1.5T NEUROLOGICAL MRI PROTOCOLS
(Updated April 19, 2018)

CISS/FIESTA
FSPGR/MPRAGE

BRAIN ROUTINE (HA, trauma, CVA, dizziness, altered mental status, etc.)
T1 Sag
Diffusion Axial
FLAIR Axial
CONTRAST
T2 FS Axial
GRE Cor
T2 FS Cor
T1 FS Cor post
T1 FS Axial post

BRAIN ROUTINE WITHOUT CONTRAST
T1 Sag
Diffusion Axial
FLAIR Axial
T2 FS Axial
GRE Cor
T2 FS Cor

BRAIN BRACES/SIGNIFICANT METAL IN MOUTH – NON FS, TSE/FSE
T1 Sag
Diffusion Axial
FLAIR Axial
CONTRAST
T2 Axial
GRE Cor
T2 Cor
T1 Cor post
T1 Axial post

SETON NETWORK ONLY * BRAIN ROUTINE (HA, trauma, CVA, dizziness, altered mental status, etc.)
T1 Sag
Diffusion Axial
FLAIR Axial
CONTRAST
T2 FS Axial
GRE Axial
GRE Cor
T2 FS Cor
T1 FS Cor post
T1 FS Axial post
SETON NETWORK ONLY * BRAIN ROUTINE WITHOUT CONTRAST

T1 Sag
Diffusion Axial
FLAIR Axial
T2 FS Axial
GRE Axial
GRE Cor
T2 FS Cor

BRAIN SEIZURE (0-49 y/o) * 3T PREFERRED / SEE 3T PROTOCOL PAGE
(50+y/o ONLY if ordered by neurologist specifically requesting SZ protocol)

** PEDI SEIZURE ** – mprage must include entire brain with air around skull for future MEG planning

Diffusion Axial
** T1 3D FSPGR/MPRAGE Axial 1mm (MPR 3x0 Cor & Sag)
FLAIR Axial
FLAIR Cor hires (include entire temporal lobe, 26+ slices)
CONTRAST
T2 Obl Cor hires (include entire temporal lobe, 26+ slices)
T2 FS Axial
GRE Cor
T1 FS Cor post
T1 FS Axial post

NOTE:
• Create 3x0mm Cor & Sag MPR from T1 3D PSPGR/MPRAGE.
• If patient is 50+y/o perform routine brain protocol.
• Optional sequence for Dr. Briggs, T2 SPACE FLAIR 3D Sag post.

BRAIN SEIZURE ICTAL SCAN (ST. DAVIDS)

Diffusion Axial
T1 3D FSPGR/MPRAGE Axial 1mm (MPR 3x0 Cor & Sag – mandatory for MIM software)
FLAIR Axial
FLAIR Cor hires (include entire temporal lobe, 26+ slices)
CONTRAST
T2 Obl Cor hires (include entire temporal lobe, 26+ slices)
T2 FS Axial
GRE Cor
T1 FS Cor post
T1 FS Axial post

NOTE:
• Create 3x0mm Cor & Sag MPR from T1 3D PSPGR/MPRAGE.
BRAIN MS
T1 Sag
Flair Sag
Diffusion Axial
FLAIR Axial
CONTRAST
T2 FS Axial
GRE Cor
T2 FS Cor
T1 FS Cor post
T1 FS Axial post

BRAIN CRANIAL NERVE (trigeminal neuralgia, facial pain / twitch)
T1 Sag
Diffusion Axial
FLAIR Axial
CONTRAST
T2 FS Axial
GRE Cor
T2 CISS Axial hires (posterior fossa)
T2 FS Cor hires (behind pons through face)
T1 FS Cor hires post (behind pons through face)
T1 FS Axial hires post (posterior fossa)
T1 FS Axial post

BRAIN TUMOR/METS
T1 Sag
Diffusion Axial
FLAIR Axial
T1 Axial
CONTRAST FULL DOSE
T2 FS Axial
GRE Cor
T2 FS Cor
T1 FS Cor post
T1 FS Sag post
T1 FS Axial post (4x0)

BRAIN OR PITUITARY AUSTIN CA CTR THERAPY STAGING 3x0, skin to skin, no angle, full 100% FOV.
T1 Axial
T2 3D Axial
CONTRAST FULL DOSE
T1 Axial post
T1 3D FSPGR Axial post
BRAIN IACS NON-CONTRAST (cerebellopontine angle mass, tinnitus, hearing loss, dizziness)
T1 Sag
Diffusion Axial
Flair Axial
T2 FS Axial
GRE Cor
3D FSE T2 Axial hires (IACs only, with 1mm Cor MPR)
T1 Axial hires (IACs only)

Note: Follow up / known schwannoma studies may be ordered without contrast (Dr. Kemper).
- Create 1mm Cor MPR from 3D FSE T2 Axial hires for non-contrast studies.

