Neck: root, prevertebral region & great vessels

Curricular Objectives
By the end of this session students are expected to:

Theory
1. Define the root of the neck and List its content
2. Summarize the location, attachments and nerve supply of Scalenus anterior
3. Recall the location and attachments of Scalenus medius
4. Name the structures related to Scalenus anterior at the root of the neck
5. Review the extensions of prevertebral fascia and the structures deep to it
6. Describe formation, course and tributaries of the Subclavian vein
7. Acknowledge the risk of Subclavian vein thrombosis and its effects on upper limb
8. Name the structures encountered by the needle during Subclavian vein catheterization (infra-clavicular approach)
9. Discuss the course, parts, and branches of the Subclavian artery
10. Discuss the difference in the course of the vertebral vessels
11. Recall the surface anatomy of 3rd part of Subclavian artery and its clinical importance
12. Recall the attachment of suprapleural membrane and its role in respiration
13. Clarify the association between pleura, lungs and penetrating injuries of the neck
14. Outline the location, course & ganglia of cervical part of sympathetic trunk.
15. Review the distribution of cervical sympathetic ganglia.
16. Summarize the cervical course and the body regions drained by the thoracic duct
17. Define cervical rib and discuss its effects

Practical
1. Locate the root of the neck and distinguish its bounding structures
2. Identify the Scalenus anterior muscle & acknowledge its importance as a key muscle
3. Recall the structures related to Scalenus anterior at the root of the neck
4. Follow the course of Subclavian vein noting its relation to Scalenus anterior & clavicle
5. Palpate to locate the site for Subclavian vein catheterization (infra-clavicular approach) Using the surface landmarks.
6. Trace the Subclavian artery noting the difference in origin between right and left sides
7. Divide the Subclavian artery into three parts by its relation to Scalenus anterior
8. Recognize the branches of the 1st part of Subclavian artery
9. Mark the site used to compress the third part of Subclavian artery to stop bleeding
10. Distinguish the cervical part of the sympathetic trunk noting its three ganglia
11. Label the thoracic duct noting its variable termination
12. Differentiate the course of phrenic nerve from that of Supraclavicular nerves

Selected references and suggested resources
✧ Clinical Anatomy by Regions, Richard S. Snell, 9th edition
✧ Grant’s Atlas of Anatomy, 13th Edition
✧ McMinn’s Clinical Atlas of Human Anatomy, 7th Edition
✧ Anatomy for Babylon medical students (Facebook page)
✧ Human Anatomy Education (Facebook page)
✧ Human anatomy education (you tube channel)

Feedback and suggestions
✧ http://goo.gl/forms/SjyjGeUpvH
Session check list

- **Key landmarks**
  - 1st thoracic vertebra/ 1st rib and its cartilage / Manubrium of Sternum
  - 6th and 7th cervical vertebrae
  - Scalenus anterior (key muscle)

- **Root of the neck**
  - **Location**: the area of the neck immediately above the inlet into the thorax
  - **Boundaries**: ______________________________
  - **Content**
    1. **Muscles**: Scalenus anterior, medius and posterior
    2. **Vessels**: CCA, IJV, Subclavian vessels (A.&V.), vertebral vessels, thyrocervical trunk.
    3. **Nerves**: Vagus, recurrent laryngeal, phrenic, sympathetic trunk (which ganglion?)
    4. **Viscera**: Trachea and esophagus
    5. **Others**: Apex of pleura, supra-pleural membrane, and thoracic duct

- **Scalene muscles**
  - **Scalenus anterior**:
    - **Origin**: typical cervical vertebra (anterior tubercle)
    - **Insertion**: 1st rib (specify ____________ )
    - **Important relations**:
      - Anterior: ______________
      - Posterior: Cervical part of pleura / Supracleural membrane / ______________
      - Medial: __________________________
      - Lateral: __________________________
  - **Scalenus medius**
    - **Location**: behind the Scalenus anterior and ________________
    - **Attachment**: __________________________
  - **Scalenus posterior**

  **Note**: Scalene muscles act as **accessory muscles of respiration** by elevating 1st & 2nd ribs

- **Vessels at the root of the neck**
  - **Subclavian vein**
    - Common tributaries on the left side are ____________, on the right side are ____________
    - Surface anatomy: immediately **behind the medial third of clavicle**
  - **Subclavian artery**:
    - Right and left subclavian arteries have different origin. Review.
    - Arched Course: behind Scalenus anterior (between the Scalenus anterior and medius)
    - Divided into 3 parts by Scalenus anterior 1st is medial, 2nd is posterior, 3rd is lateral to ____________

<table>
<thead>
<tr>
<th>First Part</th>
<th>Second Part</th>
<th>Third Part</th>
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</thead>
<tbody>
<tr>
<td>1. Vertebral artery</td>
<td>No branches</td>
<td>?</td>
</tr>
<tr>
<td>2. Thyrocervical trunk (main branch/inferior thyroid A)</td>
<td></td>
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<tr>
<td>3. Internal thoracic artery</td>
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- **Applied anatomy**: hemorrhage from lacerated axillary artery can be stopped by strong pressure on the third part of the Subclavian artery
Nerves at the root of the neck

- **Phrenic Nerve**
  - Is a branch of the cervical plexus
  - It is a mixed nerve containing motor and sensory fibers
  - Takes a vertical course on the anterior surface of Scalenus anterior muscle
  - The only motor nerve supply to the diaphragm.

