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What's New in Breast Cancer Imaging?

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Imaging technology has changed rapidly over the last four decades. This is especially true in the area of breast cancer. In the late 20 the century, aim of the imaging was anatomic delineation of the breast, while recently the major focus has been shifted toward physiologic and molecular tumor detection.

The goals of imaging are three folds: 1) the earliest possible detection of the tumor, 2) correlation of imaging results with other clinical parameters to assess disease biology and 3) accurate staging and follow up after treatment.

Some of the **newer imaging technologies** are:

1. Digital Mammography
2. Digital Subtraction Mammography
3. Computer Aided Detection and Diagnosis (CADD)
4. Power Doppler ultrasound
5. Magnetic Resonance Imaging
6. Scintimammography
7. Positron Emission Tomography
8. Electro potential Measurements
9. Electrical Impedance Imaging
10. Ductoscopy

Digital Mammography:

It is a type of mammography that records the radiographic images electronically in a digital format and is stored in computer. These can be displayed on a fluorescent monitor or transferred to hard copy. X rays passing through the breast are converted in to an electric signal that can then be processed by a computer. These mammography systems count the numbers of X ray photons passing through the breast at every point and provide a number (digit) for each point that indicate the count.

Basic difference between conventional and digital mammography is that in conventional mammography the film acts both as detector (that acquires the image) and as display media. While in digital mammography, image acquisition occurs in three steps: 1) detection of photons 2) computer display of image 3) storage of image.

In conventional mammography, film mammogram is the only film. It is fixed for ever once it is acquired. It can be under/over exposed so information can be lost requiring repeat exposure to the patient. With film mammography, bad images can't be readjusted or corrected .We sees what we get. Similarly, a film mammogram is the only copy of the study. It is difficult to copy as information is lost on the copy. In digital mammography, an image can be optimized and adjusted to allow visualization of subtle details. It can also be duplicated as many times as needed and can be transmitted anywhere in the world. Identical copies can be saved electronically.

Under lying technologies in Digital mammography may be 1) conversion of x-ray photon into visible light by a fluorescent screen and then conduction of these light photons through fibro optic coupling devices that covert light into electric signals.2) direct conversion of photons in to electric signals 3) conversion of photon to light and the measurement of this light by at each pixel by solid state detectors in a matrix over a large area.

Digital mammography will solve many of the problems inherent to film mammography, such as limited contrast, lost films, limited film storage. Added **advantage** includes, ability to do image manipulation on display monitor, to use computer added diagnosis (to be discussed later), and to transmit the images over long distances (tele-radiography). **Disadvantages** of digital mammography include: high cost, limited resolution of current monitors and limited image storage capacity.

Digital mammography- practical utility: To date, there has been only one large screening trial[2] to evaluate digital mammography. This trial enrolled 4,521 asymptomatic women who underwent both digital and screen film mammography. All 6,768 examinations were interpreted independently, with patients recalled for additional testing if either test was positive. This study showed a statistically significant reduction in recall rates for digital mammography (11%) vs. screen – film mammography (15%). In addition there were significant fewer biopsies caused by the digital studies than by the screen film mammography. As for breast cancer detection, there was no significant difference in the number of cases detected using digital or screen film mammography. Further studies will be needed to determine exact role of digital mammography in the evaluation of breast cancer.

Digital Subtraction Mammaography:

Digital mammography is done using intravenous contrast. Precontrast images are subtracted from post contrast images electronically. It is believed that this may be of value in visualizing the breast cancer better; particularly gauging extent of disease in patient with high risk for multicentricity. This may be especially useful in women with dense breast, and those with invasive lobular carcinoma, as this lesion is especially difficult to fully characterize using traditional technology

Computor Aided Detection and Diagnosis (CADD) :

It is possible because of digital mammography. Detection algorithms for specific mammographic features associated with malignancy are used. CADD uses software to assist radiologists in interpreting mammograms. Diagnostic accuracy can be improved these programs. Large numbers of normal and abnormal digital mammograms are needed to train the computer in how to distinguish abnormal areas. CADD enhance the mammographer's ability to detect breast cancer. With the increasing numbers of women screened, it is evident that there are pitfalls, with radiologists missing a small but significant numbers of cancers. There are different options to diminish the numbers of missed cancers. One option is the reading of mammogram by two radiologists. The other alternative is CADD. CADD can detect cancers that are otherwise missed even after double reading[3].

