MAMMOGRAPHY AND SCREENING FOR BREAST CANCER

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ABSTRACT

Mammography has been in general use as a breast imaging procedure for many years. More recently, it has taken on another important role, as a screening procedure for breast cancer. This article reviews its effectiveness in reducing morbidity and mortality resulting from the disease.

Keywords : *mammography, screening, breast cancer.*

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INTRODUCTION

There has been a relatively recent rekindling of interest in mammography. This can be attributed both to improved techniques providing a safe and effective imaging procedure, and widespread publicity regarding its use in various screening and healthcare programmes in Europe and the United States.

Mammography was initially developed as a diagnostic tool for the assessment of both benign and malignant conditions. It has however, proven itself to be a safe, reliable and economical screening test as well. Its use has been further extended to form part of the work up for metastatic malignancy where the primary is unknown.

Screening

The term "screening" is taken to mean the performance of tests on apparently well women to detect those with a specific disease - in this context, breast cancer.

Principles of screening were first formulated in 1968 by Wilson and Jungner for the World Health Organisation[1]. In general, the condition should pose an important health problem, have a natural history that is well understood, a recognisable early stage, and early treatment should be of more benefit than late treatment. There should be a suitable test for it, which is acceptable to the population and adequate facilities for diagnosis and treatment. Screening should be repeated at suitable intervals for diseases of insidious onset. It should not harm the patient physically or psychologically, and should be economically viable.

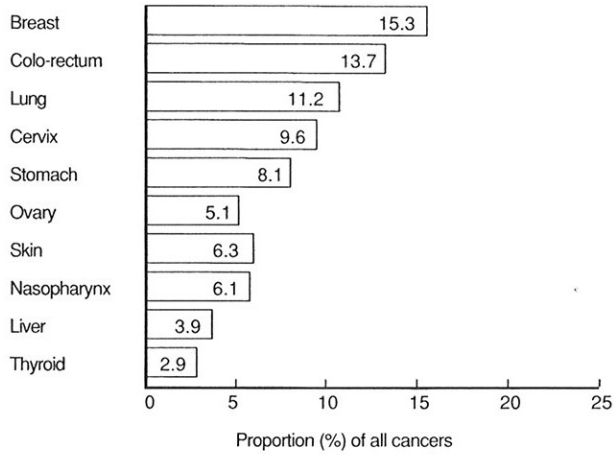
Incidence and natural history of breast cancer

Breast cancer is an important health problem. It is the commonest malignancy in females in many countries in the West, and also in Singapore, where it accounts for 15.3% of all cancers in women[2] (Fig 1).

The disease starts in the acinar cells in the breast and in the cells lining the ducts. There is a pre-invasive stage during which the malignant cells are confined to the duct system and acini, followed by an invasive stage, first locally and then distally.

Although breast cancer may disseminate early in its natural history, the rate of growth is variable and in many women, it tends to be slow. The main aim of screening is to detect cancers that are still localised to the breast and too small to be clinically palpable. It is also important in the assessment of patients already known to have a malignancy in one breast.

Fig 1 - Ten most frequent cancers in females, 1978-1982[2]



Up to 20% of cancers that are too small to be clinically evident are not invasive. Invasive cancers that are detected while small (less than 1 cm in diameter) are less likely to have metastasized to regional lymph nodes or distally. These non-invasive and small invasive tumours are generally regarded as constituting early disease.

Like most malignancies, the earlier the tumour is detected and treated, the better the prognosis. It has been estimated that half to two-thirds of females developing breast cancer will die from the disease. Breast cancer survival depends on two factors:

1. the size of the lesion,
2. lymph node status.

With early stage disease, 5-year survival is excellent, with 93% of patients still alive 20 years later[3]. Only about 10% of those with advanced stage tumours, however, will make the first 5 years. In patients with no spread to lymph nodes, survival is 30 - 40% better overall than patients with involved lymph nodes.

METHODS

There are various methods of examining the breast, the most commonly used being :

1. Physical examination
2. Mammography
3. Sonography

Mammography has generally been found to be more useful than the other two means, detecting 97% of early tumours

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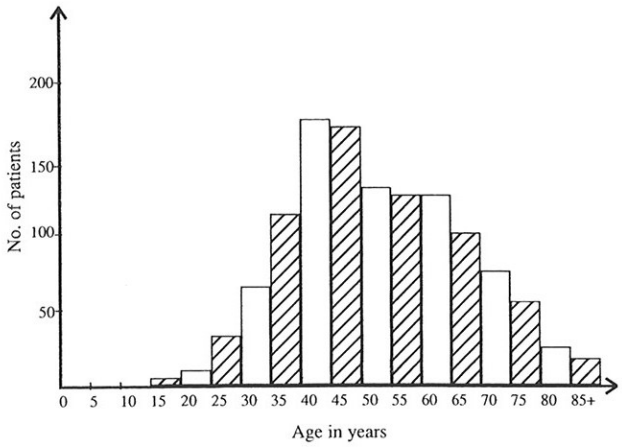
Fig 2 - Distribution of cancer of the female breast by age group, 1978 - 1982[2] (n=1217)



as compared with 33% on physical examination[4]. As the breast lesions get larger and spread occurs, this gap narrows.

It also has a higher pick up rate than ultrasound, detecting 97% of all cancers, as opposed to 58%[5]. The difference again narrows as the lesion increases in size and widens with smaller tumours, particularly those less than 1 cm in diameter.

Microcalcifications are a feature peculiar to mammograms. Quite often not seen even in pathological specimens, sonography would not be expected to pick up the lesion unless there is an associated mass. They are seen on mammography in approximately 30% of cases of breast cancer.

