# ULTRASOUND PROTOCOLS

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Advanced Ultrasound Exam Protocols

**Abdomen Ultrasound** - see REVISED worksheet!

**Prep:** NPO 8 hours  
**Equipment:** 3-5 MHz curved transducer

Include images of:
- **Liver**
  - Right lobe-transverse and longitudinal  
  - Left lobe-transverse and longitudinal
- **Kidneys**
  - Transverse-superior, mid and inferior  
  - Longitudinal-lateral, mid and medial
- **Gallbladder**
  - Supine-transverse and longitudinal  
  - Left lateral decubitus  
  - Additional positions as needed (for example: prone or upright)
- **Common Bile Duct**
  - Longitudinal image with and without measurements
- **Porta**
- **Inferior Vena Cava**
  - Longitudinal
- **Aorta**
  - Longitudinal-proximal, mid and distal to bifurcation and transverse-bifurcation.
- **Pancreas**
  - Head, body and tail, longitudinal and transverse
- **Spleen**
  - Longitudinal and transverse

**Measurements**
- **Right lobe of liver- longest axis**  
- **Left lobe of liver- longest axis**  
- **Right and left kidney- AP, transverse and longitudinal**  
- **CBD- at porta hepatis and distally**  
- **Aorta-proximal, mid and distal- maximal diameter in each section**  
- **Spleen- longitudinal (If >13 cm in any dimension, measure in AP and transverse and longitudinal planes.)**

Sonographic Murphy’s sign Y/N. = Maximal abdominal tenderness from pressure of the ultrasound probe over the visualized gallbladder. i.e. hurts the worst when scanning over the GB.

*Document all pathology, image without calipers and with calipers, measuring in 3 dimensions—include transverse and longitudinal images and color Doppler image. If numerous, e.g multiple hepatic metastases or cysts, just measure largest in each lobe and document on worksheet that numerous are seen.  
*Annotate ALL images  
Porcelain GB Example
Abdominal Doppler – see NEW worksheet!

- Prep: NPO 8 hours
- Grayscale, Color Doppler and Spectral Doppler velocity measurements for ALL.
- Main Portal Vein, Right and Left Portal Veins – also indicate direction of flow (hepatopetal towards liver vs hepatofugal away from liver)
- Hepatic Artery, include resistive index
- Hepatic Veins, Right, Left and Middle
- Splenic Vein at hilum and at pancreas – also indicate direction of flow
- IVC
- Measure diameter of main portal vein
- *Annotate ALL images

Thrombosed Hepatic Vein Example

Normal Hepatic Vein Waveform
Normal Main Portal Vein Waveform

Normal Inferior Vena Cava Waveform

Liver Hilum Anatomy
Appendix Ultrasound - see NEW worksheet!

For female patients, a pelvic ultrasound should also be performed to rule out ovarian pathology

Prep: None

Equipment: 7-15 MHz linear transducer

Detail patient’s symptoms and provide relevant labs e.g. WBC count

Document the normal anatomy of the RLQ, from lower liver margin to superior bladder, include images of the iliac vessels

Image any pathology found in 2 grayscale planes, including measurements and any vascularity with color Doppler imaging.

-Transverse with and without compression images
-Document “area of pain”
-Image RLQ gutter for free fluid
-Document and measure any lymph nodes

Tubular structure seen? Y or N
If yes, is it hypervascular? Y or N
Is it compressible? Y or N
Patient tolerant of compression? Y or N
Free fluid in RLQ and/or posterior to the bladder? Y or N
Lymph nodes seen? Y or N
Peristalsing bowel? Y or N
Appendicolith(s) present? Y or N

Normal Appendix Example
Normal Appendix Example

Abnormal Appendix Example

Abnormal Appendix Example
**Breast Ultrasound** - see REVISED Worksheet!

**Prep:** None  
**Equipment:** 7-15 MHz linear transducer

Scan area of concern. Check with radiologist or review recent mammogram report prior to scanning.

Acquire transverse and longitudinal images (or radial/antiradial) in area of concern.

