Ankle and Foot Protocols - Last Update 5-18-2015

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Ankle / Midfoot - Routine	Ankle Pain Injury, Internal Derangement Talar OCD, Coalition	Axial = In Relation to Leg "Footprint" (Long Axis to Foot) Coronal = In Relation to Leg (Short Axis Foot)	T1 FSE PD SPAIR	PD SPAIR	T1 FSE STIR

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Ankle / Midfoot - Arthritis	Arthritis	Axial = In Relation to Leg "Footprint" (Long Axis to Foot) Coronal = In Relation to Leg (Short Axis Foot)	PD SPAIR T1 SPIR POST	PD SPAIR	T1 FSE STIR T1 SPIR POST

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Foot - Routine	Pain, AVN	Axial = In Relation to Leg "Footprint" (Long Axis to Foot) Coronal = In Relation to Leg (Short Axis Foot)	T1 FSE PD SPAIR	PD FSE PD SPAIR	T1 FSE STIR

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Foot - Arthritis	Arthritis	Axial = In Relation to Leg "Footprint" (Long Axis to Foot) Coronal = In Relation to Leg (Short Axis Foot)	T1 FSE PD SPAIR 3D WATS T1 SPIR POST	PD SPAIR	STIR T1 SPIR POST

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Great Toe / MTP Joints	Turf Toe Sesamoiditis	Smallest Coil Possible (Microcoil if Available) FoV = Mid Metatarsal Through Distal Phalanges Slice thickness = 2-3 mm, 10% gap Axial = In relation to the great toe (short axis foot) Coronal = In relation to the great toe (long axis foot / footprint)	PD FSE PD SPAIR	T1 FSE PD SPAIR	PD FSE PD SPAIR

Appropriate Coronal Plane for
Both Ankle and Foot Imaging

Elbow Protocols - Last Update 8-6-2019

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Elbow - Routine	Pain	If concern for fracture or	PD FSE	T1 FSE	PD SPAIR
	Panner Disease / OCD	OCD, optional:	STIR	PD SPAIR	
	Internal Derangement (with Joint Effusion)	COR WATS/MEDIC			

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Elbow - Arthritis	Arthritis		PD SPAIR	T1 FSE	PD SPAIR
				PD SPAIR	3D WATS
			Post T1 SPIR		Post T1 SPIR

Hand & Wrist Protocols - Last Update 8-6-2019

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Finger	Pain	MD to Indicate FoV Based on Request	PD FSE	T1 FSE	T1 FSE
	Fracture	May Be 1 Finger or Multiple Fingers	STIR	PD SPAIR	T2 FFE
	Ligament / Tendon Injury	For Infection, Use Modified Osteomyelitis			
	***Cor and Sag in relation to finger(s), not hand!	T2 FFE: Slice Thickness = 1 mm			

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Hand / Wrist - Arthritis	Arthritis	*If wrist MRI, use SMALL FOV	PD SPAIR	T1 FSE	PD SPAIR
		***This should be wrist or hand, usually not both**	Post T1 SPIR	STIR	
				3D WATS	
				Post T1 SPIR	

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Hand / Wrist - Routine	Pain	For Infection, Use Osteomyelitis Protocol	T1 FSE	T1 FSE	PD SPAIR
	Tendon / Ligament Evaluation	*If wrist MRI, use SMALL FOV	PD SPAIR	STIR	
	Fracture	***This should be wrist or hand, usually not both**		3D WATS	

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Thumb	Fracture	Image in plane of thumb and sesamoids	T1 FSE	T1 FSE	PD SPAIR
	Collateral Ligament Injury / Stener	Microcoil (if available)	PD FSE	High Res T2 FFE	
		Limited FOV for thumb only		PD SPAIR	

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Scaphoid	Sccaphoid Fracture	Check with MD before IV Contrast admin	PD SPAIR	T1 FSE	PD SPAIR
		If FX present, GIVE CONTRAST		3D WATS	
		5 minute delay for post contrast		STIR	
		Optional: Dynamic post		T1 SPIR	
				Post T1 SPIR	

Coronal = handprint

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Hips & Pelvis Protocols - Last Update 9-29-2015

