CT Soft Tissue Neck

The neck is a highly complex and challenging anatomical space. A thorough knowledge of the deep spaces, lymph node stations, and normal fat planes is essential to a comprehensive approach. Each of these is a topic in its own right.

The below is a guide to my approach. I use an organization of starting centrally, and looking increasingly peripherally. A reverse (outside in) structure could also work. First, I examine the aerodigestive track and associated mucosa; surfaces. Then I check the deep spaces, fascial, and fat planes in the neck. Then I check for adenopathy, look at incidentally imaged anatomy outside the neck, then check the bones and spinal canal. It is essential to look closely for subtle head and neck cancer on every study, and make sure not to miss a lesion in the incidentally imaged lung, brain, or bones.

1. **Check the indication, history, and priors.**

2. **Assess adequacy, technique, and limitations.**
    a. Use MPRs as necessary to correct as necessary for patient positioning.

3. **Always look at the localizer (scout) views first for incidentals outside your field of view, and to prime you to major findings.**

4. **Check the air way on lung windows.**
    a. Quickly check the airway from the nasal and oral cavities through the oropharynx, nasopharynx, hypopharynx, laryngeal structures, and trachea.
    b. Look for normal contours of the fossae of Rosenmuller, torus tubarius, vallecula, piriform sinuses. Check for symmetry of vocal cords. Look for mass lesions and asymmetry of these structures.
    c. Take a quick look at the lung apices for pneumothorax, nodules/masses while on lung windows.

5. **Switch to soft tissue windows to assess the mucosa and midline deep spaces. Using narrow windows may improve sensitivity.**
    a. Check the nasal cavity for mass lesions and anatomic distortion.
    b. Check the oral cavity for subtle mass lesion in the tongue or at the floor of the mouth.
    c. For help in seeing subtle lesions, look to see if the fat of the median raphe of the tongue, as well as between the intrinsic muscles tongue are preserved. Look to see if the fat immediately posterior to the mandible, as well as between the strap muscles is preserved. A second look at the sublingual and submandibular spaces on coronal and sagittal sections is useful here.

d. Look at the posterior nasopharynx on soft tissue windows. Look for asymmetry/effacement of the fossa of Rosenmuller. Look for loss of the retropharyngeal fat stripe or thickening of the retropharyngeal soft tissues. (These soft tissues are conglomeration of the posterior pharyngeal mucosal space, retropharyngeal space, and part of the perivertebral space)
e. Check the oropharynx. Look for lesions at the base of the tongue, vallecula, or associated with the tonsillar pillars. Look for loss of the retropharyngeal fat stripe or thickening the retropharyngeal soft tissues. Also check for integrity of the parapharyngeal fat, and pre-epiglottic fat. Correlation of axial and sagittal images can be helpful here.
f. At the hypopharynx and larynx, look for symmetry/mass lesion of the vocal cords and piriform sinuses. Check the paraglottic fat. Look for sclerosis or erosion of the hyoid and thyroid/cricoid cartilages.

6. Assess the remaining (paramedian and lateral) deep spaces of the neck.

a. Starting superiorly, at the temporalis muscles, track the infratemporal fossae to their posterior extents at the TMJ, then medially to the pterygopalatine fissure. Assess integrity of the fat planes, musculature, and bones at these sites.
b. Inferior to the pterygopalatine fossae, centered about the parapharyngeal fat pads, are the masticator, parotid, and carotid space. Assess each of these to their inferior extent. When assessing the carotid space, remember to follow it to the thoracic inlet/mediastinum, as this space extends into the infrahyoid neck. Assess the parapharyngeal fat for displacement or infiltration of soft tissue density.
    i. When looking at the masticator and parotid spaces, it may be helpful split them into those parts medial and lateral to the mandible.
c. The remaining spaces in the neck are more peripheral, and include the perivertebral spaces, anterior/posterior cervical space, and buccal spaces. Check these for major distortions of the relevant musculature or lesions within normal fat distribution.

7. Check the normal "glands in the neck"

a. Assess the parotid glands (if not yet done).
b. Assess the submandibular glands.
c. Assess the thyroid gland.
d. At the above, look for mass lesions, absence/surgical changes, inflammatory change.

8. **Assess the great vessels.**
    a. Start with the visualized aorta and trace aortic branch vessels from their origin to their smallest branches, or the edge of the study.
    b. Trace the cerebral venous sinuses to the internal jugular veins, and follow these to the heart.

9. **Look for adenopathy.**
    a. I find that this is easiest done on the coronal reformats, with correlation on the sagittal images for problems solving. Look in the submandibular area, along each sternocleidomastoid, at the posterior triangle, at the supraclavicular fossa, and at the visualized mediastinum.

10. **Remember to check the superior and inferior aspect of the study.**
    a. Look at the visualized intracranial contents. A portion of the brain and other posterior fossa contents are usually seen. The sella is sometimes imaged. Make sure to evaluate each of these. Check the intracranial vasculature (arteries/sinuses) for aneurysms or thrombosis.
    b. Check the spinal canal for masses/collections.
    c. Take a look at the central airway and lung apices if you haven't already.
    d. Make sure to check the visualized mediastinum, internal mammary nodal chain, and sometimes incidentally imaged axillary nodes. It can be easy to pass by mass lesions or suspicious adenopathy at the more peripheral sites.

11. **Check the bones.**
    a. Similar to when assessing a head/neck CT, check the calvarium, paranasal sinuses, mastoid air cells, orbits, skull base and facial bones.
    b. Remember to look at the mandible, maxilla, and teeth. Dental disease is a common finding.
    c. Assess the cervical spine and visualized thoracic cage.
    d. Remember to describe significant disc protrusions/extrusions and any encroachment on neuroforamina or the spinal canal.
    e. The sternum and clavicles are a common blindspot.

12. **Perform last checks and proofread.**
    a. Be especially careful not to miss mucosal lesions, neck mass/adenopathy, and incidentals in the chest.

An Abbreviated Checklist for the CT Soft Tissue Neck

1. **Pre-read checks.**

2. **Airway, lung apices**

3. **Mucosal spaces**
    a. Nasal and oral cavities
        i. Sublingual and submandibular spaces
    b. Nasopharynx: fossa of Rosenmuller, RP fat stripe
    c. Oropharynx: RP tissues/fat stripe, base of tongue, vallecular, tonsils
    d. Hypopharynx/laryngeal structures, and trachea

4. **Other fat planes and deep spaces**
    a. Infratemporal fossa, PPFs, peri-antral
    b. Parapharyngeal fat
    c. Massicator, parotid, and carotid spaces
    d. Others: perivertebral/cervical and buccal spaces

5. **Glands**
    a. Parotid, submandibular, thyroid

6. **Lymph node levels**
    a. Cervical, supraclavicular, upper mediastinal
    b. Incidental mass lesions?

7. **Corners of the study: lower head, upper chest**
    a. Brain, skull base, vasculature
    b. Spinal canal
    c. Lung apices/pleura (again)

8. **Bones**

9. **Last checks**