Sling Complications: Prevention and Management

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Disclosures

• No Disclosures
Objectives

• To review surgical procedures for retropubic, transobturator and single incision slings (mini-slings)
• To describe common and rare sling complications
• To describe techniques to prevent complications
• To describe management of rare complications
### Prevalence Of Stress, Urge And Mixed Incontinence In Women Of Varying Age Groups

<table>
<thead>
<tr>
<th>Author</th>
<th>Age</th>
<th>N</th>
<th>Stress (%)</th>
<th>Urge (%)</th>
<th>Mixed (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iosif, 1984</td>
<td>61</td>
<td>912</td>
<td>40</td>
<td>27</td>
<td>33</td>
</tr>
<tr>
<td>Hording, 1986</td>
<td>45</td>
<td>515</td>
<td>75</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>Elving, 1989</td>
<td>30–59</td>
<td>2631</td>
<td>48</td>
<td>7</td>
<td>45</td>
</tr>
<tr>
<td>Sommer, 1990</td>
<td>20–79</td>
<td>414</td>
<td>38</td>
<td>33</td>
<td>45</td>
</tr>
<tr>
<td>Harrison, 1994</td>
<td>20+</td>
<td>314</td>
<td>48</td>
<td>9</td>
<td>44</td>
</tr>
<tr>
<td>Yarnell, 1981</td>
<td>18+</td>
<td>1000</td>
<td>50</td>
<td>19</td>
<td>31</td>
</tr>
<tr>
<td>Diokno, 1986</td>
<td>60+</td>
<td>1995</td>
<td>29</td>
<td>10</td>
<td>61</td>
</tr>
<tr>
<td>Holst, 1998</td>
<td>18+</td>
<td>851</td>
<td>52</td>
<td>25</td>
<td>23</td>
</tr>
<tr>
<td>Burgio, 1991</td>
<td>42–50</td>
<td>541</td>
<td>50</td>
<td>12</td>
<td>38</td>
</tr>
<tr>
<td>Lara, 1994</td>
<td>18+</td>
<td>556</td>
<td>48</td>
<td>27</td>
<td>21</td>
</tr>
<tr>
<td>Sandvik, 1995</td>
<td>20+</td>
<td>1820</td>
<td>51</td>
<td>10</td>
<td>39</td>
</tr>
<tr>
<td><strong>Mean (range)</strong></td>
<td></td>
<td></td>
<td><strong>48 (29–75)</strong></td>
<td><strong>17 (7–33)</strong></td>
<td><strong>34 (14–61)</strong></td>
</tr>
</tbody>
</table>

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Impact

• Patient Effects
  – Psychological morbidity- **Twice** more likely to suffer from depression than patients without incontinence regardless of age
  – Social/behavioral
  – Sexual/relationships

• Societal Effects
  – Annual cost: 12.4 billion per year (1995)
  – Institutionalization

Zorn BH et al, Urinary Incontinence and depression. J Urol 1999;162:82-84
Conservative

• Pelvic Floor Physical therapy: Kegels
• Pessary
• Continence Tampons
• Urethral Plugs
Surgical Management

• Retropubic urethropexy: Burch, MMK
• Pubovaginal sling: Autologous Fascial slings
• Mid-urethral sling
  – Retropubic
  – Transobturator
  – Single Incision slings (Mini slings)
• Periurethral bulking agents
Mid-Urethral Sling Options

- Retropubic Sling
- Transobturator Sling
- Single Incision Sling
Mid-Urethral Slings

The primary goal of surgery is twofold: prevent urethral descent and to provide a backboard against which the bladder neck and proximal urethra can be compressed during increases in abdominal pressure.1

1. pubourethral ligament
2. urethropelvic ligament
## SUI Surgical Cure Rates

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Cure rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior colporrhaphy</td>
<td>34-100% (average 60%)</td>
</tr>
<tr>
<td>Retropubic colposuspension</td>
<td>68-97% (average 84%)</td>
</tr>
<tr>
<td>Needle Urethropexy</td>
<td>61-97% (average 88%)</td>
</tr>
<tr>
<td>Midurethral slings</td>
<td>81-100% (average 88%)</td>
</tr>
<tr>
<td>Pubovaginal sling</td>
<td>66-89% (average 81%)</td>
</tr>
</tbody>
</table>
Cochrane review of MUS