**Pathology:**
- **Label pathology with the appropriate “o’clock”**
- **Label pathology with “cm from nipple”**

Use the breast marker picture to document location—in addition to labeling. Nodules less than 1 cm deep should be imaged with a standoff pad in addition to standard images.

Document color Doppler flow in any nodule.

Document all abnormal findings: e.g. complex cysts, solid nodules, shadowing lesions, etc..

*Number pathology on U/S images to correlate with worksheet numbering. Draw in approximate location on worksheet breast diagram. Do not need to measure every *simple* cyst, but document all findings in the vicinity of a palpable lump or area of concern and document largest simple cysts, up to two in each quadrant evaluated.*

*Annotate ALL images*
Carotid Doppler/Cerebrovascular Duplex—see REVISED worksheet!

Prep: None
Equipment: 3.5 to 10 MHz transducer

**Grayscale and Color Doppler:**
Transverse Images: Common Carotid Arteries (CCAs) – Proximal to carotid bifurcation
Internal Carotid Arteries (ICAs) and External Carotid Arteries (ECAs) – Carotid bifurcation to highest possible point
Longitudinal Images: CCAs – Proximal to bifurcation
ICAs and ECAs – Bifurcation to highest visible point
Vertebral: Image with color Doppler (showing vein and artery)

**Measurements:**
Spectral Doppler: Measure Peak Systolic and End Diastolic Velocities of CCAs and ICAs
  CCAs- Proximal and Distal (within 2 cm of bifurcation)
  ICAs- Proximal, Mid, and Distal
Spectral Doppler: Measure Peak Systolic Velocities of ECAs and Vertebral and Subclavian Arteries
  ECAs- proximal
  Vertebral arteries
  Subclavian arteries

Indicate direction of flow of vertebral arteries --antegrade/retrograde
Indicate any plaque or tortuosity seen.
Survey any stenotic areas for highest velocities
At sites of greatest narrowing in carotid bulbs and/or internal carotid arteries include axial and longitudinal gray-scale and color Doppler images to estimate % diameter reduction (i.e. none, < 50%, ≥ 50%, visible lumen, or no detectable lumen)
*Do not take CCA velocity for ratios at area of plaque
*Annotate all images
*Note any other abnormality seen
*Include image of report page/worksheet

ICA Stenosis

Carotid Anatomy
Tortuous ICA

Diameter Reduction Images

Carotid Body Tumor
Hernia Ultrasound

Prep: None

Equipment: 7-12 MHz linear transducer
- Inguinal canal at rest and with Valsalva maneuver in 2 planes
- Femoral canal at rest and with Valsalva maneuver in 2 planes

Hernia Ultrasound Example

Include comparison to contralateral side – e.g. split image displaying representative transverse image of the area of concern and comparison opposite side transverse image and second split screen image with representative longitudinal view of the area of concern and comparison contralateral longitudinal image.

Identify the content of the hernia (omental fat and/or bowel)
Include any alternative pathology

*Annotate ALL images

Incarcerated Hernia
Infant Hip Ultrasound Bilateral

Prep: NPO for 4 hours, bring bottle with patient

Equipment: 7-12 MHz linear transducer
- Images in the coronal plane
- Images in the transverse plane
- Images while the radiologist is manipulating each hip

If looking for hip joint effusion, include comparison to contralateral side — e.g. split image displaying representative longitudinal view of the area of concern and comparison contralateral longitudinal image and second split screen image with representative transverse image of the area of concern and comparison opposite side transverse image.

Normal Hip

![Normal Hip Ultrasound Example](image)

Abnormal Hip Ultrasound Example

![Abnormal Hip Ultrasound Example](image)

Hip Effusion Example

![Hip Effusion Example](image)
Lower Extremity Arterial Duplex

Prep: None
Equipment: Linear 5-7 MHz transducer for groin down
Curved transducer 3-6 MHz to examine Abdominal Aorta and Iliac arteries

An Ankle/Brachial Index (ABI) must be performed first.
- Bilateral brachial artery systolic pressures must be obtained from both arms and the higher of the two used for ABI
- Ankle systolic pressures must be obtained bilaterally from the distal posterior tibial artery (PTA) and Anterior Tibial Artery (ATA) & Dorsalis Pedis Artery (DPA) and the higher of the two pressures on each side used for ABI
- Calculate the ABI by dividing the highest ankle systolic pressure from each leg by the highest brachial systolic pressure
- If the ABI is normal, then have the patient walk for 5 minutes and repeat the ABI’s

