterior vaginal wall prolapse.
- Success rate 85-90% at 1 year and 70% at 5 year(1).

# Burch colposuspension

**FIGURE 1** Burch procedure showing two periurethral sutures attached to Cooper's ligament.





# Burch colposuspension

## Complications.

- 1) Posterior compartment prolapse (10-25%).
- 2) De novo urgency incontinence (15%).
- 3) Voiding dysfunction (10%).

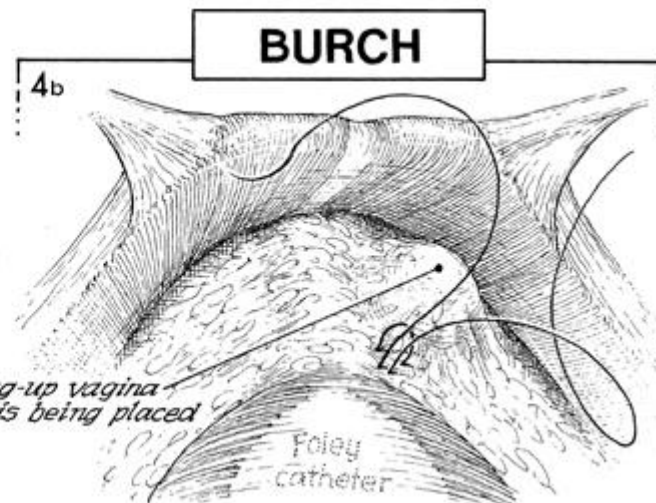
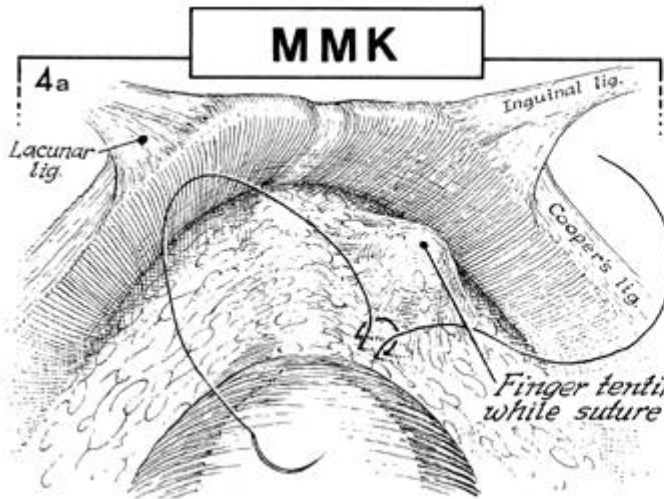
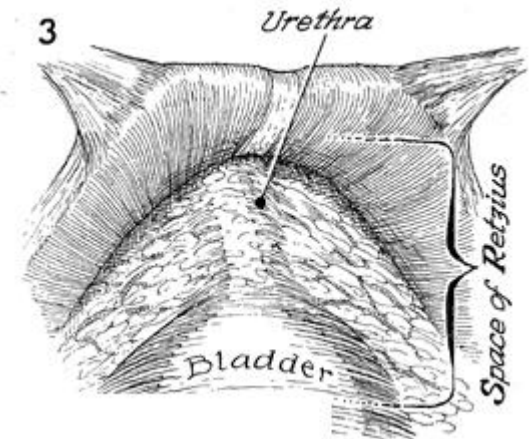
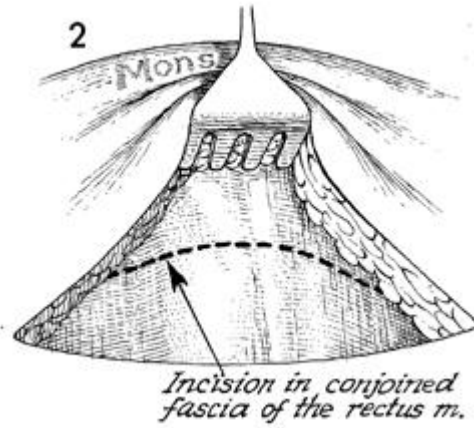
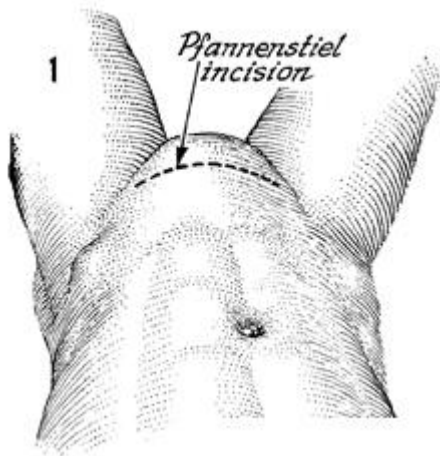
## Retropubic suspension – vagino obturator shelf.

