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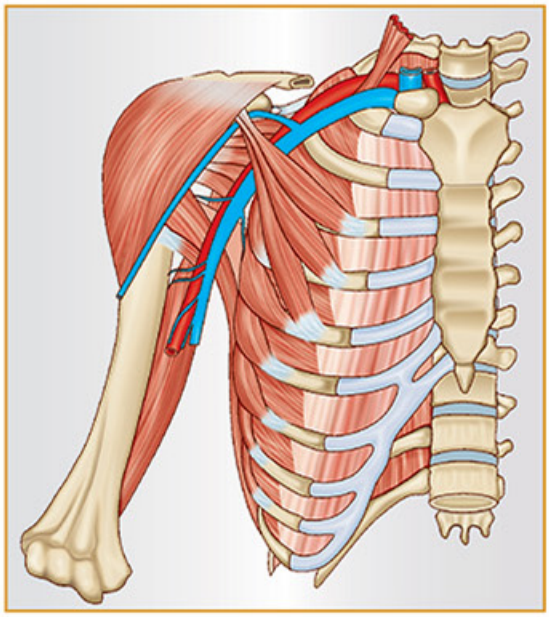
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Volume 1

Dissection Manual

With Regions & Applied Anatomy

Upper Extremity and Thorax





Mercy Navis

Forewords KS Ravindranath • Sriprakash KS

2nd Edition

JAYPEE

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CHAPTER

3

Pectoral Region

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LEARNING OBJECTIVES

At the end of the dissection of the pectoral region, the students will be able to identify the following:

1. Cutaneous nerves
2. Breast
3. Pectoral muscles
4. Subclavius
5. Serratus anterior
6. Clavipectoral fascia
7. Cephalic vein
8. Pectoral nerves
9. Long thoracic nerve
10. Blood vessels

Introduction

1. Pectoral region is part of the shoulder region.
2. The cutaneous nerves that supply the pectoral region are the three branches of the supraclavicular nerves (medial, intermediate and lateral). They arise from the ventral rami of C3, C4.
3. Anterior and lateral cutaneous branches of the intercostal nerves also supply the skin.
4. Breast (mammary gland) lies in the superficial fascia of the pectoral region.
5. The pectoral muscles include the pectoralis major (superficial) and pectoralis minor (deep).
6. Subclavius muscle is a short muscle which connects the first rib and the clavicle.
7. Serratus anterior is a thin sheet of muscle on the side of the chest wall, attached to the first eight ribs.
8. Clavipectoral fascia lies deep to the pectoralis major and encloses the subclavius and pectoralis minor muscles.
9. The medial and lateral pectoral nerves (branches of the brachial plexus) supply the pectoralis major and minor.
10. Long thoracic nerve comes from the C5 to C7 roots of the branchial plexus, supplies the serratus anterior muscle.
11. The arteries come from thoracoacromial artery, lateral thoracic artery (branches of axillary artery) and internal thoracic artery (branch of subclavian artery).

Landmarks (Fig. 3.1)

1. Clavicle (the collar bone) lies horizontally and subcutaneously.
2. Infraclavicular fossa is a depression beneath the clavicle.
3. Sternoclavicular joint is formed by the medial end of clavicle and the clavicular notch of the sternum.
4. Sternum lies in the anterior wall of the chest region.
5. Jugular notch lies in the upper part of the manubrium sterni.
6. Sternal angle is the ridge formed by the junction of the manubrium and body of sternum. It lies at the level of the second costal cartilage.
7. Xiphoid process, the lower part of the sternum, lies in the epigastric region.
8. Costal cartilages connect the ribs to the sternum.
9. First seven ribs are connected to the sternum by costal cartilages.
10. Nipple is a conical projection of the breast.

11. Corocoid process of the scapula projects forward and can be palpated inferior to the clavicle.
12. Acromion process is the lateral end of the spinous process of scapula which is subcutaneous.
13. Acromioclavicular joint is a synovial, plane joint, formed by the lateral end of the clavicle and the acromion process.

