**Preamble**

- Pathophysiology & Etiology of SUI
  - Epidemiology
  - Enhoring’s Theory & Hammock Theory
- Management of SUI
  - Conservative & Surgery
  - Management of intra & post-operative complications
- Case discussions

**Conservative Rx options**

**Initial approach to \( \text{Q} \) LUTs**

**What is conservative Rx?**

- Lifestyle changes
- Weight Loss
- Pelvic Floor Rehabilitation
- Continence pessary
- Bladder training

**Obesity & UI**

- Independent RF for prevalence of UI
- Increased BMI RF for SUI failure after MUS
  - BMI \( >25 \): OR for failure = 2.9
  - Massive weight loss (15 to 20 BMI points) significantly decreases UI in morbidly obese women. (LoE 2)
  - Moderate weight loss also results in decreased UI. (LoE 1)
  - If Morbid (BMI>40) or moderately obese (BMI 35-40), weight loss = 1st line to reduce UI

**Weight loss group has greater reduction in leakage episodes**

- Weight loss of 8 kg (vs 2kg): wkdly 1hr activity, reduced calorie diet
- Reduction of IEL 6 months
  - IEL: Incontinence Episode Leakage
  - % wt loss @ 6,12,18m: 8, 7.5, 5.5
  - wkdly IEL reduction
  - @12m: 65 vs 67%, p<001
  - @18m: greater proportion had IEL>70%
Pelvic Floor rehabilitation

Kegel (pelvic floor muscle exercises) 1948
vaginal cones / gadgets
biofeedback
electrical stimulation
magnetic stimulation

PFME

Regular PFME to improve PFM function

Muscle Awareness
Muscle Response Coordination
The Knack

Muscle Strength
Endurance
Muscle bulk
Muscle tone
Muscle position

Functional positions

Physiological basis of how PFME works

Pelvic Floor rehabilitation

Kegel (pelvic floor muscle exercises) 1948
vaginal cones / gadgets
biofeedback
electrical stimulation
magnetic stimulation

PFMT

• PMFT
  – Activation of PFM before during physical exertion seems to be automatic response
  – Bladder neck supported by strong toned PFM
  – Contraction of transversus abdominus co activates PFM

• SUI
  – Strengthen pelvic floor musculature, urethral support
  – Regain normal unconscious activation of pelvic floor muscles during increases in abdominal pressures
  – Learn voluntary activation of compensatory mechanism

been there, done that

30% unable to correctly contract
PFM on verbal instruction alone
25% perform straining instead (or something else!)

Digital VE to confirm technique
Dynamic USS

Supervised PFMT to verify, support, enhance optimal PFM contractions

Pelvic Floor assessment

Modified Oxford Scale
0 no palpable movement
1 minimal or small muscle bulging
2 small range of movement weak, brief hold
3 definite muscle movement up to ¼ range, lift
4 firm muscle movement closure around finger, ¼ range
5 firm muscle pull, compresses finger, full range, strong hold

PFMT regimens

Variation in regimens include

Amount of contact (supervision):
Individual vs Group supervision
Direct vs Indirect exercise: (eg Shum, Paula Mathod, Sapsford method)
Generic vs Individualised:
Submaximal vs near maximal:
Daily vs 3x per week:
Addition of upright position:
Addition to strength training:
Addition of abdominal muscle exercise:

Provide most intensive physio-led PFMT program
Supervised better than self directed
More contact is better than less

15/08/2016
PFMT regimens

PFMT

- 3 sets of 8-12 slow velocity maximum voluntary PFM
- Sustained 6 – 8 seconds
- Performed 3 – 4 times a week
- for 15 – 20 weeks (3-4 months)


PFMT – efficacy

Late pregnancy (34 weeks or later): 30% less likely to report UI. (RR 0.71, 95% CI 0.54 to 0.95)

Treatment of UI (post partum): 40% less likely to have UI (RR 0.60, 95% CI 0.35 to 1.03) Cochrane

