Multiple Sclerosis (MS) Protocol Training

E. Mark Haacke, PhD
Wayne State University
October 29, 2009

Scanning Procedure

- While registering the subject, include their height and weight. This plays an important role in flow quantification.
- Use both Head and Neck coil for all the sequences.
- Also put a Pulse trigger on the subject’s (left / right) index finger before starting the scan.

	Head (brain/dural sinuses)			Neck (jugular/azygous)	
				3D MRV (Dynamic)	
	3D SWI	**2D MRV**	**Flow Quantification***	***Inject Contrast after 1st measurement for the 3D MRV***	**(Hi-res MRA)*** **
Sequence	gre	Fl 2d_tof	fl_fq_retro	fl3d_ce	Fl 3d_tof
Orientation	Axial	Axial	Axial*	Coronal	Coronal
TR (ms)	29	23	42.15	3.41	15
TE (ms)	20	5.02	4.14	1.27	3.77
FA (degree)	15	60	25	20	30
FOV (mm^2)	256x192	256x256	256x256	340x255	400x400
Matrix size	512x256	512x256	448x448	384x384	640x640
Nz/TH (mm)	128/2	128/2.5	1/4	96/0.9	144/0.63
Voxel size (mm^3)	0.5x1x2	0.5x1x2.5	0.57x0.57x4	0.9x0.9x0.9	0.63x0.63x0.63
Ave./Meas.	1	1	1	1/15	1
Phase oversmpl.	0	0	0	0	10%
Slice oversmpl				8.3%	22.2%
Dist. factor	N/A	-33.0%	0	20%	N/A
Phase Enc. Dir	R>>L	A>>P	A>>P	R>>L	R>>L
iPAT	2/24	2/24	2/24	3/24	2/32
BW (Hz/pixel)	120	217	531	590	182
Flow Comp	Yes	Yes	No	Yes	Yes
Special Sat.		Tracking F	No		
Pre Saturation		Gap10mm; TH 40mm			
Flow Mode			Single Dir.		
Venc. (cm/s)			50		
1st Signal/Mode			Pulse/Retro		
Coils	Head+Neck + SP1	Head+Neck + SP1	Head+Neck + SP1	Head+Neck + SP1	Head+Neck + SP1
Time			**(x7)****	**4:18**	**(7:10)**
Total Time				**27:32**	**(34:42)**

Note: **For MS patient, please add your institutional MS protocol.**

* Should put pulse trigger on the patient's finger.

**Flow quantification will be done through and parallel the straight sinus, two trans, sag, the jugular vein on its upper and lower part, which leads to a total of 7 acquisitions.(Please use venc. of 10 for parallel to the straight sinus.)

*** It is an option that if you have time.

Slice Positioning for different sequences

3D SWI 1X0.5X2

Note: Cover the whole brain including neck.