BRAIN IACS (cerebellopontine angle mass, tinnitus, hearing loss, dizziness)
T1 Sag
Diffusion Axial
Flair Axial
T2 FS Axial
GRE Cor
3D FSE T2 Axial hires
T1 Axial hires pre (IACs only)
CONTRAST
T1 FS Axial hires post (IACs only)
T1 FS Cor hires post (IACs only)
T1 FS Axial post (include entire brain)

BRAIN CHOLESTEATOMA Avanto, Espree, or TIM Symphony only. This protocol is intended for “recurrent” or difficult to diagnose cholesteatomas by CT or otologic exam. Consult with a Radiologist if ordered for any other indication.
FLAIR Axial (include entire brain)
T2 FS Cor (3mm, anterior to IAC through mastoid)
T2 3D CISS Axial (1mm, above IAC through mastoid)
T2 HASTE Diffusion Cor (anterior to IAC through mastoid)
T2 HASTE Diffusion Axial (above IAC through mastoid)
T1 Axial 3mm pre (above IAC through mastoid)
CONTRAST
T1 FS Axial post (3mm, above IAC through mastoid)
T1 FS Cor post (3mm, anterior to IAC through mastoid)

PITUITARY Always to be scanned as an individual / free-standing exam.
Diffusion Axial
T1 Sag hires (11-12 slices)
T2 FS Axial (include entire brain, use to prescribe True Cor/Sag)
T2 Cor hires
T1 Cor hires pre
CONTRAST
T1 Cor hires post
T1 Sag hires post
NOTE: The following protocols: RTP, Stealth, Stryker, Cyberknife, & Stereotatic Therapy Planning Unless otherwise stated. Do not angle images. Scan from inferior to superior. Entire brain skin to skin, include hard palate to skull vertex. Do not cut off tip of nose, top of head, or ear lobes. Smallest FOV to include patient’s external contours. 100% FOV/no rectangular FOV. Slice thickness of 1x0mm. Matrix of 256x256. Contrast full dose.

**BRAIN RTP WITH CONTRAST (TO INCLUDE TOPA – TX ONCOLOGY REFERRING’s DR. WU / DR. TIERNEY / DR. SHEINBEIN)**

T2 3D Space dark fluid Axial post (230 FOV, 1x0mm, 174x256, 5000 TR) *CSF suppressed
T1 3D Flash Axial post (230 FOV, 1x0mm, 251x256)

**NOTE:**
- Create 1mm Cor & Sag MPRs from both post sequences & send all to PACS.
- Both to be performed with interpolation on.
- Do not perform on GE, SW MR1 Symphony, SM Symphony, WLK Symphony, WMC Symphony.

**BRAIN CRANIAL NERVE RTP WITH CONTRAST (TO INCLUDE TOPA – TX ONCOLOGY REFERRING’S DR. WU / DR. TIERNEY / DR. SHEINBEIN)**

3D CISS Axial post (230 FOV, 1x0mm, 256x256)
T1 3D Flash Axial post (230 FOV, 1x0mm, 251x256)

**NOTE:**
- Create 1mm Cor & Sag MPRs from both post sequences & send all to PACS.
- Both to be performed with interpolation on.
- Do not perform on GE, SW MR1 Symphony, SM Symphony, WLK Symphony, WMC Symphony.

