Level 1: Declarative Knowledge
1. The learner should be able to list the benefits midurethral slings
   - Lower morbidity
   - Less pain
   - Short OR time
   - Rapid recovery
   - Outpatient
   - Faster return to normal activities
   - Simple and reproducible
   - Highly effective
   - Low rate of serious adverse events
   - Less voiding dysfunction than traditional open retropubic procedures

MECHANISM OF ACTION
Midurethral sling placement involves the introduction of a polypropylene tape (approximately 1 cm in width) covered in a plastic sheath beneath the midportion of the urethra. This sling functions as a backboard that offers resistance beneath the urethra during increases in intraabdominal pressure, but is tension-free at rest. Ultrasound data suggest that continence is achieved by compression of the urethra between the sling and the pubic symphysis [1,2].

2. The learner should be able to list indications for midurethral slings
   - Stress incontinence
   - Hypermobile urethra
   - Women who are planning repair of prolapse of the vaginal apex and who have known or suspected occult SUI
   - Indications for Transobturator approach
     - Stress incontinence-uncomplicated
   - Indications for Retropubic approach
     - Stress incontinence-complicated
     - Intrinsic sphincter deficiency
     - Previous failed procedure

3. The learner should be able to list the contraindications for midurethral slings
   - Previous radiation to the area
   - Current urinary tract infection
   - Current pregnancy
   - Anticoagulation
   - Structures in the retropubic space that are in the path of sling placement (eg, vascular graft, bowel, transplanted pelvic kidney)

4. The learner should be able to document examination under anesthesia:
   - Appropriate gynecologic anatomy: uterus, ovaries, anterior and posterior cul de sacs
5. The learner should be able to identify anatomic landmarks:
- Urethra and midurethra
- Obturator fossa
- Adductor longus tendon
- Arcus Tendineous Fascia Pelvis

6. Basic knowledge:
- There are two main variations of full-length retropubic midurethral slings, based upon the initial incision site and direction of insertion:
  - Bottom-to-top – Two needle trocars are inserted through a vaginal incision and passed through the retropubic space, exiting at the abdominal wall (eg, TVT, TVT-Exact, Advantage, Retroarc).
  - Top-to-bottom – Two needle trocars are inserted through abdominal incisions and passed through the retropubic space, exiting through a vaginal incision (eg, SPARC).
- Complications: Bladder injury — Intraoperative bladder perforation is the most common complication of retropubic midurethral sling placement. In studies of 200 or more procedures, the reported rate ranges between 3.5 to 6.6 percent [3-7]. Bladder perforation does not appear to be associated with reduced SUI cure rates or with long-term sequelae [3].
- The likelihood of bladder perforation depends upon the surgeon’s experience. A report of 600 procedures performed by an experienced surgeon had a 1 percent rate of bladder perforation [8], while inexperienced operators have reported rates ranging from 15 to 34 percent [9,10].
- Urethral injury — Intraoperative urethral perforation or laceration occurs in approximately 0.9 percent of midurethral retropubic sling placements [11].
- Urinary tract infection — Urinary tract infection is a common complication after midurethral sling placement. Urinary tract infections have been reported in up to 34 percent of patients within the first three postoperative months [12]. At one-year follow-up, the rate is 50 percent [12].
- Voiding dysfunction — Urinary retention or incomplete bladder emptying are commonly reported after retropubic midurethral sling placement [13]. The reported rate of voiding dysfunction varies from 19.7 to 47 percent of cases, depending upon the definition and diagnostic criteria used [14,5].
- Sling release — Most cases of postoperative urinary retention resolve with conservative management. Urinary retention that persists after four to six weeks may require surgical intervention in the form of a sling release [15,16]. In a study of billing codes of over 180,000 women who underwent a midurethral sling procedure between 2001 and 2010, the cumulative rate of sling release performed for the indication of urinary retention was 1.3 percent at nine years postoperatively [17].
- Vaginal mesh exposure—Approximately 0.9%-2.5% [17].
- Pelvic pain—chronic pelvic pain following retropubic midurethral sling placement up to 7.5% [5].
ACOG Surgical Curriculum Working Group
Midurethral Transobturator and Retropubic Slings

