Body MR protocols (MCR)

When reaching out to the rads with questions, if possible, Please always include MRN or link of the case on PACS chat if it is applicable, because many times, answers are specific to that particular patient.

Updates Feb 2025:

- **Scrotum/testes: FOV updated in the document; need smaller FOV- plz see the protocol for details**
- **MR chest: Plz call rad before the study on what to focus and after the study (before letting the patient go) to see if images are adequate**
- **MR pelvis (placenta protocol): plz see the full protocol.**

General Updates for October 2025

- MR urogram: axial T2 non fat sat (NOT axial T1 non fat sat); diffusion should include both abd and pelvis; precon LAVA/VIBE should be both abdomen and pelvis; coronal post con should include bladder as well, prefer bladder coverage over liver
- **Any study with indication of palpable lump/mass, please ALWAYS place surface marker on at least two sides of the palpable finding.**
- Vaginal gel for all GYN cancer (cervical or vaginal or endometrial cancer)1
- MRI chest: no need to do candy-cane view by default; ALL chest MRI would benefit from discussion with the rads (exam can be shorter and can run important sequences earlier to decrease artifact), if feasible; so discussion is highly encouraged.

General Updates for July 2024

- All enterography in SUPINE position, NOT prone.
- Please send subtractions for all studies including MR pelvis
- Add T1 fat sat axial small FOV and T2 axial non-fat sat pre-contrast small FOV for MR pelvis if the indication is endometriosis (small FOV should be coverage similar to prostate MRI)
- MR pelvis-fibroid: should also have AXIAL precon T1 fat sat (LAVA/VIBE)
- Will start iron quantification sequences (in process, update in near future)

General Updates for March 2024

- Add T2 sagittal to renal protocol (some sites already doing this)
- Add NON fat sat axial T2 (not FIESTA) to enterography protocol (some sites already doing this)
- Please send subtractions

General Updates for January 2024

- Add T2 sagittal to renal protocol (some sites already doing this)
- Add NON fat sat axial T2 to enterography protocol (some sites already doing this)

Protocols

- Abdomen/Pelvis
- Abdomen- Liver
    - Post-treatment
    - Cholangiocarcinoma
    - Eovist
- Abdomen- Pancreas
- Abdomen- Adrenals
- Abdomen- Kidneys
- Abdomen- Appendicitis (pregnancy)
- MRCP
- Abdomen + MRCP
- Abdomen without contrast
- Enterography
- Pelvis-Rectum
- Pelvis- Anal fistula
- Prostate
- Pelvis- Penile or Scrotum/testicles
- Pelvis- Routine
- Pelvis- placenta
- Pelvis- Fibroids or Uterine Anomaly
- Pelvis- Cervical, vaginal, endometrial cancer
- Pelvis- pelvic floor or Defecogram
- Pelvic congestion
- Pelvis- Urethra (diverticulum)
- MR Urography
- MRAs

- Chest
- Chest MRA
- Chest/Abdomen/Pelvis

ABDOMEN + PELVIS COMBO

Coronal HASTE/SSFSE large FOV for both abdomen and pelvis (do not include chest)

Axial HASTE/SSFSE	BOTH abdomen and pelvis
Axial HASTE/SSFSE FS	BOTH abdomen and pelvis
Axial DIFFUSION/ADC (must go to B1000)	BOTH Abdomen and Pelvis
Axial IN/OUT PHASE BH	ABDOMEN ONLY
Sagittal T2 FSE *	PELVIS ONLY
Axial T1 VIBE FS PRE BH	BOTH abdomen and pelvis

Contrast

ABDOMEN ONLY axial T1 VIBE FS arterial 20 sec
ABDOMEN ONLY axial T1 VIBE FS venous 40 sec
ABDOMEN ONLY axial T1 VIBE FS venous 70 sec
ABDOMEN ONLY axial T1 VIBE FS 3 min delay
PELVIS ONLY axial T1 VIBE FS delay following abdomen ~4min
ABDOMEN + PELVIS COMBINED Coronal T1 VIBE FS ~5 min delay

*this sagittal T2 sequence ONLY needs to be performed if there is a specific indication (female pelvic pain).

