

MUGA (with SPECT)

Special Instructions *In vitro* (Ultra Tag) labeling preferred. Do not use *in vivo* (stannous pyrophosphate) labeling if the patient has undergone chemotherapy within one week.

When *in vitro* labeling is performed, erythrocyte labeling patient verification must be performed. Refer to Radiology - Nuclear Medicine - Handling of Blood Products Procedure. Follow instructions in UltraTag kit for red blood cell labeling. If an allergy to heparin exists, ACD (Anticoagulant Citrate Dextrose) may be substituted (ACD must be ordered from Pharmacy).

To be performed at UNMH and SRMC.

Radiopharmaceutical: Tc-99m pertechnetate, typically *in vitro* (UltraTag); may substitute *in vivo* (with stannous pyrophosphate) with radiologist approval.

Dose (Adult/Pediatric): Refer to Nuclear Medicine Dose Chart for pharmaceutical and radiopharmaceutical doses

Route of Administration: Intravenous

Patient Preparation: None.

Equipment Setup: Collimator: High resolution
 Camera: ECAM/SPECT-CT/Evo/Symbia E
 Planar:
 For first-pass RVEF (if requested by the ordering physician or radiologist):

- 64 x 64 matrix
- Time for each frame (default is 50 milliseconds) calculated from:
 - R = heart rate (determine from EKG)
 - $(R/16) * 1000 = \text{milliseconds/frame}$
- 15° RAO with head 1

- For LVEF (all patients):
- 128 X 128 matrix
 - LAO with head 2, best septal separation between the LV and RV
 - **2.67 ZOOM**
 - Gated - 32 frames
 - Acquire for 8 million counts or 15 minutes (whichever is

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shorter)

SPECT (QBS):

- Head orientation – 90 degrees
- CCW
- Gated - 32 frames, 15 secs/frame
- NCO prescan
- 64 x 64 matrix
- **ZOOM 1.0**
- Number of frames - 16

Patient Positioning: Supine

Procedure:

- For *in vitro* labeling (preferred), follow UltraTag kit instructions for labeling procedure, and note that ACD can be substituted for heparin if an allergy exists. Follow Radiology - Nuclear Medicine - Handling of Blood Products Procedure for drawing blood and administering labeled blood. If RVEF required, *in vitro* labeling should be performed.
- For *in vivo* labeling, administer stannous pyrophosphate intravenously and allow it to circulate for at least 20 minutes prior to administering pertechnetate. After the pertechnetate has been administered, allow to equilibrate for at least 5 minutes prior to imaging
- Attach nuclear medicine computer EKG leads to the patient and confirm that the EKG is functioning properly. If there is an arrhythmia involving a significant number of beats (e.g., atrial fibrillation), consult with the radiologist prior to beginning acquisition.
- If first pass RVEF is required, inject and start imaging immediately.
- The LAO acquisition should be performed next (or first if no RVEF is needed).
 - Obtain gated modified LAO acquisition with best septal separation between the left ventricle and right ventricle, typically 30° to 45° LAO with 10-15° caudal angulation but will vary for each patient.
 - If the best septal separation is difficult to find, consult with the radiologist to see if chest CT or radiographs might help demonstrate the position of the heart.
 - Confirm count rate (should typically have at least 800K counts per minute) during the first minute of acquisition.
- **The LAO acquisition is the most importantly clinically. Therefore, if count rate is poor, increase acquisition time appropriately, and consult with the radiologist about possibly forgoing the SPECT acquisition.**
- Obtain gated SPECT acquisition.
 - Process the LAO acquisition while the SPECT acquisition is being performed, and prior to releasing the patient.
 - **If there are problems with the LAO processing, repeat the**

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acquisition and/or show images to the radiologist before releasing the patient.

Processing:

RAO Planar RVEF (if required):

- Define the range (1st image should be as the labeled blood is just entering the RV; last image should be as it is going from the pulmonary artery into the lungs)
- Draw the ROI around the right ventricle. Manual processing for each frame is often required to ensure that the ROI follows the right ventricle as it contracts. Consult with the radiologist for questions.

