

INTRODUCTION

In 1980s the indications for breast reconstruction were liberalized as a result of increasing experience with the various procedures, including microsurgery, development of implants and tissue expanders designed for breast reconstruction (*Edney, 2002*).

Breast reconstruction attempts to surgically recreate the natural contour of a woman's breast, lost partially or totally, to the treatment of cancer (or other disease), can include employing the patient's own tissue (autologous tissue reconstruction) or alloplastic material in the forms of tissue expanders or implants or combination of both (*Clough et al., 2004*).

The breast reconstruction may begin at the time of mastectomy (immediate) or weeks to years afterwards (delayed). Not every woman facing a mastectomy desires breast reconstruction or volume replacement in any form, and some are satisfied with the use of external breast prostheses worn under clothing (*Grotting et al., 2003*).

Immediate reconstruction begins when the mastectomy is complete, under the same anesthesia. Advantages of immediate reconstruction include the avoidance of any period of deformity of the missing breast, and a single episode of surgery (or rather reduced number of surgeries). From a reconstructive standpoint, immediate reconstruction is desirable. The mastectomy skin flaps

are pliable, and it is easier to preserve the inframammary fold, rather than reestablish it later. The potential recipient blood vessels for free tissue transfer are convenient to expose, if not exposed by the mastectomy, and have not been damaged by postoperative scarring (*Grotting et al., 2003*).

Regarding “advantages” of delayed breast reconstruction: some women are so devastated by their diagnosis, that they are unable to meaningfully participate in reconstructive considerations, and delayed reconstruction defers decisions about reconstruction. For others, there may have been some contraindication to immediate reconstruction (e.g., co-morbidities necessitating limitation of the initial surgical intervention and need for post-mastectomy radiation therapy).

Surgical breast reconstruction after mastectomy consists of two general kinds of procedures, those involving alloplastic tissue expanders or implants and those that use autologous tissues, though both techniques may also be used (*Goffman et al., 2005*).

The current surgical options for postmastectomy reconstruction are:

- Alloplastic reconstruction: single-staged with long term prosthesis (long term implant, or volume adjusting implant).
- Alloplastic reconstruction: Staged with tissue expansion, with secondary exchange of expander for long term prosthesis.

- Autologous reconstruction: regional musculocutaneous flap (e.g., latissimus dorsi musculocutaneous flap, or transverse rectus abdominis musculocutaneous flap (TRAM)).
- Autologous reconstruction: distant flap, microvascular free tissue transfer.
- Combined autologous-alloplastic reconstruction (e.g., latissimus dorsi musculocutaneous flap with an implant beneath).

The increasing use of radiotherapy after mastectomy, including partial mastectomy, has significant implications for breast reconstruction. In general, there is a consensus that the combination of radiation and implants is associated with greater than 50 % risk of complications in wound healing, capsular contracture, and pain. Patients who undergo “expander/implant” type of breast reconstruction after radiotherapy have a higher rate of complications than patients not receiving radiotherapy (*Goffman et al., 2005*).

Expansion of indications for postmastectomy radiotherapy may affect the timing and the reconstructive options available, possibly decreasing the use of immediate reconstruction especially with implants. Some recommend delayed reconstruction even with micro surgically transferred free TRAM flaps for those undergoing adjuvant radiotherapy because of the increased rate of such complications as fat necrosis, loss of flap volume, fibrosis and flap

contracture. Unfortunately, for immediate reconstruction, it is often not known whether subsequent radiotherapy will follow (*Disa et al., 2003*).

Given significant rate of postradiation complications impacting the aesthetic outcome, saline inflatable, and in particular volume-adjustable implants, seem to be a more logical implant choice for reconstruction of the breast mound if one decides to proceed with the initial stage of reconstruction prior to radiotherapy. Permanent or temporary reduction of an implant volume may be helpful in the management of pain or a wound healing problem, and temporary overexpansion may be helpful in preventing or managing effects of radiation fibrosis (*Goffman et al., 2005*).