ABDOMEN- LIVER

Coronal SSFSE BH
Axial SSFSE
Axial SSFSE FS
Axial diffusion
Axial in/out
Axial LAVA FS pre

Axial LAVA FS 20/40/70
Axial LAVA FS 3 min delay
Axial LAVA FS 5 min delay

Special Situations

***HCC/Liver Treatment**
Coronal LAVA FS delay
-axial subtractions

***Cholangiocarcinoma**
Axial LAVA FS 20 minute delay

***Eovist**
Axial LAVA FS 20 min delay

ABDOMEN- Pancreas

Coronal SSFSE BH
Axial SSFSE
Axial SSFSE FS
Coronal FIESTA FS
Axial diffusion
Axial in/out
Axial LAVA FS pre

Axial LAVA FS 20/40/70
Axial LAVA FS 3 min delay

ABDOMEN- Adrenals

Coronal SSFSE BH
Axial SSFSE
Axial SSFSE FS
Axial in/out
Coronal in/out
Axial LAVA FS pre
diffusion/ADC

If contrast needed (per order or by radiologist- pheochromocytoma)
Axial LAVA FS 20/40/70
Coronal LAVA FS 3 min delay

ABDOMEN- Kidneys

Coronal SSFSE BH
Sagittal SSFSE/HASTE
Axial SSFSE
Axial SSFSE FS
Axial diffusion
Axial in/out
Axial LAVA FS pre

Axial LAVA FS 20/40/70
Axial LAVA FS 3 min delay
Coronal LAVA FS 4 minute delay

ABDOMEN- Appendix (appendicitis in pregnancy)

Coronal SSFSE BH
Axial SSFSE
Axial SSFSE FS
Sagittal SSFSE

Call rad to localize appendix/cecum and then do smaller FOV of that area

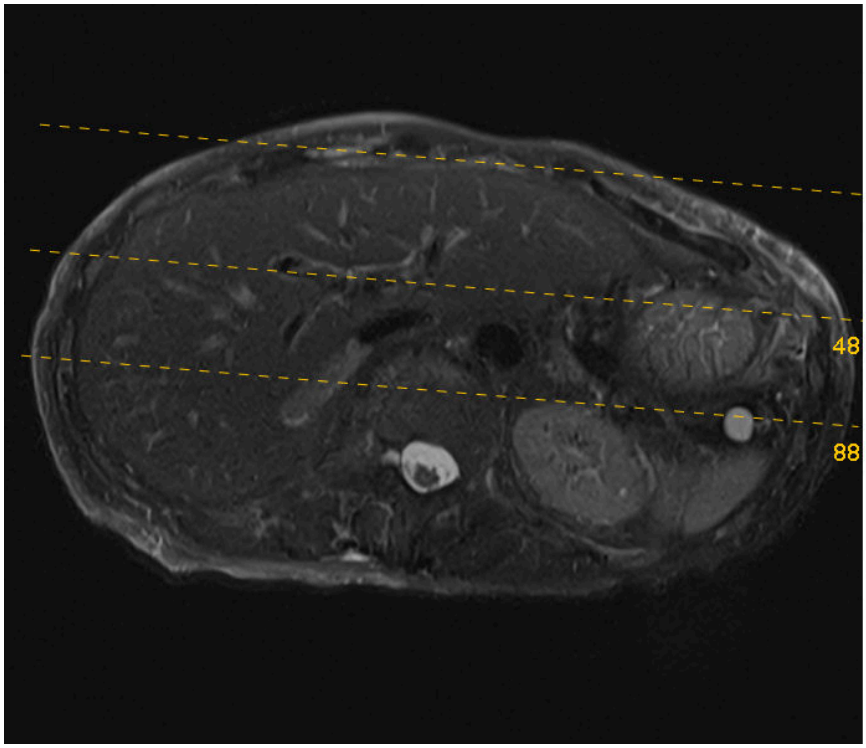
Axial T2 FS
Coronal T2 SSFSE FS
Axial FIESTA
Axial in/out phase

MRCP
Coronal SSFSE
Axial SSFSE
Axial diffusion
Coronal FIESTA FS
Axial in/out
Axial LAVA pre FS
Coronal T2 FS 3D MRCP
Coronal T2 FS Radial
Coronal SSFSE FS thin
Axial SSFSE FS thin