- 62 trials; quality of evidence was moderate
- Synthetic MUS are as effective as fascial slings but with shorter OR time, less voiding dysfunction and de novo urge
- Synthetic MUS are as effective as Burch
  - TO route was less favorable than RP route in objective cure (84%; RR 0.96; 17 trials; N = 2434) although there was no difference in subjective cure rates.
  - TO slings have less voiding dysfunction, blood loss, bladder perforations, and shorter operative times than RP slings

Intraoperative complications

• Bladder perforation
• Bleeding
• Urethral injury
• Vaginal perforations or “button holes
Postoperative

• Pain
• Mesh extrusion/exposure
• Mesh erosion
• Urinary tract infection
• De Novo Urgency
### Perioperative complications and Adverse events of TO monarc to TVT
Barber et al Am J Obstet Gynecol 2006

<table>
<thead>
<tr>
<th>Injury</th>
<th>TO</th>
<th>TVT</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major bleeding</td>
<td>4%</td>
<td>2%</td>
<td>.16</td>
</tr>
<tr>
<td>Bowel injury</td>
<td>0%</td>
<td>0%</td>
<td>1.0</td>
</tr>
<tr>
<td>Retropubic hematoma</td>
<td>2%</td>
<td>1%</td>
<td>.44</td>
</tr>
<tr>
<td>Bladder Injury</td>
<td>0%</td>
<td>5.1%</td>
<td>0.004</td>
</tr>
<tr>
<td>Voiding Dysfunction</td>
<td>2.9%</td>
<td>8.9%</td>
<td>0.01</td>
</tr>
<tr>
<td>Post op Anticholinergics</td>
<td>6.3%</td>
<td>14%</td>
<td>0.05</td>
</tr>
<tr>
<td>Leg Comp.</td>
<td>0.5%</td>
<td>0.5%</td>
<td>.89</td>
</tr>
<tr>
<td>Nerve Injury</td>
<td>2%</td>
<td>1%</td>
<td>.44</td>
</tr>
<tr>
<td>UTI</td>
<td>7.4%</td>
<td>12.7%</td>
<td>0.8</td>
</tr>
<tr>
<td>Mesh erosion</td>
<td>0.5%</td>
<td>1%</td>
<td>.99</td>
</tr>
<tr>
<td>Reoperation SUI</td>
<td>1.5%</td>
<td>2.4%</td>
<td>.51</td>
</tr>
</tbody>
</table>
Pelvic Anatomy - Landmarks

- Ischial tuberosity
- Midline pubic symphysis
- Inferior pubic rami

Labels:
- Coxa (or hip bone)
- Ilium
- Pubic bone
- Sacrum
- Coccyx
- Pelvic brim
- Ischial spine
- Acetabulum
- Pubic symphysis

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Pelvic Anatomy - Landmarks

- Urogenital triangle
- Anal triangle
- Urethra
- Vagina
- Bulbospongiosus
- Ischiocavernosus
- Superficial transverse perineal muscle
- Levator ani
- Gluteus maximus

Superficial
Placement of TVT

FIGURE 2: TVT. The insert shows the retropubic location with reference to the bony landmarks.
Vessel Injury <1%
Complications of TVT

Figure 1. The tension-free vaginal tape needle is directed in three planes during insertion: the plane from mid-labia majora to the ipsilateral shoulder (a), the plane from mid-labia majora to the biceps brachii muscle (b), and the plane from the mid-labia majora to 6 cm beyond the mid-biceps brachii muscle (c).

