

CT Cervical Spine

As the osseous structures are typically of primary interest, I begin my approach to the CT cervical spine on bone windows. There are portions of the exam that resemble the search pattern for the cervical spine radiograph. Typically, I end with an evaluation of the soft tissues via approach similar to the CT soft tissue neck.

The CT cervical spine is usually done without contrast, and may be provided with bone reconstruction, so a detailed exam of the soft tissues will be of comparatively lower yield. However, it is essential to remain vigilant to avoid missing incident soft tissue mass lesions or findings in the incidentally imaged lungs, brain, and bones.

- 1. Check the history, indication, and priors.**
- 2. Check the adequacy, technique, and limitations.**
 - a. Does the study include the craniocervical junction?
 - b. Poor mineralization, motion, significant degenerative change, or artifact from hardware can all degrade the study.
- 3. Check the scout images.**
- 4. Look at 3D reconstructions to get a sense of overall anatomy and distribution of abnormality.**
 - a. Some findings may be more conspicuous on the 3D renderings than on projected slices, e.g. jumped facets and calcified stylohyoid ligaments.
- 5. Assess any hardware.**
 - a. Narrow windowing and piece by piece evaluation help reduce the chance of glossing over hardware failure.
- 6. Look in the spinal canal first.**
 - a. Assess for epidural/extradural collection (“do not miss” lesion).
 - b. This is an oft-forgotten step, which can lead to bad outcomes. Collections and mass lesions in the canal are a high-risk, low prevalence finding.
- 7. Assess the bones on axial images.**
 - a. Do a dedicated search along the course to the transverse foramina for adjacent fractures. Look at structures adjacent to the V3-V4 course of the vertebral arteries (around C1-C2). Correlating with another projection can be helpful.
 - b. Check the skull base/mastoid air cells.
 - c. Look very carefully at the C1 arch, which is well evaluated on axial images.

- d. Check each subsequent vertebral body, each posterior arch, each lateral mass.
- e. Take a quick look at the visualized osseous thorax.

8. Assess the bones on coronal images.

- a. The coronal reconstructions are ideal for the evaluation of the dens. Check the odontoid process, base, and lateral masses of C2.
- b. Look at the skull base and mastoid air cells again. Trace the margin of the foramen magnum.
 - i. You may often see the pterygoid plates, TMJs, and other skull base structures. May sure to look at each of these in turn.
- c. Assess the occipital condyles, lateral masses of C1, and lateral masses of C2 as cohesive unit. Look for fracture or pathology involving this region, i.e. the jugular tubercle, adjacent hypoglossal canal, and jugular foramen.
- d. Check the remaining, more inferior cervical spine.
 - i. Look at each vertebral bone.
 - ii. Assess the uncovertebral joints.
 - iii. Look at the facet joints.
 - iv. Look at the posterior elements.
 - v. Assess the ribs/sternum/clavicles or other visualized thorax.

9. Assess the bones on sagittal images.

- a. Check bone mineralization/morphology.
 - i. Is there relative osteopenia or sclerosis?
 - ii. Are there 7 cervical vertebrae?
 - iii. Are there cervical ribs? Other segmentation anomalies?
 - iv. Are the vertebra abnormal in shape?
 - v. Are there any diseases of bony fusion such as DISH/OPLL/AS?
- b. Check alignment/instability.
 - i. Assess the basion-dens interval.
 - ii. Assess the atlantodental interval.
 - iii. Assess the anterior, posterior, spinolaminar lines.
 - iv. The right and left spinal lines (coronals)
 - v. As necessary, the Chamberlain/McGregor lines (for basilar invagination)
- c. Assess for fracture/discopathy.
 - i. Check vertebral heights and disc heights.
 - ii. Look for widening of the distance between spinous processes. Look for spinous process fractures.
 - iii. On parasagittal images, look for apposition and integrity of the facet joints.

- iv. Check for disruption of any usually confluent ossified ligaments or syndesmophytes.
- d. At each level, look for degenerative changes, osseous spinal/neuroforaminal encroachment.
 - i. Look in the spinal canal for collection, mass lesion, or lipomatosis. Thickening of the ligamentum flavum is also common in the cervical spine.
- e. Remember to look at all the bones, including the hyoid, skull base, and thoracic cage.

10. Look for signs of erosive/inflammatory arthritides.

- a. Look for inflammatory thickening at the dens.
- b. Look for bony erosions.

11. Assess the soft tissues.

- a. Use a similar search pattern as on the CT neck. A few specific points are included here.
- b. Check Waldeyer's ring for prominence/airway narrowing
- c. Look at the epiglottis. Is it thickened? Are the aryepiglottic folds thickened, or do you see a "thumb sign"
- d. Check the trachea. Assess for narrowing - glottic vs subglottic. Check for membranes/foreign body.
- e. Look along the course of the air column, at the piriform sinuses, and vallecula for asymmetry/mass lesion.
- f. Check the prevertebral soft tissues. Are they less than half a vertebral body to the level of C4, and no more than a full vertebral body in width after that?
- g. Check the posterior paraspinal musculature for injury.

12. Assess the visualized lungs/thoracic cavity.

13. Assess the visualized brain/intracranial contents.

14. Perform any last checks.

- a. Major management changing findings include epidural collection, fracture through a transverse foramen, and mass lesion in the neck/imaged thorax. Make sure to keep these in mind as you go through your search.