

## **Neuroradiology CT Protocols**

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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)

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## **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.

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## **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, angled to exclude orbits.
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 reformats, and post-contrast 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.

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## **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, angled to exclude orbits.
Scan delay	1) NA 2) Care Bolus at C1; peak + 5 sec 3) To follow CTA
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 (CTA) 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 CTA. 1 mm 3-D MIP (sagittal & coronal), and/or VRT reformats
Filming	1) H30s kernel 2) H30s kernel 3) H30s, H70s kernels

### Comments:

- Siemens HeadAngioVol package

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## **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, angled to exclude orbits.
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 HeadAngioVol package

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### **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:

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### **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	<u>Maxilla only:</u> bottom of orbits to maxillary teeth. <u>Mandible only:</u> mandibular teeth through bottom of mandible. <u>Maxilla and mandible:</u> 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 <u>without</u> 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.



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## **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 direct axials
Slice thickness	3.0 axials, 3.0 mm coronal and sagittal reformats.
Filming	H70f kernel

Comments:

- Suggested scan parameters: 120 kV, 100 mAs.
- Use radiation shields for the eyes.

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## **N 4C: Sinus CT with contrast**

Indications: sinus tumor evaluation.

Contrast parameters	100 mL @ 2.5 mL/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 direct axials
Slice thickness	3.0 axials, 3.0 mm coronal and sagittal reformats.
Filming	H32f, H70f kernels

Comments:

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

Indications: screening for orbital foreign bodies prior to MR.

Contrast parameters	NA
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	3.0 mm axials, 3.0 mm coronal reformats.
Filming	H30f, B70f kernels

Comments:

- Siemens Orbit package

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## **N 5C: Orbit CT with contrast**

Indications: intra-orbital masses, thyroid ophthalmopathy.

Contrast parameters	100 mL @ 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	3.0 mm axials; 3.0 mm coronal reformats
Filming	H30f, H70s kernels

### Comments:

- Siemens Orbit package

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## **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
Scan delay	NA
Detector collimation	0.6 mm non-helical direct axials and direct coronals.
Slice thickness	1.0 mm axials, 1.0 mm coronals.
Filming	U90u kernel

### Comments:

- Siemens InnerEarSeqUHR package.
- Acquire each side separately.

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## **N 6C: Mastoid CT with contrast**

Indications: middle ear vascular tumors.

Contrast parameters	150 mL @ 2.5 mL/sec, OR 100 mL @ 2.5 mL/sec with 30 mL saline chaser
Region of scan	EAC through top of petrous bones
Scan delay	60 sec
Detector collimation	0.6 mm non-helical direct axials and direct coronals.
Slice thickness	1.0 mm axials, 1.0 mm coronals.
Filming	H30f, U90u kernels

### Comments:

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

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## **N 7: Soft tissue neck CT with contrast**

Indications: neck masses, tumor staging, abscesses.

Contrast parameters	125 mL @ 2.5 mL/sec; OR 100 mL @ 2.5 mL/sec, with 30 mL saline flush
Region of scan	1) Sella to aortic arch 2) Pharynx (angled axials)
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 and oblique axials; 3.0 mm thick coronal reformats
Filming	B31s kernel

### Comments:

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

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## **N 8: Neck CT angiography**

Indications: stroke, carotid dissection.

Contrast parameters	100mL @ 4 mL/sec
Region of scan	Aortic arch to Circle of Willis
Scan delay	Care Bolus at C6; peak + 3sec
Detector collimation	16 x 0.75 mm, 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	1.5 mm axials, 1 mm <sup>3</sup> -D coronal MIP (coronal and sagittal), and/or VRT reformats
Filming	B30f kernel

### Comments:

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



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

Indications: tumors, vocal cord paralysis, trauma.

