CT Abdomen - Adrenal Mass
CT Abdomen - Appendix for Pediatric Patients
CT Abdomen - Appendix for Pregnant Patients
CT Abdomen - Cystogram
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CT Angiogram Chest - Pulmonary Embolism for Pregnant Patient
CT Angiogram Chest - Pulmonary Embolism
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CT Angiogram Coronary
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CT Angiogram Neck Only (Carotid and Vertebral Arteries)
CT Angiogram Head and Neck combined
CT Angiogram for GI Bleeding
CT Angiogram of the Mesenteric Arteries
CT Angiogram of the Renal Arteries
CT Angiogram Runoff
CT Angiogram TAVR
CT Angiogram Upper Extremity
CT Chest - Aortic Dissection
CT Chest - High Resolution CT

CT Chest - Lung Cancer Detection
CT Chest - Neck/Chest/Abd/Pel
CT Chest - Nodule
CT Chest - Trauma Chest/Abd/Pel with spine
CT Chest - Trauma Chest/Abd/Pel with spine-Pediatric
CT Chest with Contrast
CT Chest/Abd or Chest/Abd/Pel
CT Extremity for Infection
CT Extremity - Ankle -Foot
CT Extremity - Elbow
CT Extremity - Hand or Wrist
CT Extremity - Knees
CT Extremity - Shoulder
CT Head - Facial Bones
CT Head - Orbits
CT Head - Pediatric Head for Craniosynostosis
CT Head - Sella
CT Head - Sinus Complete
CT Head - Soft Tissue Neck
CT Head -Soft Tissue Neck /Parathyroid Adenoma
CT Head - Stroke Alert Protocol
CT Head - Temporal Bone
CT Head - Adult Protocol
CT Head - Pediatric Protocol 0-5 years
CT Head-Venogram
CT Pelvis - Pelvis/Hips for Fracture or Bone Lesion
CT Spine - Cervical Post Myelogram
CT Spine - Cervical
CT Spine - Lumbar Post Myelogram
CT Spine - Lumbar
CT Spine - Thoracic
CT Guided SI Joint Injections
Misc - Contrast Consent Form
Misc - Contrast Extravasation Policy
Misc - Contrast Reaction Home Care Instructions
Misc – Contrast Premedication Indications

TRANSLATION OF TERMS

TOSHIBA	SIEMENS	PHILLIPS	GE
Sure Exposure	Caredose	ICT – doserite	Dose Reduction
Surestart	Bolus Tracking	Bolus Tracking	Smart Prep
Scanogram	Topogram		Scout

The other terms are self-explanatory, if you have questions please contact us at RCI.

Abdomen CT for adrenal nodule workup

This protocol is designed for detection and characterization of clinically suspected adrenal nodules. The decision on whether to give IV contrast for suspected pheochromocytomas will be at the discretion of the interpreting radiologist. If an extra-adrenal pheochromocytoma is suspected and IV contrast given, include pelvis on post IV contrast portion of the exam.

1. Prep: Clear liquids 4 hrs prior to exam.

2. Enteric contrast: None.

4. Scan Parameters

a. FOV: Variable by patient size

b. MA: Use dose reduction software if available, otherwise 300-400 MA

c. KV: 120

d. Scan time: 0.5 second

e. Pitch: As appropriate per detector configuration

f. Raw thickness: 1mm [1.25mm]

g. Image slice thickness: 3mm [2.5mm]

h. Table Increment: 3 mm [2.5mm]

i. Reconstruction Interval: 3 mm [2.5mm]

j. Reconstruction algorithm: Soft Tissue

5. Pre IV Contrast Scans- Scan from lung bases through crest. Have radiologist review the images to evaluate if IV contrast exam will be necessary.

IV Contrast Administration: If giving contrast use Standard concentration (eg: Omnipaque 300) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 3mL/sec.

6. Post IV Contrast early phase: lung bases to crest. **70 second delay**. If an extraadrenal pheochromocytoma is suspected, then scan through the pelvis, through the pubic symphysis.

7. Delayed Scan: **15 minute delay** through abdomen.

10. Reconstructions: Coronal and Sagittal x 3 mm on all contrast phases

Radiologist information: Determine RPW (Relative % Washout) and APW (Absolute % Washout) for each adrenal nodule

pre=attenuation of nodule on precontrast exam

venous=attenuation of nodule on 70 second delay

delay=attenuation of nodule on 15 minute delay

RPW= 100 x (venous-delayed)/(venous-pre)

APW= 100 x (venous-delayed)/venous Online calculator: http://www-hsc.usc.edu/~phillimc/calc/adrenal_ct.html

Adenoma if RPW > 40% and APW > 60%

See Powerscribe template “Reference Incidental Adrenal” to correctly followup indeterminate lesions

Last revised 10/03/2023 HRM

CT Appendix for Pediatric Patients
[GE slice thickness in brackets]

1. Indication - Pediatric patients with suspected appendicitis

2. Prep – Clear liquids after midnight or > 4 hrs. prior to exam.

3. Enteric contrast: Oral 2 hr prep (doses given 2 hours, 1 hour and 30 minutes prior to scan):

    i. under 3 years = see rad
    ii. 3-6 years 120 mL x 3 for 360 ml total.
    iii. 6-12 years 166 ml x 3 for 500 ml total
    iv. 12-18 years 250 ml x 3 for 750 ml total (same as adult

4. One CT image at the top of the iliac crest will be obtained 2 hours after the initiation of the oral contrast (or an AP scout). Contrast must be in the cecum before proceeding with the abdomen and pelvis CT. If the technologist is unsure if the prep is adequate (contrast in the right colon) have the Radiologist review and determine what the next step is.

5. Scan parameters:
    a. FOV: Variable by patient size
    b. MA: Use dose reduction software if available, otherwise 200-300 MA
    c. KV: 120
    d. Scan time: 0.5 sec
    e. Pitch: As appropriate per detector configuration
    f. Raw thickness: 1 mm [1.25 mm]
    g. Image slice thickness: 3 mm
    h. Table Increment: 3 mm [2.5 mm]
    i. Reconstruction interval: 3 mm [2.5 mm]
    j. Reconstruction algorithm: Soft Tissue

6. Pre IV Contrast Scans for localization only.

7. IV Contrast Administration: 1 ml per pound up to a maximum dose of up to 100 ml contrast as a single dose injection; Preferably administration of contrast will be done with a power injector at the highest rate as determined by type and location of IV access. Hand injection is acceptable when power injection is not possible. Use a 70 second delay before image acquisition (do not use Surestart).

8. Post IV Contrast Scans: Liver dome to pubic symphysis. One run only.

9. Delay scan: None.

10. Reconstructions: Coronal and Sagittal x 3 mm. Send soft tissue algorithm and reconstructions to PACS. No lung algorithm needed on abdomen CT.

Last revised 10/03/2023 HRM

CT Appendix for Pregnant Patients

[GE slice thickness in brackets]

1. Indication - Pregnant patients in 2nd or 3rd trimester with suspected appendicitis

   The following algorithm can be used for imaging pregnant patients for suspected appendicitis
   1st trimester: options for imaging include US and MRI. Do not use CT.
   2nd and 3rd trimester: options include US, MRI or CT at the discretion of the covering radiologist.

   Notification – The Radiologist must be notified before the exam occurs so consent can be obtained. Scan is to be limited to pregnant women who are in their 2nd or 3rd trimester.

2. Prep – Clear liquids after midnight or > 4 hrs prior to exam.
3. Enteric contrast-
   a. Oral
   1. Gastroview and/or Gastrografin-250 ml 1 hr, 250 ml ½ hour, and 250 ml immediately prior to exam-the diluted recommendations are listed as 7.5 ml GV in 250ml water.
4. Other: None

5. Scan parameters:
   a. FOV: Variable by patient size
   b. MA: Use dose reduction software if available, otherwise 300-400 MA
   c. KV: 120
   d. Scan time: 0.5 sec
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 1 mm [1.25 mm]
   g. Image slice thickness: 3 mm [2.5 mm]
   h. Table Increment: 3 mm [2.5 mm]
   i. Reconstruction interval: 3 mm [2.5 mm]
   j. Reconstruction algorithm: Soft Tissue

6. Pre IV Contrast Scans for localization only

7. IV Contrast Administration: Standard concentration (eg:Ultravist 300) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 3mL/sec. Use 70 second delay (do not use Surestart)

8. Post IV Contrast Scans: Liver dome to pubic symphysis. One run only.

9. Delay scan: None
10. Reconstructions: Coronal and Sagittal x 3 mm, lung algorithm not needed on abdominal CT.

Send soft tissue algorithm and reconstructions to PACS

Last revised 10/03/2023 HRM

CT CYSTOGRAM

[GE slice thickness]

1. Indications:
    a. Pre-operative evaluation for suprapubic catheter placement.
    b. Suspected bladder wall rupture: traumatic or iatrogenic
    c. Suspsected bladder fistula: vaginal, rectal or small bowel
    d. Suspected vesicourethral anastomotic leak
2. Intra-vesicular contrast:
    a. Foley catheter: placed by ED provider, urologist or radiology nurse. Clamp prior to examination.
    b. Dilute 2-3% solution of iodinated contrast media (100 mL of 300-320 mg/I Isovue, Optiray or similar into 1000 mL normal saline) OR
    c. 50% dilution of Cystografin (e.g. 300mL Cystografin diluted with 300 mL normal saline)
    d. Instillation:
        i. Gravity, approximately 200-400 mL contrast volume, stop if patient experiences pain
        ii. Recently post-operative (<6 weeks): limit to 350 mL or when patient subjectively feels "full"
3. IV contrast (optional):
    a. Indications:
        i. Pre-operative evaluation for suprapubic catheter placement: No.
        ii. Suspected bladder wall rupture: No.
        iii. Suspected bladder fistula: Yes.
        iv. Suspected vesicourethral anastomotic leak: check with radiologist
    b. Contrast media: standard concentration nonionic contrast medium (e.g. Omnipaque 300)
    c. Administration:
        i. Access: peripheral IV (18-22G). Power PICC or Power Port
        ii. Injection rate 3 mL/sec.
4. Acquisitions
    a. Pre-contrast: pelvis only
    b. Full bladder: bottom of liver through pelvis
        i. IV contrast (optional) administered during this scan
        ii. Contact radiologist to check images for suspected rupture, fistula or anastomotic leak
        iii. Do not contact radiologist for pre-operative evaluation of suprapubic catheter placement
    c. Post void (optional): pelvis only, or as directed by the radiologist
5. Scan parameters
    a. Scan coverage: as above
    b. FOV: variable
    c. MA: Dose modulation, 300-400 mA
    d. KV: 120
    e. Raw thickness: 1 mm [1.25 mm]
6. Reconstructions
    a. Slice thickness: 3 mm [2.5 mm]
    b. Interval: 3 mm [2.5 mm]
    c. Algorithm: soft tissue

Last revised 10/22/2024 HRM

CT Enterography

[GE slice thickness in brackets]

1. Indication: Evaluation of diseases of the small intestine (Crohn's disease and small bowel obstruction. For other small bowel disease, please contact the radiologist first.)

2. Prep: NPO>4hrs

3. Enteric contrast: Negative contrast
   a. Four (450mL) bottles of Citra Select (Genus) or similar contrast followed by 500 mL water over 60 minutes. Drink one 450 mL bottle of Citra Select or similar contrast every 15 minutes. Directly before the exam drink 500 mL water.

4. Other: none

5. Scan parameters:
   a. FOV: Variable by patient size
   b. MA: Use dose reduction software if available, otherwise 300-400 MA
   c. KV: 120
   d. Scan time: 0.5 second
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 1mm [1.25mm]
   g. Image slice thickness: 3mm [2.5mm]
   h. Table Increment: 3 mm [2.5mm]
   i. Reconstruction Interval: 3mm [2.5mm]
   j. Reconstruction algorithm: Soft Tissue

6. Pre IV Contrast Scans- For localization only

7. IV contrast administration - Iohexol 300 mg/ml (Omnipaque) up to 100 ml IV (18g-22g upper extremity peripheral IV, Power PICC or Power Port). Injection rate 3 mL/sec. Start scanning 50 seconds after contrast is administered.

8. Post IV contrast scan: Scan entire abdomen and pelvis.

9. Delay scan: none

10. Reconstructions: Coronal and Sagittal images x 3 mm
    Send axial images to Vitrea
    Send soft tissue algorithm and reconstructions to PACS

    Last revised 10/03/2023 HRM

CT Abdomen or Abdomen/Pelvis for Post Gastric Bypass/ Gastric Sleeve Surgery

[GE slice thickness in brackets]

1. Indication: CT of the abdomen, or abdomen and pelvis with IV and oral contrast to evaluate the integrity of gastric surgery, or evaluate for potential complications of gastric surgery.

2. Prep: Clear liquids after midnight or >4 hours prior to exam.

3. Enteric contrast-
   a. Oral (Use one of the following)
   1. Gastroview and/or Gastrografin – 200ml 1 hr prior to exam, and 50 ml immediately prior to the exam. The 50ml will be administered in the CT Suite under the supervision of the CT Technologist. The diluted recommendations are listed as 7.5ml GV in 250ml water.

4. Other-
   a. Rectal- As per radiologist
   b. Vaginal tampon as per radiologists for female patients with suspected gynecologic, rectal or pelvic masses.
   c. Clamp Foley catheter prior to exam (unclamp when exam finished!).

5. Scan parameters for CT Abdomen
   a. FOV: Variable by patient size
   b. MA: Use dose reduction software if available, otherwise 300-400 MA
   c. KV: 120
   d. Scan time: 0.5 second
   e. Pitch: as appropriate per detector configuration
   f. Raw thickness: 1mm [1.25mm]
   g. Image slice thickness: 3mm [2.5mm]
   h. Table Increment: 3 mm [2.5mm]
   i. Reconstruction interval: 3 mm [2.5mm]
   j. Reconstruction algorithm: Soft Tissue

6. Pre IV Contrast Scans: For localization only

7. IV contrast administration - Standard concentration nonionic contrast medium up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC or Power Port) at 3 mL/sec. with a 70 second delay.

8. Post IV Contrast Scans: Diaphragm through aortic bifurcation (abdomen only), diaphragm through pubic symphysis (abdomen and pelvis) during the portal venous phase of contrast enhancement.

9. Delay images: None

10. Reconstructions: Coronal and Sagittal x 3 mm on venous phase. Send soft tissue algorithm and reconstructions to PACS

Last revised 10/03/2023 HRM

CT Esophagram

[GE slice thickness in brackets]

1. Indication: Esophageal trauma or post-operative complication. Confirm exam protocol with the radiologist.

2. Prep: None

3. Exam (2 total scans):
    a. Non-contrast chest CT:
        i. Coverage: thoracic inlet through adrenals
        ii. Contrast: **NONE.** No oral or IV contrast.
    b. Post-oral contrast chest CT:
        i. Coverage: thoracic inlet through adrenals
        ii. Contrast: oral dose (see #4) +/- IV dose (see #5)

4. Enteric Contrast:
    a. Omnipaque pre-mixed oral solution (9 mg/mL), 500 mL bottle
    b. **To be administered after initial non-contrast exam**.
    c. Half of the contrast (approximately 200-250 mL) should be taken by mouth while sitting up on the table.
    d. Half of the contrast (approximately 200-250 mL) taken by mouth lying down, head turned using a straw immediately prior to scan.

5. IV Contrast: dependent on indication
    a. No IV contrast: esophageal tear, vomiting
    b. IV Contrast: post-operative/post-procedural (recent EGD with biopsy/cauterization, esophagectomy, Roux-en-Y gastric bypass, cardiac ablation)
    c. Standard concentration nonionic contrast medium (e.g. Omnipaque 300), up to 100 ml intravenously (18-22g peripheral IV, Power PICC or Power Port) at 3mL/sec. Use 70 second delay.

6. Scan parameters for all phases of imaging
    a. FOV: Variable by patient size
    b. MA: Use dose reduction software if available, otherwise 300-400 MA
    c. KV: 120
    d. Scan time: 0.5 second
    e. Pitch: As appropriate per detector configuration
    f. Raw thickness: 1mm [1.25mm]
    g. Slice thickness 3 mm [2.5mm]
    h. Reconstruction Interval: 3 mm [2.5mm]
    i. Reconstruction algorithm: Soft Tissue, Lung

7. Reconstructions
    a. Pre-oral contrast images:
        i. Soft tissue kernel: axial, coronal and sagittal 3 mm slice thickness x 3 mm interval
        ii. Lung kernel: axial 3 mm slice thickness x 3 mm interval
        iii. Axial slab MIP: soft tissue kernel, 7 mm slice thickness x 3 mm interval saved to PACS in lung window.
    b. Post-oral (+/- IV) contrast images:
        i. Soft tissue kernel: axial, coronal and sagittal 3 mm slice thickness x 3 mm interval

Multiphase CT Abdomen, Abdomen/Pelvis, Chest/abdomen or Chest/abdomen/pelvis of the Liver

[GE slice thickness in brackets]

1. Indication-Patients with known or suspected liver lesions such as hemangiomas. This protocol should be used for followup of hepatocellular carcinoma, cholangiocarcinoma and neuroendocrine tumor of liver. For many other lesion followup exams, a routine CT with only portal venous phase may be sufficient.

2. Prep: Clear liquids after midnight or >4 hours prior to exam.

3. Enteric contrast- None

4. Other: None

5. Scan parameters
   a. FOV: Variable by patient size
   b. MA: Use dose reduction software if available, otherwise 300-400 MA
   c. KV: 120
   d. Scan time: 0.5 second
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 1mm[1.25mm]
   g. Image slice thickness: 3 mm[2.5mm]
   h. Table Increment: 3mm[2.5mm]
   i. Reconstruction interval: 3mm[2.5mm]
   j. Reconstruction algorithm: Soft Tissue

6. Pre IV Contrast Scans: Axial images of liver only

7. IV Contrast Administration: Inject up to 100 ml standard concentration (eg: Omnipaque 300) nonionic contrast medium at 3 ml/second.

8. Post IV contrast scans:
   a. Arterial phase - 35 second delay, then scan liver. No Surestart.
   b. Portal venous phase - scan entire abdomen 70 seconds after start of contrast injection.
      i. If a pelvis is ordered, then continue through the pelvis.
      ii. If chest/abdomen/pelvis is ordered, then scan the entire chest, abdomen and pelvis (one helical run). Scan from the base of the neck through the perineum.
      iii. If chest, abdomen is ordered scan base of neck to the iliac crests.
   c. Delay scan: Scan entire abdomen during delayed venous phase of contrast enhancement (5 minutes post injection).

9. Reconstructions: Coronal and Sagittal on all 4 phases.
   Send soft tissue algorithm and reconstructions to PACS

Last revised 10/03/2023 HRM

CT Abd, Abd/Pelvis, Chest/Abd or Chest/Abd/Pelvis of the Pancreas 2-12-20

[GE slice thickness in brackets]

1. Indication
    1. Evaluation of a known or suspected pancreas mass
    2. Staging or followup imaging for pancreatic tumor.

For known pseudocyst followup, do a routine single phase CT abdomen or abdomen/pelvis.

