INTRODUCTION

Breast cancer is the commonest cancer in the United Kingdom. Its incidence is increasing and although mortality from the disease is decreasing it still accounts for over 10,000 deaths a year. The treatment of patients with breast cancer should be multidisciplinary and all patients should be discussed and treatment plans formulated at regular multidisciplinary meetings. Patients with breast cancer are usually treated surgically and may have a range of surgical options offered to them, although for the majority this will involve breast-conserving surgery or mastectomy. A lymph node staging procedure is also performed for invasive cancers to guide the use of adjuvant therapy and achieve locoregional disease control. Unless there is preoperative evidence of involved axillary lymph nodes this should take the form of a sentinel lymph node biopsy. Throughout the course of treatment, patients should have access to dedicated breast care nurses to help explain treatment options further, answer questions, and allay any fears they may have ***(Berry and Gomez, 2009).***

An increasing number of treatment options are available for early breast cancer, and some patients can now be cured of breast cancer by a combination of surgery, radiotherapy and systemic adjuvant therapy ***(Cussac, 2008).***

Modern techniques allow for aggressive and early intervention in carcinoma of the breast with less morbidity and better cosmoses ***(Pisani et al., 1999 and Jani et al., 2003).***

Axillary lymph node dissection has been an integral part of breast cancer management for over 100 years. Its role is threefold: accurate nodal staging, effective regional disease control and controversial therapeutic value in terms of overall survival. Axillary lymph node status is the most powerful predictor of recurrence, and survival in breast cancer, so it is an essential component of the decision to use adjuvant therapy. However, it is not done without morbidity including pain, paraesthesia, seroma, infection, limitation of shoulder movement and lymhoedema ***(Velanovich and Szmanski, 1999).***

In oncologic surgery the term "Halstedian" theory holds that there is an orderly progression of tumor growth and spread to regional lymph nodes. Sentinel lymph nodes is the first stop in the route of lymphatic drainage from a primary tumor. It is now widely accepted that the presence or absence of metastasic disease in the sentinel lymph nodes can predict the status of the axillary lymph nodes in case of breast cancer ***(Krag et al., 2009).***

Histopathological examination of sentinel lymph nodes can accurately determine whether or not the axillary nodal basin harbours regional metastases and necessitating further therapeutic maneuvers. Sentinel nodes biopsy is rapidly

evolving as an alternative to level I and II axillary node dissection for staging of partients with operable breast cancer. It is less invasive procedure than axillary lymph nodes dissection and can lower than both morbidity and cost ***(Manounas, 2003 and Wong et al., 2002).***

However caution is warranted because of the false-negative rates for sentinel lymph nodes biopsy which represents the percentage of patients with nodal metastases that would be incorrectly under staged with sentinel lymph node biopsy. It is important to recognize that a 2% - 3% false-negative rate is accepted for axillary lymph nodes dissection because of potential disease remaining in the level III nodes. However, these nodes are not generally removed for standard breast cancer staging because of the increased risk of lymphedema ***(Wong et al., 2002).***

There is a variety of techniques used in lymphatic mapping for breast carcinoma. It includes blue dye technique, radio colloid technique and a combination of both. The blue dye technique uses patent blue dye. There are three different radio colloid preparations currently in use, these are micro-colloidal that is used primarily in Europe. Antimony sulfide is used in Austria while sulfur colloid is used in USA and Canada, owing to its availability and low cost ***(Cox et al., 2000 and Mortia et al., 2000).***

Lymphatic mapping for breast cancer diagnosis is a rapid, accurate technique that provides increased accuracy in

detection of lymphatic metastasis when careful lymphatic evaluation with serial sections and cytokeratin analysis is performed. A possibility exists that 1% to 2% of positive nodes will be missed, but in every series this appears to have been the function of a learning curve for performing the procedure, with nearly all false-negatives occurring in the initial surgical experience. The risk-benefit analysis of lymphatic mapping provides a net 8% to 9% improvement in staging, with reduced morbidity, elimination of general anesthesia, elimination of a surgical drain, and elimination of a hospital stay for over 70% of population treated. With these concrete and significant advantages, it is apparent that lymphatic mapping will soon become the standard of care for breast cancer diagnosis and staging ***(Cox et al., 2000).***

AIM OF THE WORK

The aim of this thesis is to evaluate and study the feasibility and efficacy of sentinel lymph node biopsy versus axillary lymph node dissection and clearance in conservative breast mastectomy.

