Ultrasound – Transvaginal Pelvis – 3D Pelvic Floor (Mesh) Evaluation

PURPOSE:
To evaluate urethral sling, vaginal mesh, and periurethral bulking agent injection.

SCOPE:
Applies to all ultrasound mesh pelvis studies performed in Imaging Services / Radiology, UTSW.

- Scheduled only at Outpatient Building (OPB)

ORDERABLE:

- EPIC Order: US Pelvis

CHARGEABLES:

- US Pelvis Transvaginal Only (cpt 76830)
- US 3D Charge
    - End Exam:
        - Charges: Charge Code
            - HCHG 3D REND W/INTERP W/O PSTPROCES
                - Quantity 1

INDICATIONS:

- History of suburethral sling procedure
- History of vaginal mesh placement
- Prior periurethral Macroplastique (MPQ) or collagen bulking agent injection
- Assess for bulking agent volume and configuration
- Female stress incontinence

CONTRAINDICATIONS:

- No absolute contraindications.
- A chaperone is required for male sonographers. Chaperone's name should be documented in tech notes.

EQUIPMENT:

- Endovaginal transducer (3D) with a frequency of 5 MHz or greater. Probe cover.
- Other 3D, small footprint, and other transducers for possible trans-abdominal, translabial, or trans-perineal imaging

PATIENT PREPARATION:

- For transvaginal approach:
    - Obtain chaperone (requirement for all male sonographers)
    - The bladder should be partially distended

EXAMINATION:

GENERAL GUIDELINES:

- A complete examination includes evaluation of the entire urethra, mesh/sling, bulking agent injections and/or revisions.
- Generally performed in the nonemergent, outpatient setting. .

EXAM INITIATION:

- Introduce yourself to the patient
- Verify patient identity using patient name and DOB
- Obtain patient history including symptoms
- Review what type of sling for vagina or urethra was placed
- Review how much bulking agent was injected
- Explain test
- Enter and store data page
- Place patient in supine and/or lithotomy position
- For transvaginal exam, apply endovaginal probe cover

TECHNICAL CONSIDERATIONS:

- Always review any prior imaging, making note of abnormalities requiring further evaluation.
- Review patient's surgical history.
- Review what type of sling/mesh was placed, and if any revisions have been attempted.
- Survey with 2D imaging first to orient to anatomy
- Obtain representative 3D acquisitions
- 3D acquisitions must be acquired for all patients with coronal reformatted images submitted to PACS.
- Special attention:
    - Bulking agent: Assess for areas of extravasation into the peri-urethral soft tissues; location of bulking agent relative to the urethra (prox, mid and distal).
    - Sling: Assess presence of sling; sling type: Tension-free vaginal tape (TVT), Transobturator tape (TOT), Tension-free vaginal tape-transobturator (TVT-O)
        - Sling position with consideration for distance from the central urethral lumen and vaginal wall
        - Assess distance from sling to bladder neck
        - Assess sling in transverse: prox, mid or distal; course of sling arms (large projections adjacent to arms, lateral)
- Focal abnormalities should be documented in or near sling/mesh position, near the urethra, or vagina. Evaluate for kinking/narrowing in the midline plane
- Evaluate for urethral kinking/narrowing secondary to sling on dynamic images
- Evaluate for urethral invasion/vaginal exposure
- Note and report any abnormalities such as cystocele, rectocele/enterocele if seen
- Increase dynamic range to better demonstrate central urethral lumen

DOCUMENTATION:

This targeted examination only requires imaging of the structure or region of interest for purposes of follow up. Exam may include any of the following:

- Transvaginal/Translabial approach:
    - Urethra
        - Grayscale images
            - Longitudinal images:
                - Urethra

- Right of Urethra, mid, and left of urethra
- 2D images and cine sweeps of urethra with and without increased gain to demonstrate mucosa within urethra.
- Add measurements
    - Sling to Lumen
        - Calipers are placed from the most anterior and/or posterior aspect of the sling to the central urethral lumen.
            - Sling to central lumen distance of 3-5mm is normal
                - <3 mm = Erosion
                - >5 mm = Vaginal Exposure
    - Sling to Bladder Neck
        - Caliper is placed from the mid aspect of the sling to the proximal urethra at the bladder neck.
            - Average urethral length is 3-4 cm.
                - Normal mid urethral placement is between 1.5-2 cm.
                - Distance <1.5 = Proximal placement
                - Distance >2cm = Distal placement

- Transverse images:
    - Anterior to urethra, mid, and posterior to urethra all the way through cervix into anal canal
    - 2D images and cine sweeps of urethra with and without increased gain to demonstrate mucosa within urethra.
    - Increase dynamic range to better demonstrate central urethral lumen
- Cine sweep, transverse (superior to inferior) and longitudinal urethra (Right to Left) through posterior cervix.