Power Doppler Ultrasound[3]: Doppler technologies have been now used to differentiate benign from malignant lesions. The fact of angiogenesis occurring in malignant lesion has been used.

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Doppler ultrasound has the capability not only to document the presence of this microvascularity, but also to characterize vessels further in terms of benign and malignant characteristics. Presently the question of usefulness of Doppler is still unanswered. McNicholas et al[4] found that detection of angiogenesis by Doppler did not aid in diagnosis. However when the spatial pattern and maximal velocity were evaluated, an overall sensitivity of 94%, specificity of 93% was found. Raza and Baum[5] correlated patterns of vascular distribution and morphology of blood vessels with histology. They found that using the presence of penetrating vessels, sensitivity of Doppler was 68% and specificity was 95 %. Additional role of Doppler ultrasound requires further studies.

Magnetic Resonance Imaging[6]

Earlier there was reluctance towards use of MRI mainly because of lack of standardized protocols and a greater difficulty in accessing MRI units. But new protocols, image interpretation criteria and terminology have been standardized. In MR imaging of breast, Gadolinium chelate is given as a rapid intravenous bolus injection. During the first pass phase of the contrast, the difference between intravenous and extra venous compartment is maximum, and in this phase, transportation of contrast from vessel into the tissue occur rapidly. Contrast medium present in capillaries and extra vascular extra cellular compartment provide enhancement. Regions of hypervacularity, increased capillary permeability, and increased interstitial space develop predominantly at the margins of tumor because of angiogenesis. This creates beds of pooling of contrast. Most important determinant of image quality in MR imaging of the breast is the choice of pulse sequence. Mainly two types of pulse sequence are used in MR imaging of breast: 1) gradient echo technique with/ without routine subs traction 2) techniques using fat suppression.

MR Rodeo: **Ro**tating **D**elivery of **E**xcitation **o**ff resonance sequence is a specialized high resolution fat suppressed technique first described by Harms et al[7]. It has a sensitivity of 95% in the diagnosis of breast cancer. Most important role of MR imaging is in identification of tumors not detected with conventional imaging methods. The **sensitivity** of MR imaging in the diagnosis of breast cancer is **80% - 100%**[6] and **specificity** exceeds **80%**[8]. MR imaging is especially useful in dense breast that significantly impair mammography. While mammography and ultrasonography depend on architectural distortion to detect tumors, MRI uses morphological and physiological properties, allowing it to assess tumors that cause no architectural distortion. In addition MRI depicts soft tissue with more gradations of contrast than mammography and ultrasound, and provide thin- section and multiplanar imaging, thus allowing better characterization of lesion.

MR imaging & breast cancer staging: Assessment of disease extent is important for planning, prognosis and considering treatment modalities. Optimal surgical results rely on the surgeon's ability to obtain clear histological margins. Ideally complete loco regional staging requires the assessment of tumor size, and multicentricity, and of the involvement of the nipple, skin, chest wall, and Axillary lymph nodes. To attain this goal with the highest diagnostic confidence, high spatial resolution is needed. The improved sensitivity of MR imaging in breast cancer detection has made it possible to do loco regional staging of the breast cancer with higher accuracy.

I. Assessment of tumor size: Lesion identification depends on contrast enhancement within the breast after intravenous injection of contrast. As both normal and abnormal breast tissue will enhance after contrast administration, characterization of a malignant lesion with in normal breast tissue is based on kinetic and architectural features of malignant lesion. **Mammography and ultrasonography significantly underestimate tumor size by 14% and 18 % respectively**, while a MR imaging show no significant difference compared with that determined by pathological examination[9]. Mumtaz et al[10] also demonstrated that MRI was more accurate than mammography in determining tumor size in 85 invasive tumors. **MRI gives the most accurate measurement of tumor size of invasive tumor**[11]**.** Because of this fact, MR imaging has the potential for supplanting clinical and mammographical tumor size assessment in the preoperative TNM/UICC staging system. The sensitivity of MRI in detecting DCIS is known to be lower than for invasive disease. The reported sensitivity of MRI for DCIS is about 77%[12]. MRI studies with lesion size assessment of DCIS and correlation to maximal DCIS diameter have not yet been published. Also, because MRI is relatively insensitive to microcalcification, its exact role in DCIS is debatable. An extensive intraductal component (EIC) was assessed in a study of 92 patients reporting a sensitivity of 81% for MRI vs. 62% for mammography, and a specificity of 93% for MRI and 81% for mammography[10]. More adequate tumor size measurement by MRI may reduce the percentage of positive margins after the breast conserving surgery and therefore decrease the numbers of subsequent surgical reexcision to obtain clear surgical margins.