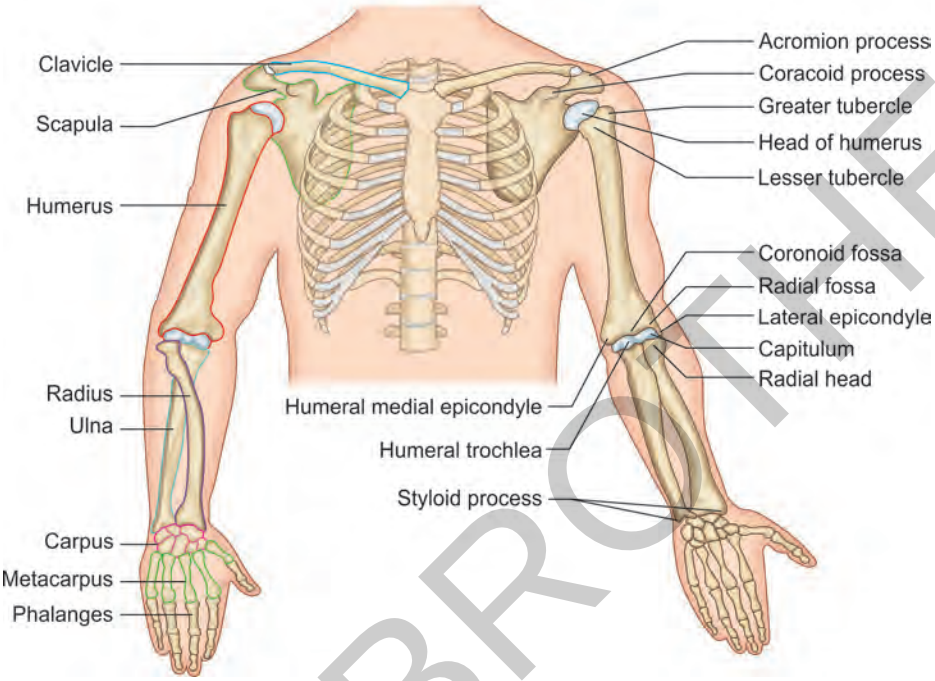


Fig. 3.1: Landmarks

Pectoral Region

Skin incisions in pectoral region are marked in Figure 3.2.

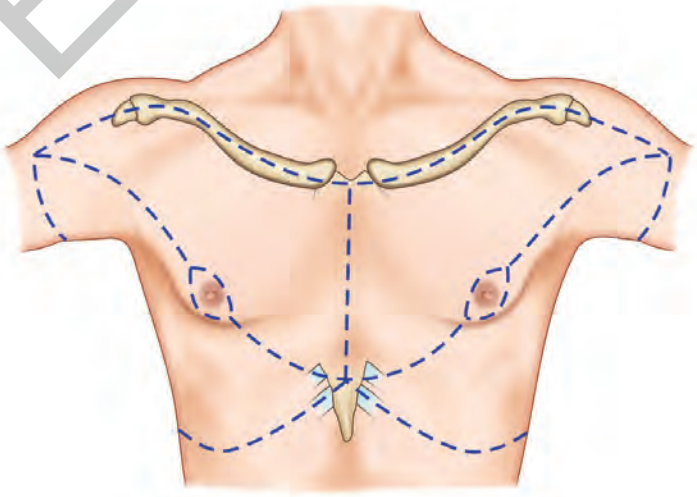


Fig. 3.2: Skin Incisions

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Cutaneous Nerves (Fig. 3.3)

Dissection

1. The body should be in supine position, make a median vertical incision from the jugular notch to the xiphoid process.
2. Make a horizontal incision along the clavicle to the acromion and a curved incision from the xiphoid process along the costal margin to the side of the body.
3. Make an oblique incision from the xiphoid process upward around the areola of the mammary gland along the medial margin of the arm.
4. Cut the skin along the midline from the jugular notch to the xiphoid process and from the jugular notch along the clavicle as far as the acromion.
5. Cut the skin upward around the areola of the mammary gland to the medial margin of the arm and along the costal margin to the side of the body.
6. Look for the **superficial fascia** beneath the skin, a thin layer with fat and trace the cutaneous nerves and blood vessels.
7. Trace the **supraclavicular nerves**, at the level of the clavicle and the **intercostobrachial nerve** on the medial side of the arm.
8. Trace the **anterior cutaneous branches** and **lateral cutaneous branches of the intercostal nerves** near the anterior and lateral wall of the thorax.

