PENILE ULTRASOUND PROTOCOL

BILLING CODES:
UPEN - Penile 2D only, no spectral doppler performed
UPENDC - Penile with complete vascular (artery and vein)
UPENDL- Penile with limited vascular (artery or vein)

PATIENT PREP: No prep

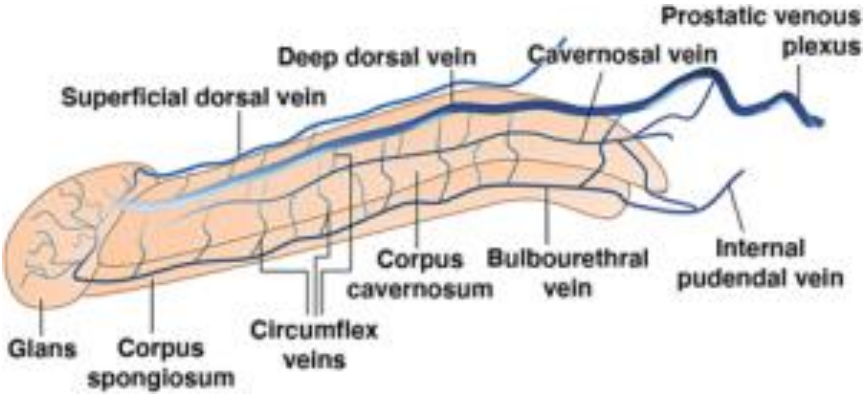
EQUIPMENT: High-frequency linear array transducer with a frequency range of at least 7-18 MHz

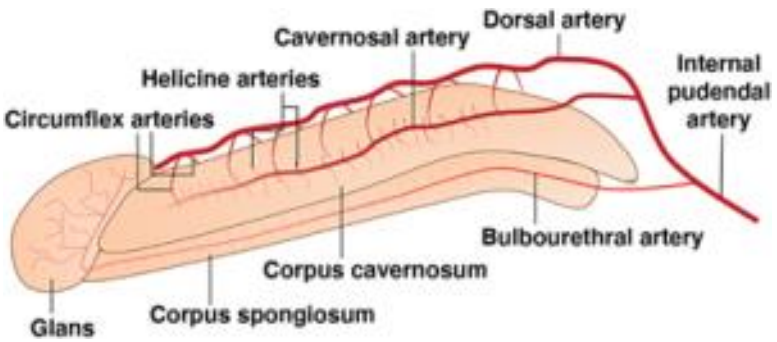
GENERAL GUIDELINES: A complete examination includes evaluation of the entirety of the penile shaft, penile base, glans penis, both corpora cavernosa and central arteries, and corpora spongiosum.

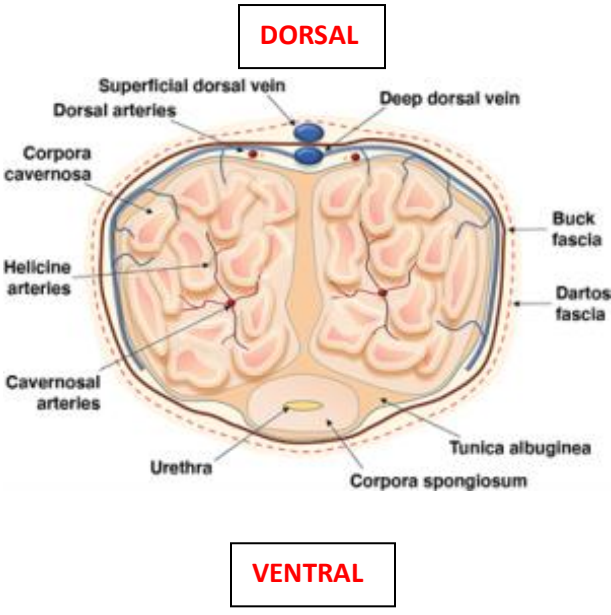
PATIENT POSITION: Place patient in supine position with a towel covering the scrotum. The penis should be orientated toward the feet, placed over the towel, for imaging of the dorsal penile surface. For imaging of the ventral surface, the penis should be oriented toward the head, positioned on the abdomen over a towel.

PENILE ANATOMY

- The paired corpora cavernosa, along the dorsal penis, constitute the erectile tissue of the penis and extend from the penile base to the glans penis (tip)
- The cavernosal arteries are located centrally within each corpus cavernosum.
- The single corpus spongiosum, along the ventral penis, contains the penile urethra and distally expands to form the glans penis.





