

Aortic Valve Study: Step by Step AO Function and Flow

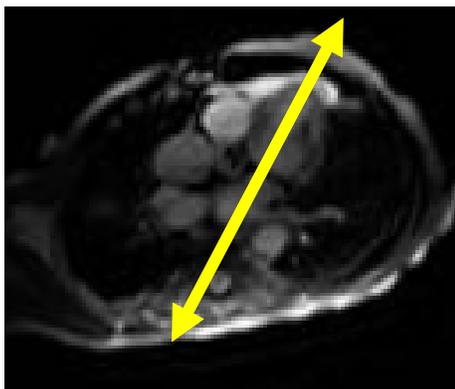
Equipment Check List:

1. Cardiac Synergy Coil
2. ECG or VCG cables
3. Electrodes
4. Electrode prep pads or gel scrub
5. 4 x 4 non-sterile pads

Function Evaluation

Planning and Pulse Sequences:

1. **Multi- plane TFE Survey of the thorax - scan duration:** 12 sec. gated axial, sagittal, and coronal stacks
 2. **SENSE Reference Scan for Cardiac Synergy Coil:** approx. 1.5 minutes (Philips)
 3. **Pre-Loading Interactive and Cine Sequences:** After the SENSE reference scan has started load the interactive sequence, HLA Cine, LVOT Cine, VLA Cine, and SA cine stack. Make sure that the stored geometry parameter is set correctly for each view. While loading the cine sequences check the patient's heart rate and adjust.
 4. **Interactive Tool** – This is a Philips specific tool used for interactive scanning to determine geometry of standard cardiac views. See the Basic Function Study for description without interactive tool. Begin with interactive tool in the continuous mode and transverse plan. Plan for VLA cine (4a)
- 4a. VLA (vertical long axis / two chamber) Cine:** use transverse image with a good view of the left ventricle including apex, the left atrium and mitral valve plane to plan scan. Bisect mitral valve plane and apex using *tilt* option. Then check the fold over direction is either AP or RL, which is found in the *scan parameters*. Next use *inplane transfer* option to center image for minimum fold over artifact. *Store geometry* as VLA in the geometry drop-down box.

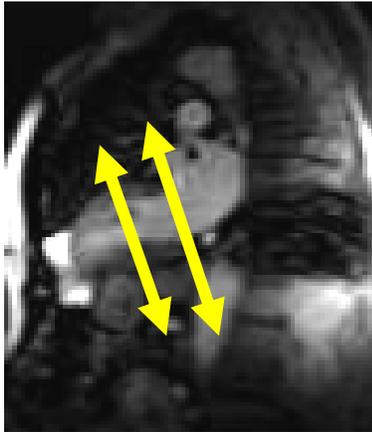


Interactive Survey for VLA cine

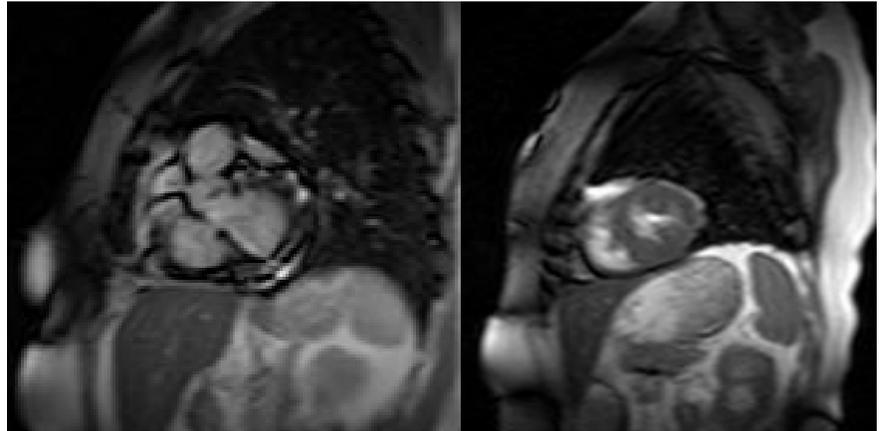


Resulting VLA image using Stored Geometry

4b. SA (2 short axis- midventricular and basal) survey - use VLA survey to plan slices. Using the *tilt option* the slice should be parallel to atrioventricular valve plane, one slice at midventricular level. Copy midventricle survey to opposite frame. Then select the *push-pull* option moving toward the basal level (valve plane) of the ventricle until left ventricular outflow tract is visualized. Store the surveys. These surveys are used for planning geometry for the HLA and LVOT views.