ANATOMY OF THE BREAST

The breast tissue includes both epithelial parenchymal elements and stroma. The epithelial component comprises about 10%-15% of the breast mass and the remainder is being stroma ***(Bland et al., 2007).***

Embryology of the Mammary Gland:

The breast is a highly modified skin gland that develops as ingrowths from ectoderm to form the alveoli and ducts. Supporting vascularized connective tissue is derived solely from mesenchyme ***(Bland et al., 2005).***

At the fifth or sixth week of fetal development, two ventral bands of thickened ectoderm (mammary ridges, milk lines) are evident in the embryo. In most mammals, paired breasts develop along these ridges, which extend from the base of the forelimb (future axilla) to the region of the hind limb (inguinal area). These ridges are not prominent in the human embryo and disappear after a short time, except for small portions that may persist in the pectoral region. Accessory breasts (*polymastia*) or accessory nipples (*polythelia*) may occur along the milk line when normal regression fails (Fig. 1) ***(Bland et al., 2010).***

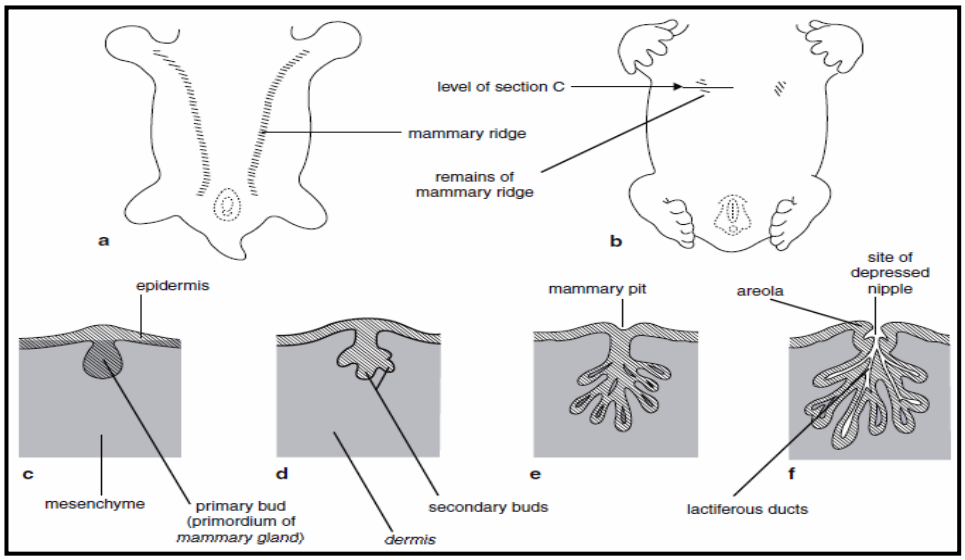

Figure 1: Embryonic development of the mammary glands. (a)Ventral view of a 28-day embryo, with regression of the mammary ridge by 6 weeks, as represented in (b) (c-f) Cross sections of the developing breast bud from 6 weeks to birth ***(Shermak., 2010).***

Each breast develops when an ingrowth of ectoderm forms a primary tissue bud in the mesenchyme. The primary bud, in turn, initiates the development of 15 to 20 secondary buds. Epithelial cords develop from the secondary buds and extend into the surrounding mesenchyme. Major (lactiferous) ducts develop, which open into a shallow mammary pit ***(Bland et al., 2010).***

Gross Anatomy:

- **Extent and Location:**

The adult female breast lies between the second and sixth ribs (Fig. 2) and between the sternal edge and the midaxillary line **,** breast tissue frequently extends into the axilla as the axillary tail of Spence. Posteriorly, the upper portion of

the breast rests on the fascia of the pectoralis major muscle; inferolaterally, it is bounded by the fascia of the serratus anterior ***(Morrow and Khan, 2006).***

