New concepts in Axillary Management of Breast cancer

Essay

Submitted for Partial Fulfilment of M.Sc. Degree in General surgery

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2016

Abstract

Background: In the last decades, surgical treatment of breast cancer has evolved from more extensive procedures like radical mastectomy to less invasive breast conserving surgery. Similarly, surgical management of axilla has enormously changed from routine axillary dissection to sentinel lymph node biopsy. Traditional surgical approach to the axilla in case of sentinel lymph node negativity is to avoid completion axillary dissection. However, surgeons even avoid performing axillary dissection in selected patients with positive sentinel lymph node in clinical practice depending on the recent randomized controlled studies supporting this concept. All of the recent changes in the management of positive axilla necessitate surgeons to refresh their knowledge on this challenging topic. **Aim of the Work:** This work aims to summarize new concepts in axillary management of breast cancer. **Summary:** Based on the considerations that we have summarized in this review, we strongly believe that the decision whether to omit or not ALND after a positive SLNB, even in patients who fulfill the criteria for ALND omission, be dealt by a multidisciplinary team at the time of surgical planning. Indeed, each specialist may influence the final outcome of axillary treatment, either by detecting positive axillary nodes at preoperative imaging (radiologist), or excising a larger number of sentinel nodes and clinically suspicious nonsentinel nodes (surgeon), or suggesting a high risk of nonsentinel node metastasis (pathologist), or requesting the total number of positive nodes for adjuvant treatment decisions (medical oncologist and radiotherapist).

Key words: Breast Axailla – ALND – SLNB – Sentinle – Biopsy – Breast Cancer.

INTRODUCTION

Breast cancer is a major global problem with nearly one million cases occurring each year over the past several decades, the incidence of the disease has rising worldwide, increasing in developing and developed countries. It comprises 17% of all cancers ***(American Cancer Society, 2012).***

In Egypt, breast cancer represents the most common cancer among Egyptian females and constitutes 37% of all female cancers ***(Omar, 2010).***

All therapies in medicine carry an inherent associated morbidity; surgery is the starkest example because of its invasive nature. Consequently, all surgical procedures have to be justified via decreased risk/benefit ratio to be ethically acceptable. Therefore, the natural direction of surgical research, development, and innovation gravitates towards less invasive techniques in order to minimize the risk/benefit ratio. The evolution of management of axilla in breast cancer is a classic example of this natural sequence ***(Rahman et al., 2015).***

In the last decades, surgical treatment of breast cancer has evolved from more extensive procedures like radical mastectomy to less invasive breast conserving surgery. Similarly, surgical management of axilla has enormously changed from routine axillary dissection to sentinel lymph node biopsy. Traditional surgical approach to the axilla in case of sentinel lymph node

negativity is to avoid completion axillary dissection. However, surgeons even avoid performing axillary dissection in selected patients with positive sentinel lymph node in clinical practice depending on the recent randomized controlled studies supporting this concept. All of the recent changes in the management of positive axilla necessitate surgeons to refresh their knowledge on this challenging topic ***(Atalay, 2014).***

During the last two decades, sentinel node biopsy (SLNB) has largely replaced axillary node dissection for clinical node negative disease. This approach has been validated via two large prospective randomized controlled trials. This decade is pushing the envelope, to ascertain if SLNB can replace axillary dissection in clinical node positive disease. Whereas, there is no doubt that SLNB procedure is minimally invasive and is associated with lower complication rate, reducing the risk; whether it maintains the benefit of axillary dissection across a variety of clinical scenarios, remains controversial ***(Rahman et al., 2015).***

Axillary Lymph node dissection (ALND), as a means for achieving local disease control, carries an indisputable and often unacceptable risk of complications such as seroma, infection, and lymphedema. (SLND) was therefore developed to accurately stage tumor draining axillary nodes with less morbidity than ALND. SLND alone is the accepted management for patients whose they had received neoadjuvant hormonal therapy or chemotherapy ***(Giuliano et al., 2011).***

AIM OF THE WORK

This work aims to summarize new concepts in axillary management of breast cancer.

