

 <small>INCORPORATED PROFESSIONAL SERVICES</small>	<b>Neuro: CT Protocols</b>		
	Reviewed:	Date: 8/02/2023	G. Cooper
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Sp 1: Cervical spine CT without contrast

Sp 1M: Cervical spine CT myelogram

Sp 2: Thoracic spine CT without contrast

Sp 2M: Thoracic spine CT myelogram

Sp 3: Lumbar spine CT without contrast

Sp 3M: Lumbar spine CT myelogram

Sp 4: Sacrum CT without contrast

Sp 5: Cervical *or* thoracic *or* lumbar spine CT with contrast (infection and mass protocol)

Sp 6: Epidural / Nerve Root / Facet Injection C and L spine

## **N 1: Head CT without contrast**

Indications: bleeds, stroke, dementia, headaches.

Contrast parameters	None
Region of scan	Foramen magnum to vertex, <i>angled to exclude orbits.</i>
Scan delay	NA
Detector collimation	Non-helical 16 x 1.5 mm OR helical 64 x 1.2 mm, 32 x 1.2 mm (128 slice)
Slice thickness	4.5 mm OR (helical) 5 mm thick axial and coronal reformats.
Filming	H30s, H70s kernels.

Comments:

- Use mAs of 375.

## N 1C: Pre- and post-contrast head CT

Indications: mass, metastases, AVM.

Contrast parameters	1) None 2) 100 mL at 2.5 mL/sec
Region of scan	Foramen magnum to vertex, <i>angled to exclude orbits.</i>
Scan delay	1) NA 2) 60 sec
Detector collimation	Non-helical 16 x 1.5 mm OR helical 64 x 1.2 mm, 32 x 1.2 mm (128 slice)
Slice thickness	4.5 mm OR (helical) 5 mm thick axial and coronal reformats.
Filming	1) H30s kernel (axials) 2) H30s and H70s kernels (axials)

### Comments:

- Use mAs of 375.
- 16 slice CT scanners: non-helical axial slices only, no coronal or sagittal reformats recommended.

## N 2: Head CT angiography

Indications: aneurysm, subarachnoid hemorrhage, AVM.

Contrast parameters	1) None 2) 100 mL at 4 mL/sec
Region of scan	Foramen magnum to vertex, <i>angled to exclude orbits.</i>
Scan delay	1) NA 2) Care Bolus at C1; peak + 5 sec 3) 3) To follow CTA
Detector collimation	1) Non-helical 16 x 1.5mm OR helical 64 x 1.2mm, 32 x 1.2mm (128 slice) 2) 16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm (CTA) 3) 3) Non-helical 16 x 1.5mm OR helical 64 x 1.2mm, 32 x 1.2mm )128 slice)
Slice thickness	4.5 or 5mm axials for pre and post contrast brain. 1 mm axials for CTA. 1 mm 3-D MIP (sagittal & coronal), and/or VRT reformats. Thick MIPS 10x5mm Sag/Cor
Filming	1) H30s kernal 2) H30s kernel 3) H30s, H70s kernals

Comments:

- Siemens Head Angio Vol package

## **N 2A: Head/Neck CT Angiography combo**

Indications: aneurysm, subarachnoid hemorrhage, AVM.

Contrast parameters	100 mL at 4 mL/sec
Region of scan	Vertex to Aortic arch
Scan delay	Care Bolus at C1; peak + 5 sec
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm (CTA)
Slice thickness	1mm axials Head/neck, 10mm MIP at 5mm interval (sagittal and coronal whole scan range) and 1mm MIP at 1mm interval Sag/Cor
Filming	HR38 CT Angio (1mm Axial, Cor and Sag. 10 x 5 Cor and Sag MIP )

## N 2V: Head CT angiography (venogram)

Indications: suspected sinus thrombosis.

