

# Short 3T MRI Protocol for Head, Neck & Azygus MS study

## Without Contrast

(NOTE: Please follow the sequence order)

<b>Head – without Contrast</b> (Center at the orbital ridge)				
<b>Sequence Order</b>	<b>#1</b>	<b>#2</b>	<b>#3</b>	<b>#4</b>
	<b>Dual Echo SWI</b>	<b>T2 WI</b>	<b>3D FLAIR</b>	<b>MPRAGE</b>
<b>Sequence</b>	gre	tse	tse_vfl	tfl
Orientation	Axial	Axial	Sagittal	Axial
TR (ms)	29	7080	6000	1750
TE (ms)	1 <sup>st</sup> TE = 6, 2 <sup>nd</sup> TE = 20	77	397	2.98
TI (ms)			2200	900
FA (degree)	15	120		9
FOV (mm <sup>2</sup> )	256x192	256x192	256x256	256x256
Matrix size	512x256	512x256	256x256	512x256
Nz/TH (mm)	128/2	100/2	160/1	192/1
Voxel size (mm <sup>3</sup> )	0.5x1x2	0.5x1x2	1x1x1	0.5x1x1
Ave./Meas.	1	1	1	1
Phase oversmpl				
Slice oversmpl				16.7%
Dist. factor	20%	0%	0%	50%
Phase Enc. Dir	R>>L	R>>L	A>>P	R>>L
iPAT	2/24	2/24	2/24	2/24
BW (Hz/pixel)	470 and 120	222	781	180
Flow Comp	Yes for 1 <sup>st</sup> TE, No for 2 <sup>nd</sup> TE	No	No	No
Phase partial Fourier	Off	Off	Allowed	Off
Slice partial Fourier	Off	Off	7/8	Off
Flow Mode/Direction				
Venc. (cm/s)				
1 <sup>st</sup> Signal/Mode				
Echo spacing (ms)		11.1	3.32	7.6
Turbo factor		18	141	
Echo trains per slice		6	1	
Coils	Head	Head	Head	Head
<b>Time</b>	<b>06:39</b>	<b>2:30</b>	<b>5:20</b>	<b>4:03</b>
<b>Total Time</b>	<b>06:39</b>	<b>9:09</b>	<b>14:29</b>	<b>18:32</b>

### Note:

- Position the subject at the orbital ridge.
- Slice position for the above sequences (Dual Echo SWI, T2, MPRAGE) should be true axial.
- If Dual Echo SWI is not possible at your center, run the sequence with a single echo TE = 20ms.
- 3D FLAIR should be acquired in a sagittal plane.

Total Scan Time: ~ 53 minutes

<b>Neck (CSF / Jugulars) - without Contrast</b> (Center at the chin)				
<b>Sequence Order</b>	<b>#5</b>	<b>#6</b>	<b>#7</b>	<b>#8</b>
	<b>2D MRV (neck)</b>	<b>T2 WI</b>	<b>Flow Quantification (CSF)</b>	<b>Flow Quantification (Jugulars)</b>
<b>Sequence</b>	fl_tof	tse	fl_fq_retro	fl_fq_retro
Orientation	Axial	Sagittal	Axial	Axial
TR (ms)	29	2800	95.25	95.25
TE (ms)	5.02	82	10	10
FA (degree)	60	160	20	20
FOV (mm <sup>2</sup> )	320x256	256x256	256x256	256x256
Matrix size	512x256	384x268	448x448	448x448
Nz/TH (mm)	128/3	19/3	1/2.5	1/2.5
Voxel size (mm <sup>3</sup> )	0.6x1.3x3	0.7x1x3	0.6x0.6x2.5	0.6x0.6x2.5
Ave./Meas.	1	1	1	1
Phase oversmpl		100%		
Slice oversmpl				
Dist. factor	-25.0%	0%	20%	20%
Phase Enc. Dir	A>>P	H>>F	A>>P	A>>P
iPAT	2/24	None	2/24	2/24
BW (Hz/pixel)	217	260	192	192
Flow Comp	Yes	Read	No	No
Phase partial Fourier		Allowed		
Slice partial Fourier				
Special Sat.	Tracking F			
Pre Saturation	Gap10mm; TH 40mm			
Flow Mode / Direction			Single Dir./ Through Plane	Single Dir./ Through Plane
Venc. (cm/s)			15	50
1 <sup>st</sup> Signal/Mode			Pulse/Retro	Pulse/Retro
Echo spacing (ms)		10.3		
Turbo factor		11		
Echo trains per slice		49		
Coils	Head+Nec k+SP1,2	Head+Neck +SP1,2	Head+Neck+S P1,2	Head+Neck+S P1,2
<b>Time</b>	<b>6:57</b>	<b>2:22</b>	<b>1:42</b>	<b>1:42(x3)</b>
<b>Total Time</b>	<b>6:57</b>	<b>9:19</b>	<b>11:01</b>	<b>16:07</b>

**Note:**

- Position the subject to the chin for the neck. Make sure to use HEA;HEP;NE1,2;SP1,2 coils are highlighted.
- Please put a pulse trigger on the patient's index finger.
- Flow quantification will be done perpendicular to the CSF flow at C2/C3 neck level with a venc of 15cm/sec, and perpendicular to the internal jugular veins (IJV's) at the C2/C3, C5/C6 and T1/T2 neck levels with a venc of 50cm/sec.

Total Scan Time: ~ 53 minutes

<b>Azygus - without Contrast</b> (Center at the mid sternum)			
<b>Sequence Order</b>	<b>#9</b>	<b>#10</b>	<b>#11</b>
	<b>2D MRV (azygus)</b>	<b>2D MRV (azygus arch)</b>	<b>Flow Quantification (Azygus)</b>
<b>Sequence</b>	fl_tof	fl_tof	fl_fq_retro
Orientation	Axial	Axial	Axial
TR (ms)	41	40	95.25
TE (ms)	5.02	5.02	10
FA (degree)	60	60	20
FOV (mm <sup>2</sup> )	256x256	256x256	256x256
Matrix size	512x256	512x256	448x448
Nz/TH (mm)	92/3	46/3	1/2.5
Voxel size (mm <sup>3</sup> )	0.5x1x3	0.5x1x3	0.6x0.6x2.5
Ave./Meas.	1	1	1
Phase oversmpl	20%	20%	
Slice oversmpl			
Dist. factor	-33.0%	-33.0%	20%
Phase Enc. Dir	R>>L	R>>L	A>>P
iPAT	2/24	2/24	2/24
BW (Hz/pixel)	217	217	192
Flow Comp	Yes	Yes	No
Sat Region 1	86 mm – Anterior	86 mm – Anterior	
Sat Region 2			
Special Sat.	Tracking H	Tracking F	
Pre Saturation	Gap10mm; TH 40mm	Gap10mm; TH 40mm	
Flow Mode / Direction			Single Dir./ Through Plane
Venc. (cm/s)			50
1 <sup>st</sup> Signal/Mode			Pulse/Retro
Coils	Neck +SP1,2,3,4	Neck +SP1,2,3,4	Neck +SP1,2,3,4
<b>Time</b>	<b>10:39</b>	<b>5:12</b>	<b>1:42</b>
<b>Total Time</b>	<b>10:39</b>	<b>15:51</b>	<b>17:33</b>

**Note:**

- Position the subject center to the mid sternum. Make sure to use NE1,2;SP1,2,3,4 coils.
- Flow quantification will be done perpendicular to the azygus vein at the upper level. Please use venc of 50cm/s.