GUNDERSEN HEALTH SYSTEM ULTRASOUND DEPARTMENT POLICY AND PROCEDURE MANUAL

SUBJECT: **Venous Insufficiency (Reflux) Ultrasound**
SECTION: **Vascular Ultrasound**
ORIGINATOR: **Kraig Schuster**
REVISED DATE: February 27, 2020

APPROVED BY: _____
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Scheduling: 90 minutes for bilateral; 45 minutes for unilateral.

Patient Position: Reverse Trendelenburg position with head elevated at least 60 degrees. If performing the reflux exam at a site **without** a tilt cart, and reflux is not demonstrated with the patient in the reverse Trendelenburg position, then an image of the SFJ with Valsalva should be obtained with the patient in a standing position.

Equipment: Color flow duplex ultrasound unit with 5.0 MHz and 7 MHz linear array transducers.
*****Procedure should be performed at the lowest possible power settings.**

Objective:
I. Assessment of lower extremity valvular competency.
II. Detection of incompetent perforator veins.

Exam Protocol: The venous reflux exam has these major components:
1. **Patency**: An exam of the deep and superficial veins of the lower extremity is performed for evidence of acute or chronic DVT. For unilateral exams the contralateral CFV waveform will also be obtained with color and spectral Doppler using the same settings as the ipsilateral CFV.
2. **Venous Insufficiency Exam (reflux)**: Assessment and grading of any retrograde flow in the deep and superficial veins of the lower extremity.
3. Localization of perforating veins may be requested.
4. Any areas of vessel tortuosity and/or venous aneurysm should be commented on with the tortuous areas drawn on the worksheet.
5. The diameters of the GSV and SSV may be obtained in either the longitudinal or transverse plane with the AP inner to inner vessel diameter measured.
6. **The surgeons would like a description of branch veins and prominent varicose veins. Describing location, depth from skin surface, tortuosity, estimated length, diameter and where they drain into if you can tell is helpful.**
7. **Reflux at the SFJ only is not a candidate for laser ablation.**
8. **Occlusive thrombus at the SFJ is not a candidate for laser ablation. HOWEVER, nonocclusive thrombus may still be ablated if reflux. The patent lumen diameter is important to document.**
9. **Tortuous vessel is not candidate for ablation**
10. **Superficial vessel not a candidate ("breaks sheath" important to document…consider adding depth from skin for completeness)**
11. **< 10 cm segment of vein refluxing is not a candidate**
12. **Perforators are important when there are nonhealing ulcers. They need to be > 4mm to be treated.**

Patency Exam:
The patency exam will consist of a transverse compression exam of the lower extremity veins for DVT. The Common Femoral vein through the Popliteal, Posterior Tibial, Peroneal, and Greater and Short Saphenous Veins should be evaluated in this fashion. The vein will be compressed sequentially every one to two centimeters with moderate probe pressure. The vein should be observed to completely coapt and then reopen as pressure is released. Any thrombus seen should be commented on/drawn on the worksheet.

Venous Insufficiency Exam:
1. Place the transducer on the mid FV and have the patient Valsalva while recording the spectral Doppler tracing. If the Valsalva maneuver does not cause retrograde flow, then squeeze the thigh distal to the transducer to cause augmentation while recording the spectral tracing. Using the time scale on the display, note the duration of any retrograde flow.
2. A spectral tracing is taken at the popliteal vein with Valsalva. If the Valsalva maneuver doesn't cause retrograde flow, then distal augmentation is performed to demonstrate reflux.
3. The transducer is then placed on the Greater Saphenous vein **near the origin and just inferior to the epigastric vein branch** and a spectral Doppler tracing is taken with Valsalva. Distal augmentation is also performed if the Valsalva maneuver doesn't cause retrograde flow.
4. The Greater Saphenous vein will have a spectral tracing taken at the mid and distal thigh with Valsalva, and distal augmentation if the Valsalva maneuver doesn't cause reflux.
5. If a duplicated GSV is seen it should also be evaluated for venous reflux.
6. If requested, the Posterior Tibial, Peroneal, Anterior Tibial, and Lesser Saphenous veins may be evaluated using distal augmentation, and/or the Valsalva maneuver to assess valve competency.
7. **Because the surgeon has been starting most laser ablations of the GSV slightly below the knee, an AP inner to inner measurement in either the transverse or longitudinal plane of the GSV diameter will be obtained at 5 cm. BK.**

Perforator Exam:
This portion is performed as an adjunct to the venous insufficiency ultrasound exam. It is used for the evaluation perforator vein incompetence. Ulcers are frequently a local process due to perforator valve incompetence. The area adjacent to the ulcer is interrogated for perforating veins. Competent perforators have valves that only allow flow towards the deep system. An incompetent valve will allow retrograde flow. A spectral tracing of the perforator vein with distal compression or foot dorsi flexion should be taken. The diameter of any evaluated perforator vein should be measured.