Contrast parameters	1) None 2) 100 mL at 4 mL/sec
Region of scan	Foramen magnum to vertex, <i>angled to exclude orbits.</i>
Scan delay	1) NA 2) 40 seconds 3) To follow CT venogram
Detector collimation	1) Non-helical 16 x 1.5 mm OR helical 64 x 1.2 mm, 32 x 1.2 mm (128 slice) 2) 16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm (CTV) 3) Non-helical 16 x 1.5 mm OR helical 64 x 1.2 mm, 32 x 1.2 mm (128 slice)
Slice thickness	4.5 or 5 mm axials for pre- and post-contrast brain. 1 mm axials for CT venogram. 1 mm 3-D MIP (sagittal & coronal), and/or VRT reformats
Filming	1) H30s kernel 2) H20s kernel 3) H30s, H70s kernels

Comments:

- Siemens Head Angio Vol package

### **N 3: Maxillofacial CT without contrast (trauma protocol)**

Indications: orbital floor fractures, other facial trauma.

Contrast parameters	None
Region of scan	Mandible to frontal sinuses
Scan delay	NA
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	1.5 mm axials; 1.5 mm coronal and sagittal reformats
Filming	H32f, B70f kernels

Comments:



### **N 3C: Maxillofacial CT with contrast**

Indications: facial cellulitis or abscess.

Contrast parameters	100mL @ 2.5 mL/sec.
Region of scan	C5 to frontal sinuses
Scan delay	40 sec
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	3.0 mm axials; 3.0 mm coronal reformats
Filming	H31s, B70f kernels

Comments:

### **N 3D: Maxillofacial CT without contrast (dental implant protocol)**

Indications: evaluate condition of bone prior to dental implant placement.

Contrast parameters	None
Region of scan	Maxilla only: bottom of orbits to maxillary teeth. Mandible only: mandibular teeth through bottom of mandible. Maxilla and mandible: bottom of orbits through bottom of mandible.
Scan delay	NA
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	1.0 mm axials
Filming	B70f kernels; burn CD without viewing tools.

#### Comments:

- Have patients bite down on disposable bite blocks to minimize motion.
- Line up scans parallel to maxillary or mandibular teeth surface when scanning. When scanning both regions, split the difference between the two teeth surfaces.

#### **N 4: Sinus CT without contrast**

Indications: sinusitis

Contrast parameters	None
Region of scan	Frontal sinus to floor of maxillary sinus; patient supine
Scan delay	NA
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	3.0 mm axials. 3.0 mm coronal and sagittal reformats Reformat in Sag/Cor/Ax Bone Kernel, Ax Soft Tissue
Filming	B70f kernels; burn CD without viewing tools.

Comments:

## N 4C: Sinus CT with contrast

Indications: sinus tumor evaluation

Contrast parameters	100mL @ 2.5mL/sec
Region of scan	Frontal sinus to floor of maxillary sinus; patient supine
Scan delay	60 seconds
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	3.0 mm axials. 3.0 mm coronal and sagittal reformats Reformat in Sag/Cor/Ax Bone Kernel, Ax Soft Tissue
Filming	B70f kernels; burn CD without viewing tools.

Comments:

## **N 5: Orbit CT without contrast**

Indications: screening for orbital foreign bodies prior to MR

Contrast parameters	None
Region of scan	Orbital floor to roof
Scan delay	NA
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	2.0 mm axials. 2.0 mm coronal and sagittal reformats
Filming	B70f kernels; burn CD without viewing tools.

Comments:

- Siemens Orbit package

## N 5C: Orbit CT with contrast

Indications: intra-orbital masses, thyroid ophthalmopathy

Contrast parameters	100mL @ 2.5 mL/sec
Region of scan	Orbital floor to roof
Scan delay	60 seconds
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	2.0 mm axials. 2.0 mm coronal and sagittal reformats
Filming	B70f kernels; burn CD without viewing tools.

