Clinical Overview

Population Screening for Breast Cancer

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Abstract

Screening female population for breast cancer has a significant impact on survival rate. The quality of this screening service provided by the UK and other developed countries are improving continually, with increased sensitivity reducing rates of non-surgical diagnoses. The results of screening have exceeded the initial expectations of the service, where an improvement in disease-specific survival of 25% was anticipated. Virtually, to reduce the mortality of breast cancer up to 30-40%. We recommend that National Breast Cancer Screening Program should be launched in the developing nations also to rip benefits of screening.

Keywords: Breast cancer; Screening; Mammography.

Introduction

Breast cancer remains a major health burden among women, worldwide. Reportedly, breast cancer remains the most common cancer both in developed and developing countries being the principal cause of cancer death among the women, globally.[1]

Randomized controlled trials and meta-analysis have shown that screening by mammography can significantly reduce mortality and morbidity from breast cancer.[2] Data from national cancer institute in Bangladesh shows that breast cancer remains at top (23%) of the list of cancer among women.[3]

The highest incidence of breast cancer is seen in Northern and Western Europe, USA, Australia and New Zealand (about 95 per 100 000). For this reason, these countries have adopted nationwide breast cancer screening program.

There are some countries which have intermediate incidence. Screening program in these countries are at the stage of evolution or in pilot study. In most of the Asian and African countries the incidence is lowest (about 22 per 100 000). Bangladesh falls in this category. Because of the low incidence of breast cancer and of limited resources launching any screening program is not feasible for country like Bangladesh-which should be tried for.

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Brief History of Screening of Breast Cancer (CA)

In 1913 by a German surgeon Albert Solomon 1st performed mammogram by in his paper "Contributions to the Pathology in Clinical Medicine of Breast Cancer", demonstrating existence of different types of breast CA and spreading those out through axillary lymph nodes [4].

In 1927, German surgeons Otto Kleinschmidt and Erwin Payr 1st described role of mammography in early detection of breast CA [5] followed by another author who established radiology to assess breast tumors in 1932.[6]

Thus in 1976 modern mammography was 1st officially recommended by American Cancer Society (ACS) and then mammogram emerged as the most reliable method to screen out breast CA.[7] After that mammography and breast imaging has been progressing with potential applications successively towards DBT (Digital Breast Tomosynthesis, Contrast-Enhanced Mammography (CEM), Breast MRI and Breast Ultrasound for effectively screening breast CA.

Methodology and Bias

There are 3 major types of bias which must be considered when assessing a screening program:

i) lead-time bias,

ii) length-time bias, and,

iii) selection bias.

These aforementioned potential biases in evolution of screening trials make it unwise to use prognostic factor (number of tumors detected or length of survival following diagnosis) as measures of screening.

That is why, the „gold standard" method of evaluating screening is by randomized controlled clinical trial using breast cancer mortality as the end point.

The World Health Organization"s 10 principles of screening-[8]

1. The condition sought should be an important health problem
2. There should be an accepted treatment for patients with recognized disease
3. Facilities for diagnosis and treatment should be available
4. There should be a recognizable latent or early symptomatic stage
5. There should be a suitable test or examination
6. The test should be acceptable to the population
7. The natural history of the condition, including development from latent to declared disease, should be adequately understood
8. There should be an agreed policy on whom to treat as patients
9. The cost of case-findings (including diagnosis and treatment of patients diagnosed) should be economically balanced in relation to possible expenditure on medical care as a whole
10. Case finding should be a continuing process and not a 'once and for all' project

Modalities of screening

Clinical breast examination (CBE), Breast self-examination (BSE), Ultrasonography, Mammography, MRI, Nipple aspirate and Tissue sampling, all were tried as methods of population screening. But mammography was found to have highest sensitivity and specify in detection of cancer. Its overall sensitivity is about 80-90% and specificity are about 95%.

Reduction of Mortality

Other findings showed that screening was associated with reduction of breast cancer specific mortality of about 30-40%.[9] Five-year survival of screen detected cancer was about 96.5% compared to 70% for symptomatic cancer. Women aged 50-74 years get more benefit compared to women between 40 to 49 years.[10]

The UK breast screening program is restricted to women aged 50–70 years (see below). Women are invited to attend for two-view mammography every three years. Further assessment may be required if an abnormality is noted i.e. further mammographic views of the area (focal compression views); high-resolution ultrasound and percutaneous or surgical excision biopsy may be done if the abnormality is significant.

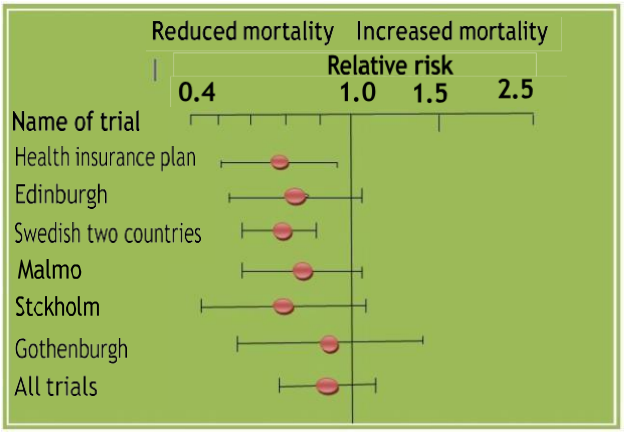

Figure-1: Relative risk of mortality in breast cancer in women aged 50-74 years invited for screening compared to controls Meta-analysis 1995 0.74 (CI 95%), (D 0.66-0.83)

Disadvantages of screening

Anxiety, additional intervention, radiation exposure, over-diagnosis are adverse effects of screening.