ANATOMY OF THE AXILLA

The axilla is located between the upper part of the thoracic wall and the arm. Its shape and size vary according to the position of the arm. Thus, it almost disappears when the arm is completely abducted. The axilla forms a passageway for the vessels and nerves from the neck to reach the upper limb (Fig.1) ***(Bland et al., 2007).***

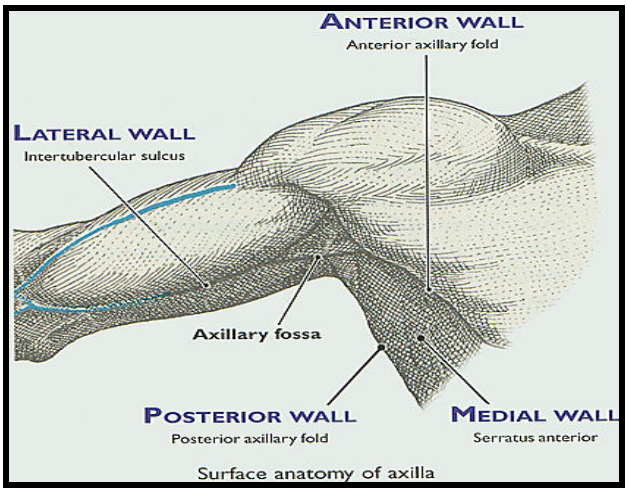

Figure (1): Surface anatomy of the axilla ***(Agur & Dalley, 2009).***

❖ Boundaries of the axilla:

Anatomically, the axilla is pyramidal in shape having an apex, a base and four walls, three of which formed by muscles. It is bounded in front and behind by the anterior & posterior axillary folds, communicating above with the posterior triangle of the neck and containing neurovascular structures, including lymph nodes, for the upper limb and the side wall of the chest (Figs.2) ***(Sinnatamby, 2006).***

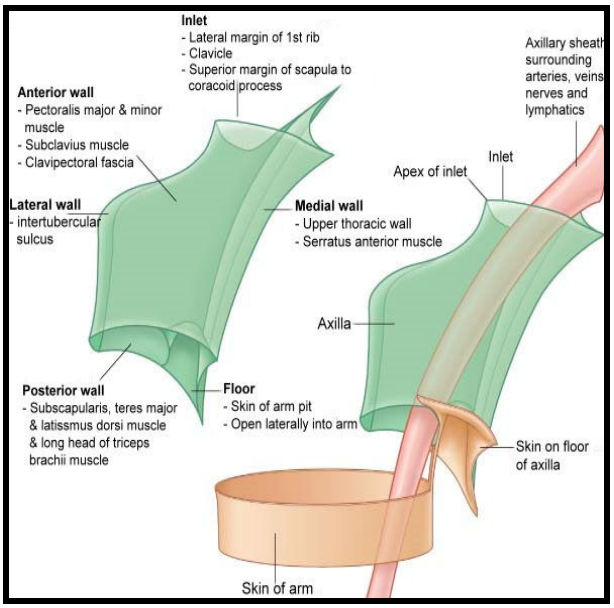

Figure (2): Boundaries & walls of axilla ***(Drake, 2005).***

- **The apex:** is the channel of communication between axilla & the posterior triangle of the neck (corresponds to the threshold zone) between lower part of the neck and the highest part of the axilla (cervicoaxillary canal). Its components are all bones, namely: bounded medially by the first rib, posteriorly by the upper border of the scapula & medial aspect of coracoid process of the scapula and anteriorly by the clavicle. The arteries & nerves go through the apex from the neck to the upper limb while the veins & lymphatics go in the opposite direction (Fig.3) ***(Sinnatamby, 2006).***

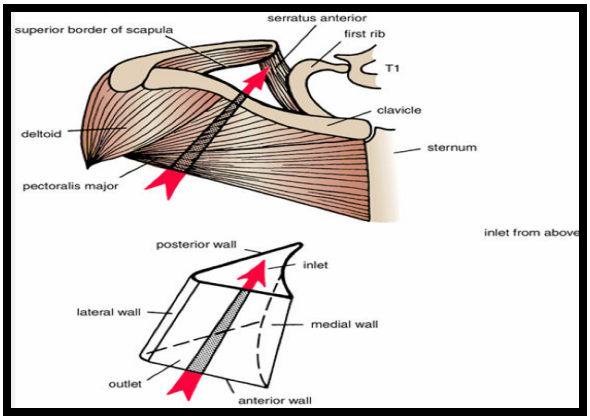

Figure (3): Apex of axilla ***(Snell, 2006).***

- **The base:** It is an imaginary downward-turned surface that is wide at the thorax , narrow at the arm and correlates with the skin & thick layer of the axillary fascia between the inferior margins of pectoralis major muscle (anterior axillary fold) anteriorly and latissimus dorsi (posterior axillary fold) posteriorly ***(Moore & Dalley, 2010).***
- **The anterior wall:** formed by three muscles; pectoralis major, pectoralis minor and subclavius muscles in addition to the clavipectoral fascia (axillary aponeurosis) that envelops the muscles and fills the space between them. The lower part of the anterior wall is called anterior axillary fold ***(Skandalakis et al., 2006).***

