

**Decrease FOV for anatomy**, no need to adjust other parameters! **C-Spine Sag shouldn't cover lower than T2**, small stature adults can have Axial T and L spine sequences decreased to better view cord.  
**\*\*Watch SAR at 3T; Talk to patients and ensure they aren't getting too warm. Fan on High.** **\*\*PLACE ANTERIOR SAT ON ALL AXIAL AND SAGITTAL SEQUENCES**  
**\*\*Watch slice order for Axial scans! Please ensure slices go superior to inferior. Rads are noticing sometimes they go different directions in the same study. Do not do that. Thank you**

**CERVICAL SPINE**

\*\*\*\*If you see FAST ORTHO C-Sp protocol. Sag T2 and Ax T2 (not MERGE) only 30min time slot\* on an order, only run Sag T2 and Ax T2. No other sequences needed\*\*\*

1. 3 pl loc **\*\*IMAGES\*\***

2. Sag T1 (Just below pons to not lower than mid-T2)

3. Sag FSTIR

4a. Sag T2 (450w, 750, Explorer, any scanner less than 30.0)

4b. Sag T2 CUBE (Obl on Sag to Spinal Cord) Reformatted Rt & Lt Foraminal Obliques at 0.8mm This replaces request for Foraminal Obliques. If motion on CUBE, Run Sag T2 Propeller. Add FAT SAT For TRAUMA to Sag T2 CUBE or Sag T2

5. Ax T1

6. Ax T2\* MERGE (Ax T2 for metal or if motion on MERGE)

**MS Patients—run Sag PSIR on scanners that have capability (Auto TR 1800-3000 ms)**

\*Community patients on any scanner without CUBE—always run 2d Rt and Lt Foraminal Obliques unless protocolled with contrast.

► **OPTIONAL CONTRAST**

7. +c Sag T1 fat sat -- SHIM

8. +c Ax T1 fat sat -- MSK Peds Neuro and Peds (no fat Adult Neuro, and Community cases!)-SHIM

**Optional Contrast:**  
 Vueway 0.05mmol/kg  
 Max 10

Low eGFR inpatient dosing: no change

**FORAMINAL OBLIQUE CERVICAL SPINE (Dr. Hanna/Guebbels)**

1. 3 pl loc **\*\*IMAGES\*\***

2. Sag T1

3. Sag T2 FAT

4. Ax T2 \* MERGE

5. OBL Sag T2—Angle Perpendicular to RT C-5/6 Foramina on Axial image

6. OBL Sag T2—Angle Perpendicular to LT C-5/6 Foramina on Axial image

**THORACIC SPINE**

1. 3 pl loc TOP **INCLUDE SKULL BASE**

2. 3 pl loc BOT **INCLUDE COCCYX**

3. Sag T1 ► T1 through conus (usually about L1)

4. Sag T2

5. Sag FSTIR

6. Adults: Ax T2 FRFSE no fat Peds: Ax T2\* GRE

**OPTIONAL CONTRAST:**

7. Ax T1 PRE contrast (Always run for Neuro, Peds, and Community cases!)

8. +c Sag T1 fat sat SHIM

9. +c Ax T1 fat sat MSK Peds Neuro and Peds (no fat Adult Neuro, and Community cases!)-**BIND Upper and Lower Axials together and send to ALI, no need to send un-bound images to SOURCE**

**Optional Contrast:**  
 Vueway 0.05mmol/kg  
 Max 10

Low eGFR inpatient dosing: no change

**\*\*IMAGES\*\***

**MSK LUMBAR SPINE**

1. 3 pl loc **\*\*IMAGES\*\***

2. Sag T1 FSE (FSE on 1.5T and 3T) ► Cover through neuro foramina  
 ► FOV to include Superior T12 through inferior endplate of S2

3. Sag T2 fat sat

4. Sag PD

5. Ax T2 ► **Bottom 3 disks angled to L4-5, higher if needed**  
 ► Extend axials through terminal end of thecal sac

**OPTIONAL CONTRAST:**

6. Ax T1 PRE contrast **Bottom 3 disks angled to L4-5, higher if needed**

7. +c Sag T1 fat sat **Superior FOV at top of T-12**

8. +c Ax T1 fat sat **Bottom 3 disks angled to L4-5, higher if needed**

**SHIM FAT SAT Sequences**

**\*\*BIND Upper and Lower Axials together and send to ALI, no need to send un-bound images to SOURCE**

Add Sag PD MAVRIC and Sag FLUID MAVRIC if requested by Dr. Bice—request should mention "MAVRIC"