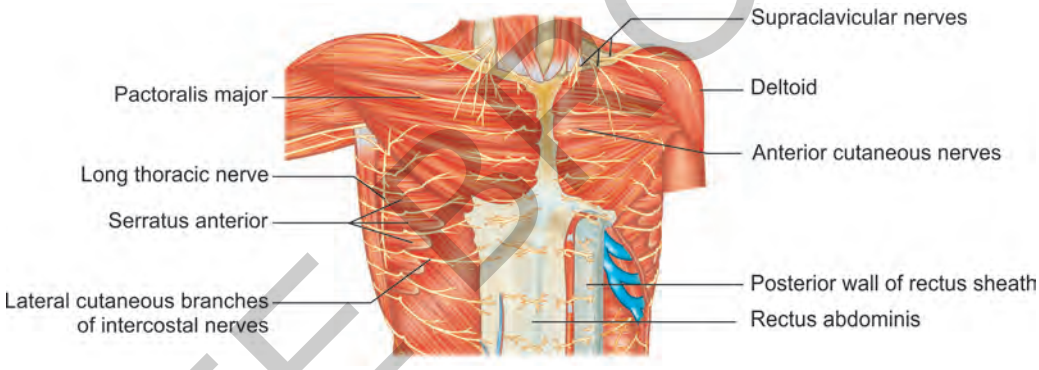


Fig. 3.3: Cutaneous nerves

Supraclavicular nerves run at the level of the clavicle and supply the skin over the deltoid and pectoral region.

Intercostobrachial nerve runs on the medial side of the arm and is the lateral cutaneous branch of the 2nd intercostal nerve. It joins the medial cutaneous nerve of the arm and supplies the skin of the upper part of the medial and posterior aspects of the arm.

Anterior cutaneous branches of the intercostal nerves run near the sternum and supply the skin over the pectoralis major.

Lateral cutaneous branches of the intercostal nerves run near the lateral wall of the thorax and supply the skin over the pectoralis major, intercostal muscles and serratus anterior.

Applied Anatomy (Clinical)

Cutaneous nerve block of the upper extremity is used as a supplement for the block of the brachial plexus, which is done by the local anesthetic in the subcutaneous tissue.

Intercostobrachial nerve block is done by the subcutaneous infiltration of the skin on the medial aspect of the arm.

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Breast

Dissection

1. Clean the fascia on the breast and observe the breast; in males, it is rudimentary and in females, it consists of the **mammary gland, fatty tissue, areola** and **nipple.**
2. Cut the mammary gland from the superficial fascia, lateral to sternum to mid axillary line and from the 2nd to the 6th ribs.
3. Place the gland in a tray and dissect gently and identify its **lobules, lactiferous ducts** and **sinuses**, radiating towards the areola and nipple (Figs 3.4 and 3.5).

Mammary gland lies on the pectoralis major muscle and consists of the **lobules, lactiferous ducts and lactiferous sinuses** (the dilated part of the lactiferous ducts) close to the nipple.

Axillary tail is the superolateral part of the gland which extends into the axilla and corresponds to the inferior border of the pectoralis major muscle (Fig. 3.4).

Skin of the areola and **nipple** contain sweat and sebaceous glands.

Suspensory ligaments of Cooper (fibrocollagenous septa) are the connective tissue in the breast which gives support and maintains its structural integrity.