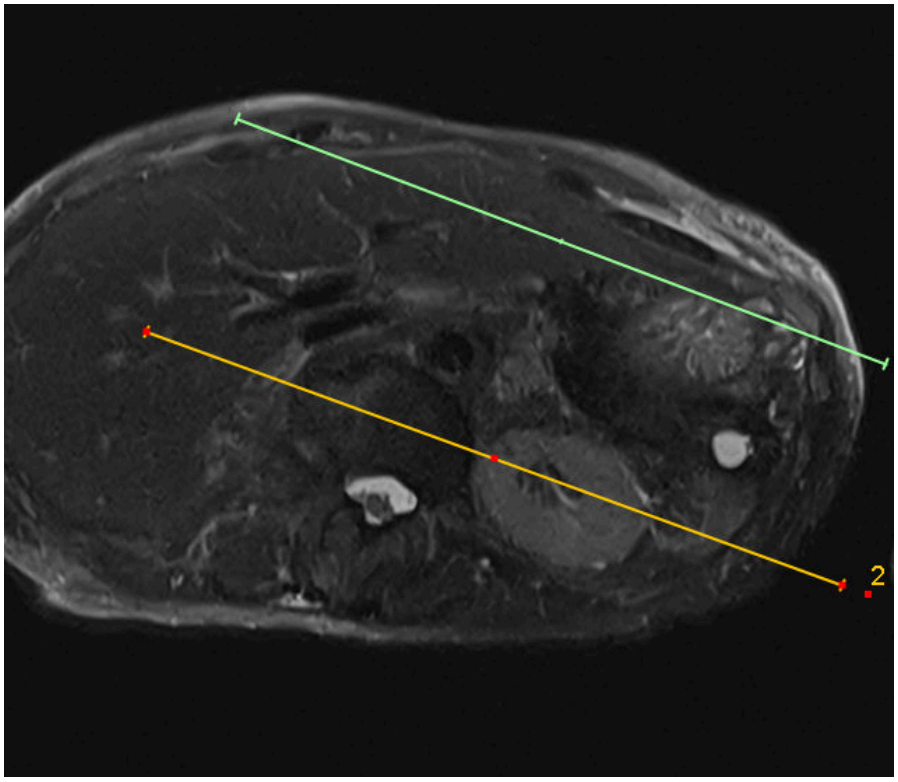
Note: When running MRCP, plz figure out what is the area of interest, CBD or panc head/neck vs tail area. Cause might not always be practical to include all the biliary and pancreatic area in FOV, so in those case, try your best to include that particular area in MRCP even if it means sacrificing rest of the biliary or pancreatic anatomy.

plz make optimal effort to include region of interest in MRCP sequences espe 3D thin section e.g.

clinical question is panc tail cyst, but this angulation did not include tail cyst optimally,



instead, it should have been,



ABDOMEN + MRCP

Coronal SSFSE BH
Axial SSFSE
Axial SSFSE FS
Axial diffusion
Axial in/out
Axial LAVA pre

Axial LAVA 20/40/70
Axial LAVA 3 min delay
Axial LAVA 5 min delay

Coronal FIESTA FS
Coronal T2 FS 3D MRCP
Coronal T2 FS Radial

Coronal SSFSE FS thin

ABDOMEN- WITHOUT

Coronal SSFSE BH
Axial SSFSE
Axial SSFSE FS
Axial diffusion
Axial in/out
Axial LAVA FS pre

Enterography

- All enterography should be done in SUPINE position, NOT prone.

Coronal cine
Coronal SSFSE BH
Coronal FIESTA
Axial SSFSE FS
Axial T2 HASTE (NO fat sat)
Axial FIESTA
Axial diffusion
Axial LAVA pre
Coronal LAVA pre

Coronal LAVA post
Axial LAVA post

Coronal LAVA 1 min delay
Axial LAVA 1 min delay

Coronal LAVA 2 min delay
Axial LAVA 1 min delay

RECTUM STAGING MRI

Sagittal T2 HASTE/SSFSE to find tumor site. CALL RADIOLOGIST TO CONFIRM SITE AND DETERMINE SCAN PLANE ANGLED TO LOCATION OF MASS.