- A variant of Burch procedure.
- Sutures are placed by the vaginal wall and paravaginal fascia, then passed through the obturator fascia to attach to the parietal pelvic fascia.
- Aim : Disperse tension on the paravesical tissue laterally to reduce risk of prolapse.
- Success rate up to 85%.

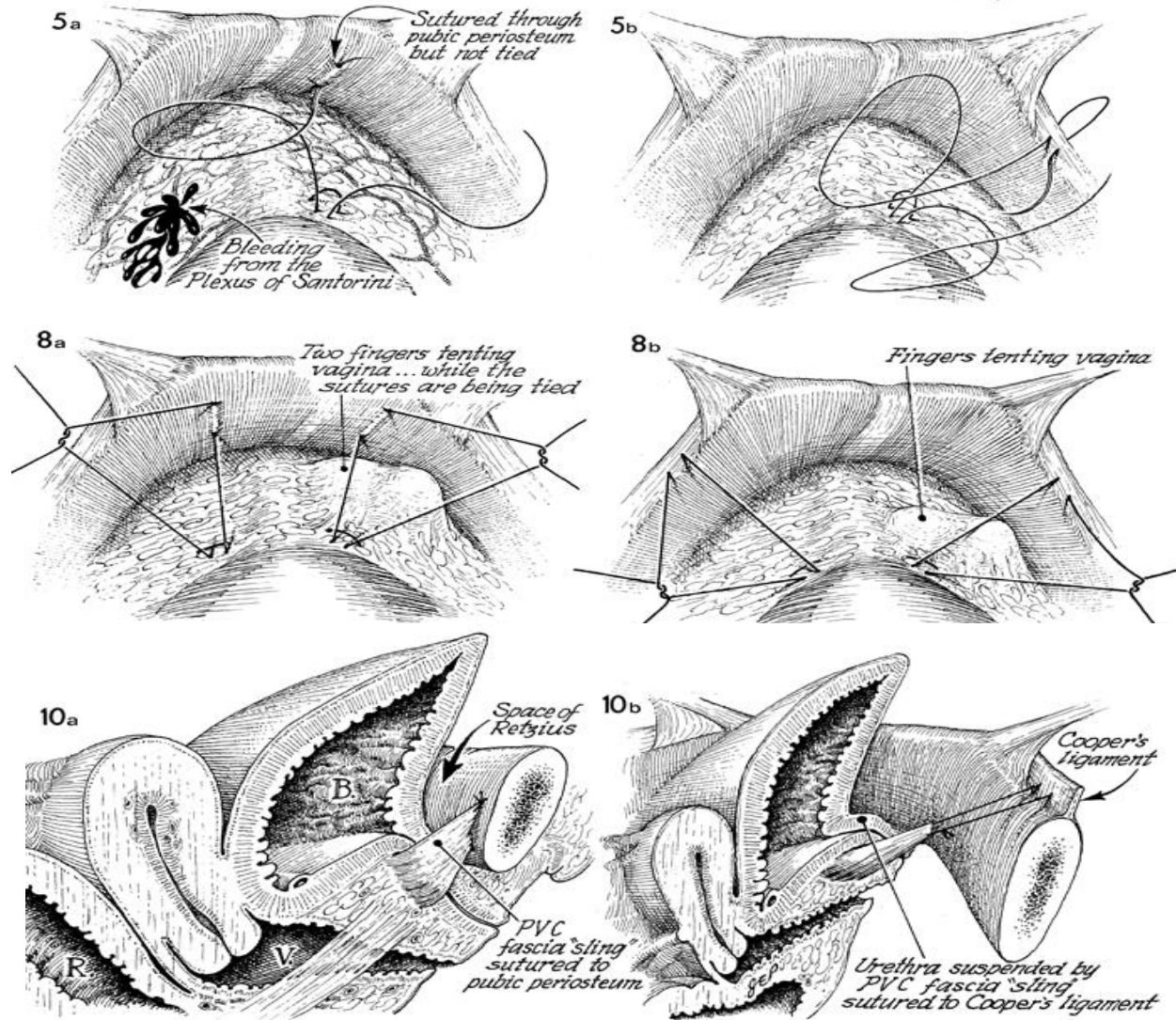
# Retropubic suspension – Marshall Marchetti Krantz (MMK) procedure.

