Society of Abdominal Radiology Colorectal & Anal Cancer Disease-Focused Panel
Rectal Cancer Pelvis MRI Protocol for Siemens 1.5T & 3T Scanners

(compatible with scanners running software version VE11C or later)

Step-by-step Instructions for Protocol Installation & Use

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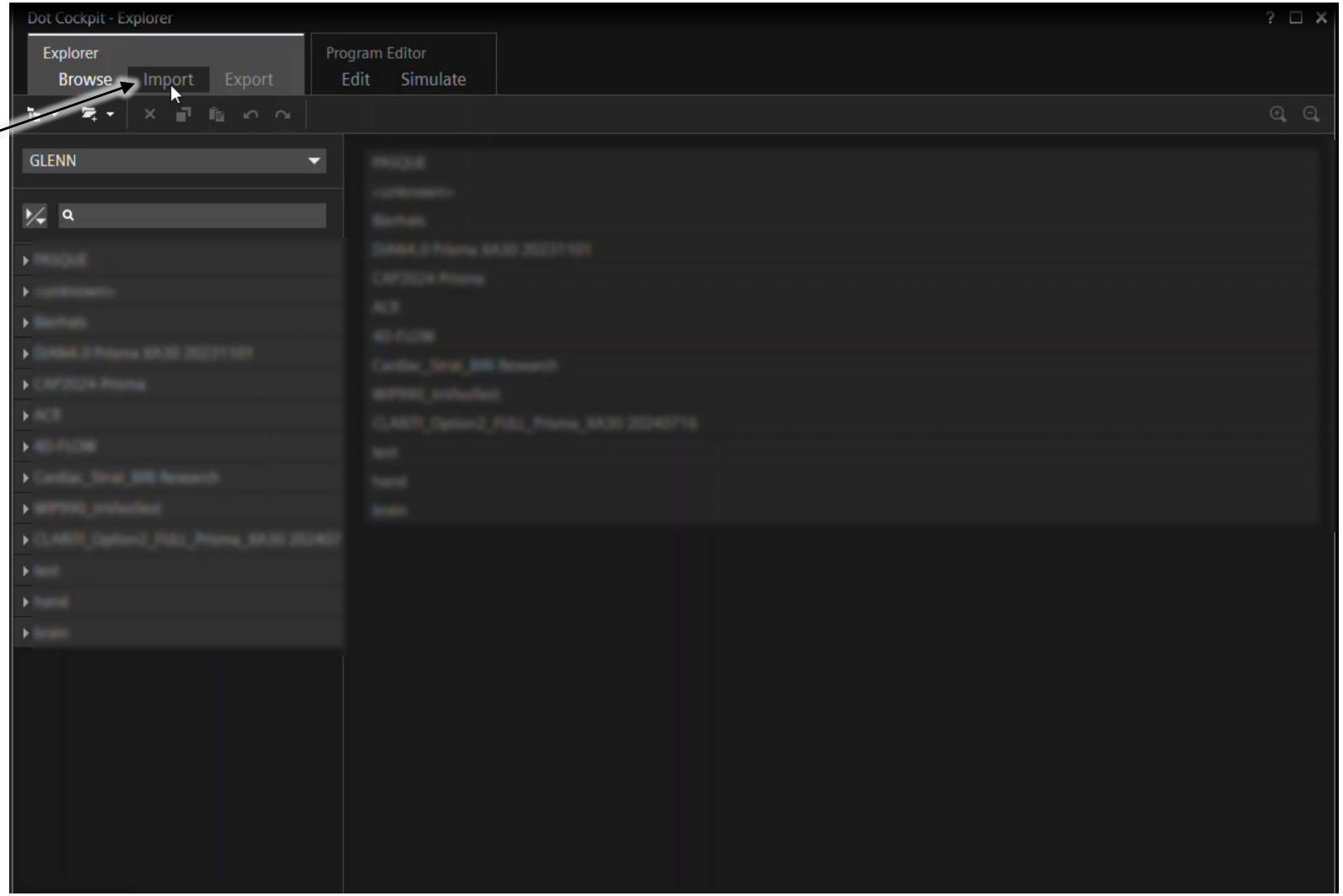
Protocol Installation

(shown for transfer from USB drive to Siemens Vida 3T scanner running XA31 software – appearance will differ for other software versions)

Executable protocol files and protocol PDFs are available for free download at:
https://abdominalradiology.org/sar-subpages/dfp-panels/

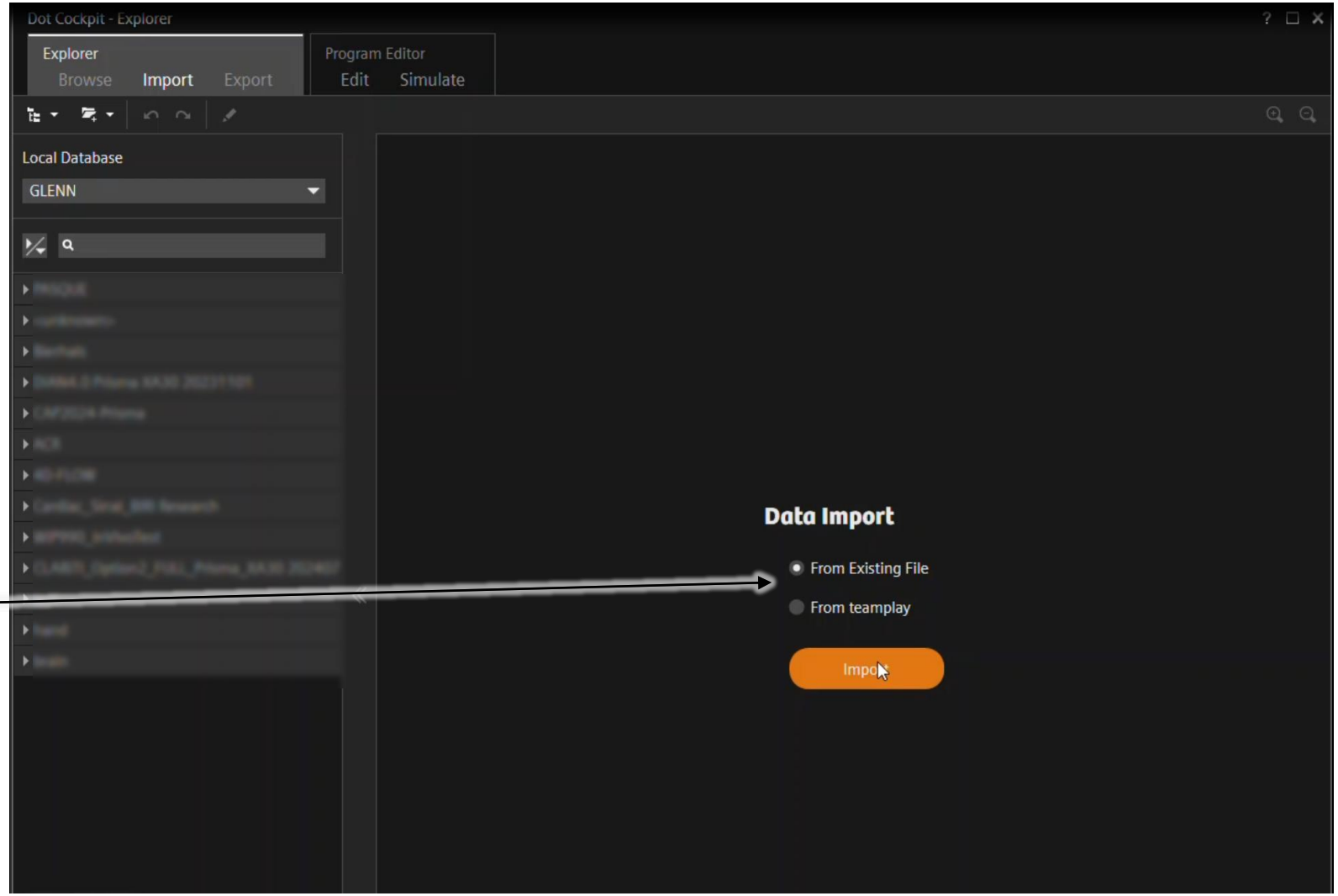
Protocol Installation (shown for Siemens Vida 3T scanner running XA31 software; appearance will differ for other software versions)

#1: Select Import tab in the Explorer window.



Protocol Installation (shown for Siemens Vida 3T scanner running XA31 software; appearance will differ for other software versions)