LARGE FOV PELVIS T2 HASTE AXIAL (Non Fat Sat)
LARGE FOV PELVIS T1 AXIAL (Non Fat Sat)

SMALL FOV ANGLED TO THE LOCATION OF THE MASS : 3mm or thinner/ no gap, 12-20cm to cover the rectum segment of concern

Sagittal, Axial oblique, Coronal oblique T2 FSE (NO FAT SAT!) VS. 3D T2 MPR thin reconstructed in axial, sagittal, coronal if scanner capable
Diffusion to B1000, ADC (? oblique axial)
Axial VIBE FS (? oblique)
sagittal, Axial oblique, coronal oblique VIBE FS GAD

LARGE FOV pelvis True Axial VIBE FS GAD delay

*** Always give rectal gel, irresepctive of surgical status (e.g. colostomy), except if pt has no anal canal-rectum e.g. after APR abdominoperineal resection (as long as patient is agreeable)***

ANAL FISTULA MR

SMALL FOV LOWER RECTUM THROUGH LOW BUTTOCK SKIN ANGLED TO PLANE OF ANAL CANAL FOR ALL: 3mm / no gap, 12-20cm, CALL RADIOLOGIST IF QUESTION ABOUT COVERAGE/FISTULA LOCATION

Axial and Coronal T2 FSE
Axial and Sagittal STIR
Axial T1
Axial T1 VIBE FS
Axial, Sagittal, and Coronal T1 VIBE FS GAD

PROSTATE MRI

LARGE FOV pelvis T1

SMALL FOV SEQUENCES (TRUE AXIAL): 3 mm or thinner/ no gap, 12-20cm to cover entire prostate and seminal vesicles
Axial, Sagittal, Coronal T2 FSE (NO FAT SAT!)
Diffusion to at least B1500
ADC map
Axial VIBE FS
Axial VIBE FS GAD dynamic (immediate scanning at injection, ~7sec/acquisition, for 2 min)

PENILE OR TESTICLE/SCROTUM MRI

POSITIONING: Patient supine w/ towel between upper thighs to elevate scrotum. Dorsiflexed penis placed vertically against midline anterior abdominal wall & taped to prevent motion. Scan plane angled to position of the penis. Image penis through scrotum. 3/5 in. surface coil

Axial, sagittal, coronal T2 FSE: small FOV 16 cm (see fig), upto 20 cm is okay

- in plane of penis (if indication is penile) or
- regular plane (if indication is testicle)

Axial T2 HASTE FS small FOV 16 cm
Axial T1; wide FOV 32-34 cm
DWI to B1000, ADC; wide FOV 32-34 cm
Axial T1 VIBE FS; wide FOV
Axial, Sag T1 VIBE FS GAD; wide FOV

<u>If history is TRAUMA then add</u>:
Sagittal T2 FS small FOV 16 cm
Axial T1 IN/OUT of phase