- Color Doppler
    - Longitudinal to urethra
    - Transverse to mesh arms
    - If slow flow within vessels; have patient Kegel exercise or Valsalva to help show flow.

- <u>3D acquisition</u>
    - Longitudinal: urethra with and without increased gain
        - Take multiple 3D volumes/renderings of Sling/Mesh in Long
    - Transverse: urethra with and without increased gain
        - Take multiple 3D in Transverse for MPQ/Collagen
        - Stacked Measurements in Transverse of MPQ / Collagen
    - 3D images through the urethra must be obtained with coronal reformatted images submitted to PACS (on 3D-capable ultrasound devices only).

- Strain
  - Acquire cine image of the urethra in the midline sagittal plane with sling at the 6:00 position with patient straining
    - Pay attention to vagina, posterior bladder neck as additional slings or vaginal mesh material may become more apparent with strain imaging
    - Evaluate for urethral narrowing/kinking secondary to sling
  - Acquire cine image in midline sagittal plane angled posterior to include urethra and rectum in view.
    - Pay attention to near rectum for rectocele or enterocele.

PROCESSING:

- Reconstruct volume of bulking agent; add stacked contours with measurements of bulking agent volume
- Sling - reconstructed representative axial images through urethra
- Review examination images and data
- Export all images to PACS
- Confirm data in iMorgon
- Document relevant history (including amount of MPQ injected, when sling and/or MPQ was injected) and any study limitations.

REFERENCES:

- https://link.springer.com/article/10.1007/s00261-020-02404-x
- https://pubmed.ncbi.nlm.nih.gov/31626522/
- https://pubs.rsna.org/doi/full/10.1148/rg.2016150215
- https://pubs.rsna.org/doi/10.1148/rg.307105054
- https://pubmed.ncbi.nlm.nih.gov/12893325/

APPENDIX:

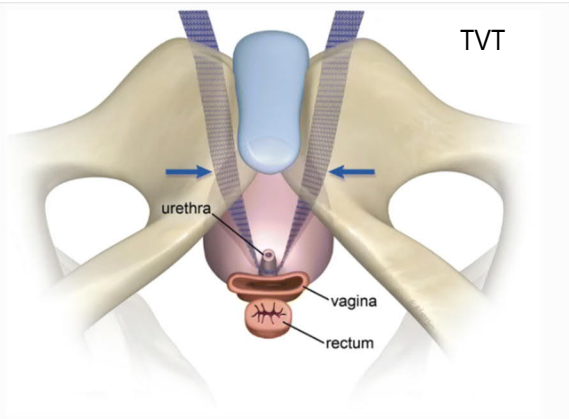


Illustration demonstrating a retropubic sling as visualized from the pelvic floor. Note the U-shape of the sling around the urethra and anterior extension of arms into the retropubic space behind the pubic bone (arrows)