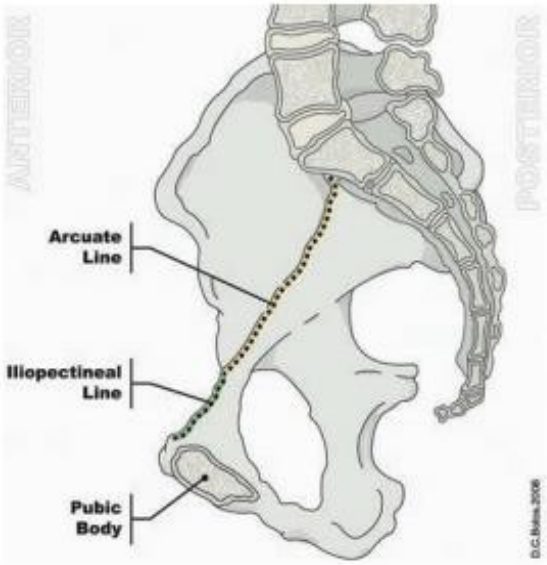
Protocol	Indications	Notes	Axial	Coronal	Sagittal
Hip - Routine	Hip Pain	Pelvis = Bilateral FoV. Hip = Unilateral Small FoV / High Resolution	PD FSE - Hip FoV	T1 FSE - Pelvis FoV	PD FSE - Hip FoV
	FAI	Axial = Axial in relation to pelvis		STIR - Pelvis FoV	
	Labral Injury	Coronal Obl = Parallel to Femoral Neck (Off of Sagittal Localizer)		PD FSE - Hip FoV	**Radial Oblique**
	Dysplasia	Sagittal Obl = Orthogonal to Axial Oblique			PD FSE - Hip FoV
		Radial Oblique = Spins around Axis of Femoral Neck (Small FoV)			

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Pelvis - Routine	Pain	For Infection, Use Osteomyelitis Protocol	T1 FSE	T1 FSE	PD SPAIR
	Trauma	If trauma, include axial WATS and may need dedicated small FOV of a hip	PD SPAIR WATS (for trauma only)	STIR	

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Pelvis - With Contrast	Arthritis	For Infection, can use this or Osteomyelitis protocol	T1 FSE	T1 FSE	PD SPAIR
	Synovitis		PD SPAIR	T2 SPAIR	
	AVN		Post T1 SPIR	Post T1 SPIR	
		(Optional for AVN) - Dynamic Contrast Enhancement		Dynamic THRIVE Pre, xx, etc	
			Delayed Post T1 SPIR		

Protocol	Indications	Notes	Axial - SI Joint	Coronal - Pelvis	Sagittal
Sacrum / SI Joints	Pain	Coronals = Pelvis FoV - Angled to Long Axis of Sacrum	T1 FSE	T1 FSE	PD SPAIR
	Sacroiliitis	Include All of Pelvis and Entirety of Sacrum in FoV	STIR	STIR	
		Axials = Small SI Joint FoV - Include Only SI Joints and Sacrum	Post T1 SPIR	Post T1 SPIR	
		Axial Oblique Images Orthogonal to Plane of SI Joints			
		Sagittal = Sagittal to Plane of Sacrum, Including SI Joints			

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Sport Hernia / Pubalgia	Pubic Pain Sports Hernia	Axial Oblique = In Relation to the Iliopectineal Line (See Image) Call MD to Check. If Concern for Infection, May Give IV Contrast	PD SPAIR Ax Obl T1 FSE Ax Obl PD SPAIR	T1 FSE STIR	PD SPAIR



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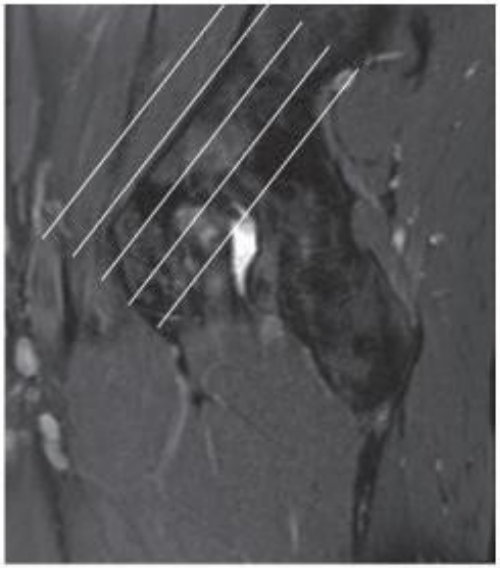

b.

c.