**Optional Contrast:**  
 Vueway 0.05mmol/kg  
 Max 10

Low eGFR inpatient dosing: no change

3T—Sag seq freq A/P, Phase (Flow Artifacts) go S/I, ensure to place a inferior sat band angled to sacrum to reduce flow, especially post con

**Neuro (Peds and Community) Lumbar Spine**

3T—Sag seq freq A/P, Phase (Flow Artifacts) go S/I, ensure to place a inferior sat band angled to sacrum to reduce flow, especially post con

1. 3 pl loc **\*\*IMAGES\*\***

2. Sag T1 ► FOV to include Superior T12 through inferior endplate of S2  
 ► Cover through neuro foramina (3T-FLAIR must be scanned in 1 Acquisition. For some patients you will need to run a Sag T1 FSE if on normal mode)

3. Sag T2

4. Sag FSTIR

5. Ax T2 ► **One stack Conus- S2 angled to L3-4**

6. Ax T1 ► **One stack Conus- S2 angled to L3-4**

► **OPTIONAL CONTRAST**

7. +c Sag T1 fat sat ► **Superior FOV at top of T-12**

8. +c Ax T1 (FAT for Peds Neuro and Peds)

► **One stack Conus- S2 angled to L3-4**

**Optional Contrast:**  
 Vueway 0.05mmol/kg  
 Max 10

Low eGFR inpatient dosing: no change

**QUICK SPINE (see Peds Neuro QB QS instruction sheet)**

**FLOW – FORAMEN MAGNUM**

**NEUTRAL:**

1. Sag T2 FSE CUBE Non gated, centered at C 1-2

\*\*If done with a spine, it can be a limited slab. No Fat Sat or FC on this scan

2. Ax Fast PC VENC 10 - 8 slices ► Perpendicular to cord at C 1-2 level ► 1st slice just above foramen magnum  
 ► Place slices superior to inferior

3. Sag Cine PC VENC 10 1 slice - midline cord, center at C-3

4. Axial CIESTA SHIM (Copy from Ax CSF FLOW)

5. Sag Midline CIESTA SHIM  
 Single slice centered over spinal cord

**OPTIONAL: FLEXION & EXTENSION:**

6. 3 pl loc FLEX

7. 7. FLEX Sag T2 7 - 8 slices, anatomical images

8. 3 pl loc EXT

9. EXT Sag T2 7 - 8 slices, anatomical images

**Peripheral gating**

**ED Total Spine FAST Screen** Best on Gems Scanners

1. 3 pl Loc TOP 2. 3 pl Loc Bot (not thru coccyx) 3. C- Sag STIR

4. C- Sag Cube T1 5. T- Sag STIR 6. T- Sag CUBE T1

7. L- Sag STIR 8. L- Sag T1 CUBE

► **OPTIONAL CONTRAST:** 9. C- Sag CUBE T1 FAT 10. T- Sag T1 CUBE FAT 11. L- Sag T1 CUBE FAT

\*\* CUBE sequences—Don't decrease #slices in. Place Right & Left Sat Bands—Do Not place an anterior sat band—this increases wrap.

\*\*Ax Reformats of CUBE Series-ALI **check images after running STIR sequences**

\*If no additional scanning required, change order to Pediatric Quick Spine.

\*If Ax T2's of entire spine requested, keep order as Total Spine w/o

\*If additional imaging in one level requested, change that level to a w/o (or w/w/o) and add the other two levels as limited charges.

\*If contrast is needed, run Sag T1 CUBE FAT, change order to Total Spine w/w/o. Radiologist might request additional axial scans. There is no limited charge available if contrast is given.

**ED will Order Tot Sp w/o- or Total Spine w/w/o—radiologist will protocol Tot Sp Fast ED Screen (w/o or w/w/o)—change order as needed (see instructions in protocol)**

**L-Sp FAST Cauda Equina**

1. 3pl Loc

2. Sag T1 CUBE (4mm Sag and Ax Reformats)

3. Sag T2 CUBE FAT (4mm Sag and Ax Reformats)

**Request:**  
 L-spine w/o contrast

**TOTAL SPINE 3 PARTS**

See Peds Spine sheet for Peds specific protocols.

