EDITORIAL

USE OF MAMMOGRAPHY IN SINGAPORE : AN OVERVIEW

F C Ng

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Breast cancer is the commonest cancer in women in the West and in Singapore. It was estimated that 1 in 12 women in western countries will develop breast cancer, but the National Cancer Institute of America recently recalculated in 1993; the North American women's risk is increased to 1 in 8, if women above the age of 85 are included[1,2]. In Singapore, it accounts for 17.2% of all cancers in women (1987). The age standardised rate is 31.2 per 100,000 per year. The incidence here is about 50% that of Western Europe, North America and Australasia, same as in Eastern Europe but higher than in China (Shanghai), India (Madras) and Japan[3]. The number of new breast cancer cases in Singapore is rapidly growing. Breast cancer is actually many different diseases with different cellular characteristics, different rates of growth, and different metastatic tendencies. Patient response to the disease vary from rapid demisc to long term survival, with slow progression of the disease.

Neither the cause of the disease or method of prevention is known. The disease starts in the terminal ductal lobule of the breast ie the basic milk producing unit. In the pre-invasive stage of the cancer, the malignant cells are confined within the acini and ductal system. This is followed by the invasive stage when the cancer cells break out into the surrounding tissues and have the potential for spread to regional lymph nodes and distant sites eg bones, liver and brain.

In every second women diagnosed with breast cancer in Singapore, the carcinoma has already progressed to systemic disease at the time of diagnosis. Thus the need to find the early stage of cancer when it is too small to be clinically detected. Advances in surgery, medical oncology, hormone therapy and radiotherapy have achieved only modest increases in survival following treatment. The main reason is that effectiveness of treatment is directly related to the stage at which the disease presents. With early detection, the in-situ or locally invasive cancer is less likely to have metastasised to local lymph node or distant sites. Breast cancer survival depends on two factors, size of lesion and lymph node status. With early stage disease, 5-year survival rate is excellent with 93% of patients still alive 20 years on. In patients with no nodal involvement, survival is 30% to 40% better than with nodal metastasis. Only 10% of patients with advanced diseases are alive after five years.

HISTORY OF MAMMOGRAM

In 1913, Dr A Salomon, a German surgeon from Berlin, reported the clinical and radiological findings of surgically removed tumoured breast. In 1930, Stafford Warren of the US reported the diagnostic value of performing mammography on live patient. J Gershon-Cohen in 1947 renewed interest in mammography by correlating the radiographic images with anatomy and pathology of the breast. Then Dr R Leborgne of Uruguay in 1950 reported the appearance of microcalcifications and their association with certain types of breast cancer. He and Dr Robert Egan of M D Anderson Hospital, in 1956 suggested the need to provide consistent high quality mammograms by optimising X-ray equipment using a low KV technique for radiographic soft issues of the breast, dedicated processing, correct film type, and the proper training of technologies and radiologists.

In 1960 Professor C M Gros of France introduced two additional concepts to film mammography. First, the use of Molybdenum (Mo) to replace Tungsten (W) as the target. Molybdenum target improved the contrast between the subtle breast architecture; fat, calcifications and parenchymal tissue. Second, vigorous compression of the breast was applied during exposure of the film. Compression separated the breast tissues to provide a uniform thickness and help to eliminate patient motion. Prof Gros' work led to the introduction of the first dedicated X-ray unit for mammography in 1967[4].

In Singapore, Khoo, Chia and Vaithilingam regularly performed mammography since October 1967 at the Singapore General Hospital employing Dr Egan's technique, adapting a 500 mA diagnostic X-ray machine to examine breasts of patients presenting with palpable breast lumps[5]. In 1981, the first dedicated mammographic machine was installed in the Department of Diagnostic Radiology at the Singapore General Hospital. Soon after, several private radiological practices and private hospitals also bought dedicated mammographic machines. The practice of mammography became an established technique in the detection and management of breast disease.

Mammography is the most accurate and sensitive method for detecting occult breast cancer by its ability to detect a mass, abnormal density, architectural distortion and microcalcifications. No single test for breast cancer is perfect. Mammography is imperfect in that it is less effective when used to examine radiographically dense glandular breasts in which isodense lesions can be concealed. Mammography is also not diagnostically specific. Benign and malignant processes cause similar or identical mammographic changes. Differentiating one from the other is frequently not possible. Biopsy is frequently needed to make the distinction. Mammography will fail to detect some breast cancers due to omissions in reading, technical limitations and the unfortunate fact that some breast cancers do not produce a recognisable change in the mammographic image. Thus mammography complements but cannot replace clinical physical examination and Breast Self Examination (BSE). Visible cancers need not be palpable and palpable cancers are not always visible.

