

CTA Chest / Upper extremity (Thoracic Outlet Syndrome, Subclavian stenosis, Paget-Schroetter, etc)

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In accordance with the ALARA principle, TRA policies and protocols promote the utilization of radiation dose reduction techniques for all CT examinations. For scanner/protocol combinations that allow for the use of automated exposure control and/or iterative reconstruction algorithms while maintaining diagnostic image quality, those techniques can be employed when appropriate. For examinations that require manual or fixed mA/kV settings as a result of individual patient or scanner/protocol specific factors, technologists are empowered and encouraged to adjust mA, kV or other scan parameters based on patient size (including such variables as height, weight, body mass index and/or lateral width) with the goals of reducing radiation dose and maintaining diagnostic image quality.

If any patient at a TRA outpatient facility requires CT re-imaging, obtain radiologist advice prior to proceeding with the exam.

The following document is an updated CT protocol for all of the sites at which TRA is responsible for the administration, quality, and interpretation of CT examinations.

Include for ALL exams

- **Scout:** Send all scouts for all cases
- **Reformats:** Made from *thinnest source* acquisition
 - Scroll Display
 - Axial recons - Cranial to caudal
 - Coronal recons - Anterior to posterior
 - Sagittal recons - Right to left
 - Chest reformats should be in separate series from Abdomen/Pelvis reformats, where applicable
- **kVp**
 - 100 @ <140lbs
 - 120 @ >140lbs
- **mAs**
 - Prefer: Quality reference mAs for specific exam, scanner and patient size
 - Auto mAs, as necessary

CTA Chest / Upper Extremity (Thoracic Outlet Syndrome, Subclavian stenosis)

Indication: Thoracic Outlet Syndrome, subclavian stenosis, subclavian thrombus, Paget-Schroetter, venous thrombosis, blood pressure differential in upper extremity, etc

**This protocol is for nonemergent studies in patients with chronic symptoms, intended for the outpatient setting. For ER/In patient/urgent studies, the routine CTA upper extremity protocol should be implemented.

Patient Position: Supine, both arms up

Scan Range (CC z-axis): bottom of heart to mid humerus (don't need to include costophrenic angles of lungs)

- If CTA upper extremity also ordered w/ the CTA chest, then scan range is from bottom of heart to the fingertips

IV Contrast Dose, Flush, Rate, and Delay:

- Access: Should be 18 or 20g in arm opposite of symptomatic arm
- Dose: (modify volume if using something other than Isovue 370)
 - < 200 lbs 65 cc
 - > 200 lbs 85 cc
- Flush: 50 mL saline
- Rate: 4 cc/sec

Acquisitions: 2 (arterial and venous)

- **Arterial phase**
 - Trigger off thoracic aorta (Threshold 100HU)
 - Acquisition helical thickness (slice) 0.6 – 1 mm
 - Caudocranial acquisition
 - Full respiratory breathing instructions for end inspiration
- **Venous phase**
 - Delay of 75 sec after injection
 - Acquisition helical thickness (slice) 1.0 – 1.25 mm

Series + Reformats (machine specific slice thicknesses below):

- **Arterial**

- Axial (thin) 0.6 – 1 mm vascular kernel “ThinArt”
- Axial (not thin) 2 - 2.5 mm vascular kernel “ThickArt”
- Coronal 1 – 1.25 mm x 1-1.25 mm vascular kernel “ArtCor”
- Sagittal 1 – 1.25 mm x 1-1.25 mm vascular kernel “ArtSag”
- Coronal MIP 5 x 2 mm soft tissue kernel “MIPS”

- **Venous**

- Axial 1 – 1.25mm soft tissue kernel “VenAx”
- Coronal 2 x 2 mm soft tissue kernel “VenCor”
- Sagittal 2 x 2 mm soft tissue kernel “VenSag”

Machine specific recons (axial ranges given above for machine variability):

*AXIAL ARTERIAL THIN - machine-specific thickness (axial):