**If protocolled W/Only, please see protocol below.** Always run Sag T2's and check to see if Axials needed

1. 3 pl loc TOP **INCLUDE SKULL BASE** 2. 3 pl loc BOT **INCLUDE COCCYX**

3. C-Sag T1 7. T-Sag T1 11. L-Sag T1

4. C-Sag T2 FAT 8. T-Sag T2 FAT 12. L-Sag T2 FAT

5. C-Ax T2 \* MERGE 9. T-Ax T2 FRFSE 13. L-Ax T2

6. C-Ax T1 10.T-Ax T1 14. L-Ax T1

(T-PEDS Ax T2 \* GRE)

**if looking for tethered cord go through coccyx for Ax T1**

**OPT Contrast (Multihance .1mmol/kg, Max 20 ml)**

10. C- Sag T1 FAT 12. T-Sag T1 FAT 14. L-Sag T1 FAT

11. C-Ax T1 (FAT) 13. T-Ax T1 (FAT) 15. L-Ax T1 (FAT)

**\*\*ADULT NEURO and Community use +c Ax T1 no fat**

**\*\*MSK and Peds Neuro use +c Ax T1 FAT**

**Optional Contrast:**  
 Vueway 0.05mmol/kg  
 Max 10

**+C ONLY Total Spine Drop Mets (ordered with Head MRI w/w/o)**  
 (ADULT, please see Peds Neuro for Pediatric pts)

\*\*Pick sequences from total spine protocol, \*\*not to be used with first time eval for drop mets, \*\*to be used for brain tumor follow up where they are looking for drop mets \*\*Only Ax T2 if requested

**\*\*Always run Sag T2's!!!**

1. 3 pl loc **INCLUDE SKULL BASE** 2. 3 pl loc **BOT INCLUDE COCCYX**

3. +C C-Sag T1 FAT 4. +C C-Sag T2 Fat 5. +C C- Ax T1 no fat

6. +C T-Sag T1 FAT 7. +C T-Sag T2 Fat 8. +C T-Ax T1 no fat

9. +C L-Sag T1 FAT 10. +C L-Sag T2 FAT 11. +C L-Ax T1 no fat

**Contrast:**  
 Vueway 0.05mmol/kg  
 Max 10

Low eGFR inpatient dosing: no change

**Total Spine CSF Leak w/o contrast**

1. 3pl loc TOP 2. 3pl loc Bot 3. C-Sag T1

4. T-Sag T1 5. L-Sag T1 6. C-Sag T2 FAT

7. T-Sag T2 FAT 8. L-Sag T2 FAT 9. C- Ax T2 FAT

10. T Ax T2 FAT 11. L-Ax T2 FAT

**Request: MRI Total Spine w/o contrast**

**OPTIONAL ADDITIONS TO EXAMS**

<p><b>DWI (Diff Dir All. Assat on) (C, T or Lsp)</b></p> <p>Ax DWI</p> <p>Sag DWI</p> <p>Process ADC maps</p> <p>Send everything to ALI</p>	<p><b>Osseous METS:</b></p> <p>1. Sag DWI (OK to keep on RP1 and RP2)</p> <p>Process ADC maps</p> <p>Send everything to ALI</p>	<p><b>Tethered Cord:</b></p> <p>Sag SSFSE C/T Spine Loc (Overlapping L-sp Loc to help with counting)</p> <p>Ax T1 T8 thru coccyx</p> <p>Cor T2 fat sat- T6 through coccyx (PLACE MARKER TO THE RIGHT OF THE DIMPLE IF THERE IS ONE)</p>
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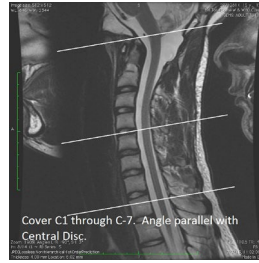
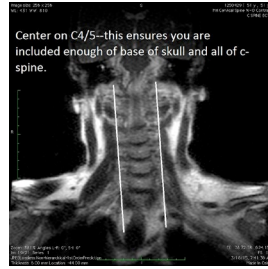
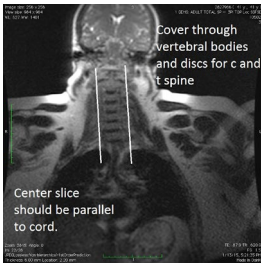
<p><b>SCOLIOSIS (in addition to total spine):</b></p> <p>Upper Cor SSFSE—C2-T7 ► posterior spinous processes through vertebral body</p> <p>Lower Cor SSFSE—T7-S2</p> <p>Axial T2 (all levels from top sp protocol)</p> <p>Ax T1 Conus through thecal sac</p>	<p><b>SI Joints or Sacrum: Add to L-sp</b></p> <p>Cor T1 Obl ► sacrum</p> <p>Cor STIR Obl ► sacrum</p> <p>If contrast given:</p> <p>Cor T1 FAT ► c sacrum</p>	<p><b>VETEROBROPLASTY</b></p> <p>Add: Sag FSTIR &amp; Ax T1 through compressed vertebrae</p>
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**Sag 3d Fiesta (NAT) Non Accidental Trauma (found in 3d spine folder)**

