**LAB 1**

**Pectoral Region, Axilla, Posterior Triangle of the Neck**

**CASE REPORT:**

A 51 y/o woman presents to the office with a 1-month history of a lump in her right breast which she discovered during breast self-examination. The lump is not tender and has not changed in size since she first noticed it. She reports no skin changes or nipple discharge. She has been in good health and has no significant medical history. She had her first menstrual period at age 13 and has had three full-term pregnancies, the first at age 22. She reached menopause 3 years ago. She has no family history of breast or ovarian cancer and has never had a mammogram. Her last gynecological examination was 1 year ago and was normal. She takes no medications or hormonal supplements. Her part medical and surgical histories are noncontributory.

*Examination:*

* Inspection while seated
  + Breasts are symmetrical
  + No skin changes, dimpling, or erythema
  + Nipples both everted
* Supine Position
  + Upper outer quadrant of right breast has a pea size nodule (10 o’clock position) 3cm from the areolar border
  + Nodule is 1cm X 1cm, firm and non-tender
  + No palpable masses in the left breast
  + No cervical, supraclavicular, or axillary adenopathy

Mammogram was ordered confirming the mass. Ultrasound examination was ordered to determine if the mass was solid or a fluid-filled cyst. It was confirmed to be a solid mass. Biopsy confirms infiltrating ductal carcinoma.

*Initial Treatment:*

Sentinel lymph node biopsy followed by lumpectomy. Analysis of the biopsy will determine if a complete axillary lymph node dissection is required.

**ANATOMY OF THE ANTERIOR CHEST WALL:**

1. The Pectoral Region – extends from the root of the neck to the axilla (armpit) laterally and to the costal margin inferiorly.
   1. **Bones of the Pectoral Girdle [Insert picture of boney wall]**
      1. **Clavicle** – Only bony attachment of the upper limb to the axial skeleton. It acts as a “strut” propping the shoulder away from the chest. It extends from the manubrium of the sternum to the acromion of the scapula. The medial 2/3rds of the body is convex anteriorly; the lateral 1/3rd is flattened and concave anteriorly.
         * Fractures of the clavicle medial to the coracoclavicular ligament are common, especially in children. In children the fracture is often incomplete, i.e., a **green stick fracture** in which one cortex of the bone breaks and the opposite one bends.
      2. **The Scapula** – connects the clavicle to the humerus. The acromion process articulates with the distal end of the clavicle forming the acromioclavicular joint and the glenoid fossa articulates with the head of the humerus forming the glenohumeral joint.
2. Surface Anatomy of the Pectoral Girdle [highlight the boney landmarks listed below]
   * 1. Clavicle – can be palpated throughout its entire length. Between the two medial elevations is the **jugular notch** of the **manubrium**. Be able to 1identify an isolated clavicle and its anatomical orientation as to right, left, anterior, and posterior surfaces, superior and inferior surfaces, etc.
     2. The Scapula – a highly mobile bone that glides over the posterior surface of the thoracic cage. The **acromion process** is often referred to as the point of the shoulder. The acromion is important because it is the proximal point from which clinicians measure the length of the upper limb. The **superior angle** of the scapula lies at about the level of T2 vertebra; the **inferior angle** at the spinous process of T7 vertebra. The tip of the **coracoid process** can be palpated by pressing deeply just under the lateral border of the **deltopectoral triangle**.
3. **Breasts and mammary glands** [Do they have this on the VHD? Insert picture of real breast along with a dissected breast]– situated on the anterior surface of the thorax, overlying the **pectoral muscles**. The mammary glands are accessory organs of the female reproductive system, located within the breasts. The amount of fat surrounding the glands determines the size of the breast. The breasts are usually described with the upper limb because they must be removed during dissection to study the pectoral muscles. Male mammary glands are normally rudimentary; therefore, the following describes the female breasts.
   * 1. The circular areas of skin around the nipples are called **areolae**. **Lactiferous ducts** give rise to **lobules** of glandular tissue (mammary glands). Each lobule is drained by a lactiferous duct, each of which opens on the **nipple**.
     2. The lactiferous ducts extend from the nipple like spokes of a wheel. Under the areola each duct has a dilated portion, called the **lactiferous sinus**, in which milk accumulates during lactation.
     3. The mammary gland is situated within the superficial fascia. The mammary gland is firmly attached to the skin of the breast by **suspensory (Cooper) ligaments**; these bands support the breast.
     4. At puberty the lactiferous ducts undergo branching and thereafter progressive enlargement of the breasts occurs.
   1. Arterial Supply [**Add in arteries**]– Abundant blood supply derived from perforating branches of the **internal thoracic (mammary) artery** (branch of the subclavian artery), **lateral thoracic artery** (branch of the axillary artery), and the **intercostal arteries** (branches of the internal thoracic arteries).
   2. Venous Drainage [**Add in veins**]– veins from the breast drain into the axillary, internal thoracic, lateral thoracic, and intercostal veins. There are connections between the intercostal veins and the **vertebral venous plexus**. The **chief venous drainage** is toward the **axilla**.
   3. Nerve Supply [**Add in nerves**] – **Lateral** and **anterior cutaneous** branches of the second to sixth **intercostal nerves**. Secretory activity chiefly under hormonal control.
   4. Lymphatic Drainage [**Insert a clear picture of lymph drainage**]– Lymph passes to a **subareolar plexus**, and then follows the breast venous drainage to the axilla. Most of the lymphatic drainage of the breast is to the **pectoral group** of axillary lymph nodes. Some lymph vessels pass to the **apical** and **subscapular groups** of axillary nodes. In addition, some vessels pass to the **supraclavicular nodes**, the **opposite breast**, the **parasternal nodes,** and the **abdominal nodes**.
   5. A clear understanding of the lymphatic and venous drainages of the breast must be obtained because of their clinical importance in the spread of carcinoma of the breast. **Axillary lymph nodes** are the **most common site of metastases** from carcinoma of the breast. The connections between the intercostal veins and the vertebral venous plexus allow metastasis to the bones and brain.