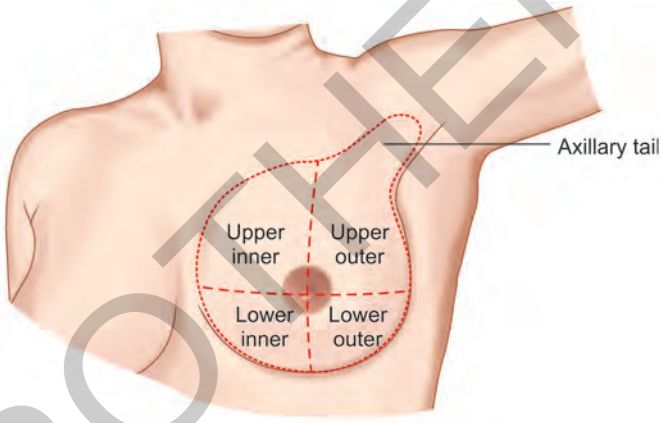


Fig. 3.4: Breast

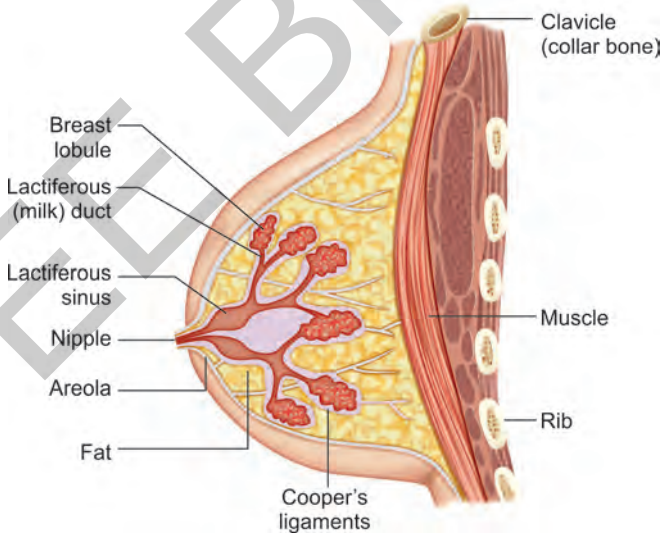


Fig. 3.5: Structure of the breast

Lymphatic Drainage of the Breast (Fig. 3.6)

Lymph vessels of the breast originate in the walls of the lactiferous ducts and communicate with the cutaneous lymphatic plexus around the nipple in the s**ubareolar plexus.**

Efferent vessels pass from the breast end in **pectoral, subscapular** and **apical nodes** (the axillary nodes receive 75% of the lymph from the breast) and the remaining vessels end in **parasternal nodes, posterior intercostal nodes** and **sub diaphragmatic nodes.**

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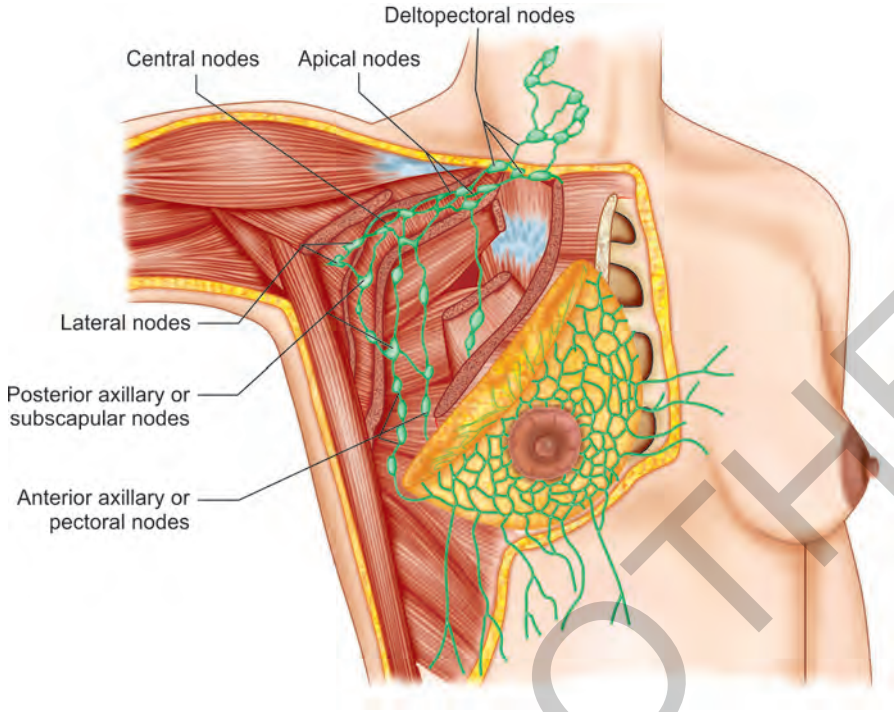


Fig. 3.6: Lymphatic drainage of the breast

Applied Anatomy (Clinical)

Breast cancers (carcinomas of the breast) are malignant tumors which arise from the epithelial cells of the lactiferous ducts of the lobules in the mammary gland and involves the suspensory ligament which is attached to the skin. They may spread through the lymph vessels from the breast to axillary lymph nodes, producing metastases. **Enlargement of these nodes** are the signs of breast cancer which helps in early detection.

In **early breast cancer,** the tumor size of less than 2 cm, no axillary lymph nodes are palpable (not involved).

In **late breast cancer,** the tumor size of more than 2 cm, the axillary lymph nodes are palpable (involved).

Breast cancer staging (TNM staging) involves the tumor size, (T) nodal status (N) and distant metastasis (M) to the lungs, liver and brain.

Blockage of lymphatic vessels by the tumor cells in the breast will cause cutaneous lymphatic edema, tethering of the skin over the breast, roughness, swelling and redness of the skin.

Sentinel lymph node is the first standing guard of lymph node in the axilla. The cancer cells from the breast metastasize first into this node which is referred as loco regional spread of breast cancer and the biopsy of this lymph node is called **SLN Biopsy.**

Sentinel lymph node dissection (SLND) is less invasive surgery alternative to the traditional lymph node dissection which has more morbidity (lymphedema of arm, nerves and vessels injury. Normally it is combined with mastectomy or lumpectomy (surgical procedure of the breast).