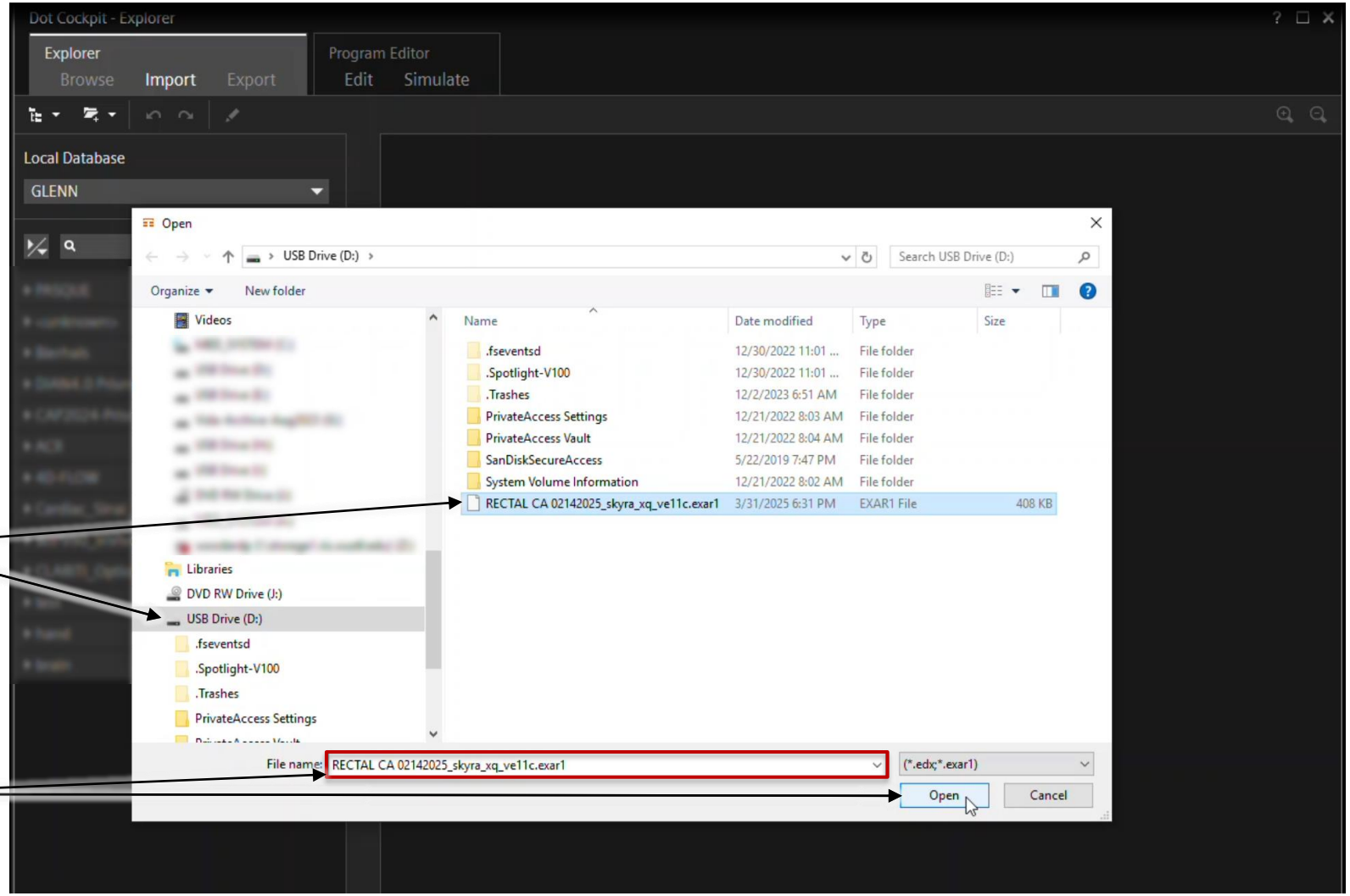
#2: Ensure “From Existing File” is selected; then click Import.



Protocol Installation (shown for Siemens Vida 3T scanner running XA31 software; appearance will differ for other software versions)

#3: Navigate to external USB drive and select downloaded protocol.

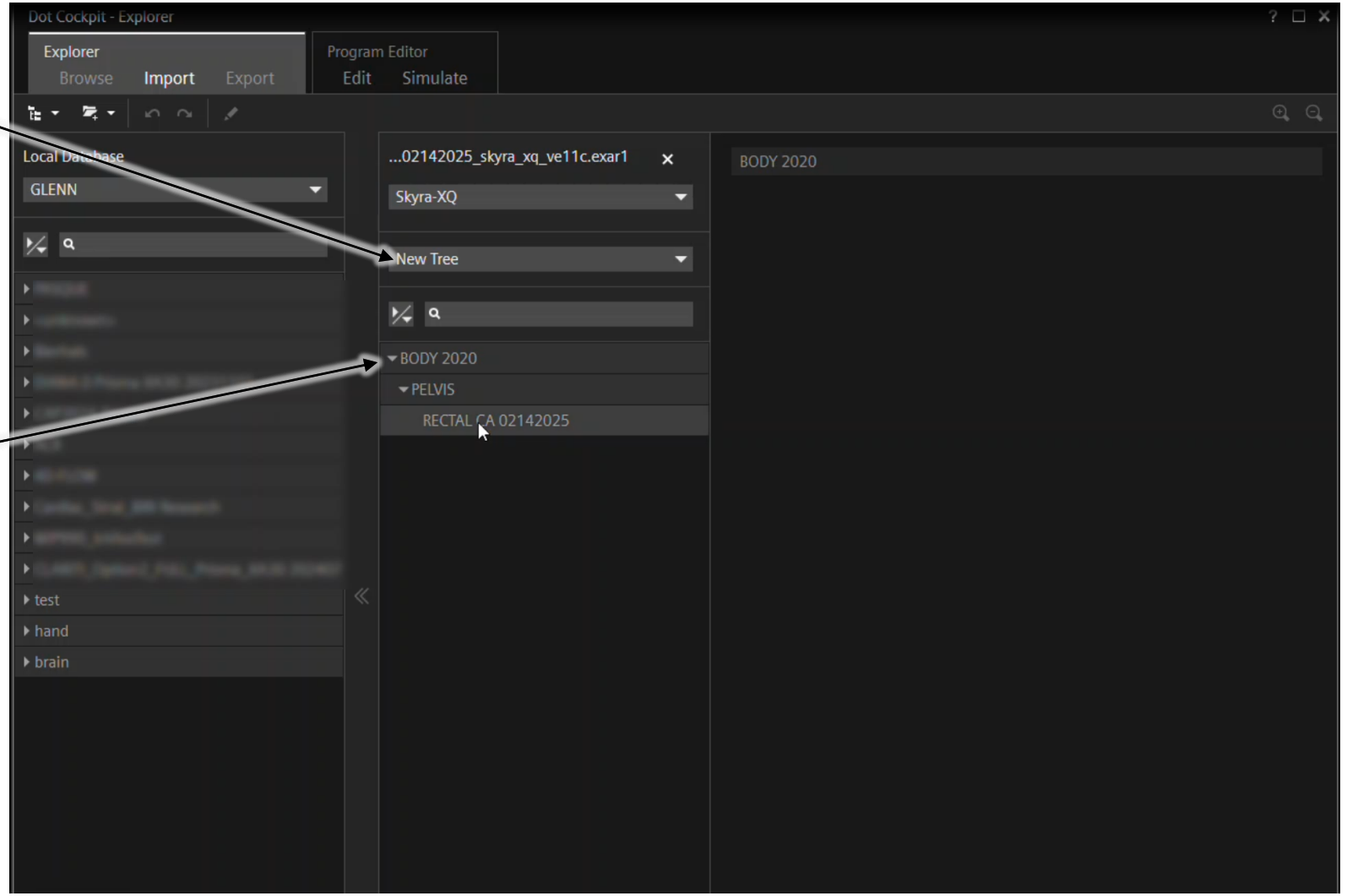
#4: Click Open button.



Protocol Installation (shown for Siemens Vida 3T scanner running XA31 software; appearance will differ for other software versions)

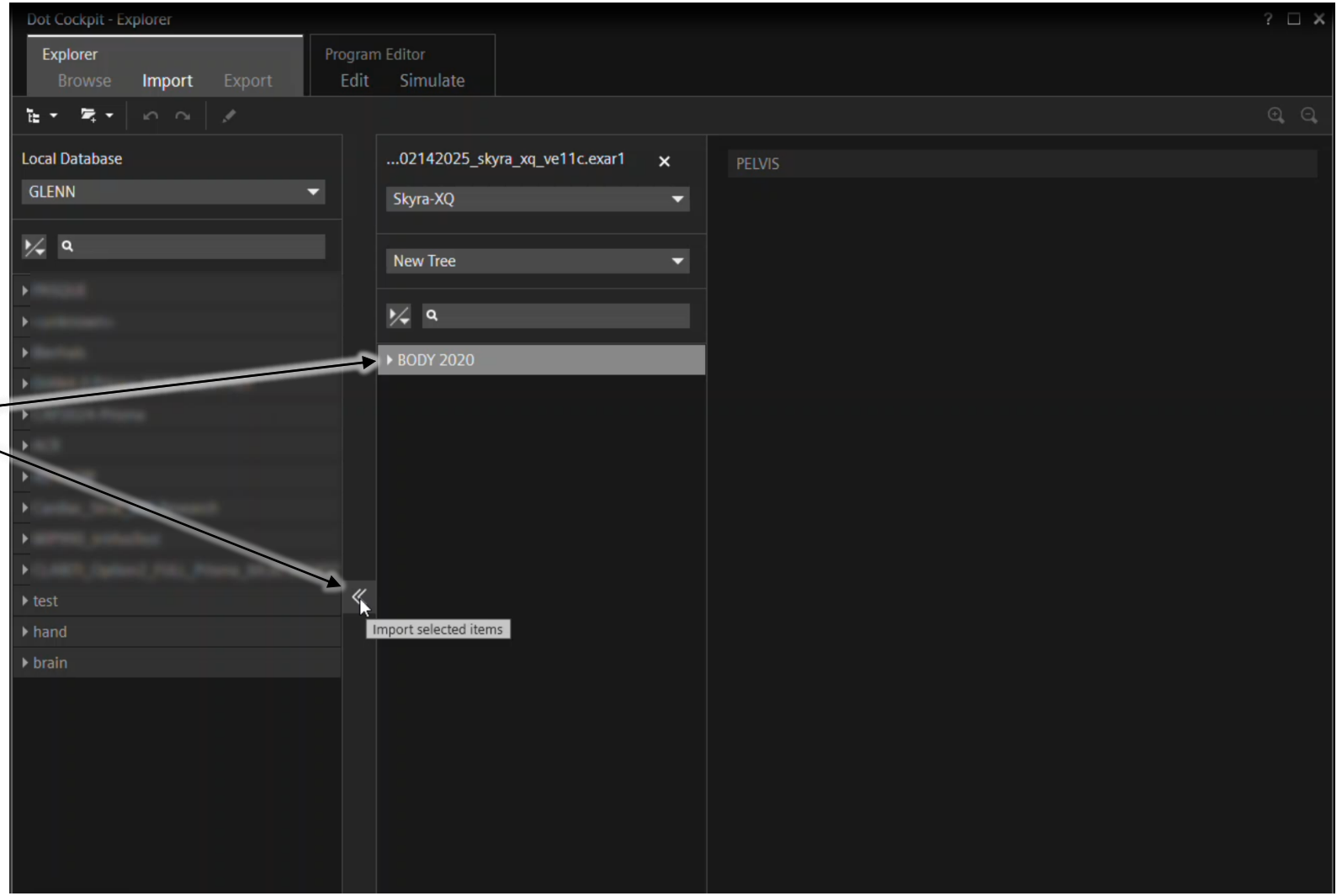
#4: Choose New Tree or select folder in scanner's protocol library hierarchy in which new protocol should reside.