The whole pectoralis major forms part of the wall, while only the intermediate portion of pectoralis minor forms part of it. The space between the upper margin of pectoralis minor and the clavicle is occupied by the clavipectoral fascia, while the space between the lower margin of pectoralis minor muscle and

the dermis at the axillary base is filled by the suspensory ligament of the axilla ***(Moore & Dalley, 2010).***

- **The posterior wall:** formed by the scapula and three muscles; subscapularis muscle in its upper part& teres major and latissimus dorsi muscles in its lower part. Its lower part is called posterior axillary fold, it extends downwards more than the anterior axillary fold. It forms a muscle bed for the axillary artery ***(Skandalakis et al., 2006).***
- **The medial wall:** formed by the lateral thoracic wall, with the 2^{nd} - 6^{th} ribs with their intercostal muscles, and the upper part of serratus anterior muscle. ***(Skandalakis et al., 2006).***
- **The lateral wall:** It is the narrowest of the walls being formed by the tendon of the long head of the biceps brachii muscle and, more medially, the coracobrachialis muscle**;** while the anterior and posterior walls converge laterally towards the bicipital groove of the humerus ***(Skandalakis, et al., 2006).***
- **The floor:** is the deep fascia extending from the anterior to the posterior axillary folds and from fascia over the serratus anterior to deep fascia of the arm. The suspensory ligament from the lower margin of pectoralis minor is attached to the fascial floor from above. It becomes tense when the arm is abducted or raised above the head ***(Sinnatamby, 2006).***

➢ **Muscles of pectoral region:**

There are three muscles of surgical importance ***(Oliver Jones, 2013)***:

1) Pectoralis major muscle (Fig.4)**:** Forming the anterior wall of the axilla

Origin = Clavicular Head: Anterior surface of medial half clavicle, Sternocostal Head: 1st to 6th rib, anterior surface of sternum, aponeurosis of external oblique muscle.

Insertion = Lateral lip of the humerus.

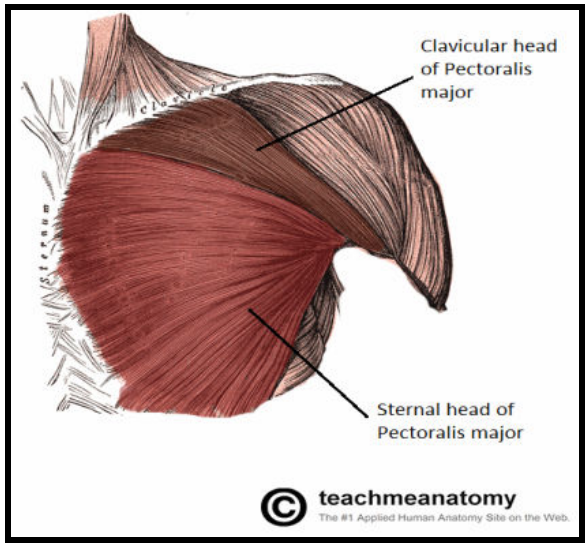

Figure (4): Pectoralis major muscle ***(Oliver Jones, 2013).***

2) Serratus anterior muscle (Fig.5)**:** Forming the medial wall of the axilla

Origin=Lateral external part of 1st to 8th rib.

Insertion=Anterior medial surface of the Scapula.

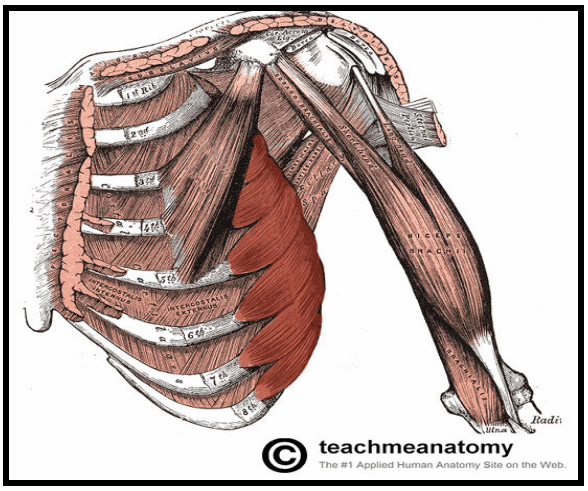

Figure (5): Serratus anterior muscle ***(Oliver Jones, 2013).***

3) Latissimus dorsi (Fig.6)**:** Forming the posterior wall of the axilla

Origin = spinous processes of the 7^{th} to 12^{th} vertebrae, thoracolumbar fascia, iliac crest, 9^{th} to 12^{th} rib & inferior angle of the scapula.