Clinical aspect of examination of the breast involves the four quadrants, the upper medial, lower medial, upper lateral and lower lateral quadrants, central areola, nipple and finally the axillary tail towards the axilla.

Surgical incisions for removal of the lumps in breast follows the circular lines around the surface of the breast **(Langer's lines)** for better cosmoses.

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Cephalic Vein and Pectoralis Major

Dissection

1. Remove the superficial fascia and clean the deep fascia which is thicker and fibrous.
2. Cut the deep fascia on the **pectoralis major** and observe the attachments of the pectoralis major.
3. Look for the **cephalic vein** that runs between the upper border of the pectoralis major and deltoid muscles.

Cephalic Vein

Cephalic vein is one of the superficial veins of the upper extremity that runs in the deltopectoral groove with the **deltoid branch of thoracoacromial artery**. It follows upward into the infraclavicular fossa where it pierces **the clavipectoral fascia** and ends in the **axillary vein.**

Applied Anatomy (Clinical)

Cephalic vein in the deltopectoral triangle is of clinical importance for emergency **catheterization procedures,** because it is relatively large and constant, usually allowing for easy cannulation (Fig. 3.7).

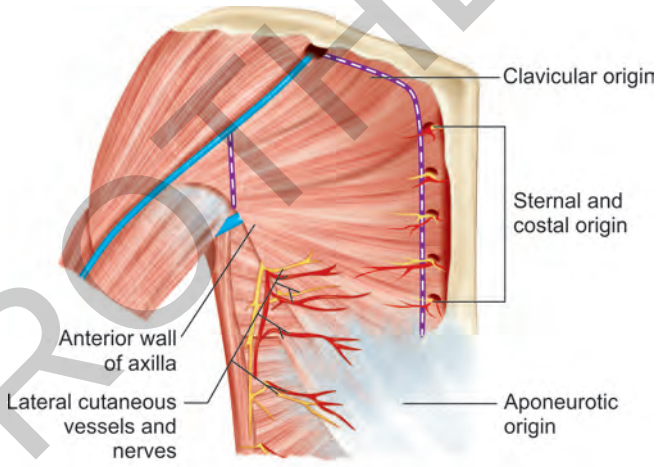


Fig. 3.7: Cephalic vein

Pectoralis Major

Pectoralis major is a large, fan shaped muscle that covers the anterior wall of chest, takes **origin** from the medial half of the clavicle, anterior surface of the sternum, cartilages of 6 or 7 ribs and aponeurosis of external oblique abdominis and **inserts** into the lateral lip of the intertuberculuar sulcus (bicipital groove) of the humerus (Fig. 3.8).

It is innervated by **medial** and **lateral pectoral nerves** (from the medial and lateral cords of the brachial plexus) and it abducts and medially rotates the humerus.

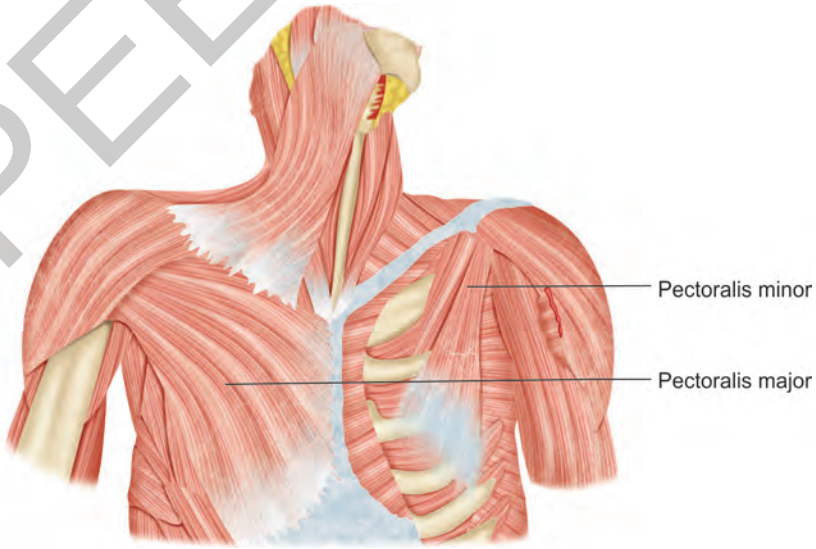


Fig. 3.8: Pectoralis major

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Applied Anatomy (Clinical)

Pectoral strain is caused by the stretch or contraction of the muscle (in athletes) and the tension is excess due to high force which may lead to gradual degeneration, weakening and tearing of the muscle.