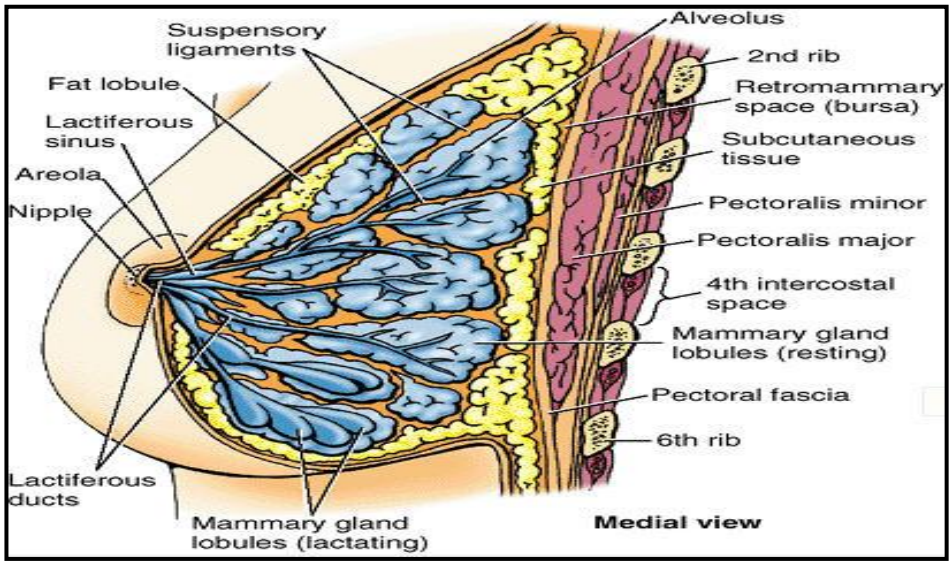

Figure 2: Diagrammatic sagittal section through the no lactating female breast and anterior thoracic wall ***(Jatio et al., 2006).***

- **Size and Form:**

The size of the adult female breast varies widely among individuals, and considerable discrepancy in breast size is seen between the breasts of an individual woman. The breast is composed of skin, subcutaneous tissue, and breast tissue. The breast tissue includes both epithelial parenchymal elements and stroma. The epithelial component comprises about 10% to 15% of the breast mass, with the remainder being stroma ***(Morrow and Khan, 2006).***

- **Nipple and Areola:**

The nipple is located over the fourth intercostal space in the non pendulous breast and is surrounded by a circular,

pigmented areola. Beneath the nipple and areola are bundles of radially arranged smooth-muscle fibers that are responsible for the erection of the nipple in response to a variety of stimuli. The nipple and areola contain sebaceous glands and apocrine sweat glands, but no hair follicles. In addition, the tubercles of Morgagni are nodular elevations formed by the openings of the Montgomery glands at the periphery of the areola ***(Morrow and Khan, 2006).***

- **Fascia of The Breast:**

The fascial framework of the breast is important in relation to clinical manifestations of disease and surgical technique. Because the breast develops as a skin appendage, it does so within the superficial fascia, such that the superficial part of the superficial fascia forms an anterior boundary and the deep layer of the superficial fascia forms a posterior boundary. In between, condensation of this inter lobar fascia gives rise to ligaments of Cooper, called suspensory ligaments because they provide a supporting framework to the breast lobes **,**They are best developed in the upper part of the breast and are connected to both pectoral fascia and skin by fibrous extensions ***(Wilkson et al., 2009).***

- **Microscopic Anatomy of The Breast:**

A mature breast is composed of three principal tissue types; glandular epithelium, fibrous stroma, supporting structures, and fat. Infiltrating cells, including lymphocytes and macrophages, are also found within the breast ***(Iglehart and Smith, 2008).***

Vascular Anatomy of the Breast:

The arterial supply from the axillary artery via its thoracoacromial, **lateral thoracic** and subscapular arteries, and from the subclavian artery via the **internal thoracic (mammary) artery .**The internal thoracic artery supplies three large anterior perforating branches through the second, third and fourth intercostal spaces. **Perforating branches** from the anterior intercostal arteries also come through these spaces more laterally. **The veins** form a rich subareolar plexus and drain to the intercostal and axillary veins and to the internal thoracic veins (Fig. 3) ***(Maliniac, 2009).***