ABI’s: Normal: 1.0-1.4
Abnormal: 0.41-0.90 Mild to Moderate Arterial Disease
0-0.41 Severe Arterial Disease

Imaging Documentation:
Color Doppler images of:
Common Femoral Artery (CFA)
Profunda Femoris Artery (PFA)
Femoral Artery (FA)
Popliteal Artery
Aorta, Common and External Iliac arteries and Tibial arteries when appropriate

Spectral Doppler waveforms and velocity measurements:
CFA
PFA
FA
Popliteal Artery
Posterior Tibial Artery (PTA)
Anterior Tibial Artery (ATA)
Peroneal Artery
Aorta, Common and External Iliac arteries when appropriate.

*Document the normal anatomy and the peak velocities. Document any stenosis or occlusion lengths.
*Annotate ALL images
Lower Extremity Segmental Pressures

Prep: None

Wrap blood pressure cuffs:
1. Above ankles with #10 cuff
2. Below knees with #10 cuff
3. Above knees with #12 cuff
4. High thigh with #12 cuff

Attach inflator module to appropriate cuff
Follow machine instructions as to which cuff to inflate for segmental pressure setting

Brachial Pressures: Locate artery with probe at wrist or elbow
   Inflated cuff until artery is occluded
   Press button to store when first pulse returns
   Repeat in other arm

Leg Pressures: Locate artery with probe in post tibial or on top of foot
   Start with cuff 1
   Inflated cuff until artery is occluded
   Press button to store when first pulse returns
   Repeat for all cuffs, both legs

Store settings when all pressures are recorded

Leg Waveforms: Start with cuff 1
   Inflated to between 65-70 mmHg
   Record waveform
   Repeat through all cuffs, both legs

*If patient is diabetic perform toe pressures and waveforms on the great toe
*If patient can walk, walk patient for 5 minutes or until patient tires
*Do post exercise ABI’s until resting pressure is reached

**Non-Vascular Extremity Ultrasound**

**Prep:** None  
**Equipment:** 7-12 MHz linear transducer

To evaluate: Groin, joints, soft tissue masses, foreign bodies, tendons, areas of pain, swelling, and/or masses in the axilla

*Image area of interest in longitudinal and transverse with measurements if needed  
*Color Doppler images over area  
*With and without compression pictures over the area  
*Comparison images of opposite side. Even if no pathology, always include split image displaying representative transverse image of the area of concern and comparison opposite side transverse image and second split screen image with representative longitudinal view of the area of concern and comparison contralateral longitudinal image.  
*Use body marker to show area of interest and use diagram/drawing as necessary on worksheet.  
*Document all pathology, image without calipers and with calipers, measuring in 3 dimensions—include transverse and longitudinal images and color Doppler image.  
*Annotate ALL images

**Abnormal Groin Lymph Node:**
OB-1st Trimester < 14 weeks
Prep: Full Bladder
Equipment: 3-5 MHz curved transducer

Transabdominal Scan:
- Uterus-longitudinal and transverse
- Right and Left Ovaries-longitudinal and transverse
  Document blood flow in ovaries

Transvaginal Scan:
- Gestational Sac-sagittal and coronal
- Crown Rump Length
- Right and Left Ovaries-sagittal and coronal
  Document blood flow in ovaries
- Yolk Sac
- Uterus-sagittal and coronal

Measurements:
- Uterus-AP, longitudinal and transverse
- Gestational Sac-AP, sagittal and coronal
- Crown Rump Length
- Right and Left Ovaries-AP, sagittal and transverse
- Yolk Sac
- Fetal Heart Rate

***If a fetal pole is present, dates should be based on CRL ONLY-NOT on gestational sac size or an average of gestational sac size and crown rump length. If subchorionic hemorrhage or implantation bleed is suspected, please document size in all 3 dimensions and include color Doppler image of the area.