- Sutures placed on either side of the urethra around the level of the bladder neck.
- Then tied to the hyaline cartilage of the symphysis pubis.
- Short term success about 90%(1).
- Efficacy declines over time.
- Complications : osteitis pubis (8%).

# Retropubic suspension



# Retropubic suspension



## Retropubic suspension – EAU March 2013

- Anterior colporrhaphy has lower rates of cure for UI especially in the longer term.
- Offer colposuspension to women with SUI if mid-urethral sling cannot be considered. (A)

# Surgery for Incontinence

- Urethral bulking agents.
- Retropubic suspension.
- Suburethral slings.
- Artificial urinary sphincters.

# Suburethral tapes and slings

- Types of sling.
  - 1) Synthetic tapes – Retropubic tension-free vaginal tape (TVT), Transobturator tape (TOT).
  - 2) Autologous – rectus fascia, fascia lata, vaginal wall slings.
  - 3) Non-autologous – allograft fascia lata from cadaveric tissue.



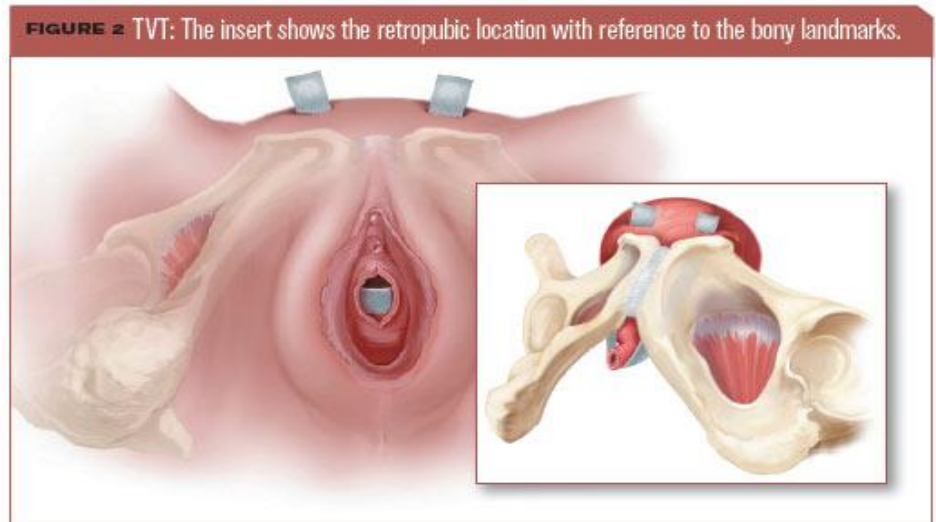
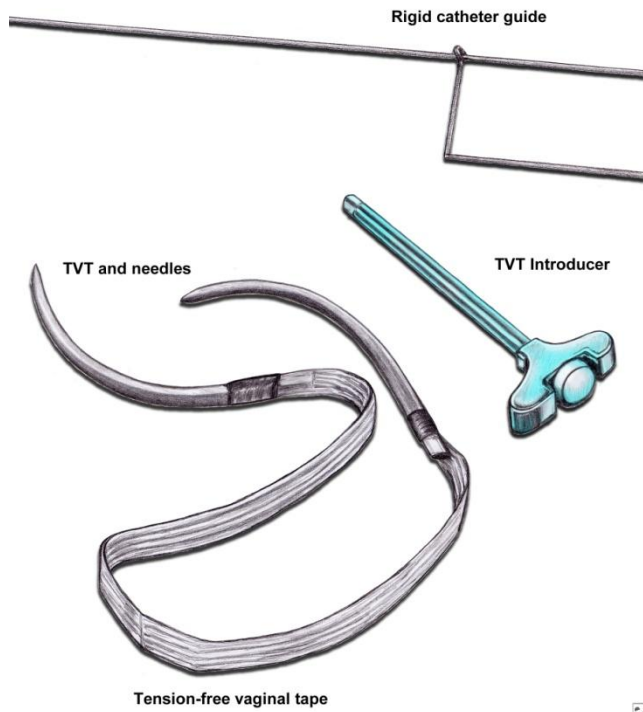
# Synthetic tapes