II. Assessment of multifocality and multicentricity: At MRI **multifocality is diagnosed if two or more clearly separated suspicious enhancing lesions are identified**. Cancers are considered **multicentric if suspicious**, **focally enhancing lesions are present in more than one breast quadrants**. For the diagnosis of **mutifoca**l disease MR imaging is found to be **60-100% sensitive**[11]. For the diagnosis of **multicentric** lesion, MRI is **89% -100%** sensitive in **bilateral** imaging and **95% -100% sensitive** in **unilateral** imaging. It is **82%- 97% specific**[11]. Multicentricity in the beast cancer has been reported at MR imaging in a substantial number of the patients whose mammogram otherwise showed unifocal disease. In one study[15] MR imaging detected additional unsuspected disease confined to one quadrant in 6 patients, and in two or more quadrants in four patients. In this study, as a consequence, treatment was changed from breast conservation to mastectomy in four patients. Lower sensitivity of mammography in detecting multicentricity depends on breast density. Greatest value of MRI is in patients with homogenous or heterogenous breast parenchyma. Patients with dense parenchyma are considered ideal candidate for preoperative staging with MRI.

III. Assessment of disease extent to the Nipple, Skin and Chest wall: Morris et al evaluated[13] MRI in patients with posterior breast tumors and clinical or mammographical suspicion of chest wall invasion. Abnormal enhancement of the pectoralis muscle was found to represent the best diagnostic criteria to confirm muscle involvement at surgery. Five out of 19 patients had masses that abutted the muscles, with the obliteration of the fat planes and muscle enhancement. All 5 had muscle involvement at surgery. In

the remaining 14 patients, no enhancement was seen; none of them had muscle invasion. MRI can assess involvement of pectoralis muscle as well as chest wall. Assessment of nipple involvement is necessary in surgical planning of patients undergoing conservative surgery. In case of nipple involvement, MRI shows disruption of the normal "two layered" linear contrast enhancement, thickening of dermis and confluent, nodular enhancement extending directly from abnormally enhancing retro-areolar mass.

IV. **Axillary Lymph nodes involvement:** Few MRI studies have focused on the assessment of axilla. These studies indicate that MRI may have a role in the diagnosis of axillary nodal metastases. A major technical limitation is current breast coil design, which covers only the lower portion of breast. Mumtaz et al[10] found that lymph nodes measuring > 5 mm in short axis and appearing as high signal spot were likely to be malignant. Sensitivity to predict axillary involvement was 90% and specificity was 82% in that study. However there was poor correlation between total numbers of malignant lymph nodes identified on MRI and the pathological analysis. MR imaging may be useful in evaluating patients with metastatic axillary lymph nodes with unknown primary i.e. normal mammography, sonographic and no evidence of primary lesion on clinical examination in breast or elsewhere. Previously these patients were offered mastectomy as treatment, despite the fact that only two third of these patients had a primary cancer found on histopathological examination of mastectomy specimens. In one study[14] MR imaging showed disease with in the breast of 3 patients with normal mammogram and Axillary adenopathy, MR findings of single unifocal lesion in the breast altered treatment from mastectomy to breast conservation in two of these patients. The reported **sensitivities** of available **MRI** methods are **close to** the reported sensitivities of **sentinel node assessment**. Therefore, further use of breast MRI including the axilla may avoid surgical staging procedure.

V. **MR imaging and Distant Metastases**: Total body echo-planar MRI has been proposed as an alternative to conventional imaging, such as bone scintigraphy, abdominal ultrasound, and computed tomography, to detect distant metastases. The main advantage of total body MRI is a decreased time of staging workup (6 minutes) and the fact that it is completely noninvasive. However, it depends on the availability of this fast imaging technique that is not routinely available in all MRI units.

VI. **MRI extent of Disease Classification:** Recommended by the Breast Cancer Staging working Group[15], the maximum diameter of the index lesion (T); the maximum diameter of area that includes all foci of suspicious enhancement and the index lesion (F); and the numbers of the quadrants involved, one quadrant occupying 25% of the breast (Q), have been taken in to account for the staging. This staging pattern is still under evaluation.