Table 2. Distance From the TVT Needle to External Iliac and Obturator Vessels When the Insertion Is Directed in Three Planes

<table>
<thead>
<tr>
<th>Vessel</th>
<th>Shoulder</th>
<th>Mid-biceps brachii muscle</th>
<th>6 cm lateral to mid-biceps brachii muscle</th>
</tr>
</thead>
<tbody>
<tr>
<td>External iliac</td>
<td>3.6, 3.8</td>
<td>1.6, 1.7</td>
<td>0, 0.6</td>
</tr>
<tr>
<td>Obturator</td>
<td>3.9, 4.0</td>
<td>2.5, 2.5</td>
<td>0.9, 1.2</td>
</tr>
</tbody>
</table>

Numbers represent the needle passage on each side in one cadaver (cm).

Pelvic Nerves

Epigastric vessels

Ilioinguinal nerve

Ilioinguinal variation

Iliohypogastric variation
Iliohypogastric nerve

Genital br., genitofemoral
- ILIOINGUINAL N.
- GENITOFEMORAL N.
Pelvic nerves

Ilioinguinal nerve
• Innervates anterior surface of Labia majora, mons pubis and small portion of upper anterior medial thigh

Genitofemoral Nerve
• Innervates upper anterior thigh, mons pubis
Complications of TVT

• Bladder perforation
  • 2.7 % (Tammussino et al 2001 Austrian registry – summary of # 2795 women who had undergone TVT sling operation)\textsuperscript{6}
  • 3.8% (Kuuva et al 2002 Finland – summary of # 1455)\textsuperscript{7}
  • 4.9% (Karram et al 2003 – summary of # 350)\textsuperscript{8}

\textsuperscript{6} Obstet Gynecol. 2001 Nov;98:732-6
\textsuperscript{8} Obstet Gynecol. 2003 May;101:929-32.
Complications *Bladder Perforation*

- **Prevention:**
  - Inject local anesthetic for hydrodissection
  - Ensure that the bladder is empty during needle passage
  - Deviate the urethra/bladder neck
  - Ensure the needle is passed along the surface of the pubic bone
  - Perform cystoscopy of the bladder and proximal urethra after each pass of the needle

15. Schulz and Costantini
Complications *Bladder Perforation*

- **Intervention:**
  - If the bladder has been entered, remove and reinsert needle
  - Insert indwelling catheter for 1-3 days

15. schulz and costantini
Complications of TVT

- Residual voiding dysfunctions
  - 2.4% (Tammussino et al 2001)
  - 7.6% (Kuuva et al 2002)
  - 4.9% (Karram et al 2003)
Complications of TVT

- **Rare**
  - Vessel injuries
    - 0.7% (Tammussino et al 2001)
    - 0.7% (Kuuva et al 2002)
    - 0.9% (Karram et al 2003)
  - Mesh erosion
    - 0.7% (Kuuva et al 2002)
    - 0.9% (Karram et al 2003)
  - Urethral erosion
    - De novo urgency with or without incontinence
    - Voiding dysfunction
    - Urethritis
    - Relapse Stress-Incontinence
    - Recurrent urinary tract infections
    - Hematuria

- Bowel injury – only case studies demonstrated

Placement of TOT
Complications of TOT

• Muscles the trocar (and mesh) will pass through
  - Gracillis
  - Adductor brevis
  - Obturator externus
  - (Obturator Membrane)
  - Obturator internus
  - (Periurethral endopelvic fascia)

Up to 9.4% with neurological symptoms (TOMUS Trial)
TVT vs TOT

• Retropubic versus Transobturator Midurethral Slings for Stress Incontinence – TOMUS Trial\(^\text{13}\)

• **Primary Outcome:** Treatment success at 12 months according to both objective criteria (a negative stress test, a negative pad test, and no retreatment) and subjective criteria (self-reported absence of symptoms, no leakages episodes recorded, and no retreatment)

• **Methods:** N=583 patients randomly assigned to TVT vs TOT groups with 94% follow up (n = 565) for patients in the analysis

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\(^{13}\) Richter et al 2010 NEJM TOMUS Trial
TVT vs TOT

• **Results:**
  
  – Rates of objectively assessed treatment success was 80.8% in the TVT group and 77.7% in the TOT group (3.0 percentage point difference)
  
  – The rates of subjectively assessed treatment success was 62.2% in TVT group and 55.8% in TOT group (6.4 percentage point difference)