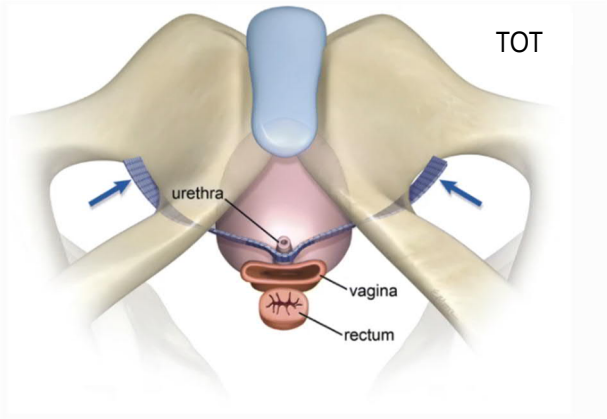
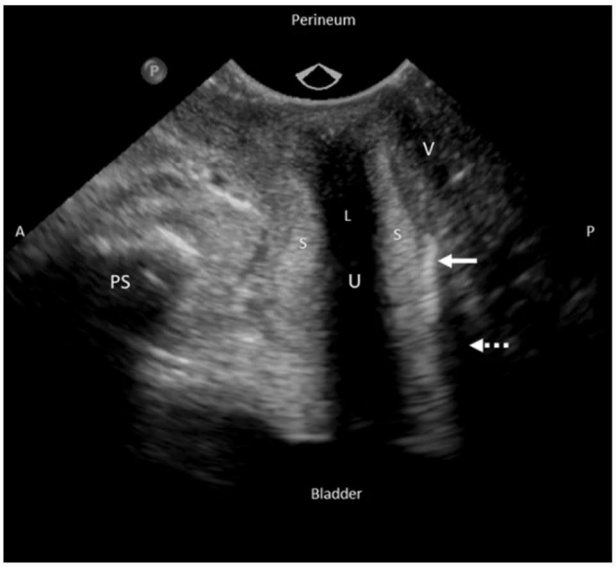
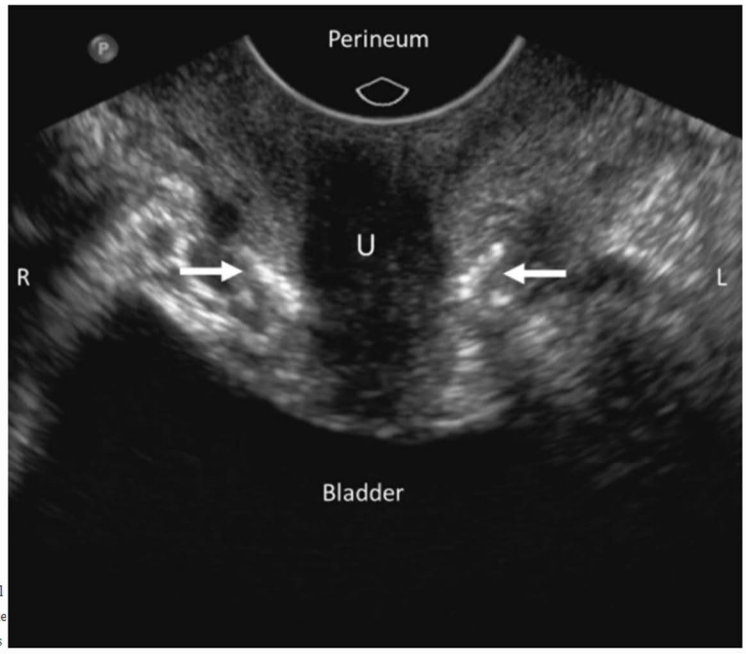


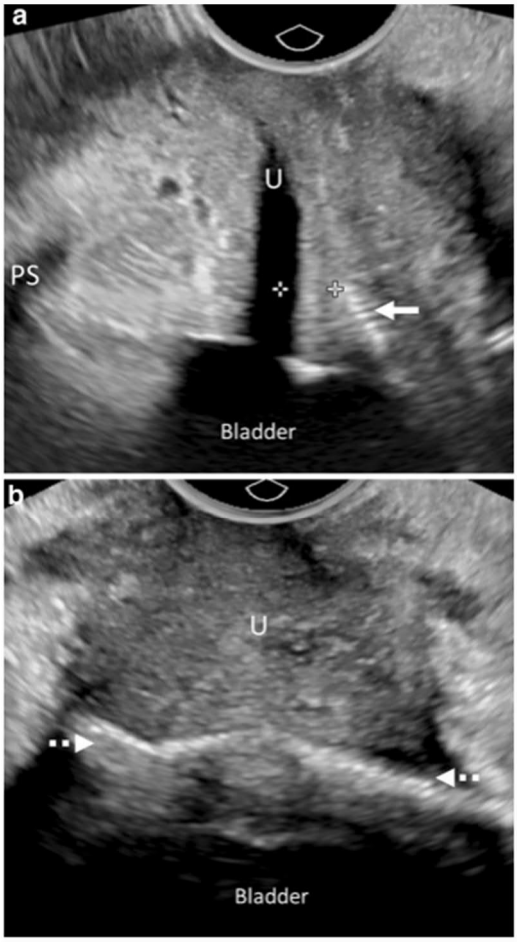
Illustration demonstrating a non-retropubic transobturator sling as visualized from the pelvic floor. Note the wider hammock-like shape posterior to the urethra and the lateral extension of the arms into the obturator foramen on either side (arrows)