[Insert a cadaver video of lymph nodes]

1. The Pectoral Muscles
   1. **Pectoralis Major Muscle**
      1. Origin – Clavicular Head – anterior surface of medial half of clavicle.

Sternal Head – anterior surface of the sternum, superior six costal cartilages, aponeurosis of the external oblique muscle.

* + 1. Insertion – Lateral lip of bicipital (intertubercular) groove of humerus
    2. Innervation – lateral pectoral and medial pectoral nerves
    3. Action – Adducts and medial rotates the shoulder joint; flexes shoulder joint (clavicular head); extends shoulder joint from a flexed position (sternal head).
    4. Blood supply – pectoral branch of thoracoacromial trunk
  1. **Pectoralis Minor Muscle** – surrounded by clavipectoral fascia.
     1. Origin – Ribs 3, 4, 5
     2. Insertion – coracoid process
     3. Innervation – medial pectoral nerve
     4. Action – stabilizes the scapula by drawing it inferior and anterior.
     5. Blood Supply – pectoral beanch of thoracoacromial trunk, lateral thoracic artery.
  2. Subclavius Muscle – no real significant function in bipeds.
     1. Origin – junction of the first rib and its costal cartilage
     2. insertion – inferior surface of clavicle in the “groove for sublavius”.
     3. Innervation – nerve to subclavius
     4. Action – no real action of significance
     5. Blood Supply – clavicular branch of thoracoacromial trunk.

**Case Report cont. –** A sentinel lymph node biopsy refers to a biopsy of the lymph node in which cancer cells are most likely to spread to first. Based on the location of the mass in this patient [insert picture that indicates the quadrants of the breast] the most likely lymph node(s) involved first would be **pectoral nodes**. In some cases, a complete axillary lymph node dissection will be performed. In these instances, it is imperative that the surgeon understand the anatomy of the **Axilla** and the neurovascular structures within.