Rupture of the pectoralis major usually occurs near the insertion. It is followed by sudden pain, deformity, weakness and a tearing sensation in the chest or front of the shoulder.

Intramuscular lipomas are common occurrence in pectoralis major muscle.

Pectoralis major myocutaneous flaps are fashioned based upon the vascular supply of the muscle and skin to cover the defect in the neck and **maxillofacial oncoplastic surgical procedures.**

Clavipectoral Fascia

Dissection

1. Cut the **pectoralis major** from the medial part of the clavicle, manubrium sterni, body of the sternum and the costal cartilages of upper 6 or 7 ribs.
2. Reflect the muscle laterally toward its insertion into the lateral lip of the intertuberculur sulcus (bicipital groove of the humerus).
3. Trace the following structures deep to the pectoralis major, **lateral, medial pectoral nerves** and **thoracoacromial artery** (branch of the second part of the axillary artery).
4. Observe the **clavipectoral fascia** deep to the pectoralis major muscle.

Clavipectoral fascia, a sheet of soft tissue separates the pectoralis major from the muscles deep to it (Fig. 3.9).

Superiorly, attached to the margins of the subclavian groove on the inferior surface of the clavicle, it encloses the **subclavius**, continues down to enclose the **pectoralis minor** and blends with the axillary fascia.

Laterally, it is thick and dense, and attaches to the coracoid process of the scapula and the part of the fascia that extends from the first rib to the coracoid process is called **costocoracoid membrane.**

Clavipectoral fascia is pierced by the **cephalic vein, lateral pectoral nerve** and **thoracoacromial artery.**

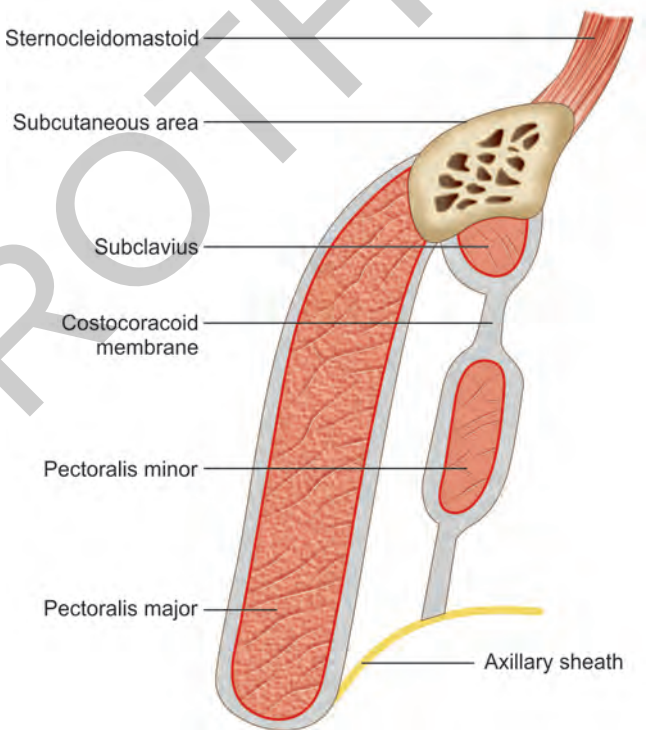


Fig. 3.9: Clavipectoral fascia

Pectoralis Minor and Subclavius

Dissection

Remove the **clavipectoral fascia** and expose the two muscles, **pectoralis minor** and the **subclavius** and observe their attachments (Fig. 3.10).