Level 2 A
Simulated and Clinical Performance Midurethral Slings: Transobturator Approach

7. Preparation:
   a. Time out
   b. SCDs/DVT prophylaxis as indicated
   c. Single dose antibiotics prophylaxis
   d. Position
      • Stirrups supporting the entire leg are preferable
      • Angles: 90 degrees between thigh and torso, and at the knee
   e. Exam under anesthesia
   f. Betadine/Ethanol scrub
   g. Drape: Self adherent Surgical Drape

Procedure
   a. Place foley catheter
   b. Identify midurethra and infiltrate with local anesthetic solution of choice
   c. Make an approximately 1.5 cm incision through the full thickness of the vaginal wall
   d. Dissect laterally along the full thickness vaginal wall plane to the inferior edge of the pubic bone
   e. Insert fingertip to palpate bone edge
   f. Locate insertion of adductor longus tendon on patient’s right and left sides, palpate notch along internal edge of ischiopubic ramus and make small skin incisions.
   g. With surgeon’s left fingertip in vaginal tunnel and thumb on top of needle curve, push needle tip through patient’s left skin incision until the obturator membrane is perforated and rotate needle tip toward vaginal incision keeping the needle tip on your finger to guide it through the vaginal incision
   h. Connect sling assembly to trocar needle
   i. Reverse the rotation of the trocar to bring the sling arm back through the skin incision, detach sling
   j. Repeat steps on contralateral side and detach sling
   k. Perform cystoscopy
   l. Carefully position/tension sling underneath the midurethra and remove plastic sheath bilaterally
   m. Cut sling arms at the subcutaneous levels and close skin incisions
   n. Check for hemostasis and close vaginal incision with absorbable suture
Preparation
a. Time out
b. SCDs/DVT prophylaxis
c. Single dose antibiotics prophylaxis
d. Position
   • Stirrups supporting the entire leg are preferable
   • Angles: 90 degrees between thigh and torso, and at the knee
e. Exam under anesthesia
f. Betadine/Ethanol scrub
   Drape: Self adherent Surgical Drape

8. Procedure: Placement of a bottom-to-top full-length retropubic midurethral sling

a. Use of size 18 French will allow the rigid catheter guide to be introduced. This catheter guide is used to deviate the bladder away from the side of trocar placement.
b. Marking abdominal incisions- Mark the two planned abdominal exit points for the tape at the superior margin of the pubic bone, 2 cm lateral to the midline. Some surgeons make small stab incisions at these locations to facilitate trocar passage through the skin
c. Hydrodissection- Some surgeons hydrodissect the vaginal incision site and/or the path of the trocars. Either local anesthetic (with or without epinephrine) or sterile saline may be used. In the original description of the procedure, 40 ml of fluid was injected into the vaginal wall inferior and lateral to the urethra [18]. An additional 60 to 70 mL of fluid was injected at the planned abdominal incision sites and downward along the back of the pubic bone to the retropubic space. Alternatively, fluid may be injected into the retropubic space through the vaginal sulci
d. Midurethral vaginal incision– Make a vertical (longitudinal) vaginal incision, starting 1 cm proximal to the urethral meatus and 1 to 1.5 cm in length to accommodate the width of the sling in the appropriate location. Place Allis clamps on the lateral edges of the incision to provide exposure by retracting the vaginal mucosa laterally. The best ways to prevent a midurethral sling from being too proximal are to start the vaginal incision for the midurethral sling 1 cm from the urethral meatus, as recommended by Ulmsten in the original TVT publication, and to never use an anterior repair incision to place the midurethral sling [18]. Minimal dissection lateral to the midurethra, between the vaginal mucosa and the pubocervical fascia, is performed bilaterally with the Metzenbaum scissors. The scissors are angled towards the retropubic space just behind the pubic symphysis.
e. Lateral deviation of the bladder– Drain the bladder completely and introduce the rigid catheter guide into the bladder catheter. Deviate the bladder to the side opposite of the first trocar insertion
f. Initial trocar insertion— Insertion of the trocar along the correct path is the critical part of the procedure to ensure that the procedure is effective and to avoid complications.
g. General trocar insertion: Insert the first trocar into the tract lateral to the urethra that was dissected out with Metzenbaum scissors. Pass the trocar behind the pubic symphysis (through the retropubic space) and exit through the abdominal incision sites. The trocar is left in place with the tip just past the level of the abdominal skin.
h. Techniques for successful placement include:

i. The operator must maintain a firm grasp of the trocar and handle while manipulating the needle through the tissues. Resistance of the tissues may sometimes result in deviation of the needle. Some surgeons use a hand in the vagina to control and direct the trocar while the opposite hand on the handle is used to apply gentle force to advance the trocar.

j. Care should be taken to aim the trocar handle in the direction of the outer aspect of the patient’s ipsilateral shoulder [19].

k. The tip of the trocar should be positioned just behind the pubic symphysis. It is often helpful to actually place the tip of the trocar on the underside of the pubic symphysis and to gently slide it behind the bone, staying as close to the bone as possible. To do this, the surgeon must lower the hand that is holding the trocar handle so that the curve of the insertion needle follows the posterior surface of the pubic bone through the retropubic space. The trocar should pass easily in the retropubic space in direct opposition to the posterior side of the symphysis. More force is needed when the trocar passes through the rectus sheath and then out through the skin at the suprapubic level.

l. The trocar handle must be kept parallel to the floor during retropubic passage to prevent the lateral rotation of the trocar tip.

m. After insertion, the anterior vaginal sulci are inspected and palpated to ensure that they have not been perforated by the trocar. If there is a perforation, then the trocar or the plastic sheaths with the mesh can be seen traversing the vaginal sulcus. The first sign of a vaginal perforation is often the onset of vaginal bleeding that does not appear to be coming from the midurethral vaginal incision.

n. Cystourethroscopy—After each trocar is placed, perform cystourethroscopy to inspect for bladder perforation. A 70-degree cystoscope should be used and the bladder filled adequately to allow complete examination of the urethra and bladder surface [18]. Examination of the bladder requires an experienced clinician; a study of surgical trainees reported that 37 percent of bladder injuries were missed on cystourethroscopy [9].

o. Adjusting the sling tension—To ensure that the sling is tension-free and does not compress the urethra while the patient is at rest, many surgeons insert an instrument (eg, Kelly clamp, needle holder, or number 8 Hegar dilator) between the sling and the urethra while adjusting the sling tension.

p. Sheath removal—With the spacer in place, remove the plastic sheaths; this prevents excess tightening of the mesh during plastic sheath removal. The surgeon should assess the entire plastic sheath to confirm that it has been completely removed.

q. Trim the mesh at the abdominal incisions. Mesh protrusion and irritation at the skin surface can be prevented by depressing the skin slightly to trim the mesh just below the skin surface. The mesh does not require suturing, since it is held in by friction and then fibrosis [18].

r. Incision closure: Vaginal-absorbable suture, Abdominal-per surgeon preference

9. Assess actual performance during simulated midurethral sling placement according to the Checklist (see next page).
ACOG Surgical Curriculum Working Group
Midurethral Transobturator and Retropubic Slings

Checklist: Midurethral Transobturator and Retropubic Slings

<table>
<thead>
<tr>
<th>Part 1: Knowledge</th>
<th>Points</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The learner is able to list benefits of midurethral slings</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>a. Unable to list</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>b. Able to list several</td>
<td></td>
<td></td>
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<tr>
<td>2. The learner is able to list indications/qualifications for a midurethral slings</td>
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</tr>
<tr>
<td>a. Unable to list</td>
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</tr>
<tr>
<td>b. Able to list several</td>
<td></td>
<td></td>
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<tr>
<td>3. The learner is able to identify anatomic landmarks</td>
<td>1</td>
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</tr>
<tr>
<td>a. Unable to list</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>b. Able to list several</td>
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<tr>
<td>4. Knows incidence of urinary system injury</td>
<td>1</td>
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</table>