Figure 6. Axial oblique MR image acquisitions and normal appearance of the pubic region. **(a)** Sagittal schematic shows orientation of the arcuate line along the medial surface of the hemipelvis. **(b)** Sagittal T2-weighted fat-suppressed turbo spin-echo image obtained near the medial acetabulum shows the plane (lines) prescribed for axial oblique MR imaging of the pubic region, which parallels the arcuate line. **(c)** Axial oblique T1-weighted image shows normal muscles around the pubic symphysis *(PS)*. *AB/AM* = adductor brevis and adductor magnus, *AL* = adductor longus, *OE* = obturator externus, *OI* = obturator internus, *PEC* = pectineus.

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Knee Protocols - Last Update 8-6-2019

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Knee - Routine	Pain	CHIC-P: Include	STIR	T1 FSE	PD FSE
	Internal Derangement	Sag MapIT		PD SPAIR	PD SPAIR
	Popliteal Cyst			3D WATS	
	Osteochondral Defect		Recon WATS		Recon WATS

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Knee - Arthritis	Arthritis		T2 SPAIR	T1 FSE	PD SPAIR
	Synovitis			PD SPAIR	
	PVNS		Recon WATS	3D WATS	Recon WATS
	Internal derangement vs Arthritis				
			Post T1 SPIR		Post T1 SPIR

Shoulder MSK Protocols - Last Updated 12-6-2017

Protocol	Indications	Notes	Axial	Coronal Obl	Sagittal Obl
Shoulder - Routine	Pain, fracture, RTC tear	Sag Obl = Parallel to Plane of Glenoid Cor Obl = Perpendicular to Plane of Glenoid	PD SPAIR T2 FFE (Thin Slice)	PD SPAIR	T1 FSE PD SPAIR

Protocol	Indications	Notes	Axial	Coronal Obl	Sagittal Obl
Shoulder - Arthritis	Pain, JIA, arthritis	Sag Obl = Parallel to Plane of Glenoid Cor Obl = Perpendicular to Plane of Glenoid	T2 SPAIR POST T1 FS	PD SPAIR POST T1 FS	T1 FSE PD SPAIR

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Shoulder - Erb Palsy	Brachial Plexopathy Erbs palsy Glenohumeral dysplasia	Sequences Performed for Both Shoulders - Even if One Is Normal (For Comparison)	PD SPAIR T1 FSE	WATS	PD FSE

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Arthrogram Protocols - Last Update 8-6-2019

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Elbow - Arthrogram	Pain UCL Injury Ligament Injury Loose Body		T1 SPIR PD SPAIR	T1 FSE T1 SPIR PD SPAIR T1FS VIBE	T1 SPIR

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Hip - Arthrogram	Hip Pain Labral Tear FAI	Axial Oblique = Parallel to the Axis of the Femoral Neck Coronal Oblique = Perpendicular to the Axis of the Femoral Neck (this should look like a coronal with respect to the pelvis) Radial Oblique = "Spin" around long axis of Femoral Neck	T1 FSE PD SPAIR T1FS VIBE	STIR Whole Pelvis T1 SPIR PD FSE	T1 SPIR PD FSE Rad Obl T1 SPIR

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Shoulder - Arthrogram	Pain Labral Tear GHL Injury	Same General Imaging Planes as Routine Shoulder Adds ABER View	T1 SPIR T1FS VIBE ABER T1 SPIR	T1 SPIR PD SPAIR	T1 FSE T1 SPIR PD SPAIR

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Wrist - Arthrogram	Pain Ligament Tear TFCC Injury	T2 FFE: Slice Thickness = 1 mm	T1 SPIR PD SPAIR	T1 T1 SPIR T2 FFE T1FS VIBE	T1 SPIR

Miscellaneous MSK Protocols - Last Updated 4-5-2017

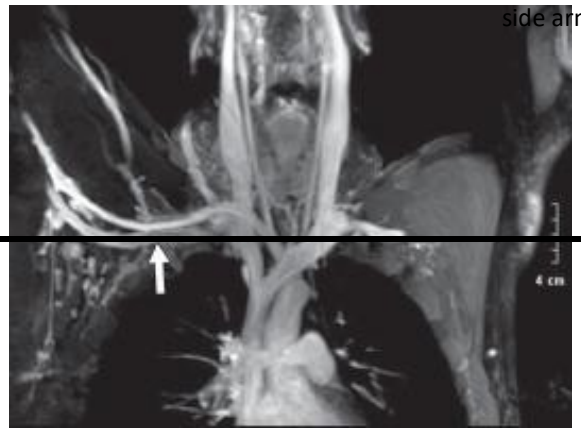
Protocol	Indications	Notes	Axial	Coronal	Sagittal
Stress Fracture	Long bone stress fracture	Notate FoV in Protocol Comments	PD SPAIR T1 FSE	STIR T1 FSE	STIR