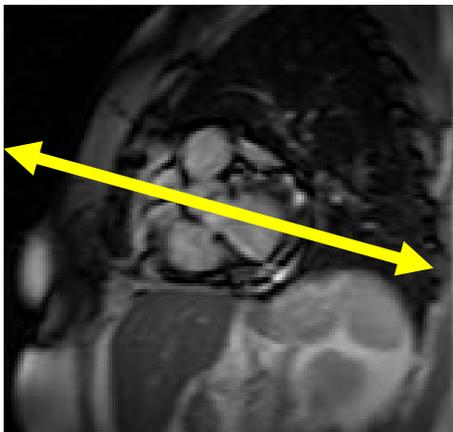


Interactive Survey for SA Survey



Resulting SA Survey image

4c. LVOT (left ventricular outflow tract) Cine: Plan the geometry from the basal SA survey image, angle to bisect the center of LV and aortic valve/outflow tract by using the *tilt option*. This view should include the left atrium, left ventricle, and left ventricular outflow tract. *Store geometry* as LVOT in the geometry drop-down box.

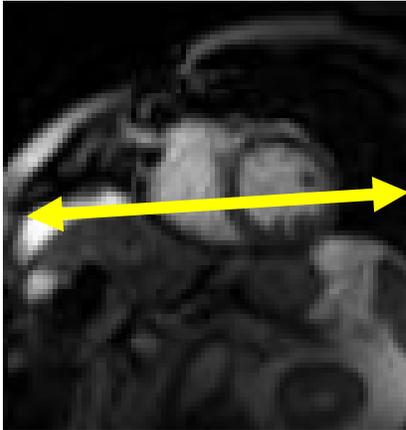


Interactive Survey for LVOT



Resulting LVOT image using *Stored Geometry*

4d. HLA (horizontal long axis/4 Chamber) Cine: Plan the geometry from the mid-ventricular SA survey; bisect point of right ventricle and center of left ventricular cavity (use papillary muscles as a guide) on short axis survey using the *tilt option*. This view should include the right and left chambers of the heart. Make sure no LVOT is in the resulting image. *Store geometry* as HLA in the geometry drop-down box.

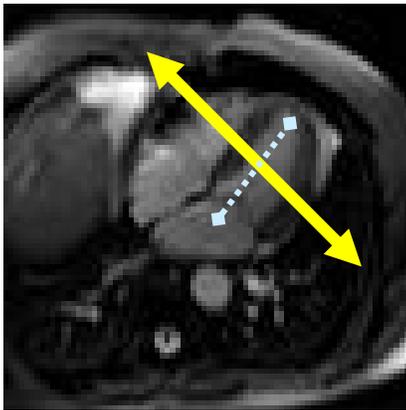


Interactive Survey for HLA view



Resulting HLA image using *Stored Geometry*

4e. SA (short axis) Multi Slice Cine Plan the geometry from the HLA view, place a slice at the mid-ventricular level and parallel to A-V valve plane by using the *tilt option*, slices will continue on either side through ventricles, the last slices ending at the apex of the ventricle and at the basal level, for a total of nine slices. Note: If A-V grooves are unclear, use continuous mode HLA view to visualize valves. *Store geometry* as SA in the geometry drop-down box.