2. Prep- Clear liquids > 4 hrs prior to exam.

3. Enteric contrast-
    a. Oral- 8 oz water just prior to scanning

4. Other: None

5. Scan Parameters
    a. FOV: Variable by patient size
    b. MA: Use dose reduction software if available, otherwise 300-400 MA
    c. KV: 120
    d. Scan time: 0.5 second
    e. Pitch: As appropriate per detector configuration
    f. Raw thickness: 1mm[1.25mm]
    g. Image slice thickness: 3 mm[2.5mm]
    h. Table Increment: 3mm[2.5mm]
    i. Reconstruction Interval: 3mm[2.5mm]
    j. Reconstruction algorithm: Soft Tissue

6. Pre IV Contrast Scans- Axial images through pancreas

7. IV contrast administration- Standard concentration (eg:Ultravist 300) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 3mL/sec.

8. Post IV contrast scanning:
    a. (pancreatic phase) 40 second delay then begin scan. Scan entire abdomen, diaphragms to the iliac crests.
    b. (venous phase) Scan entire abdomen 70 seconds after start of contrast injection.
        i. If a pelvis is ordered, then continue through the pelvis.
        ii. If chest/abdomen/pelvis is ordered, then scan the entire chest, abdomen and pelvis (one helical run). Scan from the base of the neck through the perineum.
        iii. If chest, abdomen is ordered scan base of neck to the iliac crests.
    c. Delayed scan: None

9. Reconstructions-
    a. Abd/Pelvis Reconstructions:
        1) MPR Axial, Coronal and Sagittal 3x3 mm soft tissue kernel on ALL PHASES ACQUIRED
    b. Chest Reconstructions:
        1) MPR Axial, Coronal and Sagittal 3x3 mm soft tissue kernel and standard lung algorithm
        2) Axial slab MIPs 7mm thick at 3mm increment, soft tissue kernel, but saved to PACS in lung window/level
    Send 3mm soft tissue and lung algorithm axials, and all reconstructions to PACS

Last revised 10/03/2023 HRM

CT PERITONEOGRAPHY

1. Indication- Recurrent peritonitis, difficulty with fluid exchange, abdominal wall or genital soft-tissue edema, localized bulging of the abdomen, and poor ultrafiltration.

2. Prep- Prior to CT peritoneography, the peritoneal cavity is completely drained of dialysate.

3. Enteric contrast- None

4. IV Contrast- None

5. Other- None

6. Pre Contrast Scan- None

7. A dialysis nurse will instill contrast material into the peritoneal cavity. Strict adherence to an aseptic technique is mandatory. 1 ml/kg of nonionic contrast material (300mg/ml Isovue, Optiray, or other similar iodinated contrast material) is mixed with30 ml/kg of dialysate and infused into the peritoneal cavity. The patient is encouraged to walk, strain and bend for 30 minutes to achieve good distribution of the contrast material and dialysate mixture.

8. Post Contrast Scan-Scan abdomen and pelvis from diaphragm through pubic symphysis. If a leak is suspected, CT should be delayed for 1 hour after administration of contrast material, and repeated at 4 hours if the 1-hour scan is negative. Drain contrast material-dialysate mixture at the end of the procedure.

9. Have Radiologist check images before moving patient from scan table. Lateral decubitus or prone images may be necessary to evaluate questionable findings.

10. Scan parameters for CT
    a. Scan distance: diaphragm through pubic symphysis on post-contrast scan. Charge as abd/pelvis without.
    b. FOV: Variable by patient size
    c. MA: 300-360, or dose modulation (do not overdo dose modulation in large patients)
    d. KV: 120
    e. g. Collimation thickness: 1mm
    f. h. Image thickness: 3mm
    g. Reconstruction algorithm: soft tissue 3 planes

Last revised 8/27/2015 RJS

CT Abdomen/Pelvis Venogram (IVC, portal vein, May-Thurner)

[GE slice thickness in brackets]

1. Indications: Evaluate for venous thrombus within the abdomen and pelvis (IVC, iliacs, portal, splenic and mesenteric, gonadal, renal) or May-Thurner Syndrome.

2. Prep: none.

3. Enteric contrast: none.

4. IV contrast administration: high concentration nonionic contrast medium (Omnipaque 350, Isovue 370, etc.), 100 mL intravenously (18-22g peripheral IV, Power PICC or Power Port) at 3mL/sec.

5. Post-IV contrast scans:
    a. Coverage: lung bases through perineum
    b. Phases:
        i. Portal venous: 70 seconds post-injection
        ii. Delayed: 180 seconds post-injection

6. Scan parameters:
    a. FOV: Variable by patient size
    b. MA: Use dose reduction software if available, otherwise 300-400 MA
    c. KV: 120
    d. Scan time: 0.5 second
    e. Pitch: As appropriate per detector configuration
    f. Raw thickness: 1mm [0.625 mm]
    g. Slice thickness: 3 mm [2.5mm]
    h. Reconstruction Interval: 3 mm [2.5mm]
    i. Reconstruction algorithm: soft tissue

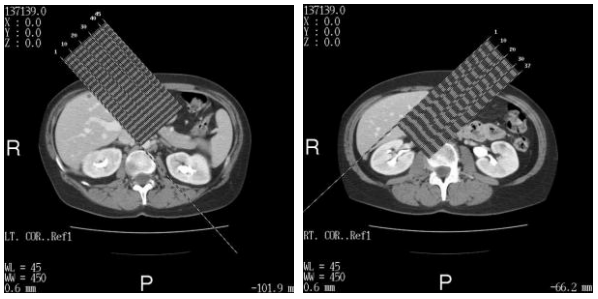
7. Reconstructions:
    a. Soft tissue kernel
    b. MPR: axial, coronal and sagittal 3 mm slice thickness x 3 mm interval

Protocol updated 2/19/25 HRM

CT Urogram: Split-bolus for patients < 40 years old

[GE slice thickness]

1. Indications:
    a. Hematuria (gross or microscopic)
    b. Hydronephrosis
    c. Congenital urinary tract malformation
    d. Transitional cell carcinoma staging and follow-up
2. Oral preparation: 900 mL water approximately 30 minutes prior to examination.
3. Other preparation: Do not allow patients to void after water administration if possible.
4. IV contrast:
    a. Contrast media: standard concentration nonionic contrast medium (e.g. Omnipaque 300)
    b. Volume: 150 mL split into separate 70 ml and 80 ml boluses
    c. Administration:
        i. Access: peripheral IV (18-22G). Power PICC or Power Port
        ii. Injection rate 3 mL/sec.
        iii. Protocol: inject 70 mL of contrast and wait 10 minutes. Then inject 80 mL contrast and scan as detailed below
5. Acquisitions
    a. Pre-contrast: above the diaphragm through the pubic symphysis
        i. Acquire chest images during this scan if ordered
    b. Post-contrast (split-bolus):
        i. 70 second delay after the second 80 mL contrast injection.
        ii. Above diaphragm through pubic symphysis
        iii. **Do not rescan for suboptimal opacification of the ureters**
6. Scan parameters
    a. Scan coverage: as above
    b. FOV: variable
    c. MA: Dose modulation, 300-400 mA
    d. KV: 120
    e. Scan time: 0.5 seconds
    f. Pitch: as appropriate per detector configuration
    g. Raw thickness: 1 mm [1.25 mm]
7. Reconstructions
    a. Non-contrast:
        i. 3-plane reformats: 3 mm [2.5 mm] slice thickness with 3 mm [2.5 mm] interval, soft tissue kernel
    b. Post-contrast (split-bolus):
        i. 3-plane reformats: 3 mm [2.5 mm] slice thickness with 3 mm [2.5 mm] interval, soft tissue kernel
        ii. Oblique coronal reformats of the kidneys: 1 mm [1.25 mm] slice thickness with 1 mm [1.25 mm] interval, soft tissue kernel
        iii. MIP: coronal slab, 10 mm slice thickness with 2 mm interval, soft tissue kernel

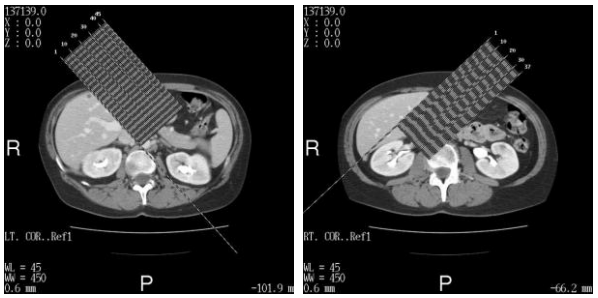


Last revised 7/24/25 HRM

CT Urogram: Single bolus for patients ≥ 40 years old
(or history of urothelial malignancy)

[GE slice thickness]

1. Indications:
    a. Hematuria (gross or microscopic)
    b. Hydronephrosis
    c. Congenital urinary tract malformation
    d. Transitional cell carcinoma staging and follow-up
2. Oral preparation: 900 mL water approximately 30 minutes prior to examination.
3. Other preparation: Do not allow patients to void after water administration if possible.
4. IV contrast:
    a. Contrast media: standard concentration nonionic contrast medium (e.g. Omnipaque 300)
    b. Volume: 150 mL single bolus
    c. Administration:
        i. Access: peripheral IV (18-22G). Power PICC or Power Port
        ii. Injection rate 3 mL/sec.
5. Acquisitions
    a. Pre-contrast: above the diaphragm through the pubic symphysis
    b. Post-contrast:
        i. Nephrographic phase
            1. 90 second delay
            2. Above diaphragm through pubic symphysis
            3. Acquire chest images during this scan if ordered
        ii. Excretory phase
            1. 10-minute delay
            2. Above diaphragm through pubic symphysis
            3. **Do not rescan for suboptimal opacification of the ureters**
6. Scan parameters
    a. Scan coverage: as above
    b. FOV: variable
    c. MA: Dose modulation, 300-400 mA
    d. KV: 120
    e. Scan time: 0.5 seconds
    f. Pitch: as appropriate per detector configuration
    g. Raw thickness: 1 mm [1.25 mm]
7. Reconstructions
    a. Non-contrast:
        i. 3-plane reformats: 3 mm [2.5 mm] slice thickness with 3 mm [2.5 mm] interval, soft tissue kernel
    b. Nephrographic phase:
        i. 3-plane reformats: 3 mm [2.5 mm] slice thickness with 3 mm [2.5 mm] interval, soft tissue kernel
    c. Excretory phase:
        i. 3-plane reformats: 3 mm [2.5 mm] slice thickness with 3 mm [2.5 mm] interval, soft tissue kernel
        ii. Oblique coronal reformats of the kidneys: 1 mm [1.25 mm] slice thickness with 1 mm [1.25 mm] interval, soft tissue kernel
        iii. MIP: coronal slab, 10 mm slice thickness with 2 mm interval, soft tissue kernel



Last revised 7/24/25 HRM

CT Renal Mass 4 Phase Exam

[GE slice thickness in brackets]

1. Indication:
    a. Initial evaluation of an indeterminate renal mass of the renal parenchyma.
    b. Pre-operative Renal Cell Carcinoma (RCC) staging
    c. Initial post treatment CT evaluation of the kidneys after partial nephrectomy or ablation therapy.
    d. Rule out urine leak from kidney or ureter. (Use CT cystogram to rule out a leak from the urinary bladder.)

2. Prep: Clear liquids > 4 hrs prior to exam.

3. Enteric contrast: None

4. Other: None

5. Scan Parameters
    a. FOV: Variable by patient size
    b. MA: Use dose reduction software if available, otherwise 300-400 MA
    c. KV: 120
    d. Scan time: 0.5 second
    e. Pitch: As appropriate per detector configuration
    f. Raw thickness: 1mm [1.25mm]
    g. Image slice thickness: 3mm[2.5mm]
    h. Table Increment: 3 mm[2.5mm]
    i. Reconstruction Interval: 3 mm[2.5mm]
    j. Reconstruction algorithm: Soft Tissue

6. Pre IV Contrast Scans: Axial images of kidneys only

7. IV contrast administration: IV contrast administration- Standard concentration (eg:Omnipaque 300) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 3mL/sec.

8. Post IV contrast scans:
    a. Corticomedullary phase: Scan using 45 second delay post contrast injection. Scan the entire abdomen (diaphragms to iliac crest)
    b. Nephrogenic phase: Scan using 90 second delay post contrast injection. Scan the entire abdomen (diaphragms to iliac crest)
    c. Excretory phase: Scan using 180 second delay post contrast injection. Scan through the kidneys

10. Reconstructions: Coronal and Sagittal x 3 mm on all phases. No lung algorithm needed on abdomen CT.
    Send soft tissue algorithm and reconstructions to PACS

    Last revised 10/03/2023 HRM

CT Renal Mass 2-Phase Exam

[GE slice thickness in brackets]

1. Indications:

A. Followup of a renal parenchymal mass previously evaluated by CT Renal Mass 4-Phase exam.
B. Followup post treatment CT evaluation of the kidneys after PARTIAL nephrectomy or ablation therapy, PREVIOUSLY EVALUATED by a post treatment CT Renal Mass 4-Phase exam.
C. Follow-up renal cell carcinoma (RCC) after radical nephrectomy

2. Prep: Clear liquids > 4 hrs prior to exam.

3. Enteric contrast: None

4. Other: None

5. Scan Parameters
a. FOV: Variable by patient size
b. MA: Use dose reduction software if available, otherwise 300-400 MA
c. KV: 120
d. Scan time: 0.5 second
e. Pitch: As appropriate per detector configuration
f. Raw thickness: 1mm [1.25mm]
g. Image slice thickness: 3mm[2.5mm]
h. Table Increment: 3 mm[2.5mm]
i. Reconstruction Interval: 3 mm[2.5mm]
j. Reconstruction algorithm: Soft Tissue

6. Pre IV Contrast Scans: None

7. IV contrast administration: IV contrast administration- Standard concentration (eg:Omnipaque 300) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 3mL/sec.

8. Post IV contrast scans:

a. Corticomedullary phase: Scan using 45 second delay post contrast injection. Scan the entire abdomen (diaphragms to iliac crest)
b. Nephrogenic phase: Scan using 90 second delay post contrast injection. Scan the entire abdomen (diaphragms to iliac crest)

9. Reconstructions: Coronal and Sagittal x 3 mm on all phases. No lung algorithm needed on abdomen CT. Send soft tissue algorithm and reconstructions to PACS

Last revised 10/03/2023 HRM

CT Renal stone

[GE slice thickness in brackets]

1. Indication: Patients with suspected urolithiasis

2. Prep: None.

3. Enteric contrast: None unless requested

4. Other: None

5. Scan Parameters
   a. FOV: Variable by patient size
   b. MA: Use dose reduction software if available, otherwise 300-400 MA
   c. KV: 120
   d. Scan time: 0.5 second
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 1mm [1.25mm]
   g. Image slice thickness: 3mm[2.5mm]
   h. Table Increment: 3 mm[2.5mm]
   i. Reconstruction Interval: 3 mm[2.5mm]
   j. Reconstruction algorithm: Soft Tissue

6. Pre IV Contrast Scans- Scan from lung bases through the pubic symphysis (same as an abdomen and pelvis CT without contrast).

7. IV Contrast Administration: None

8. Post IV Contrast Scans: None

9. Delay Scan: None

10. Reconstructions: Coronal and Sagittal x 3 mm
    Send soft tissue algorithm and reconstructions to PACS

Last revised 9/13/24
HRM

CT Renal Stone for Pregnant Patients

[GE slice thickness in brackets]

1. Indication - Pregnant patients in their 2nd or 3rd trimester with suspected kidney stone

   The following algorithm can be used for imaging pregnant patients for suspected kidney stone
   1st trimester: Do not use CT
   2nd and 3rd trimester: Patient must have ultrasound first, and must have had a consult and approval by Urologist. Patient must give informed written consent that is scanned into PACS.

2. Prep – None.

3. Enteric contrast- None

8. Other: None

9. Scan parameters:
   a. FOV: Variable by patient size
   b. MA: Use dose reduction software if available, otherwise 300-400 MA
   c. **KV: 120 if ≥ 200lbs, 100 if < 200lbs**
   d. Scan time: 0.5 sec
   e. Pitch: 20 (16 slice), 50-60 (64 slice)
   f. Raw thickness: 1 mm [1.25 mm]
   g. Image slice thickness: 3 mm [2.5 mm]
   h. Table Increment: 3 mm [2.5 mm]
   i. Reconstruction interval: 3 mm [2.5 mm]
   j. Reconstruction algorithm: Soft Tissue

10. Pre IV Contrast Scans: Scan from top of diaphragm to pubic bone

7. IV Contrast Administration: None

8. Post IV Contrast Scans: None

10. Delay scan: None

11. Reconstructions: Coronal and Sagittal by 3 mm
    Send soft tissue algorithm and reconstructions to PACS
    Last revised 2/22/24 GDS

CT Abdomen, Pelvis or Abdomen/Pelvis For Suspected Abdominal Wall or Inguinal Hernia

[GE slice thickness in brackets]

1. Indication: Routine CT of the abdomen, pelvis or abdomen and pelvis for suspected or follow up of known abdominal wall or inguinal hernia.
2. Prep: Clear liquids after midnight or >4 hours prior to exam.
3. Enteric contrast- None
4. Other-
    a. i. may limit scan to the abdomen for suspected abdominal wall hernia that is located above iliac crest.
       ii. may limit scan to the pelvis for suspected inguinal hernia
       iii. if unsure of size or extent of the abdominal wall hernia, include the abdomen and pelvis
    b. use IV contrast unless specifically contraindicated, or ordered without contrast by ordering provider.
    c. place CT visible marker on skin to indicate location of suspected abdominal wall hernia. Marker not needed for suspected inguinal hernia.
    d. Clamp Foley catheter prior to exam (unclamp when exam finished!).
    e. Scan while patient performing a Valsalva maneuver.
5. Scan parameters for CT Abdomen
    a. FOV: Variable by patient size
    b. MA: Use dose reduction software if available, otherwise 300-400 MA
    c. KV: 120
    d. Scan time: 0.5 second
    e. Pitch: As appropriate per detector configuration
    f. Raw thickness: 1mm [1.25mm]
    g. Image slice thickness: 3mm[2.5mm]
    h. Table Increment: 3 mm[2.5mm]
    i. Reconstruction interval: 3 mm[2.5mm]
    j. Reconstruction algorithm: Soft Tissue
6. Pre IV Contrast Scans: For localization only
7. IV contrast administration- Standard concentration (eg:Ultravist 300) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 3mL/sec. Use 70 second delay.
8. Post IV Contrast Scans: For the abdomen only, scan from the lung bases through aortic bifurcation. For the abdomen and pelvis scan from lung bases, including both diaphragms, through the perineum.
9. If doing Pelvis only, give single bolus of IV contrast with an 80 second delay.
10. Delayed post contrast scans: Not to be done on a routine basis.
11. Reconstructions: Coronal and Sagittal x 3 mm on venous phase. Coronal only on delayed phase. Send soft tissue algorithm and reconstructions to PACS. Last revised 10/03/2023 HRM

Soft tissue/retroperitoneal hematoma with or without active bleeding

[GE slice thickness in brackets]

1. Indications: history of/concern for soft tissue or retroperitoneal hematoma with or without active bleeding (expanding hematoma).
    a. Coverage will depend on the field of interest as this protocol may be applied to the chest, abdomen, pelvis or an extremity. **The entire area of concern must be covered**.