Considering all arguments pros- and cons-, autologous tissue breast reconstruction seems to be preferred to immediate breast mound reconstruction option for women with a significant probability of postmastectomy radiotherapy by reconstructive surgeons. Overall, excellent local and regional disease control and satisfactory cosmetic results by autologous tissue breast reconstruction are reported (*Spear et al., 2005*).

Relatively, little evidence exists regarding fears that chemotherapy might affect healing and both induction and adjuvant chemotherapy may impact results of reconstructive procedures. It was found that induction chemotherapy slightly

prolonged the interval to postoperative chemotherapy in patients with locally advanced breast cancer, however, no effect on survival associated with this delay was noted. Immediate breast reconstruction seems not to delay the start of adjuvant chemotherapy (*Wilson et al., 2004*).

AIM OF THE WORK

The aim of this essay is to review the literature regarding immediate versus delayed breast reconstruction after mastectomy and its different modalities with the benefits of each technique from oncogenic point of view.

BREAST ANATOMY

I-Macroscopical anatomy of the breast

A-Site and Extension

The adult female breast is located within the superficial fascia of the anterior chest wall. The base of the breast extends from the level of the 2nd or 3rd rib to the infra-mammary fold, which is at the level of 6th or 7th rib, and from the sternal border medially to the mid-axillary line laterally. Two thirds of the base of the breast lies anterior to the pectoralis major muscle, while the remainder lies anterior to the serratus anterior muscle. A small part may lie over the aponeurosis of external oblique muscle. In about 95% of women there is a prolongation of the upper lateral quadrant towards the axilla forming tail (of Spence). The breast tissue passes up to the level of the 3rd rib in the axilla where it is in direct contact with the main lymph nodes of the breast (anterior axillary nodes). This process of breast tissue enters a hiatus (of Langer) in the deep fascia of the anterior axillary wall (*Lawson, 2002*).

b-The deep fascia

The deep fascia or pectoral fascia encloses the pectoralis major and pectoralis minor muscles and then is reflected laterally across the axilla to the latissimus dorsi muscle posteriorly. This deep fascia also extends from the clavicle and deltoid muscle above to the serratus anterior and external oblique muscles on the

thoracic wall. The deep layer of pectoral fascia encloses the pectoralis minor and is reflected from the coracoid process to the clavicle as the costo – coracoid or clavi – pectoral fascia. This layer of pectoral fascia is continuous across the midline and superiorly into the neck as the deep cervical fascia. The upper portion of the clavi – pectoral fascia encloses the subclavius muscle and pectoralis minor muscle. The lower portion of the clavi – pectoral fascia located below pectoralis minor muscle is sometimes called the suspensory ligament of the axilla or the coraco – axillary fascia. The breast is supported by ligaments of Cooper, which give the young breast its protuberant shape and when atrophic in old age it renders the breast to be pendulous and ptosed (*Romrell and Bland, 2004*).

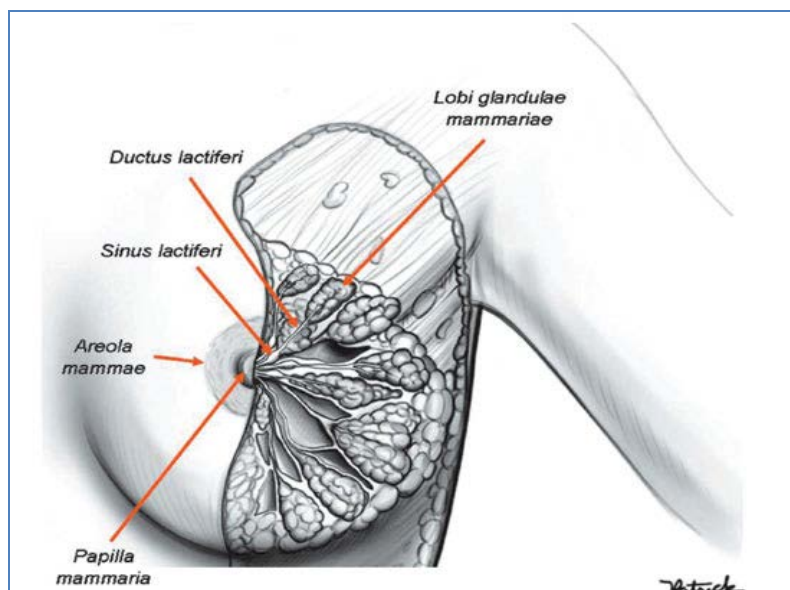


Fig (1) Form and components of the breast
(*Romrell and Bland, 2004*).