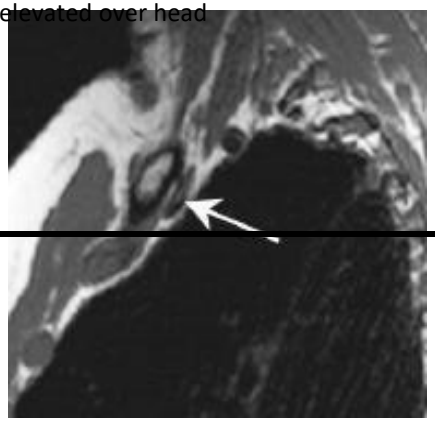
Protocol	Indications	Notes	Axial	Coronal	Sagittal
Lower Extremity Muscle - Limited	Biopsy Planning Dermatomyositis / Polymyositis	FOV is along length of femurs Bilat Lower Extremities	T1 FSE STIR	T1 FSE STIR	

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Physeal Bar	Bone Bar After Trauma / Infection	FoV = Very Limited, Just Above and Below Physis of Interest	WATS (Recon) PD SPAIR	3D WATS T1 FSE	STIR

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Bone Infarct	Concern For Bone Infarcts - Chemotherapy / Steroids	 Optional Post-Contrast if Pre-Contrast Are Normal		T1 FSE STIR Post T1 SPIR	

Protocol	Indications	Notes	Axial - DOWN	Coronal - DOWN	Sagittal - DOWN
TOS - Thoracic Outlet Syndrome	Thoracic outlet syndrome	Sag = SMALL FOV, midline through axilla Cor Dynamic ThRIVE or VIBE to include central vessels and proximal arms blaterally, generate dynamic MIP seqeunces Imaging obtained with arms down, then with symptomatic side arm elevated over head	STIR	T1	PD T1 FSE Bright Blood
			Axial - UP	**Coronal - UP**	**Sagittal - UP**
				POST Dyanamic (Reformat MIPs)	PD T1 FSE Bright Blood POST T1 Fat sat





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Osseous / Extremity Neoplasm Protocols - Last Updated: 8-6-2019

Protocol	Indications	Notes	Axial	Coronal or Sagittal (2nd Plane)
Vascular Malformation	Vascular malformation Hemangioma	** 2nd planes required when the lesion involves the following areas: ** Coronal = Chest / Abd / Pelvic Wall , Intra-thoracic / abdominal / pelvic , Involves the Hip Joints ** Sagittal = Involves the Axilla, Shoulder, Knee, or Ankle	STIR T1-W (no FS) Post T1-W FS	** STIR **All Lesions Get Coronal or Sagittal Dynamic Images** Dynamic TWIST (Siemens) Dynamic THRIVE (Phillips) **Coronal or Sagittal (2nd Plane)** ** Post T1-W FS

Protocol	Indications	Notes	Axial	Coronal (Large FoV)	Sagittal
Bone Lesion - Aggressive	Concern for New Aggressive Bone Lesion - Osteosarcoma, Ewing Sarcoma, Lymphoma, LCH, etc	Coronal Sequences are Large FoV - Confirm Coverage With Radiologist Before Ending Study - FoV = Through the Metaphyses of the Bones Across the Joints on Both Sides of Primary Site (Example: Distal Femur Primary: FoV = Acetabulum through Proximal Tibial Metaphysis)	STIR T1-W FS PD-W (no FS) DWIBS (b=800)	STIR T1-W (no FS)	
SEE BELOW FOR CEDERBERG RESEARCH PROTOCOL	Follow Up Known Malignant Bone Lesion Extremity Soft Tissue Sarcomas - Synovial Cell Sarcoma - Malignant Periph Nerve Sheath Tumor	May Reduce Axial FoV to Region of Abnl Mass/Signal * Post Contrast Sagittal: If Lesion Involves Shoulder, Elbow, Knee, or Ankle Joints	Post T1-W FS	Post T1-W FS	* Post T1-W FS