Boyle CDSR 2012

Duroupin CDSR 2014

UFMT versus Colpo: 8 times more likely to report cure (RR: 8.38, 95% CI 3.68 to 19.87)

Klarskov Uro Intl 1986

PFMT versus MUS: less likely to report cure @4m (RR 0.20, 95% CI 0.07 to 0.61)

Peresicot 2010

Preamble

- Pathophysiology & Etiology of SUI
  - Epidemiology
  - Enhorning’s Theory & Hammock Theory
- Assessment of UI
- Management of SUI
  - Conservative & Surgery
  - Management of intra & post operative complications
  - Case discussions

Surgery for SUI

- Traditional
  - MMK, Burch Colpo suspension & pubovaginal slings
  - Needle suspension (inc Bladder neck)
  - Midurethral slings
  - Evidence for SUI surgery

UGSA 2016 MUS training program
Surgery for SUI

**Objective cure rates for 1st procedure & recurrent SUI**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Mean (%)</th>
<th>95% CI</th>
<th>Mean (%)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First Procedure</td>
<td>Recurrent Incontinence</td>
<td>First Procedure</td>
<td>Recurrent Incontinence</td>
</tr>
<tr>
<td>Slings</td>
<td>93.9</td>
<td>89.2 - 98.6</td>
<td>96.1</td>
<td>92.4 - 99.8</td>
</tr>
<tr>
<td>Burch colposuspension</td>
<td>89.8</td>
<td>87.6 - 92.1</td>
<td>92.9</td>
<td>89.6 - 96.2</td>
</tr>
<tr>
<td>Needle suspension</td>
<td>88.7</td>
<td>70.5 - 97.8</td>
<td>90.6</td>
<td>72.4 - 100</td>
</tr>
<tr>
<td>Anterior vaginal repair</td>
<td>87.0</td>
<td>83.7 - 90.3</td>
<td>88.8</td>
<td>83.4 - 94.2</td>
</tr>
<tr>
<td>Injections</td>
<td>86.7</td>
<td>70.5 - 92.5</td>
<td>87.8</td>
<td>78.2 - 97.4</td>
</tr>
</tbody>
</table>

- First procedure does better than 2nd procedure
- Some operations have much worst efficacy

**Late 1990s**

**Jarvis BJOG 1994**

**MMK**

- VF Marshall, AA Marchetti, Kermit E Krantz placed abdominal retropubic urethropexy for UI in gynecologic surgeons' repertoire (1949)
- an anterior suspension of the urethral hammock
  - retropubic urethropexy
- Complications
  - Ureteral, urethral, bladder
  - Retention, bleeding
  - Otitis pubis 5-7%

**Colposuspension**

- John Burch (1961), initially and successfully sutured paravaginal fascia laterally to the anterior tendinous arches (paravaginal repair) but abandoned this site in favour of Cooper's ligament
- Tanagho (1979) modification Burch – lateral placement of vaginal sutures to suspend anterior vaginal vault at BN with no approximation to Cooper's
- More lateral/anterior compared to Marshall Marchetti Krantz (MMK), less urethral obstruction

**Lap Burch – ICI 2013**

- Laparoscopic colposuspension shows comparable subjective and objective outcome to open colposuspension in the short, medium (RR 0.98; 95% CI 0.75 to 1.25, and long-term term

**Recommendations:**

- Laparoscopic colposuspension can only be recommended for the surgical treatment of SUI in women by surgeons with appropriate training and experience. (Grade D)
- Women can be reassured regarding the long-term (5 years plus) data on lap colposuspension.
- Laparoscopic colposuspension might be considered for the treatment of SUI in women who wish to avoid MUS or undergoing concurrent laparoscopic surgery for other reasons. (Grade D)

**Role for Laparoscopic Burch Colposuspension @present ?**
Pubovaginal Sling

• Autologous rectus fascia, underneath proximal urethra, pass retropubically, secured to abdominal wall permanent sutures