2. Prep: none

3. Enteric contrast: none

4. IV contrast administration: dependent upon indication, see chart below.
    a. Retroperitoneal hematoma
        i. No concern for active bleeding: No IV contrast
        ii. Concern for active bleeding: IV contrast, multiphase including non-contrast exam
    b. Other location of hematoma (e.g. chest wall, rectus sheath, intra-abdominal, extremity)
        i. No concern for active bleeding: IV contrast, single phase portal venous
        ii. Concern for active bleeding: IV contrast, multiphase including non-contrast exam
    c. Standard concentration nonionic contrast medium, 100 mL intravenously (18-22g peripheral IV, Power PICC or Power Port) at 3-5 mL/sec.

Retroperitoneal hematoma		Other location of hematoma	
No active bleeding	Active bleeding	No active bleeding	Active bleeding
Non-contrast	Non-contrast Arterial phase Portal venous phase	Portal venous phase	Non-contrast Arterial phase Portal venous phase

5. Scan parameters:
    a. FOV: Variable by patient size
    b. MA: Use dose reduction software if available, otherwise 300-400 MA
    c. KV: 120
    d. Scan time: 0.5 second
    e. Pitch: As appropriate per detector configuration
    f. Raw thickness: 1mm [0.625 mm]
    g. Slice thickness: 1 mm [0.625mm]

6. Reconstructions:
    a. Non-contrast
        i. Soft tissue kernel
        ii. MPR: axial, coronal and sagittal 3 mm slice thickness x 3 mm interval
    b. Arterial phase
        i. Soft tissue kernel
        ii. MPR: axial, coronal and sagittal 2 mm slice thickness x 2 mm interval
    c. Portal venous phase
        i. Soft tissue kernel
        ii. MPR: axial, coronal and sagittal 3 mm slice thickness x 3 mm interval
    d. Additional optional reformats depending on FOV covered
        i. Lung kernel axial, 3 mm slice thickness x 3 mm interval
        ii. Lung MIPS: axial slab 7 mm slice thickness x 3 mm interval, soft tissue kernel but saved as lung window in PACS

Last revised HRM 1/20/25

CT Virtual Colonography

[GE slice thickness in brackets]

1. Indication: high risk for colonoscopy or previous failed colonoscopy

2. Prep: Oral prep and patient instructions will need to be picked up at facility at least 2 days prior.
   To be completed the day before exam-
   Clear liquid diet all day.
   At 12:00pm, take 3 bisacodyl (Dulcolax) tablets.
   At 3:00pm, drink 5oz Magnesium Citrate with 8oz clear juice/carbonated drink. Follow with at least 4-8 cups of clear liquids throughout the afternoon.
   At 6:00pm, drink 225ml (1/2 bottle) of 2.2% barium. Drink 5oz Magnesium Citrate with 8oz clear juice or carbonated drink. Drink at least 4-8 more cups of clear liquid throughout the evening.
   At 9:00pm, drink 60ml Gastrografin mixed with 8 or more oz clear juice/water/carbonated beverage. Can continue clear liquids until midnight. NPO after midnight.

3. Other: Air contrast- Fill colon with carbon dioxide from colon insufflator machine. Start with patient on left side, fill part-way with air, then roll patient to supine position to continue filling. Scan when colon insufflator says Ready to Scan.
   IF COLON DOES NOT APPEAR INSUFFLATED ENOUGH ON SCOUT IMAGE, attempt to fill more, then repeat scout. Consult with radiologist if continued insufflation failure.

4. Scan parameters for supine and prone imaging
   a. FOV: Variable by patient size
   b. MA: Use dose reduction software if available, otherwise 300-400 MA
   c. KV: 120
   d. Scan time: 0.5 second
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 1mm [1.25mm]
   g. Image slice thickness: 1mm [1.25mm]
   h. Table Increment: 1 mm [1.25mm]
   I Reconstruction Interval: 1 mm [1.25mm]
   j. Reconstruction algorithm: Soft Tissue

5. Scan from diaphragm to symphysis with patient supine. Then, roll patient to prone position and scan from diaphragm to symphysis.

6. Reconstruction: Axial, Coronal, Sagittal 3mm x 3mm in soft tissue algorithm. Additional soft tissue axial recons at approx. 0.6mm. Send thin images to Vitrea workstation for review by the Radiologist. Send all reconstructions (including thins) to PACS.
   If available, send most recent colonoscopy report to PACS.

Last revised 5/7/25 HRM

CT Abdomen and Pelvis, CT Abdomen or CT Pelvis (non-MSK)

[GE slice thickness in brackets]

1. Indications: routine CT of the abdomen, pelvis (non-MSK) or abdomen and pelvis in an **atraumatic** patient.
    a. **Please see TRAUMA CT abdomen and pelvis protocol for trauma indication**

2. Prep: none

3. Enteric contrast for the following indications:
    a. Rule out intra-abdominal abscess or fluid collection
    b. If specifically ordered by surgical team, most often to evaluate small bowel obstruction or post-operative leak
    c. Per radiologist

4. Other protocol options per radiologist:
    a. Rectal contrast
    b. Clamp foley catheter, unclamp after examination

5. IV contrast administration: standard concentration nonionic contrast medium, 100 mL intravenously (18-22g peripheral IV, Power PICC or Power Port) at 3mL/sec. Use 70 second delay.

6. Post-IV contrast scan:
    a. Coverage
        i. Abdomen and Pelvis: lung bases through perineum
        ii. Abdomen only: lung bases to top of iliac crest
        iii. Pelvis only: top of iliac crest through perineum
    b. Portal venous phase (70 second delay)

7. Delayed phase post-IV contrast scan: **per radiologist**

8. Scan parameters:
    a. FOV: Variable by patient size
    b. MA: Use dose reduction software if available, otherwise 300-400 MA
    c. KV: 120
    d. Scan time: 0.5 second
    e. Pitch: As appropriate per detector configuration
    f. Raw thickness: 1mm [0.625 mm]
    g. Slice thickness: 3 mm [2.5mm]
    h. Reconstruction Interval: 3 mm [2.5mm]
    i. Reconstruction algorithm: soft tissue

9. Reconstructions:
    a. Soft tissue kernel
        i. MPR: axial, coronal and sagittal 3 mm slice thickness x 3 mm interval

TRAUMA CT Abdomen and Pelvis +/- Lumbar Spine Reconstructions

[GE slice thickness in brackets]

1. Indications: Multiphase CT of the abdomen and pelvis in the setting of **acute trauma** +/- lumbar spine reconstructions per provider request.

2. Prep: none

3. Enteric contrast: None

4. IV contrast administration: standard concentration nonionic contrast medium, 100 mL intravenously (18-22g peripheral IV, Power PICC or Power Port) at 3mL/sec. Use 70 second delay.

5. Post-IV contrast scans:
    a. Coverage: Lung bases through the perineum
    b. Phases (2)
        i. Portal venous (70 second delay)
        ii. Delayed (5-minute delay)

6. Scan parameters:
    a. FOV: Variable by patient size
    b. MA: Use dose reduction software if available, otherwise 300-400 MA
    c. KV: 120
    d. Scan time: 0.5 second
    e. Pitch: As appropriate per detector configuration
    f. Raw thickness: 1mm [0.625 mm]
    g. Slice thickness: 3 mm [2.5mm]
    h. Reconstruction Interval: 3 mm [2.5mm]
    i. Reconstruction algorithm: soft tissue +/- bone

7. Reconstructions:
    a. Soft tissue kernel
        i. MPR: axial, coronal and sagittal 3 mm slice thickness x 3 mm interval
    b. Optional small FOV lumbar spine reconstructions per provider request
        i. Bone and soft tissue kernel
        ii. MPR: axial, coronal and sagittal 1 mm slice thickness x 1 mm interval
        iii. Send to PACS as a separate CT exam for interpretation.

Last revised 1/8/25 HRM

CT Abdominal Aortic Aneurysm (Surgical Planning or Stent Graft Planning)

[GE slice thickness in brackets]

1. Indication: Surgical Planning or Stent Planning for known abdominal aortic aneurysm (Note: For patients with suspected or for follow up of known abdominal Aortic Aneurysm, do routine abdomen/pelvis CT protocol (including delayed images) with IV only, not CTA. For patients with suspected or for follow up of known thoracic Aortic Aneurysm, do routine chest CT protocol with IV only, not CTA).

2. Prep:
   a. Trauma room patient- None
   b. Routine scheduled patient with known aneurysm- Clear liquids >4 his prior to exam
3. Enteric Contrast- None
4. Other: None.

5. Scan parameters
   a. FOV: Variable by patient size
   b. MA: Use dose reduction software if available, otherwise 300-400 MA
   c. KV: 120
   d. Scan time: 0.5 second
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 1mm [1.25mm]
   g. Image slice thickness: 3mm[2.5mm]
   h. Table Increment: 3 mm[2.5mm]
   i. Reconstruction Interval: 3 mm[2.5mm]
   j. Reconstruction algorithm: Soft Tissue, Lung

6. Pre IV Contrast scans- None

7. IV contrast administration- Standard concentration (eg:Ultravist 300) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 3mL/sec. Manual Sure Start with the blushing of the kidneys or 20 second delay.

8. Post IV Contrast Scans: Scan from diaphragm through symphysis pubis Arterial phase only.

9. Delay scan: None.

10. Reconstructions: soft tissue kernel

Arterial series:
   i. Axial: 2 mm slice thickness x 1.2 mm interval
   ii. Coronal and sagittal: 2 mm slice thickness x 2 mm interval
   ii. MIPS: Coronal slab 10 mm slice thickness x 5 mm interval

Last revised 10/03/2023 HRM

CT Abdominal Aortic Stent Graft Follow Up

[GE slice thickness in brackets]

1. Indication: Evaluation of the aorta in patients with an aortic stent graft (s/p endovascular repair). This is generally in the abdominal aorta.

2. Prep: Routine scheduled patient- Clear liquids> 4 hrs prior to exam
3. Enteric Contrast: None
4. Other: None

5. Scan parameters for all phases of imaging:
   a. FOV: Variable by patient size
   b. MA: Use dose reduction software if available, otherwise 300-400 MA
   d. KV: 120
   d. Scan time: 0.5 second
   e. Pitch As appropriate per detector configuration
   f. Raw thickness: 1mm [1.25mm]
   g. Image slice thickness: 3mm[2.5mm]
   h. Table Increment: 3 mm[2.5mm]
   i. Reconstruction Interval: 3 mm[2.5mm]
   j. Reconstruction algorithm: Soft Tissue

6. Pre IV Contrast Scan: Abdominal aorta- thru the entire length of the stent graft

7. IV contrast administration- Standard concentration (eg:Ultravist 300) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 3mL/sec.

8. Post IV Contrast Scans: Abdominal aorta- arterial phase (trigger on abdominal aorta or use 30 second delay)

9. Delay scan: through stent graft (5 minutes post IV contrast injection)

10. Reconstructions: soft tissue kernel
    a. Non-contrast series:
       i. Axial, coronal and sagittal: 3 mm slice thickness x 3 mm interval
    b. Arterial series:
       i. Axial: 2 mm slice thickness x 1.2 mm interval
       ii. Coronal and sagittal: 2 mm slice thickness x 2 mm interval
       ii. MIPS: Coronal slab 10 mm slice thickness x 5 mm interval
    c. Delay series:
       i. Axial, coronal and sagittal: 3 mm slice thickness x 3 mm interval

Last revised: 10/03/2023 HRM

CT Angiogram of the Abdominal Wall

1. Indication: Evaluation of DIEA perforator flap, prior to plastic surgery.

2. Prep: Clear liquids > 4 hrs prior to exam

3. Enteric Contrast: None

4. Other: None.

5. Scan Parameters for CTA
   a. FOV: Large enough to include entire abdomen including abdominal wall
   b. MA: Use dose reduction software if available, otherwise 300-400 MA
   c. KV: 120
   d. Scan time: 0.37 seconds
   e. Pitch: As appropriate per detector configuration
   f. Collimation thickness: 0.5 mm
   g. Image thickness: 0.4 mm
   h. Table Increment: 0.8 mm
   i. Reconstruction Interval: 0.8 mm arterial
   j. Reconstruction algorithm: Soft Tissue

6. Pre IV contrast scans: Only for setting up Surestart at level of common femoral artery.

7. IV contrast administration- High concentration (eg:Ultravist 370) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 4mL/sec followed by a 50ml saline bolus flush.
   Trigger with Surestart Wait 15 seconds before surestart, then manual or auto trigger when contrast reaches 100 HU at the common femoral artery.

8. Post IV Contrast scan: Arterial – scan caudal to cranial, symphysis pubis to 5 cm above umbilicus.

9. Delay scan: None

10. Reconstructions: soft tissue kernel
    Arterial series:
        i. Axial: 2 mm slice thickness x 1.2 mm interval
        ii. Coronal and sagittal: 2 mm slice thickness x 2 mm interval
        ii. MIPS: Coronal slab 10 mm slice thickness x 5 mm interval

Last revised 10/03/2023 HRM

Coronary CT Angiography

1. Indication: Patients with chest pain, equivocal SPECT imaging, and normal EKG

2. Prep: Beta Blocker on all patients to get heart rate below 70.

3. Enteric contrast: None

4. Other: Nitro administered just prior to contrast injection. If calcium score above 800, check with radiologist prior to scanning.

5. Scan Parameters:
    a. FOV: Fit the field to just larger than the heart (22cm)
    b. MA: 320 (Variable)
    c. KV: 100 to120
    d. Scan time: 0.35 second
    e. Pitch: 17.1 (PF 0.267)
    f. Raw thickness: 0.5 mm
    g. Image slice thickness: 0.5 mm
    h. Table Increment: 0.5 mm
    i. Reconstruction Interval: 0.3 mm
    j. Reconstruction algorithm: Standard

6. Pre IV Contrast Scan: Sure Start Image at Mid heart.

7. IV contrast administration: 80-100 ml nonionic contrast high concentration at 5.0 ml per second with 50 ml saline flush. Trigger on the descending Aorta at 180 hu's.

8. Post IV contrast scan: prospectively gated helical images from above LAD through apex of heart.

9. Delay scan: None.

10. Reconstruction: Send to Vitrea for evaluation.
    Last revised 10/12/2023 SJB

CT Angiogram Head only (Circle of Willis)

[GE slice thickness in brackets]

1. Indication: Evaluation for vascular disease of the Circle of Willis

2. Prep: None

3. Scan Parameters
   a. FOV: Small 18 cm.
   b. MA: variable
   c. KV: 120
   d. Scan time: 0.5 sec.
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 0.5 mm. [0.625mm]
   g. Image slice thickness: 0.5 mm. [0.625mm]
   h. Table Increment: 0.5 mm[0.625mm]
   i. Reconstruction interval: 0.3 mm
   j. Reconstruction algorithm: Soft Tissue

4. Pre IV contrast scan: for localization only.

5. IV Contrast Administration and scanning
   a. 60ml of high concentration (eg: Ultravist 370)
   b. Follow with 20ml of saline
   c. Inject 5ml/sec if 20 gauge needle
      Inject 4ml/sec if 22 gauge needle

   High concentration (eg: Ultravist 370) nonionic contrast medium, 60 ml intravenously followed by 20mL saline given at (5mL/sec if using a 20g IV in the AC, Power PICC, or Power Port) or at (4mL/sec if using a 22 g IV in the AC).

6. Post IV contrast scan:
   a. Manual trigger visually from a slice 2 cm below foramen magnum, and start scan as soon as contrast is seen in carotid arteries.
   b. Scan from 2 cm below foramen magnum to top of lateral ventricles (or top of head when requested by Radiologist).

7. Delay scan: None.

8. Reconstructions:
   - MPR: Coronal and Sagittal 1 x 1 mm of entire data set.
   - MIPS: Axial, Coronal & Oblique Coronal*(Fig. 1): 20mm x 5mm.
   - Send source axial images to Vitrea workstation. Send axial soft tissue algorithm and all reconstructions to PACS.

(*see Fig.1 on next page for set-up of Oblique Coronal MIPS)

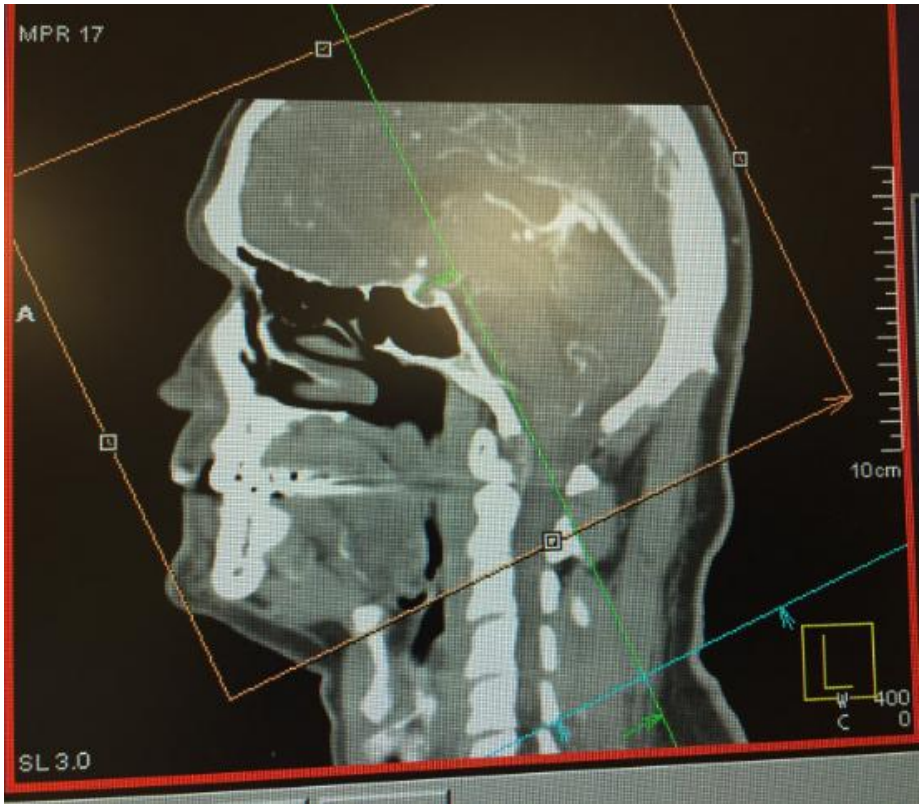


Fig. 1: Shows green line parallel to clivus at midline, for set-up of Oblique Coronal MIPS from CTA data through the Head.