- GE = 0.625 mm
- Siemens = 0.6 – 0.8 mm
- Toshiba = 1 mm

*AXIAL ARTERIAL NOT THIN - machine-specific thickness (axial):

- GE = 2.5 mm
- Siemens = 2 mm
- Toshiba = 2 mm

*AXIAL VENOUS PHASE - machine-specific thickness (axial):

- GE = 1.25 mm
- Siemens = 1.0 mm – 1.25mm
- Toshiba = 1 mm

*SAG & COR VENOUS PHASE - machine-specific thickness (axial):

- GE = 1.25 mm
- Siemens = 1.0 mm – 1.25mm
- Toshiba = 1 mm

General Comments

NOTE:

Use of IV contrast is preferred for most indications *aside from*: pulmonary nodule follow-up, HRCT, lung cancer screening, and in patients with a contraindication to iodinated contrast (see below).

Contrast Relative Contraindications

- **Severe contrast allergy**: anaphylaxis, laryngospasm, severe bronchospasm
 - If there is history of severe contrast allergy to IV contrast, avoid administration of oral contrast
- **Acute kidney injury (AKI)**: Creatinine increase of greater than 30% over baseline
 - Reference hospital protocol (creatinine cut-off may vary)
- **Chronic kidney disease (CKD) stage 4 or 5** (eGFR < 30 mL/min per 1.73 m²) **NOT** on dialysis
 - Reference hospital protocol

Contrast Allergy Protocol

- Per hospital protocol
- Discuss with radiologist as necessary

Hydration Protocol

- For eGFR **30-45 mL/min** per 1.73 m²: Follow approved hydration protocol

IV Contrast (where indicated)

- Isovue 370 is the default intravenous contrast agent
 - See specific protocols for contrast volume and injection rate
- If Isovue 370 is unavailable:
 - Osmolality 350-370 (i.e., Omnipaque 250): Use same volume as Isovue 370
 - Osmolality 380-320 (i.e., Isovue 300, Visipaque): Use indicated volume + **25 mL** (*not to exceed 125 mL total contrast*)

Oral Contrast

- Dilutions to be performed per site/hospital policy (unless otherwise listed)
- Volumes to be given per site/hospital policy (unless otherwise listed)
- TRA-MINW document is available for reference if necessary (see website)

Brief Summary

- Chest only
 - ✓ Chest W, Chest WO
 - ✓ CTPE
 - ✓ HRCT
 - ✓ Low Dose Screening/Nodule
 - None
- Pelvis only
 - ✓ Pelvis W, Pelvis WO
 - Water, full instructions as indicated



- Routine, excluding chest only and pelvis only
 - ✓ Abd W, Abd WO
 - ✓ Abd/Pel W, Abd/Pel WO
 - ✓ Chest/Abd W, Chest/Abd WO
 - ✓ Chest/Abd/Pel W, Chest/Abd/Pel WO
 - ✓ Neck/Chest/Abd/Pel W, Neck/Chest Abd Pel WO
 - ✓ CTPE + Abd/Pel W

 - TRA-MINW offices: Dilute Isovue-370
 - Hospital sites:
 - ED: Water, if possible
 - Inpatient: prefer Dilute Isovue 370
 - Gastrografin OK if Isovue unavailable
 - Avoid Barium (Readi-Cat)
 - FHS/MHS Outpatient: Gastrografin and/or Barium (Readi-Cat)

- Multiphase abdomen/pelvis
 - ✓ Liver, pancreas
 - Water, full instructions as indicated

 - ✓ Renal, adrenal
 - None

- CTA abdomen/pelvis
 - ✓ Mesenteric ischemia, acute GI bleed, endograft
 - Water, full instructions as indicated

- Enterography
 - Breeza, full instructions as indicated

- Esophogram
 - Dilute Isovue 370, full instructions as indicated

- Cystogram, Urogram
 - None

- Venogram
 - Water, full instructions as indicated