VII. **MRI and local recurrence:** MR imaging is useful in evaluating the irradiated conserved breast. Heywang et al[16] observed that reliable distinction between scar tissue and recurrent tumor was not possible in the first 9 months after surgery. By this time inflammatory changes that resulted in overlap in the pattern of the speed of enhancement between benign and malignant lesions had resolved in the majority of patients. In other study[17], MRI showed a sensitivity of 93% in the diagnosis of local recurrence compared with mammography (50% sensitive) and fine needle aspiration (75% sensitive). MR imaging with RODEO sequences may be able to depict residual tumor in the immediate post operative period with greater accuracy than conventional MRI[18].

VIII. **MRI and assessment of Neoadjuvant treatment**: Currently, increasing numbers of breast cancer patient are treated with neoadjuvant chemotherapy. MRI has shown definitive role in several studies. Knopp et al[19] showed that a decrease in the rate of contrast enhancement correlated with response to chemotherapy. In another study[20], MR RODEO imaging was done to evaluate response to neoadjuvant chemotherapy in 40 breasts of 39 patients. The clinical assessment of response by the surgeon and the medical oncologist agreed with MR imaging in 52% and 55% cases, respectively and mammography correlated with MRI in 52 % cases. MRI accurately predicted the pathological determination of residual disease in 97 % of the ceases.

MRI is the most accurate of current imaging modalities at predicting response to primary chemotherapy.

IX. **MRI and Silicon implant**[10,21]**:** The attenuation of x-rays by silicon limits the mammographic demonstration of breast cancer. This problem is more in breasts with silicon injections. Silicon does not impair MRI imaging for cancer detection. Further, specialized silicon sequence have been developed that can be used to provide specific information on the composition of the mass. When these sequences are used in conjunction with contrast enhancement, masses in patients with silicon implants can readily be characterized. MRI has also been useful in assessing silicon implant integrity. Loss of integrity can be classified in to silicon gel bleed (producing inverted drop sign); intracapsular rupture (producing linguine sign) and extra capsular rupture in which free silicon is seen in the soft tissue surrounding the implant. MRI can distinguish silicon granuloma from small tumors and is considered the "gold standard" for assessing intracapsular rupture. MRI is likely to have a promising role in percutneous ablation of breast cancer using thermal ablative techniques, such as interstitial laser photocoagulation, focused ultrasound and bipolar radiofrequency ablation.

Recommended indications of MRI of breast[22] (1. Investigation of the source of Axillary adenopathy when mammography and ultrasound are unhelpful. (2. Follow up for recurrence of the breast cancer after surgery or radiotherapy. (3. Evaluation of augmented breast. (4. Staging of DCIS, lobular carcinoma, and suspected multifocal breast cancer. (5. Assessment of high risk patient who carry the BRCA gene and have dense breast.

To summarize, MRI of the breast is more accurate than mammography and ultrasonography in the local staging of the primary breast cancer, diagnosis of local recurrence, assessment of response to neoadjuvant chemotherapy and evaluation of silicon implant.

Scintimammography

Nuclear medicine breast imaging provides functional or metabolic

information of breast tumors as these techniques are based on physiologic and biochemical characteristics of tumor. ^{99m}Technetium sestamibi and ^{99m}Tc-tetrafosmin are most commonly used radiotracers in scintimammography. **^{99m}Technetium sestamibi** was initially developed as a cardiac imaging agent to document myocardial blood flow. As it is avidly taken by the tumor cells, its role in cancer imaging has been studied. Mammoscintigraphy has excellent sensitivity in the diagnosis of breast cancer for tumors larger than 1 cm; sensitivity is poor for smaller, nonpalpable or medially located tumors. In another study[23], sensitivity of 99mTechnetium sestamibi was 26% for T1a, 56% for T1b, 95 % for T1c, and 97% for T2 tumors. Overall sensitivity for palpable lesion is upto 100%, while for nonpalpable lesions, as low as 25%. Specificity ranges from 74% to 90%[3]

Mechanism: The mechanism by which ^{99m}Technetium sestamibi enters and exits tumor cells is not fully understood. A number of **hypothesis** have been investigated: degree of neovascularity, increased cell membrane permeability, intracellular mitochondrial density, cellular proliferation and desmoplastic activity, modification of cellular metabolism such as calcium transport, pH changes [24].