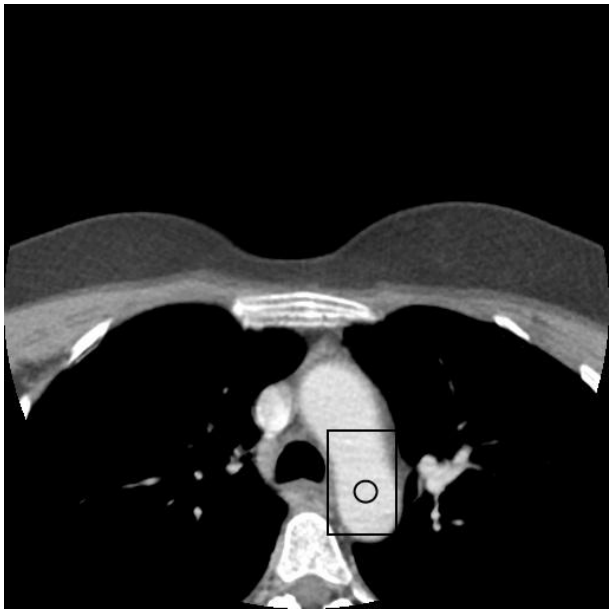


Fig. 2: ROI placement for trigger for CTA Neck, or combined CTA Neck-Head
Last revised 4/29/16 GMH

CT Angiogram Neck only (Carotid and Vertebral arteries)

[GE slice thickness in brackets]

1. Indication: Evaluation of vascular patency of arteries of the neck only.

2. Prep: None

3. Scan parameters for CTA
   a. FOV: Variable per patient size
   b. MA: variable
   c. KV: 120
   d. Scan time: 0.5 second
   e. Pitch; As appropriate per detector configuration
   f. Raw thickness: 0.5 mm[0.625mm]
   g. Image slice thickness: 0.5 mm[0.625mm]
   h. Table Increment: 0.5 mm[0.625mm]
   i. Reconstruction interval: 0.3 mm[0.312mm]
   j. Reconstruction algorithm: Soft Tissue

4. Pre IV contrast scans- For localization only

5. IV contrast Administration:
   a. 60ml of high concentration (eg: Ultravist 370) nonionic contrast medium intravenously, (18g-22g upper extremity peripheral IV, Power PICC, or Power Port)
   b. Follow with 20 ml of saline (can only do with dual head injector)
   c. Inject at 5ml/sec if 20 gauge needle
      Inject at 4ml/sec if 22 gauge needle
   d. Place surestart ROI at mid-lumen at posterior aortic arch (Fig. 2), (streak artifact can interfere if ROI is placed in the anterior aortic arch) and begin scan when ROI reaches 100 to 150 HU (depending on the speed of your scanner) either by manual start or autotrigger.

6. Post IV contrast scan: Scan from base of aortic arch to 2 cm above the foramen magnum (about mid clivus). Do not include sella.

7. Delay scan: None.

8. Reconstructions:
   - MPR: Coronal and Sagittal 1 x 1 mm of entire data set.
   - MIP: Coronal and Sagittal 20 mm x 5 mm of entire data set.
   - Send source axial images to Vitrea workstation. Send axial soft tissue algorithm and all reconstructions to PACS.

Last revised 10/2/24 BLH

CT Angiogram Head and Neck combined

[GE slice thickness in brackets]

1. Indication: Evaluation of vascular patency of arteries of the neck and Circle of Willis.

2. Prep: None

3. Scan parameters for CTA
   a. FOV: Variable per patient size
   b. MA: variable
   c. KV: 120
   d. Scan time: 0.5 second
   e. Pitch; As appropriate per detector configuration
   f. Raw thickness: 0.5 mm[0.625mm]
   g. Image slice thickness: 0.5 mm[0.625mm]
   h. Table Increment: 0.5 mm[0.625mm]
   i. Reconstruction interval: 0.3 mm[0.312mm]
   j. Reconstruction algorithm: Soft Tissue

4. Pre IV contrast scans- For localization only

5. IV contrast Administration:
   a. 60ml of high concentration (eg: Ultravist 370) nonionic contrast medium intravenously, (18g-22g upper extremity peripheral IV, Power PICC, or Power Port)
   b. Follow with 20 ml of saline (can only do with dual head injector)
   c. Inject at 5ml/sec if 20 gauge needle (Inject at 4ml/sec if 22 gauge needle)
   d. Place surestart ROI at mid-lumen at posterior aortic arch (Fig. 2), (streak artifact can interfere if ROI is placed in the anterior aortic arch) and begin scan when ROI reaches 100 to 150 HU (depending on the speed of your scanner) either by manual start or autotrigger.

6. Post IV contrast scan: Scan from base of aortic arch to lateral ventricles (or top of head if requested by Rad).

7. Delay scan: None.

8. Reconstructions:
   - MPR: Coronal and Sagittal 1 x 1 mm of entire data set.
   - MIPS of entire data set: Coronal and Sagittal 20 mm x 5 mm.
   - MIPS of head data only: Axial and Oblique Coronal*(Fig. 1): 20mm x 5mm.
   - Send source axial images to Vitrea workstation. Send axial soft tissue algorithm and all reconstructions to PACS.

(*see Fig.1 in protocol for CTA Head for set-up of Oblique Coronal MIPS)
Last revised 10/16/23 BLH

CT Angiogram for GI Bleeding
[GE slice thickness in brackets]

1. Indication: Evaluation for active lower GI Bleed in the emergent setting.

2. Prep: None

3. Enteric Contrast: None

4. Other: None.

5. Scan Parameters
    a. FOV: Large enough to include entire abdomen including abdominal wall
    b. MA: 350
    c. KV: 120
    d. Scan time: 0.5 second
    e. Pitch: As appropriate per detector configuration
    f. Collimation thickness: 1 mm [1.25mm]
    g. Raw image thickness: 0.5 mm [0.625 mm]
    h. Table Increment: 0.5 mm [0.625 mm]

6. Pre IV contrast scans: Diaphragm through symphysis pubis.

7. IV contrast administration- High concentration (eg:Ultravist 370) nonionic contrast medium, 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 4mL/sec. Trigger with Surestart Wait 15 seconds before surestart, then manual or auto trigger when contrast reaches upper abdominal aorta (at about level of diaphragm).

8. Post IV Contrast scan: Arterial - Diaphragm to symphysis pubis then routine portal venous phase entire abdomen and pelvis.

9. Delay scan: None

10. Reconstructions: soft tissue kernel
    a. Non-contrast series:
        i. Axial, coronal and sagittal: 3 mm slice thickness x 3 mm interval
    b. Arterial series:
        i. Axial: 2 mm slice thickness x 1.2 mm interval
        ii. Coronal and sagittal: 2 mm slice thickness x 2 mm interval
        ii. MIPS: Coronal slab 10 mm slice thickness x 5 mm interval
    c. Venous series:
        i. Axial, coronal and sagittal: 3 mm slice thickness x 3 mm interval
    d. Do not send to Vitrea.

Updated 3/20/24

CT Angiogram of the Mesenteric Arteries
[GE slice thickness in brackets]

e. Indication: Evaluation for vascular disease of the mesenteric arterial system, typically in the emergent setting.

f. Prep: None

g. Enteric Contrast: None.

h. Other: None.

5. Scan Parameters
   a. FOV: Large enough to include entire abdomen including abdominal wall
   b. MA: 350
   c. KV: 120
   d. Scan time: 0.5 second
   e. Pitch: As appropriate per detector configuration
   f. Collimation thickness: 1 mm [1.25mm]
   g. Raw image thickness: 0.5 mm [0.625 mm]
   h. Table Increment: 0.5mm [0.625 mm]

i. Pre IV contrast scans: Only for setting up Surestart at level of upper abdominal aorta.

j. IV contrast administration- High concentration (eg:Ultravist 370) nonionic contrast medium, 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 4mL/sec. Trigger with Surestart Wait 15 seconds before surestart, then manual or auto trigger when contrast reaches upper abdominal aorta (at about level of diaphragm)

k. Post IV Contrast scan: Arterial – Diaphragm to the pubic symphysis, then routine portal venous phase entire abdomen and pelvis.

l. Delay scan: None

10. Reconstructions: soft tissue kernel
    a. Arterial series:
        i. Axial: 2 mm slice thickness x 1.2 mm interval
        ii. Coronal and sagittal: 2 mm slice thickness x 2 mm interval
        ii. MIPS: Coronal slab 10 mm slice thickness x 5 mm interval
    c. Venous series:
        i. Axial, coronal and sagittal: 3 mm slice thickness x 3 mm interval
    d. Do not send to Vitrea.

Updated 3/20/24

CT Angiogram of the Renal Arteries

[GE slice thickness in brackets]

1. Indication- Evaluation for renal artery disease

2. Prep- Clear liquids > 4 hrs.

3. Enteric contrast- 900 mL water 30 minutes prior to scan.

4. Other: None

5. Scan parameters for CT
   a. FOV: Medium, to include kidneys for CTA portion only
   b. MA: 350
   c. KV: 120
   d. Scan time: 0.5 second
   e. Pitch: 15
   f. Raw thickness: 1 mm [1.25mm]
   g. Image slice thickness: 0.8 mm [0.625mm]
   h. Table Increment: 1 mm[1.25mm]
   i. Reconstruction Interval: 0.8 and 3 mm
   j. Reconstruction algorithm: Soft Tissue

6. Pre IV contrast scan: None

7. IV contrast administration- High concentration (eg:Ultravist 370) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 3mL/sec. Trigger with surestart. Wait 15 seconds before surestart scanning, then manual or auto trigger when contrast reaches upper abdominal aorta.

8. Post IV contrast scan: Scan through kidneys for CTA then Routine CT of the abdomen with a 70 second delay.

9. Delay scan: None

10. Reconstructions: soft tissue kernel

    a. Arterial series:
        i. Axial: 2 mm slice thickness x 1.2 mm interval
        ii. Coronal and sagittal: 2 mm slice thickness x 2 mm interval
        ii. MIPS: Coronal slab 10 mm slice thickness x 5 mm interval
    b. Venous series:
        i. Axial, coronal and sagittal: 3 mm slice thickness x 3 mm interval

Last revised 11/8/2023 HRM

CT Angiogram Runoff

[GE slice thickness in brackets]

1. Indication: Evaluation for aorto-iliac and lower extremity vascular disease

2. Prep: Clear liquids > 4 hrs.

3. Enteric contrast: None

4. Other: None.

5. Scan parameters:
   a. FOV: Variable per patient size
   b. MA: 320
   c. KV: 120
   d. Scan time: 0.5 second
   e. Pitch: 23
   f. Raw thickness: 1 mm [1.25mm]
   g. Image slice thickness: 1 mm [1.25mm]
   h. Table Increment: 1 mm [1.25mm]
   i. Reconstruction Interval: 1 mm
   j. Reconstruction algorithm: Soft Tissue

6. Pre IV contrast scans- For localization of the kidneys prior to injection

7. IV contrast administration- High concentration (eg:Ultravist 370) nonionic contrast medium, 150 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 3-4mL/sec. Trigger with surestart at level of kidneys. Wait 10 seconds before surestart scanning. Manual trigger when a renal cortical nephrogram is visualized (generally 30-40 seconds after start of injection).

8. Post IV contrast scan: From above lung bases through toes.

9. Delay scan: 14 seconds after end of first run, scan from above knee joint through toes.

10. Reconstruction:
    Coronal and sagittal MPR 1x1soft tissue, separate legs from torso.
    Coronal and sagittal MIP's 5x5 soft tissue.
    If possible rotating 3D images.
    Send images to Vitrea workstation
    Send soft tissue algorithm and reconstructions to PACS

Last revised 3/6/23 RJS

reviewed 2/16/21

CTA TAVR

Order- TAVR (CT Heart Eval Cardiac Structure/CTA Chest/CTA Abdomen & Pelvis w /wo)

MUST BE SCANNED ON THE TOSHIBA AQUILLION SCANNER

1. Prep: Clear liquids 4 hours prior
   For questions or concerns regarding heart rate, contrast dose and/or kidney function, contact ordering provider.

2. Enteric Contrast: None

3. AP/Lateral Scouts-Apices through lesser trochanters/Lesser trochanters through apices

4. Scan &View (to set Sure Start - ROI): **Set in ascending aorta between the arch and root** —after taking this do a breathing exercise to determine patient's heart rate. Use Orange Heart Rate chart to determine exposure window **(see chart below)**.
5. Scan Parameters: **HEART**
   a. FOV: 220 or to fit entire heart
   b. Range: up to 160mm – arch through base of heart
   c. MA: Sure Exposure
   d. KV: 120
   e. Rotation time: 0.35 sec
   f. Pitch: 0
   g. Raw thickness: 0.5 mm
   h. Slice thickness: 1.0 mm
   i. Reconstruction Interval: 1.0 mm
   j. Reconstruction algorithm: Cardiac CTA Standard
      - **Volume 1**- CFA 20%-70% (every 10% step) Send to PACS and Vitrea
      - **Volume 2** – 0.5 x 0.5 mm Cardiac CTA Standard – Best Phase Send to PACS and Vitrea

   Scan Parameters: **CTA CHEST/ABDOMEN/PELVIS**

   a. FOV: 320 (cannot go larger without a long delay)
   b. MA: Sure Exposure
   c. KV: 120
   d. Rotation time: 0.35 sec
   e. Pitch: 81
   f. Raw thickness: 0.5 mm x 100
   g. Slice thickness: 1.0 mm
   h. Reconstruction Interval: 0.8 mm
   i. Reconstruction algorithm: CTA Body – **Volume 1**

6. IV Contrast administration: Iohexol 350mg/ml (Omnipaque) IV (18-20g antecubital peripheral IV- Preferably Right, Power PICC, or Power Port) and 100 ml 0.9% Sodium Chloride. On MedRad, under Chest, choose TAVR protocol per patient's weight to determine injection rate and amount **(see chart below).** Trigger with SureStart onAorta (**set in ascending aorta between the arch and root** –Start injector and scanner together.

7. Post IV Contrast scans: **HEART** – Arch though base of heart then immediately image **CTA Chest/Abdomen/Pelvis –** Apices through lesser trochanters including all subclavian arteries
8. Delay scan: None
9. Reconstructions:
   a. **Axial 1 –** 1.0 x 1.0 mm CTA Chest/Abdomen/Pelvis – Send to PACS and Vitrea
   b. **Axial 2 –** 3.0 x 3.0 mm Lung – Send to PACS
   c. **Volume 1 –** 1.0 mm x 0.8 mm CTA Chest/Abdomen/Pelvis – Send to Vitrea
      Multiview 1: 3 mm x 3 mm CTA Coronal/Sagittal – Send to PACS
   d. **Volume 2 –** 1.0 mm x 0.8 mm MIP – Send to Vitrea
      Multiview 2: 20 mm x 7 mm Coronal MIP – Send to PACS

TAVR Reader: Dr. Burke and Dr. Hopper– contact them when study is on his list
If both are on vacation or not working a day shift at Mercy or St. Luke's, the CTA portion can be read by any Radiologist

Contact Shellie Pike, RRA when the exam is ready to process on Vitrea.
Shellie Cell: 319-929-6682

Reference Charts:

Heart Rate Chart (BPM to Millisecond) R to R Interval

	Millisecond R to R	
Heart Rate	130 bpm	462 ms
	120 bpm	500 ms
	110 bpm	550 ms
	100 bpm	600 ms
	90 bpm	667 ms
	80 bpm	750 ms
	70 bpm	858 ms
	60 bpm	1000 ms
	50 bpm	1200 ms
	40 bpm	1500 ms
	30 bpm	2000 ms

Amount of Omnipaque (Iohexol) 350 to Administer Based on Weight

Patient Weight	Amount of Contrast
Less than 73 kg	66 ml
74 kg – 114 kg	86 ml
114 kg – 160 kg	up to 100 ml
Greater than 136kg	**125ml**

Revise 1/30/26

CT Angiogram Upper Extremity

Indication: Evaluation of upper extremity for claudication, trauma, arterial thoracic outlet, or embolic disease.

1. Prep: None

2. Scan parameters for CTA- cover entire area of concern on both scout images.
   a. FOV: large from arch to elbow, medium from elbow to fingertips (include entire area of concern in FOV).
   b. MA: variable
   c. KV: 120 on first section, 100 from elbow to fingertips
   d. Scan time: 0.5 second
   e. Pitch; As appropriate per detector configuration
   f. Raw thickness: 0.5 mm[0.625mm]
   g. Image slice thickness: 0.5 mm[0.625mm]
   h. Table Increment: 0.5 mm[0.625mm]
   i. Reconstruction interval: 0.3 mm[0.312mm]
   j. Reconstruction algorithm: Soft Tissue

3. Pre IV contrast scans- Obtain a biplane scout topogram to prescribe the scanning range and field of view.

4. Positioning: Position patient supine with affected arm above head, palm up if able to or allowed to raise arm over head. If unable to raise arm over head for medical or physical reasons, then perform with arm at side positioned at the isocenter as much as possible with appropriate changes in field of view. Scan from base of aortic arch to just below elbow, then from just above elbow to fingertips of affected side. If arm is at side, start scan at the base of the neck. If the concern is distal forearm or hand keep the hand warm if possible in a warm blanket until the time of scanning. If scanning is primarily for thoracic outlet syndrome the scanning can be done in the symptomatic position simulating the Adson maneuver (arm abduction and extension while rotating head to the ipsilateral side with extended neck and deep inspiration, this can be repeated with scanning in the neutral position, check with Interventional Radiology if this is the specific request.

5. IV contrast Administration:
   e. up to 100 ml of high concentration (eg: Ultravist 370) nonionic contrast medium intravenously, (18g-22g upper extremity peripheral IV in **non-affected arm**, Power PICC, or Power Port),on 64 slice scanner or higher. Central lines can be used for either arm, and are needed if there is an indication for bilateral upper extremity CTA.
   f. Follow with 40 ml of saline (can only do with dual head injector)
   g. Inject at 5ml/sec if 20 gauge needle
   h. Place surestart ROI at mid-lumen at posterior aortic arch (Fig. 2), (streak artifact can interfere if ROI is placed in the anterior aortic arch) and begin scan when ROI reaches 100 to 150 HU (depending on the speed of your scanner) either by manual start or autotrigger.

6. Delay scan: None.

7. Reconstructions:
   - MPR: Coronal and Sagittal 1 x 1 mm of entire data set.
   - MIP: Coronal and Sagittal 5 mm x 5 mm of entire data set.
   - Send source axial images to Vitrea workstation. Send axial soft tissue algorithm and all reconstructions to PACS.

Last revised 10/03/2023 HRM

CT Aortic Dissection

[GE slice thickness in brackets]

1. Indication: Patients with known or suspected aortic dissection
2. Prep: None
3. Enteric contrast: None
4. Other: None
5. Scan parameters:
    a. FOV: Variable by patient size
    b. MA: Use dose reduction software if available, otherwise 300-400 MA
    c. KV: 120
    d. Scan time: 0.5 second
    e. Pitch: As appropriate per detector configuration
    f. Raw thickness: 1mm [1.25mm]
    g. Image slice thickness: 3 mm[2.5mm]
    h. Table Increment: 3 mm[2.5mm]
    i. Reconstruction Interval: 3 mm[2.5mm]
    j. Reconstruction algorithm: Soft Tissue, Lung
6. Pre IV contrast scans: Thoracic aorta from above arch to diaphragm.
    a. Do for first time patients, or follow-up patients with acute chest symptoms raising the question of worsening dissection. For patients with known dissections who are asymptomatic you may skip the pre- IV contrast enhanced portion of the exam.
7. IV contrast administration- High concentration (eg: Omnipaque 350) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 4-5mL/sec. If available, use bolus tracking (e.g. Surestart) with the ROI placed in the aortic arch. If bolus tracking is not available, use a 20 second delay.
8. Post IV contrast scans:
    a. Arterial phase: scan from above arch through aortic bifurcation.
    b. Venous phase: scan from lung apex through aortic bifurcation at approximately 1 minute after contrast injection (Charge exam: Chest, Abdomen).
9. Reconstructions:
    a. Non-contrast:
        a. Axial plane, 3 mm slice thickness with 3 mm interval, soft tissue kernel
    b. Arterial phase
        a. 3-plane reformats: 3 mm slice thickness with 3 mm interval, soft tissue kernel.
        b. MIPS: coronal slab 7 mm slice thickness with 3 mm interval, soft tissue kernel
    c. Venous phase:
        a. 3-plane reformats: 3 mm slice thickness with 3 mm interval, soft tissue kernel
        b. Axial plane: 3 mm slice thickness with 3 mm interval, lung kernel
        c. MIPS: axial slab 7 mm slice thickness with 3 mm interval. Send as soft tissue kernel but save to PACS using lung window/level.