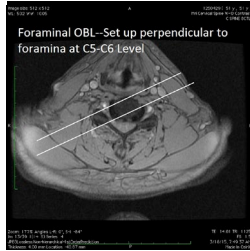
<p><b>TRICKS for MRA—AVM:</b></p> <p><b>Request: MRA Spinal Canal w contrast</b></p> <p><b>Contrast: Vueway *100lbs+ 5ml per injection 10ml total</b></p> <p><b>*Less than 100lbs 0.05 mmol/kg diluted to 10ml Inject 5ml each injection @ 2ml/second</b></p> <p><b>Peds under 2yo: Multihance 0.05 mmol/kg per injection = 0.1mmol/kg total</b></p> <p><b>Inject at 2ml/sec</b></p> <p><b>Monitored, 2 injections</b></p> <p>1. Sag TRICKS</p> <p>2. Cor TRICKS</p> <p>► scan mask, scanner pauses, inject and scan with a 5 second scan delay (2 seconds for small peds)</p> <p><b>May request "slow flow"</b></p>	<p><b>SCREENING LOCS—</b></p> <p>UPPER/LOWER SAG SSFSE</p> <p>Localizers—Place Sat bands so Abdomen doesn't show in the FOV</p> <p><b>Spondylo CUBE—ONLY RUN Sag T2 CUBE in addition to routine protocol. If scanner has oZTEo (Artists, MR5, MR6, SMC3) instead of CUBE, Scan Sag oZTEo</b></p> <p><b>**Peds can protocol a "SPONDYLO" protocol. See AFCH SPINE</b></p>	<p><b>TRAUMA:</b></p> <p><b>C-sp:</b></p> <p><b>Add:</b> FAT SAT on Sag T2 CUBE or Sag T2 to help visualize fluid in ligaments</p> <p>1. Cor CUBE STIR (if issues or not available run Cor T2 IDEAL)</p> <p>2. Sag 3D FIESTA 14 FOV (Centered over C2 (midbrain through C4) SHIM</p> <p><b>T and L spine:</b></p> <p><b>Add:</b> Cor T2 IDEALarc</p> <p>L-SP ADD: Sag FSTIR</p>
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**FOR METAL:** Use MARS \*\*T2 FAT-use STIR \*\*T1 FAT Take off FAT SAT IDEAL ONLY if requested \*\*If images are undiagnostic, MR3, MR4, and TAC1 have a "MAVRIC Spine" protocol. Pt can be brought back if deemed necessary by radiologist or if already on scanner you can TRY to run a SAG T1 MAVRIC, SAG FLUID MAVRIC, Ax PD MAVRIC, and Ax FLUID MAVRIC.

## Cervical Spine Set up:

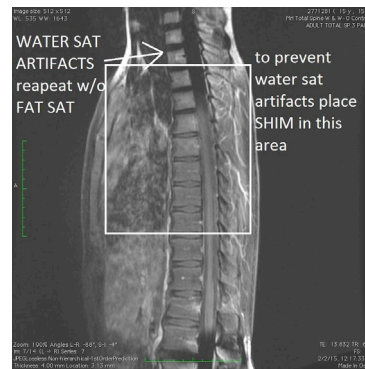
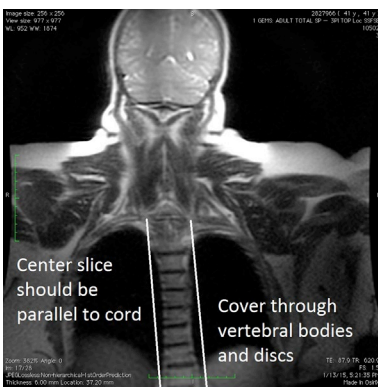


## Foraminal OBL SAG:

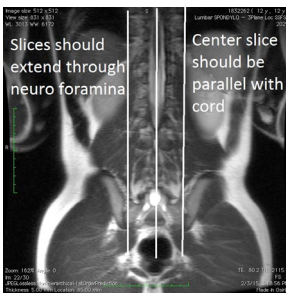


## Thoracic Spine Set up:

**\*\*Back to Protocol\*\***



## Lumbar Spine Set up:



- MSK--When scanning a lumbar spine with a disc higher than the surgical site (lower 3 Lsp. Discs), acquire an upper T2 through the disc. A pre/post contrast axial T1 in an area other than surgical site is not needed.
  - **No upper axial T1 imaging needed for herniated disc for MSK L-spine**