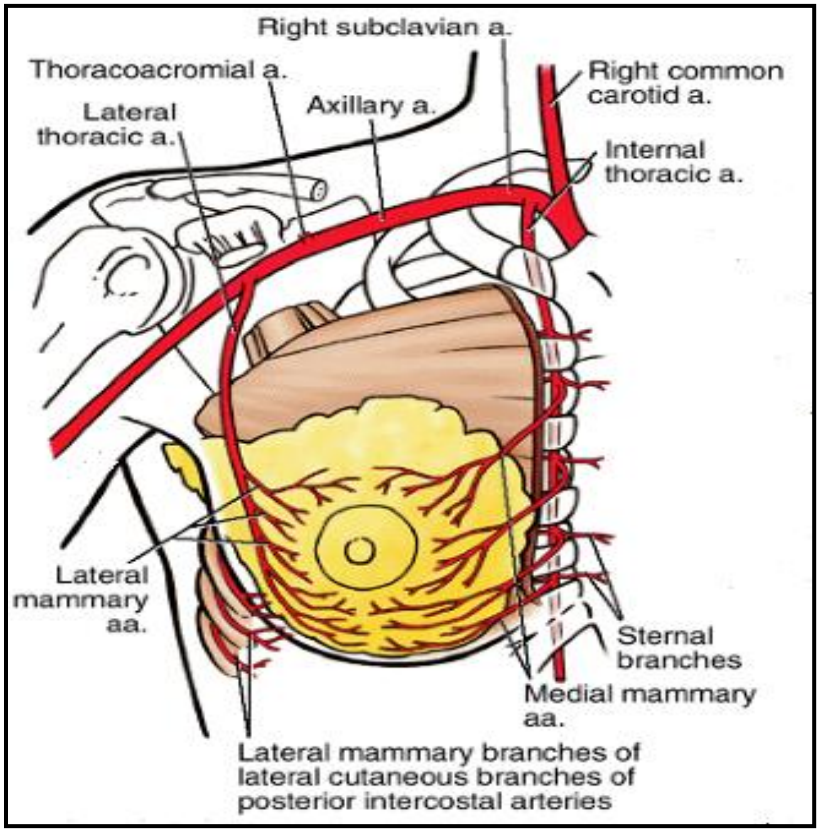

Figure 3: Arterial supply of the breast ***(Moore and Agur, 2007).***

Lymphatic Drainage:

The lymphatics of the breast are thin-walled, valveless vessels that drain uni-directionally except when obstructed by inflammatory or neoplastic disease. The superficial subareolar lymphatic plexus drains primarily the skin of the breast, the nipple and areola, in addition to some of the central portion of the gland. This plexus is interconnected with the deep lymphatic plexus, which drains most of the breast parenchyma. Injections of radioactively labeled colloid demonstrated that about 97% of the lymphatic flow from the breast drains directly into the axillary lymph nodes, with the remaining 3% draining into the internal mammary nodes. All quadrants of the breast drain into the internal mammary nodes ***(Morrow and Khan, 2006).***

The lymphatic drainage of the breast can be very variable. From the subareolar plexus (of Sappey) there are efferent vessels draining to the following:

A- The contralateral breast.

B- The internal mammary lymph nodes chain, and via:

1- The mediastinal lymph nodes to the para-aortic lymph nodes, bronchomediastinal trunks, thoracic duct and right thoracic duct.

2- Inferiorly, the superior and inferior epigastric lymphatic routes to the groin.

C- **The axillary lymph nodes,** the predominant site of drainage from the breast .These numbers from **20-40**; in the past there were named and grouped artificially as **lower,**

central, subscapular, lateral and apical. Nowadays, a simpler nomenclature is generally adopted, based on the relation of the nodes to pectoralis minor (Fig. 4):

- **Level I nodes,** Those lying below the pectoralis minor.
- **Level II nodes,** Those behind the pectoralis minor and inferior to the axillary vein.
- **Level III nodes,** The upper or apical nodes, lying between the pectoralis minor and the lower border of the clavicle ***(Sainsbury., 2006)*.**