Burch Colposuspension

• Permanent sutures 2 each anterior vaginal @ level bladder neck
• Pubopectineal ligament

Cure = no self-reported symptoms of SUI, a negative stress test and no retreatment for SUI

66% Cure @24m 49% P<0.001
48% UTI 32%
14% voiding dysfunction 2%
27% post op urgency need R.
30.8% continence @9yr 24.1%
83% satisfaction @9yr 73%

PVS in 21st Century

• salvage procedure for recurrent SUI
• adjunct to urethral and bladder reconstruction
• functionally close the urethra to abandon urethral access to the bladder
• who decline to have synthetic material implanted

Prev MUS ME, radiation, urethral injuries, concurrent fistula/diverticulum

PVS = pubovaginal sling

Retropubic MUS benefits

• Efficacy comparable to Colposuspension
• Far less invasive procedure
• Usually requiring a shorter hospital stay
• Quicker recovery times
  – Can be performed under local anaesthesia
• An advantage to high operative risk pts
• post operative voiding problems similar colpo
• No post operative catheterisation
• Cost effective

MUS vs traditional SUI Surgery

<table>
<thead>
<tr>
<th>Study</th>
<th>Comparison</th>
<th>Subjective success at 12 months</th>
<th>Objective success at 1.2 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robinson et al.</td>
<td>Burch vs midurethral sling</td>
<td>Equal success (n=500)</td>
<td>Equal success* (n=100)</td>
</tr>
<tr>
<td>Albo et al.</td>
<td>Colposuspension vs midurethral sling</td>
<td>Equal success (n=500)</td>
<td>Equal success* (n=100)</td>
</tr>
<tr>
<td>Albo et al.</td>
<td>Burch vs midurethral sling</td>
<td>Very similar success rates</td>
<td>Very similar success rates</td>
</tr>
<tr>
<td>Albo et al.</td>
<td>Midurethral sling vs pubovaginal sling</td>
<td>Equal success (n=500)</td>
<td>Equal success (n=100)</td>
</tr>
<tr>
<td>Albo et al.</td>
<td>Burch vs midurethral sling</td>
<td>Very similar success rates</td>
<td>Very similar success rates</td>
</tr>
<tr>
<td>Albo et al.</td>
<td>Colposuspension vs midurethral sling</td>
<td>Equal success (n=500)</td>
<td>Equal success (n=100)</td>
</tr>
<tr>
<td>Albo et al.</td>
<td>Midurethral sling vs pubovaginal sling</td>
<td>Equal success (n=500)</td>
<td>Equal success (n=100)</td>
</tr>
<tr>
<td>Lee Dwyer</td>
<td>Midurethral sling vs colposuspension</td>
<td>Subjective success &gt;50%</td>
<td>Objective success &gt;50%</td>
</tr>
<tr>
<td>Lee Dwyer</td>
<td>Midurethral sling vs pubovaginal sling</td>
<td>Subjective success &gt;50%</td>
<td>Objective success &gt;50%</td>
</tr>
<tr>
<td>Lee Dwyer</td>
<td>Colposuspension vs pubovaginal sling</td>
<td>Subjective success &gt;50%</td>
<td>Objective success &gt;50%</td>
</tr>
</tbody>
</table>

MUS performs as well as traditional SUI surgery
### Surgery for SUI

- Traditional
  - MMR, Burch Colposuspension & pubovaginal slings
  - Needle suspension (inc Bladder neck)
  - Midurethral slings
  - Evidence for SUI surgery
- Types of MUS
  - Retropubic: bottom up or Top down
  - Transobturator: inside out or outside in
  - MiniSlings: various anchorage mechanism

### MUS: other routes

<table>
<thead>
<tr>
<th>Study</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Effect Size</th>
<th>95% CI</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottom up</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top down</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Retropubic top down approach out of favour

### Retropubic vs transobturator MUS ISD

<table>
<thead>
<tr>
<th>Procedure</th>
<th>ISD 2015</th>
<th>Ford et al IUJ 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottom up</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top down</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ISD: Incontinence for Surgeons