Last revised 4/3/24 HRM

High Resolution CT (HRCT) of the Chest

[GE slice thickness in brackets]

1. Indication: Evaluation of parenchymal lung disease
2. Prep: None
3. Enteric Contrast: None
4. Other: None
5. Scan Parameters: Prone Inspiration and Supine Expiration
   a. FOV: Variable by patient size
   b. MA: Use dose reduction software if available, otherwise 300-400 MA
   c. KV: 120
   d. Scan time: 0.5 second
   e. Pitch: As appropriate per detector configurationnon-helical
   f. Raw thickness: 0.5mm[0.625mm]
   g. Image slice thickness: 0.5 mm[0.625mm]
   h. Table Increment: 10 mm
   i. Reconstruction interval: 10 mm
   j. Reconstruction algorithm: Soft Tissue, Lung

   Supine Inspiration
   a. FOV: Variable by patient size
   b. MA: Use dose reduction software if available, otherwise 300-400 MA
   c. KV: 120
   d. Scan time: 0.5 second
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 1mm [1.25mm]
   g. Image slice thickness: 1 mm [1.25mm]
   h. Table Increment: 1 mm [1.25mm]
   i. Reconstruction Interval: 1 mm [1.25mm]
   j. Reconstruction algorithm: Smooth and Sharp
6. Pre IV contrast scan: Can scan prone images first for patient comfort
   a. Supine images at full inspiration: Helical 1 x 1
   b. Supine images at full expiration: 4 x 0.5, one each at the aortic arch, subcarinal region and lung base. No stack
   c. Prone images at full inspiration: 10 mm intervals from the lung apices through the diaphragm. No stack. Repeat images with motion artifact.
7. IV Contrast administration: None.
8. Post IV Contrast scan: None.
9. Delay Scan: None
10. Reconstructions:
    a. MPR Coronal and Sagittal 1x1 mm soft tissue kernel on helical set
    b. Axial slab MIPs 7mm thick at 3mm increment, soft tissue kernel, but saved to PACS in lung window/level.

Send soft tissue and lung algorithm axials, and all reconstructions to PACS.
Last revised: 10/5/16 GDS

CT for Lung Cancer Detection (screening)

[GE slice thickness in brackets]

1. Indication: Asymptomatic patients at risk for lung cancer, ages 50-77 unless ok'd by radiologist. Patient should have a smoking history of 20 pack years. If no longer smoking, quit in the last 15 years. Patients will be offered a smoking cessation packet when finished with exam.

2. Prep: None

3. Enteric contrast: None

4. Other: None

5. Scan parameters
   a. FOV: Variable by patient size
   b. MA: 50-100 (variable with at max limit of 100mA, unless patient is extremely large, then adjust per radiologist recommendation)
   c. KV: 100
   d. Scan time: 0.5 second
   e. Pitch As appropriate per detector configuration
   f. Raw thickness: 1mm [1.25mm]
   g. Image slice thickness: 1mm[1.25mm]
   h. Table Increment: 1 mm[1.25mm]
   i. Reconstruction Interval: 1 mm [1.25mm]
   j. Reconstruction algorithm: Soft Tissue, Lung

6. Pre IV contrast scan: Lung apices through the lung bases

7. IV Contrast administration: None.

8. Post IV contrast scan: None

9. Delay scan: None

10. Reconstructions:
    a. MPR Coronal and Sagittal 1x1 mm soft tissue kernel
    b. Axial slab MIPs 7mm thick at 3mm increment, soft tissue kernel, but saved to PACS in lung window/level

Send soft tissue and lung algorithm axials, and all reconstructions to PACS.

Last revised 3/10/26 HRM

Neck, Chest, Abdomen, Pelvis

[GE slice thickness in brackets]

CT examinations of the neck with additional imaging of the chest, abdomen and/or pelvis are most commonly utilized in patients with known malignancy.

The CT exam of the neck should always be done after the CT of the chest, abdomen and pelvis. **When ordered, exams should be separated into CT Soft Tissue Neck and CT Chest/Abdomen/Pelvis.**

up to 100 ml of contrast are utilized for imaging of the chest, abdomen and/or pelvis then 50 ml of contrast are injected and the CT neck images are performed.

CT Chest/Abdomen or Chest/Abdomen/Pelvis

1. Indication: Routine CT of the chest and abd. or chest/abd/pelvis with contrast

2. Prep: Clear liquids after midnight or >4 hours prior to exam.

3. Enteric contrast- None, unless for following indications:

    1. Positive contrast to rule out abscess, fluid collection or bile leak. Gastroview and/or Gastrografin-250 ml 1 hr, 250 ml ½ hour, and 250 ml immediately prior to exam-the diluted recommendations are listed as 7.5 ml GV in 250ml water.

    2. Gastric tumor or gastric pathology: 2 cups water, immediately before exam.

    3. Specific pathology of the stomach, duodenum or small bowel. Discuss use with radiologist

4. Other-

    a. Rectal- As per radiologist *Enema prep: 12 mL Gastroview in 400mL warm water, then roll patient.*

    b. Vaginal tampon as per radiologist for female patients with suspected gynecologic, rectal or pelvic masses.

    c. Clamp Foley catheter prior to exam. (Unclamp once exam complete)

5. Scan parameters

    a. FOV: Variable by patient size
    b. MA: Use dose reduction software if available, otherwise 300-400 MA
    c. KV: 120
    d. Scan time: 0.5 second
    e. Pitch: As appropriate per detector configuration
    f. Raw thickness: 1 mm [0.625mm]
    g. Image slice thickness: 3mm [2.5mm]
    h. Table Increment: 3 mm [2.5mm]
    i. Reconstruction Interval: 3 mm [2.5mm]
    j. Reconstruction algorithm: Soft Tissue

6. Pre IV Contrast Scans- For localization only

7. IV contrast administration- of standard concentration (eg:Ultravist 300) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 3mL/sec. Use 70 second delay.

8. Post IV contrast scans: Scan entire chest abdomen and pelvis (one helical run) during the portal venous phase (use 70 second delay) of contrast enhancement. Scan from base of the neck through perineum.

9. Delayed Post IV Contrast Scans: Not to be done on a routine basis. Only to be done for:
a. Trauma history: do the appropriate trauma protocol
b. history of cancer of the renal pelvis, ureter or bladder:
1. If the study is being done for an acute indication such as "pain, rule out obstruction, etc..." then add 5 minute delay scanning from the top of the kidneys through the bladder.
2. If the CT is being done specifically for cancer followup of a cancer of the renal pelvis, ureter or bladder, then do a CT urogram for imaging of the abdomen and pelvis.
a. if requested by the interpreting radiologist.

10. Reconstructions:
1) CAP Axial, Coronal, and Sagittal 3x3 mm soft tissue kernel on venous (and delayed if performed) phase images
2) Axial lung window 3x3 mm
3) Axial slab MIPs (**CHEST ONLY**) 7mm thick at 3mm increment, soft tissue kernel, but saved to PACS in lung window/level

CT SOFT TISSUE NECK

1. Indication: Routine CT Soft Tissue Neck (see Exceptions below for specific indications)
2. Prep: Clear liquids > 4 hrs prior to exam
3. Enteric Contrast: None
4. Other: Breathing Instructions for all series (place skin marker over lump, if appropriate):
Just before scanning: Instruct patient to "Clear your throat, and then swallow. Now during the scan, **don't hold your breath**, but **quietly breathe through your nose and mouth with your mouth slightly open**, and don't swallow."

5. Scan Parameters
a. FOV: 18 cm
b. MA: Use dose reduction software if available, otherwise 300-400 MA
c. KV: 120
d. Scan time: 0.5 second
e. Pitch: As appropriate per detector configuration
f. Raw thickness: 1 mm [1.25mm]
g. Image slice thickness: 2 mm [2.5mm]
h. Table Increment: 2 mm [2.5mm]

i. Reconstruction interval: 2 mm [2.5 mm]
j. Reconstruction algorithm: Soft Tissue

6. Pre IV contrast scans: typically for localization only ***Exception:** When looking for stone, scan from EAC through floor of mouth w/o by 2mm [2.5mm]

7. IV Contrast Administration
a. Standard concentration (eg:Ultravist 300) nonionic contrast medium, 50 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 1.5mL/sec.
b. Scan after injection complete (need good venous and arterial enhancement)

8. Post IV contrast scans
a. From 1 cm above external auditory canal to sternoclavicular joints
***Exception:** If patient has vocal cord paralysis or paresis, vocal cord lesion, hoarseness, or dysphagia – continue scan down to the main pulmonary artery level (indicate on worksheet right vs. left vocal cord paralysis or lesion, by history)
b. **Additional angled series gantry tilt** (-20 to -30 degrees) through the region of the oropharynx obscured by dental amalgam artifact on standard axial slices (send this angled series to PACS as a separate series)
c.***Note:** If vocal cord lesion is of concern, reprocess images through the vocal cords using slice thickness of 1 mm, and reconstruction interval of 1 mm.

9. Delay scan: Check images before getting patient off the CT table, and **perform repeat scanning through any areas where there is swallowing or motion artifact**. If the vocal cords are touching each other, rescan thin slices through the larynx, with same breathing instructions as above.

10. Reconstructions:
Soft tissue Axials (and metal reduction if needed) 2x2 mm
Coronal and Sagittal 2x2 mm

Additional note: A single marker should be placed over each lump noted by the patient. If using any type of marker that produces streak artifact, take a few slices unenhanced through the marker – then remove before injecting and scanning. If using a non-artifact producing marker, then the marker can stay on for the exam, no pre-contrast images through the marker are needed. Markers that cause streak artifact should be phased out and replaced with markers made for CT such as Beekley or Suremark brands.

Last revised 4/17/24 BLH

CT Chest-Nodule

[GE slice thickness in brackets]

1. Indication: Evaluation or follow up of a pulmonary nodule

2. Prep: None

3. Enteric Contrast: None

4. Other: None

5. Scan parameters for all phases of imaging
   a. FOV: Variable by patient size
   b. MA: Use dose reduction software if available, otherwise 300-400 MA
   c. KV: 120
   d. Scan time: 0.5 second
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 1mm [1.25mm]
   g. Slice thickness 3 mm [2.5mm]
   h. Reconstruction Interval: 3 mm [2.5mm]
   i. Reconstruction algorithm: Soft Tissue, Lung

6. Pre IV Contrast scans: Through nodule or per radiologist request

7. IV Contrast administration: None

8. Post IV Contrast scans: None

9. Delay scan: None

10. Reconstructions:
    a. MPR Coronal and Sagittal 3x3 mm soft tissue kernel
    b. Axial slab MIPs 7mm thick at 3mm increment, soft tissue kernel, but saved to PACS in lung window/level.

    Send soft tissue and lung algorithm axials, and all reconstructions to PACS.

    Last revised 12/12/16 GDS

Combined CT Pulmonary Embolism/Aortic Dissection

(Charge exam: Chest, Abdomen)

1. Indication: specific request to evaluate for both pulmonary embolism and aortic dissection in the same scan.
2. Prep: None
3. Enteric contrast: None
4. Other: None
5. Pre IV contrast scan: Cover from above the arch to the diaphragm.
6. IV contrast administration- High concentration (eg: Omnipaque 350) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 4-6mL/sec followed by 20mL saline.
7. Post IV contrast scans:
   a. Pulmonary artery phase: per pulmonary embolism protocol
   b. Aorta phase: cover lung apices through aortic bifurcation at 25-30 seconds post contrast injection
8. Reconstructions
   a. Non-contrast: axial plane, 3 mm slice thickness with 3 mm interval, soft tissue kernel
   b. Pulmonary artery phase:
      i. 3-plane reformats: 1 mm slice thickness with 1 mm interval, soft tissue kernel
      ii. MIPS: coronal slab 10 mm thick with 5 mm interval, soft tissue kernel
   c. Aorta phase:
      i. 3-plane reformats: 3 mm slice thickness with 3 mm interval, soft tissue kernel
      ii. Axial plane: 3 mm slice thickness with 3 mm interval, lung kernel
         a. MIPS: axial slab 7 mm slice thickness with 3 mm interval. Send as soft tissue kernel but save to PACS using lung window/level.

Last revised 4/3/24 HRM

CT Angiogram Chest for Pulmonary Embolism for Pregnant Patient

[GE slice thickness in brackets]

1. Indication: Patients with clinically suspected pulmonary embolism. Must be ok'd by Radiologist.

2. Prep: None (emergency procedure)

3. Enteric contrast: None

4. Other: Pt must sign consent form about radiation risk
5. Scan Parameters: Pulmonary arterial phase only
    a. FOV: Fit the field to just larger than the lungs (may exclude chest wall)
    b. MA: Use dose reduction software if available, otherwise 300-400 MA
    c. KV: 120
    d. Scan time: 0.5 second
    e. Pitch: As appropriate per detector configuration
    f. Raw thickness: 1mm [1.25mm]
    g. Image slice thickness: 1mm [1.25mm]
    h. Table Increment: 1 mm [1.25mm]
    i. Reconstruction Interval: 1 mm [1.25mm]
    j. Reconstruction algorithm: Soft Tissue, Lung

6. Pre IV Contrast Scan: Sure Start Image at Left Pulmonary Artery
7. IV contrast administration- High concentration (eg: Ultravist 370) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 4mL/sec followed by 20mL saline.

8. Post IV contrast scan: Pulmonary arterial phase images-From the lung apex through the lung bases. Begin first scan when the contrast bolus reaches the pulmonary artery. Do not use automated breathing instructions. Manually tell the patient to breathe normally for 3-4 seconds (or longer if the built in table delay is longer) then hold her breath. Instruct her ahead of time not to take a deep breath, but simply hold her breath when you instruct her to.

9. Delay scan: None.
10. Reconstructions:
    a. Axial 1x1 mm, soft tissue and lung kernel.
    b. MPR Coronal and Sagittal 1x1 mm, soft tissue kernel.
    c. Coronal slab MIP 10mm thick at 5mm increment, soft tissue kernel.
    d. Axial slab MIPs 7mm thick at 3mm increment, soft tissue kernel, but saved to PACS in lung window/level.

Send 1mm & 3mm soft tissue and lung algorithm axials, and all reconstructions to PACS

Last revised 12/11/2023 HRM

CT Angiogram Chest for Pulmonary Embolism

[GE slice thickness in brackets]

1. Indication: Patients with clinically suspected pulmonary embolism
2. Prep: None (emergency procedure)
3. Enteric contrast: None
4. Scan Parameters: A. Pulmonary arterial phase, B. Pulmonary venous phase
   - A. a. FOV: Fit the field to just larger than the lungs (may exclude chest wall)
     b. MA: Use dose reduction software if available, otherwise 300-400 MA
     c. KV: 120
     d. Scan time: 0.5 second
     e. Pitch: As appropriate per detector configuration
     f. Raw thickness: 1mm [1.25mm]
     g. Image slice thickness: 1mm [1.25mm]
     h. Table Increment: 1 mm [1.25mm]
     i. Reconstruction Interval: 1 mm [1.25mm]
     j. Reconstruction algorithm: Soft Tissue, Lung
   - B. a. FOV: Variable by patient size
     b. MA: Use dose reduction software if available, otherwise 300-400 MA
     c. KV: 120
     d. Scan time: 0.5 second
     e. Pitch: As appropriate per detector configuration
     f. Raw thickness: 1mm [1.25mm]
     g. Image slice thickness: 3mm[2.5mm]
     h. Table Increment: 3 mm[2.5mm]
     i. Reconstruction Interval: 3 mm[2.5mm]
     j. Reconstruction algorithm: Soft Tissue, Lung

5. Pre IV Contrast Scan: Sure Start Image at Left Pulmonary Artery
6. IV contrast administration- High concentration (eg: Ultravist 370) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 4mL/sec followed by 20mL saline.
7. Post IV contrast scan: Pulmonary arterial phase images-From the aortic knob through the lung bases. Pulmonary venous phase images-Scan from lung apices through adrenal glands. Begin first scan when the contrast bolus reaches the pulmonary artery. Begin the second scan approximately 15 seconds after the first scan.
8. Delay scan: as above.
9. Reconstructions:
   a. MPR Axial Soft Tissue 1x1 and lung algorithm 1x1, Coronal and Sagittal 1x1 mm, soft tissue kernel.
   b. Coronal slab MIP 10mm thick at 5mm increment, soft tissue kernel.
   c. Axial slab MIPs 7mm thick at 3mm increment, soft tissue kernel, but saved to PACS in lung window/level.

Send 1mm & 3mm soft tissue and lung algorithm axials, and all reconstructions to PACS.
Last revised 10/03/2023 HRM

CT Angiogram Chest for Pulmonary Embolism with P3T injector

[GE slice thickness in brackets]

1. Indication: Patients with clinically suspected pulmonary embolism
2. Prep: None (emergency procedure)
3. Enteric contrast: None
4. Other: Only if using P3T on dual head injector!

5. Scan Parameters: Pulmonary arterial phase only
    a. FOV: Fit the field to just larger than the lungs (may exclude chest wall)
    b. MA: Use dose reduction software if available, otherwise 300-400 MA
    c. KV: 120
    d. Scan time: 0.5 second
    e. Pitch: As appropriate per detector configuration
    f. Raw thickness: 1mm [1.25mm]
    g. Image slice thickness: 1mm [1.25mm]
    h. Table Increment: 1 mm [1.25mm]
    i. Reconstruction Interval: 1 mm [1.25mm]
    j. Reconstruction algorithm: Soft Tissue, Lung

6. Pre IV Contrast Scan: Sure Start Image at Left Pulmonary Artery

7. IV contrast administration- High concentration (eg:Ultravist 370) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 4mL/sec followed by 20mL saline.

8. Post IV contrast scan: Pulmonary arterial phase images only-From the lung bases through the lung apex. Begin first scan when the contrast bolus reaches the pulmonary artery.

9. Delay scan: None.

11. Reconstructions:
    a. Axial 1x1 mm, soft tissue and lung kernel.
    b. MPR Coronal and Sagittal 1x1 mm, soft tissue kernel.
    c. Coronal slab MIP 10mm thick at 5mm increment, soft tissue kernel.
    d. Axial slab MIPs 7mm thick at 3mm increment, soft tissue kernel, but saved to PACS in lung window/level.