Contrast parameters	125mL @ 2.5 mL/sec; OR 100 mL @ 2.5 mL/sec, with 30 mL saline flush. 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 sec
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	B31s kernel; add B70f for trauma cases

### 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: assesses cord paralysis
  - Quiet breathing: abducts vocal cords

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## **N 10: Pre- and post-contrast sella CT**

Indications: pituitary pathology and contraindication to MRI scan.

Contrast parameters	1) None 2) 100 mL at 2.5 mL/sec
Region of scan	Foramen magnum to vertex, angled to avoid orbits.
Scan delay	1) NA 2) 60 sec
Detector collimation	1) Non-helical 16 x 1.5 mm, OR helical 64 x 0.6 mm, 128 x .6 mm (128 slice) 2) 16 x 0.75 mm OR helical 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	1) 4.5 mm or 5.0 mm axials through entire head. 2) 1 mm coronal and sagittal reformats through pituitary fossa. 4.5 mm or 5.0 mm axials from foramen magnum to vertex.
Filming	1) H30s and H70s kernels 2) H30s kernel

Comments:

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

Indications: locate parathyroid adenomas prior to surgery.

Contrast parameters	75 mL @ 4.0 mL/sec, with 25mL saline flush (preferred), or 100 mL @ 4.0 mL/sec.
Region of scan	1) Non-contrast: mandible angle to carina 2) Arterial phase: mandible angle to carina 3) Venous phase: 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	B31s kernel

### Comments:

- To reduce beam hardening artifact & noise at base of neck: place rolled towel b/w shoulder blades, ask patients to pull shoulders down.
- Instruct patients not to swallow, speak, or cough during scan.

## Sp 1: Cervical spine CT without contrast

Indications: trauma.

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, 2.0 mm sagittal and coronal MPR
Filming	B20s, B70s kernels

### Comments:

- Siemens C-SpineVol package.
- 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.

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## **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 admin
Detector collimation	16 x 0.75 mm. 64 x 0.6 mm, 128 x 0.6 mm
Slice thickness	3.0 mm axials, 2.0 mm sagittal and coronal MPR
Filming	B20s, B70s kernels

### Comments:

- Siemens C-SpineVol package.

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## **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, 3.0 mm sagittal and coronal MPR
Filming	B70s kernel; optional B20s for non-trauma cases

### Comments:

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

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## **Sp 2M: Thoracic spine CT myelogram**

Indications: degeneration, disc herniation, cord compression.

Contrast parameters	Intrathecal Isovue M300
Region of scan	To be specified by radiologist
Scan delay	30-60 minutes after intrathecal contrast admin
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 sagittal and coronal MPR
Filming	B20s, B70s kernels

### Comments:

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

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### **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, 3.0 mm sagittal and coronal MPR
Filming	B20s, B70s kernels

Comments:

- Siemens SpineVol package.
- Oblique axial scan plane, to best parallel the discs as a whole.



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## **Sp 3M: Lumbar spine CT myelogram**

Indications: degeneration, canal or foraminal stenosis.

Contrast parameters	Intrathecal Isovue M200
Region of scan	T12 to S1
Scan delay	30 to 60 minutes after intrathecal contrast admin
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 sagittal and coronal MPR, and oblique-axial MPR parallel to individual T12-L1 to L5-S1 discs.
Filming	B20s, B70s kernels

### Comments:

- Siemens SpineVol package.
- Roll patient 3 times before transferring to gantry, to mix contrast.

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## **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, 3.0 mm sagittal and oblique coronal MPR
Filming	B20s, B70s kernels

### Comments:

- Siemens SpineVol package.

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

Indications: osteomyelitis, diskitis, epidural abscess, masses.

Contrast parameters	125 mL at 2.5cc/sec, OR 100 mL at 2.5 cc/sec, with 30 mL saline chaser
Region of scan	As specified by radiologist or referring physician
Scan delay	60 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 mm sagittal and coronal MPR (T- and L-spine) or 2 mm reformats (C-spine).
Filming	B20s, B70s kernels

### Comments:

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