Comments:

- Siemens Orbit package

## N 6: Mastoid CT without contrast

Indications: mastoiditis, cholesteatomas, otitis media, fractures, otosclerosis

Contrast parameters	None
Region of scan	EAC through top of petrous bones (Sequential Scan – If Patient cannot lay prone Scan Spiral)
Scan delay	none
Detector collimation	2 x 0.6 mm, 16 x 0.6 mm, 128 x 0.6 mm Non-helical direct axial
Slice thickness	0.6 mm direct axials. 0.6 mm coronal reformats
Filming	U90u kernels; burn CD without viewing tools.

Comments:

- Siemens InnerEarSeqUHR package
- Acquire each side separately

## N 6C: Mastoid CT with contrast

Indications: intra-orbital masses, thyroid ophthalmopathy

Contrast parameters	100mL @ 2.5 mL/sec with 30 mL saline chaser
Region of scan	EAC through top of petrous bones (Sequential Scan – If Patient cannot lay prone Scan Spiral)
Scan delay	60 seconds
Detector collimation	2 x 0.6 mm, 16 x 0.6 mm, 128 x 0.6 mm Non-helical direct axial and direct coronals
Slice thickness	1.0 mm axials. 1.0 mm coronals
Filming	U90u kernels; burn CD without viewing tools.

Comments:

- Siemens InnerEarSeqUHR package
- Acquire through symptomatic side only; divide contrast dose between axial and coronal acquisitions



## N 7: Soft tissue neck CT with contrast

Indications: neck masses, tumor staging, abscesses

Contrast parameters	125mL @ 2.5mL/sec or 100mL @ 2.5 mL/sec with 30 mL saline chaser
Region of scan	Sella to Aortic Arch
Scan delay	40 seconds
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	3.0 mm axials, coronal, & sagittal reformats
Filming	H41f – medium+(3mm axial, coronal, & sagittal larynx); burn CD without viewing tools.

Comments:

- Siemens NeckVol package
- If concomitant trauma C-spine evaluation needed, perform additional 3mm axials, 2mm sagittal and coronal MPR as specifies in protocol Sp1, and merge with current study
- Dose Notification: CTDI 28.00mGy

## N 8: Neck CT angiography

Indications: stroke, carotid dissection

Contrast parameters	100mL @ 4.0 mL/sec with 30 mL saline chaser
Region of scan	Aortic Arch to Circle of Willis
Scan delay	Care Bolus at C6; peak + 3 sec
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	1.5 mm axials, 10mm MIP at 5mm intervals (coronal & sagittal)
Filming	H24hs – medium smooth (1.5 mm axial, coronal, & sagittal-angio; 10 x 5 mm axial, coronal, and sagittal MIP); burn CD without viewing tools.

Comments:

- Siemens CarotidAngioVol package
- If concomitant trauma C-spine evaluation needed, perform additional 3mm axials, 2mm sagittal and coronal MPR as specifies in protocol Sp1, and merge with current study

## N 9: Soft tissue neck CT with contrast (larynx protocol)

Indications: tumors, vocal chord paralysis, trauma

Contrast parameters	125mL @ 2.5mL/sec or 100mL @ 2.5 mL/sec with 30 mL saline chaser. No contrast for trauma evaluation
Region of scan	1) Tumors: Hard palate to sternal notch 2) Cord Paralysis: sella to carina 3) Trauma: hyoid to sternal notch
Scan delay	40 seconds
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	3.0 mm axials with additional 1.5 mm axials through true vocal cords, 1.0 mm thick coronal reformats.
Filming	H31s – medium smooth (3mm, 1.5mm axial, 3.0mm coronal, & sagittal larynx); add H70f – very sharp (3mm axial, coronal & sag – osteo for trauma cases); burn CD without viewing tools.