**BRAIN STEREOTACTIC THERAPY PLANNING, DR. DZIUK & DR. THATIKONDA**

T2 3D Axial
T1 3D Axial pre
T1 3D Axial post

**BRAIN STEALTH WITH CONTRAST**

T2 3D Axial CISS post
T1 3D VIBE Axial post

**BRAIN STRYKER**

T2 3D Axial
T1 3D Axial pre
T1 3D Axial post

**BRAIN MULTIPLE SYSTEM ATROPHY (MSA) DR. IZOR** Evaluation of Middle Cerebellar Peduncle width.

T1 Sag
T1 3D FSPGR / MPRAGE Sag (240 FOV, .9 slice thickness, 192 slices/slab, create Cor MPR at 1x1)
Diffusion Axial
FLAIR Axial
CONTRAST
T2 FS Axial
GRE Cor
T2 FS Cor
T1 FS Cor post
T1 FS Axial post
BRAIN FAST ACQUISITION
T2 HASTE / SSFSE Axial
T2 HASTE / SSFSE Sag

BRAIN SPINKS
T1 Sag
Diffusion Axial
FLAIR Axial
T1 Axial
T1 3D FSPGR/MPRAGE Axial (1mm, with Cor MPR)
T2 3D SPACE Sag (1mm, with Cor/Axial 1mm MPRs)
CONTRAST
T2 FS Axial
T2 FS Cor
GRE Cor
T1 FS Cor post
T1 FS Axial post

TMJ Acquire sequences in this exact order, document # of cm open mouth.
Left T1 Cor
Left PD Sag
Left T2 FS Sag
Right T1 Cor
Right PD Sag
Right T2 FS Sag
Right PD Sag open
Left PD Sag open

Contrast: RA, infection, abscess, etc. Add following sequences post contrast.
Left T1 FS Cor closed post
Left T1 FS Sag closed post
Right T1 FS Cor closed post
Right T1 FS Sag closed post

NOTE: Open series performed with patient in maximum open mouth, document mm in Tech Notes.
**TMJ WITH CINE** Acquire sequences in this exact order.

Left T1 Cor
Left PD Sag
Left T2 FS Sag
Right T1 Cor
Right PD Sag
Right T2 FS Sag
Right PD Sag open
Left PD Sag open

*The following sequences are to be centered mid-line joint space. Do not send the following sequences to PACS, only the resulting cine series.*

PD tse sag bilat closed
PD tse sag bilat bite (biting down)
PD tse sag bilat 4mm
PD tse sag bilat 8mm
PD tse sag bilat 12mm
PD tse sag bilat 16mm
PD tse sag bilat 20mm
PD tse sag bilat 24mm

**NOTE:**

- To create the cine, save the center slice from each of the 8 sequences into a separate sequence, named “RT PD Sag Cine” and/or “LT PD Sag Cine” in separate series. Once this is complete you will need to label each slice with the appropriate opening, “CLOSED” “BITE” “4MM”, etc.
- Open series performed with patient in maximum open mouth, document mm in Tech Notes.

Contrast for RA, infection, abscess, etc. Add following sequences post contrast.

Left T1 FS Cor closed post
Left T1 FS Sag closed post
Right T1 FS Cor closed post
Right T1 FS Sag closed post

**ORBITS** Always to be scanned as an individual / free-standing exam.

T1 Sag
Diffusion Axial
STIR Cor hires (mid-pons to mid-globe)
T1 Cor hires pre
**CONTRAST**
T1 FS Cor hires post
T1 FS Obl Axial hires post
T2 FS Obl Axial hires post
INTRACRANIAL MRA WITH 1ML CONTRAST
3D TOF Axial (include entire brain)

Note:
- All Intracranial MRAs should be done with 1ml of Gadolinium flushed with 10ml of saline.
- No iPAT / parallel imaging.
- Send raw data & MIPs to PACS.
- Consult with a Radiologist with metallic dental work causing significant artifact. The Radiologist may prefer a CTA. If a CTA is preferred then the referring physician’s office should be notified for a change of orders prior to the patient being scanned.

INTRACRANIAL MRV Include entire skull.
Sag Localizer
GRE Cor
2D TOF Cor
3D Cor Volume pre
BOLUS CONTRAST: 10ML Gadavist, 20ML Multihance, 2 ml/sec
- 15ml normal saline flush. Axial slice centered at skull base, start post 5 seconds after observing contrast.
3D Cor Volume post

NOTE: Subtract pre/post & use resulting subtraction for MIP lateral & tumble.

INTRACRANIAL MRV WITHOUT CONTRAST
GRE Cor
2D TOF Cor
2D TOG Obl Sag

NOTE: Add T1 Sag full brain, if patient does not have a concurrent brain exam.