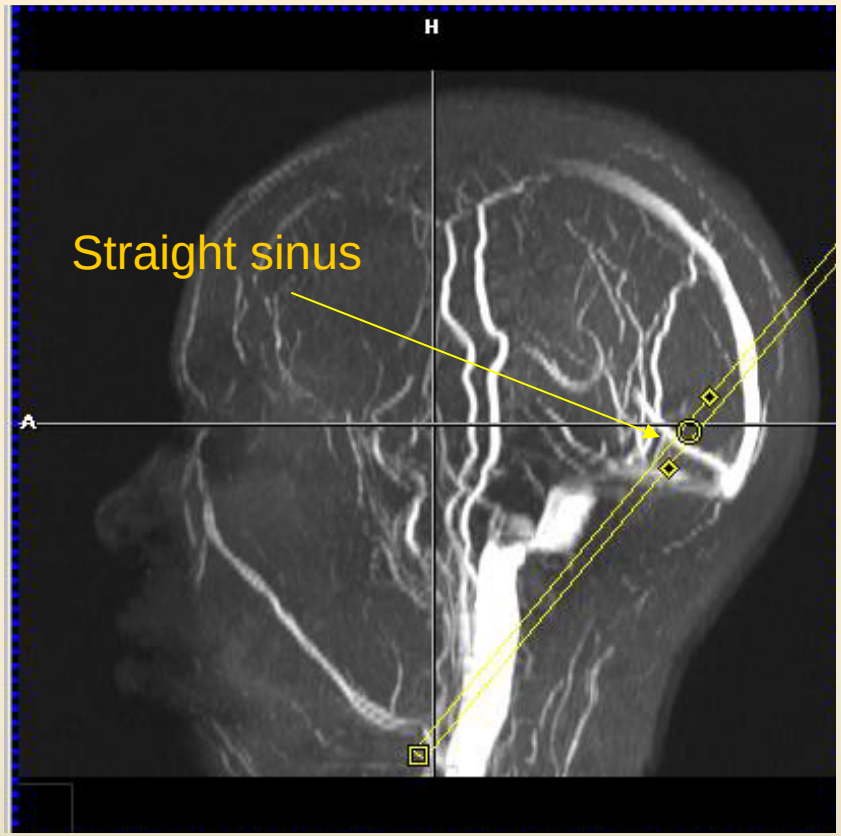
2D MRV

Note: Cover the whole brain including neck.

Flow Quantification

- Make sure to put the pulse trigger on the subject's (left / right) index finger.
- This sequence need to be repeated for different parts of the brain. See the next slides.

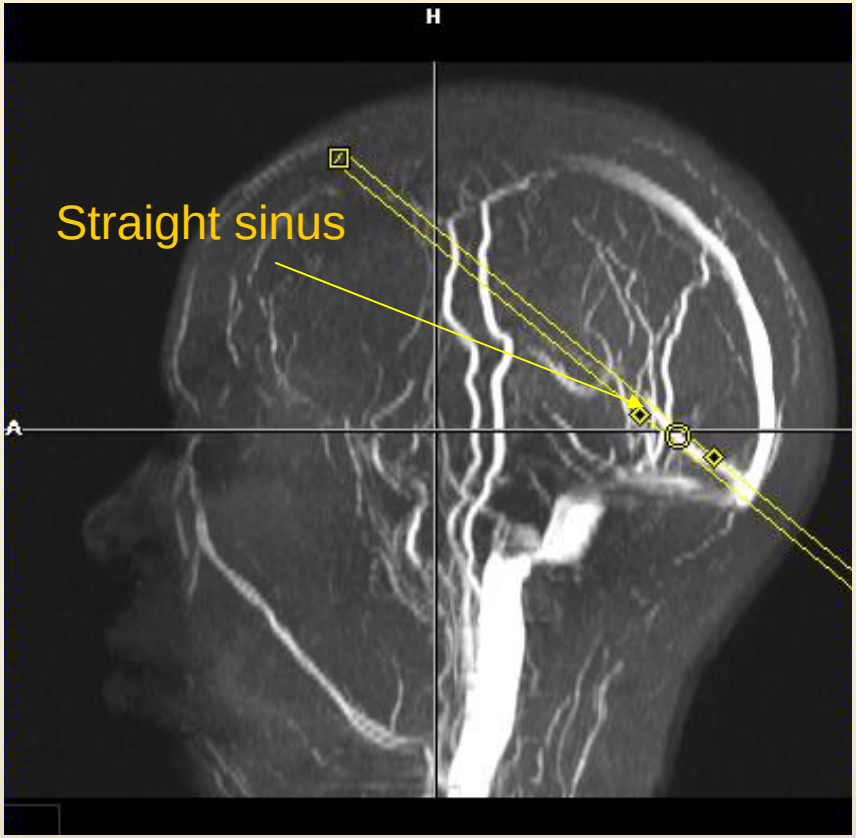
Perpendicular to Straight sinus



Note:

1) Position the slice slab perpendicular to Straight sinus as shown above.
2) Make sure to use venc = 50 cm/sec.

