

SPR MRI Committee Optimized Sequences for Pediatric Abdominal Imaging: Siemens

The following sequences have been provided, optimized and preliminarily tested by members of the Society of Pediatric Radiology MRI committee. This is **not a protocol**. It is a library of T1-, T2-, and diffusion-weighted sequences that can be used when imaging the pediatric abdomen.

HOW TO USE:

1. **Download** the appropriate exam card for your scanner/software version and **upload** to your scanner.
 - a. Remember to decide where you will save this DOT engine in your scanner's tree for ease of search/access.
2. Work with team (e.g., radiologist, lead MR tech) to **build your protocol** using sequences from this library and from local sequences, depending on experience/optimization.
 - a. Selection of *which* sequences will depend upon the clinical question and radiologist preference (e.g. using DIXON, BLADE).
 - b. Common indications include solid organ mass characterization and screening in setting of abdominal pain.
 - c. Use/delivery of contrast, delayed post-contrast imaging, and area of interest should be determined by the radiologist.
3. **Select patient size and breathing strategy** (breath hold or free breathing)
 - a. Field of view is optimized for each size; adjusting FOV is NOT recommended.
 - b. You can change between breath holds and free breathing strategies as needed.
4. **SCAN!**
 - a. See notes below to serve as helpful reminders and to aid in troubleshooting.
 - b. If you have any issues or questions, please contact chair/vice chair of the Society for Pediatric Radiology MRI committee via email or using form link below.
5. Please **provide feedback** using the following form: https://docs.google.com/forms/d/e/1FAIpQLSc_kcsiup0HhFOAKy1ixpmqcj7VGbzR7q1x6AplbdK--qv4vQ/viewform?usp=sf_link

OVERVIEW: SEQUENCES INCLUDED IN EACH LIBRARY

NOTE: Field of view is optimized for each size. Adjusting the FOV is NOT recommended. Please use a different size category if a smaller or larger FOV is needed.				
T2 Library				
Teen (matrix size)		Child (matrix size)	Infant (matrix size)	Notes
3D		3D	3D	
COR T2 3D SPACE NAV		COR T2 3D SPACE NAV	COR T2 3D SPACE NAV	For use as Urogram, MRCP
Anatomical		Anatomical	Anatomical	
bh	fb	fb	fb	
COR T2 HASTE BH	COR T2 HASTE NAV	COR STIR	COR STIR	HASTE and STIR can also be run as axial and sagittal
COR T2 FS BLADE	COR T2 DIXON NAV	COR T2 DIXON NAV	COR T2 DIXON NAV	
AX T2 FS BLADE	AX T2 DIXON NAV	AX T2 DIXON NAV	AX T2 DIXON NAV	BLADE – If high SAR warning → select flip angle range change per warning recommendations
	COR T2 BLADE FS NAV	COR T2 TSE FS NAV	COR T2 TSE FS NAV	See below for more information on navigator placement
	AX T2 BLADE FS NAV	AX T2 TSE FS NAV	AX T2 TSE FS NAV	
	COR T2 TSE FS NAV	SAG T2 TSE FS NAV	SAG T2 TSE FS NAV	
	AX T2 TSE FS NAV			
	SAG T2 TSE FS NAV			

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DIFFUSION WEIGHTED IMAGING (DWI) LIBRARY				
TEEN	CHILD	INFANT	Notes	
Standard	Standard	Standard	Two B values allow for calculation of ADC and save time compared to three values	
AX DWI	AX DWI	AX DWI 50-800		
SMS	SMS	SMS		
AX DWI SMS	AX DWI SMS	AX DWI SMS 50-800		