Radiation Exposure:

The radiation dose of the mammogram may contribute to the development of some cancers, although the risk of such low dose radiation exposure is extremely low.

A single mammogram exposure of 2 mGy may cause 4.5/million cases of breast cancer in 40–49-year-olds and 1.5/million in 50–59-year-olds.[11]

Overdiagnosis:

A significant proportion of screen-detected cancers would not have become symptomatic during a woman"s lifetime; this rate of overdiagnosis is 10–40%.[12] There is a 3.5 times greater incidence of diagnosis of in situ disease in women aged 66–79 who have screening compared to those who do not. [13]

Mammography

Mammography is currently the best available population-based method to detect the breast cancer of women of average risk. Its sensitivity and specify is highest

among all the available tests. Its overall sensitivity is about 80-90% and specify is up to 95%.[14] Mammography is nothing but plain x-ray of the breast when it is sandwiched between two plates (fig-2). Medio-lateral and cranio-caudal (Two views) views are taken.

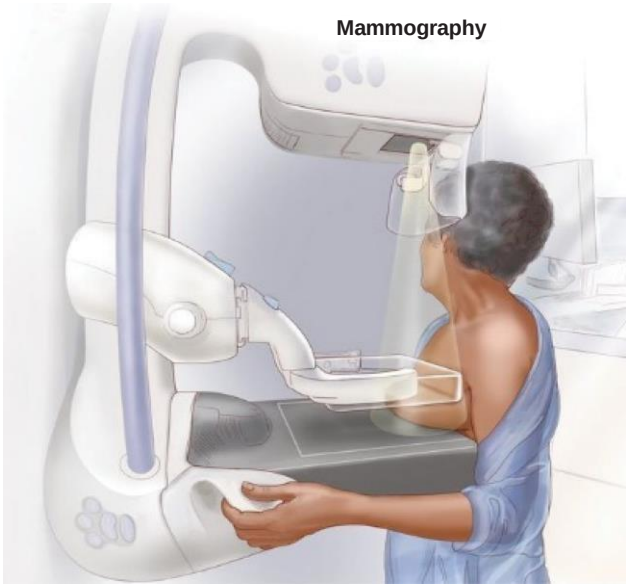

Figure-2 : Procedure of mammography

Mammographic features of breast cancer

A. Dense opacity (Figure-3)
B. Microcalcification (Figure-4)
C. Irregular outline with spiculation (Figure-5)
D. Skin tethering or thickening (Figure-6)
E. Architectural distortion of the breast (Figure-7)

Involved lymph nodes can sometimes be seen. Micro-calcification alone is features of DICS (ductal carcinoma in situ).