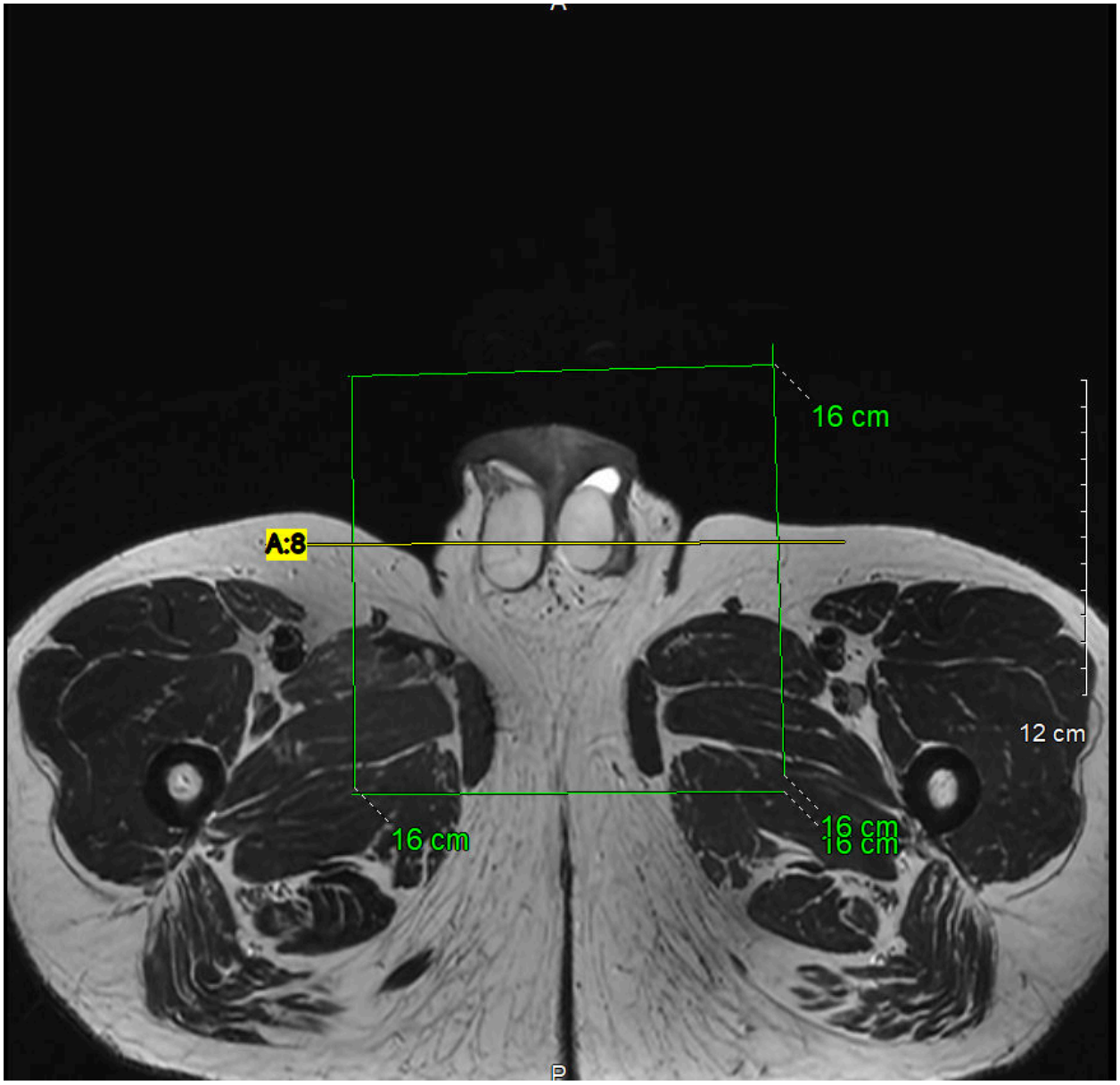