Protocol	Indications	Notes	Axial	Coronal or Sagittal
Bone Lesion - Unspecified, Non-Aggressive	Further Evaluation of Non-Aggressive Bone Lesions NOF, Enchondroma, Osteoblastoma Simple Bone Cyst, Aneurysmal Bone Cyst	FoV Confined to Location of Lesion Radiologist to Specify Desired 2nd Plane *** Contrast May Not Be Necessary In All Cases ***	T1 SPAIR T2 FSE Post T1 SPIR	T1 FSE STIR *OPTIONAL* 3rd Plane STIR Post T1 SPIR

Protocol	Indications	Notes	Axial	Coronal or Sagittal
Extremity Soft Tissue Mass / Lesion	Extremity Soft Tissue Mass / Cyst of Unknown etiology	* 2nd Plane Dependent on Location of Lesion - Medial / Lateral = Coronal - Anterior / Posterior = Sagittal	T1 FSE T1 SPIR T2 SPAIR DWIBS (b=800)	STIR *OPTIONAL* 3rd Plane STIR
	Follow Up of a Benign Extremity Soft Tissue Lesion		Post T1 SPIR	Post T1 SPIR

Protocol	Indications	Notes	Axial	Coronal or Sagittal
Osteochondroma	Osteochondroma	FoV Confined to Location of Lesion * 2nd Plane Dependent on Location of Lesion - Medial / Lateral = Coronal - Anterior / Posterior = Sagittal	T1 FSE PD SPAIR	T2 SPAIR *OPTIONAL* 3rd Plane PD FSE

Protocol	Indications	Notes	Axial	Coronal or Sagittal
Osteoid Osteoma	Osteoid Osteoma Brodie Abscess	FoV Confined to Location of Lesion Radiologist to Specify Desired 2nd Plane	T1 SPIR T2 FSE Post T1 SPIR	T1 FSE STIR *OPTIONAL* 3rd Plane STIR Dynamic Post T1 FS *OPTIONAL* 3rd Plane Post T1 SPIR

Protocol	Indications	Notes	Axial	Coronal or Sagittal
Plexiform Neurofibroma	Known Extremity Neurofibromatosis Follow Up for Change	Coronal = Involvement of the Neck or Pelvis Sagittal = Involvement of Shoulder, Elbow, Knee, Ankle **OPTIONAL** Contrast Usually Not Necessary	STIR ** See Parameters Below Post T1 SPIR	STIR Post T1 SPIR

Volumetric sequence for PN**			
Axial STIR	**Recommended Range**	**Head-Neck or Small## Trunk-Extremity PN**	**Large## Trunk-Extremity PN**
Echo Train Length	5 - 15	7	15
TR	3000 - 6000	6000	4000
TE	30 - 50	34	30
TI	150-180	150	150
Slice Thickness	3 - 10 mm	3 mm	10 mm
Skip	0	0	0
Matrix	256x256 - 512x512	256x256	320 x256 - 512x512
FOV	18 - 50 cm	22 cm	45 cm
Phase FOV	0.8	0.8	0.8
NEX	2 - 4	3	2
Frequency Direction	A→P	A→P	A→P

**Spinal/paraspinal PN should be imaged with the appropriate protocol based on tumor size. Tumors that include the neck and trunk, for which the majority of the tumor is in the trunk, should be imaged with the Large Trunk-Extremity PN protocol.

Protocol	Indications	Notes
Bone Lesion - Aggressive	Osteosarcoma - Research Protocol *****Siemens T3 Magnet ONLY*****	Coronal FoV should be identical for the diagnostic T1-W non-fat sat and STIR images and for the research sequences, covering the primary tumor. Check with MD regarding coverage, if unsure.
Research Protocol Cederberg	Patients will have both 5 week and 10 week studies. Parameters and coil selection for both studies **MUST** be identical. Please contact Dr. Cederberg for any questions. Diagnostic report may be made by any radiologist.	Slice thickness for all coronal sequences should be the same (likely matching the DWI sequence). The exception is the Delayed Post-T1 3D SPACE fat sat. Additional coronal T1-W non-fat stat and STIR images to ensure joint-through-joint coverage. Do not need to compose coronal images. Axial images to be full joint-through-joint coverage

Axial **Coronal**

Tumor Coverage	
	T1-W non-fat sat
	STIR
	DWI (Resolve) with ADC Map (b = 0, 400, 800)