Abnormal 1st Trimester Ultrasounds

Ectopic Ultrasound

![Ectopic Ultrasound Image]

* Image of ectopic pregnancy detected by ultrasound.
Partial Molar Pregnancy

**OB-2\textsuperscript{nd} and 3\textsuperscript{rd} Trimester > 14 weeks** - see REVISED Worksheet!

Prep: Full Bladder
Equipment: 3-5 MHz curved transducer

- Posterior Fossa
- Lateral Ventricle
- Spine-longitudinal and transverse images of C, T, L, and LS spine
- 4 Chamber Heart
- Outflow Tracts
- Fetal Cord Insertion into abdomen and placenta
- 3 Vessel Cord in transverse (short axis) dimension external to fetus
- Cord Doppler
- Stomach
- Bladder
- Kidneys
- Face: image face and lips (nose and upper lip) coronal en face and a profile view
- Extremities
- Placenta-longitudinal and transverse
- Cervix
- Right and Left Maternal Adnexa

*If patient’s bladder is full during exam, do post void images to document the lower margin of the placenta and to accurately measure the length of the cervix.

Measurements:
- BPD
- Head Circumference
- Abdomen Circumference
- Femur Length
Deepest Vertical Pocket not containing fetal extremities or umbilical cord (instead of Amniotic Fluid Index)--normal between 2 and 8 cm.

Cervical Length

Graphs should be included:

- BPD
- HC
- AC
- FL
- EFW

*Annotate ALL images

**OB-Biophysical Profile**

**Time:** 30 minutes  
**Prep:** None  
**Equipment:** 3-5 MHz curved transducer

Complete OB Scan (unless a recent scan is available)

**Assess**

1) Fetal Gross Body Movements 0 or 2  
2) Fetal Tone 0 or 2  
3) Fetal Breathing Movements 0 or 2  
4) Amniotic Fluid Deepest Vertical Pocket 0 or 2

Document each and total score out of 8 maximum.

**Fetal Biophysical Profile Scoring Table**

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>SCORE 2</th>
<th>SCORE 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fetal Breathing Movements</td>
<td>1 or more episodes of rhythmic fetal breathing for ≥ 30 seconds within 30 minutes</td>
<td>Absent or no episode of ≥ 30 seconds within 30 minutes</td>
</tr>
<tr>
<td>Fetal Gross Body Movements</td>
<td>3 or more discrete body/limb movements within 30 minutes (episodes of active continuous movement considered as a single movement)</td>
<td>&lt; 3 episodes of body/limb movements within 30 minutes</td>
</tr>
<tr>
<td>Fetal Tone</td>
<td>1 or more episodes of active extension with return to flexion of fetal limb(s) or trunk (opening and closing of hand considered normal tone)</td>
<td>Slow extension with return to partial flexion, movement of limb in full extension, absent fetal movement, or partially open fetal hand.</td>
</tr>
<tr>
<td>Amniotic Fluid = Deepest Vertical Pocket</td>
<td>1 or more pockets of fluid measuring ≥ 2 cm in vertical axis.</td>
<td>Either no pockets or largest pocket &lt; 2 cm in vertical axis.</td>
</tr>
</tbody>
</table>
Pelvic Ultrasound

Prep: 48 oz. of water 60 minutes before exam time
Equipment: 3-5 MHz curved transducer

Uterus
Longitudinal and transverse-transvaginal and transabdominal
Scan to right and left of endometrium in longitudinal
Scan fundus to vagina in transverse

Ovaries
Longitudinal and transverse-transvaginal and transabdominal
Color Doppler flow and spectral Doppler of both ovaries-transvaginal and transabdominal

Adnexa
Longitudinal and transverse of both right and left sides
Transabdominal and transvaginal

(If RLQ pain is indicated or clinician asked for appendix- a high resolution transducer should be used in the RLQ to identify the appendix—see appendix protocol)

Measurements
Uterus: AP, transverse and longitudinal, include the cervix in longitudinal
Ovaries: AP, transverse and longitudinal
Endometrium: longitudinal AP dimension

*Document all pathology, image without calipers and with calipers, measuring in 3 dimensions—include transverse and longitudinal images and color Doppler image. Uterine/endometrial pathology-draw in approximate location on worksheet uterus diagrams.
If clinical concern for retained products of conception or infection, must include multiple longitudinal and transverse grayscale and color Doppler images of the endometrium/uterus.