Send 1mm soft tissue and lung algorithm axials, and all reconstructions to PACS

Last revised 10/03/2023 HRM

CT Trauma Chest, Abdomen and/or Pelvis with Spine Imaging

[GE slice thickness in brackets]

1. Indication: Major trauma patients- Only create thin slice reconstructions of Thoracic or Lumbar Spine upon request of the ordering provider for high suspicion of fracture. (Must have separate order for CT Thoracic and/or Lumbar spine, so a separate radiology report for the spine CT can be generated.)
3. Enteric contrast: None
4. Other: Set up like a spine. Scan through symphysis on initial imaging so that all of the spine can be included on initial recons.
5. Scan parameters:
    a. FOV: Variable by patient size
    b. MA: Use dose reduction software if available, otherwise 300-400 MA
    c. KV: 120
    d. Scan time: 0.5 second
    e. Pitch: As appropriate per detector configuration
    f. Raw thickness: 1mm [1.25mm]
    g. Image slice thickness: 3mm for soft tissue, 2 mm for spine[2.5mm]
    h. Table Increment: 3 mm[2.5mm]
    i. Reconstruction Interval: 3mm[2.5mm] for soft tissue, 1 mm for spine [1.25mm]
    j. Reconstruction algorithm: Soft Tissue, Lung (Bone for spine)
6. Pre IV contrast scan: For localization only.
7. IV contrast administration- standard concentration (eg:Ultravist 300) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 3mL/sec.
8. Post IV contrast scan, 1st run: Scan entire chest, abdomen and pelvis (one helical run) during portal venous phase (use 70 second delay) contrast enhancement. Scan from the base of the neck through the perineum.
9. Delay scan: 5 minute delay from top of liver through pubic symphysis on all patients to include contrast-filled bladder. Exception: pregnant patients, call Radiologist for protocol.
10. Reconstructions: Axial, Coronal and Sagittal 3x3 mm for Chest/Abd/Pelvis, Soft Tissue kernel and standard lung algorithm, axial and coronal only on delayed.
11. When dedicated spine reconstructions are requested – MPR Axial, Coronal and Sagittal for spine 1x1 mm bone and soft tissue algorithm (send to PACS as a separate Spine CT exam for dictation).

Updated 10/03/2023 HRM

CT Trauma Chest, Abdomen and/or Pelvis with Spine Imaging for Pediatrics

[GE slice thickness in brackets]

1. Indication: Major trauma patients- Only create thin slice reconstructions of Thoracic or Lumbar Spine upon request of the ordering provider for high suspicion of fracture. (Must have separate order for CT Thoracic and/or Lumbar spine, so a separate radiology report for the spine CT can be generated.)

3. Enteric contrast: None

4. Other: Set up like a spine. Scan through symphysis on initial imaging so that all of the spine can be included on initial recons.

5. Scan parameters:
   a. FOV: Variable by patient size
   b. MA: Use dose reduction software if available, otherwise 200-300 MA
   c. KV: 120
   d. Scan time: 0.5 second
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 1mm [1.25mm]
   g. Image slice thickness: 3mm for soft tissue, 2 mm for spine[2.5mm]
   h. Table Increment: 3 mm[2.5mm]
   i. Reconstruction Interval: 3mm[2.5mm] for soft tissue, 1 mm for spine [1.25mm]
   j. Reconstruction algorithm: Soft Tissue, Lung (Bone for spine)

6. Pre IV contrast scan: For localization only.

7. IV contrast administration:
   a. Chest/Abdomen/Pelvis- 1 ml per pound up to a maximum dose of up to 100 ml non-ionic contrast medium (eg: Ultravist 300), scanning at 70 seconds. Preferably administration of contrast will be done with a power injector at the highest rate as determined by type and location of IV access. Hand injection is acceptable when power injection is not possible.

8. Post IV contrast scans
   1st run from apex to pubic symphysis.

9. Delay scan: 5 minutes from top of liver through pubic symphysis on all patients to include contrast-filled bladder.

10. Reconstructions: Axial, Coronal and Sagittal 3x3 mm for Chest/Abd/Pelvis, Soft Tissue kernel and standard lung algorithm, axial and coronal only on delayed.

11. When dedicated spine reconstructions are requested – MPR Axial, Coronal and Sagittal for spine 1x1 mm bone and soft tissue algorithm (send to PACS as a separate Spine CT exam for dictation).
    Last revised 10/03/2023 HRM

CT Chest-Routine with Contrast

[GE slice thickness in brackets]

1. Indication: Routine CT Chest and for suspected or follow up of known Thoracic Aortic Aneurysm

2. Prep: Clear liquids > 4 hrs prior to exam.

3. Enteric contrast: None

4. Other: None.

5. Scan parameters for all phases of imaging
   a. FOV: Variable by patient size
   b. MA: Use dose reduction software if available, otherwise 300-400 MA
   c. KV: 120
   d. Scan time: 0.5 second
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 1mm [1.25mm]
   g. Image slice thickness: 3mm[2.5mm]
   h. Table Increment: 3 mm[2.5mm]
   i. Reconstruction Interval: 3mm[2.5mm]
   j. Reconstruction algorithm: Soft Tissue, Lung

6. Pre IV contrast scan: None.

7. IV Contrast administration: standard concentration (eg: Ultravist 300) non-ionic contrast medium up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 3 ml/second. Set Surestart on aortic arch or use 20 second delay without Surestart.

8. Post IV contrast scans. Thoracic inlet through adrenals

9. Delay scan: None.

10. Reconstructions:
    a. MPR Axial soft tissue and lung algorithm, Coronal and Sagittal soft tissue kernel 3x3 mm.
    b. Axial slab MIPs 7mm thick at 3mm increment, soft tissue kernel, but saved to PACS in lung window/level.

Send 3mm soft tissue and lung algorithm axials, and all reconstructions to PACS

Last revised 10/03/2023 HRM

CT Chest/Abdomen or Chest/Abdomen/Pelvis

[GE slice thickness in brackets]

1. Indication: routine, non-posttraumatic CT of the chest-abdomen or chest-abdomen-pelvis

2. Prep: none

3. Enteric contrast for the following indications:
    a. Rule out abscess or fluid collection
    b. If specifically ordered by surgical team, most often to evaluate small bowel obstruction or post-operative leak
    c. Per radiologist

4. Other protocol options per radiologist:
    a. Rectal contrast
    b. Clamp foley catheter, unclamp after examination

5. IV contrast administration: standard concentration nonionic contrast medium, 100 mL intravenously (18-22g peripheral IV, Power PICC or Power Port) at 3mL/sec. Use 70 second delay.

6. Post-IV contrast scan:
    a. Cover base of neck through perineum (one helical run)
    b. Portal venous phase (70 seconds)

7. Delayed phase post-IV contrast scan: per radiologist

8. Scan parameters:
    a. FOV: Variable by patient size
    b. MA: Use dose reduction software if available, otherwise 300-400 MA
    c. KV: 120
    d. Scan time: 0.5 second
    e. Pitch: As appropriate per detector configuration
    f. Raw thickness: 1mm [0.625 mm]
    g. Slice thickness: 3 mm [2.5mm]
    h. Reconstruction Interval: 3 mm [2.5mm]
    i. Reconstruction algorithm: soft tissue, lung

9. Reconstructions:
    a. Soft tissue kernel
        i. MPR: axial, coronal and sagittal 3 mm slice thickness x 3 mm interval
        ii. <u>Do not split the chest from the abdomen and pelvis</u>
    b. Lung kernel (chest only)
        i. MPR: axial 3 mm slice thickness x 3 mm interval
        ii. MIPS: axial slab 7 mm slice thickness with 3 mm interval. Send as soft tissue kernel but save to PACS using lung window/level.

Last revised 11/11/2024 HRM

CT Extremity for Infection

[GE slice thickness in brackets]

1. Indication: Evaluation of extremity for infection

2. Prep: Clear liquids > 4 hrs.

3. Enteric contrast: None

4. Other: None.

5. Scan parameters:
   a. FOV: Variable per patient size
   b. MA: 320
   c. KV: 120
   d. Scan time: 0.5 second
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 1 mm [1.25mm]
   g. Image slice thickness: 1 mm [1.25mm]
   h. Table Increment: 1 mm [1.25mm]
   i. Reconstruction Interval: 1 mm [1.25mm]
   j. Reconstruction algorithm: Soft Tissue

6. Pre IV contrast scans- none

7. IV contrast administration- Normal concentration (eg:Ultravist 300) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 3-4mL/sec.
   Delay 2 minutes after start of injection before scanning.

8. Post IV contrast scan: extremity of concern through questionable infected area.

9. Delay scan: None.

10. Reconstruction: Axial, Coronal and Sagittal images by 1 mm in both soft tissue and bone window.
    Send all images to PACS

    Last revised 10/03/2023 HRM

CT Ankle/Foot

[GE slice thickness in brackets]

1. Indication: Trauma, pain, tumor

2. Prep: None.

3. Enteric contrast: None

4. Other: Foot or Ankle- Supine with knees bent and feet flat on scan couch, or leg extended toes pointing up. Affected side only unless for coalition.

5. Scan parameters – Protocol with Radiologist.
   a. FOV: Variable to patient size
   b. MA: 320
   c. KV: 120
   d. Scan time: 1 second
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 0.5 mm [0.625mm]
   g. Image slice thickness: 0.5 mm [0.625mm]
   h. Table Increment: 0.5mm [0.625mm]
   i. Reconstruction Interval: 0.5mm [0.625mm]
   j. Reconstruction algorithm: Soft Tissue, Bone

6. Pre IV contrast scan: Through area of interest.

7. IV Contrast administration: None.

8. Post IV contrast scan: None.

9. Delay scan: None.

10. Reconstructions: Sagittal and Coronal x 1 mm with bone windows

    Midfoot or Forefoot – second metatarsal
    Ankle or Hindfoot- Tibiotalar joint
    Send soft tissue, bone algorithm and reconstructions to PACS

Last revised 8/27/15
GMH

CT Elbow

[GE slice thickness in brackets]

1. Indication: Trauma, pain, tumor

2. Prep: None.

3. Enteric contrast: None

4. Other: Patient in prone position with arm overhead, palm turned up on scan couch- Affected side only

5. Scan parameters – Protocol with Radiologist.
   a. FOV: size to area of interest
   b. MA: 320
   c. KV: 120
   d. Scan time: 1 second
   e. Pitch : As appropriate per detector configuration
   f. Raw thickness: 0.5 mm [0.625mm]
   g. Image slice thickness: 0.5 mm [0.625mm]
   h. Table Increment: 0.5 mm [0.625mm]
   i. Reconstruction Interval: 0.5 mm [0.625mm]
   j. Reconstruction algorithm: Soft Tissue, Bone

6. Pre IV contrast scan: distal humerus through proximal radius.

7. IV Contrast administration: None.

8. Post IV contrast scan: None

9. Delay scan: None.

10. Post processing: Sagittal and Coronal x 1mm with bone windows
    Coronal - one set to Humerus
    - one set to Radius
    Sagittal – one set to Humerus and Ulna

    Send soft tissue, bone algorithm and reconstructions to PACS

Last revised 8/27/15 GMH

CT Hand or Wrist

[GE slice thickness in brackets]

1. Indication: Trauma, pain, tumor

2. Prep: None.

3. Enteric contrast: None

4. Other: Hand or Wrist- Patient in prone position with arm overhead, palm flat on scan couch – Affected side only

5. Scan parameters – Protocol with Radiologist.
   a. FOV: Variable to body part.
   b. MA: 320
   c. KV: 120
   d. Scan time: 1 second
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 0.5 mm [0.625mm]
   g. Image slice thickness: 0.5 mm [0.625mm]
   h. Table Increment: 0.5 mm [0.625mm]
   i. Reconstruction Interval: 0.5 mm [0.625mm]
   j. Reconstruction algorithm: Soft Tissue, Bone

6. Pre IV contrast scan: Through area of interest per radiologist.

7. IV contrast administration: None

8. Post IV contrast scan: None

9. Delay scan: None

10. Reconstructions: Sagittal and coronal x 1 mm with bone windows

    Hand – through the 3rd Metacarpal
    Wrist – coronals to Radiocarpal joint
    – sagittal to Lunate and Capitate

    Send soft tissue, bone algorithm and reconstructions to PACS

Last revised 8/27/15 GMH

CT Knees

[GE slice thickness in brackets]

1. Indication: Trauma, pain, tumor

2. Prep: None.

3. Enteric contrast: None

4. Other: Affected side only

5. Scan parameters – Protocol with Radiologist.
   a. FOV: Variable.
   b. Scan angle: Straight axial
   c. MA: 320
   d. KV: 120
   e. Scan time: 1 second
   f. Pitch: As appropriate per detector configuration
   g. Raw thickness: 1 mm [1.25mm]
   h. Image slice thickness: 1 mm [1.25mm]
   i. Reconstruction Interval 1mm [1.25mm]
   j. Reconstruction algorithm: Soft Tissue, Bone

6. Pre IV contrast scan: above patella to below patella through joint

7. IV Contrast administration

8. Post IV contrast scan: None

9. Delay scan: None.

10. Reconstructions: Sagittal and Coronal x 1 mm with bone windows

    If knee is flexed, one set of Coronals to femur, one set to tibia
    Sagittal to femur and tibia

    Send soft tissue, bone algorithm and reconstructions to PACS

Last revised 8/27/15 GMH

CT SHOULDER

[GE slice thickness in brackets]

1. Indication: Trauma, pain, tumor

2. Prep: None.

3. Enteric contrast: None

4. Other: Affected side only.

5. Scan parameters – Protocol with Radiologist.
   a. FOV: Variable.
   b. MA: 320
   c. KV: 120
   d. Scan time: 1 second
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 1 mm [1.25mm]
   g. Image slice thickness: 1 mm [1.25mm]
   h. Table Increment: 1 mm [1.25mm]
   i. Reconstruction Interval: 1 mm [1.25mm]
   j. Reconstruction algorithm: Soft Tissue, Bone

6. IV Contrast administration: None.

7. Post IV contrast scan: None.

8. Delay scan: None.

9. Reconstructions: Sagittal and coronal x 1 mm with bone windows through the glenohumeral joint.

   Send soft tissue, bone algorithm and reconstructions to PACS

Last revised 8/27/15 GMH

CT Facial Bones

[GE slice thickness in brackets]

1. Indication: Routine CT of the facial bones

1. Prep: If IV contrast administered, clear liquids > 4 hrs prior to exam.

3. Enteric contrast: None

4. Other: none

5. Scan parameters:
   a. FOV: 14-20(open field to include skin on nose, face, and ears)
   b. MA: 150 (Note- May use MA of 300 and scan time of 0.5 sec if patient is uncooperative)
   c. KV: 120
   d. Scan time: 1 sec
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 0.5mm [0.625mm]
   g. Image slice thickness: 0.5mm [0.625mm]
   h. Table Increment: 0.5 mm [0.625mm]
   i. Reconstruction Interval: 1.0mm [1.25mm]
   j. Reconstruction algorithm: Soft Tissue, Bone

6. **NON CONTRAST EXAM**:
   1) For trauma to facial bones/mandible: From below mandible to 4-5 cm above supraorbital rim .
   2) **For trauma to orbits or nasal bones only**: From bottom of upper teeth to 4-5 cm above supraorbital rim.

7. **CONTRAST EXAM**:
   a. Standard concentration (eg:Ultravist 300) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 1.5mL/sec.
   b. Scan after injection complete (need good venous and arterial enhancement)
   Scan from below mandible to 4-5 cm above supraorbital rim.
   Delay scan: None

8. Reconstructions:
   NON CONTRAST EXAM: Axial Soft tissue, Axial Bone, and Sagittal and Coronal Bone reconstructions 1 x 1 mm.

   CONTRAST EXAM: Axial Soft tissue, Axial Bone, and Sagittal and Coronal soft tissue reconstructions
   1 x 1 mm.

Send axials and all recons to PACS

Last revised 4/12/24 BLH

CT Orbits -Axial

[GE slice thickness in brackets]

1. Indication: Routine CT of the orbits

2. Prep: If IV contrast administered, clear liquids > 4 hrs prior to exam.

3. Enteric contrast: None

4. Other: Supine, instruct patient to hold eyes fixed in slight upward gaze.

5. Scan parameters:
   a. FOV: 14-20 (open field to include skin on nose, face, and ears)
   b. MA: 150 (Note- May use MA of 300 and scan time of 0.5 sec if patient is uncooperative)
   c. KV: 120
   d. Scan time: 1 sec
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 0.5mm [0.625mm]
   g. Image slice thickness: 0.5mm [0.625mm]
   h. Table Increment: 0.5mm [0.625mm]
   i. Reconstruction interval: 0.5mm [0.625mm]
   j. Reconstruction algorithm: Soft Tissue, Bone

6. Pre IV contrast scan: to be completed only if non contrast study ordered. Mid maxilla to 4-5 cm above supraorbital rim.

7. IV Contrast Administration – if recommended-
   a. Standard concentration (eg:Ultravist 300) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 1.5mL/sec.
   b. Scan after injection complete (need good venous and arterial enhancement)

8. Post IV contrast enhanced scanning: to be completed only if contrasted study ordered. Same as pre-contrast scanning.

9. Delay Scan: None.

10. Reconstructions: Straight Sagittal and Coronal 1 x 1 mm (No need to create separate oblique sagittals parallel to the right and left optic nerves, unless specifically requested).
    Send axials and all recons in **bone algorithm**, and axials, coronals, and sagittals in **soft tissue** algorithm to PACS

Last revised 10/16/23 BLH

Pediatric Head CT for Craniosynostosis

[GE slice thickness in brackets]

1. Indication: CT of the head for craniosynostosis

2. Prep: None

3. Enteric contrast: None

4. Other: Be sure to take extra time to position the head carefully. It is important that the head not be tilted or rotated.

5. Scan Parameters:
   a. FOV: 18-23
   b. MA: 200
   c. KV: 120
   d. Scan time: 0.5 sec
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 1mm [1.25mm]
   g. Image slice thickness: 1mm [1.25mm]
   h. Table Increment: 1mm [1.25mm]
   i. Reconstruction Interval: 1 mm
   h. Reconstruction algorithm: Brain, Bone

6. Pre IV contrast scan: Helical scanning only.
   Scan from base of skull completely through the vertex

6. IV Contrast administration: None

7. Post IV contrast scan: None

8. Delay scan: None.

9. Reconstructions:
   a. 3D surface reformations, rotated somersault and also side-to-side.
   b. MPR coronal and sagittal 1x1 mm, bone algorithm.
   c. Send axial images to the Vitrea workstation.

   Send bone and brain algorithm 1x1 mm axials, and all reconstructions to PACS

Last revised 10/5/16 GMH

CT Sella

[GE slice thickness in brackets]

1. Indication: To look at sellar and parasellar masses, including tumors of the pituitary gland, in patients who are unable to have an MRI

2. Prep: Clear liquids > 4 hr.

3. Enteric contrast: None

4. Other: None

5. Scan parameters:
   a. FOV: 14-20
   b. MA: 300
   c. KV: 120
   d. Scan time: 0.5 sec
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 0.5 mm [.75mm]
   g. Image slice thickness: 0.5 mm [.75mm]
   h. Table Increment: 0.5 mm [.75mm]
   i. Reconstruction Interval: 0.5 mm
   j. Reconstruction algorithm: Soft Tissue, Bone

6. Pre IV contrast scan: None

7. IV contrast administration- standard concentration (eg:Ultravist 300) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) hand injection or at 1mL/sec.