Full Joint through Joint FoV	
STIR	
T1-W Fat Sat	
PD-W FSE	

Additional Coronal Coverage (if necessary)	
	T1-W non-fat sat
	STIR

Tumor Coverage (Same FoV as Above)	
	Dynamic Contrast Enhanced VIBE (Continuous through 3 minutes)
	Delayed Post T1-W 3D SPACE fat sat

Full Joint through Joint FoV	
Delayed Post T1-W 3D SPACE fat sat	

Osteomyelitis Protocols - Last Updated 1-4-2015

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Osteomyelitis - Specific (Preferred)	Osteomyelitis Pyomyositis Septic Arthritis	Tailored Protocol to Exact Area of Clinical Concern - As Per Discussion with Orthopedic Surgery - Radiologist Should Annotate Desired Planes and FoV in Protocol Comments Call MD to Check Cor STIR While Running Cor T1 FSE to Determine Necessary FoV for Axial STIR Most studies will be ordered without contrast (per MSI guidelines)	STIR Post T1 SPIR	STIR (1st sequence) T1 FSE Post T1 SPIR **Post will usually will not be ordered or necessary**	STIR (Optional: Elbow/Ankle) Post T1 SPIR

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Osteomyelitis - General	Osteomyelitis Pyomyositis Septic Arthritis	Standardized Protocol for When Consultation With Orthopedic Surgery is Not Possible and When Checking With Radiologist is not Feasible - Radiologist Should Annotate Desired Planes and FoV in Protocol Comments - All Sequences Use Same FoV	STIR T1 SPIR Post T1 SPIR	STIR T1 FSE Post T1 SPIR	STIR (Optional: Elbow/Ankle) Post T1 SPIR (Optional: Elbow/Ankle)

TMJ Protocols - Last Updated 1-4-2015

Protocol	Indications	Notes	Axial	Coronal	Sagittal
TMJ - Routine	Pain Clicking Meniscus Evaluation	Sagittal Must Be In Plane of TMJ - Small FoV for Each Side Annotate Open or Closed Mouth	T1 FSE Closed (Bilateral, Wide FoV)	PD FSE Closed (Bilateral, Wide FoV)	T2 SPAIR Closed PD FSE Closed PD FSE Open

Protocol	Indications	Notes	Axial	Coronal	Sagittal
TMJ - Arthritis	JIA Arthritis	Axial and Coronal = Bilateral, Wide FoV Sagittal Must Be In Plane of TMJ - Small Separate FoV for Each Side Annotate Open or Closed Mouth	T1 SPIR Closed	T1 FSE Closed PD FSE Closed	T2 SPAIR Closed PD FSE Closed PD FSE Open
		After Contrast, Perform Axial and Coronal Before Sagittal	Post T1 SPIR Closed		Post T1 SPIR Closed
		Cannot Use eTHRIVE for Axial / Coronal due to Artifact from Mastoid Air Cells		Post eTHRIVE Closed	

MR Neurography Protocols - Last Updated 8-6-2019

These should be done on 3T, and usually at CMC Main Dallas

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Neurography - Central - Brachial Plexus	Brachial Plexus injury, n **NOTE**: Need to determine if SHOULDER- ERB PALSY should be done in addition	Each exam must have specific FOVs depending on nerve of concern **C-Spine: normal C-spine FOV** **Other: See FOV image below, include C2 through shoulder joint**	C-Spine: Axial T2 FS *Optional: POST T1 FS (DIXON)*	T1 FSE STIR 3D STIR SPACE Diffusion (1-2mm) *Optional: POST T1 FS (DIXON)*	C-Spine: Sag T2 FS PD

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Neurography - Central - Lumbosacral Plexus	Lumbosacral Plexus injury, numbness	Each exam must have specific FOVs depending on nerve of concern	PD T2 DIXON (send both fat and water only) *Optional: POST T1 FS (DIXON)*	T1 FSE STIR 3D STIR SPACE Diffusion (1-2mm) *Optional: POST T1 FS (DIXON)*	

Protocol	Indications	Notes	Axial	Coronal	Sagittal
Neurography - Peripheral	Extremity	Each exam must have specific FOVs depending on nerve of concern. **See Below for more technical details of each sequence.** *****Smaller Slice thickness for peripheral protocol** ******axial: 1-3mm thickness, minimal / no gap**	T1 FSE T2 DIXON (send both fat and water only) PD *Optional: POST T1 FS (DIXON)*	3D SPACE SPAIR Diffusion (1-2mm) *Optional: POST T1 FS (DIXON)*	T2 SPAIR or STIR