There has been a great deal of interest in the detection of multidrug resistant (MDR 1) phenotype in the breast cancer. MDR1 gene produces P-glycoprotein, a transmembrane protein which is believed to be responsible for active removal of chemotherapy drugs from cancer cells. ^{99m}Technetium sestamibi is a transport substrate of the P glycoprotein (Pgp) which appears to actively transport ^{99m}Technetium sestamibi out of the tumor cells. High levels of Pgp results in rapid efflux of ^{99m}Technetium sestamibi and can be used in the in vivo identification of the MDR 1 phenotype[25]. This has been used to predict response to neoadjuvant chemotherapy for locally advanced breast cancer. **The rapid clearance of ^{99m}Technetium sestamibi may predict lack of response to chemotherapy**[26]. Standard scintimammography has been also been used to monitor response to chemotherapy and also been used to assess patients with suspected recurrent disease and found to be 85% accurate[27]. It can be used as an alternative to MRI in indeterminate lesions as assessment of recurrence may be difficult with mammography, ultrasonography and by FNAC.

^{99m}Tc-Tetrafosmin (99mTc-TF): It is a lipophilic agent, routinely used for cardiac imaging. It has also been used in tumor imaging. Mechanisms are similar to ^{99m}Technetium sestamibi scan and poorly understood. It is also a substrate for P glycoprotein. There are few controlled trials of the two agents, so it is difficult to assess at present which might be more useful. ^{99m}Tc-Tetrafosmin SPET (Single Photon Emission Tomography) acquisition improves the accuracy of the ^{99m}Tc-Tetrafosmin planar scintimammography. It has particularly important role in the detection of non palpable primary breast cancer and Axillary involvement. In one study[28], overall sensitivity of SPET and planar imaging was 95.8% and 75.9%respsctively. For palpable lesion SPET was more sensitive (96.5%) than planar (79.5%). For nonpalpable lesion also, SPET was more sensitive (90%) than planar imaging (45%). For palpable axillary adenopathy, SPET was 100% sensitive and was 90.5% sensitive for nonpalpable adenopathy. The specificity was 91 % (for SPET) and 100 %(for planar).

Although it is not easy to localize lesions seen only on scintimammography, successful **nuclear medicine – guided Stereotactic prebiopsy localization** of the occult breast lesion has been reported[29]. With a specially designed device, infiltrating ductal carcinomas were found in two patients with normal clinical and mammographic evaluation.

Lymphoscintigraphy, with use of 99mTc colloids, has also been used for preoperative and intraoperative localization of nonpalpable breast lesions.

To summarize,

1. Scintimammography can not be recommended as screening test due to poor sensitivity for small lesions,
2. Value in assessment of dense breast,
3. Value in cases of Axillary lymphadenopathy with unknown primary,
4. Value in assessing response to chemotherapy

Positron Emission Tomography Scan

It is a functional imaging technique. It can be used to measure tumor metabolism, assess blood flow, and quantitate estrogen and progesterone density. Compounds labeled with positron emitting radionuclide without losing their chemical properties are injected intravenously. After reaching in to the tissue, these compounds emit positron (positively charged electrons). These positrons travel only a short distance (0.2-2.5 mm). With in surrounding tissue before they collide with a local electron. This collision produces two gamma rays at 180^0 to each other. Patient is placed in the center of a ring of gamma ray detector and simultaneous emission of these gamma rays is detected. Tomographic images are produced with the help of computer. The most commonly used positron emitting tracer is the glucose analogue **2-(18F)-fluoro-2-deoxy-D-glucose (FDG).** This compound is thought to accumulate in malignant cells because 1) malignant cells have high level of hexokinase. This enzyme catalyze rate limiting step in glycolysis i.e. conversion of glucose to glucose-6- phosphate. If the positron emitting substance is provided for substrate for the hexokinase catalyzed reaction, 2-(18F)-fluoro-2-deoxy-D-glucose–6-phosphate is produced. This compound can not be metabolized further. Therefore the rate limiting hexokinase catalyzed reaction has effectively been isolated from main glycolytic pathway and thus the rate at which FDG accumulate in the cells is proportional to the rate of cellular glycolysis. 2) Malignant cells have increased membrane Glut-1 and Glut-3 transport proteins which allow malignant cells to accumulate glucose at higher rate than normal cells.

