Skagit RADIOLOGY INCORPORATED PROFESSIONAL SERVICES	**Vascular: CT Protocols**		
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Vascular CT Protocols

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V13: Thoracic Outlet CTA

V 1D: Chest and abdominal CT angiogram (aortic dissection protocol)

Indications: chest pain, differences in upper extremity blood pressures.

Contrast parameters	1) None 2) 100 mL @ 4 mL/sec,
Region of scan	Lung apices to iliac crests
Scan delay	1) NA 2) Care Bolus at diaphragmatic aorta; peak + 5 sec
Detector collimation	1) 16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm 2) 16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	Axial 1mm lung kernel with 8x2 MIPS Axial 2mm soft tissue kernel Coronal and sagittal 2mm reformats with soft tissue kernel
Filming	B30f kernel B70f kernel (lung bases)

Comments:

- Siemens ThorAngioVol package

V 1T: Chest CT angiogram (aortic trauma protocol)

Indications: blunt chest trauma, abnormal CXR.

Contrast parameters	100 mL @ 4 mL/sec
Region of scan	Lung apices to posterior lung bases
Scan delay	20 mL Care Bolus at diaphragmatic aorta; peak + 3 sec
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	Axial 1 mm lung kernel with 8X2 MIPS Axial 2mm soft tissue kernel Coronal and sagittal 2 mm reformats with soft tissue kernel
Filming	B30f kernel B70f kernel for lung bases

Comments:

- Siemens ThorAngioVol package

V 2: Abdominal and pelvis CT angiogram (aortic aneurysm protocol)

Indications: characterize aortic abdominal aneurysms prior to planned repair.

Contrast parameters	100 mL @ 4 mL/sec
Region of scan	Diaphragm to symphysis
Scan delay	Care Bolus at mid-aorta (not in aneurysm); peak + 5 sec
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	Axial 2mm soft tissue kernel Coronal and sagittal 2mm reformats with soft tissue kernel
Filming	B30f kernel B70f kernel for lung bases

Comments:

- Siemens BodyAngioRoutine or BodyAngioFast package
- For unstable patients with suspected ruptured AAA, perform protocol A4 instead (no IV contrast).
- Region of scan can vary, depending on superior extent of aneurysm.

V2S: Abdominal and pelvis CT angiogram (aortic stent graft followup)

Indications: assess for endoleaks after AAA stent graft placement.

Contrast parameters	1) None 2) 100 mL @ 4 mL/sec
Region of scan	Diaphragm to symphysis
Scan delay	1) NA 2) Care Bolus at mid-aorta; peak minus 1 sec 3) 120 seconds
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	1) 3 mm axials 2) 2 mm axials; 2mm coronal and sagittal 3) 3 mm axials
Filming	B30f kernel B70f kernel for lung bases

Comments:

- Siemens BodyAngioRoutine or BodyAngioFast package

V 3: Abdominal aorta and bilateral iliofemoral lower extremity runoff CT angiogram

Indications: peripheral vascular disease, claudication.

Contrast parameters	5 mL/sec for 5 sec, then by 3-4mL/sec for 40 sec. OR 5mL/sec for 5 sec, then 3-4mL/sec for 30 sec, followed by 30 mL saline flush
Region of scan	1) T12 to feet; position patient feet-first and supine 2) Patella to feet immediately after initial scan.
Scan delay	Care Bolus at mid-aorta; peak + 0 sec
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	2mm axials from T12 to feet 1mm coronal and sagittal 3-D MIP, and/or 3-D VRT reformats noth with and without adjacent bony structures.
Filming	B30f kernel

Comments:

- Siemens AngioRunoff package
- Increase injection rates for patients > 90 kg.
- Perform optional delayed sequence if there is inadequate distal lower extremity contrast opacification on initial scans.

V 4: Upper extremity CT angiogram

Indications: acute ischemia.

Contrast parameters	5mL/sec for 5 sec, then 3 mL/sec for 30 sec. OR 5 mL/sec for 5 sec, then 3 mL/sec for 25 sec, then 30 mL saline flush
Region of scan	1) Aortic arch to fingertips (symptomatic side only); place arm overhead if possible. 2) Optional delays: elbow to fingers
Scan delay	Care Bolus at aortic arch; peak + 0 sec
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	2.0mm axial 1 mm 3-D coronal & sagittal MIP, and/or 3-D VRT reformats with and without bony structures.
Filming	B30f kernel

Comments:

- Siemens AngioRunoff package
- Perform optional delayed sequence if there is inadequate distal upper extremity contrast opacification on initial scans.