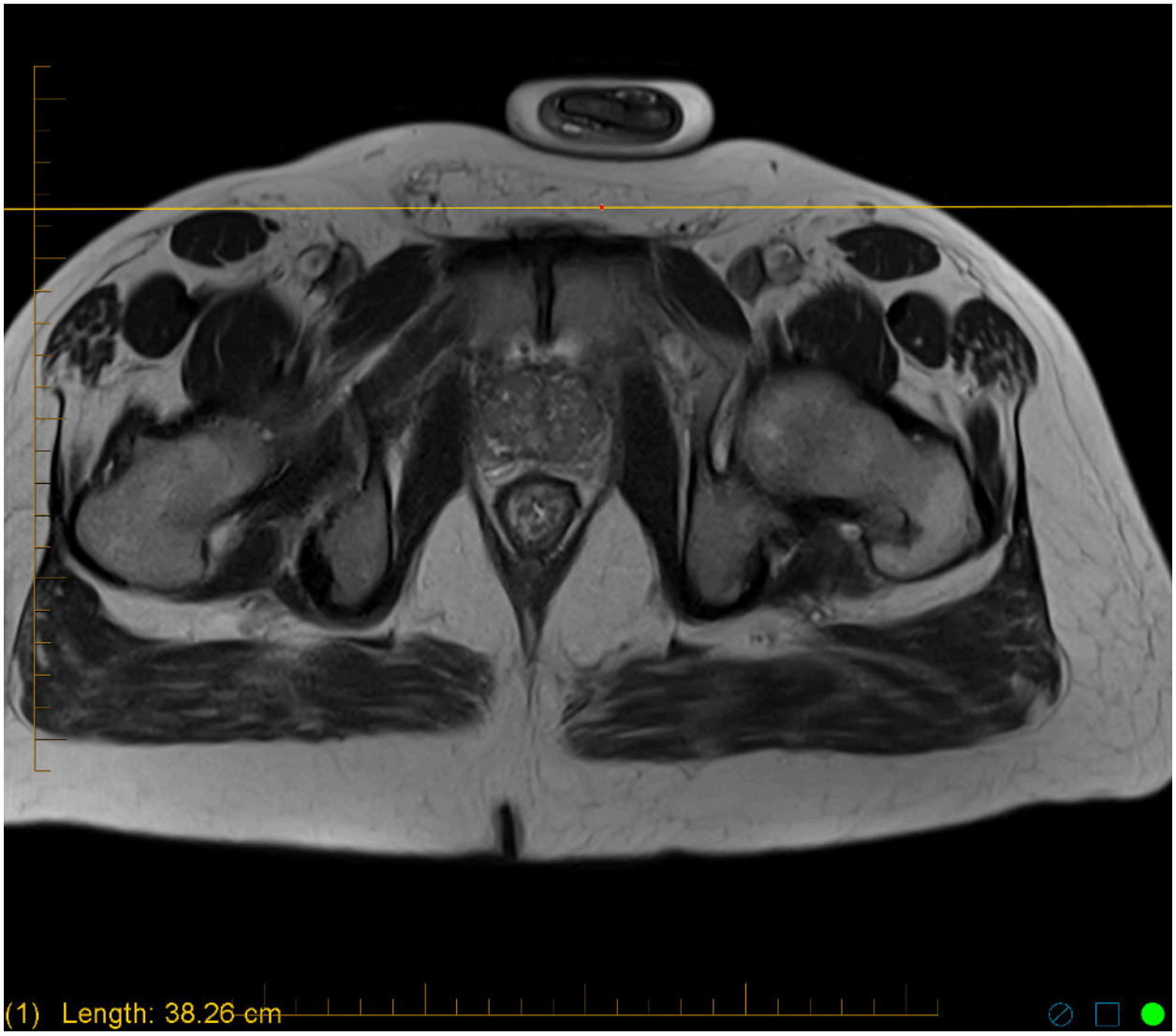