*Annotate ALL images

Abnormal Ovarian Examples
Polycystic Ovaries
Pyloric Stenosis Ultrasound

Prep: NPO for 4 hours
Equipment: 9-15 MHz linear transducer

- Transverse images of the pylorus
- Longitudinal images of the pylorus
- Measurements of the muscle thickness (hyperechoic muscle layer) and pyloric length
- Images of the pylorus demonstrating movement (or absence of movement) of fluid from the stomach through the pylorus and into the duodenum.

*Annotate ALL images

Normal Pylorus Example
Pyloric Stenosis Example

Pyloric Stenosis Example
Renal/Aorta/Retroperitoneal Ultrasound—see REVISED Worksheet!

Prep: For AAA- NPO 8 hours. For kidneys-well-hydrated
Equipment: 3-5 MHz curved transducer

Right and Left Kidneys-
   Transverse-superior, mid and inferior
   Longitudinal-lateral, mid and medial
   If hydrenephrosis is present, also obtain post void kidney images to document the renal pelvis.

IVC-
   Longitudinal

Aorta-
   Proximal, mid and distal to bifurcation-transverse and longitudinal

Common Iliac Vessels-transverse and longitudinal

Bladder-
   Transverse and longitudinal
   Bilateral ureteral jets-if not easily visualized and documented, watch for at least 5 minutes.

Prostate-
   AP, transverse and longitudinal

Measurements
   Kidneys-AP, transverse and longitudinal
   Aorta- Proximal, mid and distal
   (If the indication for the exam is AAA-Maximal transverse and longitudinal images and measurements should be obtained at each level as well as for the common iliac arteries)

*Document all pathology, image without calipers and with calipers, measuring in 3 dimensions—include transverse and longitudinal images and color Doppler image. If numerous, e.g multiple simple cysts, just measure largest three on each side but still document all complex lesions. Draw in approximate location on worksheet kidney diagrams.
*Annotate ALL images

Medullary Sponge Kidney

Renal Tumor
Aorta Aneurysm

Renal Artery Stenosis/Renal Doppler - see REVISED Worksheet!

Prep: NPO 8 hrs
Equipment: 3-5 MHz curved transducer

Right and Left Kidneys -
   Transverse-superior, mid and inferior
   Longitudinal-lateral, mid and medial
   If hydronephrosis is present, also obtain post void kidney images to document the renal pelvis.

Color Doppler image of both kidneys
IVC -
   Longitudinal
Aorta -
   Proximal, mid and distal to bifurcation-transverse and longitudinal
Common Iliac Vessels-transverse and longitudinal

Measurements
   Kidneys-AP, transverse and longitudinal
   Aorta-Proximal, mid and distal
   Upper Arcuate Artery/Segmental Artery Resistive Index (RI), Acceleration Time (AT), and Acceleration Index (AI)
   Mid Arcuate Artery/Segmental Artery RI, AT, and AI
   Lower Arcuate Artery/Segmental Artery RI, AT, and AI
   Main Renal Artery Peak Systolic Velocity (PSV)--proximal, mid, and distal
   Aorta Peak Systolic Velocity
   Calculate Renal/Aortic Ratio (Highest PSV Renal Artery/Highest PSV Aorta)
*Note accessory renal arteries and location

*Document all pathology, image without calipers and with calipers, measuring in 3 dimensions—including transverse and longitudinal images and color Doppler image. If numerous, e.g., multiple simple cysts, just measure largest three on each side but still document all complex lesions.

Normal Renal Artery Waveform

Abnormal Renal Artery Waveform

**Scrotal Ultrasound**

Prep: None  
Equipment: 7-15 MHz transducer

Right and Left Testicles
- Transverse-superior, mid and inferior
- Longitudinal-lateral, mid and medial

Right and Left Epididymis
- Longitudinal and transverse
- Color Doppler flow of both testicles and epididymis
  (Make sure color gain is the same throughout the study)
Spectral Doppler of Both Testicles
Transverse Comparison Image of Right and Left Testicles
   Grayscale and color Doppler (on same image if possible, if you have to use dual
   screen, do not change depth or gain settings)
Measurements
   Right and Left Testicles-AP, transverse, and longitudinal
   Right and Left Epididymis-AP, transverse, and longitudinal

*Undescended testicles- Scan both hemiscrotum. If testicle(s) is absent, scan inguinal canal(s) up
   into the pelvis.