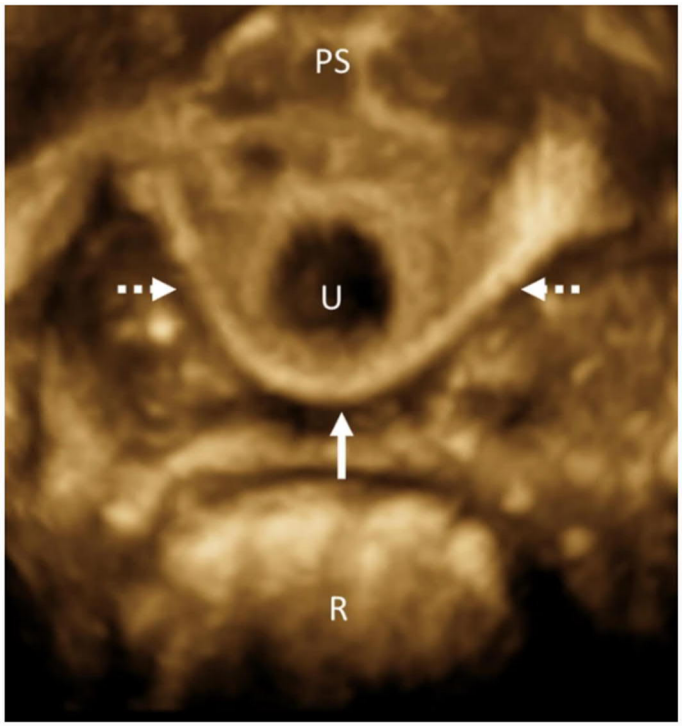
Sagittal two-dimensional (2-D) grayscale ultrasound image showing normal position of mid-urethral sling (solid arrow), seen as an echogenic structure posterior to the mid urethra. The hypoechoic cente of the urethra represents the longitudinal smooth muscle (L), while the outer striated muscle layer is more echogenic (S). Note the posterior echogenic shadowing from the sling material (dashed arrow); *A* anterior, *P* posterior, *PS* pubic symphysis, *U* urethra, *V* vagina



Coronal two-dimensional (2-D) grayscale ultrasound image through the mid-section of the urethra showing normal position of the arms of the sling, seen as echogenic bands on either side of the mid urethra (solid arrows); *U* urethra, *R* right, *L* left

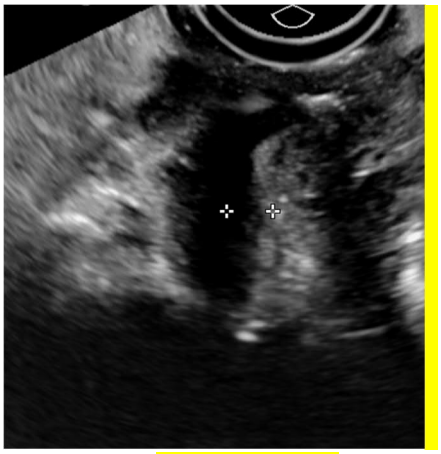


Sagittal (**a**) and Coronal (**b**) 2-D grayscale ultrasound images demonstrating sling along the posterior wall of the proximal urethra (arrows) very close to the bladder neck. The more horizontal orientation of the sling seen on the coronal image (dashed arrows) suggests a non-retropubic sling (such as Transobturator or Single-incision sling); *Ps* pubic symphysis