C-Shape of the breast

Normal breasts range widely in size and vary greatly in shape. The shape of the breast depends primarily upon the arrangement of the glandular tissue, the fibrous support structures and the skin envelope. Overtime, breast shape may transform dramatically with pregnancy, breast feeding, weight changes and aging. The "ideal" or even "normal!" breast shape is subjective and elusive. However, certain characteristics are generally considered aesthetically desirable. These characteristics include; round configuration from the frontal view, conical profile, superior fullness, firmness, nipple that point forwards and slightly upward and outward. In viewing the ideal breast in profile, the level of the nipple is usually at or just above the inframammary fold (*Ramselaar, 1988*).

II-Microscopical anatomy

The adult female breast has two components; these are the epithelial component responsible for milk formation and transport, namely the acini and ducts. Another component is supporting tissue as muscles, fascia and fat. The epithelial element consists of twenty or more lobes, each lobe drains into a mammary duct, each of which will ends separately at the nipple. The lobe consists of lobules, the number of which is very variable, each lobule is a collection of about tens to hundreds of acini grouped around and converging on a collecting duct, each acinus is a sphere of cells capable of milk secretion draining into a terminal duct (*Cuschiere et al., 1996*).

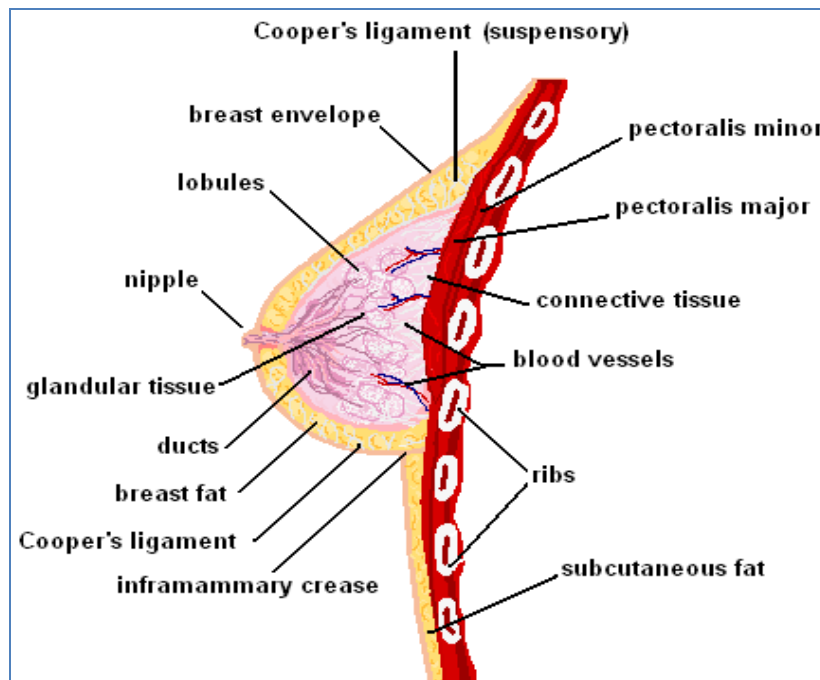


Fig. (2): Microscopical anatomy of the breast (**Lawson , 2002**).

Therefore, the mammary gland is a fibro – fatty – glandular structure composed of:

- a) Glandular tissue.
- b) Fibrous tissue, connecting its lobes.
- c) Fatty tissue in the intervals between the lobes.

The mammary gland is contained within the superficial pectoral fascia , which divides to encapsulate the gland between the anterior layer and a posterior layer , these layer are continuous cephalically with the superficial cervical fascia , and they rejoin at the inframammary fold to become continuous caudally with the Camper's and Scarpa's superficial abdominal fascia (**John and William, 2002**).