*Document all pathology, image without calipers and with calipers, measuring in 3 dimensions—
   include transverse and longitudinal images and color Doppler image.
*Number masses on U/S images to correlate with worksheet numbering. Draw in approximate
   location on worksheet diagrams.
*Document enlarged veins/varicoceles with color Doppler before and after Valsalva maneuver and
document maximal diameter.
*Annotate ALL images

Abnormal Scrotal Example-Torsion

Abnormal Scrotal Example-Tumor

Scrotal Inguinal Hernia
**Soft Tissue Ultrasound**

Prep: None  
Equipment: Linear transducer

*Image area of interest in longitudinal and transverse with measurements if needed*  
*Color Doppler images over area*  
*With and without compression pictures over the area*  
*Comparison images of opposite side. Even if no pathology, always include split image displaying representative transverse image of the area of concern and comparison opposite side transverse image and second split screen image with representative longitudinal view of the area of concern and comparison contralateral longitudinal image.*

*Use body marker to show area of interest and use diagram/drawing as necessary on worksheet.*  
*Document all pathology, image without calipers and with calipers, measuring in 3 dimensions—include transverse and longitudinal images and color Doppler image.*  
*Annotate ALL images*

**Superior Mesenteric Artery (SMA)/Mesenteric Doppler** -see NEW worksheet!

Prep: NPO for 8 hours  
Equipment: 3-5 MHz curved transducer

Scan entire abdomen if a recent study is not available.
Fasting spectral Doppler angle corrected velocities, peak systolic velocities (PSV) and end diastolic velocities, (use Doppler angle < 60°) at celiac artery and SMA (proximal, mid & distal)

Fasting aorta--measure peak systolic velocity at level of celiac artery and SMA.

Ensure (32 oz.) 16 oz. minimum (710 cal, 26 pro, 25 g fat, 95 g carb) or similar.
45 minutes post prandial, perform repeat spectral Doppler velocity measurements at SMA and celiac artery.

Calculate fasting SMA PSV to Aortic PSV ratio (mesenteric to aortic ratio). Normal <3.0

*Annotate ALL images
**Thyroid Ultrasound** - see REVISED Worksheet!

**Prep:** None  
**Equipment:** 7-15 MHz transducer

Right and Left lobe  
- Transverse- superior, mid and inferior  
- Longitudinal- lateral, mid and medial

Isthmus  
Right and Left Carotid Sheath  
- Longitudinal and transverse

**Measurements**  
- Right and Left Lobe- AP, transverse and longitudinal  
- Isthmus- AP

**Pathology**  
- Thyroid Nodules- AP, transverse and longitudinal  
  - Measure the three largest nodules in each lobe and any with suspicious features (calcifications, central flow, and solid)  
  - Document color Doppler flow and calcifications in nodules  
  - Document nodules in consecutive pictures-transverse measurement, longitudinal measurement, and color Doppler image e.g. split screen transverse and longitudinal image of nodule, then split screen transverse and longitudinal image of nodule with measurements, then color Doppler image of nodule.  
  
  *Number nodules* on U/S images to correlate with worksheet numbering.  
  
  *Draw in approximate location on worksheet thyroid lobe diagrams.*  

- Lymph Nodes- AP, transverse and longitudinal  
  - Document location on neck diagram at the bottom of worksheet.  
  - Document echogenic hilum and hilar flow

*Annote ALL images

**Thyroid Nodule Example**

![Thyroid Nodule Example Image]
Upper Extremity Arterial Duplex

Prep: None
Equipment: 5-15 MHz linear transducer

Blood Pressures are obtained on both arms for comparison.