V 5: Abdominal CT angiogram

Indications: renovascular hypertension, mesenteric arteries.

Contrast parameters	100 mL @ 4 mL/sec
Region of scan	Diaphragm to iliac crests
Scan delay	Care Bolus at mid-aorta; peak + 0 sec
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	2 mm axials 1 mm 3-D coronal and sagittal MIP, and/or 3-D VRT reformats.
Filming	B30f kernel B70f kernel for lung bases.

Comments:

- Siemens BodyAngioRoutine package
- Perform coronal MPR for renal artery evaluation; sagittal MPR for mesenteric artery evaluation.

V6: Abdomen and pelvis CT angiogram (breast reconstruction surgery protocol)

Indications: planning for reconstructive breast surgery.

Contrast parameters	100 mL @ 4mL/sec
Region of scan	Lesser femoral trochanters to diaphragm (bottom to top).
Scan delay	Care Bolus at level of acetabulum, ROI in right external iliac artery; peak + 7 sec
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	2 mm 1.0 mm 3-D coronal and sagittal MIP through anterior abdominal wall, and 3-D VRT skin surface reformats.
Filming	B20 smooth kernel

Comments:

- 3 mm beam collimation; 120 kVp, 200 mA; pitch 1.15, rotation time 0.5 s.

V7V: Abdominal and pelvis CT angiogram (Venogram option)

Indications: to assess venous anatomy, determine venous patency & delineate collateral circulation. Must be approved by covering radiologist.

Contrast parameters	150 mL or (2mL/kg BW) @ 3mL/sec, 30 mL saline bolus @ 3mL/sec preferred
Region of scan	Diaphragm to Symphysis
Scan delay	120 seconds
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	2.0 mm axials; 10 mm MIP at 5mm interval (coronal / sagittal reformats) and 2.0 mm MIP at 2 mm interval (coronal / sagittal reformats)
Filming	Br38 -mediastinum (2mm axial, coronal, & sag; 10 x 5coronal & sag MIP's -soft tissue), BR39-lung (5mm axial)

Comments:

- A kernel of BR59 or lower must be selected when using iMAR metal reduction software

V8V: Pelvis CT angiogram (Venogram option)

Indications: to assess venous anatomy, determine venous patency & delineate collateral circulation. Pelvic congestion syndrome. Must be approved by covering radiologist.

Contrast parameters	150 mL or (2mL/kg BW) @ 3mL/sec, 30 mL saline bolus @ 3mL/sec preferred
Region of scan	Iliac crest to Symphysis
Scan delay	120 seconds
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	2.0 mm axials; 10 mm MIP at 5mm interval (coronal / sagittal reformats) and 2.0 mm MIP at 2 mm interval (coronal / sagittal reformats)
Filming	Br38 -mediastinum (2mm axial, coronal, & sag; 10 x 5coronal & sag MIP's -soft tissue), BR39-lung (5mm axial)

Comments:

- A kernel of BR59 or lower must be selected when using iMAR metal reduction software

V9V: Upper Extremity (Venogram option)

Indications: to assess venous anatomy, determine venous patency & delineate collateral circulation. Must be approved by covering radiologist. Ultrasound preferred modality.

Contrast parameters	150 mL or (2mL/kg BW) @ 3mL/sec, 30 mL saline bolus @ 3mL/sec preferred
Region of scan	Aortic arch to tips of fingers
Scan delay	70-80 seconds
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	2.0 mm axials; 1.0mm 3D coronal & sagittal MIP, and/or 3D VRT reformats with and without bony structures.
Filming	Br38 -abdomen (2mm axial; 1mm coronal & sagittal MIPs) optional VRT

Comments:

- IV must be placed in opposite arm
- A kernel of BR59 or lower must be selected when using iMAR metal reduction software

V10V: Lower Extremity (Venogram option)

Indications: to assess venous anatomy, determine venous patency & delineate collateral circulation. Must be approved by covering radiologist. Ultrasound preferred modality.