- First-line surgical treatment for female SUI.
- Local or regional anaesthesia as daycare procedure.
- Retropubic route (TVT) or transobturator route (TOT, TVTO).
- Lynx TVT tape, Monarc Subfascial Hammock TOT tape, Obtryx tape.
- Bladder empty and catheterized.

# Retropubic tapes

- Small midline anterior incision over mid-urethra.
- Long trocars at end of tape inserted either side of urethra and perforate through the endopelvic fascia.
- Pushed from bottom upwards into the lower abdominal wall, just above the pubic bone.
- Tape positioned tension-free over mid urethra, its covering removed, its ends cut and vaginal epithelium closed.
- Outcomes : TVT success rate up to 90% at 1 yr and 80% at 5yr(1).

# Transvaginal Tape



# Transobturator tapes

- Midline anterior vaginal incision for dissection around the urethra.
- Two small incisions lateral to the labia majora at clitoris level.
- Transobturator tape (TOT) – curved handle device passes from outside to inside.
- Transvaginal Transobturator tape (TVT-O) – curved handle device passes from inside to outside.

# Transobturator tape



## Suburethral tapes - Outcomes

- TVT success rates at 1yr up to 90% and 5yr up to 80%(1).
- TVT vs colposuspension : No statistically significant difference in cure rate up to 5 year follow up(2). But lower OAB symptoms and prolapse in TVT group(2).
- TOT vs TVT : equivalent subjective cure rates(3). TOT less voiding dysfunction, blood loss, bladder perforation, and shorter OT time(3). TVT less vaginal injuries / erosion, less pain in the groin(4).

## Suburethral tapes – EAU March 2013

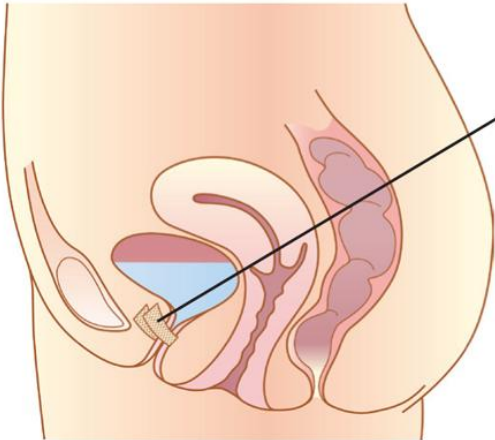
- Compared to colposuspension, the retropubic mid-urethral synthetic sling gives equivalent patient-reported cure of SUI at 12 months.
- Mid-urethral synthetic sling by either transobturator or retropubic route gives equivalent patient-reported outcome at 12 months.
- Offer mid-urethral sling to women with uncomplicated SUI as the preferred surgical intervention whenever available. (A)