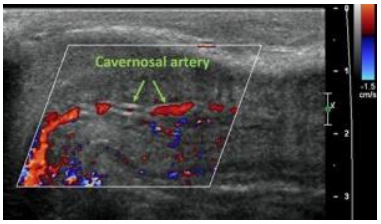


IMAGES TO OBTAIN

***Images should be annotated with the location and the surface being imaged from - ventral vs dorsal*

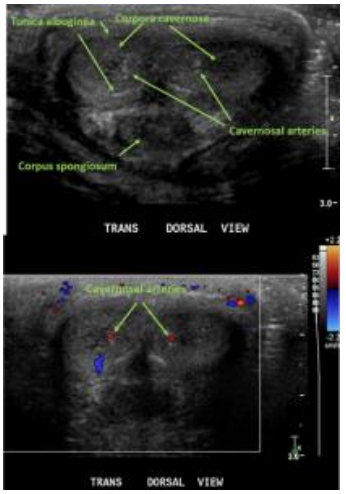
VENTRAL PENIS

- Transverse images:
  - Proximal base
  - Mid
  - Distal, near glans
  - Glans, if indicated
  - Cine sweep-through corpus cavernosum, base to glans
  - Cine sweep with color doppler through corpus cavernosum, base to glans with color
- Longitudinal images:
  - Right corpus cavernosum
  - Right corpus cavernosum and cavernosal artery with color
  - Midline/corpus spongiosum
  - Left corpus cavernosum
  - Left corpus cavernosum and cavernosal artery with color
  - Cine sweep through corpus cavernosum R-L
- Additional images with and without color at any area of concern as needed.
- Measure any hematoma or other collection, mass, or any plaque visualized.
-



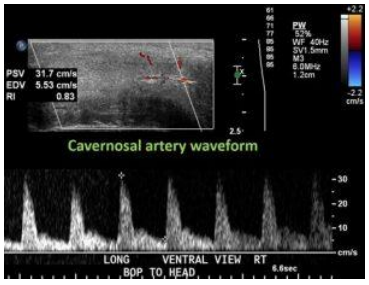
DORSAL PENIS *IF INDICATED* - NEEDED FOR TRAUMA, FRACTURE, PEYRONIE'S OR IF LUMP ON DORSAL PENIS

- Transverse images:
  - Proximal base
  - Mid
  - Distal, near glans
  - Glans, if indicated
  - Cine sweep through corpus cavernosum, base to glans
  - Cine sweep with color through corpus cavernosum, base to glans
- Longitudinal images:
  - Right corpus cavernosum
  - Right corpus cavernosum and cavernosal artery with color
  - Midline/corpus spongiosum
  - Midline/corpus spongiosum and superficial dorsal vein with color
  - Left corpus cavernosum
  - Left corpus cavernosum and cavernosal artery with color
  - Cine sweep through corpus cavernosum R-L
- Additional images with and without color at any area of concern as needed.
- Measure any hematoma or other collection, mass, or any plaque visualized.



SPECTRAL DOPPLER IMAGES *IF INDICATED* - NEEDED FOR PRIAPISM AND ERECTILE DYSFUNCTION

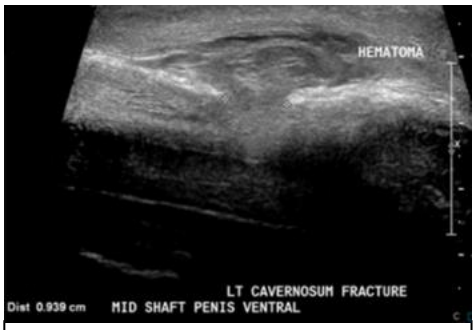
- Right cavernosal artery - proximal, mid and distal
- Left cavernosal artery - proximal, mid and distal
- Midline superficial dorsal vein
- Billing codes to be used:
  - UPENDC - Penile with complete vascular (artery and vein)
  - UPENDL- Penile with limited vascular (artery or vein)



ADDITIONAL INFORMATION

PENILE FRACTURE:

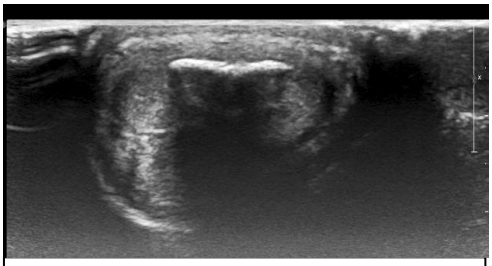
- Evaluate corpora for disruption of echogenic tunica.
- Evaluate for hematoma as this often correlates to area of fracture.
- Key images are gray-scale and color images in areas of hematoma, tunica disruption or where there is the most pain.



Penile fracture with disruption of tunica and resulting hematoma.

PEYRONIE'S DISEASE:

- Peyronie's disease is a connective tissue disorder in which scar tissue forms under the skin of the penis, usually in the tunica albuginea or tissue surrounding the corpus cavernosa. It can cause painful erections, erectile dysfunction and a curvature of the penis.
- Evaluate the corpora cavernosa for calcified plaque or regions of peripheral tunica thickening. This will be most commonly present on the dorsal side and near the base of penis.
- Key images are transverse and gray-scale images of any tunical plaques with size and location.



Example of Peyronie's plaque.