#5: Click on protocol at the folder level (Body 2020) after confirming that the "RECTAL CA 02142025" protocol file is contained in the folder.



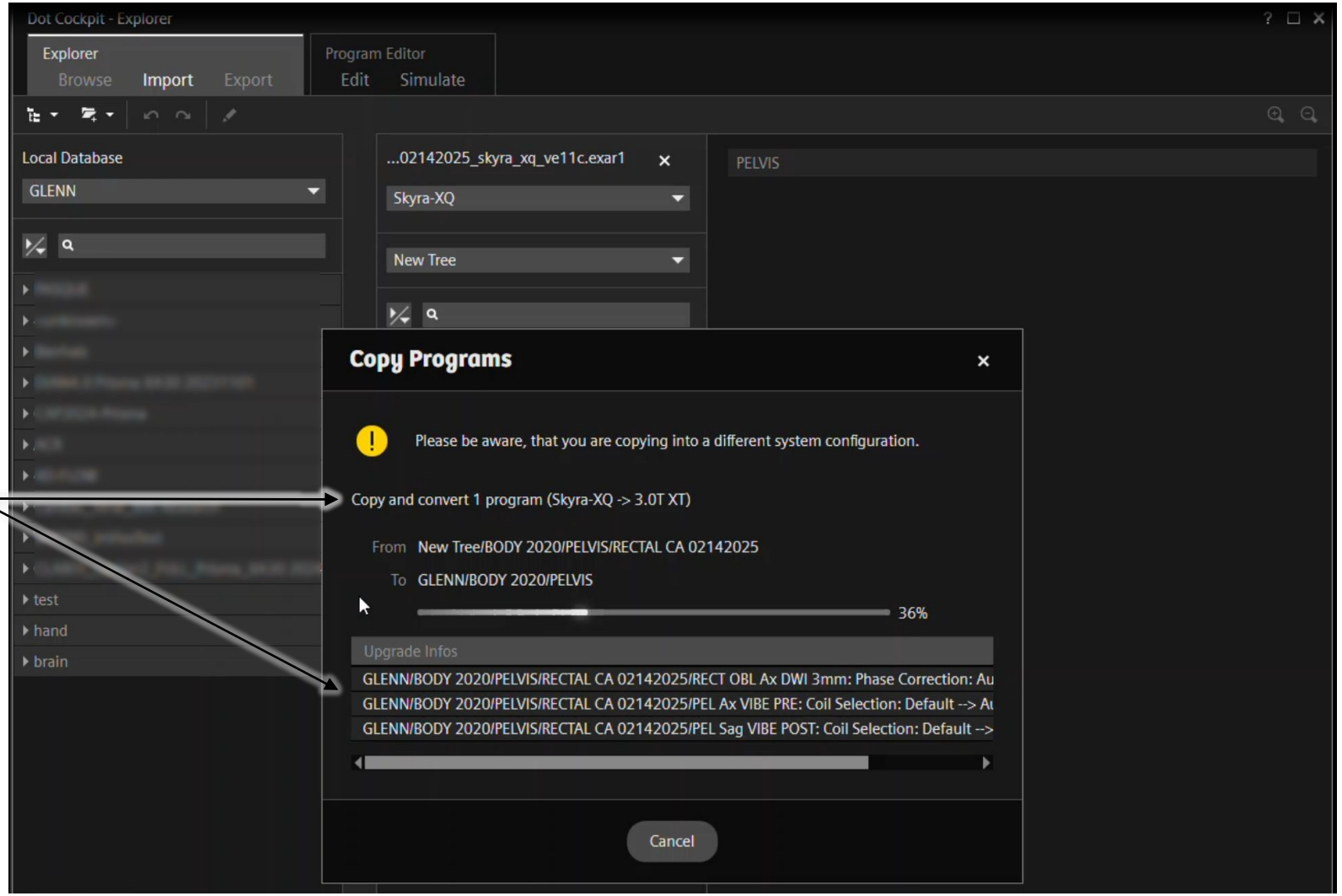
Protocol Installation (shown for Siemens Vida 3T scanner running XA31 software; appearance will differ for other software versions)

#6: With Body 2020 folder highlighted, click on the double leftward arrow to initiate import process.



Protocol Installation (shown for Siemens Vida 3T scanner running XA31 software; appearance will differ for other software versions)

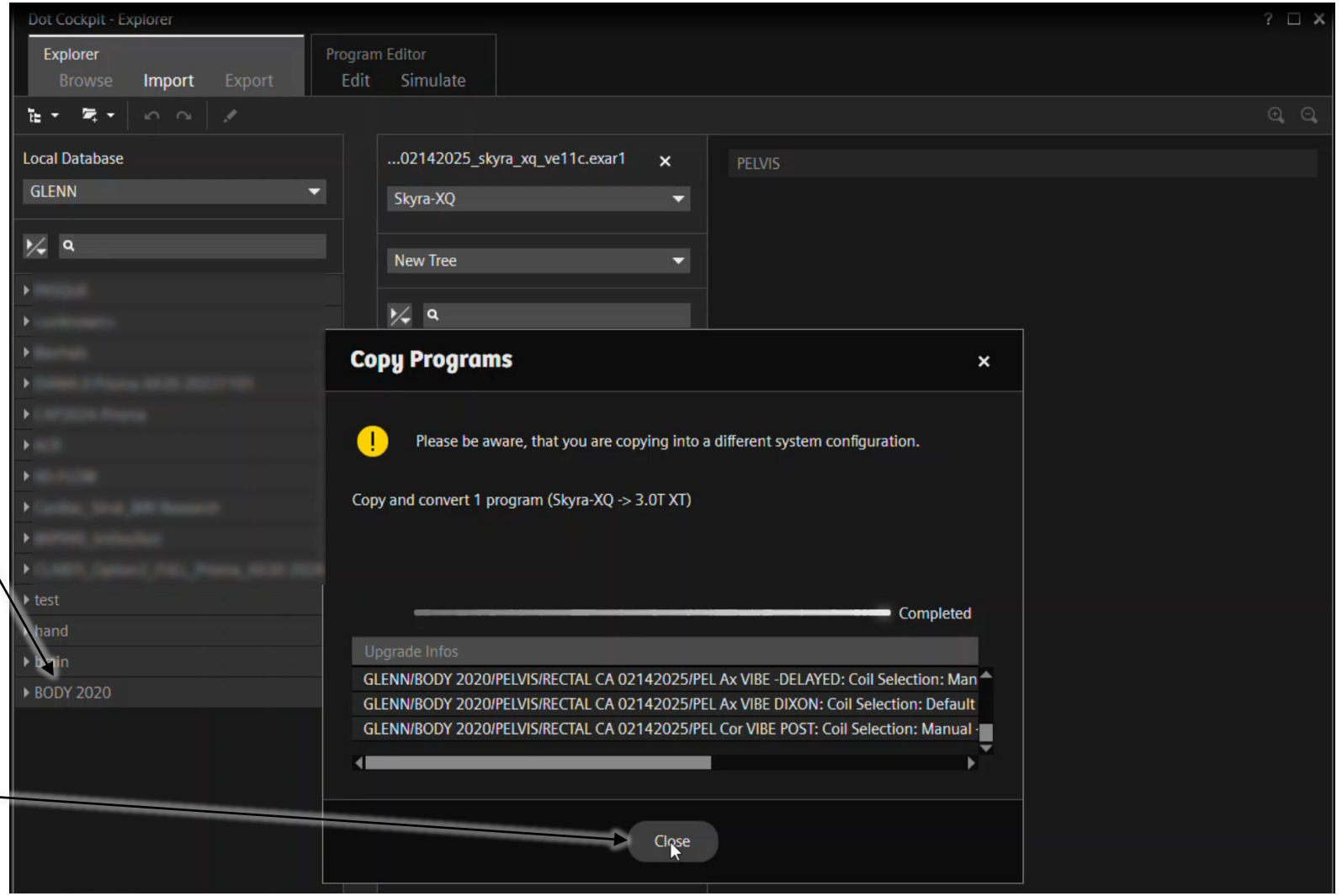
#7: Depending on the software version of the scanner, a conversion step may be required during the import process. Sequences will appear in the list as they are successfully converted.



Protocol Installation (shown for Siemens Vida 3T scanner running XA31 software; appearance will differ for other software versions)