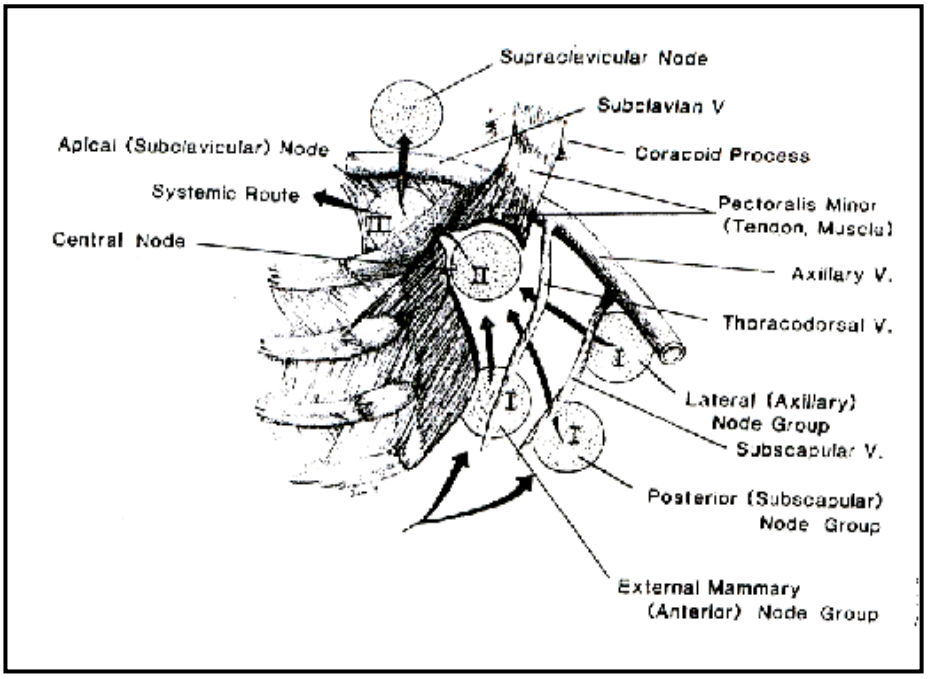

Figure 4: The major lymph node groups associated with lymphatic drainage of the breast ***(Romrell and Bland, 1998).***

The axillary lymph nodes arranged in the following groups, **lateral group**; along the axillary vein, **anterior group**; along the lateral thoracic vessels, **posterior group**; along the subscapular vessels, **central group**; embedded in fat in the

center of axilla, **interpectoral group**; a few nodes lying between the pectoralis major and minor muscles, and **apical group**; which lie above the level of the pectoralis minor tendon in continuity with the lateral nodes and which receive the efferents of all the other groups. Apical nodes are also in continuity with the supraclavicular nodes and drain into the subclavian lymph trunk, which enters the great veins directly or via the thoracic duct or jugular trunk (**Fig.5**) ***(Sainsbury, 2008).***

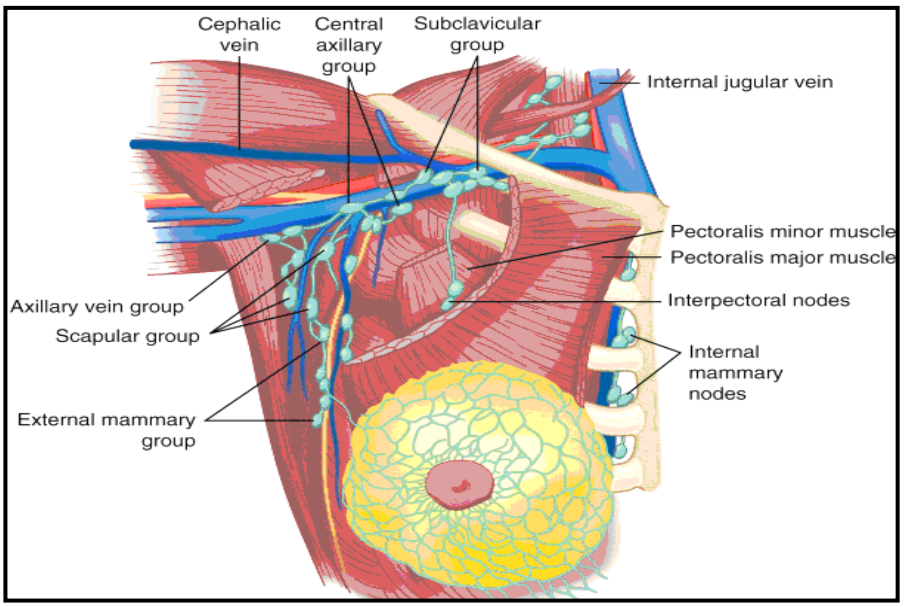

Figure 5: Lymphatic drainage of the breast ***(Iglehart and Smith, 2008).***

Innervation:

The innervation to the skin and parenchyma of the breast occurs by way of the medial and lateral intercostal nerves (Fig. 6)**,** although a portion of the superior breast as well as the upper chest wall comes from branches of the supraclavicular nerve, which originate as a branch of the cervical plexus. The

innervation to the nipple is from the lateral and medial branches of fourth intercostal nerve. The lateral portion of the breast and chest wall receive sensory innervation from the lateral branches of the third through sixes intercostal nerves, whereas the medial aspect and sternal area receives its innervation from the medial branches ***(Roses and Giuliano, 2005).***

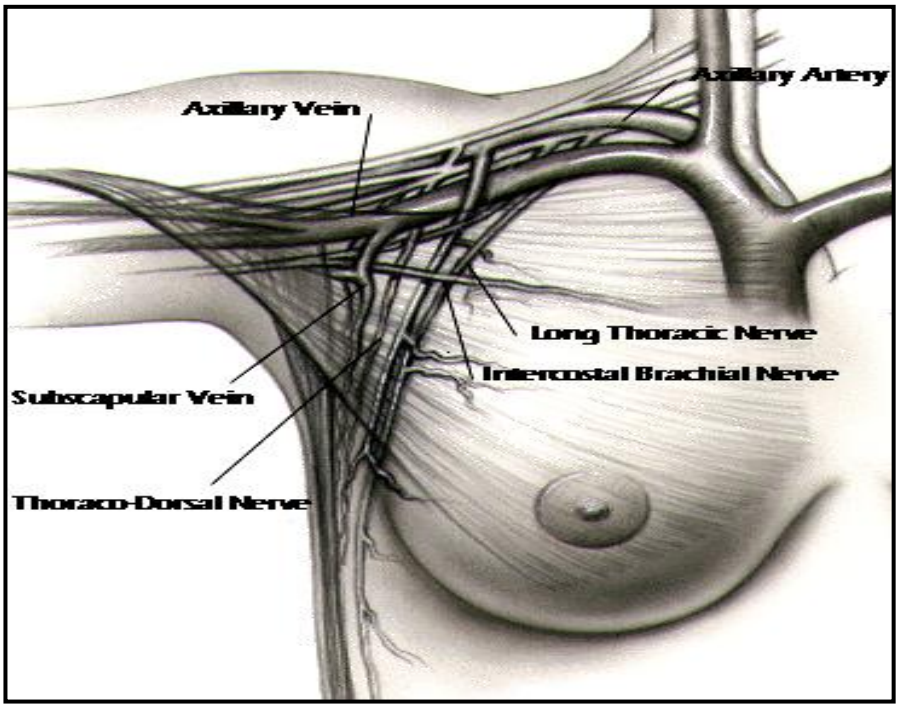

Figure 6: Blood and Nerve supply of the breast ***(Romrell,1998).***

Anatomy of The Axilla:

The axilla is a pyramidal compartment located between the upper extremity and the thoracic wall; this structure has four boundaries inclusive of a base and an apex. The curved base is composed of the axillary fascia. The apex of the axilla represents an aperture that extends into the posterior triangle of

the neck via the cervicoaxillary canal. Most structures that course between the neck and the upper extremity enter this anatomic passage, which is bounded anteriorly by the clavicle, medially by the first rib, and posteriorly by the scapula. The anterior wall of the axilla is composed of the pectoralis major and minor muscles and their associated fasciae. The posterior wall is formed primarily of the subscapularis muscle, located on the anterior surface of the scapula, and to a lesser extent by the teres major and latissimus dorsi muscles. The lateral wall of the axilla is the bicipital groove ***(Bland, 2007).***

- **Content of The Axilla:**

There are several clinically important structures within the axilla (Fig. 7). Between the pectoralis major and minor muscles are the interpectoral lymph nodes (Rotter's nodes) that are usually found on the posterior surface of the pectoralis major muscle. The lateral pectoral nerve also courses along the posterior surface of the pectoralis major muscle. The medial pectoral nerve, which has a Y-shape, innervates the infero-lateral aspect of the pectoralis major muscle. The second cutaneous intercostobrachial nerve lies approximately 1 cm inferior to the axillary vein and runs in a medial–lateral direction. The long thoracic nerve, which innervates the serratus anterior muscle, can be identified just posterior to the intercostobrachial nerve at the second intercostal space. The long thoracic nerve follows the curve of the chest wall inferiorly and posteriorly, until it divides into branches that