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Surgical treatment of breast cancer

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Surgery is a primary treatment for newly diagnosed breast cancer and a tertiary risk-reduction for women at increased risk. The number of women in the United States diagnosed with breast cancer in 2014 is estimated to be 232,670, and the number of deaths in women from breast cancer is estimated to be 40,000 in 2014.[1]

Mammography and clinical breast exam are recommended as screening for breast cancer.[2] The screening frequency and additional testing (such as breast magnetic resonance imaging) is determined by the woman's risk factors and personal risk assessment using a breast cancer prediction model (such as the Gail model, BRCAPRO, Tyrer-Cuzick, or Claus model).[3-6]

Women are considered at increased risk for breast cancer development secondary to their history of the following: personal history of abnormal breast biopsy (for example, atypical ductal or lobular hyperplasia, lobular carcinoma in situ [LCIS]), mutation of the BRCA1 or BRCA2 genes, personal history of breast cancer, Ashkenazi Jewish ancestry, breast cancer in first-degree relatives (particularly if age 50 or under), ovarian cancer in first-degree relative (age 50 and under), male relative with breast cancer, two second-degree relatives (at least one age 50 or under), ovarian cancer in two second-degree relatives (at least one age 50 or under), or pancreatic cancer with a genetic mutation.[2-5,7]

Options to reduce breast cancer risk include lifestyle changes, medications, and surgical interventions. Referral for genetic counseling is essential because it is important for the woman to understand her individual risks and potential benefits from a risk-reducing surgery. A risk-reducing mastectomy involves a bilateral total mastectomy without removal of axillary lymph nodes.[2,4,7-9,10] Restorative surgery can be performed simultaneously with bilateral breast reconstruction. The nipple and areolar complex may be retained with nipple-sparing procedures.[2] Women have reported that nipple-sparing procedures made the decision to undergo risk-reducing surgery easier and were willing to risk future cancer in the nipple/areolar complex.[9,11]

Annual follow-up includes an examination of the chest wall, axillary and nipple/areolar complex as well as a family history update.[2] A breast malignancy can still occur despite risk-reducing surgery (3% to

5% chance), most commonly at the lateral chest wall, midaxillary line, below the clavicle, anterior chest, or supraclavicular or axillary lymph nodes.[12]

Core needle biopsy

Based on findings from the clinical breast exam and screening test results, a breast biopsy may be necessary.[4] Nurses are essential to provide information about abnormalities, biopsy procedures, and anticipated findings to prevent unnecessary distress associated with the experience.[11]

A spring-loaded core needle apparatus is used to biopsy abnormalities observed on imaging studies or palpated during physical examination. Core needles limit the possibility of tumor cell dissemination due to their protective sheath.[12,13] Excisional biopsies are seldom performed unless a second biopsy of the lesion is necessary to reexamine preinvasive cells (for example, LCIS, or atypical ductal or lobular hyperplasia).[12-14]

Following sterile skin preparation and local anesthesia, a skin nick is made and the spring-loaded core needle apparatus is inserted.[12-14] Biopsy samples are obtained, placed in sterile 0.9% sodium chloride or formalin, and sent to pathology for microscopic examination.

A stereotactic approach is used to biopsy microcalcifications without a corresponding mass.[14] The patient lies prone, with the breast hanging through an opening in the table; the area is biopsied using mammographic guidance. The biopsy specimens are imaged to confirm the presence of calcium, indicating appropriate samples. A tiny metal clip is placed at the biopsy site at the end of the procedure, which serves to mark the area of concern; a needle-localization is necessary for definitive surgery if the biopsy is positive.

Nursing care following biopsy

Nursing care after core needle biopsies includes an ice pack and firm pressure to the biopsy site for 15 to 20 minutes to avoid hematoma formation or migration of the clip secondary to excessive bleeding.

Pathologic findings of a noninvasive (DCIS) or invasive malignancy require definitive surgery.

A sterile dressing is applied, and an ice pack is inserted in a firm brassiere. The patient is instructed to wrap the ice pack in a wash cloth and apply for 15 minute intervals every 1 to 2 hours for 24 hours, avoid excessive movement for at least 24 to 48 hours (jogging, weights), and to call the surgeon to report bleeding, excessive bruising, or hematoma formation. The team should ensure information has been provided to the patient about the abnormal imaging, biopsy procedure, follow-up care, and date the patient will be notified of biopsy results.[11]

Pathology findings

A second biopsy is necessary when a high index of suspicion for malignancy exists and the biopsy result is negative.[12-14] A needle-localization biopsy is typically performed to completely excise the area and provide pathologic evaluation. A needle-localization biopsy is performed to ensure no malignant cells are present in adjacent or surrounding tissue when biopsy results indicate atypical cells or LCIS.[7,12-14]

The evaluation is complete when the biopsy results are negative and the area of concern is of low suspicion for malignancy; the patient is scheduled for follow-up imaging in 4 to 6 months.[13,14] The subsequent imaging is performed to verify a solid lesion has not enlarged, residual microcalcifications have not increased, evidence of scarring, and the presence or absence of metal biopsy clips.

