EARLY DETECTION OF BREAST CANCER BY IMAGING

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Breast cancer is common among cancers of women and comes the second rank in Thai women. The incidence is increasing in these recent years especially in the fourth to sixth decades. Breast cancer is a major cause of morbidity and mortality. In order to reduce the death rate, breast cancer must be treated at a small size and early stage. This requires that the breasts should be evaluated before there are signs and symptoms to suggest the presence of malignancy. Self breast examination (SBE) and clinical breast examination (CBE) may not help to detect early lesion until it grew large enough to be felt by women and her physician. Imaging modalities are effective tools in early detection of breast cancer including mammography, sonography, magnetic resonance imaging and scintimammography.

Screening mammography has been proved to be the most effective method for early detection of breast cancer. Success or failure of screening depends on the detection time when the tumor is cured or defered death. Many studies have repeatedly shown that prognosis is directly related to the size of the cancer, then the goal of screening mammography is to detect the lesion at early stage when the metastatic disease is free. Early lesion is the status of early growth usually lower than 1 centimeter which could not be evident by palpation. Each tumor does not have synchronized growth, the time for the preclinical phase to clinical event called "Sojourn time". Time between screening is critical importance. The ideal for early detection is to have the screening interval being short. On the other hand, the cost in screening is high that effect the economic status. The American cancer society (ACS) and the National cancer institution (NCI) promote for all women to have screening mammography at a favourable peroid of 40-80 years. They suggest that a high screening frequency results in more life time gained especially at relatively young ages. For the high risk groups are recommened to have screening at the age 35 years. Genetic, envivonmental, and gene-environvmental interactions are factors which induced breast cancer.

The major risk factors for breast cancer are these followings.

- Age after 35
- Early menarch
- Late menopause
- Nulliparity
- Late age at first full term pregnancy (after age 30)
- Affected first degree relative (mother, sister, or daughter)
- Previous history of breast cancer
- Biopsy proof of atypical epithetial proliferation
- Biopsy proof of lobular carcinoma in situ

Mammography should be performed in the right way by the trained technologists in order to obtain good image. Basically, two standard views are required for each breast including mediolateral obilique and craniocaudial views. Additional views including spot compression, cone down or magnification may be necessary for the doubtful lesion. The received radiation dose is low which is in the safety limit. Women should be better informed about the risks of mammographic screening especially for the low dose radiation gained, the compressive effect from the technique and the uncertainty in the diagnosis of carcinoma in situ.

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Now a days, the mammographic equipment has been developed by advanced technology in order to reduce the radiation dose and to get very good detail of internal structures. Advanced digital mammography is promising in the future for the quantitative analysis of the radiographic features of microcalcifications and masses that may help the radiologists to improve their specificity. Noteworthy the important factors influenced the early cancer detection are :

1. Good equipment
2. Good technique
3. Good interpretation

BREAST ULTRASOUND

Since the sensitivity of mammographic detection of lesion is reduced in women with dense breasts. The Asian women usually have smaller and dense breasts than the Western women. The normal mammographic breast patterns of Thai women of Chulalongkorn hospital were studied and the result was that 80% of women in the ages of 40 to 60 years have dense breasts. Breast ultrasound has been accepted to be the primary imaging modality in early detection of breast cancer in dense breasts, and widely used in Chinese women. Basically, breast ultrasound is used strictly for diagnosis, the benefits are to distinguish between solid and cystic mass, and to differentiate benign versus malignant lesion. On the otherhand, the microcalcifications can not be detected by ultrasound, then the early cancer presenting with microcalcifications would be missed. Several studies have been reported that 10 to 30% of women who have breast cancer have negative mammograms and for the women who went for biopsy, only 20% to 40% have breast cancer. The major goal of breast ultrasound is to give a more specific diagnosis but not for cancer screening. The development of the advanced ultrasound equipments that provide the excellent resolution and superb color doppler study, help to gain much more informations of the lesion. The main purposes of performing breast ultrasound are :

1. to prevent unnecessary biopsy
2. to obviate "short term" follow up
3. to judge the indeterminate lesion for biopsy
4. to guide needles procedures

MRI is one of the imaging tool in evaluating breast lesion with the requirement of contrast enhancement. Although mammography is accepted to be an effective method of early breast cancer detection, there are some weaknesses that limit the sensitivity and specificity. The factor masking the tumors are including the histologic tumor type, the absence of microcalcifications and the presence of dense breasts. MRI is used as a second level screening technology that may be able to detect early cancers with clinically and mammographically occult cancers. MRI give the additional capability for the diagnostic problem cases, these include :

1. Suspected leaks from silicone implants
2. Follow up multiple known mammographic or sonographic lesions.
3. Women with radiation phobia
4. Strong familial history of breast cancer with dense breasts
5. Metastases thought to be of breast origin but negative mammography

SCINTIMAMMOGRAPHY

PET (position emission tomography) plays an important role in breast imaging providing anatomical imaging method as well as function information with dynamic imaging. Many kinds of radiophamaceutical agents used for scintimammography including ^{201}Tl Cl, Tc^{99m} sesta MIBI and Tc^{99m} MDP were proved to increase the sensitivity and specificity in the cases of palpable masses. The sensitivity and specificity of mammography are lower in young patients, dense breasts, fibrocystic change, dysplasia, implantation, and evaluation after biopsy, surgery or radiotherapy. Scintimammography is introduced for these conditions. The mechanisms of increased uptake in the lesion are hypothesized as :

- changes in secretory function and cell metabolism with calcium accumulated in the necrotic degenerative tissue and modification of permeability.

- increased vascularization, inflammatory change and angiogenesis

- active mitochondria in neoplasm

- hormonal effect

The scintimammograms of breast cancer and some benign conditions with hypercellularity such as fibrocystic disease and fibroadenoma show abnormal increased uptake. To distinguish benign and malignant lesion depends directly on the calculated value of the tumor uptake ratio. A comparative study of breast cancer detection between the scintimammography and mammography in a group of patients of Chulalongkorn hospital, the results confirmed that scintimammography gave more specificity and accuracy for detection of breast cancer larger than 1 centimeter. Scintimammography should be used as a complementary to mammography, especially for the indeterminated lesion, in order to avoid the unnecessary biopsies.

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