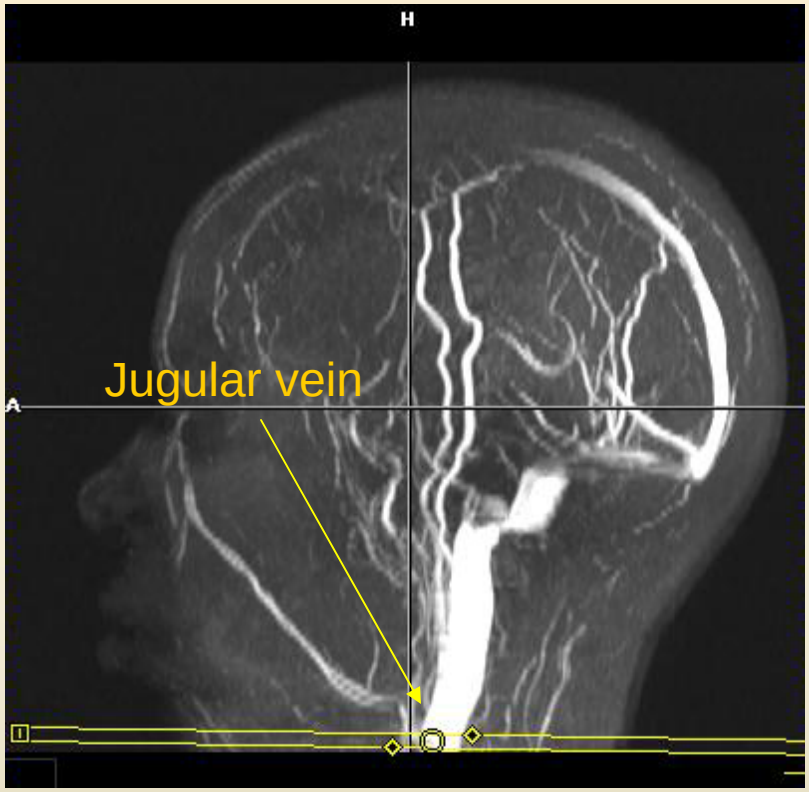
In-plane to Straight sinus



Note:

1) Position the slice slab in-plane to Straight sinus.
2) Make sure to use venc = 10 cm/sec.

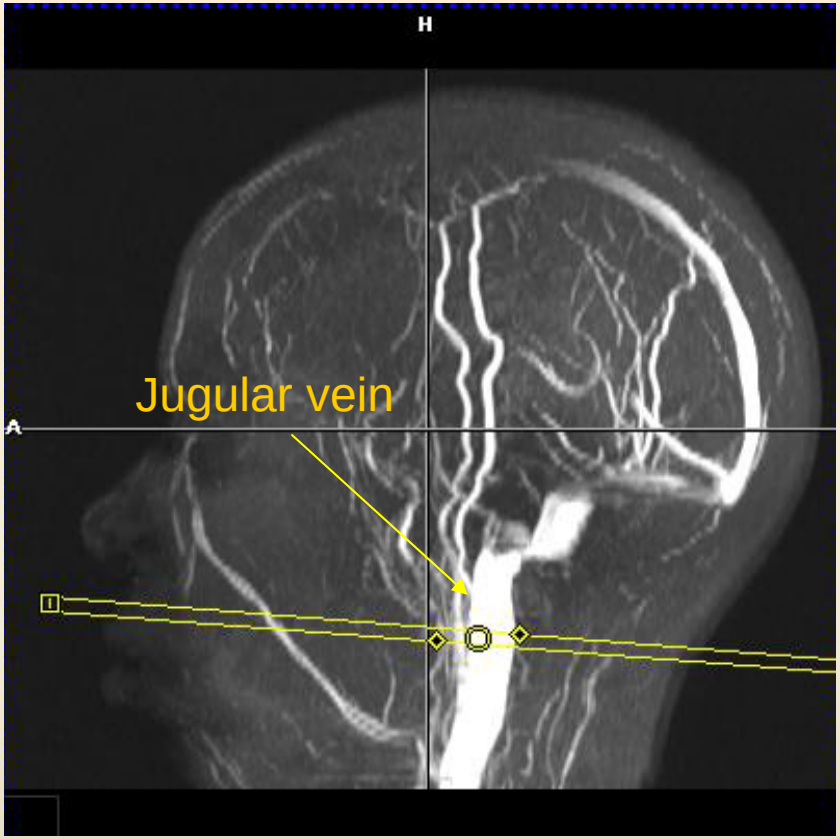
Perpendicular to Jugular vein (Lower part of the neck)



Note:

1) Position the slice slab perpendicular to Jugular vein in the lower part of the neck.
2) Make sure to use venc = 50 cm/sec.