**Axilla:** [define this area in the 3D window and cross sections]

* The axilla (arm pit) is a pyramid shaped space that provides a passageway for nerves and vessels of the trunk to reach the upper limb.
* The **apex** of the axilla is formed by the convergence of the bones in its three major walls; clavicle in the anterior wall, scapula in the posterior wall, and the first rib in the medial wall. This convergence creates an opening at the apex called the **cervicoaxillary canal** through which the major nerves and vessels pass.
* The **base** of the axilla is formed by the axillary fascia and overlying skin.
* **Anterior Wall** – formed by the clavicle and the pectoral muscles
* **Posterior Wall** – formed chiefly by the scapula and the subscapularis, latissimus dorsi, and teres major muscles
* **Lateral Wall** – Medial surface of the proximal humerus and coracobrachialis muscle
* **Medial Wall** – formed by the upper ribs, intercostal muscles, and serratus anterior muscle
* The axilla contains large important nerves – branches of the brachial plexus, which pass from the neck to supply the upper limb. The axilla also contains axillary vessels as well as several groups of axillary lymph nodes.

1. The **Brachial Plexus** – this network of nerves extends from the neck into the axilla and supplies motor, sensory, and sympathetic nerve fibers to the upper limb. The brachial plexus is formed by the union of the ventral rami of Nerves C5 – T1. The ventral rami that form the brachial plexus lie between the anterior and middle scalene muscles.
   1. The usual plan of the brachial plexus
      1. As the **ventral primary rami** enter the **posterior triangle of the neck (see below for a more complete description of the posterior triangle)**, those from **C5** and **C6** unite to form the **superior trunk**. The **ventral ramus of C7** continues as a **middle trunk**, and the **ventral rami of C8** and **T1** unite at the neck of the first rib to form an **inferior trunk**. The inferior trunk lies on the first rib posterior to the subclavian artery.
      2. Each of the three trunks then divides into **anterior** and **posterior divisions** posterior to the clavicle. These divisions are of fundamental significance because the **anterior divisions supply the flexor (anterior)** parts and the **posterior divisions supply extensor (posterior)** parts of the upper limb.
      3. The **three posterior divisions** unite to form the **posterior cord**. The **anterior divisions** of the **superior** and **middle trunks** unite to form the **lateral cord**, and the **anterior division** of the **inferior trunk** continues as the **medial cord**. Observe that the cords of the brachial plexus derive their names by virtue of their relationship to the **axillary artery**.
      4. Each cord of the brachial plexus divides into two terminal branches; the lateral cord into the **musculocutaneous nerve** and the lateral root of the **median nerve**; the medial cord into the **ulnar nerve** and the medial root of the **median nerve**; the posterior cord into the **axillary nerve** and the **radial nerve**.
   2. The branches of the brachial plexus – these may be divided into supraclavicular branches and infraclavicular branches. Only the infra clavicular branches are approachable through the axilla.
      1. The supraclavicular branches of the rami and trunks of the brachial plexus are as follows:
         1. **Dorsal Scapular Nerve** – from C5; supplies rhomboid muscles and levator scapulae muscles.
         2. **Long Thoracic Nerve** – from C5, C6, C7; supplies the serratus anterior muscle.
         3. **Nerve to Subclavius** – from C5 and C6; supplies the subclavius muscle.
         4. The **suprascapular Nerve** – arises from the superior trunk of the brachial plexus, receiving fibers from C5, C6; passes through the suprascapular notch (where it may become entrapped); supplies the supraspinatus and infraspinatus muscles (both rotator cuff muscles).
      2. The infraclavicular branches of the cords of the brachial plexus are as follows:

The lateral cord has three branches:

* + - 1. **Lateral Pectoral Nerve** – from C5 – C7 and supplies the pectoralis major muscle.
      2. **Musculocutaneous Nerve** – one of the two terminal branches of the lateral cord. Supplies the muscles of the anterior arm (coracobrachialis, biceps brachii, and brachialis). It, typically, pierces the coracobrachialis muscle and travels distal deep to the biceps brachii muscle. Just proximal to the elbow it emerges superficial, lateral to the distal biceps tendon and is now called the lateral antebrachial cutaneous nerve (or lateral cutaneous nerve of the forearm).
      3. **Lateral Root of the Median Nerve** – the other terminal branch of the lateral cord; joined by the medial root of the median nerve to form the median nerve.

The medial cord of the brachial plexus has five branches:

1. **Medial Pectoral Nerve** (C8, T1) – enters the deep surface of the pectoralis minor to supply this muscle and part of the pectoralis major.
2. **Medial Brachial Cutaneous Nerve** (medial cutaneous nerve of the arm) – supplies the skin over the medial surface of the arm – purely sensory. It unites with the intercostal brachial nerve (2nd intercostal nerve) to supply this area.
3. **Medial Antebrachial Cutaneous Nerve** (medial cutaneous nerve of the forearm) – supplies skin over the medial surface of the forearm – purely sensory.
4. **Ulnar Nerve** (C7\*, C8, T1) – A terminal branch of the medial cord of the brachial plexus; supplies one and one-half muscles in the forearm, most of the intrinsic muscles of the hand, and some sensory.
5. **Medial Root of the Median Nerve** – other terminal branch of the medial cord; joins the lateral root to form the median nerve which supplies most of the flexor muscles of the forearm and some of the muscles of the hand. Innervates some of the skin of the hand.

The posterior cord of the brachial plexus has five branches:

1. **Upper Subscapular Nerve** (C5, C6) – supplies the supscapularis muscle.
2. **Thoracodorsal Nerve** (C6, C7, C8) – supplies the latissimus dorsi muscle; arises between the upper and lower subscapular nerves.
3. **Lower Subscapular Nerve** (C5, C6) – supplies part of the subscapularis muscle and all of the teres major muscle.
4. **Axillary Nerve** (C5, C6) – one of the terminal branches of the brachial plexus; passes to the posterior aspect of the arm through the quadrangular space along with the posterior circumflex humeral vessels; supplies articular branches to the glenohumeral joint; after emerging from the quadrangular space it winds around the surgical neck of the humerus to supply the deltoid and teres minor muscles; it terminates as the superior lateral brachial cutaneous nerve supplying sensory to the superior lateral aspect of the skin covering the deltoid muscle.
5. **Radial Nerve** (C5-T1) – The other terminal branch of the posterior cord; provides the major nerve supply to the extensor muscles of the arm and forearm; as it leaves the axilla the radial nerve runs between the long and lateral heads of the triceps brachii muscle to enter the radial (spiral) groove of the humerus; gives off the posterior brachial cutaneous and posterior antebrachial cutaneous nerves. As it enters the forearm it branches into a superficial and deep branch. The deep branch travels under the supinator muscle and emerges as the posterior interosseous nerve. The superficial radial nerve travels to the hand where it supplies sensory to part of the thumb and dorsum of the hand.
6. **Axillary Artery** – this large vessel begins at the lateral border of the first rib as the continuation of the subclavian artery. The axillary artery ends at the inferior border of the teres major muscle. Here it passes into the arm where it becomes the brachial artery. The axillary artery is divided into three parts by the pectoralis minor muscle as it passes posterior to this muscle.
   1. The **first part of the axillary artery** – located between the lateral border of the first rib and the superior border of the pectoralis minor muscle. The first part of the artery is enclosed in the axillary sheath along with the axillary vein and the brachial plexus. The first part has one branch, the **superior (supreme) thoracic** artery, which helps supply the first and second intercostal spaces and the superior part of the serratus anterior muscle.
   2. The **second part of the axillary artery** – lies deep to the pectoralis minor; has two branches: the t**horacoacromial** and **lateral thoracic arteries**. The **thoracoacromial artery divides into four branches**: **acromial**, **deltoid**, **pectoral**, and **clavicular**. The lateral thoracic artery supplies parts of the pectoral muscles and in the female is an important source blood to the lateral mammary gland. The **lateral thoracic artery** typically runs along the superficial surface of the serratus anterior muscle with the **long thoracic nerve**.
   3. The third part of the axillary artery – has three branches: **subscapular, anterior circumflex humeral, and posterior circumflex humeral arteries.** The subscapular artery ends by bifurcating into the **circumflex scapular** and **thoracodorsal arteries**. The circumflex scapular artery passes around the lateral border of the scapula to supply muscles on the dorsum of the scapula. The thoracodorsal artery supplies the latissimus dorsi muscle. The anterior and posterior circumflex humeral arteries pass around the **surgical neck of the humerus**. The posterior circumflex humeral artery passes through the posterior wall of the axilla via the **quadrangular space** with the axillary nerve to supply the deltoid and teres minor muscles.
   4. The branches of the axillary artery are named according to their distribution rather than by their point of origin. There are extensive arterial anastomoses around the scapula. The surgical importance of the **collateral circulation** becomes apparent during ligation of an injured axillary or subclavian artery. The axillary artery may be ligated between the thyrocervical trunk and the subscapular artery. In this case, the direction of blood flow in the subscapular artery is reversed and blood reaches the distal portion of the axillary artery first. Note that the subscapular artery receives blood via several anastomoses with the suprascapular artery, deep transverse cervical artery (dorsal scapular artery), and some intercostal arteries. Ligation of the axillary artery distal to the subscapular artery cuts off the blood supply to the arm.
7. **Axillary Vein** – lies on the antero-medial side of the axillary artery. The axillary vein begins at the inferior border of the teres major muscle where the **basilic vein** joins with the **venae comitantes** (deep brachial veins accompanying the brachial artery). The axillary vein ends at the lateral border of the first rib, where it becomes the subclavian vein. This vein receives tributaries that correspond to the branches of the axillary artery. However, there are two veins for each artery in the limbs. Superior to the pectoralis minor the axillary vein is joined by the **cephalic vein**.
8. The **Axillary Sheath** – the axillary artery, vein, and cords of the brachial plexus are enveloped in the thin fascial sheath. Anterior to the subclavian artery the prevertebral layer of cervical fascia is prolonged laterally, where it forms the axillary sheath.
9. **Axillary Lymph Nodes** – comprised of 20 – 30 nodes which are the main lymph nodes of the upper limb. These nodes are arranged in five principal groups
   1. The pectoral group of axillary lymph nodes – receive lymph mainly from the anterior thoracic wall including the breast. Efferent vessels pass from these to the central and apical groups of nodes.
   2. Lateral group of axillary lymph nodes – receive lymph from most of the upper limb.
   3. Subscapular group of axillary lymph nodes – receive lymph from the posterior aspect of the thoracic wall and scapular region. Efferent vessels pass from these to the central group of nodes.
   4. Central group of axillary lymph nodes – receive lymph from the other groups of axillary nodes (pectoral, lateral, subscapular). Efferent vessels from this group pass to the apical group of nodes.
   5. Apical group of axillary lymph nodes – situated in the apex of the axilla; receive lymph from all other axillary lymph nodes. Efferent vessels from this group unite to form the subclavian lymphatic trunk which joins the jugular and bronchmediastinal trunks to form the right lymphatic duct. On the left side, the subclavian lymphatic trunk joins the thoracic duct.