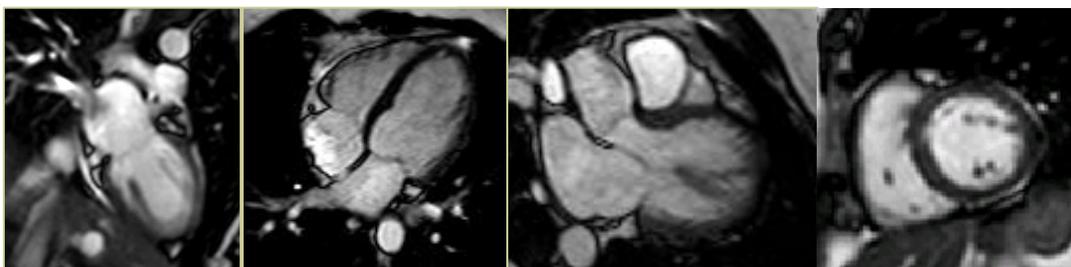


Interactive Survey for SA Stack



Resulting SA image using *Stored Geometry*

4. **Breath hold Cine Sequences:** Click on “next scan” to continue to the cine sequences. The patient will need to hold their breath at expiration for approximately 10-15 seconds. This is a series of seven breath holds to include the HLA, LVOT, VLA, and the SA stack cines.



Resulting Function Cine Images

Flow Evaluation

1. **AO Valve with LVOT View / Retrospective Quantitative Flow Mapping (non-breath hold: scan duration 2- 5 min or breath hold 15-20 sec.)** – Average velocity encoding 250 cm/sec. Place slice using the LVOT cine geometry, rotate slice plane perpendicular to AO valve as demonstrated below.