8. Post IV contrast scan: Axial Scan from base of skull through the clinoids.

9. Delay scan: None.

10. Reconstruction: Coronal and Sagittal 1x1 mm, soft tissue algorithm
    Send axials and reconstructions to PACS

Last revised 10/03/2023 HRM

Memo

To: Outreach Hospitals, Mercy CT, St. Luke's CT, RCI CT

From: RCI Neuroradiology Section

CC: B. Otto

Date: 8/1/2011

Re: Change in Protocol for Routine Axial Noncontrast Maxillofacial CT

RCI Neuroradiology section has made a slight change in protocol to the routine axial noncontrast maxillofacial CT protocol. At the request of the ENT department in Cedar Rapids, the skin of the nose, cheeks and ears should be included in patients that are undergoing a routine maxillofacial CT. To accommodate this, the field of view should be slightly increased or shifted anterior to include the anatomy and skin. How best to accommodate the increased coverage will be dependent on the CT scanner.

The reason for the change is when this additional skin tissue is included routinely, patients will not have to be brought back for repeat CT imaging prior to stereotactic operating room procedures. RCI would appreciate if this change would be implemented in your CT department by Friday, August 5th so ENT is aware that patients performed prior to this date may need additional imaging prior to surgery.

This change in protocol has been made to the RCI internet protocol section.

CT Sinus Exam - Complete

[GE slice thickness in brackets]

1. Indication: Routine CT of the sinuses

2. Prep: If IV contrast administered, clear liquids > 4 hrs prior to exam.

3. Enteric contrast: None

4. Other: None

5. Scan parameters:
   a. FOV: 14(open field to include skin on nose, face, and ears)
   b. MA: 300
   c. KV: 120
   d. Scan time: 0.5 sec
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 0.5mm [.625mm]
   g. Image slice thickness: 0.5 mm [.625mm]
   h. Table Increment: 0.5 mm [.625mm]
   i. Reconstruction Interval: 1.0 mm
   j. Reconstruction algorithm: Soft Tissue, Bone

6. Pre IV contrast scan: to be completed only if non contrast study ordered. Bottom of maxilla to 4-5 cm above supraorbital rim.

7. IV Contrast Administration- if recommended-
   a. Standard concentration (eg:Ultravist 300) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 1.5mL/sec.
   b. Scan after injection complete (need good venous and arterial enhancement)

8. Post IV contrast scan: to be completed only if contrasted study ordered.Bottom of maxilla to 4-5 cm above supraorbital rim.

9. Delay scan: None

10. Reconstructions: Coronals and Sagittals 1x1 mm, bone algorithm
    Send soft tissue and bone algorithm axials and reconstructions to PACS

Last revised 10/16/23 BLH

CT SOFT TISSUE NECK

[GE slice thickness in brackets]

1. Indication: Routine CT Soft Tissue Neck (see Exceptions below for specific indications)
2. Prep: Clear liquids > 4 hrs prior to exam
3. Enteric Contrast: None
4. Other: Breathing Instructions for all series (place skin marker over lump, if appropriate):
   Just before scanning: Instruct patient to "Clear your throat, and then swallow. Now during the scan, **don't hold your breath**, but **quietly breathe through your nose and mouth with your mouth slightly open**, and don't swallow."

5. Scan Parameters
   a. FOV: 18 cm
   b. MA: Use dose reduction software if available, otherwise 300-400 MA
   c. KV: 120
   d. Scan time: 0.5 second
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 1 mm [1.25mm]
   g. Image slice thickness: 2 mm [2.5mm]
   h. Table Increment: 2 mm [2.5mm]
   i. Reconstruction interval: 2 mm [2.5 mm]
   j. Reconstruction algorithm: Soft Tissue

7. Pre IV contrast scans: typically for localization only ***Exception:** When looking for stone, scan from EAC through floor of mouth w/o by 2mm [2.5mm]

7. IV Contrast Administration
   a. Standard concentration (eg:Ultravist 300) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 1.5mL/sec.
   b. Scan after injection complete (need good venous and arterial enhancement)

8. Post IV contrast scans
   a. From 1 cm above external auditory canal to sternoclavicular joints
   ***Exception:** If patient has vocal cord paralysis or paresis, vocal cord lesion, hoarseness, or dysphagia – continue scan down to the main pulmonary artery level (indicate on worksheet right vs. left vocal cord paralysis or lesion, by history)
   b. **Additional angled series gantry tilt** (-20 to -30 degrees) through the region of the oropharynx obscured by dental amalgam artifact on standard axial slices (send this angled series to PACS as a separate series)
   c.***Note:** If vocal cord lesion is of concern, reprocess images through the vocal cords using slice thickness of 1 mm, and reconstruction interval of 1 mm.

9. Delay scan: Check images before getting patient off the CT table, and **perform repeat scanning through any areas where there is swallowing or motion**

artifact. If the vocal cords are touching each other, rescan thin slices through the larynx, with same breathing instructions as above.

10. Reconstruction: Coronal and Sagittal x 2 mm
Send soft tissue algorithm and reconstructions to PACS

Additional note per Dr. Randall: A single marker should be placed over each lump noted by the patient. If using any type of marker that produces streak artifact, take a few slices unenhanced through the marker – then remove before injecting and scanning. If using a non-artifact producing marker, then the marker can stay on for the exam, no pre-contrast images through the marker are needed. Markers that cause streak artifact should be phased out and replaced with markers made for CT such as Beekley or Suremark brands.

Last revised 10/03/2023 HRM

CT SOFT TISSUE NECK FOR PARATHYROID ADENOMA
(aka "4D CT")

[GE slice thickness in brackets]

1. Indication: Evaluation for suspected parathyroid adenoma. "4D CT" refers to 3 image planes, in conjunction with the fourth dimension of time (multiphase imaging).
2. Prep: Clear liquids > 4 hrs prior to exam
3. Enteric Contrast: None
4. Other: Breathing Instructions for all series:
   Just before scanning: Instruct patient to "Clear your throat, and then swallow. Now during the scan, **don't hold your breath**, but **quietly breathe through your nose and mouth with your mouth slightly open**, and don't swallow."

5. Scan Parameters
   a. FOV: 18 cm
   b. MA: variable between 100-400, 100-600 arterial
   c. KV: 120
   d. Scan time: 0.5 second
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 1 mm [0.625mm]
   g. Image slice thickness: 1 mm [1.25mm]
   h. Table Increment: 1 mm [1.25mm]
   i. Reconstruction interval: 1 mm [1.25 mm]
   j. Reconstruction algorithm: Soft Tissue

6. **Pre IV contrast scan:** from angle of mandible to top of aortic arch

7. IV Contrast Administration
   Standard concentration (eg: Ultravist 300) nonionic contrast medium, up to 100 ml intravenously power-injected (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) at 4mL/sec., followed by 30 ml saline bolus chase.

8. **Post IV contrast arterial phase scan:**
   a. From angle of mandible to top of aortic arch.
   b. Scan 30 seconds after injection starts.

9. **Post IV contrast delayed scan:**
   a. From external auditory canal to the carina.
   b. Scan 80 seconds from start of injection.

10. Reconstruction: Coronal and Sagittal x 1 mm
    Send soft tissue algorithm and reconstructions to PACS

Last revised 10/03/2023 HRM

STROKE ALERT PROTOCOL if CT Perfusion ordered

1. Ordering physician requests
   a. Non-enhanced head CT with CTA

2. Staff places IV in antecubital fossa
   a. 18-20 gauge preferable
   b. 22 gauge can be used at lower infusion rate

3. Nurse must accompanies patient to CT and stay for scan

4. Standard non-infused CT head performed

5. Technologist reviews images and calls radiologist if intracranial hemorrhage is seen to determine necessity of CTA and/or Perfusion imaging. If no obvious hemorrhage seen by technologist, continue on with CTA and/or Perfusion imaging.

   a. Contraindications to CTA
      -Intraparenchymal hemorrhage (relative contraindication)
      -Large area of acute/sub acute infarct (>1/3 vascular territory or ASPECTS score <3)
      -Non-ischemic cause for stroke
      -Significant mass effect
      -History of allergy to contrast
   b. Radiologist contacts CT tech to confirm proceeding to CTA and/or CTP after discussion with ordering physician.

6. CTP Technique (call radiologist before scanning, for approval)
   - Center on superior third ventricle with oblique slices superior to orbit to reduce orbital dose
   - Perform dynamic scan
   - Technique
     a. KV 80
     b. MA 190
     c. Rotation 1 sec
     d. Thickness 4 slices 8mm. thick each
     e. Scan time 50 seconds
     f. Injection
        40 ml of Isovue 370 (or similar contrast) at 5ml/sec followed by 20 ml of saline at 5ml/sec; (decrease to 4 ml/sec if 22 gauge needle used)
   - Start scan 4 sec after start of injection
   - Send images to PACS and Vitrea

7. CTA Scan Parameters
   a. FOV: variable
   b. Pitch: As appropriate per detector configuration
   c. Scan time 0.5 sec.
   d. MA variable in neck, 250 in head
   e. KV 120
   f. Raw thickness 0.5mm
   g. Collimator thickness 0.5mm.
   h. Reconstruction Interval: 0.5 mm
   i. Reconstruction algorithm- Soft Tissue

8. CTA Injection Technique
   a. 60 ml of high concentration (eg: Ultravist 370) nonionic contrast medium
   b. Follow with 20ml of saline
   c. Inject at 5ml/sec with 20 gauge needle
      Inject at 4mlc/sec with 22 gauge needle
   d. Trigger with Sure Start in aortic arch. Begin scan
      4 seconds after Sure Start triggered.
   e. Scan base of aortic arch to near top of skull

9. Radiologist reviews CTA source images and reconstructions.

10. Radiologist load CTP onto Vitrea software and reviews CBV, CBF and MTT maps at the four levels.

Last revised 10/16/23 BLH

CT Temporal Bone

[GE slice thickness in brackets]

1. Indication: CT of the temporal bones

2. Prep: None

3. Enteric contrast: None

4. Other: None.

5. Scan parameters:
   a. FOV: To include the right and left sides simultaneously
   b. MA: 300
   c. KV: 120
   d. Scan time: 1 sec
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 0.5 mm [0.625mm]
   g. Image slice thickness: 0.5 mm [0.625mm]
   h. Table Increment: 0.5 mm [0.625mm]
   i. Reconstruction Interval: 0.5 mm [0.625mm]
   j. Reconstruction algorithm: Bone

6. Pre IV contrast scan: to be completed only if non contrast study ordered. Axial from petrous ridges through mastoid tip.

7. IV Contrast administration: None unless requested.
   Omnipaque 350(or similar) nonionic contrast medium, 60 ml intravenously. 5cc/sec

8. Post IV contrast scanning: to be completed only if contrasted study ordered. Scan from C2 to top of skull on both runs. CTA (trigger at C2 or aortic arch 150 HU, about 15 seconds) and CTV (1 minute delay). Do angio head recons on both CTA and CTV

9. Delay scan: None.

10. Reconstruction:
    a. Axial soft tissue and bone algorithm of both temporal bones simultaneously x 0.5mm or 1mm.
    b. Bone algorithm Axial, Coronal (Mandibular condyles through mastoid bone), and Sagittal reconstructions x 0.5mm or 1mm zoomed to each side with a 10 cm FOV.

    Send all reconstructions to PACS

Last revised 10/16/23 BLH

CT Head Adult Protocol

[GE slice thickness in brackets]

1. Indication: Routine CT of the head

2. Prep: If IV contrast administered, clear liquids > 4 hrs prior to exam.

3. Enteric contrast: None

4. Other: None

5. Scan parameters: Helical

   a. FOV: 24
   b. MA: 300
   c. KV: 120
   d. Scan time: 1 sec
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 1mm [1.25mm]
   g. Image slice thickness: 3 mm[2.5mm]
   h. Table increment: 3 mm[2.5mm]
   i. Reconstruction interval: 3mm
   j. Reconstruction algorithm: Brain and bone algorithm on axial.

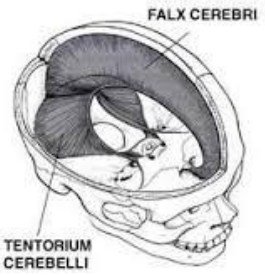
6. Pre IV contrast scan: to be completed only if non contrast study ordered. Angle parallel with the infraorbital-meatal line (preferable) or supraorbital-meatal line.

7. Standard concentration (eg:Ultravist 300) nonionic contrast medium, up to 100 ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) hand injection or slower.

8. Post IV contrast scan: to be completed only if contrasted study ordered. Same as pre-contrast scanning. Wait 5 minutes after injection to scan.

9. Delay scan: None

10. Reconstructions: Axial, Sagittal (parallel to falx) and Coronal (perp. to falx) MPR 3mm x 3mm, soft tissue (brain) algorithm. Axial 3mm x 3mm bone algorithm. Create axial MPR 3mm x 3mm soft tissue (brain) algorithm to correct asymmetry or gantry angle issues on the initial axials, if appropriate, and send these instead of original.



Last revised 10/2/24 BLH

CT Head Pediatric Protocol 0-5 yrs.

[GE slice thickness in brackets]

1. Indication: Routine CT of the head for children ≤ 5 years of age (If > 5 yrs old, use adult protocol). Do not use automatic dose reduction software for pediatric heads or spines.
2. Prep: If IV contrast administered, clear liquids > 4 hrs prior to exam.
3. Enteric contrast: None
4. Other: None
5. Scan parameters for ages 0-2 yrs old May be performed helical:
   a. FOV: 18-23
   b. MA: 200
   c. KV: 120
   d. Scan time: 0.5 sec
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 1mm [1.25mm]
   g. Image slice thickness: 3mm [2.5mm]
   h. Table Increment: 3mm [2.5mm]
   i. Reconstruction Interval: 3mm [2.5mm]
   j. Reconstruction algorithm: Brain (*Also bone algorithm if any recent head injury)
6. Scan parameters for ages 2-5 yrs old May be performed helical:
   a. FOV: 18-23
   b. MA: 170
   c. KV: 120
   d. Scan time: 1 sec
   e. Pitch: As appropriate per detector configuration15
   f. Raw thickness: 1mm [1.25mm]
   g. Image slice thickness: 3mm [2.5mm]
   h. Table Increment: 3mm [2.5mm]
   i. Reconstruction Interval: 3mm [2.5mm]
   j. Reconstruction algorithm: Brain (*Also bone algorithm if any recent head injury)

7. Pre IV contrast scan: to be completed only if non contrast study ordered. Angle parallel with the infraorbital-meatal line (preferable) or supraorbital-meatal line.
8. Standard concentration (eg:Ultravist 300) nonionic contrast medium, 2 ml/kg or 1 ml/lb up to 100ml intravenously (18g-22g upper extremity peripheral IV, Power PICC, or Power Port) hand injection or slower
9. Post IV contrast enhanced scanning: to be completed only if contrasted study ordered. Same as pre-contrast scanning.
10. Delay scan: None.

11. Reconstructions: Axial, Sagittal (parallel to falx) and Coronal (perp. to falx) MPR 3mm x 3mm, soft tissue (brain) algorithm. For trauma-also send Axial, Sagittal, Coronal 3mm x 3mm bone algorithm. Create axial MPR 3mm x 3mm soft tissue (brain) algorithm to correct asymmetry or gantry angle issues on the initial axials, if appropriate, and send these instead of original.

Last revised 10/2/24 BLH

CT Venogram Head

[GE slice thickness in brackets]

1. Indication: Dural Sinus Thrombosis

2. Prep: None

3. Scan parameters:
a. FOV: Small 18 cm
b. MA: Sure Exposure
c. KV: 120
d. Scan time: 0.5 sec
e. Pitch: As appropriate per detector configuration
f. Raw thickness: 0.5 mm [0.625 mm]
g. Image slice thickness: 0.5 mm [0.625 mm]
h. Table increment: 0.5 mm [0.625 mm]
i. Reconstruction interval: 0.3 mm
j. Reconstruction algorithm: CTA Brain

4. Pre IV contrast scan: If patient has not had a head CT in the past 48 hours do a non-contrast head CT. Have a Radiologist review study before proceeding with contrast.

5. IV Contrast Administration: Administer Iohexol 350 mg/ml (Omnipaque) **up to 100 ml** IV. Use Med Rad injector Angio Head/Neck protocol at 3 ml/second. Start scanning and injector at same time and follow with 20 ml of 0.9% Sodium Chloride IV flush.

6. Post IV contrast scan:
a. Set scanner delay to **40** seconds before scanning.
b. Scan from just below base of skull through the entire vertex of skull.

7. Delay scan: None

8. Reconstructions:
-MPR: Axial 0.5 mm x 0.5 mm, Coronal and Sagittal 1x1 mm, CTA Brain
-MIPS: Axial, Coronal and Oblique Coronal (Fig. 1*): 20 mm x 5 mm, CTA Brain
-Send source axial images to Vitrea workstation. Send axial soft tissue algorithm and all reconstructions to PACS.