Fig. 16 cm FOV should include only the area in the green square:



This is too wide FOV: should be 16, upto 20 is acceptable. but 38 is not.

this axial T2 FSE is too wide FOV and thus the testicular lesion can be too small to visualize.

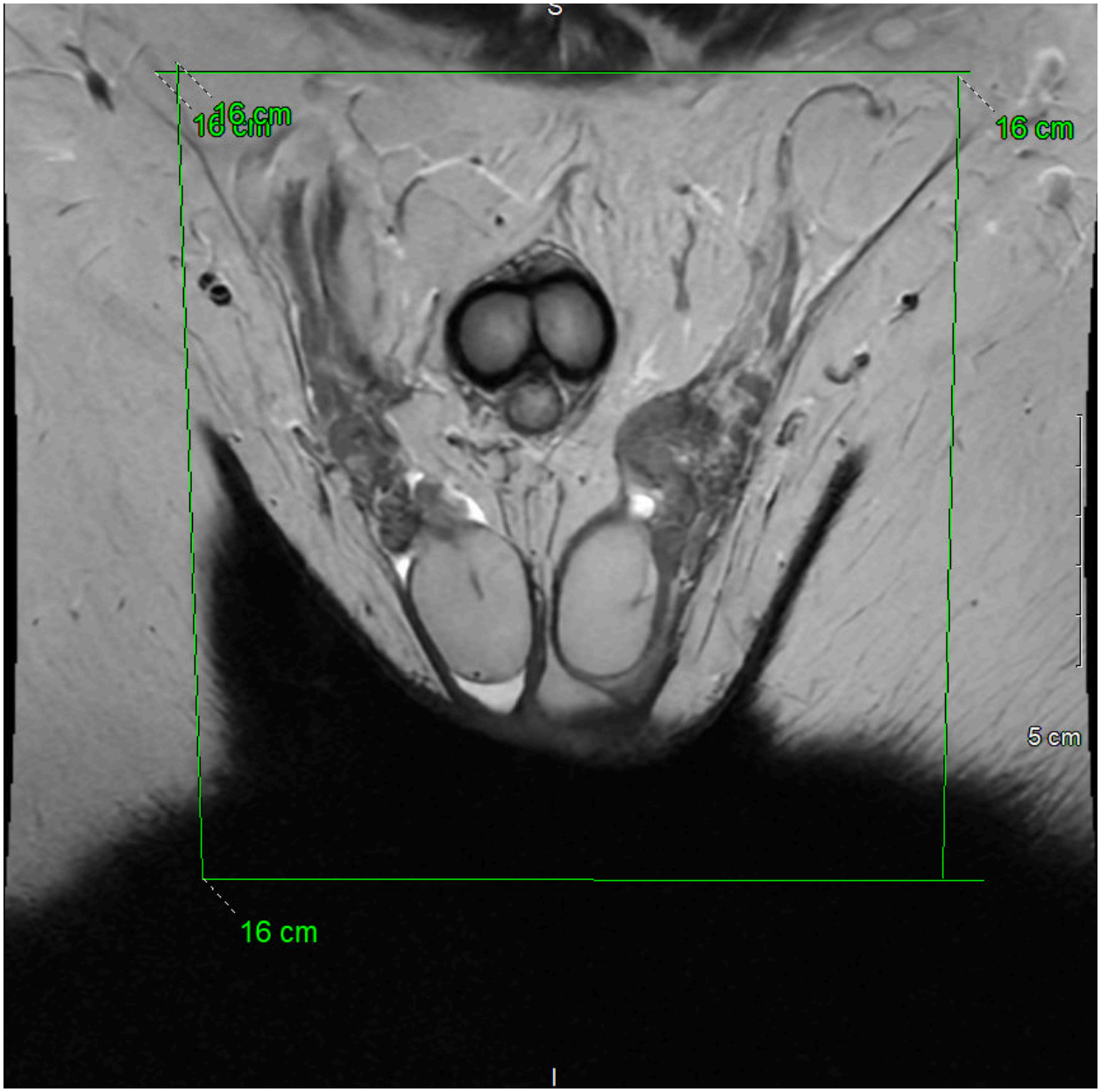


Fig. This coronal T2 small FOV is better but still too wide; need to still decrease FOV to 16 cm.

Routine pelvis (male or female)
If indication is endometriosis: Add T1 fat sat axial small FOV and T2 axial non-fat sat pre-contrast small FOV for MR pelvis (small FOV should be coverage similar to prostate MRI)

coronal T2 HASTE (true, NOT oblique)
axial T2 HASTE (true, NOT oblique)
axial T2 HASTE FS (true, NOT oblique)

axial T1 TSE (true, NOT oblique)

axial diffusion (true, NOT oblique)

axial T2 TSE (true, NOT oblique)
sagittal T2 TSE
coronal T2 TSE (true, NOT oblique)

axial VIBE FS pre (true, NOT oblique)
axial VIBE FS post (true, NOT oblique)
coronal VIBE FS post (true, NOT oblique)
sag VIBE FS post

Pelvis: placenta

Happens rarely, but needs good quality as stakes are super high.

- **coronal T2 HASTE and True-FISP/FIESTA**
- **Sagittal T2 HASTE and True-FISP/FIESTA**
- **Axial T2 HASTE and True-FISP/FIESTA**
- **LAVA/VIBE fat sat axial**
- **LAVA/VIBE fat sat sagittal**
- **DWI axial + Sagittal**

Notes: Plz put sat band on anterior abdominal wall if motion is bad.
Please call a radiologist to see if any sequence needs to be repeated at or during the study before finishing the study.

Pelvis – fibroids

Sag T2 TSE
Axial T2 TSE- oblique to uterus
Coronal T2 TSE- oblique to uterus

Axial T2 HASTE
Axial T2 HASTE FS
Axial T1 TSE

Axial diffusion

Axial VIBE FS pre
Sagittal VIBE FS post – 15 seconds, 1 min, 2 min
Coronal VIBE FS post
Axial VIBE FS post

Pelvis- Cervical, Vaginal, Endometrial Cancer

Vaginal gel for all GYN cancer (cervical or vaginal or endometrial cancer)

Sagittal T2 HASTE/SSFSE to find site of interest (cervix, vagina, endometrium). Angle scan plan to the specific area/mass. Please call radiologist if any questions.

LARGE FOV PELVIS T2 HASTE
LARGE FOV PELVIS T1

SMALL FOV ANGLED TO THE LOCATION OF THE MASS : 3mm or thinner/ no gap, cover area of concern
Axial, Sagittal, Coronal T2 FSE (NO FAT SAT!)