13. Richter et al 2010 NEJM TOMUS Trial
Table 2

Adverse Events, According to Treatment Group, Severity, and System.*

<table>
<thead>
<tr>
<th>Adverse Event</th>
<th>Retropubic Sling (N = 298)</th>
<th>Transobturator Sling (N = 299)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Events</td>
<td>Patients no. (%)</td>
<td>Events</td>
</tr>
<tr>
<td>Serious adverse event</td>
<td>43</td>
<td>41 (13.8)</td>
<td>20</td>
</tr>
<tr>
<td>Wound-related event</td>
<td>10</td>
<td>9 (3.0)</td>
<td>5</td>
</tr>
<tr>
<td>Mesh exposure</td>
<td>9</td>
<td>8 (2.7)</td>
<td>1</td>
</tr>
<tr>
<td>Mesh erosion</td>
<td>1</td>
<td>1 (0.3)</td>
<td>1</td>
</tr>
<tr>
<td>Surgical-site infection</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Granulation tissue</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Genitourinary event</td>
<td>23</td>
<td>23 (7.7)</td>
<td>13</td>
</tr>
<tr>
<td>Urethral perforation</td>
<td>1</td>
<td>1 (0.3)</td>
<td>0</td>
</tr>
<tr>
<td>Bladder perforation</td>
<td>15</td>
<td>15 (5.0)</td>
<td>0</td>
</tr>
<tr>
<td>Vaginal epithelial perforation</td>
<td>6</td>
<td>6 (2.0)</td>
<td>13</td>
</tr>
<tr>
<td>Recurrent cystitis, leading to diagnostic cystoscopy</td>
<td>1</td>
<td>1 (0.3)</td>
<td>0</td>
</tr>
<tr>
<td>Vascular or hematologic event</td>
<td>1</td>
<td>1 (0.3)</td>
<td>1</td>
</tr>
<tr>
<td>Pulmonary embolus</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Postoperative bleeding</td>
<td>1</td>
<td>1 (0.3)</td>
<td>0</td>
</tr>
<tr>
<td>Neurologic symptoms</td>
<td>1</td>
<td>1 (0.3)</td>
<td>0</td>
</tr>
<tr>
<td>Voiding dysfunction requiring surgery, use of catheter, or both</td>
<td>9</td>
<td>8 (2.7)</td>
<td>0</td>
</tr>
<tr>
<td>Other (urothelial abrasion)</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

*Richter et al 2010 NEJM TOMUS Trial*
<table>
<thead>
<tr>
<th>Adverse Event</th>
<th>Retropubic Sling (N = 298)</th>
<th>Transobturator Sling (N = 299)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Events</td>
<td>Patients no. (%)</td>
<td>Events</td>
</tr>
<tr>
<td>Adverse events, grades I and II</td>
<td>151</td>
<td>110 (36.9)</td>
<td>132</td>
</tr>
<tr>
<td>Wound-related event</td>
<td>6</td>
<td>6 (2.0)</td>
<td>5</td>
</tr>
<tr>
<td>Mesh exposure</td>
<td>4</td>
<td>4 (1.3)</td>
<td>3</td>
</tr>
<tr>
<td>Surgical-site infection</td>
<td>2</td>
<td>2 (0.7)</td>
<td>2</td>
</tr>
<tr>
<td>Genitourinary event</td>
<td>46</td>
<td>40 (13.4)</td>
<td>27</td>
</tr>
<tr>
<td>Vascular or hematologic event</td>
<td>20</td>
<td>18 (6.0)</td>
<td>7</td>
</tr>
<tr>
<td>Neurologic symptoms</td>
<td>15</td>
<td>12 (4.0)</td>
<td>31</td>
</tr>
<tr>
<td>Numbness</td>
<td>8</td>
<td>6 (2.0)</td>
<td>9</td>
</tr>
<tr>
<td>Weakness</td>
<td>7</td>
<td>7 (2.3)</td>
<td>22</td>
</tr>
<tr>
<td>Voiding dysfunction</td>
<td>16</td>
<td>10 (3.4)</td>
<td>5</td>
</tr>
<tr>
<td>Self-reported pain ≥6 wk after procedure</td>
<td>7</td>
<td>7 (2.3)</td>
<td>7</td>
</tr>
<tr>
<td>New urge incontinence **</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Persistent urge incontinence † †</td>
<td>54</td>
<td>36 (12.1)</td>
<td>55</td>
</tr>
<tr>
<td>Other † †</td>
<td>7</td>
<td>6 (2.0)</td>
<td>6</td>
</tr>
</tbody>
</table>
Complications