<table>
<thead>
<tr>
<th>Part 2: Simulated and Clinical Performance</th>
<th>Points</th>
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</thead>
<tbody>
<tr>
<td>5. Preparation</td>
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</tr>
<tr>
<td>a. Time out</td>
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</tr>
<tr>
<td>Name</td>
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</tr>
<tr>
<td>Antibiotics</td>
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<tr>
<td>Allergies</td>
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<tr>
<td>Procedure to be performed</td>
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<tr>
<td>b. SCDs/DVT prophylaxis</td>
<td>1</td>
<td>0</td>
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</tr>
<tr>
<td>c. Antibiotics</td>
<td>1</td>
<td>0</td>
<td></td>
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<tr>
<td>d. Position/Stirrups/Angles</td>
<td>1</td>
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<tr>
<td>e. Exam under anesthesia</td>
<td>1</td>
<td>0</td>
<td></td>
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<tr>
<td>f. Scrub</td>
<td>1</td>
<td>0</td>
<td></td>
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<tr>
<td>g. Drape</td>
<td>1</td>
<td>0</td>
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<tr>
<td>6. Procedure: Transoburator Outside in approach (as example)</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>a. Place Foley catheter</td>
<td></td>
<td></td>
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<tr>
<td>b. Appropriate placement of initial incision</td>
<td>1</td>
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<tr>
<td>c. Proper Dissect laterally along the full thickness vaginal wall plane to the inferior edge of the pubic bone</td>
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<td>0</td>
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<tr>
<td>d. Palpate bone edge</td>
<td>1</td>
<td>0</td>
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<tr>
<td>e. Locate insertion of adductor longus tendon on patient’s right and left sides, palpate notch along internal edge of ischiopubic ramus and make small skin incisions.</td>
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</tr>
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<td>f. With surgeon’s left fingertip in vaginal tunnel and thumb on top of needle curve, push needle tip through patient’s left skin incision until the obturator membrane is perforated and rotate needle tip toward vaginal incision keeping the needle tip on your finger to guide it through the vaginal incision</td>
<td>1</td>
<td>0</td>
<td></td>
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<tr>
<td>g. Connect sling assembly to trocar needle</td>
<td>1</td>
<td>0</td>
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<tr>
<td>h. Reverse the rotation of the trocar to bring the sling arm back through the skin incision, detach sling</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>i. Repeat steps on contra lateral side and detach sling</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>j. Perform cystoscopy</td>
<td>1</td>
<td>0</td>
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<tr>
<td>k. Carefully position/”tension” sling underneath the midurethra and remove plastic sheath bilaterally</td>
<td>1</td>
<td>0</td>
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</tr>
<tr>
<td>l. Cut sling arms at the subcutaneous levels and close skin incisions</td>
<td>1</td>
<td>0</td>
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<tr>
<td>m. Check for hemostasis and close vaginal incision with absorbable suture</td>
<td>1</td>
<td>0</td>
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</table>
ACOG Surgical Curriculum Working Group
Midurethral Transobturator and Retropubic Slings

Procedure: Placement of a bottom-to-top full-length retropubic midurethral sling (as example)