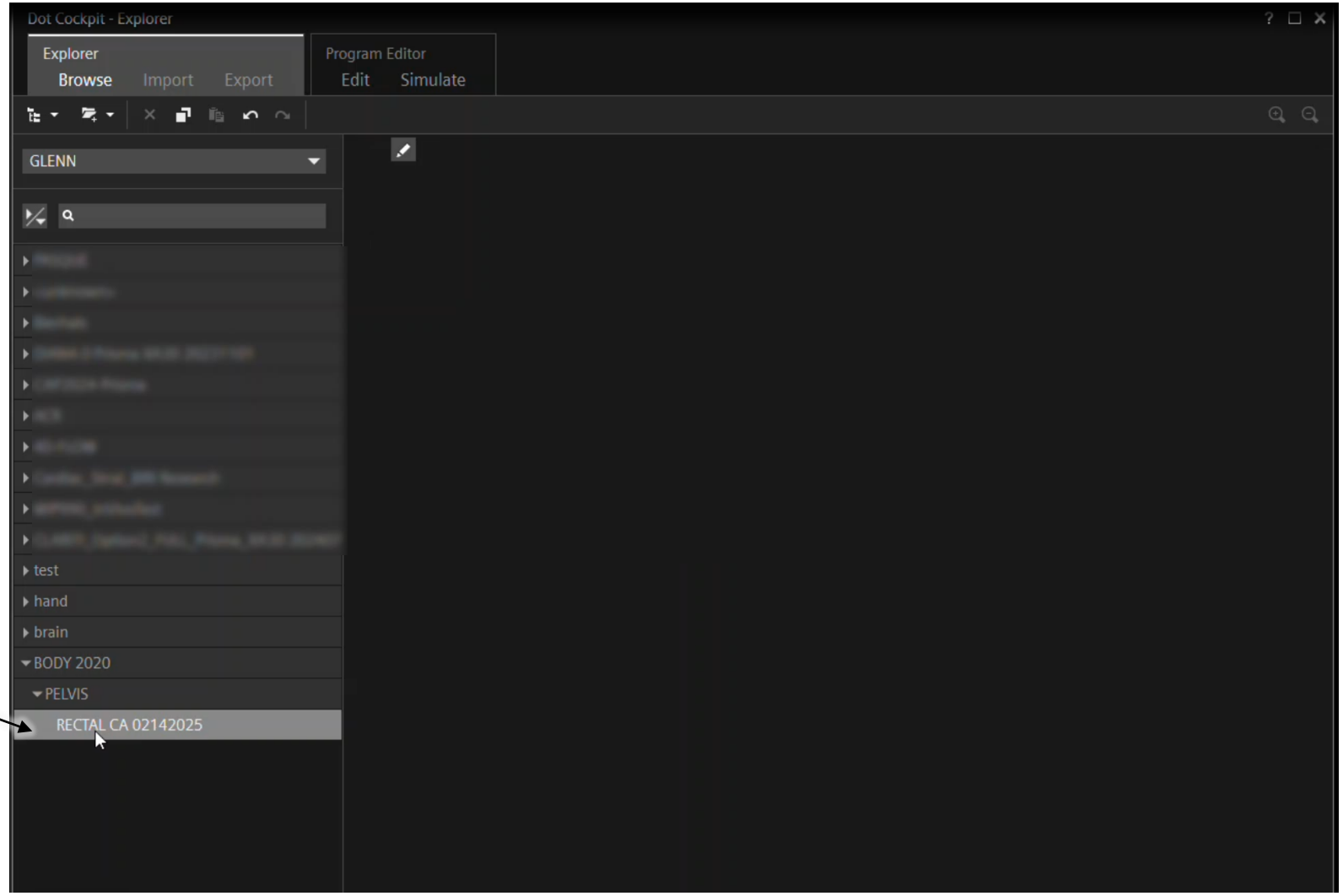
#8: When the import process is complete, the Body 2020 folder should appear in the scanner's protocol library. Note that the folder hierarchy can be revised after import is complete.

#9: Click Close button.



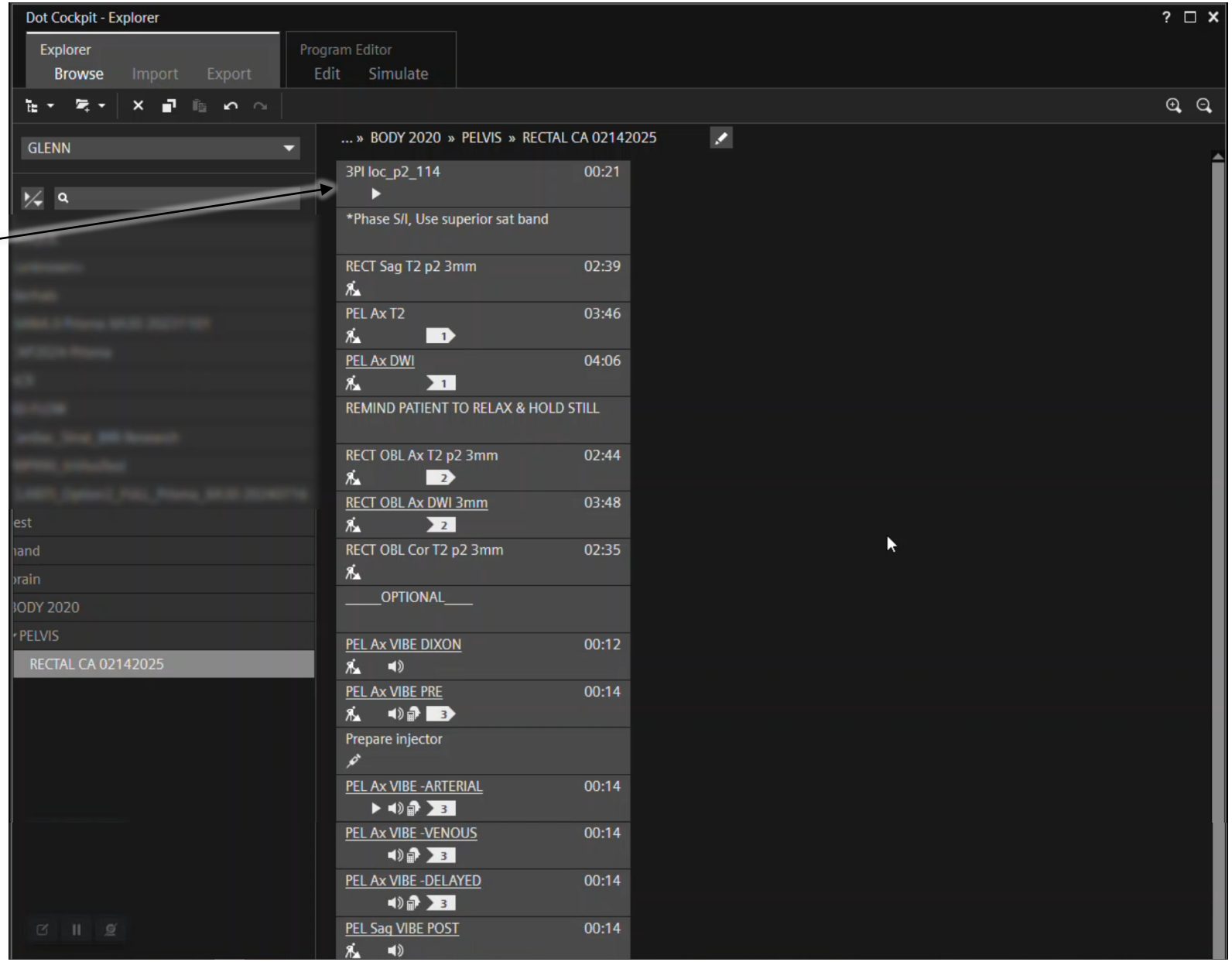
Protocol Installation (shown for Siemens Vida 3T scanner running XA31 software; appearance will differ for other software versions)

#10: Open folder hierarchy, then click on protocol file.



Protocol Installation (shown for Siemens Vida 3T scanner running XA31 software; appearance will differ for other software versions)

#11: List of protocol sequences will display.



Protocol Use

General notes on the protocol's sequences

- Provided sequences are divided into a set of *core* sequences that we believe should be part of any rectal cancer pelvic MRI protocol and a set of *optional* sequences that can be run based on institutional preferences.
- All sequences are designed for use by both older and newer MR scanners; institutions with newer scanners may opt to modify or replace certain sequences to utilize more advanced features, potentially further improving image quality or reducing scan time (e.g., simultaneous multi-slice DWI, readout-segmented DWI, deep learning-based reconstruction, etc.).
- If a sequence is replaced rather than modified, we recommend that the basic technical parameters (e.g., slice thickness, TR, TE, etc.) be preserved as much as possible.

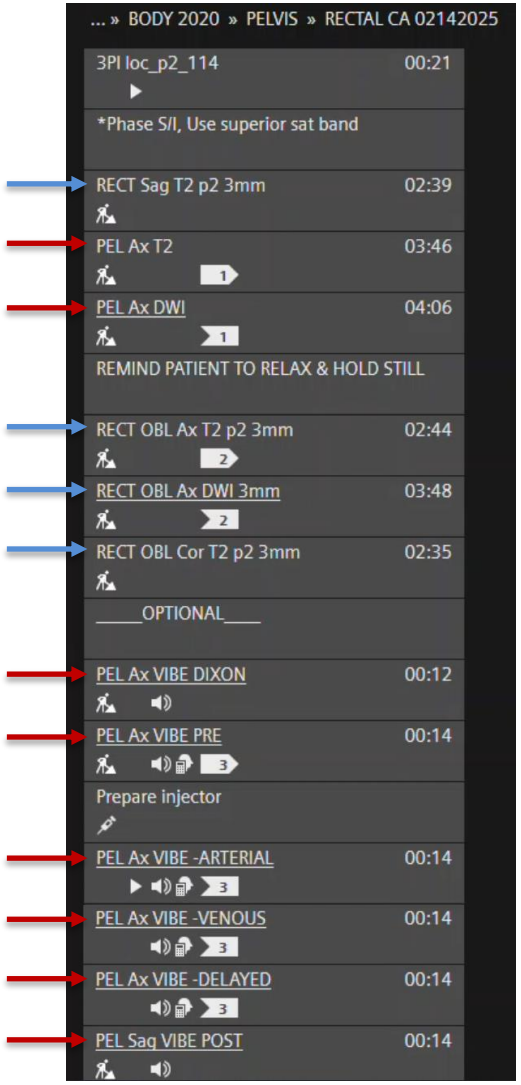
For a more detailed discussion of specific sequences, please see the following manuscript published by our group: https://pubmed.ncbi.nlm.nih.gov/36899281/

Pre-MRI patient preparation:

- Consider IV or IM anti-spasmolytic agent (e.g., glucagon, hyoscyamine) to reduce motion artifact from peristalsis
- Consider mini-enema or rectal gel to eliminate/displace stool and gas to reduce susceptibility artifact on DWI
  - Mini-enema reference: https://link.springer.com/article/10.1007/s00261-020-02718-w
  - Rectal gel reference: https://www.ajronline.org/doi/10.2214/AJR.24.31942

Protocol Use

- Sequences with RECT prefix (blue arrows) – small FOV focused on the tumor and mesorectum
- Sequences with PEL prefix (red arrows) – large FOV including entire pelvis (cover IMA origin through inguinal nodes)