[Another Lymph Flow picture here]

**Posterior Triangle of the Neck** [Have an image appear in the 3D window]

* The neck is divided into a number of triangles for the purposes of description. The two main triangles are the **Anterior Triangle** and the **Posterior Triangle**. Each of these two triangles can be broken down into smaller sub-triangles. We will discuss the specifics of those triangles during the GI theme. At this time we are only concerned with the Posterior Triangle.

1. The **sternocleidomastoid muscle** divides the neck into the anterior and posterior triangles. The posterior triangle is bounded by the posterior border of the sternocleidomastoid muscle (anteriorly) and the anterior border of the trapezius muscle (posteriorly) and by the middle 1/3 of the clavicle inferiorly.

Its roof is formed by the deep fascia which covers the space between the trapezius and sternocleidomastoid muscles. The roof is covered by skin, superficial fascia, the platysma muscle, and superficial veins and nerves.

The floor of the posterior triangle is made up of five muscles:

1. **splenius capitis**
2. **levator scapulae**
3. **anterior scalene**
4. **middle scalene**
5. **posterior scalene**
6. Muscles
   1. Sternocleidomastoid muscle runs from the sternum and clavicle to the mastoid process of the temporal bone. The external jugular vein crosses over the top of the muscle.
      1. Origin – manubrium of the sternum and medial 1/3 of the clavicle.
      2. Insertion – mastoid process of the temporal bone (and a small part of the occipital bone).
      3. Innervation – Spinal Accessory Nerve (Cranial Nerve XI).
      4. Action – Unilaterally causes the contralateral rotation of the face and ipsilateral neck side bending. When acting bilaterally they help flex the neck.
   2. **Splenius Capitis** – runs from the ligamentum nuchae and spinous processes of the superior thoracic vertebrae to the mastoid process and superior nuchal line. \*DO NOT WORRY ABOUT THIS MUSCLE NOW. IT WILL BE COVERED IN NEURO I THEME. YOU SHOULD BE ABLE TO IDENTIFY IT AT THIS POINT BUT THAT IS ALL. \*
   3. **Posterior Scalene**
      1. Origin - Posterior tubercles of transverse processes of C5-C7 vertebrae.
      2. Insertion – external border of the second rib.
      3. Innervation – ventral rami of cervical nerves C7 and C8.
      4. Action - flexes the neck laterally; elevates the second rib during forced inspiration.
   4. **Middle Scalene** 
      1. Origin – Posterior tubercles of transverse processes of C5-C7 vertebrae.
      2. Insertion – superior surface of the first rib’ posterior to the groove for subclavian artery.
      3. Innervation – ventral rami of cervical spinal nerves.
      4. Action – flexes the neck laterally; elevates the first rib during forced inspiration.
   5. **Anterior Scalene**
      1. Origin – Transverse processes of C3-C6
      2. Insertion – 1st Rib
      3. Innervation – cervical spinal nerves C4-C6
      4. Action – Flex the head

* The roots of the brachial plexus emerge from the cervical spine and travel between the anterior and middle scalene muscles as they begin to form the rest of the brachial plexus. This is a clinically relevant area for the administration of anesthetic when performing surgery on the upper limb. **[insert some type of media describing, showing the interscalene block under US. Show US images of the BP roots emerging between the scalenes.]**