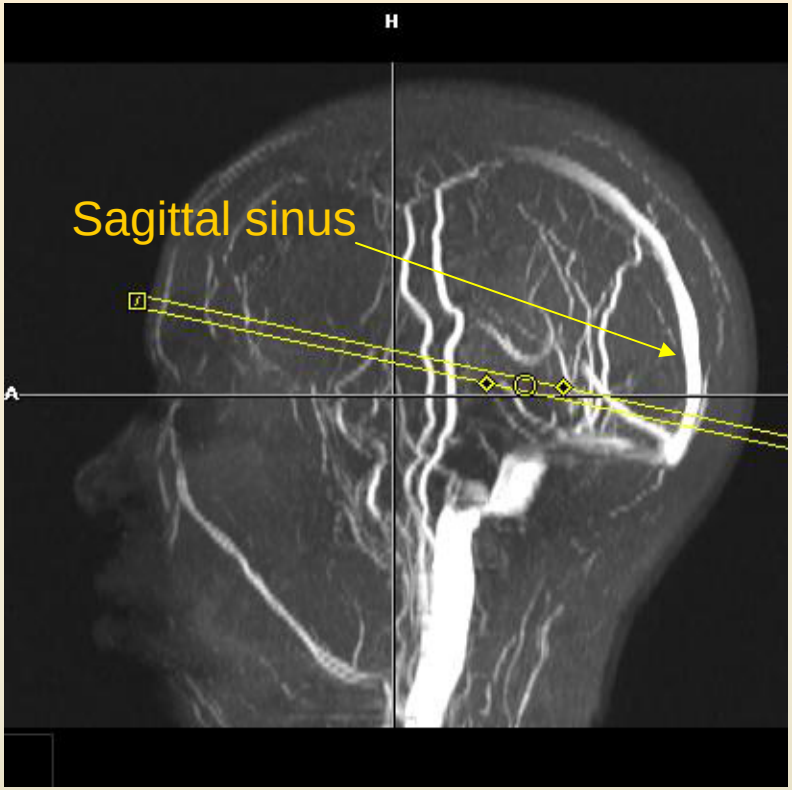
Perpendicular to Jugular vein (Upper part of the neck)



Note:

1) Position the slice slab perpendicular to Jugular vein in the upper part of the neck.
2) Make sure to use venc = 50 cm/sec.

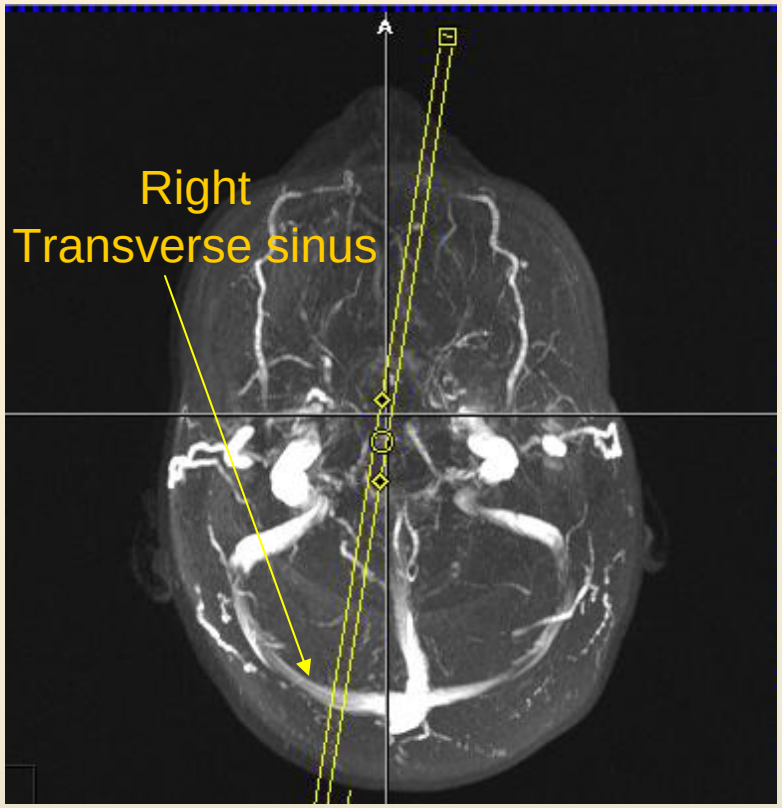
Perpendicular to Superior sagittal sinus