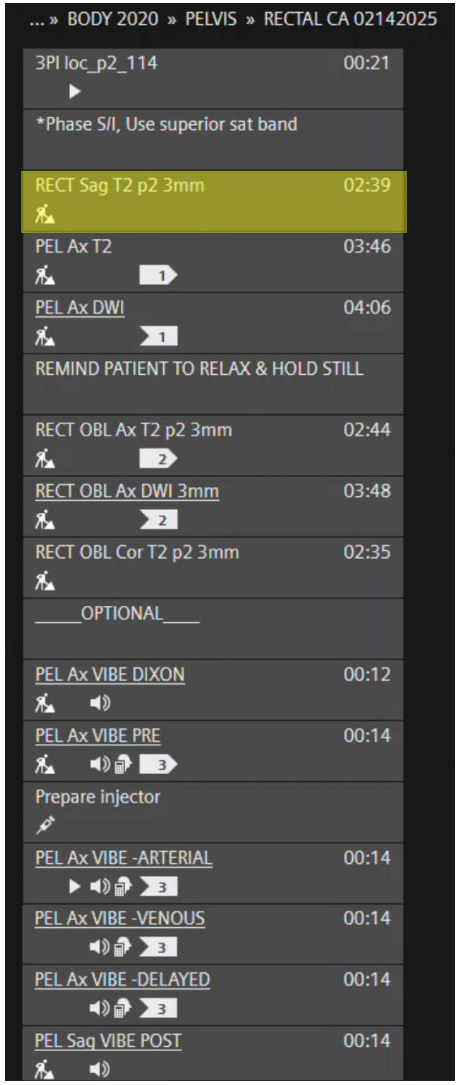
Three-plane localizer (whole pelvis)

Instructions for *RECT Sag T2 p2 3mm* sequence

Instructions for *RECT Sag T2 p2 3mm* sequence

Optional sequences

Protocol Use: RECT Sag p2 3mm

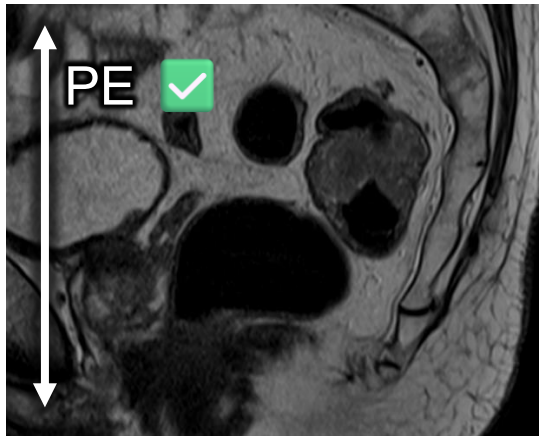


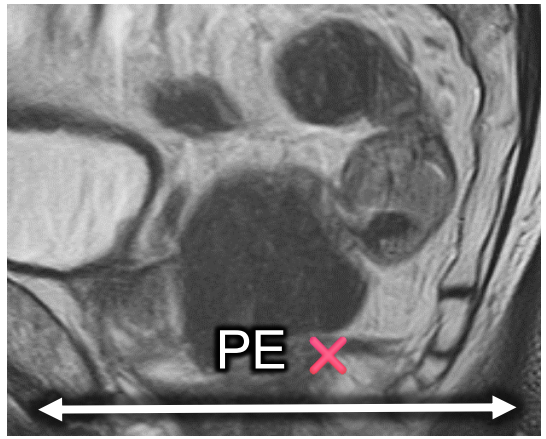
Notes:

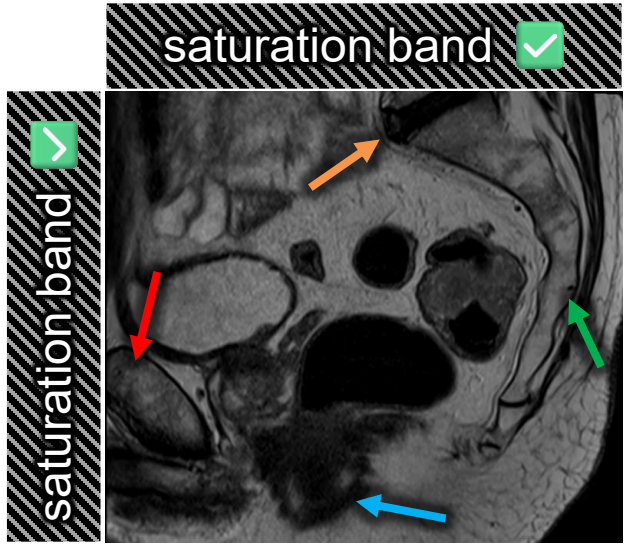
1. Phase-encoding (PE) direction should be craniocaudal rather than anterior-posterior to avoid ghosting from the anterior abdominal wall.

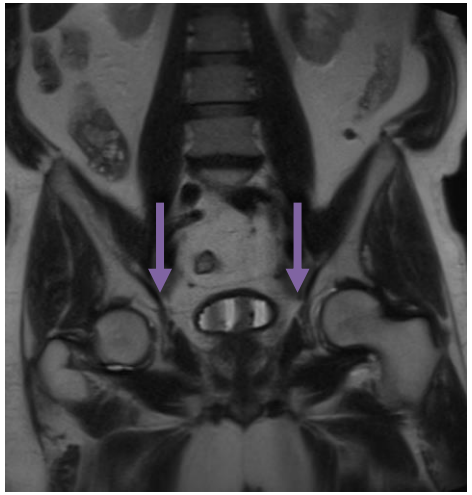
2. Using localizers, ensure that sequence covers from the sacral promontory (→) to the anal verge (→) craniocaudally; from the sacrum (→) to the pubic symphysis (→) anteroposteriorly; and from right pelvic sidewall to left pelvic sidewall laterally (→).

3. Confirm that saturation bands have been automatically placed just anterior and cranial to the specified field of view to reduce motion artifacts.

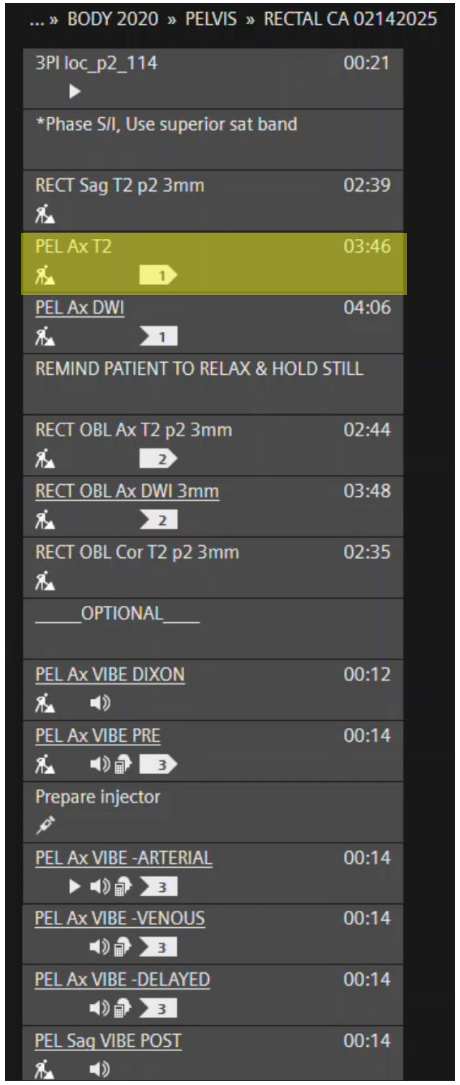








Protocol Use: PEL Ax T2



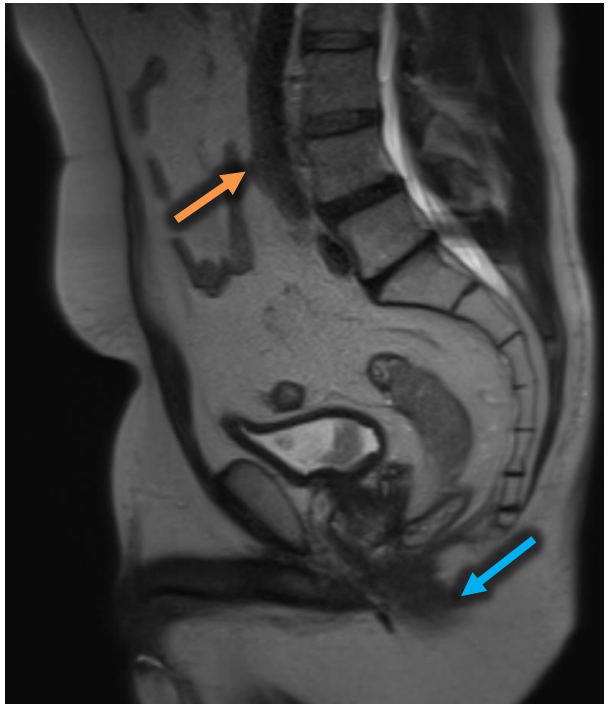
Notes:

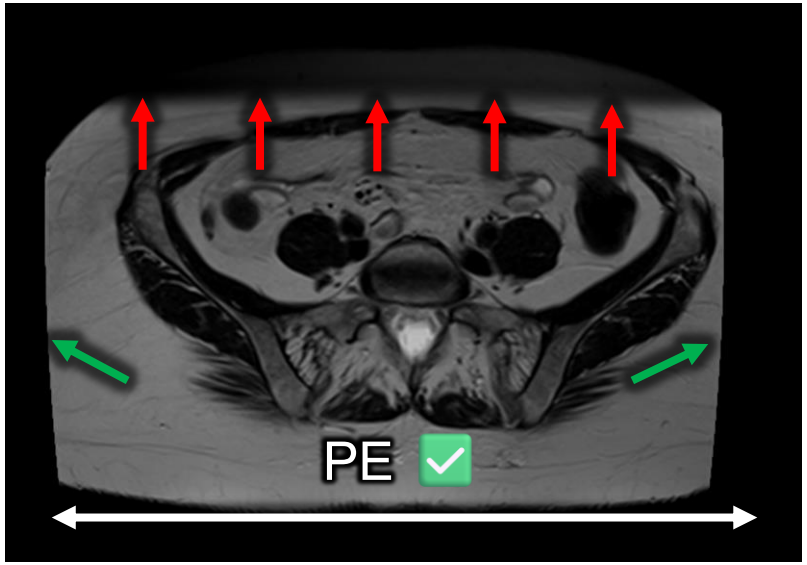
1. Using localizers, ensure that craniocaudal coverage extends from the inferior mesenteric artery origin (→), which is usually several centimeters above the aortic bifurcation, through the anal verge (→).

2. Using localizers, ensure that craniocaudal coverage includes all osseous, muscular, and visceral structures. It is okay to exclude portions of subcutaneous fat (→), particularly in overweight patients.