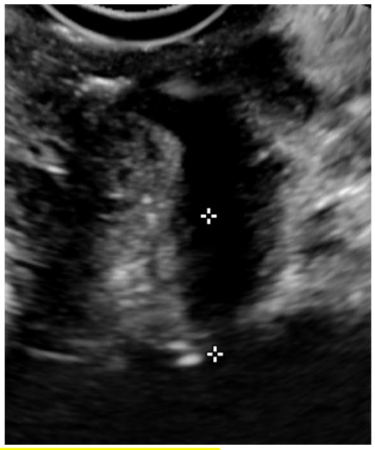


Axial three-dimensional (3-D) volume rendered ultrasound image showing the mid-urethral sling (solid arrow) encircling the posterior urethra (U) with symmetrically positioned arms extending anterolaterally in the peri-urethral space (dashed arrows); *PS* pubic symphysis, *R* rectum

Examples of Measurements:



Sling to Lumen

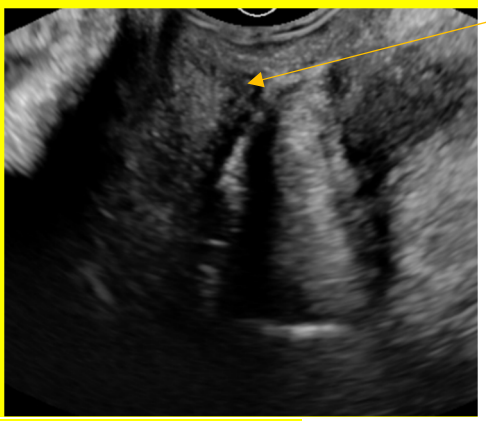


Sling to Bladder Neck

Sling to Lumen

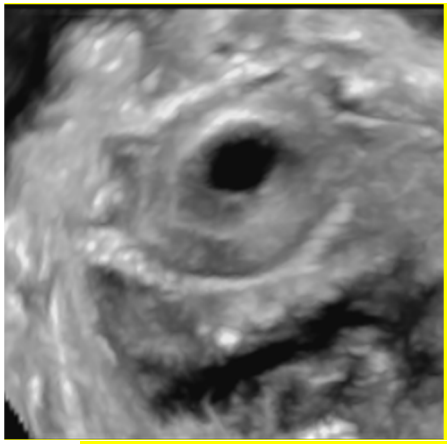
Sling to Bladder Neck

Cystocele

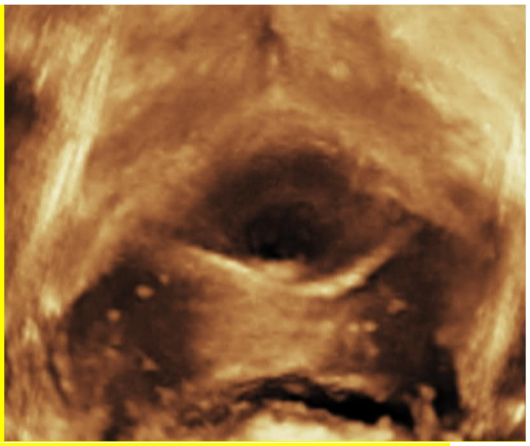


Rectocele

Examples of Slings on 3d Reconstructions:



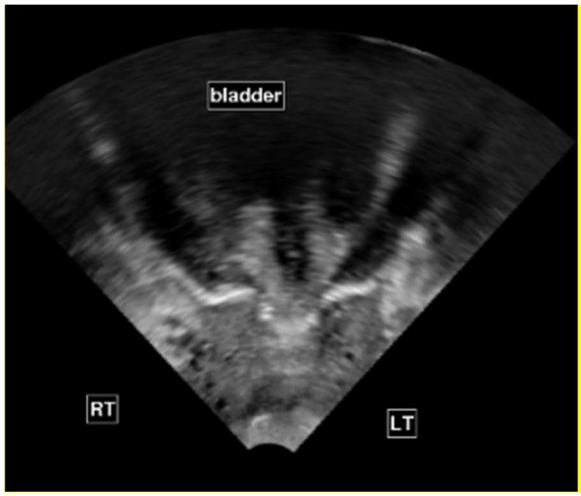
TOT with Vaginal Exposure



TOT Right Arm Twisted

TVT

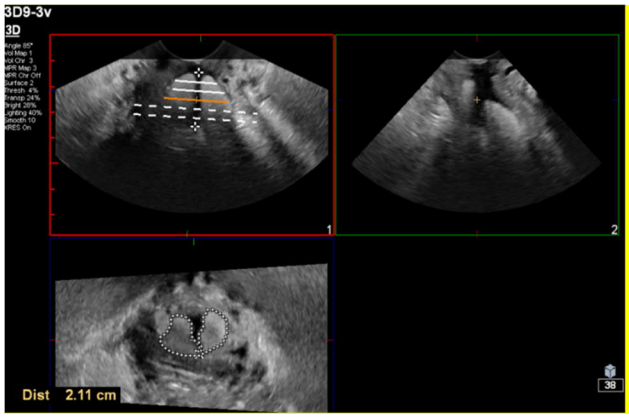
TVT

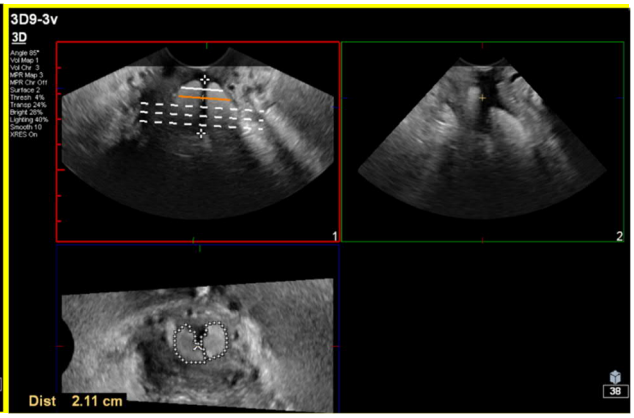


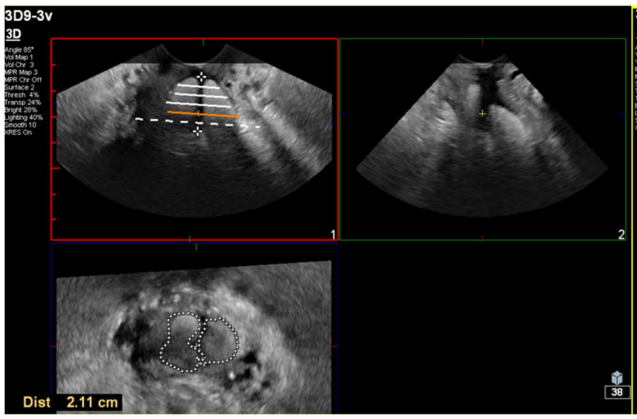
TVT-O

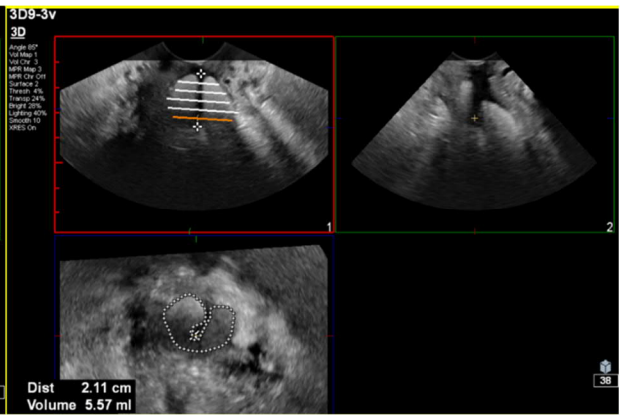
Bulking Agent Stacked Measurements

- Philips EPIQ 3D:
  - When you are ready to trace your bulking agent, select hide volume on the touchscreen
  - Press the measurement key
  - Select stacked contours
  - Set your distance where you will place your stacked contours
  - Minimum of 5 to 7 Stacked Contours is needed to calculate your volume of bulking agent.
  - Select continuous trace









REVISION HISTORY:Status	Name & Title	Date	Summary
Submission	David Fetzer, MD, Director	06/15/2022	Submitted
Approval	David Fetzer, MD, Director	06/15/2022	Approved
Review	Amber Lachowic & Laura Reynolds Advanced Practice Sonographers		
Revisions	Crystal Bruce, RDMS, RVT, RDCS	03/28/2023	Added measurement instructions for sling to lumen, and sling to bladder neck. Reference images of different sling types and measurements. Bulking Measurement instructions