Insertion = the crest of the lesser tubercle of the humerus.

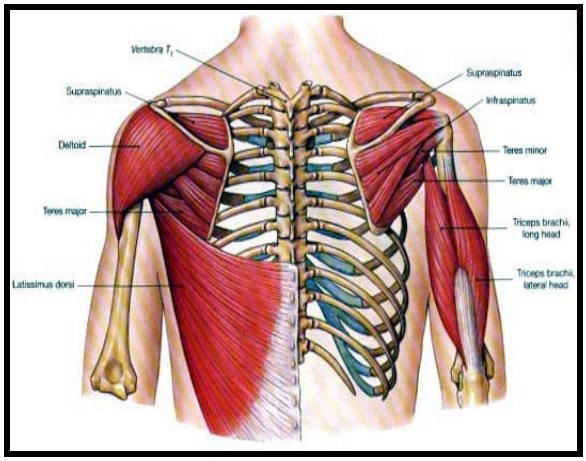

Figure (6): Latissimus dorsi ***(Oliver Jones, 2013).***

❖ **Axillary fascia:** is formed of two layers: **(1)** A superficial layer investing the pectoralis major muscle, called **pectoral fascia**, and **(2)** A deep layer that extends from the clavicle to the deep fascia in the floor of the axilla, called **clavipectoral fascia** (axillary aponeurosis). The clavipectoral fascia envelops subclavius muscle located below the clavicle and pectoralis minor muscle. The upper portion of the clavipectoral fascia is thickened and known as the costocoracoid membrane or (**Halsted's ligament**); which extends from the 1st costo-sternal articulation to the coracoid process of the scapula covering the subclavain artery &vein as they cross the 1st rib. The cephalic vein, the lateral pectoral nerve, and branches of the thoracoacromial trunk pierce this costocoracoid membrane. The medial pectoral nerve doses not pierce the costocoracoid membrane but enter the deep surface of the pectoralis minor supplying it and passes through the anterior investing layer of the pectoral fascia to innervate the pectoralis major. The lower portion of the clavipectoral fascia, located below the pectoralis minor muscle, is sometimes called the suspensory ligament of axilla or the coracoaxillary fascia. (Fig.7) ***(Bland et al., 2007).***

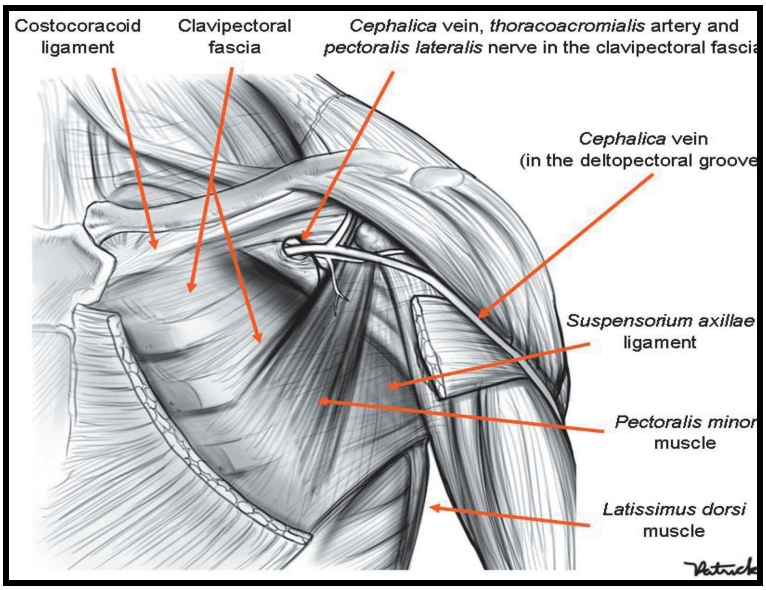

Figure (7): Clavipectoral fascia & suspensory ligament of axilla ***(MACÉA, 2006).***