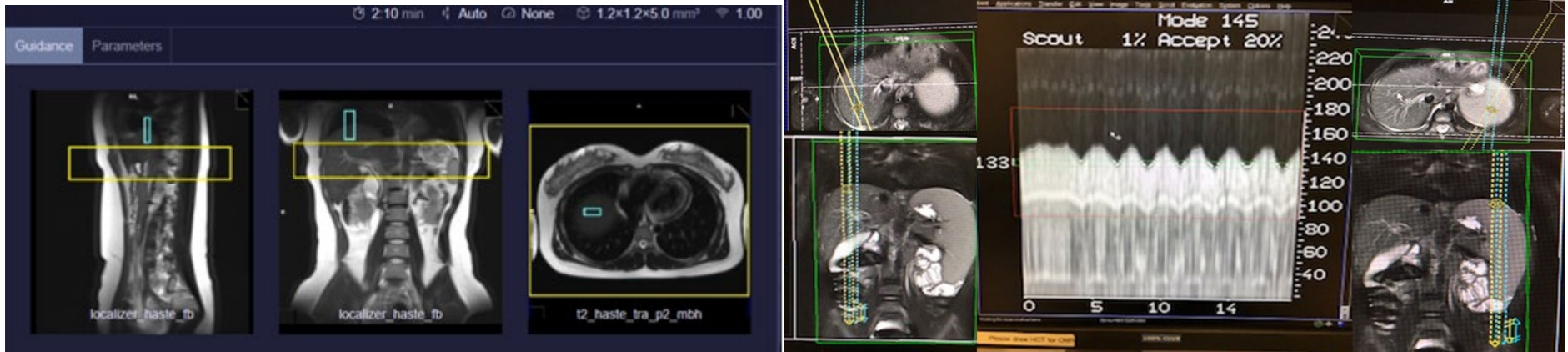
OVERVIEW: SEQUENCES INCLUDED IN EACH LIBRARY, CONTINUED

NOTE: Field of view is optimized for each size. Adjusting the FOV is NOT recommended. Please use a different size category if a smaller or larger FOV is needed.						
T1 LIBRARY						
Teen		Child		Infant		Notes
3D		3D		3D		
bh	fb	bh	fb	bh	fb	
AX T1 VIBE DIXON BH	AX T1 STARVIBE FS ISO	AX T1 VIBE DIXON BH	AX T1 STARVIBE FS ISO	AX T1 VIBE DIXON BH	AX T1 STARVIBE FS ISO	For starvibe: Do not reduce spoke number although it can be tempting. Reduction in spoke number could create or worsen radial artifact.
AX T1 VIBE FS BH		AX T1 VIBE FS BH		AX T1 VIBE FS BH		As an additional alternative to starvibe, you can increase averages for VIBE to 4 and perform free-breathing.
Anatomical		Anatomical		Anatomical		
bh	fb	bh	fb	bh	fb	
AX T1 TSE FS BH	AX T1 MULTINEX FS	AX T1 TSE FS BH	AX T1 MULTINEX FS	AX T1 TSE FS BH	AX T1 MULTINEX FS	For MultiNEX: Current number of averages is 6
	AX T1 STARVIBE FS		AX T1 STARVIBE FS		AX T1 STARVIBE FS	
Dynamics		Dynamics		Dynamics		
bh	fb	bh	fb	bh	fb	
Use BH 3D		Use BH 3D				Typically, dynamic post-contrast images include arterial, portal venous, and delayed venous phases. Arterial 16-20 s Portal Venous 45-60 s Delayed Venous 2-5 min Three phases in the dynamic can be set with this delay or the technologist can manually trigger each
Dynamic AX T1 VIBE FS BH (triple phase)	AX T1 GRASP SFS DYN GAD FB	Dynamic AX T1 VIBE FS BH (triple phase)	AX T1 GRASP SFS DYN GAD FB	Dynamic AX T1 VIBE FS BH (triple phase)	AX T1 GRASP SFS DYN GAD FB	The GRASP timing is set to produce the following phases: pre-contrast, Arterial (3) & Venous (1). See below for more details.
			AX T1 VIBE DIXON		AX T1 VIBE DIXON	DIXON: Make sure in/out of phase is OFF (or rad will see too many images)