### Reoperation rate continence surgery Fou-Ramsen AOG 2016

- 26 RCT 3308 women

### SIS vs other tape meta-analysis

- Mostafa Eur urology 2014

- 26 RCT 3308 women

**Conclusion**

- Exclude TVT secure (withdrawn market) no difference between SIS and other slings except more favourable recovery mini-sling
Choice of Tape in 2016

- **Retropubic (RPS)** Generally Procedure of choice
greatest data and follow-up
top-up better than top down
rates repeat continence 5x than obturator (9x)
slightly ↑ rates voiding dysfunction (easily managed)
↑ rates bladder perforation (no significant sequel)
groin pain ↑ in obturator slings (very difficult to treat)
obturator tapes ↓ operating time & blood loss than RPs

- **ISD**: RPS remains procedure choice
  - Objective success rate ↑ & reoperation SUI compared obturator ↓
  - **Obturator Sling** considered in Hostile abdomen, & if patients informed of ↑ rate groin pain & ↑ reoperation rate 5 years
  - Single incision sling: currently paucity data
  - consider use with ethics committee approval until further data

Learning Curve: Ward Hilton Trial

Bladder perforation generally occurred within 1st to 13th (Median 8th) in recruiting centres

Authors "we would look on it as highly regrettable if readers took this to imply that the procedure was appropriate for all surgeons to undertake"

Authors endorse "All surgical procedures should be undertaken only by those with appropriate training and experience to allow them to maintain the highest standards of practice."

Appropriate training for TVT has never been satisfactorily defined, although we would suggest that considerable experience in cystourethroscopy and in retropubic surgery are essential pre-requisites, and supervised management of at least 15 cases should be considered desirable.

Ward Hilton BMJ 2002; 325:67

Learning Curve RPMUS

- Bladder perforations as proxy
- Institution based 1568 cases 1997-2013
- 16 surgeons: perforation rate 0%-31%
- **Perforation rate**
  - 10.3% ATSM trainees (11 cases)
  - 4.5% Subspec trainee (86 cases)
  - 1.3% consultants (1284 cases)
  - Peak after 10-30 cases
  - Number needed to reach <5%: 20 to 80 cases

bladder perforation related to experience

- **N= 1136 MUS**
- Bladder injury was noted in 34 patients (3%)
- all but 1 - retropubic sling (p<0.0001)
- Thirty two (94%) of the perforations were associated with an inexperienced surgeon (p<0.0001) fellow/reg vs consultant

### STUDY 1

**Previous Caesarean Section**

<table>
<thead>
<tr>
<th>OR</th>
<th>Significance</th>
<th>95% C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.7</td>
<td>p&lt;0.05</td>
<td>1.2 - 11.5</td>
</tr>
</tbody>
</table>

**Previous Colposuspension**

<table>
<thead>
<tr>
<th>OR</th>
<th>Significance</th>
<th>95% C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.2</td>
<td>p&lt;0.05</td>
<td>1.2 - 12.7</td>
</tr>
</tbody>
</table>

**BMI < 30**

<table>
<thead>
<tr>
<th>OR</th>
<th>Significance</th>
<th>95% C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.9</td>
<td>p&lt;0.01</td>
<td>1.7 - 20.6</td>
</tr>
</tbody>
</table>

**Local anaesthesia**

<table>
<thead>
<tr>
<th>OR</th>
<th>Significance</th>
<th>95% C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.9</td>
<td>p&lt;0.001</td>
<td>2.6 - 13.7</td>
</tr>
</tbody>
</table>

**Rrotecile**

<table>
<thead>
<tr>
<th>OR</th>
<th>Significance</th>
<th>95% C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.5</td>
<td>p&lt;0.001</td>
<td>2.1 - 17.8</td>
</tr>
</tbody>
</table>