LAO Planar LVEF (see images below):

- Processing automatically launches upon completing acquisition
- Choose patient name and click on MUGA 3 View Proc
- Click on determine LV Center
- Click in center of LV
- Determine LV center, note EF
- Make sure that the LV ROIs for end diastole and end systole include all counts in the LV
- Place the background ROI between the LV and the spleen (close to the LV on the end diastolic image)
- Click on Results tab and check the EF result. (If necessary reprocess using the ROI tool)
- Make sure the volume curve has the ED and ES in the right location

SPECT (see images below):

- QBS automatically loads upon completion of acquisition
- Autocardiac – band limited filter
- Adjust regions around heart
- Views:
 - See below for orientations
- Results:
 - Polar map; arrange image for best bullseye view to separate LV/RV
- Choose patient name and click on Cardiac Bloodpool Proc
- Move ROI limit to be centered on the heart
- Click on settings and change filter to obtain the best view. If the filter is changed make sure that the change is made to both the Tomo and Gated Tomo. Move the yellow line to be centered in the LV. Adjust the Cutoff until the image appears. You must click trial reconstruction each time you adjust the cutoff.
- Adjust Masking/Centering if necessary
- On the reconstruction tab, click on scrollable views and adjust the HLA and VLA to get the proper image of the heart using the angle

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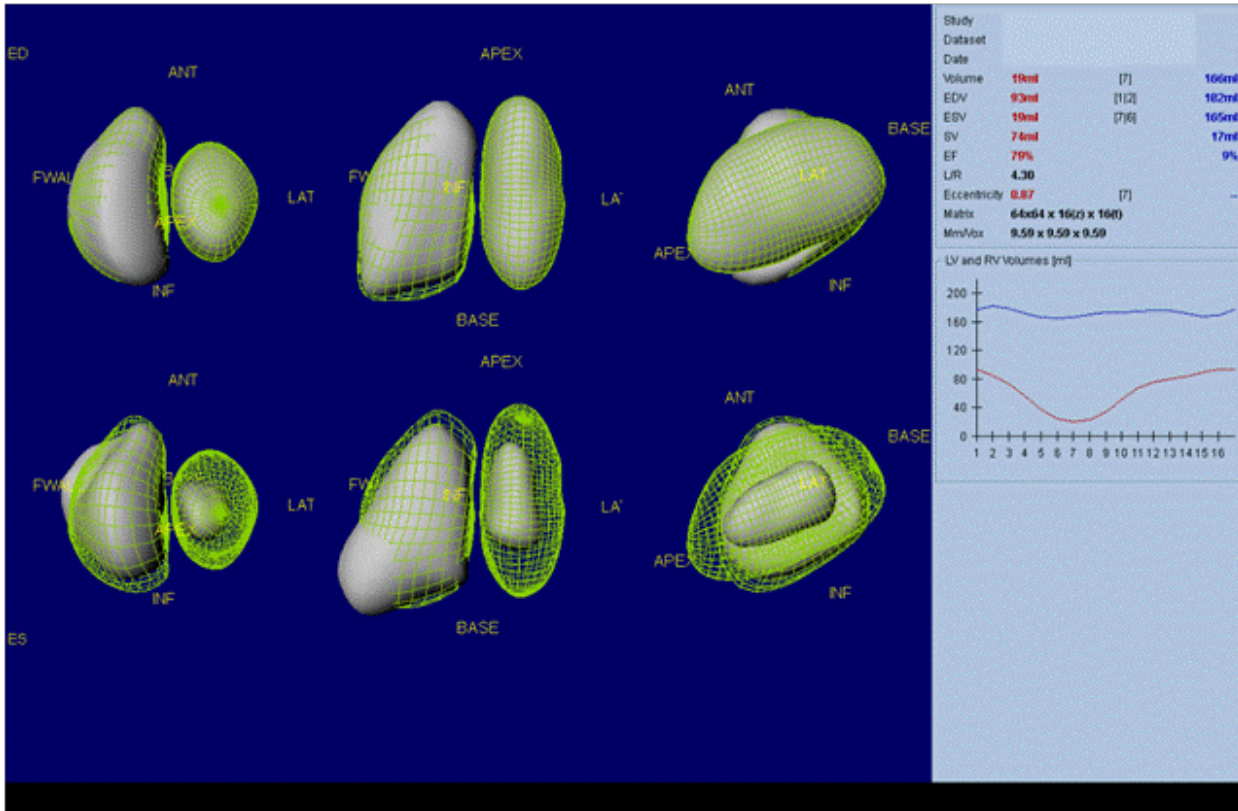
and scroll through the views