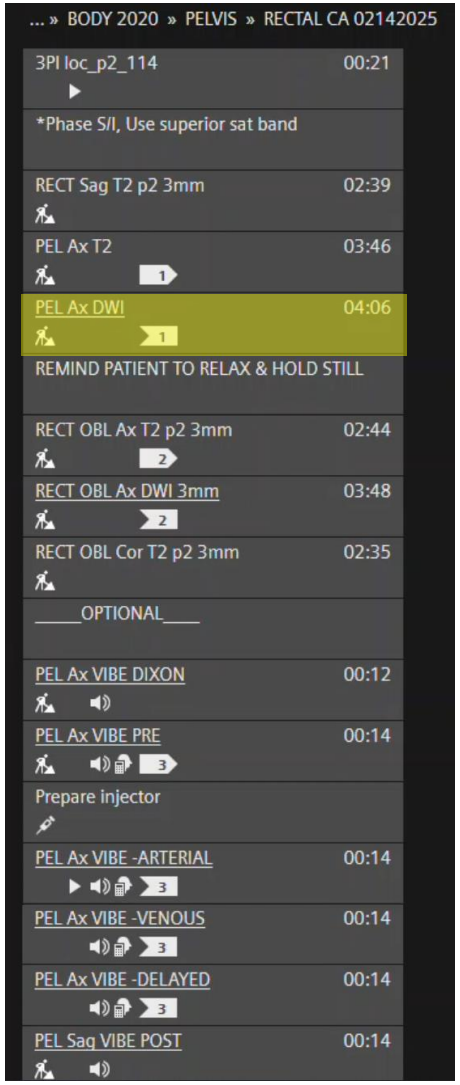
3. Ensure that phase-encoding (PE) direction is oriented right-left.

4. Saturation band should also be placed over the anterior abdominal wall (→) to reduce motion artifacts.



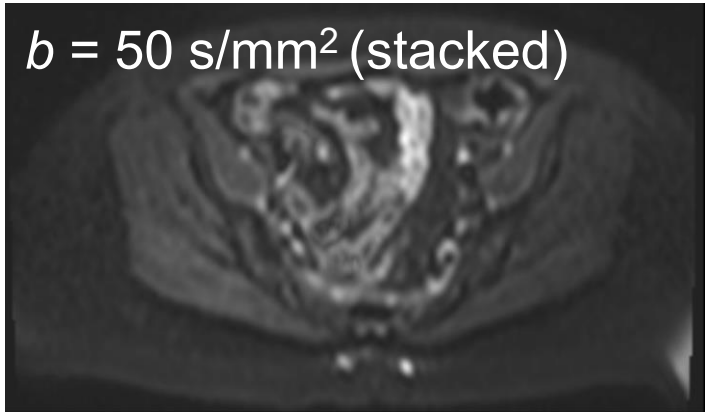


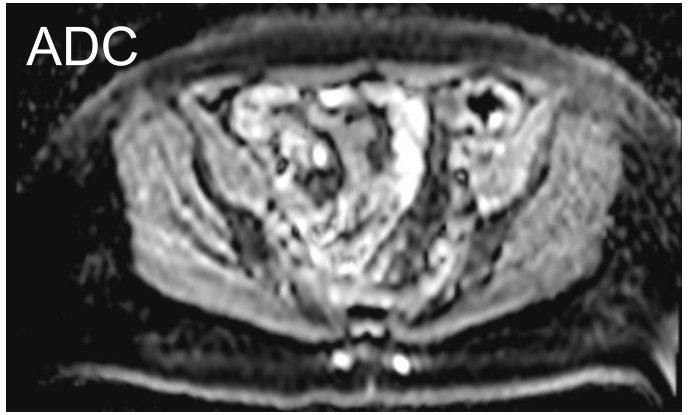
Protocol Use: PEL Ax DWI

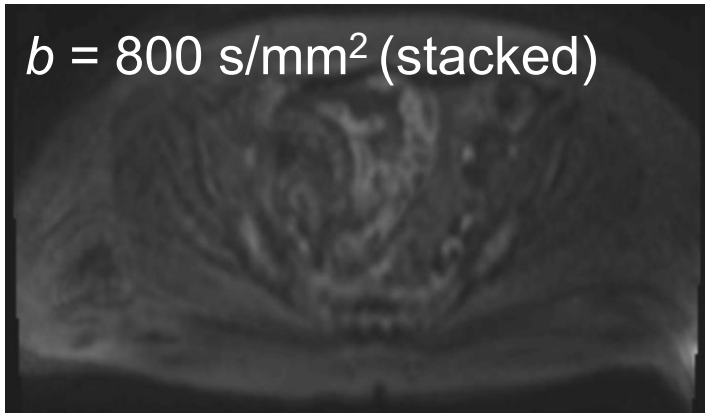


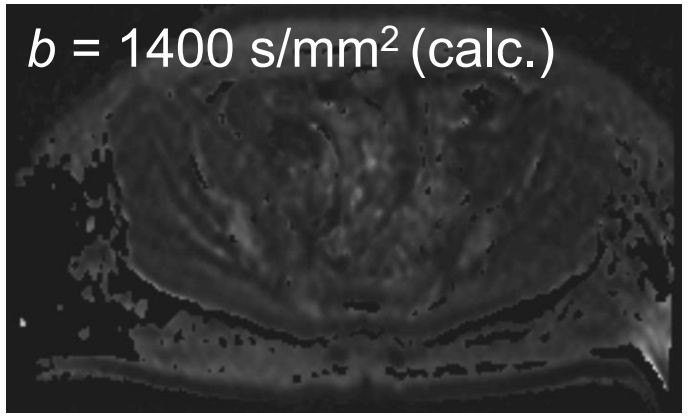
Notes:

1. Coverage should match that of the *PEL Ax T2* sequence.
2. This sequences generates four image sets, as shown below.

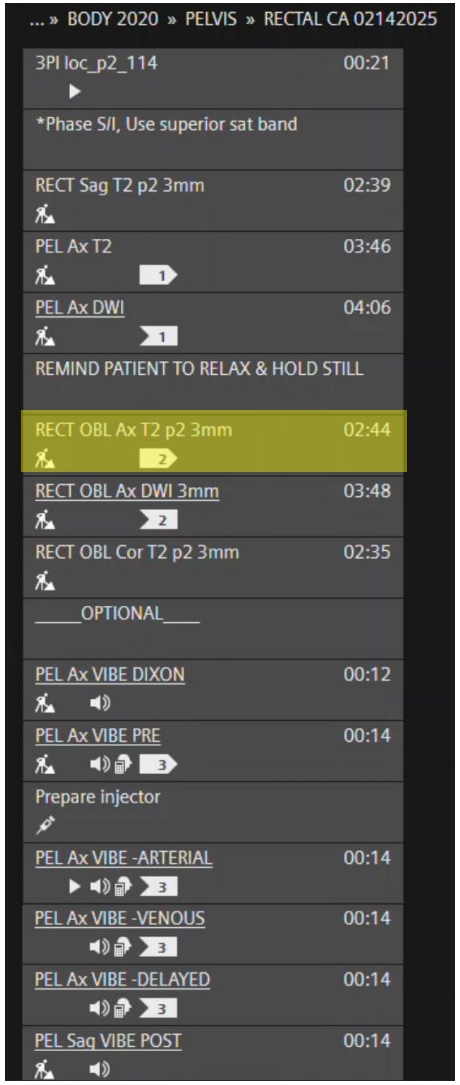








Protocol Use: RECT OBL Ax T2 p2 3mm



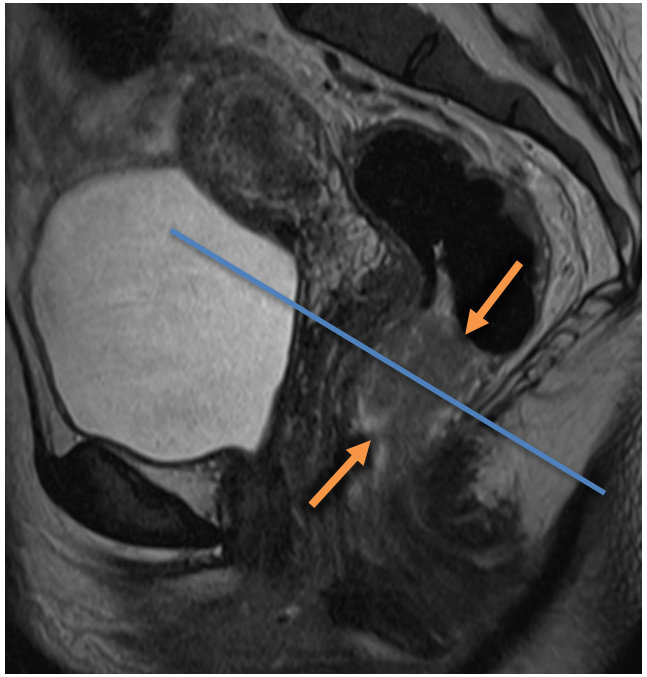
Notes:

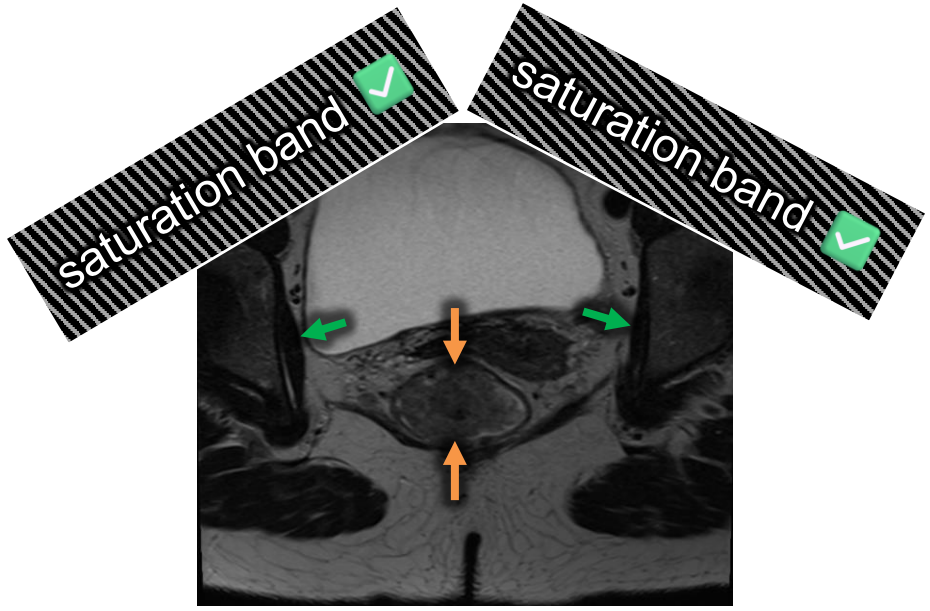
1. Using the *RECT Seg T2 p2 3mm* sequence for reference, set this sequence's obliquity (blue line) to be perpendicular to the orientation of the rectal lumen at the location of the tumor (→), as shown. Some tumors may "follow the bend" of the rectum. Use the middle of the tumor's longitudinal extent to define the obliquity.