Mammography, originally developed as a diagnostic tool to evaluate symptomatic patients with a palpable breast mass, is now more commonly used to screen asymptomatic women for clinically unsuspected breast cancer. The push for high quality

Department of Diagnostic Imaging
Singapore General Hospital
Outram Road
Singapore 0316

F C Ng, MBBS, DMRD (Lond), FRCR (UK), FAMS
Senior Consultant

optimal mammographic images, requires not only the state-of-the-art dedicated mammographic X-ray units, but also the parallel development of the best film-screen combinations. This had over the past 20 years, undergone three generations of development and improvement. This necessitated the use of dedicated film processors and quality assurance programmes to regularly monitor the equipment and image quality.

The combined use of these technical improvements resulted in remarkable reduction in patient dose, without compromise of image quality. Yet, attainment of optimal mammographic quality images do not depend on state-of-the-art equipment only, but also proper application in terms of breast positioning, compression, technique selection and quality control. The better the quality of mammogram, the larger the number of early breast cancers that will be detected and the more lives saved. This can be achieved with better trained and dedicated specialist radiographers and radiologists.

During the rapid development of film mammography in the last 30 years, other modalities were also developed and tested. Thermography (infra-red imaging) and telediaphonography (transillumination light scanning) came and went. Xeroradiography was the next best alternative, but the equipment is expensive, difficult to maintain and uses high radiation doses. High resolution grey scale ultrasonography is a great help in dense breasts. It can detect isodense breast mass concealed by the dense breast tissues and can differentiate cystic and solid breast masses. Ultrasound cannot be used to screen or make a firm diagnosis of malignancy because of the overlap of echo pattern in benign and malignant conditions[6].

SCREENING

The benefits of properly conducted and interpreted mammography have been demonstrated in several well known studies. The value of early detection of breast cancer by mass screening employing film mammography is proven by the HIP study (Health Insurance Plan of New York) involving 62,000 women over 40 years. Breast cancer mortality was reduced by 30% for up to 10 years[7]. The two-county trial in Kopperberg and Ostergotland of Sweden in 1977 involving 130,000 showed a similar effect over a 9-year follow-up period in women aged 40 to 74[8]. The chance of a screened woman dying from breast cancer was 30% to 50% less than those unscreened women. The Breast Cancer Detection Demonstration Project (BCDDP) involving 280,000 women in the US[9] and the Forrest report on Breast Cancer Screening of England, Wales, Scotland and North Ireland in 1988[10] have similar conclusions. The benefit is 1:1.7 in favour of screening.

In Singapore the three basic applications of mammography are screening of the asymptomatic concerned women, diagnosis of the symptomatic patient and monitoring of treatment of breast cancer. The major advancement of mammography and management of breast disease lies in the formation of a multi-disciplinary team of dedicated radiologists, breast surgeons and pathologists to fast track the patient so that a definite answer is obtained in the least possible time. This involves the triple assessment techniques of imaging, clinical examination and cytology. Assessment determines the next step in the management of the suspected breast cancer. Fine needle aspirations, cyst punctures and core biopsies give a pre-operative histological diagnosis in 90% of cases. Hook needle and stereotatic localisations help the surgeon to remove impalpable masses and microcalcifications for histological examination[11].

Led by the Ministry of Health and supported by the Singapore Totalisator Board and Singapore Cancer Society, a pilot project of mass screening of 28,000 asymptomatic women, aged 45 and 65, by film mammography will be carried out over a two-year period at the Singapore General Hospital and Toa Payoh General Hospital beginning in October 1994. The Singapore Breast Cancer Screening Project (SBCSP) is the first in Asia.

The aims of the study are:

1. To assess the value of screening mammography for the early detection of breast cancer among Singaporean women.
2. To determine if screening mammography leads to an increase in detection of ductal carcinoma in-situ.
3. To identify high risk groups, if any, and to determine if routine screening mammography should be recommended to the public.

Women need more education in the value of mammography. Large scale screening and diagnostic procedures, in addition to the economic cost, may have psychological and radiation costs. Many women are apprehensive about mammography and having the procedure done on them. The lack of education and communication to prepare them for the examination are major contributors. Undue discomfort or "terrible" experience during a mammogram may prevent a woman from returning for a follow-up examination. Mammography must be made a positive experience. The majority of women do not have a breast cancer. The mammogram must be regarded as a control method to reduce mortality due to breast cancer. Women must learn to treat the procedure as a routine physical examination such as a Pap (Papanicolaou) smear.

As for the radiation cost, there is no scientific evidence to link the development of breast cancer to very low doses of radiation from current mammographic techniques. The doses employed today are in the region of 0.05 to 0.15 c Gy in comparison to 2-3 c Gy previously. This dose is very safe indeed.

CONCLUSION

Screening mammography has been shown in Western studies to be highly effective in reducing mortality from breast cancer. No such study has been done in the Asian context. The popularity of mammography is increasing in Singapore. It is therefore timely that a large study will begin in 1994 to assess its value for Asian women.

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