Last revised 10/03/2023 HRM

CT Pelvis/Hips for Fracture or Bone lesion

[GE slice thickness in brackets]

1. Indication: Trauma to look for fracture; bone lesion

2. Prep: None.

3. Enteric contrast: None

4. Other:

5. Scan parameters -
   a. FOV: Variable per patient size, but include entire bony pelvis and both hips
   b. MA: Use dose reduction software if available, otherwise 300-400 MA
   c. KV: 120
   d. Scan time: 1 second
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 1 mm [1.25mm]
   g. Image slice thickness: 1 mm [1.25mm]
   h. Table Increment: 1 mm [1.25mm]
   i. Reconstruction Interval: 1 mm [1.25mm]
   j. Reconstruction algorithm: Soft Tissue, Bone

6. Pre IV contrast scan: Above iliac crest through lesser trochanters.

7. IV Contrast administration: None.

8. Post IV contrast scan: None.

9. Delay scan: None

10. Reconstructions: Sagittal and coronal 1x1 mm of entire data set, in bone and soft tissue algorithm

    Send soft tissue, bone algorithm and reconstructions to PACS

Last revised 10/5/16 GMH

CT Cervical Spine S/P Myelogram

[GE slice thickness in brackets]

1. Indication: Cervical spine CT following intrathecal injection of contrast material

2. Prep: Have patient roll prior to scanning in order to mix contrast material with CSF.

3. Enteric contrast: None

4. Other: None.

5. Scan parameters
   a. Scan angle: Straight axial
   b. FOV: 12-14
   c. MA: Use dose reduction software if available, otherwise 200-300 MA
   d. KV: 120
   e. Scan time: 1 second
   f. Pitch: As appropriate per detector configuration
   g. Raw thickness: 0.5 mm [0.625mm]
   h. Table Increment: 1 mm [1.25mm]
   i. Image slice thickness: 1 mm [1.25mm]
   j. Reconstruction algorithm: Soft Tissue, Bone

6. Pre IV contrast scan: Skull base through T-1

7. IV contrast administration: None

8. Post IV contrast scan: None.

9. Delay scan: None.

10. Reconstructions: Reconstruct angled axial images at 1 mm intervals through disks that are angled. Coronal and Sagittal bone and soft tissue algorithm x 1 mm Send soft tissue, bone algorithm and reconstructions to PACS

Last revised 8/27/15 GMH

CT Cervical Spine

[GE slice thickness in brackets]

1. Indication: Trauma or degenerative disc disease

2. Prep: None.

3. Enteric contrast: None

4. Other: None

5. Scan parameters
   a. FOV: 12-14
   b. MA: Use dose reduction software if available, otherwise 200-300 MA
   c. KV: 120
   d. Scan time: 1 second
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 0.5 mm [0.625mm]
   g. Image slice thickness: 0.5 mm [0.625mm]
   h. Table Increment: 0.5 mm [0.625mm]
   i. Reconstruction Interval: 0.5 mm [0.625mm]
   j. Reconstruction algorithm: Soft Tissue, Bone

6. Pre IV contrast scan: Through area of interest.

7. IV Contrast administration: None

8. Post IV contrast scan: None

9. Delay scan: None

10. Reconstructions: Sagittal and Coronal 1x1 mm (**bone and soft tissue algorithm**). Send soft tissue, bone algorithm and reconstructions to PACS

Last revised 8/27/15 GMH

CT Lumbar Spine S/P Myelogram

[GE slice thickness in brackets]

1. Indication: Lumbar spine CT following intrathecal injection of contrast material

2. Prep: Have patient roll prior to scanning in order to mix contrast material with CSF.

3. Enteric contrast: None

4. Other: None

5. Scan parameters
   a. FOV: 12-14
   b. MA: Use dose reduction software if available, otherwise 200-300 MA
   c. KV: 120
   d. Scan time: 1 second
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 1 mm [1.25mm]
   g. Image slice thickness: 3 mm [2.5mm]
   h. Table Increment: 3 mm [2.5mm]
   i. Reconstruction Increment: 3mm [2.5mm]
   j. Reconstruction algorithm: Soft Tissue, Bone

6. Pre IV contrast scans: Entire lumbar spine

7. IV contrast- None

8. Post IV contrast scan: None

9. Delay Scan: None

10. Post processing:
    a. Reconstruct angled axial images at 3 mm intervals through disks that are angled.
    b. Reconstruct Coronal and Sagittal bone and soft tissue algorithm x 3 mm
    Send soft tissue, bone algorithm and reconstructions to PACS

Last revised 8/27/15GMH

CT Lumbar Spine

[GE slice thickness in brackest]

1. Indication: Trauma or degenerative disc disease

2. Prep: None.

3. Enteric contrast: None

4. Other: None

5. Scan parameters
   a. FOV: 12-14
   b. MA: Use dose reduction software if available, otherwise 200-300 MA
   c. KV: 120
   d. Scan time: 1 second
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 1 mm [1.25mm]
   g. Image slice thickness: 1 mm [1.25mm]
   h. Table Increment: 1 mm [1.25mm]
   i. Reconstruction Interval: 1 mm [1.25mm]
   j. Reconstruction algorithm: Soft Tissue, Bone

6. Pre IV contrast scan: Through entire L spine or per Radiologist request.

7. IV contrast- None

8. Post IV contrast scan: None

9. Delay Scan: None

10. Reconstructions: Sagittal and Coronal 1 x 1 mm (**bone and soft tissue algorithm**).
    Send soft tissue, bone algorithm and reconstructions to PACS

Last revised 8/27/15 GMH

CT Thoracic Spine

[GE slice thickness in brackets]

1. Indication: Trauma

2. Prep: None.

3. Enteric contrast: None

4. Other: None

5. Scan parameters
   a. FOV: 12-14
   b. MA: Use dose reduction software if available, otherwise 200-300 MA
   c. KV: 120
   d. Scan time: 1 second
   e. Pitch: As appropriate per detector configuration
   f. Raw thickness: 1 mm [1.25mm]
   g. Image slice thickness: 1 mm [1.25mm]
   h. Table increment: 1 mm [1.25mm]
   i. Reconstruction Interval: 1 mm [1.25mm]
   j. Reconstruction algorithm: Soft Tissue, Bone

6. Pre IV contrast scan: Through area of interest.

7. IV Contrast administration: None.

8. Post IV contrast scan: None.

9. Delay scan: None

10. Reconstructions: Sagittal and Coronal x 1 mm (**bone and soft tissue algorithm**). Send soft tissue, bone algorithm and reconstructions to PACS

Last revised 8/27/15 GMH

CT GUIDED SI JOINT INJECTIONS

Patient Prep:

- Patient cannot take the following medications prior to signing consent: Narcotics (i.e. Hydrocodone), Sedatives (i.e. Valium), or anti-anxiety medications (i.e. Ativan). If any questions arise, ask the Radiologist or Radiologist Assistant

- Patient should stop blood thinners prior to exam per RCI Protocol **See Medication Hold List**
    - Coumadin: **patient needs INR dawn within three (3) days of the exam with results < 3.0**

Room Setup:

Ensure patient name is entered into Computed Tomography Scanner.

Supplies Needed:

- Arthrogram Tray
- Sterile Gloves
- Needle (dependent on patient size and physician performing exam)
    - 22g 1.5 inch spinal needle or 22 g 3.5 inch spinal needle
- Skin Prep: Chloraprep with Tint -- Chlorhexidine gluconate (2% w/v), Isopropyl Alcohol (70 % w/v)
- 25g 1.5 inch needle
- 2 or 3 cc syringe
- Filter Straw
- Vial access needle
- Alcohol Pads
- Gloves (6.5 for RA) and appropriate size for Rad performing procedure
- Medications
    - 1 % Lidocaine
    - Sodium Bicarbonate
    - 0.5 % Ropivacaine HCl (Naropin)
    - Depo-Medrol (Methylprednisolone Acetate Injectable suspension, USP) 40 mg per ml
- Consent Forms
- Discharge Instructions

Exam Method:

1. Technologist will get patient from lobby with any necessary paperwork.
2. Assemble supplies
    a. Place unopened sterile tray on a table with wheels and place at appropriate end of table.
3. Bring the patient into the room. The technologist will obtain history and explain the exam to the patient. Verify patient's medications and allergies and complete necessary paperwork.
4. Technologist will notify RA that the patient is ready for consent.
5. RA will come to CT suite for procedure.
6. Give history to Radiologist Assistant.
7. Radiologist or Radiologist Assistant will talk with the patient, explain the risks/benefits, and obtain written consent. **See Consent to Arthrographic Procedure**
8. Following written consent, place the patient prone on the CT table.
9. Radiologist Assistant will place biopsy grid over affected SI joint and the Technologist will obtain the first scan of images.
10.

Scout CT Scan Parameters: Patient Prone

Center	Midline to mid sacrum; Zero to above top of sacrum
Table Direction	Craniocaudal
kV	100 / 100
mA	35 / 35
Slice Thickness	0.6
Tube Rotation	Bottom / Lateral

Helical CT Scan Parameters:

FOV	Fit to area of interest
Scan Direction	Craniocaudal
Scan Coverage	As directed by Radiologist or RA
Detector Collimation	128 x 0.6 mm
Pitch	0.8
Dose Modulation	Care Dose / Care kV / Safire-3
Slice Thickness	1 mm
Slice Overlap	1 mm
Rotation Time	0.5 seconds
kV	120
Quality Reference mAs	150

11. Radiologist Assistant will mark appropriate access site and prep skin based on initial image set.
12. Technologist will assist Radiologist Assistant with setting up sterile tray and drawing up medications.
13. The Radiologist will numb the patient's skin surface, place the needle in the joint space.

14. Additional image sets will be obtained at the request of the Radiologist.
    Use same Helical CT Scan Parameters as above but center on table position as indicated by Radiologist or RA and produce 6 slices.
15. When needle placement is verified, the desired steroid solution will be injected.
16. When the needle is removed from the patient, bandage is placed over needle entry site. Technologist will clean the skin surface with soap and water.
17. Allow the patient to sit edge of bed, ensuring they are not light-headed.
18. Radiologist or Radiologist Assistant will provide the patient with the appropriate discharge instructions.
19. Send images to PACS, prepare exam for Radiologist, and clean room. Be sure to dispose of any needles, medications appropriately.
20. Technologist logs exam, places charges in Epic, and records Dose (mGy).

** Note - Do not discuss exam with patient, and inform them there is a 24 hr. turnaround time for results.

Patient Post-Procedure Instructions: Provided by Radiologist or Radiologist Assistant

12/1/21 JMM

RADIOLOGY CONSULTANTS OF IOWA, PLC
COMPUTED TOMOGRAPHY

Patient Name: _____

You are scheduled to have a special type of x-ray called COMPUTED TOMOGRAPHY (CT). This test is simple, fast and painless. Sometimes this test requires a small amount of medicine (contrast media or 'x-ray dye') through an IV into an arm vein to help show the internal organs, arteries or veins in a way that will allow us to better diagnose your current medical condition.

We are required by Iowa law to tell you about the possible complications from this CT test, even if these complications are extremely rare, Reactions to the 'x-ray' dye are uncommon. Most complications are minor such as itching, nausea or hives. In extremely rare situations, some patients may have serious reactions to x-ray dye. Such reactions require immediate medical treatment. Another rare condition arises if large amounts of x-ray dye leak out around the IV into the muscle and skin. In rare cases leakage can cause local damage to the arm.

COMPUTED TOMOGRAPHY is a test using x-rays. If you are pregnant or could be pregnant, you must tell the technologist before starting this test, even though the risk of birth defects or fetal death is very small. Medical x-ray tests use very small amounts of radiation. The risk of causing cancer from this x-ray is extremely small.

Finally, your healthcare provider understands that there may be alternative tests that do not use intravenous contrast material (x-ray dye) or radiation, but feels that this is the best test to evaluate your medical condition.

Would you like to talk to the radiologists about anything on this form? ___YES ___NO

All of my questions have been fully answered? ___YES ___NO

I acknowledge reading all information on this form about the computed tomography test. If had any questions, they have all been answered in a satisfactory manner. I freely choose to under go this test

SIGNED:_____DATE:_____

WITNESS:_____DATE:_____

NONIONIC CONTRAST EXTRAVASATION POLICY AND PROCEDURE

Purpose

To develop a consistent approach and mechanism to prevent and treat intravenous nonionic contrast extravasation.

Policy

1. IV status will be assessed prior to during and post intravenous contrast administration.
2. In the event of contrast extravasation, the radiologist will be notified and treatment administered per order
3. Patient follow up of occurrence will be performed and documented
4. Nonionic contrast material is used for all intravenous injections.

Procedure

1. When possible IV access will be obtained in the CT suite or prep area before scanning. A 20 gauge, 1-inch catheter is recommended
2. Indwelling catheters will be assessed before scanning by injection either saline solution with a syringe or with a small volume of contrast medium with the power injector while the puncture site and area proximal to it is observed for swelling by the technologist.
3. The patient is instructed to report any pain at the injection site.
4. The site of preference is the antecubital fossa. The dorsum of the hand should be avoided when possible. Other sites to avoid are any areas distal to hematomas or those near major tendons or lesions. Feet and legs should not be used to inject radiographic contrast.

Treatment Plan

Initial Treatment:

- Notify the radiologist for evaluation of the area of extravasation.
- Elevate the affected extremity above the heart.
- Ice packs - **30** minute application three times a day for 3 days.
- The patient will be observed in the department as recommended by the radiologist
- Call referring physician for any extravasation over 50 ml.

Immediate plastic surgery consultation might be warranted for the following reasons:

- Extravasated volume exceeds up to 100ml of nonionic contrast material
- Skin blistering
- Altered tissue perfusion (decreased capillary refill over or distal to injection site)
- Increasing pain after 2-4 hours
- Change in sensation distal to site extravasation

Contrast Medium Infiltrate Discharge Instructions

1. Observe the affected extremity for:
   * Increased redness or skin color change
   * Increased pain
   * Blisters
   • Increased firmness at site
   * Unusually cold or hot at site
   * Numbness or tingling of the extremity

If any of these symptoms occur, notify our office or your referring physician immediately.

2. Elevate the affected extremity above the level of the heart for the next 6 hours.

3. Apply intermittent cold packs to the site for 30 minutes three times a day for three days. Avoid wetting the skin.

4. Take Acetaminophen (Tylenol, one to two tablets every four to six hours) as necessary for discomfort at the infiltration site.

5. If any questions develop after you arrive home, please call our office at 319-364-0121 or 800-747-0121.

Discharge instructions have been explained to the patient. The patient or the person responsible for the patient fully understands these instructions.

Patient/guardian signature_____

Date_____Time_____

Technologist signature_____

HOME CARE INSTRUCTIONS

Reaction to -CT IV Contrast

You have just had a reaction to IV contrast dye. Your symptoms should be gone within 4 hours. If symptoms continue or get worse, call your doctor right away.

You are considered allergic to contrast dye and need to notify your doctor and all medical staff that you have had a reaction to contrast dye. It is very important to tell anyone who takes any x-rays or scans that may require injecting contrast material.

- Activity
  Resume your activity.

- Diet
  Resume your diet.

- **If the following occurs:**

  Shortness of breath or any difficulty breathing - CALL 911

  If increased itching or hives or if any other questions develop after you arrive home, please call our office at 319-364-0121 or 1-800-747-0121. After 5:00 p.m., call 319-369-7363 and ask for the radiologist on call.

Discharge instructions have been explained to the patient. The patient or the person responsible for the patient fully understands these instructions.

Patient/guardian signature _____

Technologist signature _____

Date _____Time_____

PREMEDICATION FOR IODINATED IV CONTRAST REACTIONS

Reactions to iodinated IV contrast occur in 1-3% of nonionic low-osmolar contrast injections. These range from mild urticaria (hives) to severe and life-threatening events. The severe life-threatening reactions are relatively rare. Although overall adverse reactions are decreased following steroid premedication, the incidence of severe life-threatening adverse events has not been affected. Therefore, administration of IV contrast in patients with previous severe reactions should be done only in exceptional circumstances with full agreement by the patient, attending physician(s) and radiologist.

1. Premedication

a. Premedication prior to intravenous iodinated and gadolinium-based contrast injections are indicated with history of prior moderate to severe reaction only. Examples include increasing hives, facial swelling, itching, acute rash, wheezing, bronchospasm, stridor, laryngeal edema and anaphylaxis

b. Premedication is not needed for history of asthma, reactions to other substances (regardless of number or severity, including shellfish and betadine) and physiologic reaction to iodinated contrast material such as a vasovagal reaction, nausea and vomiting.

c. The risk of breakthrough reaction still exists in patients with severe reaction to contrast previously (incidence of 2.1%).

d. Corticosteroids are a critical component of the premedication regimen and should be given at least 6 hours prior to the contrast.

e. If diphenhydramine (Benadryl®) is administered, the patient must have a driver to and from the appointment, due to the possibility of drowsiness from the medication.

Adult Patient

Standard oral premedication regimen:

- Prednisone—50 mg PO, 13, 7 and 1 hour prior to the procedure
  OR
- Methylprednisolone— 32 mg PO 12 hours and 2 hours prior
  AND
- Diphenhydramine—50 mg PO/IM/IV 1 hour prior to the procedure

Note: Doses may be distributed unevenly to allow a patient to get a reasonable night's sleep the evening prior to the CT; however, the first dose should be taken more than 12 hours before and a second dose within the last 6 hours of the scheduled exam.

Alternate IV protocol if a patient cannot take oral medications:

- Hydrocortisone—200 mg IV, 13, 7 and 1 hour prior to the procedure
- Diphenhydramine—50 mg IM or IV, 1 hour prior to the procedure

Accelerated IV premedication protocol, when there are no alternatives:

1. Methylprednisolone sodium succinate (e.g., Solu-Medrol®) 40 mg IV or hydrocortisone sodium succinate (e.g., Solu-Cortef®) 200 mg IV immediately, and then every 4 hours until contrast medium administration, plus diphenhydramine 50 mg IV 1 hour before contrast medium administration. This regimen usually is 4-5 hours in duration.
2. Dexamethasone sodium sulfate (e.g., Decadron®) 7.5 mg IV immediately, and then every 4 hours until contrast medium administration, plus diphenhydramine 50 mg IV 1 hour before contrast medium administration. This regimen may be useful in patients with an allergy to methylprednisolone and is also usually 4-5 hours in duration.
3. Methylprednisolone sodium succinate (e.g., Solu-Medrol®) 40 mg IV or hydrocortisone sodium succinate (e.g., Solu-Cortef®) 200 mg IV, plus diphenhydramine 50 mg IV, each 1 hour before contrast medium administration. This regimen, and all other regimens with a duration less than 4-5 hours, has no evidence of efficacy. It may be considered in emergent situations when there are no alternatives.

Note: Premedication regimens less than 4-5 hours in duration (oral or IV) have not been shown to be effective. The accelerated 4-5-hour regimen listed as Accelerated IV option 1 is supported by a case series and by a retrospective cohort study with 828 subjects.

Pediatric Patient

Standard oral premedication regimen:

- Prednisone—0.5-0.7 mg/kg PO, 13, 7 and 1 hour prior to the procedure (50 mg maximum dose)
- Diphenhydramine—1.25 mg/kg PO 1 hour prior to the procedure (50 mg maximum dose)

Note: Appropriate intravenous doses may be substituted for patients who cannot ingest PO medication.

2. Non-emergent contrast administration in premedicated patients

a. Patients requiring premedication for contrast enhanced examination, which exam is a non-emergent or elective exam, should not undergo contrast enhanced imaging between 6 pm and 7 am. Premedication should be instituted based on a scheduled exam time the next day or future date during daytime hours of 7 am to 6 pm, at such time when adequate resources are available to handle any breakthrough reactions.

b. If clinical situation warrants emergent scanning after hours in a patient who has received the premedication for prior contrast allergy:

- The afterhours scanning of the premedicated patient should be approved by the radiologist on after-hours duty at the time of the proposed scan and that radiologist should be notified immediately prior to contrast injection
- An ER or hospital inpatient nurse should accompany the patient to CT/radiology for the duration of the imaging test. They must accompany the patient back to the floor in order to cover for any delayed reaction.

c. On call and on weekends, for a patient with a history of contrast allergy, the on-call radiologist must be consulted to assess the need for an alternative test or premedication prior to contrast administration.

3. Emergent contrast administration in life-threatening situations

In cases of life-threatening emergency requiring administration of IV contrast and where clinical team cannot wait to complete the accelerated IV premedication protocol requiring administration of steroids at least 4-5 hours prior to the procedure AND the alternative test is not acceptable:

a. The clinical team must add a note in the EMR of the patient prior to the contrast administration which clearly states the following:

- Indication of the urgent study.

- Reason why the alternative exam (as offered by the radiologist) is not acceptable.
- Ensure the presence of sufficient staff capable of handling a severe contrast reaction in the examination suite, including the need for intubation and administration of life support drugs during and after the procedure

b. An optional regimen of hydrocortisone 200 mg IV and diphenhydramine (Benadryl®) 50 mg IV stat prior to contrast administration and 4 hours later to cover delayed reaction may be considered at the discretion of the referring clinician. Premedication regimens less than 4-5 hours in duration (oral or IV) do not have proven efficacy. They may be considered in emergent situations when there are no alternatives.