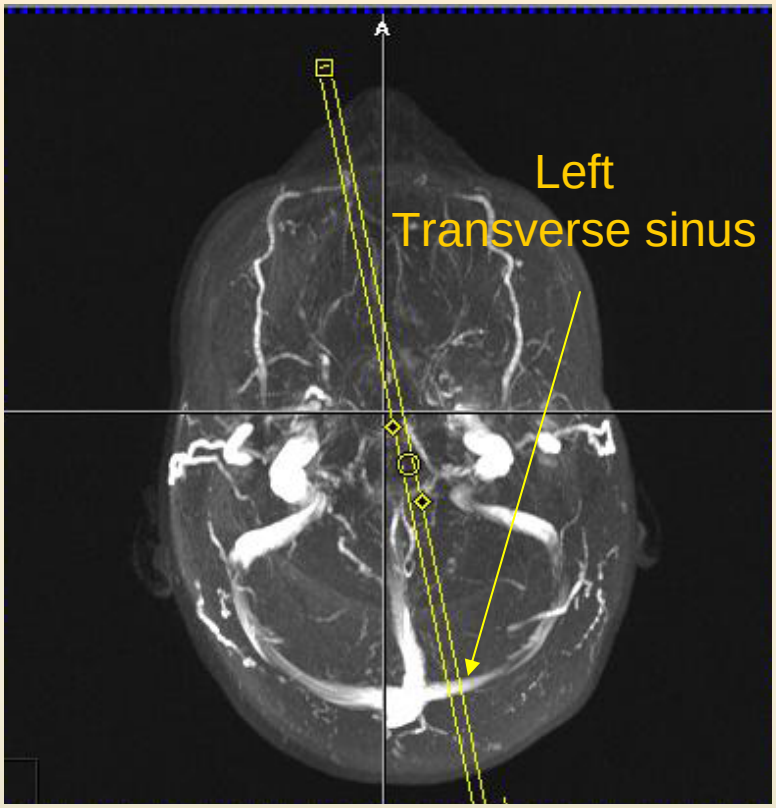


Note:

1) Position the slice slab perpendicular to Superior sagittal sinus.
2) Make sure to use venc = 50 cm/sec.

Perpendicular to Transverse sinus



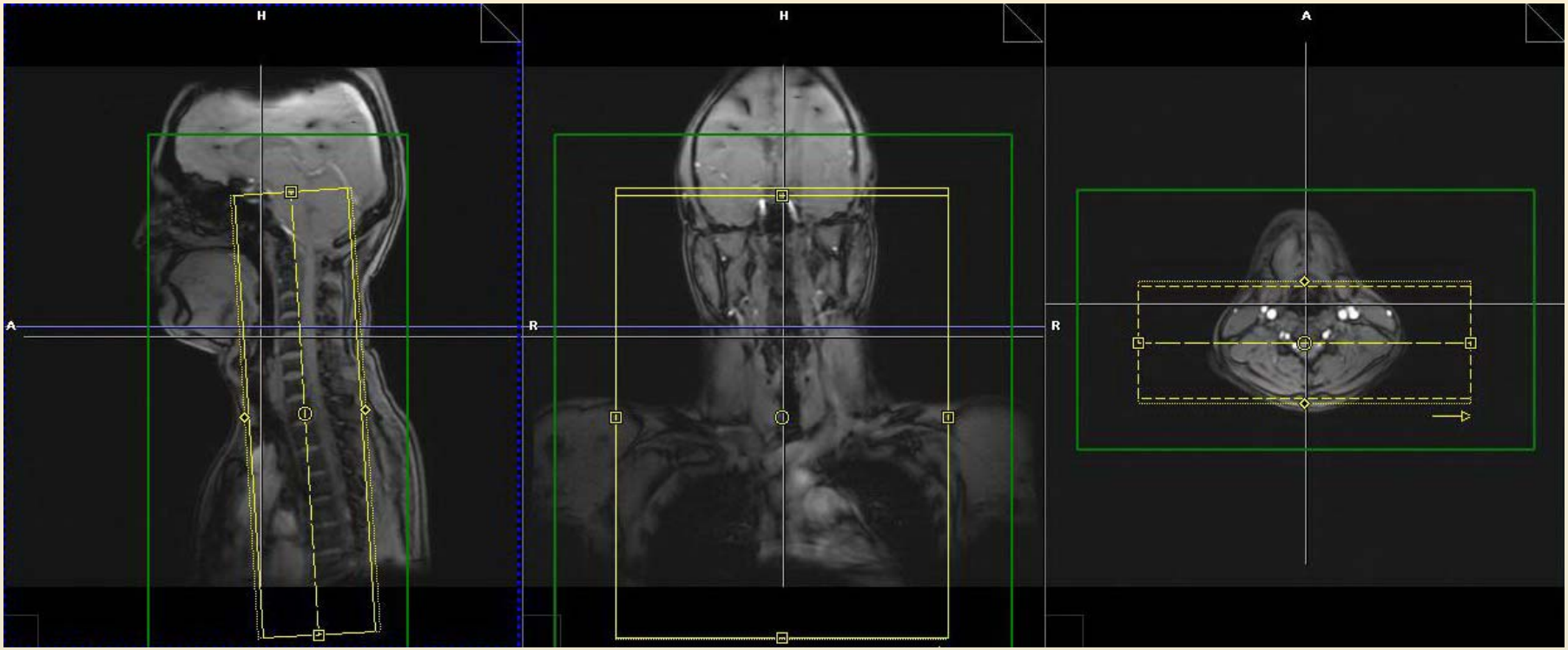


Note:

1) Position the slice slab perpendicular to Transverse sinus as shown above.
2) This sequence should be repeated twice for right and left transverse sinuses. In some subjects you might observe either left / right transverse sinus only (which is normal).
3) Make sure to use venc = 50 cm/sec.

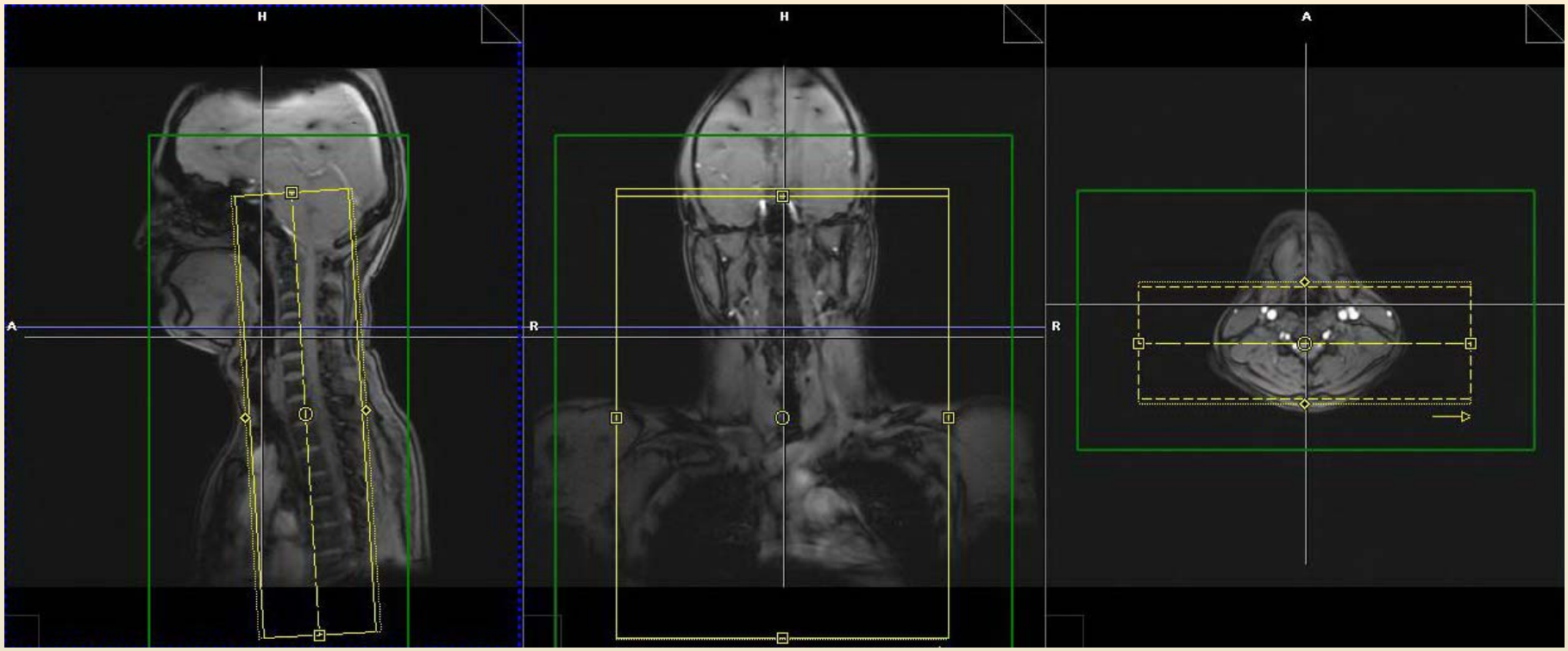
Now move the table position to the center at the neck

3D MRV (Dynamic)



Note:
Inject contrast after 1st measurement.

Hi-Res MRA



Note:
Copy the slice slab positioning from 3D MRV sequence.