Imaging Documentation
Color Doppler images of:
- Common Carotid Artery
- Subclavian Artery
- Axillary Artery
- Brachial Artery
- Radial and Ulnar Arteries

Spectral Doppler waveforms and velocity measurements:
- Common Carotid Artery
- Subclavian Artery
- Axillary Artery
- Brachial Artery
- Radial and Ulnar Arteries

*Document the normal anatomy.
*Document the peak velocities.
*Document any stenosis or occlusion lengths.
*Annotate ALL images

Venous Duplex of the Lower Extremity

Prep: None
Equipment: 3.5 to 10 MHz transducer

- Perform compression starting at proximal Common Femoral Vein (CFV) moving distally to the Femoral Vein (FV)
- Longitudinal color Doppler images of CFV, Proximal, Mid, and Distal FV and Profunda
- Spectral Doppler CFV with distal augmentation and Valsalva
- Spectral Doppler proximal and distal FV with distal augmentation and Valsalva maneuver
- Scan posterior knee: Start compressions at distal SFV and continue through the popliteal and peroneal-tibial trunk moving distally
- Spectral Doppler popliteal vein with distal augmentation and Valsalva maneuver
- Color Doppler images of posterior tibial veins and peroneal veins in the calf

**Acute Deep Venous Thrombosis Lower Extremity**

**Chronic Deep Venous Thrombosis Lower Extremity**

**Venous Duplex Post Endovenous Laser Treatment (EVLT)**

Prep: None. Imaging performed within 5-7 days after procedure
Equipment: 5-7 MHz linear transducer

* Perform a complete evaluation of the lower extremity for DVT (please see prior protocol).
* Include images of the Greater Saphenous Vein (GSV) or Small Saphenous Vein (SSV):
  - Transverse non compression and compression grayscale images of proximal and distal GSV
  - Show the GSV at the CFV confluence with and without color Doppler.
  - Longitudinal color Doppler images of the thrombosed GSV.
* If the thrombosis progresses from the GSV into the CFV and/or DVT is found, contact an IR doctor before dismissing the patient.
The Saphenous/Femoral Junction:

![Image of Saphenous/Femoral Junction](image)

Post EVLT Saphenous/Femoral Junction:

![Image of Post EVLT Saphenous/Femoral Junction](image)

**Venous Reflux Study of the Lower Extremity**

**Prep:** None  
**Equipment:** 5-12 MHz linear transducer

- *Perform a complete evaluation of both lower extremities for DVT (please see prior protocol)*

- *Have patient stand for 15 minutes and then perform competency evaluation with patient upright and bearing weight on opposite leg while being scanned.*

Competency should be tested using the Valsalva maneuver and/or distal augmentation. If vein is competent proximally, then distal augmentation should be used to test for reflux.

- *Measure the diameter of the GSV and perform Doppler with distal augmentation at the proximal, mid, and distal thigh, and proximal calf.*
*Measure the diameter of the SSV and perform Doppler with distal augmentation at the proximal and mid calf.
*Document the presence and location of any major tributaries and varicosities.
*Also note any refluxing perforators along the GSV.

Venous Reflux Example

![Venous duplex image](image)

**Venous Duplex of the Upper Extremity**

- **Prep:** None
- **Transducer:** 3.5 to 10 MHz

**Internal Jugular Vein**
- Transverse grayscale image with and without compression
- Longitudinal color Doppler image
- Perform Doppler with sniff

**Subclavian Vein**
- Color Doppler images in longitudinal of entire subclavian vein
- Perform Doppler of the subclavian vein with augmentation

**Axillary Vein**
- Transverse grayscale with and without compression
- Longitudinal color Doppler image
- Perform Doppler with augmentation

**Brachial Veins**
- Transverse grayscale image with and without compression
- Longitudinal color Doppler image
- Perform Doppler with augmentation

**Cephalic Vein**
- Transverse grayscale image with and without compression
- Transverse color Doppler image

**Basilic Vein**
- Transverse grayscale image with and without compression
- Transverse color Doppler image

**Radial and Ulnar veins**
- Transverse and/or longitudinal color Doppler images in the forearm
Deep Venous Thrombosis in the Axillary Vein

Vein Anatomy in the Upper Extremity