PET scan is **80-100% sensitive** and up to **100% specific** (30)**.** As lesions smaller than 1 cm may be missed, PET will not be able to replace conventional imaging in the diagnosis of breast cancer. PET has also been used to monitor response to neoadjuvant chemotherapy. PET is able to show any change in metabolism before any morphological change. In one study[31], FDG uptake declined rapidly just 8 days after chemotherapy. Further decline in FDG uptake was apparent at a later time intervals in patients with complete or partial response, while no significant decline in FDG uptake was seen in the non-responders.

Digital Absorption Ratio (DAR) using PET scan may be useful prognostic indicator for patients with breast cancer. In one study[32], DAR was found to be one of the most important factors predicting relapse free survival. FDG scan has also been evaluated for its ability to diagnose Axillary lymphadenopathy. In his study, Adler et al[33] found that it had a sensitivity of 95%. They concluded that patients with negative scan in the axilla did not require Axillary dissecton.

FDG PET scan is **more sensitive than 99mTc bone scan for the detection of bone metastases from breast cancer**[34]. It is also superior to other modalities in the detection of soft tissue metastases.

Estrogen and progesterone density has been measured with 16-(^{18}F) fluoroestradiol (FES)[30]. It allows 1) assessment of tissue estrogen receptor density 2) assessment of tumor response to tamoxifen therapy after as little as 7 days of therapy. However, only 30% of tumors show estrogen receptor positive imaging. Progesterone receptor ligands have not been as successful due to high uptake in liver.

To summarize,

- PET scan is not superior to conventional imaging methods of mammography, sonography and MRI.
- FDG scan has a high sensitivity but is unlikely to replace conventional imaging.
- It is expensive and not available at most of the centers.
- The radioisotopes have short half life and to be produced by a cyclotron.
- It predicts response to chemotherapy earlier than any other method.
- May be used as an independent prognostic indicator.

Electropotential Measurements[30]

Rapidly proliferating benign and malignant cells have electrically depolarized cell membranes as compared to normal cells. This effect is thought to extend from the cancerous area to the adjacent areas and is measurable at the skin surface above the lesion. It is 90% sensitive and 55% specific. Further assessment is required of this method of detection of breast caner, particularly in relation to impalpable tumors.

Electrical Impedance Imaging[30]

It maps local distribution of tissue impedance on the breast by applying a tiny electrical signal over a range of measured frequencies. It is 74-85% sensitive and 64-71% specific. This novel approach requires further investigation.

Ductoscopy and Ductal Lavage[35]

Breast ductoscopy has evolved over last decade. The fibro-optic ductoscopy can be used to visualize intraductal lesions, lavage the duct, and administer laser treatments to superficial papillomas. Although size of the scope has decreased from 1.7mm to 0.65mm, limitation of ductscopy is inability to perform biopsy and to visualize peripheral ducts. It can inspect at a depth of 4-5 cm on average and at a maximum of 9.5 cm .ductoscopy in future will allow for direct intraductal ablation of the lesion by mechanical or chemical means, which would spare surgery in selected cases. Presently ductscopy is primarily used in the management of patients with spontaneous nipple discharge. In one study[36], it demonstrated intraductal lesions in 36% patients with nipple discharge and found to be 77% sensitive and 88% specific. A microcathetor has been developed and has been used for the lavage of ducts. In his study, Dooley et al[37] reported ductal lavage in 422 high risk women and a total of 543 breasts; 16.3% and 4.7% of lavaged breasts yielded a cytological diagnosis of mild to moderate changes. One patient yielded frank diagnosis of malignancy. Ductal lavage seems to be a safe, well tolerated and minimally invasive procedure for the determination of the presence of premalignant cells. It may be adjunct to mammography and other modalities for the early detection of intraductal breast pathology.