Pathologic findings of a noninvasive ductal carcinoma in situ (DCIS) or invasive malignancy require definitive surgery.[12-14] Neoadjuvant chemotherapy may be administered prior to surgery. A multidisciplinary team consultation should occur to discuss options with the patient.

Breast cancer

Breast cancer is divided into three major pathologic groups, although additional subtypes and histologic markers exist. These characteristics, as well as host characteristics, are used to determine treatment and prognosis.[13,14]

Invasive ductal carcinoma. Invasive ductal carcinoma is the most common type (70% to 80%) of breast cancer arising in the epithelium of the breast duct and invading beyond the ductal wall into the surrounding tissue with potential invasion into lymph and blood vessels.[13,14]

Inflammatory breast cancer. Inflammatory breast cancers (2%) arise in the lymphatic channels of the breast and present with diffuse erythema, skin thickening, breast engorgement, pain, and often axillary lymphadenopathy with or without lymphedema.[13-15] This type of breast cancer can appear as acute cellulitis and is often mistakenly treated with systemic antibiotics, which may improve the erythema.[15] Inflammatory breast cancer should be considered a prime differential diagnosis in nonlactating women when a source of infection (for example, an insect bite) cannot explain the symptoms.[15] A recheck should occur after completion of antibiotics to assess response with subsequent imaging to ensure no underlying malignancy is present.[15] The primary differential diagnosis is typically mastitis in lactating women. A recheck should occur upon completion of antibiotics to ascertain the presumably mastitis-related inflammation and pain have completely resolved.[15] Imaging may be considered (ultrasound) with continued assessment and followup.[15]

Invasive lobular carcinoma. Invasive lobular carcinoma occurs in 7% to 8% of women, arising in the lobule and invading beyond the lobular wall into surrounding tissue.[7,13,14] Invasive lobular cancer tends to spread into the surrounding tissue with multiple cancerous finger-like projections that potentially invade lymph channels and blood vessels.[7] Invasive lobular carcinoma is less well defined on examination and imaging; a mastectomy is often required due to the outreaching invasive nature.[7,13-14,16]

DCIS

DCIS is a proliferation of malignant epithelial cells without evidence of invasion across basement membranes.[17,18] DCIS (also known as intraductal carcinoma) is termed a Stage 0 breast cancer and the most common noninvasive breast cancer.[18] DCIS has minimal potential of metastatic disease, as lymphatic and blood vessels are not present inside the duct. DCIS may be considered a high-risk condition versus a true cancer due to its noninvasive nature.[19,20]

DCIS is treated with surgery (lumpectomy or total mastectomy). A sentinel lymph node biopsy (SLNB) is performed in moderate- and high-grade lesions should invasive cancer be found in the surgical sample.[21]

Much controversy exists in the overall treatment of DCIS. Advocates of surgery and radiation therapy (following lumpectomy) argue that inadequate tissue markers exist to omit any facet of treatment.[18-21] Opponents argue that clinicians are overtreating women, especially in the case of low-grade DCIS, and should limit their treatment to lumpectomy alone.[18-21]

Local treatment of breast cancer

The treatment of newly diagnosed breast cancer involves prompt attention and a multimodality approach with surgical, medical, and radiation therapy oncology teams, and restorative surgeons.[22] Treatment options are discussed dependent upon the size, type, and extent of the tumor in a multimodality consultation with the patient.[23] A multidisciplinary approach individualizes care, optimizes supportive care strategies, and improves overall care, safety, and quality of life.[22,23]

Appropriate time must be spent with the patient with several visits or conversations to ensure treatment decisions are made without regret and to optimize the partnership between providers and patients.[23,24] Nurses can maximize the understanding of minority groups through information specialists, translators, and nurse navigators.[23,24] Ethnic and cultural considerations must be addressed to help patients absorb important concepts and understand their choices in their language and setting.[24]