2. The default through-plane coverage of the sequence should be centered on the tumor (→). Additional slices may be added for tumors involving a long length of the rectum.

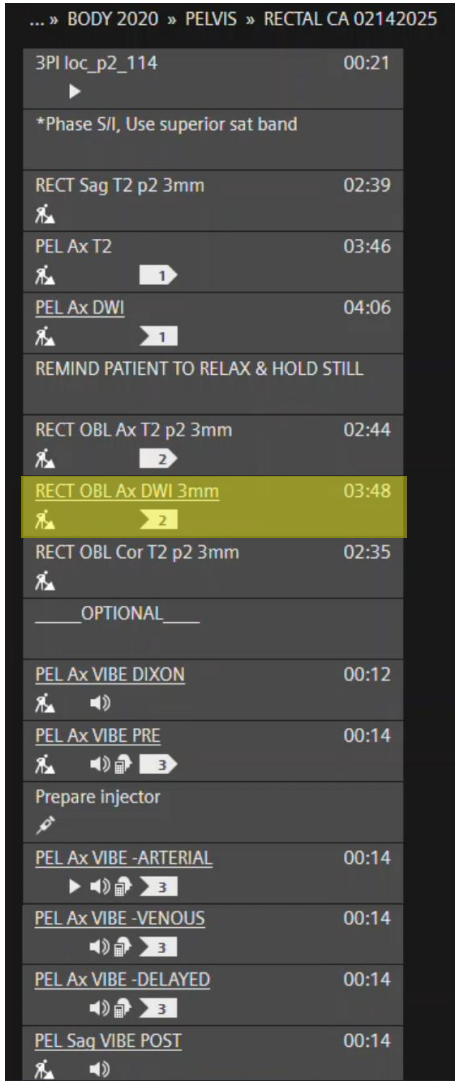
3. The default in-plane coverage should be centered on the tumor (→) and should include the pelvic side-walls (→).

4. Ensure that saturation bands are situated along the anterolateral aspects of the axial field-of-view.





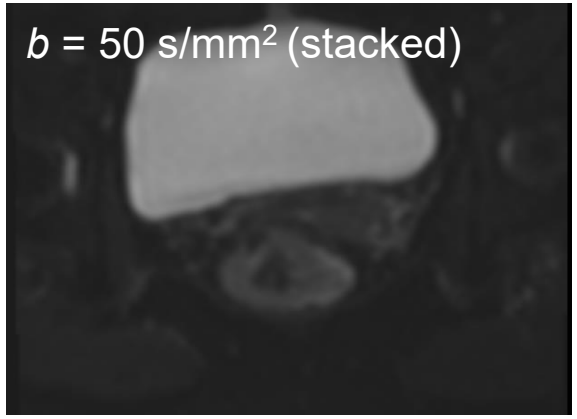
Protocol Use: RECT OBL Ax DWI 3mm

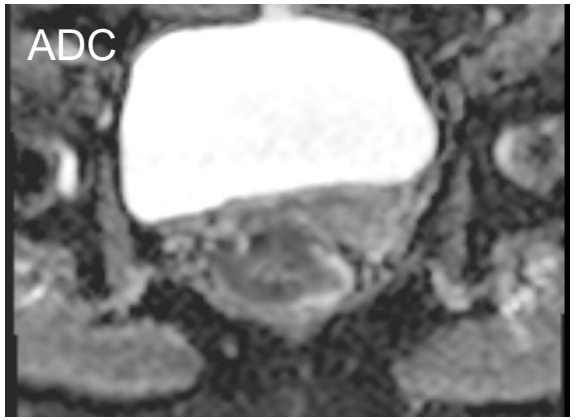


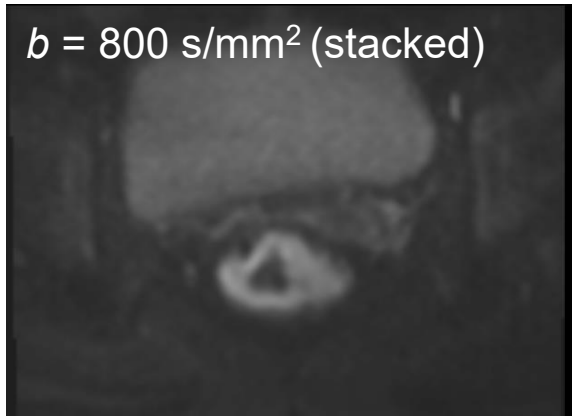
Notes:

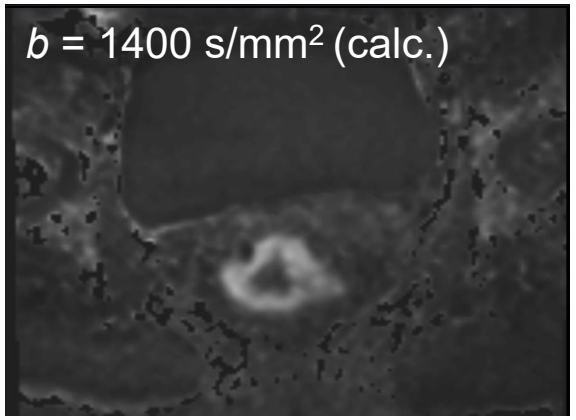
1. Coverage and slice orientation (i.e., obliquity) should match that of the *RECT OBL Ax T2 p2 3 mm* sequence to facilitate cross-sequence correlation of imaging findings.

2. This sequences generates four image sets, as shown below.

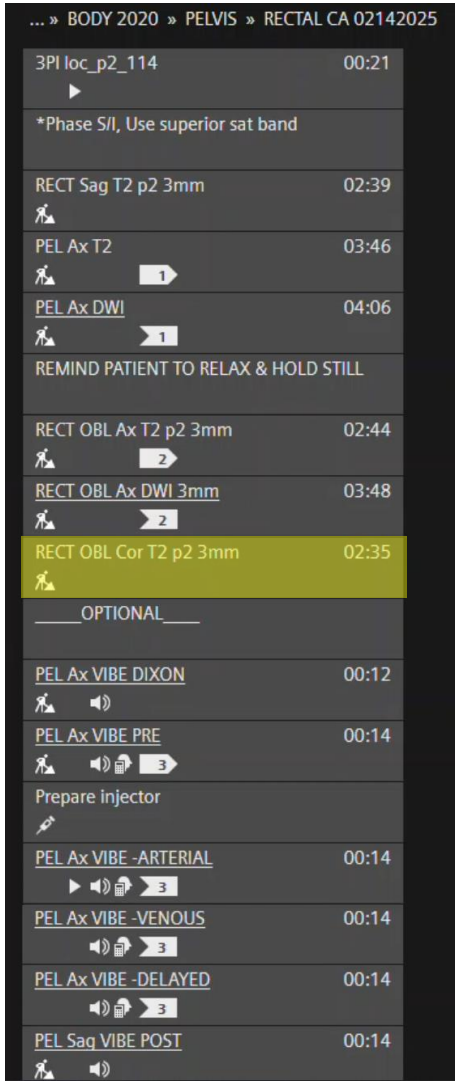








Protocol Use: RECT OBL Cor T2 p2 3mm



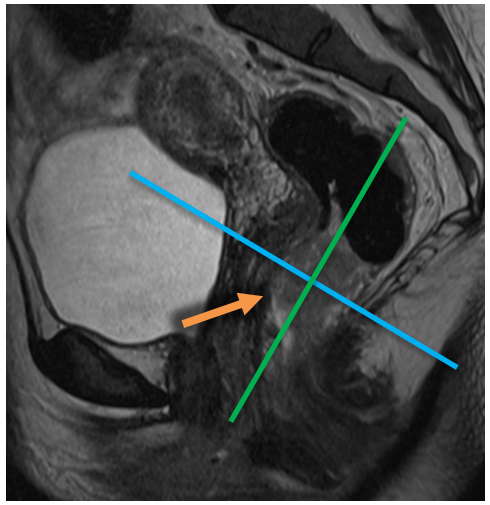
Notes:

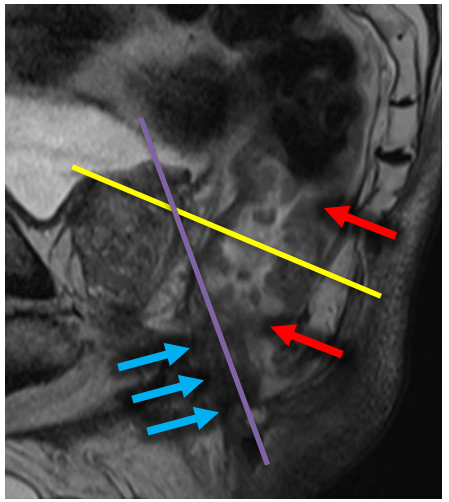
1. Use the *RECT Seg p2 3mm* sequence for planning.

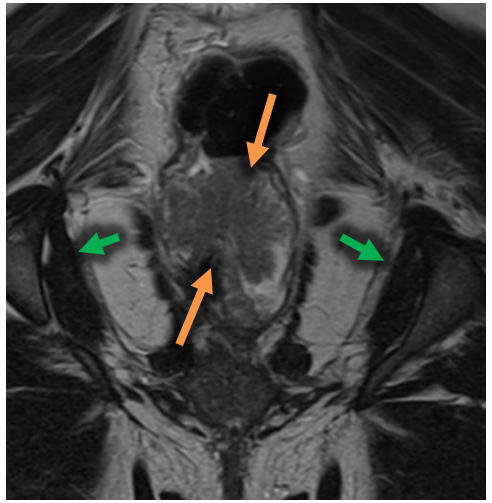
2. For tumors (→) in the upper or middle rectum, set this sequence's obliquity (green line) to be perpendicular to the previously defined obliquity (blue line) for the *RECT OBL Ax T2p2 3mm* sequence acquisition.

