GUNDERSEN/LUTHERAN ULTRASOUND DEPARTMENT POLICY AND PROCEDURE MANUAL

SUBJECT: Lower Extremity Bypass Graft Duplex Exam
SECTION: Vascular Ultrasound
ORIGINATOR: Kraig Schuster BS, RDMS, RVT
DATE: September 13, 2013

APPROVED BY: _____
Jody Riherd MD

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Dave Clayton RDMS RVT

Scheduling: One half hour.

Prep: None.

Patient Position: Supine.

Equipment: Color flow duplex ultrasound unit with a 5.0 MHz linear array transducer. All spectral Doppler velocities are taken with an angle correction of less than 60 degrees. *****Procedure should be performed at the lowest possible power settings.**

Purpose: Evaluation of lower extremity graft for patency, stenosis, fluid collection, AV fistula, and /or pseudoaneurysm.

Exam Protocol:

1. The patient's chart is obtained and the surgical report checked to ascertain the type and location of the bypass graft. This is written and drawn on the worksheet.
2. The native artery above the proximal anastomosis is first evaluated with longitudinal color flow duplex ultrasound for stenosis.
3. The transducer is then held longitudinal to the proximal graft anastomosis so that flow within the graft is confirmed.
4. With the transducer held transverse to the graft and angled 60 degrees to the skin, the entire course of the graft is followed. Fluid collections and any disturbed signal should be noted. Arteriovenous fistulas are best evaluated in transverse. The will show an increased diastolic flow proximal to the fistula and loss of reversed diastolic component in spectral analysis. The waveform will normalize distal to the fistula.
5. The entire graft and both anastomoses are then evaluated in a longitudinal orientation with color Doppler. Spectral analysis should be taken every two to three centimeters and at any areas of abnormal color signal. **Angle corrected spectral Doppler with an angle of 60 degrees or less** is taken at any site of suspected stenosis, two to three cm proximal, and two to three cm distal to this

position. **The sample gate is parallel to the vessel wall and NOT the flow jet.** A peak systolic velocity (GSV) ratio is then calculated using the velocity collected proximal to the stenosis as the denominator. The GSV of the proximal anastomosis is compared with the GSV two to three cm distal to the stenosis in a normal segment of the graft.

Doppler criteria for predicting graft failure:[1]

Classification	**Features**
0-19% diameter reduction	VR<2.0, PSV<150 cm/sec, no spectral broadening
20-49% diameter reduction	VR>2.0, spectral broadening throughout systole, no change in waveform across stenosis, PSV<150 cm/sec.
50-75% diameter reduction	VR>2.5, severe spectral broadening in systole with reversed flow components, PSV>150 cm/sec.
75% diameter reduction	VR >3.5, EDV > 100 cm/sec

Imaging Protocol:

- Native artery (in-flow) above proximal anastomosis with angle corrected spectral Doppler measurement
- Proximal anastomosis with angle corrected spectral Doppler measurement
- Graft 30 cm AK with angle corrected spectral Doppler measurement
- Graft 20 cm AK with angle corrected spectral Doppler measurement
- Graft 10 cm AK with angle corrected spectral Doppler measurement
- Graft At the knee with angle corrected spectral Doppler measurement
- Graft 10 cm BK with angle corrected spectral Doppler measurement
- Graft 20 cm BK with angle corrected spectral Doppler measurement
- Distal anastomosis with angle corrected spectral Doppler measurement
- Native artery (outflow) below distal anastomosis with angle corrected spectral Doppler measurement
- Any areas of stenosis should be documented at the area of stenosis, proximal, and distal to the stenosis with angle corrected spectral Doppler measurement.

References

1. Zierler RE, Zierler K. Duplex sonography of Lower extremity arteries. Seminars in US, CT, & MRI 1997;Vol 18(1) pg 39
2. Beidle TR, Brom-Ferral R, Gissel Letourneau J. Surveillance of Infrainguinal Vein Grafts with Duplex Sonography. AJR 1994; 162:443-448
3. Polak JF, Donaldson MC, Dobkin GR, Mannick JA, O'Leary DH. Early Detection of Saphenous Vein Arterial Bypass Graft Stenosis by Color-Assisted Duplex Sonography: A Prospective Study. AJR 1990; 154:857-861
4. Bandyk DF. Essentials of Graft Surveillance. Semin Vasc Surg 6:92-102, 1993

GUNDERSEN HEALTH SYSTEMS

DOPPLER EXAM OF PERIPHERAL ARTERY BYPASS GRAFT

NAME: _____ CLINIC #: _____ EXAM #: _____ DATE: _____

LEG EXAMINED: ___ R ___ L DATE OF SURGERY: _____ SURGEON: _____

TYPE OF GRAFT: _____

LOCATION	VELOCITY (cm/s)	WAVE FORM
INFLOW		
PROX ANASTOMOSIS		
DISTAL ANASTOMOSIS		
OUTFLOW		

LOCATION: AK-ABOVE KNEE
BK-BELOW KNEE

WAVEFORM:
T-TRIPHASIC
B-BIPHASIC
M-MONOPHASIC
H-HYPEREMIC

INTERPRETATION: _____
_____
_____
_____

Sonographer: _____

Doppler criteria for predicting graft failure:

Classification	Features
0-19% diameter reduction	VR<2.0, PSV<150cm/sec, no spectral broadening
20-49% diameter reduction	VR>2.0, spectral broadening throughout systole
	No change in waveform across stenosis, PSV<150 cm/sec
50-75% diameter reduction	VR>2.5, severe spectral broadening in systole with reversed flow components, PST>150 cm/sec
75% diameter reduction	VR>3.5, EDV > 100 cm/sec

References

1. Zierler RE, Zierler K. Duplex sonography of Lower Extremity Arteries. Seminars in US, CT, & MRI 1997; Vol 18 (1) pg 39