CAROTID MRA WITH CONTRAST
Sag Localizer
2D TOF Axial (7mm slice thickness, 36-40 slices)
T1 FS Axial pre
3D Cor Volume pre
BOLUS FULL DOSE CONTRAST: 2ml/sec, 15ml normal saline flush
3D Cor Volume post

NOTE:
- Subtract pre/post & use resulting subtraction for MIP.
- 2mm, axial MPR from 3D Cor Volume post.
- If done in conjunction with an Intracranial MRA with contrast, the 2D TOF Axial & T1 FS Axial pre must be done prior to the administration of IV contrast.

CAROTID MRA NON-CONTRAST
Sag Localizer
2D TOF Axial (3mm slice thickness, -33% distance factor)
3D TOF Axial (centered at bifurcation)
T1 FS Axial

Note: If done in conjunction with an Intracranial MRA with contrast, the 2D TOF Axial and T1 FS Axial sequences must be done prior to the administration of IV contrast for the Intracranial MRA exam.
CERVICAL SPINE
T1 Sag
STIR Sag
T2 Sag
T2* GRE Axial (inferior tip of clivus to mid T1)
T2 FS Axial

NOTE:
• Limit FOV, not including more than T1-T2 in sagittal planes.
• Document presence or absence of radiculopathy with effected side.

CERVICAL WITH CONTRAST (myelopathy, MS, CA, etc.)
T1 Sag
STIR Sag
T2 Sag
T2* GRE Axial (inferior tip of clivus to mid T1)
T2 FS Axial
CONTRAST
T1 FS Sag post
T1 Sag post (if hardware present)
T1 Axial post

NOTE:
• Limit FOV, not including more than T1-T2 in sagittal planes.
• Document presence or absence of radiculopathy with effected side.

SKULL BASE / FACE
T1 Sag (200 FOV, 3x.5, ~42 slices)
T1 Axial (220 FOV, 3x.5, ~35 slices)
T2 FS Axial
STIR Cor (180 FOV, 3x1, ~50 slices)
CONTRAST
T1 FS Axial post
T1 FS Cor post

NOTE:
• Confirm protocol with radiologist before performing.
• Primarily used for facial lesions, include entire P>A / L>R diameter of skull / face, orbital roof through C1.

SOFT TISSUE NECK
T1 Sag (5x1)
T1 Axial (4x1)
T2 FS Axial
STIR Cor (5x1)
CONTRAST
T1 FS Axial post (immediate post)
T1 Cor post
SOFT TISSUE NECK WITHOUT CONTRAST ** 3T Preferred, See 3T Protocol Page
T1 Sag (5x1)
T1 Axial (4x1)
T2 FS Axial
STIR Cor (5x1)
T1 Cor

SOFT TISSUE NECK ACC THERAPY STAGING 3x0, skin to skin, include entire anatomy, FOV to include all pathology
T2 Axial
T2 3D Axial
CONTRAST
T1 Axial post
T1 3D FSPGR Axial post

SOFT TISSUE NECK MANDIBLE, DR. PETER SCHOLL
T1 Sag (5x1)
T1 Axial (4x1)
T2 FS Axial
STIR Cor (5x1)
T1 Sag hires (2x0, 140 FOV, affected side, parallel to the long axis of the mandible)
T1 Cor Hi-Res (3x0, 160 FOV, affected side, perpendicular to the long axis of the mandible)
T1 FS Axial post (immediate post, 4x1)
T1 Cor post (5x1)

THORACIC SPINE
T1 Sag upper localizer (skull base through L1, see scout acquisition guidelines for details)
T1 Sag lower localizer (T10 through S2, see scout acquisition guidelines for details)
T1 Sag
STIR Sag
T2 Sag
T2 Axial Upper (4x2, through mid C7)
T2 Axial Lower (from mid L1 up)

NOTE:
- Document presence or absence of radiculopathy with effected side.
THORACIC SPINE WITH CONTRAST (myelopathy, MS, CA, SURG within 10 yrs., etc.)
T1 Sag upper localizer (skull base through L1, see scout acquisition guidelines for details)
T1 Sag lower localizer (T10 through S2, see scout acquisition guidelines for details)
T1 Sag
STIR Sag
T2 Sag
T2 Axial Upper (4x2, through mid T1)
T2 Axial Lower (4x2, mid L1 up)
CONTRAST
T1 FS Sag post
T1 Sag post (if hardware present)
T1 Axial Upper post
T1 Axial Lower post

NOTE:
- Contrast with history of surgery within ten years.
- If hardware limits the FS on post imaging, include additional non-FS series.
- Document presence or absence of radiculopathy with effected side.