3. For tumors (→) in the low rectum (i.e., inferior margin near or involving the anal sphincter complex), set this sequence's obliquity (purple line) to be parallel to the anal canal (→) rather than perpendicular to the plane used for the *RECT OBL Ax T2p2 3mm* sequence acquisition (yellow line).

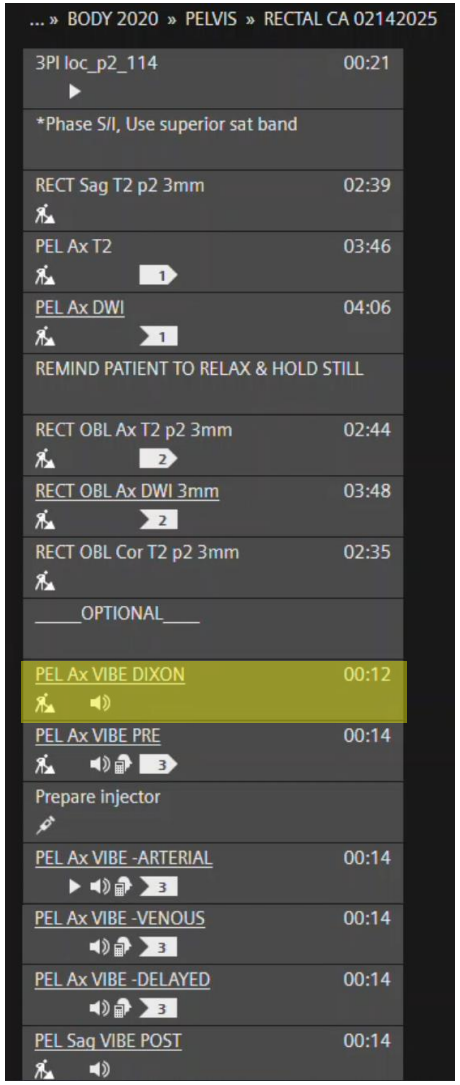
4. The default in-plane coverage should be centered on the tumor (→) and should include the pelvic side-walls (→).







Protocol Use: PEL Ax VIBE DIXON

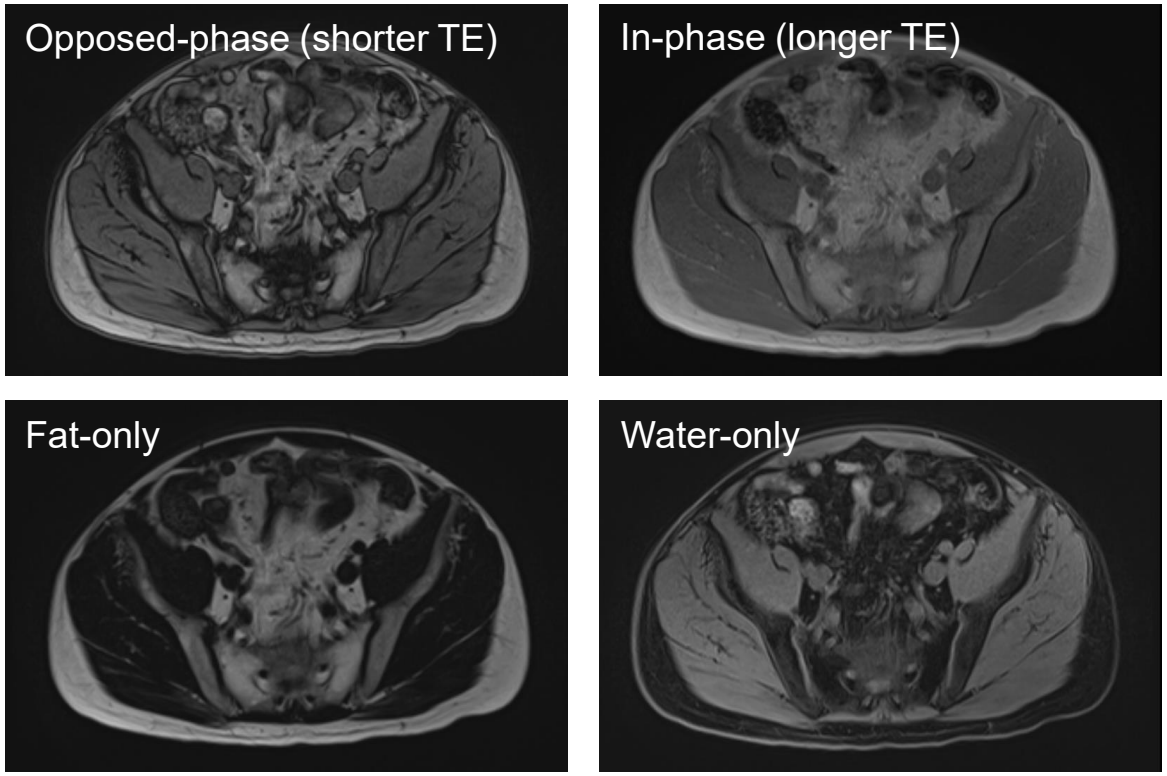


Notes:

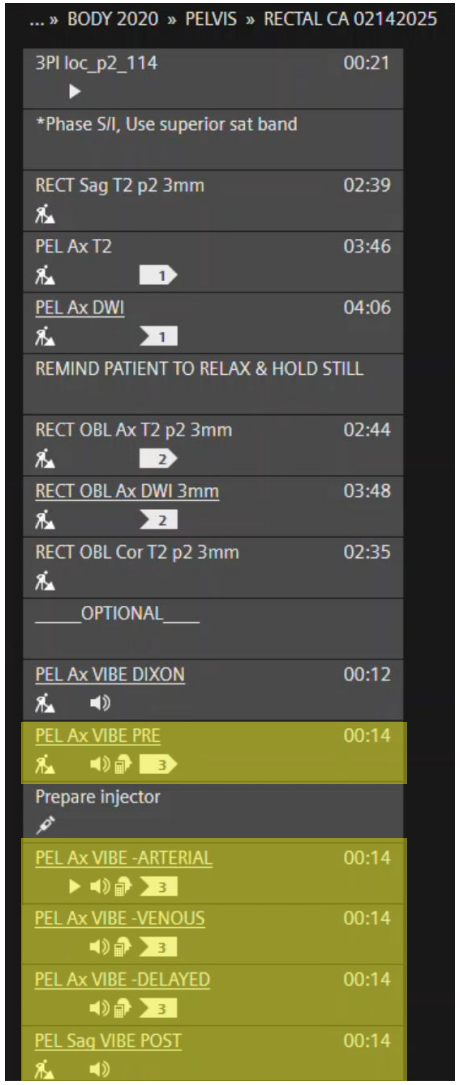
1. This sequence is optional. The acquisition time is quite short. It can be useful for characterizing incidental bone lesions and for identifying foci of extraluminal gas (longer TE in-phase images).

2. Coverage should match that of the *PEL Ax T2* sequence.

3. This sequences generates four image sets, as shown below.



Protocol Use: PEL Ax VIBE (pre/post-contrast)

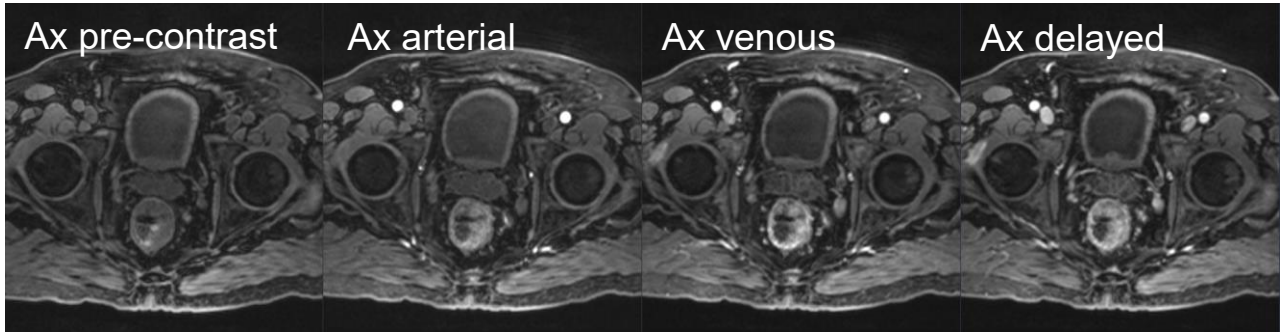


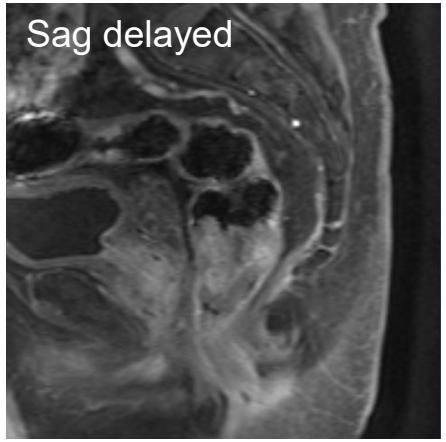
Notes:

1. These sequences are optional. Their acquisition time is relatively short. Contrast-enhanced T1-weighted images are generally not needed at initial staging but may be helpful for post-treatment restaging and surveillance in the watch-and-wait setting, particularly if the diffusion-weighted images are degraded by artifacts.

2. For axial acquisitions, coverage should match that of the *PEL Ax T2* sequence. Acquisitions are performed at 30 sec (arterial), 60 seconds (venous), and 120 sec (delayed) post-contrast.

3. For sagittal acquisition, coverage should match that of the *RECT Seg p2 3mm* sequence. Acquisition is performed immediately after the axial images are complete.





Questions or comments?

We’d love to hear from you!

Please shoot us an email:

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SAR
Society of Abdominal Radiology