Stress Urinary Incontinence
Diagnosis and Management

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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

1- Abrams P, et al 92002)
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)
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

Normal

SUI

Pelvic floor

Striated urethral sphincter

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).

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 : Sympatolytics (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 100cmH2O suggests hypermobility.
  - <60cmH2O 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.
• 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.

1 – NICE Guideline, 2006
• 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 or 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


- Aim: urethral mucosal apposition and lumen closure.

- May require 2-4 injections.

- Overall success rates variable at 50-80%(1,2).

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 colpospension.
- 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).

1 – Lapitan MCM, et a; (2009)
Burch colposuspension

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

- **Inguinal ligament**
- **Obturator neurovascular bundle**
- **Paravaginal sutures**
- **Iliopectineal (Cooper’s) ligament with Burch sutures**
- **Elevation of vaginal wall**
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
- 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 form 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

FIGURE 2: TVT: The insert shows the retropubic location with reference to the bony landmarks.
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 (TVTO) – 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