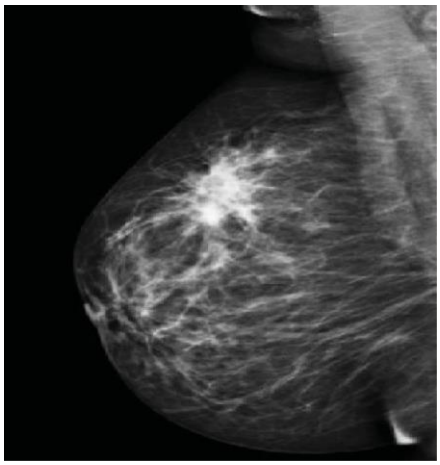

Figure-3: Dense opacity

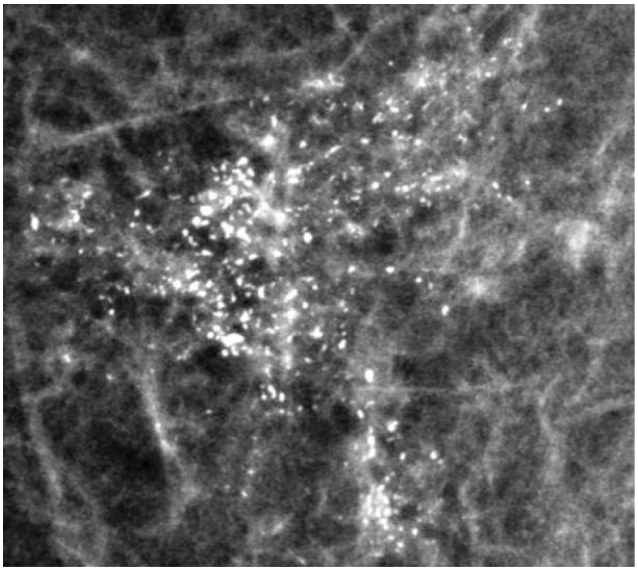

Figure-4: Microcalcification

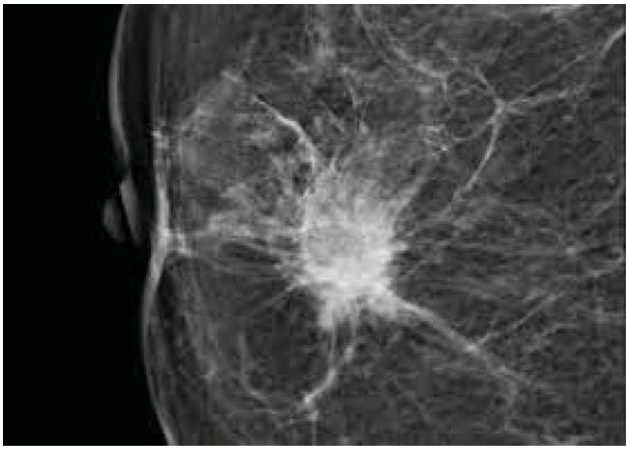

Figure-5: Spiculation

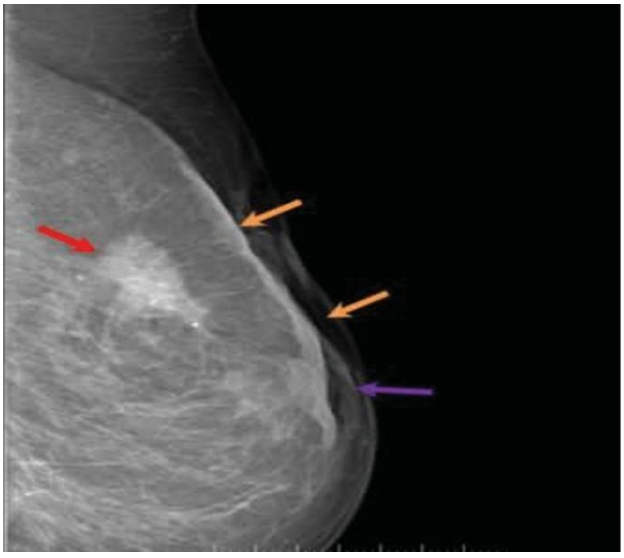

Figure-6: Skin tethering or thickening

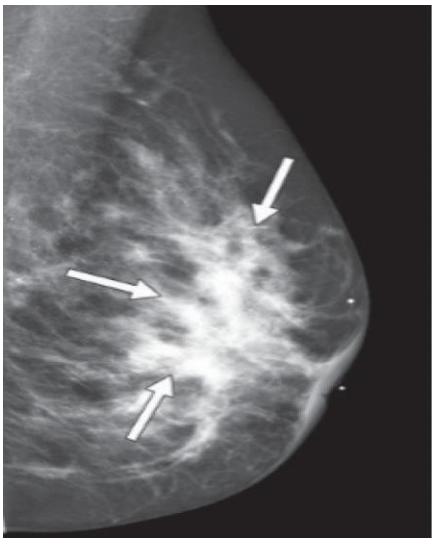

Figure-7: loss of normal architecture

Further workup

If an abnormality is noted on mammogram, further mammographic views of the area (focal compression views), high-resolution ultrasound and percutaneous or surgical excision biopsy are done. The rate of breast conservation is higher due to the smaller average size of screen detected cancers, which has obvious advantages in terms of body image and quality of life.

Table-1: UK breast cancer screening audit- 2005

	Screen detected cancer %	Symptomatic cancer %
Tumor grade- 1	31	15
Tumor grade-2	49	42
Tumor grade -3	18	30
Nottingham prognostic index	61	41
Rate of breast conservation	63	52
Rate of Mastectomy	27	48

Results of screening

55 invasive cancers are detected for every 10 000 women screened in UK National Breast cancer Screening program (NBCSP). In the period 2004-2005, despite a rising incidence of breast cancer in the UK, mortality from breast cancer fell by 30%. Of this 6% are thought to be attributable to National Breast Cancer Screening Program (NBCSP).15 (Table-1) Other factors which contributed largely to mortality reduction is improvement in treatment of breast cancer by multidisciplinary approach, routine use of systemic chemotherapy and adjuvant treatments.[16]

Current guidelines

U.S. Preventive Services Task Force (USPSTF) issued a draft update to its mammogram recommendations, proposing that women at average risk of breast cancer start mammograms at age 40 and have a mammogram every other year.[17] Women of high-risk group should be screened with mammography or MRI once in every year starting from age 25. Criteria of High risk is family history of breast cancer (any first degree relative have had breast cancer), presence of BRCA-1 or BRCA-2 gene, has had radiation exposure.

Conclusion

The screening results have exceeded the service's initial estimates of an improvement in disease-specific survival. Reduction of mortality from breast cancer can be achieved only by screening and continuous improvement on treatment. National Breast Cancer Screening Program should be implemented in emerging nations to reap the benefits of screening.

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