Actually, a thin layer of mammary tissue extends considerably farther from the clavicle above to the 7th Or 8th rib below and from the midline to the edge of latissimus dorsi posteriorly. This fact is important when performing a mastectomy, the aim of which is to remove the whole breast (**Saunders and Baum, 2000**).

The breast is made up of lobules which are embedded in fat, this fat accounts for its smooth contour and most of its bulk, these lobules are separated by fibrous septa running from the subcutaneous tissues to the fascia of the chest wall (the ligaments of Cooper). These when they contract due to malignant invasion will produce the characteristic fixation and retraction which is known as puckering. Each lobule drains lactiferous duct onto the nipple which is surrounded by pigmented areola , this area is lubricated by the areolar glands of Montgomery , which are large modified sebaceous glands which may form sebaceous cysts , which may , in turn become infected (**David et al., 2005**).

Between the breast and the deep fascia there is a loose connective tissue in the submammary space this allow some movement of the breast on the deep pectoral fascia so , advanced mammary carcinoma may by invasion , fix the breast to the pectoralis major. The Nipple projects from the centre of the breast anteriorly. Its shape varies from conical to flattened, depending on nervous, hormonal, developmental and other factors. Its level in most young females is at the fourth

intercostals space, and it turns from pink to light brown or darker in nulliparous women. It is surrounded by the areola which is a disc of skin that encircles the base of the nipple , varying in color from pink to dark brown depending on the parity and race (*David et al., 2005*).

The areola contains involuntary muscles arranged in concentric rings as well as radially in the subcutaneous tissues. The nipple is covered by thick skin with corrugations. Near its apex, the orifices of the lactiferous ducts lie. The nipple contains smooth muscle fibers arranged concentrically and longitudinally, thus it is an erectile structure that points outwards (*Saunders and Baum, 2000*).

III-Blood supply of the breast

a- Arterial blood supply

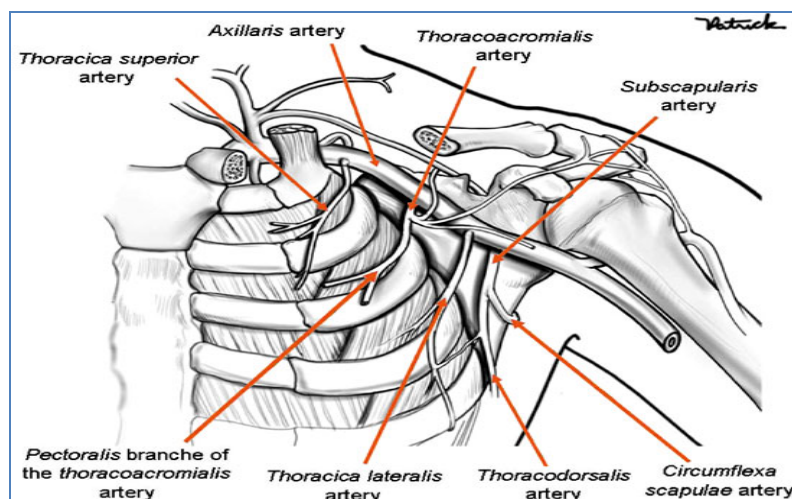


Fig. (3): Arterial blood supply of the breast
(*Romrell and Bland, 2004*).

Firstly, anterior perforating branches of the internal mammary artery that penetrate each intercostal space, supply the inner quadrants medially and the overlying pectoralis major muscle origin along the lateral sternal border. Arteries of the 2nd & 4th spaces provide the predominant supply.

Secondly, the outer quadrants of the breast are supplied by the lateral thoracic (external mammary) artery, which perforates the lateral segment of the pectoralis major muscle and comes around its lateral border. Lateral branches of posterior intercostal arteries with the third space artery also supply the outer quadrants segmentally, the fourth and fifth space arteries providing the predominant supply.