OTHER TIPS/TRICKS:

Navigator placement:

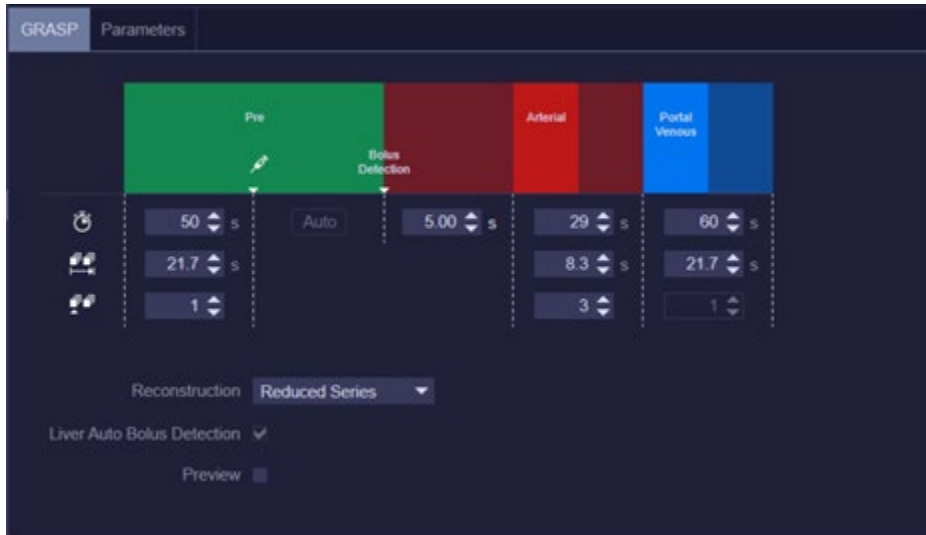
1. Use a free breathing localizer
2. Place the navigator on top of the liver on both coronal and axial images
3. Use the sagittal to recheck location as needed.
4. If anatomy is atypical or there is a right pleural effusion/consolidation, you can set the navigator on the spleen.
5. You can check the level to determine if tracking at expected level
6. You can adjust the acceptance window



GRASP (dynamic, free breathing during contrast):

1. The setup in the library contains only 3 phases: pre-contrast, arterial & venous
2. This can be adjusted to contain a delayed phase depending on local preferences
3. Position the slices as you would for a routine dynamic liver sequence
4. Inject contrast when the scanner instructs the user to do so
5. You will see a composite, single phase immediately.
 - a. There may be a slight delay before reconstructed phases become available.
 - b. Note: If it is a combination exam with multiple folders, check all folders for reconstructed sequences

A second note about GRASP: THE DISPLAY



Each column refers to the 3 phases:

- Green column = pre contrast phase
- Red column = Arterial phase
- Blue column = Venous phase.

Each phase has its own timing and series control field. Three different rows below them control the following:

- First row (headed by the stopwatch icon) controls how long each phase will last.
 - Pre contrast phase lasts 50 seconds
 - Between the pre contrast phase & the Arterial phase, there is a field to control how long will the scanner wait to switch from the pre contrast to the Arterial phase data parsing after the presence of contrast agent has been automatically detected
 - Arterial Phase lasts 29 seconds
 - Venous phase lasts 60 seconds.
- Second row controls the temporal resolution for each phase.
 - Pre contrast phase temporal resolution is 21.7 seconds
 - Arterial phase temporal resolution is 8.3 seconds
 - Venous phase temporal resolution is 21.7 seconds
- Third row controls how many series will be stored in the patient database for the Reduced Series reconstruction option.
 - Pre contrast phase will store 1 series
 - Arterial Phase will save 3 series
 - Venous Phase will save 1 series.

These parameters can be changed (except for the number of series for the Venous Phase). If there is limited experience with GRASP, it is recommend to leave them as is.