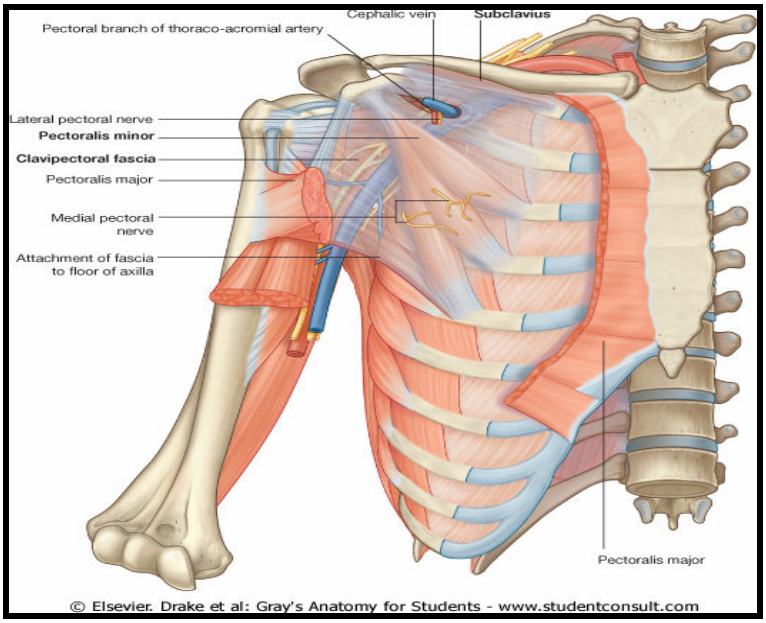

Figure (8): Clavipectoral-fascia ***(Drake et al., 2009)***

❖ **Contents of the axilla:** The axilla contains **(A)** Lymph vessels and ALNs, **(B)** The axillary artery and its branches, **(C)** The axillary vein and its tributaries and finally **(D)** The infraclavicular part of the brachial plexus and its branches, lateral branches of some intercostal nerves. Between these elements, there is adipose tissue & possibly mammary tissue that project cranially from the anterior aspect of the chest into the axilla (the axillary tail of the breast).

In the proximal portion, these elements are surrounded by axillary sheath, which is a prolongation of the pre-vertebral portion of fascia cervicalis. Axillary vessels & branches of the brachial plexus cross from the apex of axilla towards its base, along the lateral wall and closer to the anterior wall, with the axillary vein anteromedial in relation to the artery. Because of the obliquity of the upper ribs, axillary neurovascular bundle crosses the 1st intercostal space when it emerges from behind the clavicle (Fig.8) ***(Johnson et al., 2008).***

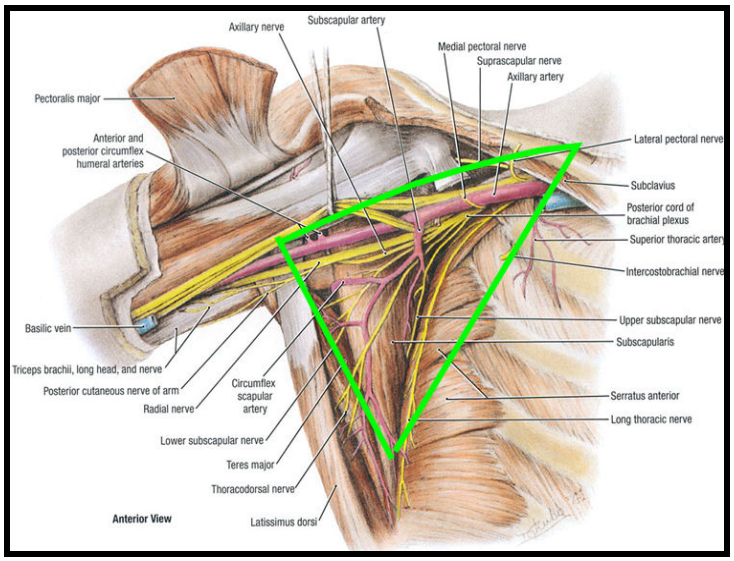

Figure (9): Contents of axilla ***(Moore & Dalley, 2010).***

(A) ALNs & axillary lymphatics:

Lymph from the whole upper limb (shoulder & scapular regions), the pectoral region (including the upper & lateral parts of the breast) and the skin of the upper part of the trunk drains through the ALNs. The ALNs are extremely important clinically since they drain the major portion of the breast. Therefore, these LNs need to be carefully palpated during any thorough breast examination. The primary route of lymphatic drainage of the breast is via ALN groups as about 75% of lymph from the breasts drains directly into the ALNs while the remaining 25 % draining into the internal mammary LNs and very limited drainage to the posterior intercostals LNs ***(Morrow & Khan, 2006).***