Imaging Protocol

Patency exam
Contralateral CFV*** with angle-corrected spectral Doppler showing respiratory variation – include the junction with the GSV in this image
Ipsilateral CFV*** with angle-corrected spectral Doppler showing respiratory variation – include the junction with the GSV in this image
Transverse noncompressed/compressed CFV
Transverse noncompressed/compressed mid FV
Transverse noncompressed/compressed popliteal vein
Longitudinal color flow mid Posterior Tibial / Peroneal veins

Venous Insufficiency

***The time of any demonstrated reflux will be measured on the image

(Augmentation images are only needed if Valsalva doesn't produce reflux).

- Longitudinal mid FV duplex with angle-corrected spectral Doppler with valsalva
- Longitudinal mid FV duplex with angle-corrected spectral Doppler with distal augmentation
- Longitudinal Popliteal vein duplex with angle-corrected spectral Doppler with valsalva
- Longitudinal Popliteal vein duplex with angle-corrected spectral Doppler with distal augmentation
- Longitudinal GSV near saphenofemoral junction – **1.5 cm distal to the CFV** - duplex with angle-corrected spectral Doppler with valsalva
- Longitudinal GSV near saphenofemoral junction – **1.5 cm distal to the CFV** - duplex with angle-corrected spectral Doppler with distal augmentation
- Longitudinal GSV upper thigh – **distal to the anterior tributary takeoff** - with angle-corrected spectral Doppler with Valsalva
- Longitudinal GSV upper thigh – **distal to the anterior tributary takeoff** - with angle-corrected spectral Doppler with distal augmentation
- Longitudinal GSV mid-thigh with angle-corrected spectral Doppler with Valsalva
- Longitudinal GSV mid-thigh with angle-corrected spectral Doppler with distal augmentation
- Longitudinal GSV distal thigh with angle-corrected spectral Doppler with Valsalva
- Longitudinal GSV distal thigh with angle-corrected spectral Doppler with distal augmentation
- **Transverse diameter GSV at upper, mid, and distal thigh**
- Transverse diameter GSV at 5 cm. BK
- Longitudinal Short Saphenous duplex in the prox calf with angle-corrected spectral Doppler with distal augmentation and/or valsalva – **2 to 3 cm distal to junction with pop vein**
- Diameter of the SSV in the prox calf
- Longitudinal Short Saphenous duplex with distal augmentation and/or valsalva in the distal calf – **10 cm from the junction with the popliteal vein**
- Diameter of the SSV in the distal calf

If specifically requested: Longitudinal PT, Per V., and ATV's duplex with angel-corrected spectral Doppler with distal augmentation and/or valsalva
Longitudinal Short Saphenous duplex with distal augmentation and/or valsalva (upper and mid-calf)

Perforator Longitudinal Perforator vein duplex with angel-corrected spectral Doppler with distal compression or dorsi flexion of foot.
Inner to inner diameter of any evaluated perforator veins

Diagnostic Criteria
Venous Insufficiency Ultrasound

Compression Criteria for Venous Thrombosis:

- Lack of Venous compressibility.
- Visualization of intraluminal thrombus with complete or partial obstruction of the vein lumen.

Criteria for Venous insufficiency:

- Competent valves: "0" (0 to < 0.5 sec.)
- Incompetent valves: "1" Mild (0.5 to < 1 sec.)
  "2" Moderate (1 to < 2 sec.)
  "3" Severe (> 2 sec.)

Criteria for Incompetent Perforator Veins:

- Reverse flow, or flow from deep to superficial is abnormal.

References:

1. Daigle R: Venous Colorflow Duplex Imaging of the Lower Extremities. *In* Program Supplement US: The Basics in Vascular Ultrasound July 31 and August 19, 1997 pp 10-23. TIP-TV 1997, General Electric Company.
2. Priest DL, Zwiebel WJ: Chronic Venous Insufficiency, Varicose Veins, and Saphenous Vein Mapping. *In* Zwiebel WJ (Ed): Introduction to Vascular Ultrasonography, 3rd ed. 1992, pp 323-331.

Name: _____ Date _____ Sonographer _____

MRN _____ Prev Surgery? _____ SIDE: RIGHT LEFT

Vein	Size (mm)	Reflux (Grade)	Tortuous Y/N	Clot Y/N	BreakSheath Y/N
FV	XXXX		XXXX		XXXX
Pop	XXXX		XXXX		XXXX
SFJ			XXXX		
Prox GSV					
Mid GSV					
Distal GSV					
Knee GSV					
BK GSV		XXXX			
Prox SSV					
Distal SSV					

Reflux Grading: (1) Mild: 0.5-<1 sec (2) Moderate: 1-<2 sec (3) Severe: >2 sec

Vein	Location	Size (mm)	Reflux (Grade)	Superficial Y/N
AntLat Trib GSV				XXXX
PostMd Trib GSV				XXXX
Giacomini v				XXXX
Other Branch/vv				
Other Branch/vv				

Perforator (GSV or SSV)	Location	Reflux Y/N	Size (mm)

Comments: *Mark ulcer and vv on diagram