- Click complete
- Click on patient name and click on Cedars QBS to process
- Click on the views button and adjust the orientation to match those below
- Savescreen the views button
- Click on results tab and adjust the Polar map; arrange image for best bullseye view to separate LV/RV (usually the ANT wall is at the top and LAT is to the right)
- Savescreen the results button

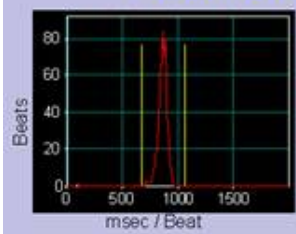
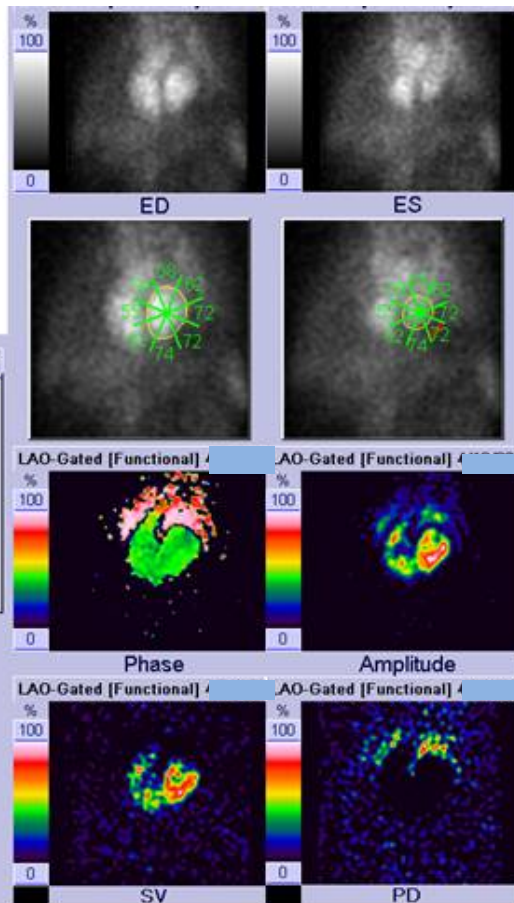
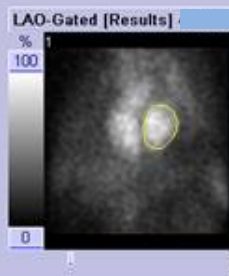
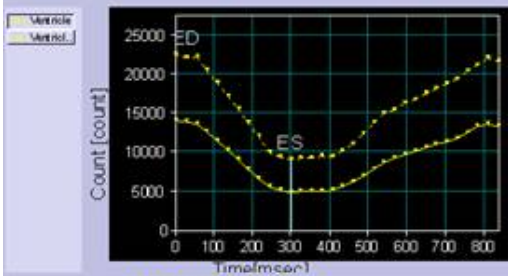
Items Required For Complete Study:

- Raw data of planar LAO MUGA (and planar RAO RVEF first pass if performed)
- Savescreens of planar LAO MUGA (Results, Curve Results, and Raw Data) and QBS MUGA (View and Results)
- Savescreens of planar RAO RVEF first pass (Results, Curve Results, and Raw Data) if performed
- Transfer of all digital images to PACS
- Complete the examination in RIS

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Item	Value	Item	Value
Heart Rate [bpm]	69	Heart Rate [bpm]	69
# of Useful Frames	32	# of Useful Frames	32
Frame Time [msec]	27	Frame Time [msec]	27
Beat Window [%]	45	Beat Window [%]	45
Framing Method	PCNT	Framing Method	PCNT
Total Beats	695	Total Beats	695
Accepted Beats	687	Accepted Beats	687
Rejected Beats	8	Rejected Beats	8
Max. R-R Time [ms...]	1056	Max. R-R Time [ms...]	1056
Min. R-R Time [msec]	665	Min. R-R Time [msec]	665
EF [%]	65.9		
EDC[count]	22363		
ED Area [pixel]	572		
ESC [count]	9038		
ES Area [pixel]	292		
BGC(Ave.) [count]	14.5		
TES [msec]	297		



99m Technetium
0.0 MBq (0.00 mCi) Tagged Red Cells