

Anatomy of the Pectoral Nerves and Physiology of the Breast

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Description

Many women with early-stage cancers can choose between having breast-conserving surgery (BCS) and mastectomy. The main advantage of BCS is that a woman keeps most of her breast. But most often, she will also need radiation. Women who have mastectomy for early-stage cancers are less likely to need radiation [1].

For some women, mastectomy may be a better option or the only option, because of the type of breast cancer, the large size of the tumor, previous treatment with radiation, or certain other factors [2-4].

The breast lies on the anterior thoracic wall and is composed of skin, subcutaneous tissue, and breast tissue. Approximately two-thirds of breast tissue rests on the pectorals major muscle, while the remaining one-third lies on the serratus anterior muscle as well as the upper portion of the oblique. There are two layers of fascia, including the superficial fascia, which is found deep to the dermis, as well as the deep fascia, which lies just anterior to the pectorals major muscle fascia. This anatomy is important during a mastectomy as an essential principle of this technique involves removing the breast tissue with adhered pectorals fascia to prove a complete resection.

Anatomy and Physiology

The anatomic boundaries of the breast are the second rib superiorly and the sixth rib inferiorly. The medial boundary is the lateral border of the sternum, and the lateral boundary is the mid-axillary line. Often, the tissue of the breast can extend into the axilla; this is known as the axillary tail of Spence [5].

The blood supply of the breast originates from three major arteries. The first arterial route accounts for approximately 60% of the breast's blood supply. It originates from the anterior perforating intercostal arteries, which initially arise from the internal thoracic

artery or internal mammary artery. These vessels are responsible for supplying the medial and central portions of the breast. An additional 30% of the blood supply to the breast originates from branches of the lateral thoracic artery, which is an extension of the axillary artery, as well as the pectoral branches of the thoracoacromial artery, which supplies the upper outer quadrant. Lastly, the remainder of the breast receives its blood supply from branches of the posterior intercostal arteries. The sub dermal plexus supplies the breast skin. Maintenance of the integrity of the internal thoracic artery is important for the nipple-areolar complex due to its perforating branches and anterior intercostal branches. Venous drainage of the breast follows the arterial supply. Drainage is towards the axilla and consists of three main veins. These include the perforating branches of the internal thoracic vein, the perforating branches of the posterior intercostal veins, as well as the tributaries of the axillary vein.

The major sensory innervation supplying the breast derives from the lateral and anterior cutaneous branches of the second through sixth intercostal nerves. An additional nerve to note is the intercostobrachial nerve, which originates as a lateral cutaneous branch of the second intercostal nerve. This nerve is responsible for supplying sensory innervation to the medial aspect of the upper arm, and surgeons generally encounter it during axillary dissection. Other nerves include the thoracodorsal nerve, which supplies the latissimus dorsi and can lead to "winged scapula" if inadvertently transected during surgery.

Some women might worry that having a less extensive surgery might raise the risk of the cancer coming back. But studies of thousands of women over more than 20 years show that when BCS is done with radiation, survival is the same as having a mastectomy, in people with early-stage cancer who are candidates for both types of surgery [6].

Treatment of Breast Cancer

Treatment of breast cancer has changed over the years, both surgically and medically. The intention of surgical treatment is to achieve local control, prevent locoregional recurrence and improve survival [7].

The NSABP B-04 trial confirmed there was no difference in disease-free survival, relapse-free survival, distant-disease-free survival, or overall survival between those who received total mastectomy or radical mastectomy. This development led to an overall shift away from radical surgical intervention. To further direct treatment away from radical approaches, the NSABP B-06 trial was a randomized prospective study that included women with tumors less than 4 cm and compared mastectomy, lumpectomy, or lumpectomy with radiation. All women in the study also underwent axillary lymph node dissection as part of their surgical treatment. The study found no difference in disease-free, distant-disease-free, or overall survival between groups. Additionally, there was a significant decrease in local recurrence rates when lumpectomy was supplemented with radiation therapy, rather than lumpectomy alone. This study was monumental in the evolution away from mastectomy towards breast-conserving surgery in women with early-stage invasive breast cancer [8].

The choice of mastectomy with implant-based reconstruction may seem like a good solution, but it is not the best choice for all. It is important to bear in mind how the patients themselves experience the different surgical procedures. By using the BREAST-Q patient-reported outcome measure, BCT was compared to mastectomy with implant-based reconstruction in a study involving approximately 3200 patients. Of these women, 63% had BCT, 4% had nipple-sparing mastectomy and 34% had skin-sparing or conventional mastectomy. Baseline

characteristics like age, marital status, race, body mass index and clinic pathologic characteristics of the tumor were included in the evaluation, and overall patients with BCT were most satisfied [9,10].

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