Thirdly, small branches of the thoracoacromial artery penetrate the pectoralis major muscle to enter and supply the deep surface of the breast. All of these arteries connect with each others via collateral branches in the breast and overlying skin (*John et al., 2002*).

b- Venous drainage of the breast

There is a circular venous plexus around the areola. From this and from the glandular tissue, blood drains in veins, which accompany the corresponding arteries that supply the breast to the axillary, internal thoracic and intercostal veins. The internal thoracic veins are venae comitantes to the inferior half of the internal thoracic artery and veins unite at the third costal

cartilage to ascend medial to the artery, ending in the brachiocephalic vein (*David et al., 2005*).

The superficial system is significant as it anastomoses across the midline of the anterior chest wall emptying to internal thoracic veins and to lower neck veins.

The deep system is the intercostal veins, which accompany the arteries, in addition to draining into azygos systems, they have the particular significance in considering the natural history of the breast cancer, and they communicate with the vertebral veins. This route could explain the predilection of bone metastasis from the breast cancer to the axial skeleton (*Cuschiere and preece, 1996*).

IV-Nerve supply of the breast

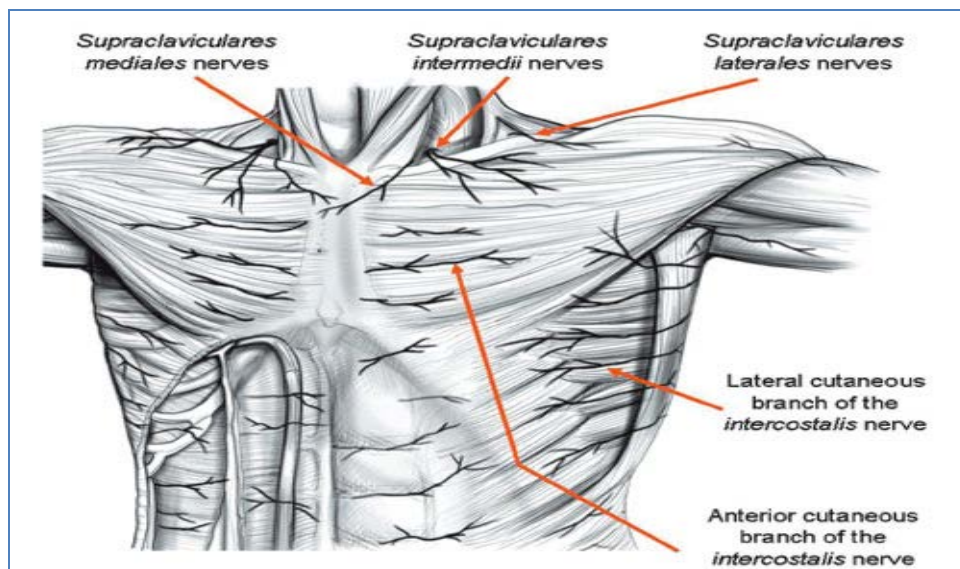


Fig. (4): Nerve supply of the breast (*Romrell and Bland, 2004*).

Skin of the breast is innervated by cutaneous nerves of the thorax. The lateral cutaneous branches of the intercostals nerves (T2 – T6) give lateral mammary branches on the axillary side of the breast. Anterior cutaneous branches of the intercostals nerves (T2 – T5) supply medial mammary branches to the sternal side of the gland. The skin over the upper most part of the gland is supplied by branches from the supra-clavicular nerves (cervical nerves C3 – C4). Nerves to the mammary parenchyma include both sensory and sympathetic fibers the sympathetic fibers pass to the glandular tissue, the smooth muscles of the areola, the nipple, and the blood vessels (*Lawson, 2002*).

V-Lymphatic drainage of the breast

a - Lymph vessels

Each lobule of the breast tissue has an extensive lymphatic plexus which in merged to form Sappy's sub-areolar plexus and deep fascial plexus which are interconnected with each other. The sub-areolar plexus drains the skin of the breast, the nipple and the areola in addition to some of the central portion of the gland (*Kumar et al., 2005*).

Lymph flows unidirectionally from the superficial to the deep plexuses and form the sub-areolar plexus through the lymphatic vessels of the lactiferous ducts to the peri-lobular and the deep subcutaneous plexus. Flow from the deep subcutaneous and infra-mammary lymphatic vessels move centrifugally towards