Diffusion/ADC (with gel in place, might need higher B value to avoid T2 shine through e.g. B1200 or B1400 - can be acquired or synthetic high B value)
Axial VIBE Fat sat precontrast
Axial, sagittal, coronal VIBE FS GAD

LARGE FOV pelvis Axial VIBE FS GAD delay

Pelvis: Pelvic floor dysfunction or defecogram

Pelvic Congestion

Pelvic Congestion:1.5T
-coverage: abdomen (above renal vessels + pelvis combined)

Sag HASTE
Cor HASTE
Ax HASTE

Ax TRUFI
Sag TRUFI
Ax VIBE FS
Ax TOF 2D Pelvis
COR TWISTttf (start scan at same time as injection, every 6 seconds for 2 minutes- full venous phase)
Ax VIBE FS 3 min Delay

Urethra:
Large FOV T2 HASTE AXIAL Pelvis
14cm FOV 3mm, 0 gap: Axial, Sagittal, Coronal T2 FSE

Axial T1 VIBE pre
Axial, Sagittal, Coronal T1 VIBE post gad

Axial diffusion

MR Urography

-vigorous oral prehydration as soon as pt arrives; Urinary bladder needs to be optimally distended for this study; if bladder NOT full on localizer, then encourage more drinking water/fluid & wait for 10-15 mins.

3 plane localizer abdomen/pelvis
Coronal SSFSE abdomen/pelvis
Axial T2 A/P (non Fat sat)
Axial RT FS FSE T2 A/P
Axial 3D FS GRE precontrast ABDOMEN & PELVIS
Axial and coronal 3D FS GRE postcon ABDOMEN (20 seconds, 45s, 5 min)
Axial postcon pelvis (5 min delay)
Opposed phase axial abdomen
Axial abdomen post-processed
Axial diffusion abdomen & pelvis

Coronal 3D Nav (MRCP type) kidneys and ureters & bladder (plz make every effort to include bladder, can sacrifice diaphragm, liver dome)

Noncontrast fast for obstruction

Axial T1 A/P
Axial SSFSE A/P
Coronal 3D Nav (MRCP type) kidneys and ureters

MRA

1. Renal MRA
Axial and Coronal HASTE
Axial and Coronal TRUFI
Coronal 3D MRA FS Post Con (arterial)
Axial VIBE FS post con
Additional MRV Sequence: 3 mins post con Coronal 3D MRA

2. Mesenteric MRA
Axial and Coronal HASTE
Axial and Coronal TRUFI
Sagittal 3D MRA Post Con (arterial)
Axial VIBE FS post con
Additional MRV Sequence: 3 mins post con Sagittal 3D MRA

3. AAA MRA
Axial and coronal HASTE
Axial and coronal TRUFI
Coronal 3D MRA FS post con (arterial)
Axial VIBE FS post con

Coronal 3D MRA FS (3 minutes post)

Chest

Chest MRA
Axial and Coronal HASTE
Axial and Coronal TRUFI
Oblique Sagittal 3D MRA Post Con. "Candy Cane Aorta" plane. Obliqued to the direction of the aorta arch.
Axial VIBE FS post con
Additional MRV Sequence: 90 seconds post con Coronal 3D MRA

Chest MR
Axial and Coronal HASTE
Axial and Coronal TRUFI
Axial T1 VIBE Precontrast
Axial T1 in and out of phase
Axial Diffusion
Axial Postcontrast T1 VIBE
If indication is:

- thymus-related or anterior mediastinal lesion→ be sure to get good quality out and in phase on axial and sagittal plane small FOV
- mediastinal cyst→ be sure to get axial T2 fat sat and axial T2 non fat sat (to see cystic nature and also to detect any fat)
- chest pain (nonspecific)--> be sure to get axial T2 fat sat or STIR (to see edema or inflammation).

Chest/Abdomen/Pelvis
Coronal SSFSE- chest
Coronal SSFSE- A/P
Axial SSFSE- CAP
Axial SSFSE FS- CAP
Axial diffusion- abdomen
Axial in/out- chest/abd
Axial LAVA FS pre- CAP

Axial LAVA FS 20/40/70- abdomen
Axial LAVA FS chest
Axial LAVA FS 3 min delay- abdomen
Axial LAVA FS delay- pelvis

Axial FIESTA if non-con