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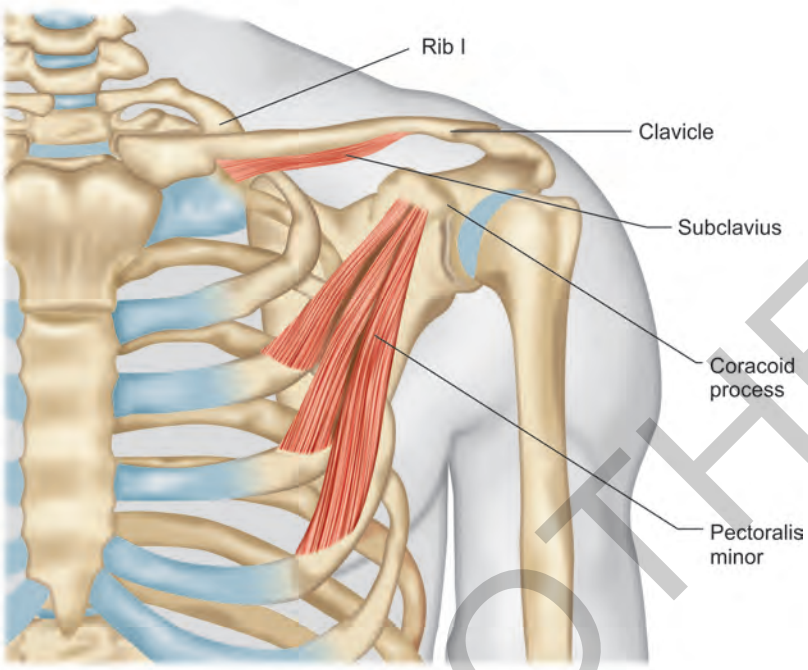


Fig. 3.10: Pectoralis minor and subclavius muscles

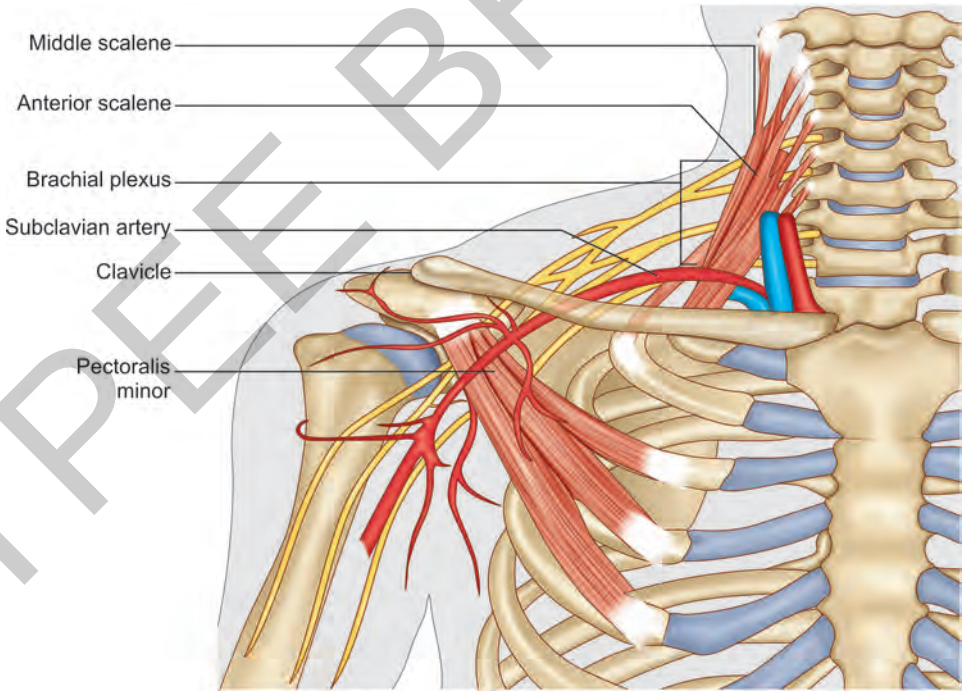


Fig. 3.11: Relations of pectoralis minor

Pectoralis Minor

Pectoralis minor is a triangular muscle that lies deep to pectoralis major. It takes **origin** from the outer surfaces of 2nd, 3rd, 4th and 5th ribs and **inserts** into the superior surface of the coracoid process of scapula (Fig. 3.11).

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It is innervated by **medial** and **lateral pectoral nerves** (branches of medial and lateral cords of brachial plexus) and it assists the serratus anterior to draw the scapula forward round the chest wall.

Applied Anatomy (Clinical)

Pectoralis minor muscle tightens and shortens, pulls the shoulders forward and causes upper back pain and may put pressure on the axillary artery and the nerves of brachial plexus causing the **symptoms,** such as numbness and tingling.

Pectoralis minor muscle in the axilla acts as a guide in the surgical procedure of **mastectomy** with the axillary lymph node dissection, in cancer surgery of the breast.

There are three surgical levels of axillary lymph nodes arrangements, which include:

The axillary lymph nodes below the lower edge of pectoralis minor **(level I group),** behind / underneath or posterior to pectoralis minor **(level II group)** and above/medial to pectoralis minor **(level III group).**

Subclavius

Subclavius is a small, triangular muscle lies between the first rib and the clavicle, takes **origin** from the junction of the first rib, its cartilage (costochondral junction) and costoclavicular ligament and **inserts** into the floor of the subclavian groove on the inferior surface of the clavicle.