Surgical options

Multiple surgical options exist for women diagnosed with early breast cancer.[14,21,25] The surgical options are more limited for women with locally advanced cancer.[14,21,25] Women are increasingly choosing to undergo uni- or bilateral mastectomy versus breast-conserving surgery with a lumpectomy.[20,26-29] Women who undergo mastectomies can choose immediate reconstruction or may delay reconstruction in the event of personal uncertainty or due to their unknown pathology report and

resulting treatment (for example, potential of chest wall or axillary radiation).[25,29] A geriatric assessment should be performed in older patients to provide additional information about life expectancy and comorbid conditions, daily living habits, and activity levels for tailored treatment to specific needs.[30]

Upon diagnosis, some women request a bilateral mastectomy because they do not want to have repeat surgery if cancer develops in the other breast.[31] It is important for the nurse and multidisciplinary team to take time to explain the nature of invasive breast cancer.[20,25] The clinical stage of disease and its related risk of metastasis must be placed in perspective with the alternative low risk of a second, contralateral breast cancer.[27,29] These can be difficult concepts to explain, especially if the patient and family have minimal understanding of systemic treatment.

Over the past decade, contralateral risk-reducing breast surgery has gained popularity and for relatively unknown reasons.[28,31,32] Women report fear of a second primary cancer in the contralateral breast, yet perhaps women do not fully understand the concepts related to the nature of breast cancer in the absence of risk factors as explained above.[31,32] Women also seek to maintain their breasts as part of their identity, as a part of femininity, or just to seek a feeling of normality.[29] The risks involved with bilateral mastectomy followed by immediate reconstruction include increased rate of infection, extended anesthesia time, and ischemic tissue secondary to decreased oxygenation.[28]

Lumpectomy

Breast-conserving surgery with adjuvant radiation therapy remains a landmark in breast cancer management in this last century.[33,34] Nearly 30 years of randomized trials provide sound evidence that breast-conservation therapy does not compromise mortality and that it may reduce long-term morbidity as compared to mastectomy.[29,33,34] A lumpectomy is a same-day surgery with discharge to home upon awakening from procedural sedation and analgesia or general anesthesia. All tissue is submitted to the pathology department for examination of the lumpectomy margins. A second lumpectomy may be required to remove residual invasive cells; a lumpectomy is considered successful when the margins around the tumor are clear of disease. A total mastectomy is recommended when a surgeon is unable to obtain clear margins.[13]

Total mastectomy

A total (simple) mastectomy is performed for local control of newly diagnosed DCIS or invasive breast cancer, or recommended by the surgeon due to several potential factors: size of tumor, tumor directly under the nipple/areolar complex, compromised cosmesis (for example, small size of breast compared with tumor size), or inability to clear margins with a lumpectomy.[13,14,25,26] A total mastectomy includes removal of all breast tissue on the anterior chest with the following anatomic markers of resection: anterior to fascia over the pectoralis major/minor, superior to the clavicle, inferior to the inframammary line, medial to the lateral sternal border, and lateral to the midaxillary line.[13]

A skin-sparing mastectomy and SLNB, with or without axillary node dissection, are often performed, especially in younger women.[8-11,34,35] The resulting incision (depending on body habitus) is generally angled, starting medially at the lateral edge of sternum, and extending superior-lateral toward the axilla; the wound is approximated with subcutaneous sutures or surgical glue. The resulting appearance is a flat surface on the anterior chest wall. Part of the lateral rib cage may be visible under the skin in very thin women, although defects traditionally observed with a radical mastectomy are no longer apparent.[25] Immediate or delayed reconstruction can be performed to restore the natural look of a breast as visualized in a bra.[29]

SLNB

SLNB is a procedure in which the surgeon or interventional radiologist (in the case of needle-localization) injects radioactive technetium on the day of surgery at the tumor site, which travels to the first lymph node(s) draining the tumor.[13,36,37] A blue dye is injected intraoperatively with gentle massage of the breast.[13,36,37] This dye rapidly uptakes and provides a visual blue tint to the first draining lymph node(s) of the tumor.[13]

A gamma probe is swept over the axillary region at the beginning of surgery to locate the sentinel node(s).[13,36,37] When located, the gamma probe emits a high-pitched signal and graphic reading that indicates the first draining lymph node(s) has been located. A small incision is made

over the area, and the visible blue and gamma "hot" lymph node(s) are removed for immediate frozen section and pathologic examination.[13,24,25] If the surgeon is comfortable that the procedure worked as planned, then the frozen section report dictates the intraoperative surgical decisions: no pathologic evidence of malignancy, the remaining nodes are left intact; one to two positive sentinel lymph nodes with microscopic evidence of disease, the surgeon may perform an axillary dissection or leave the remaining nodes intact per the results;[36] or more sentinel lymph nodes show positive disease, evidence of macroscopic disease, or other nonsentinel positive nodes are positive for cancer, an axillary dissection is performed.[36]

Reconstruction of the breast has shown psychological benefits despite the risks and time involved with additional surgery.