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Literature Review

Compiled by Dr. Chintamani

Half versus full vacuum suction drainage after modified radical mastectomy for breast cancer - a prospective randomized clinical trial [ISRCTN24484328]. *Chintamani*, Singhal V, Singh J, Bansal A, Saxena S. *BMC Cancer. 2005;5(1):11*

85 FNAC (fine needle aspiration cytology) proven cases of locally advanced breast cancer were randomized. (using randomly ordered sealed envelops, which were opened immediately before the closure of the wound) in to 50 patients with full vacuum suction (pressure=700g/m2) and 35 cases in to half vacuum suction drainage (pressure=350g/m2) groups. The two groups were comparable in respect of age, weight, and technique of operation and extent of axillary dissection. Surgery was performed by the same surgical team comprising of five surgeons (two senior and three resident surgeons) using a standardized technique with electrocautery. External compression dressing was provided over the axilla for first 48hrs and following that patients were encouraged to do active and passive shoulder exercises. The outcomes measured were postoperative morbidity and the length of hospital stay. Statistical methods used were descriptive studies performed with SPSS version 10 and group characteristics were compared using student t-test.

Half vacuum suction drains were removed earlier than the full suction vacuum suction drains. There was no significant difference in the incidence of seroma formation in the two groups and there was a significant reduction in the total hospital stay in patients with half vacuum suction drainage systems as compared to the full suction drainage group ($p<0.001$) without any added morbidity. CONCLUSIONS: Half negative suction drains provide an effective compromise between no suction and full or high suction drainage after modified radical mastectomy by reducing the hospital stay and the post operative morbidity including post operative seromas.

Clinico-morphological patterns of breast cancer including family history in a New Delhi hospital, India—a cross-sectional study. Saxena S, Rekhi B, Bansal A, Bagga A, *Chintamani*, Murthy NS. *World J Surg Oncol. 2005;13;3:67.* sunita_saxena@yahoo.com

In an attempt to evaluate the clinico-morphological patterns of breast cancer patients, including their family history of breast and/or other cancers, a detailed analysis of 569 breast cancer cases diagnosed during the years 1989-2003 was carried out. Mean and standard deviation and Odds ratios along with 95% confidence intervals were estimated. Chi2/Fisher's exact test were employed to test for proportions. Mean age of the patient at presentation was 47.8 years, ranging from 13-82 years. Among the various histo-morphological types, Infiltrating duct carcinoma (IDC) was found to be commonest type i.e. in 502 cases (88.2%), followed by infiltrating lobular carcinoma (ILC) in 21 cases (3.7%) and other types forming 9(1%). Out of 369 cases where TNM staging was available, stage IIIB (35.2%) was the commonest. Lymph node positivity was observed in 296 cases (80.2%). Out of 226 cases evaluated for presence of family history, 47 cases (20.7%) revealed positive family history of cancer, among which breast or ovarian cancer were the commonest type (72.0%). Patients below 45 years of age had more frequent occurrence of family history as compared to above 45 years. Amongst familial cases, Infiltrating duct carcinoma was the commonest form accounting for 68.8% cases while ILC was found to be in a higher proportion (12.5%) as compared to non- familial cases (5.4%).

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Randomized trial comparing neo-adjuvant versus adjuvant chemotherapy in operable locally advanced breast cancer (T4b N0-2 M0). Deo SV, Bhutani M, Shukla NK, Raina V, Rath GK, Purkayasth J.*J Surg Oncol. 2003;84(4):192-7.* svsdeo@yahoo.co.in

Locally advanced breast cancer (LABC) remains a major problem in developing countries. While trials utilizing neo-adjuvant chemotherapy demonstrate superior survival rates compared to historic controls, randomized studies evaluating the precise role of neo-adjuvant chemotherapy in LABC are lacking. In the present trial, neo-adjuvant chemotherapy was compared against adjuvant chemotherapy to assess survival advantage in operable T4b N0-2 M0 breast cancer.

A total of 101 women with operable LABC (T4b N0-2 M0) were randomized. In arm A, 50 patients received 3 cycles of CEF chemotherapy before and 3 cycles following surgery. In arm B, 51 patients had primary surgery followed by 6 cycles of CEF chemotherapy. In both arms, loco-regional radiotherapy was given after completion of CEF.

The response of primary tumor to neo-adjuvant chemotherapy was 66%, complete response (CR) 14% and partial response (PR) 52%. Clinical nodal response occurred in 95% of node positive patients. Only two (4%) patients had pathologic CR both in tumor and axilla. There was a significant ($P = 0.02$) increase in incidence of pathologically negative nodes in arm A. At a median follow up of 25 months, there was no significant difference in overall and disease free survival (DFS) in both arms ($P = 0.42$ and 0.18). Patients showing a response to neo-adjuvant chemotherapy had better DFS ($P = 0.04$) compared to those who had no response.

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