It is innervated by **nerve to subclavius** from the upper trunk of the brachial plexus and it pulls the point of shoulder downward and forward and steadies the clavicle.

Applied Anatomy (Clinical)

Working a lot on the desk (writing and reading) put direct downward pressure on the clavicles, and a **tight subclavius** muscle may cause pain in front of the shoulder, upper arm, accompanied by stiffness in the neck, paresthesia, and fatigue of the upper limbs and the **symptoms** are relieved by rest and sleep.

Serratus Anterior

Dissection

1. Clean the deep fascia on the side of the chest wall and expose the **serratus anterior** muscle and observe the attachment of the muscle to the ribs.
2. Trace the **long thoracic nerve** and the accompanying **lateral thoracic artery** from the axilla that run to the muscle.

Serratus anterior is a muscular sheet that lies on the side of the chest wall. It takes **origin** by eight digitations from the outer surfaces of upper eight ribs and **inserts** into the medial border on the costal (ventral) surface of the scapula (Fig. 3.12).

It is innervated by **long thoracic nerve** from C5, C6, and C7 roots.

It is the chief muscle for pushing and reaching movements, with the pectoralis minor it draws the scapula forward, with the trapezius it raises the arm upward.

Applied Anatomy (Clinical)

Paralysis of the serratus anterior is caused by the injury to the **long thoracic nerve** in which the medial border and inferior angle of the scapula move laterally and stand out prominently, known as **winged scapula,** resulting in inability to raise the arm completely and also in pushing movements.

During the **mastectomy procedure,** it is important to identify and preserve the **long thoracic nerve** to avoid above injury.

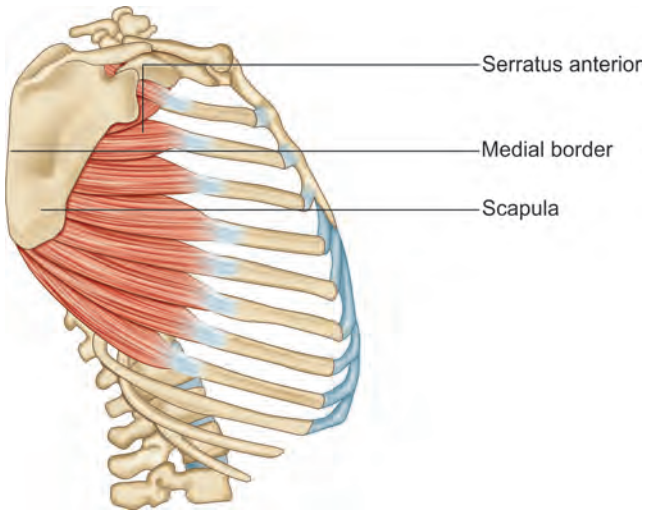


Fig. 3.12: Serratus anterior

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With Regions & Applied Anatomy

Upper Extremity and Thorax

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Mercy Navis MSc has got her Master's degree in Human Anatomy from Madras Medical College, Chennai, Tamil Nadu, India, and has an extensive teaching experience of more than 38 years. In her career, she has taught undergraduate and postgraduate medical, dental, nursing, pharmacy, physical therapy, and Chiropractic students. Currently, she is working as Associate Professor of Anatomy, Department of Basic Sciences, Life University, Atlanta, USA. She was teaching for the past 25 years, in USA, Chiropractic students, both in Sherman College, South Carolina, and in Life University, Atlanta. She has also taught the premedical and predental students in the University of South Carolina and nursing students in Spartanburg Technical College. In the past, she has worked as Assistant Professor in MS Ramaiah Medical College, Bengaluru, Karnataka, for 16 years and also Sri Krishna Medical College, Muzaffarpur, Bihar, for 3 years. She has prepared several museum specimens and created the Anatomy Museum for Sri Krishna Medical College, Muzaffarpur. Life University has awarded her as the "Teacher of the Year 2011–2012" and she was also recognized by the graduating class of March 2014 as the "Faculty of the Basic Sciences". She has conducted Dissection Seminars for the Doctors of Chiropractic and Chiropractic Diplomats from Japan. She has already published the book in USA *Gross Anatomy Dissection Manual* in August 2013 by Kendall Hunt Publishing Company.

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