# Mini tapes

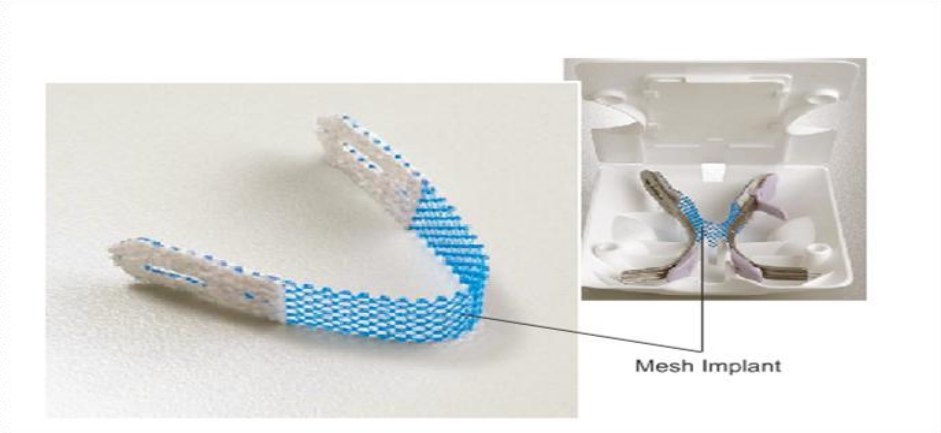
- Self retaining mini tapes inserted via a single vaginal incision.
- MiniArc and GYNECARE TVT SECUR.
- Short term success rates around 80-90%(1).



# Mini Tapes



**SLING**  
Placement of MiniArc sling supports the urethra and prevents urine leakage



Mesh Implant

## General complications of tapes

- Voiding dysfunction (urinary retention, de novo bladder overactivity).
- Vaginal, urethra, and bladder perforation or erosions.
- Pain (groin/thigh with transobturator route).
- Injury to bowel or blood vessels (rare).