**Vaginal Perforation/Mesh Erosion**

- Prevention:
  - Caution during dissection and needle passage
  - Ensure vaginal closure (inspect for button-holes)
  - Considering treating vaginal atrophy pre-op with estrogen cream
  - Counsel patient to avoid intercourse until healed (4-6 weeks)
Complications

Vaginal Perforation/Mesh Erosion

• **Intervention:**
  
  – Remove needle
  – Repair vaginal wall
  – Develop slightly deeper submucosal tract

15. Schulz and Costantini
Meta Analysis of Mini-slings

• No evidence of significant difference in patient reported cure rate or objective cure rate (f/u mean 18.6 months)
• Shorter operative time
• Lower operative pain scores
• Earlier return to normal activity and work
• Nonsignificant trend towards higher rate of repeat continence surgery

Meta Analysis of Mini-slings

- No statistically significant difference in Lower UTI, post op voiding difficulties, vaginal erosions, de novo urgency, and/or worsening pre-existing urgency
- Groin pain significantly lower

What is the most frequent symptoms found in patients with urethral mesh erosions?

• A. Stress Urinary Incontinence
• B. Hematuria
• C. De Novo Urgency
• D. Both A and C
• E. Both B and C
What is the most frequent symptoms found in patients with urethral mesh erosions?

• A. Stress Urinary Incontinence
• B. Hematuria
• C. De Novo Urgency
• D. Both A and C
• E. Both B and C
• 60 year old female with history of breast cancer and vaginal atrophy has been diagnosed with Stress urinary incontinence on urodynamic testing. She had LPP 80 cm H2O and MUCP of 45 cm H2O. The patient is not on any vaginal estrogen due to her ER positive breast cancer. She has failed physical therapy and pessary placement and incontinence tampons are too painful. The risks and benefits of retropubic sling are discussed with the patient. What is the most likely complication from this surgery?
Choices

• A. Post op voiding dysfunction
• B. Mesh exposure
• C. Urinary tract infection
• D. Injury to bladder
• E. Neurologic pain
Choices

- A. Post op voiding dysfunction
- B. Mesh exposure
- C. Urinary tract infection
- D. Injury to bladder
- E. Neurologic pain
Case Presentation 1

• 43 y.o. with Stage III Uterovaginal Prolapse and Stress Incontinence
• PMH: Rheumatoid Arthritis, hyperlipidemia, Migraines, fibromyalgia, Obesity (BMI 37)
• PSH: Abdominoplasty, Tubal ligation and reversal, Breast Augmentation
• Robotic Supracervical hysterectomy, removal of IUD, BL salpingectomy, Sacrocolpopexy, retropubic sling, cystoscopy
Case Presentation 1

• Preoperatively: Urine culture 50,000-100,000 Gardnerella Vaginalis –treated flagyl 500mg BID X 7 days

• Post op 2 weeks: complains of discharge but no bulge and happy no leakage
  – EXAM: Noted to have sling mesh exposure with complete opening of wound and foul smelling yellow discharge
  – Treated for BV (confirmed by AFFIRM testing) Flagyl 500mg BID X 7 days
Revision of intravesical mesh

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Division of Female Pelvic Medicine and Reconstructive Surgery
\textsuperscript{2}University of South Florida Department of Urology
References

- Zorn BH et al, Urinary Incontinence and depression. J Urol 1999;162:82-84
- Barber et al Perioperative complications and adverse events of MONARC transobuturator tape, compared with the tension-free vaginal tape. Am Obstet Gynecol 2006;195:1820-5.