The final pathology report may indicate microscopic disease in one or more sentinel lymph nodes, even if the frozen section indicated negative results. If the patient is scheduled to receive adjuvant chemotherapy, one can reason that an axillary node dissection is not necessary.[36] The multidisciplinary team may recommend removal of the remaining axillary nodes when other significant tumor characteristics exist (for example, high-grade, lymphovascular invasion, triple negative disease, and so on). Sentinel lymph biopsy following neoadjuvant chemotherapy remains controversial in its ability to provide reliable pathology.[38]

Disparities of SLNB: SLNB has been utilized for over 15 years, yet there are geographical areas of the United States where surgeons are not proficient and do not perform SLNB.[37] Disparities related to race exist in certain states, and unnecessary axillary dissections may be performed with more adverse reactions as compared with SLNB.[37]

Axillary node dissection

Axillary node dissection is performed to identify the number of positive nodes, an important factor in the staging and prognosis of breast cancer.[13,14,34] Level 1 and 2 nodes are removed; level 3 nodes are seldom removed unless macrometastatic disease is evident in levels 1 and 2. The removal of level 3 nodes then becomes an intervention for local control of the axilla.[13,14]

The role of axillary node dissection remains controversial in some cases including estrogen-positive tumor, postmenopausal women with one to two positive sentinel lymph nodes found at the time of surgery.[36,39] The American College of Surgeons Oncology Group Z0011 trial validated an axillary node dissection could be avoided, yet this change in practice has not been widely accepted.[36,39]

Restorative surgery

Reconstruction of the breast has shown psychological benefits despite the risks and time involved with additional surgery.[40] The use of breast reconstruction has increased over time as well as patient-requested contralateral risk-reducing mastectomy despite negative genetic mutations.[29,41] It is of importance to consider the stage of disease, extent of surgery, and possibility of adjuvant radiation therapy in the choice and timing of restorative surgery.

Nipple-sparing mastectomy may be performed to retain the nipple and areolar complex.[42] During surgery, a section of tissue is removed from the base of the nipple and areolar complex for frozen section; if abnormal cells are present, the procedure is aborted.[42] While this procedure remains controversial, it is becoming more widely accepted.[42] Nipple-sparing procedures have the advantage to retain original tissue and structures and to allow placement of the mastectomy incision along the periareola and lateral breast, thus preventing a larger, transverse incision.[42] The viability of the nipple and areolar complex is at risk as anatomical sections are manipulated during surgery, then fully reattached.[42] The nipple and areola are at increased risk (97%) of vascular compromise and resulting tissue necrosis with surgical incisions incorporating more than half the areola.[8]

Implant-based reconstruction is the most common type of breast restorative surgery; the rates of autologous tissue techniques have gradually decreased over time.[29] Disparities due to access to reconstructive surgeons, cost, and geographical variability continue to persist across the country despite mandated legislation in 1999 for insurance coverage.[29,43] These differences are in part due to the geographical distribution of plastic surgeons as well as their decreased volume of surgery (autologous reconstruction) and reduced financial compensation.[29]

Adjuvant chemotherapy is used to eradicate micrometastatic disease, a critical part of primary breast cancer treatment.

Autologous reconstruction, specifically microvascular surgery, utilizes tissue transfer techniques that result in realistic-appearing breast masses.[40] Reconstructive microvascular surgery involves the surgical transfer of tissue flaps with a preserved blood supply.[44] Microvascular surgery cases are technically complicated, lengthy, and often performed in patients with comorbidities, which can cause complications.[44] Focused and specialized care is required for these patients in order to optimize outcomes related to tissue perfusion.[44] Maximum blood flow across the microvascular anastomosis is crucial to prevent excess platelet accumulation and flap pedicle thrombosis—complications that require emergent surgery.[44]

Adjuvant radiation therapy

Adjuvant radiation therapy is a primary breast treatment. Radiation therapy after a lumpectomy is recommended to treat the breast and prevent a local recurrence of the current cancer or development of a second cancer.[45] Randomized clinical trials have shown whole breast irradiation (WBI) decreases the risk of ipsilateral recurrence.[45]

Novel radiation therapy approaches have challenged the over 20 years reign of whole breast radiation. Accelerated partial breast irradiation (APBI) provides the same overall amount of radiation to the tumor bed but in an accelerated manner (over 5 to 15 days).[46,47] APBI modalities reduce the number of radiation fractions (hypofractionation) days required for treatment and overall volume of radiated breast tissue as compared with WBI.[46,47]