Contrast parameters	150 mL or (2mL/kg BW) @ 3mL/sec, 30 mL saline bolus @ 3mL/sec preferred
Region of scan	Iliac crest to toes
Scan delay	180 seconds
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	2.0 mm axials; 1.0mm 3D coronal & sagittal MIP, and/or 3D VRT reformats with and without bony structures.
Filming	Br38 -abdomen (2mm axial; 1mm coronal & sagittal MIPs) optional VRT

Comments:

- A kernel of BR59 or lower must be selected when using iMAR metal reduction software

V11V: Venogram Chest

Indications: to assess venous anatomy, determine venous patency & delineate collateral circulation. Must be approved by covering radiologist.

Contrast parameters	150 mL or (2mL/kg BW) @ 3mL/sec, 30 mL saline bolus @ 3mL/sec preferred
Region of scan	Lung apex to posterior costophrenic angles
Scan delay	60-90 seconds
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	2 mm and 8 x 2 mm axials 7mm coronal & sagittal reformats
Filming	Br38 -abdomen (2mm axial, coronal & sagittal; 10 x 5 mm coronal & sagittal MIP's. Br39 – very sharp (1 mm axial, and 8 x 2 mm axial MIP)

Comments:

- A kernel of BR59 or lower must be selected when using iMAR metal reduction software

V12VS: CT Vasculitis protocols (Chest / Abdomen / Pelvis)

Indications: Large-Vessel Inflammation

Contrast parameters	100 mL @ 4mL/sec (370 preferred), 30 mL saline bolus @ 3mL/sec preferred
Region of scan	Lung apices to symphysis
Scan delay	1)Care Bolus at diaphragmatic aorta; peak + 5 sec (100 HU trigger) 2) 60 secons after completion of arterial scan
Detector collimation	Arterial: 16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm Venous: 16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	2 mm axials 10 mm x 5 mm and 1 mm interval coronal & sagittal MIP reformats
Filming	Br38 -mediastinum (1mm axial and 5 mm, 1 mm coronal & sagittal; 10 x 5 mm coronal & sagittal MIP's) Br39 – lung (1 mm axial, and 8 x 2 mm axial MIP)

Comments:

- Protocoled with Vascular Radiologist

V13: CTA Thoracic Outlet (Thoracic Outlet Syndrome; Subclavian Stenosis)

Indications: Thoracic Outlet Syndrome, subclavian stenosis, Paget-Schroetter, venous thrombus)

Contrast parameters	Patient<200lbs 140mL Iohexol 350(370) (70 cc each injection) Patient> 200lbs 160mL Iohexol 350(370) (80cc each injection) Saline Flush 50mL 4cc/sec injection rate
Region of scan	Aortic Arch to half-way between shoulder and elbow of symptomatic arm(if bilateral symptoms; stress with both above head looking towards most effected side)
Scan delay	1)Care Bolus at diaphragmatic aorta; peak + 5 sec (100 HU trigger) 2) 70 second Venous Delay 3)Care Bolus at diaphragmatic aorta; peak + 5 sec (100 HU trigger) 4) Venous Delay
Series	1) Arterial Stress 2) Venous Stress 3) Arterial Neutral 4) Venous Neutral
Slice thickness	1) Arterial Stress: .6-.75mm Soft Tissue Axial ; 2mm Soft Tissue Axial,Cor,Sag; Coronal MIP 5x2mm soft tissue 2) Venous Stress: Axial 0.6mm Soft tissue kernal 3) Arterial Neutral : .6-.75mm Soft Tissue Axial ; 2mm Soft Tissue Axial,Cor,Sag; Coronal MIP 5x2mm soft tissue 4) Venous Neutral : Axial 0.6mm Soft tissue kernal
Filming	Br38 -mediastinum (1mm axial and 5 mm, 1 mm coronal & sagittal; 10 x 5 mm coronal & sagittal MIP's) Br39 – lung (1 mm axial, and 8 x 2 mm axial MIP)

Comments:

• Arterial Symptoms: discoloration; numbness (place IV in opposite side arm)

- Venous Symptoms: swelling (place IV in same side arm)

Venogram

Bolus of IV contrast at 3 cc/sec, 150 mL (or 2 mL/kg BW)
Empiric delay in scanning time depending on the area of interests:

Thoracic:	60-90 seconds
UE:	70-80 seconds
Abd/Pelvis:	110 seconds
LE :	180 seconds