1. Arteries of the posterior triangle are the subclavian, transverse cervical, suprascapular, and occipital arteries.
   1. The **subclavian artery** cuts across the antero-inferior corner of the triangle, barely qualifying as one of its contents.
   2. **Transverse Cervical Artery** is one of the three branches of the thyrocervical trunk. It travels across the posterior triangle towards the trapezius muscle where it divides into superficial and deep branches. The superficial branch supplies the trapezius and levator scapulae muscles while the deep branch becomes the dorsal scapular artery supplying the muscles on the medial side of the scapula and becoming part of the scapular anastomosis.
   3. **Suprascapular Artery** is another of the three branches of the thyrocervical trunk. It supplies muscles of the scapular region, specifically, supraspinatus and infraspinatus and is a part of the scapular anastomosis.
   4. **Occipital Artery** is a branch of the external carotid artery (to be covered in GI). It enters the apex of the posterior triangle on its way to the posterior aspect of the head.
2. The veins of the posterior triangle are the **external jugular vein** and its tributaries, primarily the **retromandibular vein**. It crosses the sternocleidomastoid muscle in the superficial fascia. Just above the clavicle it pierces the deep fascia (roof of the triangle) and drains into the subclavian vein (usually).
3. Nerves of the posterior triangle are the brachial plexus, spinal accessory nerve (CN XI), sensory portion of the cervical plexus, phrenic nerve.
   1. **Roots of the brachial plexus** (ventral rami of C5-T1) lies in the posterior triangle immediately posterior to the anterior scalene and anterior to the middle scalene.
   2. **Spinal Accessory Nerve (CN XI)** divides the posterior triangle into nearly equal superior and inferior parts. The superior part contains only the lesser occipital nerve while the inferior part contains many important nerves.
      1. Spinal Accessory nerve is a motor nerve comprised of spinal and cranial roots.
   3. Cervical Plexus is a network of nerves formed by communications between the ventral rami of the first four cervical nerves (C1-C4). It has a sensory portion and a motor portion. The motor portion innervates muscles in the anterior triangle of the neck. The sensory portion emerges from deep to sternocleidomastoid, pierces the deep fascia and divides into four main sensory nerves:
      1. Lesser occipital nerve (C2) – ascends a short distance along the posterior border of the sternocleidomastoid muscle before dividing into several branches that supply the skin of the neck and scalp.
      2. Greater auricular nerve (C2-C3) – runs vertically over the sternocleidomastoid muscle toward the parotid gland (which lies anterior to the ear). It supplies branches to the skin of the neck, posterior aspect of the auricle of the ear, and an area extending from the mandible to the mastoid process.
      3. Transverse cervical nerve (C2-C3) – runs transversely across the middle of the sternocleidomastoid muscle to supply skin over the anterior triangle of the neck.
      4. **Supraclavicular nerves (C3-C4)** – arise as a single trunk and divides into three main branches. They supply skin over the anterior aspect of the chest and shoulder.
      5. **Phrenic nerve (C3, C4, C5)** – NOT part of the cervical plexus but derived from the ventral rami of C3, C4, C5. It runs on the anterior aspect of the anterior scalene muscle to enter the thoracic cavity where it ultimately innervates the diaphragm muscle (Mnemonic: C3, C4, C5 keeps the diaphragm alive).

**Case Report Conclusion**

When performing a complete axillary lymph node dissection there are several nerves that are more at risk than the other nerves of the region.

1. **Long Thoracic nerve** which arises from C5, C6, C7 cervical ventral rami passes posterior to the trunks of the brachial plexus and lies on the superficial side of the serratus anterior muscle (part of the medial wall of the axilla). This nerve also innervates the serratus anterior so damage to it will cause a condition known as “winged scapula” to be discussed in the scapular dissection. Additionally, weakness or paralysis of the serratus anterior will result in the patient having difficulty raising their hand over their head because the scapula will not be able to upwardly rotate.
2. **Thoracodorsal nerve** branches directly off of the posterior cord of the brachial plexus, descends along the posterior wall of the axilla, and innervates the large latissimus dorsi muscle. The latissimus dorsi muscle is a powerful adductor, extender, and medial rotator of the arm at the glenohumeral joint, therefore, injury to the thoracodorsal nerve will result in significant weakness of those motions.
3. **Intercostal brachial nerve** is a branch of the second intercostal nerve. It leaves the thoracic wall, spans the axilla to reach the medial side of the arm where it joins with the medial brachial cutaneous nerve to provide cutaneous sensory innervation. Injury to this nerve during the operative. Procedure can lead to persistent postoperative pain or numbness in the region.