- **Sympathetic trunk (cervical part)**
  - It is the upward continuation of the thoracic part of the sympathetic trunk
  - Ascends upward from the (just anterior to) neck of the 1\textsuperscript{st} rib to the base of the skull
  - It lies directly behind the carotid sheath, medial to Vagus
  - It has three ganglia: the superior, middle, and inferior cervical sympathetic ganglia
    - **Note:** presence of these ganglia make it easier to distinguish this trunk from the vagus
  - **Superior cervical ganglion**
    - Lies immediately below the skull
    - Branches are distributed to the head (including the eye ball) and neck along the course of the major arteries and cranial nerves
  - **Middle Cervical Ganglion**
    - Lies at the level of ..................
    - Branches are distributed to the neck, thyroid gland and upper limb (c5,6)
  - **Inferior Cervical Ganglion**
    - Usually fused with the 1\textsuperscript{st} thoracic ganglion to form the stellate ganglion.
    - It lies behind the vertebral artery in the interval between the transverse process of the 7\textsuperscript{th} cervical vertebra and the neck of the 1\textsuperscript{st} rib.
    - Branches are distributed along the subclavian and vertebral arteries
    - **Note:** all three ganglia send branches to the cardiac plexus

Others

- **Cervical pleura**
  - It covers the apex of the lung at the root of the neck on both sides
  - It rises 2.5 cm above the medial third of clavicle
  - Deep to Scalenus anterior and Subclavian artery

- **Suprapleural membrane (Sibson’s fascia):**
  - Covers the cervical pleura at the root of neck
  - It gives rigidity to thoracic inlet thereby prevents neck structures from being puffed up and down during respiration

- **Thoracic duct**
  - It conveys lymph from the whole body regions except ____________, ____________
  - And _________________ which are drained by ________________
  - Course: abdomen >>> thorax >>> root of the neck >>> left margin of esophagus >>> arches up and laterally >>> behind carotid sheath >>> drains into ________________
Cervical Rib
- Definition: a rib (bone or fibrous band) arising from _____________ vertebra
- Effects: Pressure on lower trunk of the brachial plexus and subclavian artery.

Lab Activity List
1- Root of the neck
   △ Task1: Identify the bones and cartilages forming the root of the neck
   △ List the above structures in sequence from before backward
2- Scalenus anterior muscle
   △ Task2: Locate the muscle and notice the structures related to it
   △ It is attached to _____________
   △ Which vein passes anterior to it?
   △ Which artery passes posterior to it? Can you feel its pulsation on your neck? Where?
3- Scalenus medius muscle
   △ Task3: Locate the muscle and notice the structures related to it
   △ It is attached to _____________
   △ What crosses anterior to it?
4- Subclavian vein
   △ Task4: Trace this vein
   △ Starts as a continuation of _____________ at _____________
   △ Ends by joining the _____________ vein to form _____________ vein.
5- Subclavian artery
   △ Task5: Identify the artery and trace it along its course
   △ Right artery starts as a branch of ____________ while the left starts as a branch of ____________
   △ It ends at _____________ by becoming _____________
6- Vertebral artery
   △ Task6: Trace this artery along its cervical course
   △ It is a branch of _____________
   △ It passes through the transverse foramen of _____________ vertebrae
7- Thyrocervical trunk
   △ Task7: Identify the artery and its three branches
8- Phrenic Nerve
   △ Task8: Follow the nerve along its course
   △ What is the root value of this nerve
   △ What is the most vital function of this nerve
9- Sympathetic trunk (cervical part)
   △ Task9: Follow the trunk along its course and identify its three ganglia
   △ It lie on the prevertebral muscles medial to _________________
10- Cervical pleura /Suprapleural membrane
11- Thoracic duct
Review questions:

1. Compare between typical cervical vertebra and first thoracic vertebra?
2. 1st rib is related to important structures in the neck. List & locate them
3. List the nerves running vertically along the neck, how they are differentiated from each other?
4. Lymph of body is drained by two main channels. Sketch a diagram showing the body parts drained by each of them
5. Pressure of a cervical rib on brachial plexus produces pain of ______________

Home work

1. In Subclavian vein catheterization (Infraclaviccular Approach)
   A. List two bones that are in the vicinity of the vein
   B. List the structures pierced by the needle to reach the vein
   C. List three possible uses of this technique
   D. Predict possible manifestations of thrombosis within Subclavian vein

2. Describe the clinical features of interrupting Subclavian artery circulation

3. A patient was admitted to ER after a stab wound of the neck
   A. Do you think that a chest x-ray is a must?
   B. What are the possible pathologies that may affect the thorax?

4. A penetrating wound in the right side of neck injured the phrenic nerve.
   A. What muscle will be paralyzed as a result of phrenic nerve injury?
   B. What do you expect to find in a chest x-ray
   C. Can you predict the effects on respiration?