This occurs in Fellows/Regs/surgeons who performed <50 slings

Stav J Urol 2009

---

**Authors**

- **SIS vs other**
  - Mostafa European Eur 2014

<table>
<thead>
<tr>
<th>Authors</th>
<th>SIS</th>
<th>No.</th>
<th>Obturator</th>
<th>Retropubic</th>
<th>Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>El-Ashry</td>
<td>Ovutara</td>
<td>Merail</td>
<td>Tebr</td>
<td>Schellart</td>
<td>Lee</td>
</tr>
<tr>
<td>353</td>
<td>354</td>
<td>2 yrs</td>
<td>1 yr</td>
<td>1 yr</td>
<td>1 yr</td>
</tr>
<tr>
<td>Mostafa</td>
<td>Schweitzer</td>
<td>Bati</td>
<td>Ophi</td>
<td>Amat Tandtu</td>
<td>Needleless</td>
</tr>
<tr>
<td>226</td>
<td>182</td>
<td>1 yr</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Djehdian</td>
<td>SIMS-Ajust</td>
<td>69</td>
<td>61</td>
<td>1 yr</td>
<td></td>
</tr>
<tr>
<td>Amat Tandtu</td>
<td>Needleless</td>
<td>contasure</td>
<td>157</td>
<td>118</td>
<td>2 yr</td>
</tr>
<tr>
<td>Shaheinou</td>
<td>YFS</td>
<td>40</td>
<td>40</td>
<td>2 yr</td>
<td></td>
</tr>
<tr>
<td>Gopinath</td>
<td>Solyx</td>
<td>15</td>
<td>15</td>
<td>1 yr</td>
<td></td>
</tr>
<tr>
<td>TVT-secure</td>
<td>553</td>
<td>526</td>
<td>193</td>
<td>1-3 yr</td>
<td>1 yr</td>
</tr>
</tbody>
</table>

---

**Authors**

- **SIS that remain on market in Australia**
  - Mostafa European Eur 2014

<table>
<thead>
<tr>
<th>Authors</th>
<th>SIS</th>
<th>No.</th>
<th>Obturator</th>
<th>Retropubic</th>
<th>Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>El-Ashry</td>
<td>Ovutara</td>
<td>Merail</td>
<td>Tebr</td>
<td>Schellart</td>
<td>Lee</td>
</tr>
<tr>
<td>353</td>
<td>354</td>
<td>2 yrs</td>
<td>1 yr</td>
<td>1 yr</td>
<td>1 yr</td>
</tr>
<tr>
<td>Mostafa</td>
<td>Schweitzer</td>
<td>Bati</td>
<td>Ophi</td>
<td>Amat Tandtu</td>
<td>Needleless</td>
</tr>
<tr>
<td>226</td>
<td>182</td>
<td>1 yr</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Djehdian</td>
<td>SIMS-Ajust</td>
<td>69</td>
<td>61</td>
<td>1 yr</td>
<td></td>
</tr>
<tr>
<td>Amat Tandtu</td>
<td>Needleless</td>
<td>contasure</td>
<td>157</td>
<td>118</td>
<td>2 yr</td>
</tr>
<tr>
<td>Shaheinou</td>
<td>YFS</td>
<td>40</td>
<td>40</td>
<td>2 yr</td>
<td></td>
</tr>
<tr>
<td>Gopinath</td>
<td>Solyx</td>
<td>15</td>
<td>15</td>
<td>1 yr</td>
<td></td>
</tr>
<tr>
<td>TVT-secure</td>
<td>553</td>
<td>526</td>
<td>193</td>
<td>1-3 yr</td>
<td>1 yr</td>
</tr>
</tbody>
</table>