Ultrasound is hence generally not favoured as the only or first line investigation in evaluating a breast lesion. It is however a very useful supplementary examination in a patient with a mammographically demonstrable or palpable mass, in determining the consistency of the abnormality, whether cystic, solid or mixed, and aiding in the assessment of its margins.

The radiation hazard

Excessive radiation is known to induce malignancy. Breast cancers have been documented in several groups of women so exposed [6]. There has hence been considerable public concern regarding the risks of mammography.

In the past, mammography required a relatively high radiation dose (2-3cGy). Technical advances in recent years however, with the use of dedicated mammographic units, improved film and intensifying screen systems and compression techniques have reduced doses substantially to 2.5% to 5% of the original (typically 0.05cGy - 0.15cGy).

There is no evidence to indicate that very low doses such as those from current mammographic techniques induce breast cancer. Its existence has only been inferred from the excess breast cancer incidence seen in females exposed to higher doses. The risk is hence only hypothetical, a linear extrapolation from high dose data, due to lack of adequate low dose data.

It is estimated that if 2 million women above the age of 30 years were each to receive a low dose mammogram, there would, after a period of 10 years, be one excess cancer per year in the population[7]. The risk of developing breast cancer as a result of a mammogram is so small as to be virtually non existent.

Screening groups

The most important risk factor for breast cancer is thought to be age. Risk increases with age. In the West, for women aged 50 - 54 years, the incidence is over seven times and the mortality over twelve times that of women aged 30 - 34 years. In the Singapore population, similarly, the highest incidence is in women between 40 to 65 years of age[2]. There does however, appear to be a significant number of women aged 35 to 40 years, who are afflicted (Fig 2). Most screening programmes use age as the major consideration.

Other factors known to increase the risk are[7-9] :

1. Early menarche, below the age of 12 years
2. Late menopause
3. Late age at first full term pregnancy ie after the age of 30 years.
4. Family history of breast cancer, especially in mothers and sisters.
5. History of benign breast disease.

There is also a higher incidence noted in Jewish women and patients with a history of carcinoma of the ovary, endometrium and colon.

In a randomised trial conducted by the Health Insurance Plan of Greater New York[10-13] over the past 20 years, it was found that breast cancer mortality was reduced by 30% for up to 10 years among women aged 40 - 64 years when they were first offered screening. A significant beneficial effect has persisted for 18 years. Other trials in Sweden[14,15] have shown similar results with the beneficial effect concentrated in women over the age of 50 years. Results from two studies in the Netherlands[16,17], which compared the mortality of screened and unscreened women, showed that the chances of a screened woman dying were between half to one-third of those of an unscreened woman.

In their wake, multiple centres in the United Kingdom conducting population based trials of regular screening by mammography, clinical examination and breast self examination were set up in 1979. A working group chaired by Sir Patrick Forrest[7] reviewed the results and has drawn some conclusions and made recommendations for implementing a mass population screening programme.

They opt to screen women in the 50 - 64 years age group, using a single mediolateral oblique view for each breast. This technique was initiated and established by the Swedes in their programme, although they subsequently revised this. Forrest et al also recommend the use of mammography alone, and at 3 year intervals for a start. Tabar proposes, on the basis of his screening study data from Sweden[18], that annual two view mammograms be implemented in women aged 40-49 years with the maximum interval between screening not exceeding 18 months. Screening should be performed at intervals of two years for women above the age of 50 years.

The American College of Radiology and the American Cancer Society however, have different guidelines using monthly breast self examination and annual physical examination by a physician and mammography with a baseline study at 40 years, repeating the mammogram at 1-2 years till age of 50 years and then yearly (Table I).

Table I - Screening recommendations for asymptomatic women [7,18,19]

Age in years	Screening mammogram		
	Forrest et al	Tabar et al	ACR + ACS*
20-40	-	-	Baseline by age 40 yrs
40-50	-	1 yr - 18 mths	1 - 2 yrs
50 and above	3 yearly	2 yearly	Annual

* American College of Radiology & American Cancer Society.

Most screening programmes are aimed at women between the ages of 40 years and 65 years. It is not thought to benefit those above 65 years as they have a lower acceptance rate for screening and an increasing chance of dying from other diseases rather than breast cancer. Breast malignancies also tend to run a less aggressive course in comparison with younger females.

The role of screening mammography in younger patients remains controversial. Currently, no guidelines exist. The local figures suggest a fair proportion of breast cancers occurring in the 35 to 40 years age group, and perhaps, there may be a place to start screening at the age of 35. Some workers have suggested screening at the age of 30 years for a female with a primary relative with breast cancer[20]. Others however, have shown that most mammographers do not screen patients below the age of 35 years[21].

Hereditary breast cancer accounts for only about 8% of all breast cancers, but women in an affected kindred have up to a 50% risk of developing it, and an excess incidence of bilateral breast cancer. There are however, no large series regarding screening for patients with known risk factors.

Despite encouraging results with the use of mammography in the management of breast malignancies however, it must be borne in mind that mammography like any other imaging procedure, has its limitations and a negative mammogram does not completely exclude malignancy; and particularly in a patient with signs and symptoms, further investigation is warranted should clinical suspicion be present.

CONCLUSION

Screening has an established role in reducing morbidity and mortality resulting from breast cancer. Mammography is currently the single most useful modality to assess the breast in this regard. Supplementary ultrasound studies improve its sensitivity and accuracy.

Age is considered by most workers as the most significant risk factor in the development of breast cancer. The most beneficial effects of screening mammography are seen in women aged 40 to 65 years, who should have the examination performed at intervals of between one to three years. The role of screening mammography in younger women, even with a significant family history, is controversial. There are currently no guidelines regarding them.

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