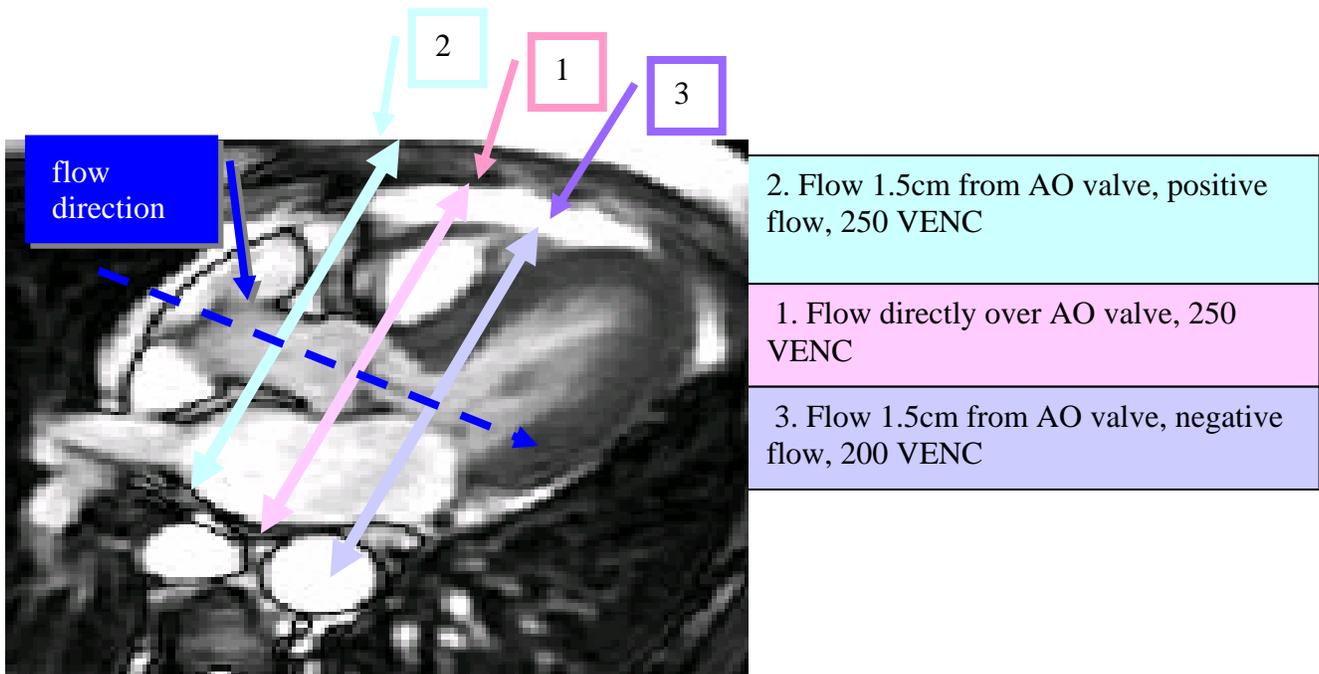


LVOT Cine Image

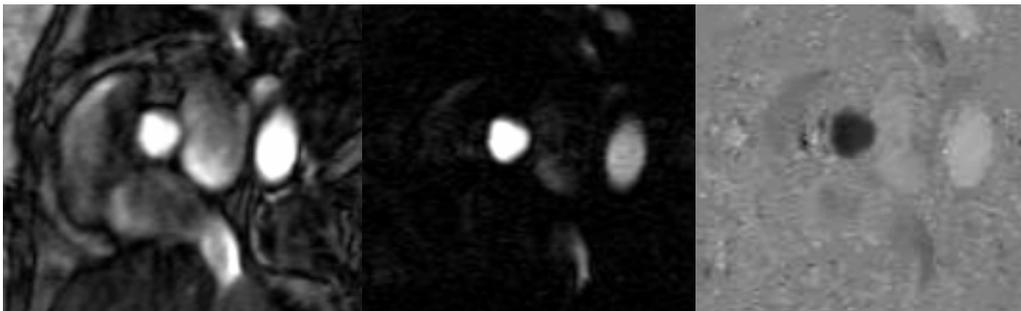
LVOT Q-Flow Image

LVOT Q-Flow Phase Image

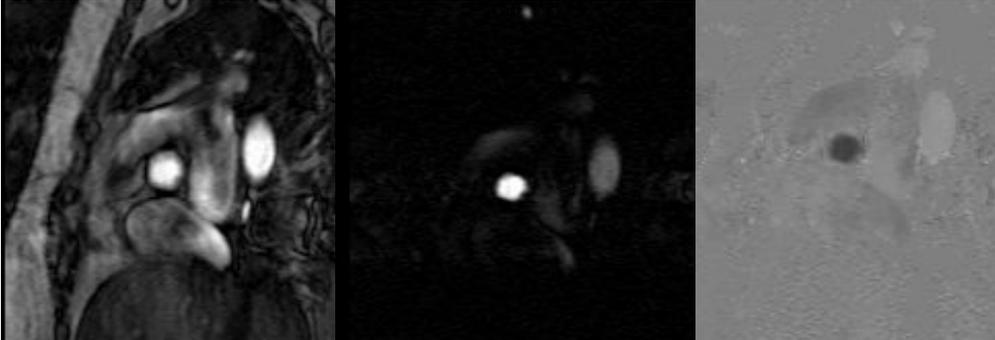
2. AO Valve in multiple Oblique Sagittal views / Retrospective Quantitative Flow Mapping – scan duration 15-20 sec. – Average velocity encoding 200 cm/sec on the ventricular side of the valve and 250 cm/sec on the Aortic side of the valve, breath hold. Place slice using the LVOT cine geometry, rotate slice plane perpendicular to AO valve as demonstrated below. Plan slices as demonstrated below. Set the velocity encoding so that it measures the through plane velocity. If it is primarily a transverse plane encoding should be FH, coronal should be AP, sagittal should be RL. Note: Check resulting phase velocity images for proper encoding and free from aliasing artifact. Repeat the scan if necessary with another encoding direction and or increased velocity. Plan slices as demonstrated below.



1. Flow directly over AO valve, 250 VENC



2. Flow 1.5cm from AO valve, positive flow,
250 VENC



3. Flow 1.5cm from AO valve, negative flow,
200 VENC