Only 2 SIS remain on market in Australia & only one compares to retropubic sling (only 15 women)
**MUS Learning Curve**
- Duration of MUS surgery shortened after 15 operations
- Higher rates of complications occur in 1st 4 months of training
- During learning (1st 50 cases) complication rates are higher - bladder injuries, urinary retention
- 24m Obj/Subj cure rates of MUS better after 20 cases
- 5 year Subj cure rate after MUS no different for surgeon < or >20 cases
- Learning curve for MUS likely variable (from one surgeon to another)
  - confounders include prior experience, difficulty of procedure, level & quality of proctor
- Relationship between aspects of surgical procedure & volume demonstrated
  - Reduce operating time, minimise complications, plateau in bladder perforation rates, optimal obj/subj cure rates
- Low volume surgeon = 1/month
- High volume (75th centile)
  - more complications
  - after 10 years, patients from low volume surgeons have 37% more complications
  - absolute risk reduction, 0.63 [0.36-0.91], P = .01
  - High volume (75th centile) surgeons= 18/year

**Complications after MUS & caseload**
- After 10 years, patients from low volume surgeons have 37% more complications
- Median cutoff for the number of yearly mesh-based procedures for SUI that defined high-volume surgeons each year of the 10-year study was greater than 16 (OR, 13-18)

**Outcomes & Volumes**
- Duration of MUS surgery shortened after 15 operations
- Higher rates of complications occur in 1st 4 months of training
- During learning (1st 50 cases) complication rates are higher - bladder injuries, urinary retention
- 24m Obj/Subj cure rates of MUS better after 20 cases
- 5 year Subj cure rate after MUS no different for surgeon < or >20 cases
- Learning curve for MUS likely variable (from one surgeon to another)
- confounders include prior experience, difficulty of procedure, level & quality of proctor

**MUS Learning**
- Dedication to acquire theoretical knowledge & experience in patients clinical journey
- Typically requires a commitment to practise formal apprenticeship type training (12-18m)
- Relationship between aspects of surgical procedure & volume demonstrated
  - 20-50 cases needed to
    - Reduce operating time, minimise complications, plateau in bladder perforation rates, optimal obj/subj cure rates
  - UGSA post fellowship program
  - Provide initial step towards credentialling
  - Ongoing exposure (Surg Database, Educational updates)

**Risk factors for failure Tape or complications**
- Patient factors
  - Obesity (BMI > 25) 2.9x failure rate (Orr 2010)
  - ISD (VLPP or MUCP lowest quartile) 2x ↑ failure (Ioji 2011)
  - Prior continence surgery 2x ↑ failure (Norton Obstet Gynecol 2011)
  - Poor urethral mobility 1.9 ↑ failure (Norton Obstet Gynecol 2011)
  - Age (per decade) 1.5 ↑ failure (Norton Obstet Gynecol 2011)
  - Severity (pad weight per 10 grams) 1.6 ↑ failure (Norton Obstet Gynecol 2011)
- Tape factors
  - Obturator slings 9x reoperation (Ford Cochrane 2015)
- Surgeon factor
  - Learning curve 20-50 cases (Hilton 2002 BMJ, IUJ 2016)
  - LVS (<16 procedures year) 1.4 ↑ complication S WelkJAMA Surg 2015

**Key points**
- Conservative options – pelvic Floor exercise
- Formal assessment could include urodynamic studies
- MUS performs as well as traditional operations – Burch / Pelvovaginal Slings
- With less complications
- Retropubic versus obturator tapes
  - RP have longer follow-up, reoperation rate SUI (8-9x)
  - RP have more bladder injury, blood loss & voiding dysfunction
  - RP have best efficacy esp for ISD
  - Obturator 4% groin pain difficult to
- Transobturator slings reasonable in
  - 7 patients on aspirin
  - Patients w Hostile abdomen (low midline scars)
  - Patients accept risk/ benefit profile
UGSA RANZCOG Position statement on MUS

RANZCOG & UGSA supports use of MUS

SUI is common & burdensome

MUS is efficacious, effective and has become the operation of choice in Australia, UK, USA & Europe

FDA safety communications on Transvaginal mesh do NOT include MUS

MUS does come with adverse events.

Evidence for its efficacy & effectiveness is robust

Questions