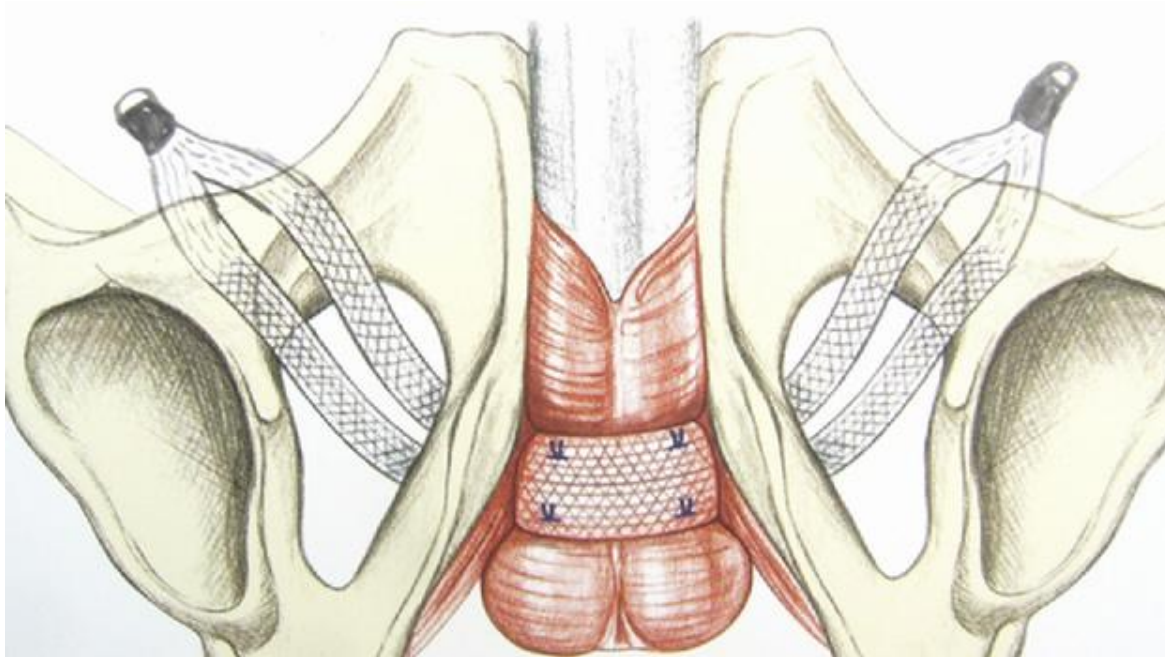
## Pubovaginal (autologous) slings

- A segment of rectus fascia 10-20cm in length with non-absorbable long sutures placed on both ends.
- Sling placed under the mid urethral and sutures through the endopelvic fascia up to the remaining rectus fascia.
- Higher complications of UTI, voiding dysfunction and urge incontinence(1).

## Male tapes

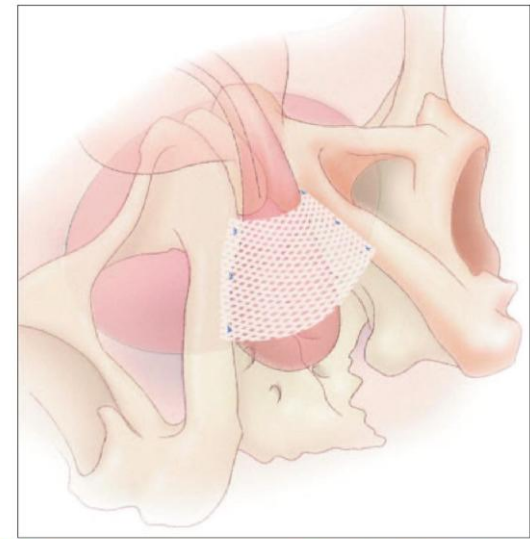
- Male Sling System – mild to moderate SUI (3-4 pads per day) with some residual sphincter function.
- Small incision in perineum and 2 incisions in each groin.
- Sling passed through the obturator foramina and positioned over the bulbar urethra to support and slightly elevate the urethra.
- Success rates 60-80% at 1 year.

# Male sling system



# Male tapes

- InVance Male Sling System.
- Mesh attached to the pubic bone by three titanium screws on both sides to compress the bulbar urethra.
- Success rates 70-80% at 3-4 years.