Several methods of APBI have been studied, including brachytherapy (interstitial, balloon), intraoperative (as one dose), 3-dimensional conformal external breast irradiation (3D-ERT), prone positioning to reduce cardiac exposure, and neoadjuvant considerations.[46-52] Various types of APBI are well tolerated by older adults given the shortened regimens.[53-55] The results of recent, large, randomized multigroup studies are not yet released, although clinicians agree that APBI may be a reasonable approach for the treatment of early breast cancer. Important items to consider include the following: tumor size, nodal status, patient age, histology, margin, multifocality, multicentricity, calcifications on mammographic views, prior radiation therapy to chest wall and breast, connective tissue disease, and family history.[55]

Systemic treatment of breast cancer

Adjuvant chemotherapy. Adjuvant chemotherapy is used to eradicate micrometastatic disease, a critical part of primary breast cancer treatment.[56,57] Adjuvant chemotherapy is administered to patients either prior to surgery (neoadjuvant) or following definitive surgical treatment and adequate healing of incisions (adjuvant). Specialized oncologic pharmacists can improve overall management of drugs, adverse reactions, and short- and long-term effects.[58,59]

Researchers and clinicians utilize genomic data, tumor markers, and host characteristics.[59,60] Subsequently, systemic adjuvant chemotherapy has shifted to a tailored, personalized approach. Information from molecular assays and drug toxicities is available to inform treatment regimens and personalized care.[57,58,61]

Neoadjuvant chemotherapy. Neoadjuvant chemotherapy is administered prior to surgery depending on treatment goals and the extent of

the cancer. The only effective outcome of this approach is to downgrade the clinical stage in order to perform less aggressive surgery with favorable outcomes (for example, clear tissue margins).[52] Neoadjuvant chemotherapy may reduce a breast cancer and enable a successful lumpectomy and SLNB instead of a modified radical mastectomy and axillary node dissection.[38,52,62] This response may indicate tumor sensitivity to the antineoplastic agents and improve surgical outcomes, but it does not improve survival of the disease.[38,62]

Adequate surgical evaluation should occur prior to neoadjuvant chemotherapy to validate the clinical stage of the tumor and provide important information to the pathologic stage.[38,52,62] Fine needle aspiration, ultrasound-guided biopsy of enlarged lymph nodes, or SLNB should be performed in addition to the routine tumor biopsy.[38] Surgical evaluation of the axilla following neoadjuvant chemotherapy using SLNB alone remains controversial.[38,62]

Targeted therapies

Targeted therapies have delivered breakthrough improvements in disease-free survival and progressive disease.[63] Targeted agents were initially used only in the metastatic setting. In recent decades, these agents have been used in the adjuvant setting in combination with chemotherapy and radiation therapy, for example, the use of trastuzumab in HER2neu positive breast cancer patients.[63] Other targeted agents (lapatinib, pertuzumab, everolimus, and P13 kinase/PARP inhibitors) have been administered in the adjuvant and metastatic settings with positive outcomes for the treatment of HER2neu positive or negative breast cancer.[63]

Long-term survivorship

The majority of women's lives are changed with a breast cancer diagnosis. Various treatments can cause life-altering changes that decrease quality of life.[64] Symptoms that may affect women long term include distress, fatigue, decreased energy, diminished stamina, and lymphedema.[64,65]

Lymphedema is a common adverse reaction that occurs in the limb, breast, or chest wall in women or men with a breast cancer history.[66] Lymphedema results from inadequate lymph flow with tissue swelling due to interstitial accumulations of plasma proteins and fluid.[65,66] There are a number of potential causes of lymphedema, including surgical removal of lymph nodes, metastatic disease to axillary lymph nodes, locally advanced breast cancer, arm infections, and as a secondary adverse reaction of chemotherapy or radiation therapy.[66] Pre- and postoperative assessment and monitoring are required to prevent or manage lymphedema.[67] Incidence rates are as high as 50% following a mastectomy and 28% with lumpectomy.[67] It was initially purported that SLNB would prevent lymphedema, although the current incidence rates reach 17%.[67]

New interventions

Breast cancer is a common diagnosis in women; the potential outcome with early stage disease is excellent. Despite these outstanding results with updated surgical interventions, systemic therapies, and a multidisciplinary team approach, women still experience negative adverse reactions that can cause long-term changes in their lifestyle and quality of life. Perioperative nurses often create relationships that enable them to impart evidence, wisdom, and knowledge as women traverse the challenges of multiple surgical options, systemic treatment, radiation therapy, and ongoing survivorship care. **OR**

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