Comments:

- Siemens NeckThinSlice package
- CPGH – using Care dose and Care KV
- Radiologist to select level of thin slices through true vocal cords
- Optional breathing instructions:
  - Straw-blowing: adducts vocal cords
  - ‘Eee’ phonation: assess vocal cord paralyzation
  - Quiet breathing: abducts vocal cords

## N 10: Pre- and post-contrast Sella CT

Indications: pituitary pathology and contraindication to MRI scan

Contrast parameters	1) None 2) 100mL @ 2.5 mL/sec with 30 mL saline chaser
Region of scan	Foramen Magnum to Vertex, angled to avoid orbits
Scan delay	1) NA 2) 60 seconds
Detector collimation	16 x 1.5 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	1) 5.0 mm axials through entire head 2) 1.0 mm coronal and sagittal reformats through pituitary fossa. 5.0 mm axials from foramen magnum to vertex
Filming	1) H30s – medium smooth (5mm axial, coronal, & sagittal - cerebrum); H70f – very sharp (osteo kernels); burn CD without viewing tools. 2) H30s – medium smooth (5mm axial, 1mm coronal, & sagittal - cerebrum);

Comments:

## N 11: Soft tissue neck CT with and without contrast (parathyroid protocol)

Indications: locate parathyroid adenomas prior to surgery

Contrast parameters	75mL @ 4.0 mL / sec or 100mL @ 4 mL/sec with 30 mL saline chaser
Region of scan	1) Non-contrast: mandible angle to carina 2) Arterial: mandible angle to carina 3) Venous: mandible angle to carina
Scan delay	1) NA 2) 25 sec (use bolus tracking for pts with significant heart disease) 3) 80 sec
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	2.0 mm axials in all 3 phases, with additional 2.0 mm coronals and sagittals in arterial and delayed phases
Filming	1) H41s – medium smooth (3mm axial, coronal, & sagittal - larynx) 2) H41s – medium smooth (3mm axial, coronal, & sagittal - larynx) 3) H41s – medium smooth (3mm axial, coronal, & sagittal - larynx)

Comments:

- To reduce beam hardening artifact & noise at base of neck; place a rolled towel b/w shoulder blades, ask patients to pull shoulders down.
- Instruct patients not to swallow, speak, or cough during scan
- Save the raw data if the patient has not had a Nuclear Medicine parathyroid yet

## SP 1: Cervical Spine CT without contrast

Indications: bleeds, stroke, dementia, headaches.

Contrast parameters	None
Region of scan	Foramen magnum to bottom of T4
Scan delay	NA
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	3.0 mm axials and 2.0 coronal and sagittal MPR.
Filming	H30s – medium smooth (3mm axial – mediastinum); H70s – very sharp (3mm axial, coronal & sag – osteo)

### Comments:

- Siemens C-SpineVol Package
- If high BMI increase kV to 140
- CPGH – using Care dose and Care KV
- Field of View: 12-13 cm; increase AP dimensions as needed for patients with C-spine kyphosis
- Trauma Criteria: AJR 2000; 174:713-717
  - Injury mechanism: high speed (>35 mph combined) MVA, MVA with death at scene, fall > 10 feet
  - Clinical evaluation: known closed head injury, pelvic or multiple extremity fx, neurologic Sx or C-spine radiculopathy

## **SP 1M: Cervical Spine CT myelogram**

Indications: degeneration, disc herniations, canal or foraminal stenosis

Contrast parameters	Intrathecal Isovue-M300
Region of scan	Foramen magnum to T1
Scan delay	Within 30 minutes of intrathecal contrast administration
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	3.0 mm axials and 2.0 coronal and sagittal MPR.
Filming	H30s – medium smooth (3mm axial – mediastinum); H70s – very sharp (3mm axial, coronal & sag – osteo)

### Comments:

- Siemens C-SpineVol Package

## SP 2: Thoracic Spine CT without contrast

Indications: degeneration, trauma

Contrast parameters	None
Region of scan	C7 to L1, or as specified by radiologist
Scan delay	NA
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	3.0 mm axials and 3.0 coronal and sagittal MPR.
Filming	H30s – medium smooth (3mm axial – mediastinum); H70s – very sharp (3mm axial, coronal & sag – osteo)

Comments:

- Siemens SpineVol Package
- In all cases, specific levels of concern should be obtained from referring physician if possible



## SP 2M: Thoracic Spine CT myelogram

Indications: degeneration, disc herniation, cord compression

Contrast parameters	Intrathecal Isovue-M300
Region of scan	To be specified by a Radiologist
Scan delay	30 – 60 minutes after intrathecal contrast administration
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	3.0 mm axials and 3.0 coronal and sagittal MPR.
Filming	H30s – medium smooth (3mm axial – mediastinum); H70s – very sharp (3mm axial, coronal & sag – osteo)

### Comments:

- Siemens C-SpineVol Package
- Roll patient 3 times on stretcher before transferring to gantry, to mix the contrast material

### SP 3: Lumbar Spine CT without contrast

Indications: degeneration, surgical fusion status, trauma, hemangiomas

Contrast parameters	None
Region of scan	T12 to S1
Scan delay	NA
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	3.0 mm axials and 3.0 coronal and sagittal MPR.
Filming	H30s – medium smooth (3mm axial – mediastinum); H70s – very sharp (3mm axial, coronal & sag – osteo)

Comments:

- Siemens SpineVol Package
- Oblique axial scan plane, to best parallel the discs as a whole
- Dose Notification: CTDI 45.00 mGy

## SP 3M: Lumbar Spine CT myelogram

Indications: degeneration, canal or foraminal stenosis

Contrast parameters	Intrathecal Isovue-M200
Region of scan	T12 – S1
Scan delay	30 – 60 minutes after intrathecal contrast administration
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	3.0 mm axials and 3.0 coronal and sagittal MPR, and oblique axial MPR parallel to individual T12-L1 to L5-S1 discs.
Filming	H30s – medium smooth (3mm axial & 3mm axial disc space– mediastinum); H70s – very sharp (3mm axial, coronal & sag – osteo)

Comments:

- Siemens C-SpineVol Package
- Roll patient 3 times on stretcher before transferring to gantry, to mix the contrast material

## **SP 4: Sacrum CT without contrast**

Indications: sciatic radiculopathy, sacral masses

Contrast parameters	None
Region of scan	L5 to inferior coccyx; supine with bent knees
Scan delay	NA
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	3.0 mm axials and 3.0mm sagittal and oblique coronal MPR.
Filming	H30s – medium smooth (3mm axial – mediastinum); H70s – very sharp (3mm axial, coronal & sag – osteo)

### Comments:

- Siemens SpineVol Package

**SP 5: Cervical / Thoracic / Lumbar CT with contrast (infection and mass protocol)**

Indications: osteomyelitis, diskitis, epidural abscess, masses

Contrast parameters	100mL @ 2.5mL/sec or 100mL @ 2.5 mL/sec with 30 mL saline chaser.
Region of scan	As specified by radiologist or referring physician
Scan delay	60 seconds
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	3.0 mm axials, 3 mm sagittal and coronal MPR (T and L – spine) or 2 mm reformats (C-spine)
Filming	H30s – medium smooth (3mm axial, coronal, & sagittal – mediastinum; 2 mm axial, coronal, & sagittal for C-SPINE); H70s – very sharp (3mm axial – osteo); burn CD without viewing tools.

Comments:

- Siemens SpineVol package
- In all cases, specific levels of concern should be obtained from referring physician

## SP 6: Epidural / Nerve Root / Facet Injection C and L Spine

Indications: osteomyelitis, diskitis, epidural abscess, masses

Contrast parameters	Isovue-200M
Region of scan	As specified by a Radiologist or referring physician
Scan delay	N/A
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	1) Scout: 3.0 mm 2) Needle Positioning: 1.5 mm for L-spine; 0.75 mm for C-spine
Filming	H70s – very sharp-osteo (please see slice thickness section)

### Comments:

- Siemens SpineVol Package
- For needle position images only 7 images are needed.
- SFOV for all images
- Send TOPO and last series of exam to PACS only