PRIAPISM:

- Priapism is a condition in which a penis remains erect for hours in the absence of stimulation or after stimulation has ended. It can be caused by sickle cell disease, leukemia, certain medications, recreational drugs, trauma and neurological disorders.
- There are two main types:
    - Ischemic/venous/ low-flow – This accounts for the majority of cases (95%). It is typically associated with a lot of pain and patients present with the penis being hard; however, the glans penis is usually not. Ischemic priapism is caused by decreased or absent venous drainage. It is usually treated with a nerve block and aspiration of blood from corpus cavernosum.
    - Nonischemic/arterial/high-flow – Patients typically do not have a lot of pain in these cases and generally present with the entire penis being only somewhat hard. It can present following trauma to the penis, after a spinal cord injury or with tumor invasion. Nonischemic priapism is caused by a connection forming between an artery and the corpus cavernosum, or due to a disruption of the parasympathetic nervous system resulting in increased arterial flow. It is usually treated with cold packs and compression.
- Key images are color and spectral Doppler images of corpora cavernosum using low-flow settings.
    - Ischemic/low flow priapism will have little, if any, flow in the corpora.
    - Nonischemic/high flow priapism often occurs in a traumatic injury and will demonstrate a focal region of high flow in the corpus cavernosum due to an arteriovenous fistula, with corresponding low-resistance waveforms in the corresponding cavernosal
- **ADDITIONAL IMAGES NEEDED FOR THESE CASES:**
    - Color and spectral doppler images of right and left cavernosal arteries - prox, mid. distal
    - Color and spectral doppler images of midline superficial dorsal vein
    - Billing codes to be used:
        - UPENDC - Penile with complete vascular (artery and vein)
        - UPENDL- Penile with limited vascular (artery or vein)

PENILE SWELLING:

- Diffuse swelling, caused by infection or inflammation.
- **Balanitis** – Inflammation of foreskin/glans penis due to infection. This is very common, especially in uncircumcised males.
- Evaluate for thickening, hyperemia, and fluid collection/abscess in the area of swelling.
- Key images are grayscale and color Doppler of area of swelling.

PENILE MASS OR LUMP

- Penile cancers usually at glans penis or involving foreskin.
- Evaluate area of any palpable mass.
- Grayscale and color Doppler images of any mass.
- If mass is located on dorsal penis, evaluate superficial dorsal vein.

INJECTION WITH UROLOGY (HMC only)

- These are performed by Harborview Medical Center's urology team with the urologist present. They will provide instructions on necessary image acquisition.
- **ADDITIONAL IMAGES TYPICALLY NEEDED FOR THESE CASES**:
    - Pre injection:
        - Right cavernosal artery baseline size (mm)
        - Left cavernosal artery baseline size (mm)
    - Post injection:
        - Right cavernosal artery size (mm)
        - Left cavernosal artery size (mm)
        - Right cavernosal artery PSV (cm/s) & Resistive Index
        - Left cavernosal artery PSV (cm/s) & Resistive Index

REFERENCES:

J Ultrasound Med 2005; 24:993–1000

Penile Doppler Ultrasound for Erectile Dysfunction: Technique and Interpretation. AJR 2019

Gupta N, Goyal P, Sharma K, Bansal I, Gupta S, Li S, Zinn K, Kumar Y. Penile fracture: role of ultrasound. Transl Androl Urol 2017;6(3):580-584. doi: 10.21037/tau.2017.03.38

Bertolotto, M., Campo, I., Sachs, C. *et al.* Sonography of the penis/erectile dysfunction. *Abdom Radiol* **45,** 1973–1989 (2020). https://doi.org/10.1007/s00261-020-02529-z

https://link.springer.com/article/10.1007/s00261-020-02529-z

PENILE ULTRASOUND IMAGE LIST

IMAGE	MODE
VENTRAL PENIS *For all cases*	
Trans Proximal/Base	2D
Trans Mid	2D
Trans Distal, near glans	2D +
Trans Base to glans cine	Cine
Trans Base to glans cine with color	Cine/color
Sag Right Corpus Cavernosum	2D
Sag Right Corpus Cavernosum & Cavernosal Artery w/ color	Color
Sag Left Corpus Cavernosum	2D
Sag Left Corpus Cavernosum & Cavernosal Artery w/ color	Color
Sag Corpus Cavernosum R-L cine	cine
Measure areas of abnormality	2D+
If for palpable area: *-Sag and Trans images labeled as "Area of Concern"* *-Measure and use color/MFI as needed*	*2D/Cine* *Color*
DORSAL PENIS *For Trauma, Fracture, Peyronie's or lump*	
Repeat above images w/ dorsal views	*Repeat above*
SPECTRAL DOPPLER *For Priapism and Erectile Disfunction*	
Cavernosal Artery w/spectral - Prox/Mid/Dist	*Spectral*
Superficial Dorsal Vein w/ spectral	*Spectral*
INJECTION WITH UROLOGY	
Pre injection Cavernosal Arteries (mm)	*2D+*
Post injection Cavernosal Arteries (mm)	*2D+*
Post inject Cavernosal Arteries cm/s & RI	*Spectral*

PENILE PROTOCOL HISTORY

	Date	Changes made	By whom
Created	11/22/2019		Manjiri Dighe S. Bornemeier
Format change	1/13/2023	Format change	Renee B Fitzgerald
Reviewed	2/29/2024		Protocol Meeting Attendees