# Surgery for Incontinence

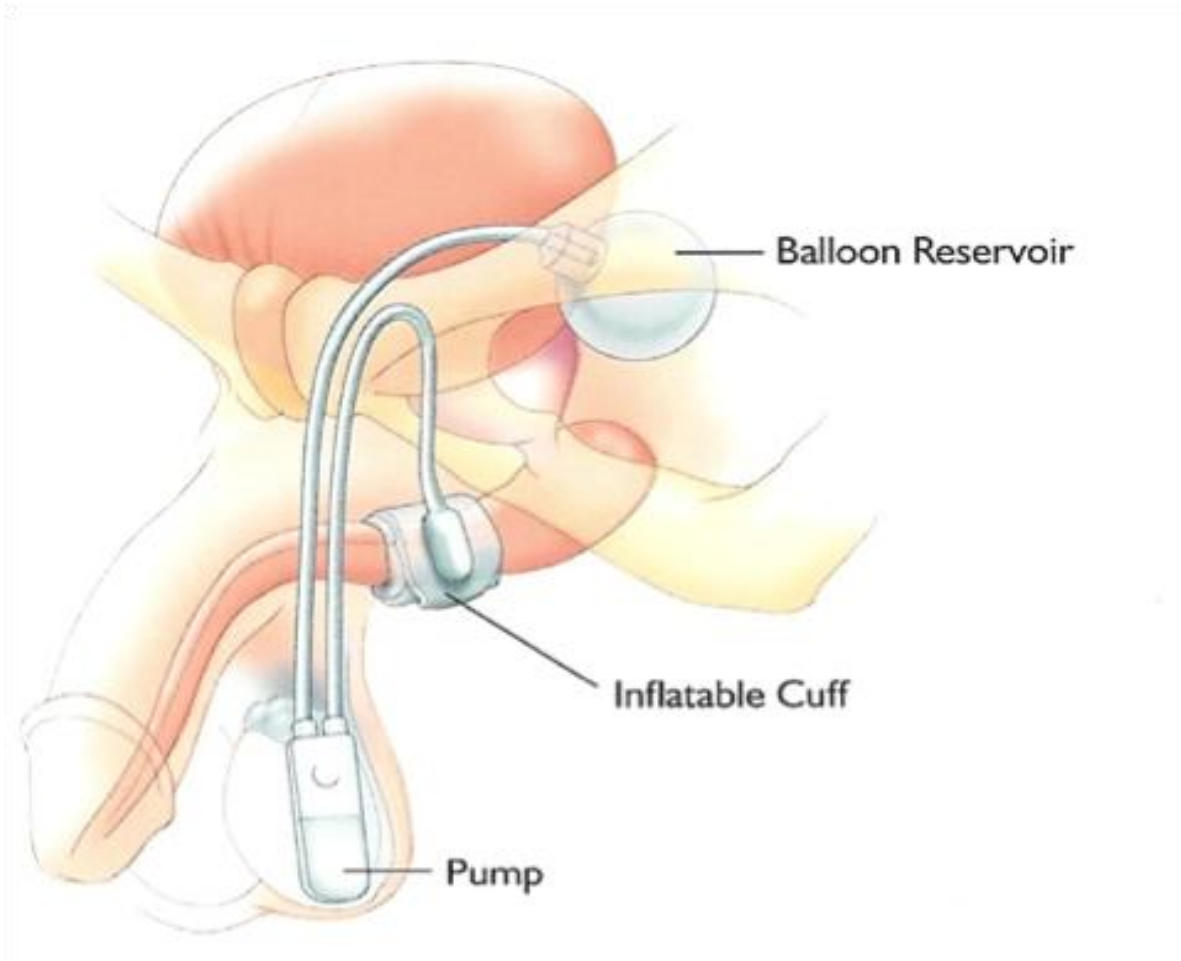
- Urethral bulking agents.
- Retropubic suspension.
- Suburethral slings.
- Artificial urinary sphincters.

# Artificial urinary sphincter

- AMS800 artificial urinary sphincter.
- Closed pressurized system with three components.
- Inflatable cuff placed around the bulbar urethra or bladder neck.
- Pressure-regulating balloon extraperitoneally in the abdomen.
- Activating pump in the scrotum or labia majora.



# Artificial Urinary Sphincter



# Artificial urinary sphincter

- To void the pump is squeezed.
- Transfers fluid to the reservoir balloon and deflates the cuff.
- Cuff refills automatically within 3 minutes.
- Balloon pressure 61-70mmHg for bulbar urethra or 71-80mmHg for bladder neck placement.

# Artificial urinary sphincter

- Indications : Moderate to severe urethral sphincter deficiency with normal bladder capacity and compliance.
- For sphincter damage post radical prostatectomy, TURP, pelvic radiotherapy, pelvic fracture, and complicated urethral reconstruction.
- In women, reserved when other treatments failed.

# Artificial urinary sphincter

- Contraindications : bladder neck stenosis, poor patient manual dexterity or cognition, active infection.
- Patient evaluation : Urodynamics, cystoscopy and upper tract imaging to evaluate voiding function and identify anatomical anomalies that might affect the efficacy of AUS.
- Results : Overall long term success 70-90%. Revision rates 20-30%.

# Artificial urinary sphincter

- Complications
  - i) Recurrent incontinence due to
    - 'Urethral atrophy' underneath the cuff.
    - Mechanical failure.
    - Urethral erosion.
    - Bladder overactivity or reduced compliance.
  - ii) Erosions : 5% most commonly at 3-4 months.
  - iii) Infection : 1-5%. Remove the entire device and wait 3-6 months before reinsertion.

Thank you