LUMBAR SPINE Use the pediatric protocol for patients under the age of 18.
T1 Sag upper localizer (skull base through L1, see scout acquisition guidelines for details)
T1 Sag lower localizer (T10 through S2, see scout acquisition guidelines for details)
T1 Sag
STIR Sag
T2 Sag
PD Axial (180 FOV, 4x1, below L5-S1 disc to mid T12)
T2 Axial
T2 Axial L5-S1 (200 FOV, parallel L5-S1 disc space)

NOTE:
- Document presence or absence of radiculopathy with effected side.
- Axials 200 FOV for A40 software scanners: WMC, SW 1.5T, WLK, SM.
**LUMBAR SPINE WITH CONTRAST** (myelopathy, MS, CA, SURG within 10 yrs., etc.)

** Use the pediatric protocol for patients under the age of 18.
T1 Sag upper localizer (skull base through L1, see scout acquisition guidelines for details)
T1 Sag lower localizer (T10 through S2, see scout acquisition guidelines for details)
T1 Sag
STIR Sag
T2 Sag
T2 Axial (180 FOV, 4x2, mid L1 to above T1)
T2 Axial L5-S1 (200 FOV, parallel L5-S1 disc space)
T1 Axial pre (below L5-S1 disc to mid T12)
T1 Axial post (below L5-S1 disc to mid T12)
CONTRAST
T1 FS Sag post
T1 Sag post (if hardware present)

**NOTE:**
- Axials 200 FOV for A40 software scanners: WMC, SW 1.5T, WLK, SM.
- Contrast with history of surgery within ten years.
- If hardware limits the FS on post imaging, include additional non-FS series.
- Document presence or absence of radiculopathy with effected side.

**LUMBAR SPINE, DR. PAUL GEIBEL OR DR. J. WESLEY WALLIS**

T1 Sag upper localizer (skull base through L1, see scout acquisition guidelines for details)
T1 Sag lower localizer (T10 through S2, see scout acquisition guidelines for details)
T1 Sag (12 slices only)
PD Sag
T2 FS Sag
PD Axial (below L5-S1 disc to mid T12)
T2 Axial
T2 Axial L5-S1 (parallel L5-S1 disc space)
T2 Axial L1-S1 (5 slices per disc, centered & parallel to each disc space from L1 to S1)

**NOTE:**
- Send all sequences to Synapse.
- Filming with only 3 sheets. T1 Sag, T2 FS Sag, & T2 Axial L1-S1 (25 on 1 with reference image in corner of each image).
SPINE SCOLIOSIS Only if scoliosis is specifically stated on the referral
Routine Protocol
Adults: T1 Cor
Pedi: T2 Cor

SPINE STEREOTACTIC THERAPY PLANNING, DR. DZIUK & DR. THATIKONDA
T1 Sag upper localizer (C2 through L1, see scout acquisition guidelines for details)
T1 Sag lower localizer (T10 through S2, see scout acquisition guidelines for details)
T2 3D Axial
CONTRAST
T1 3D Axial pre
T1 3D Axial post

NOTE:
• 180 FOV, 1-2mm slice thickness depending on requested coverage, do not angle images.
• The full spine scouts are not necessary on cervical spine studies.

SPINE STRYKER
T1 Sag upper localizer (C2 through L1, see scout acquisition guidelines for details)
T1 Sag lower localizer (T10 through S2, see scout acquisition guidelines for details)
T2 Axial
CONTRAST
T1 Axial pre
T1 Axial post

NOTE:
• Do not angle images. Image inferior to superior, including one vertebra above and below area of interest. FOV to encompass the region of interest, no rectangular FOV. 3.0, 256 x 256.
• Patient should be positioned Feet First Supine.
• The full spine scouts aren’t necessary on Cervical Spine studies.

BRACHIAL PLEXUS Affected side only.
T1 Axial
STIR Axial
T1 Cor Obl
STIR Cor Obl
T1 Sag
STIR Cor (large FOV, include both sides)

Contrast: mass, infection or post-op tumor.
T1 FS Axial post
T1 FS Cor Obl

NEURO PELVIS - LUMBOSACRAL PLEXUS *3T PREFERRED, SEE 3T PROTOCOL PAGE
T1 Axial (perpendicular to sacrum)
T2 FS Axial
T1 Cor (parallel to sacrum)
T2 FS Cor
T1 Sag
T2 FS Sag