a. Use of size 18 French will allow the rigid catheter guide to be introduced. This catheter guide is used to deviate the bladder away from the side of trocar placement.
b. Marking abdominal incisions- Mark the two planned abdominal exit points for the tape at the superior margin of the pubic bone, 2 cm lateral to the midline. Some surgeons make small stab incisions at these locations to facilitate trocar passage through the skin.
c. Hydrodissection- Some surgeons hydrodissect the vaginal incision site and/or the path of the trocars. Either local anesthetic (with or without epinephrine) or sterile saline may be used. In the original description of the procedure, 40 ml of fluid was injected into the vaginal wall inferior and lateral to the urethra [5]. An additional 60 to 70 mL of fluid was injected at the planned abdominal incision sites and downward along the back of the pubic bone to the retropubic space. Alternatively, fluid may be injected into the retropubic space through the vaginal sulci.
d. Midurethral vaginal incision– Make a vertical (longitudinal) vaginal incision, starting 1 cm proximal to the urethral meatus and 1 to 1.5 cm in length to accommodate the width of the sling in the appropriate location. Place Allis clamps on the lateral edges of the incision to provide exposure by retracting the vaginal mucosa laterally. Minimal dissection lateral to the midurethra, between the vaginal mucosa and the pubocervical fascia, is performed bilaterally with the Metzenbaum scissors. The scissors are angled towards the retropubic space just behind the pubic symphysis.
e. Lateral deviation of the bladder– Drain the bladder completely and introduce the rigid catheter guide into the bladder catheter. Deviate the bladder to the side opposite of the first trocar insertion.
f. Initial trocar insertion— Insertion of the trocar along the correct path is the critical part of the procedure to ensure that the procedure is effective and to avoid complications.
g. General trocar insertion, Insert the first trocar into the tract lateral to the urethra that was dissected out with Metzenbaum scissors. Pass the trocar behind the pubic symphysis (through the retropubic space) and exit through the abdominal incision sites. The trocar is left in place with the tip just past the level of the abdominal skin.
h. Care should be taken to aim the trocar handle in the direction of the outer aspect of the patient’s ipsilateral shoulder.
i. After insertion, the anterior vaginal sulci are inspected and palpated to ensure that they have not been perforated by the trocar.
j. Cystourethroscopy— After each trocar is placed, perform cystourethroscopy to inspect for bladder perforation. A 70 degree cystoscope should be used.
k. Adjust the sling tension— To ensure that the sling is tension-free, insert an instrument (eg, Kelly clamp, needle holder, or number 8 Hegar dilator) between the sling and the urethra while adjusting the sling tension.
l. Sheath removal- With the spacer in place, remove the plastic sheaths; this prevents excess tightening of the mesh during plastic sheath removal. The surgeon should assess the entire plastic sheath to confirm that it has been completely removed.
m. Trim the mesh at the abdominal incisions. Incision closure: Vaginal- absorbable suture, Abdominal- per surgeon preference.
<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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</tr>
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<tbody>
<tr>
<td><strong>Respect for tissue</strong></td>
<td>Often used unnecessary force on tissue or caused damage by inappropriate use of instruments</td>
<td>Careful handling of tissue but occasionally caused inadvertent damage</td>
<td>Consistently handled tissue appropriately, with minimal damage</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Time and motion</strong></td>
<td>Many unnecessary moves</td>
<td>Efficient time and motion, but some unnecessary moves</td>
<td>Economy of movement and maximum efficiency</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Instrument handling</strong></td>
<td>Repeatedly makes tentative or awkward moves with instruments</td>
<td>Competent use of instruments, although occasionally appeared stiff or awkward</td>
<td>Fluid moves with instruments and no awkwardness</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Knowledge of instruments</strong></td>
<td>Frequently asked for the wrong instrument or used an inappropriate instrument</td>
<td>Knew the names of most instruments and used appropriate instrument for the task</td>
<td>Obviously familiar with instruments required and their names</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Use of assistants</strong></td>
<td>Consistently placed assistants poorly or failed to use assistants</td>
<td>Good use of assistants most of the time</td>
<td>Strategically used assistants to the best advantage at all times</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Flow of operation and forward planning</strong></td>
<td>Frequently stopped operating or needed to discuss next move</td>
<td>Demonstrated ability for forward planning with steady progression of operative procedure</td>
<td>Obviously planned course of operation with effortless flow from one move to the next</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Knowledge of specific procedure</strong></td>
<td>Deficient knowledge. Needed specific instruction at most operative steps</td>
<td>Knew all important aspects of the operation</td>
<td>Demonstrated familiarity with all aspects of the operation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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Midurethral Transobturator and Retropubic Slings

References


ASSESS: Advanced Surgical Simulation and Endoscopic Surgical Simulation, Course Instructor Manuel, ACOG Simulation Consortium, 2014


