Breast Cancer Screening

David Euhus, MD[a,*], Philip A. Di Carlo, MD[b], Nagi F. Khouri, MD[b]

KEYWORDS

• Breast cancer • Screening • Mammography • Breast MRI • Mammographic density

KEY POINTS

- There are ample clinical trial data demonstrating that screening mammography, using decades-old technology, reduces breast cancer mortality. Recent technological advances have significantly improved the sensitivity and specificity of screening mammography.
- Screening MRI is recommended for high-risk women, but there is currently no consensus about the best approach for women with mammographically dense breasts.
- The cancer detection rate for clinical breast examination is similar to that of many imaging modalities, but it is disappearing from clinical practice.
- The menu of available screening options is expanding, and every test will diagnose cancers missed by mammography. However, each additional test introduces the chance of harm. More screening is not necessarily better screening.

INTRODUCTION

Breast cancer is the most common cancer in women in the United States and second only to lung cancer in mortality.[1] It is estimated that there were 232,670 new breast cancer cases and 40,000 deaths in the United States in 2014. Although the incidence of breast cancer increased steadily in the United States through the 1980s and 1990s, it has now leveled off at approximately 125 cases per 100,000 per year.[2] Breast cancer survival has been steadily improving for more than 2 decades.[2,3] This improvement is attributed to a combination of early detection, greater utilization of more effective treatments, and improved supportive care. The contributions of early detection and better adjuvant therapies have been judged to be about equal.[4]

Population Screening

Population screening should only be done if the benefits of screening can be shown to outweigh the harms. Improvement in overall survival may be the most desirable

[a] Department of Surgery, Johns Hopkins Hospital, Johns Hopkins University, Blalock 688, 600 North Wolfe Street, Baltimore, MD 21287, USA; [b] Department of Radiology, Johns Hopkins Hospital, Johns Hopkins University, 600 North Caroline Street, Baltimore, MD 21287, USA
* Corresponding author.
E-mail address: deuhus1@jhmi.edu

Surg Clin N Am 95 (2015) 991–1011
http://dx.doi.org/10.1016/j.suc.2015.05.008 **surgical.theclinics.com**
0039-6109/15/$ – see front matter

outcome, but reductions in disease-specific mortality and treatment morbidity also have value. Screening only works if the targeted condition is fairly common in the population, generally fatal if undetected until it is symptomatic, and generally curable if identified earlier.[5] In addition, the selected screening test must be sensitive for detecting early disease, specific for the disease (ie, have a low false-positive rate), and acceptable to most individuals.

Screening Mammography Recommendations

In 2009 the US Preventive Services Task Force recommended biennial screening mammography for women aged 50 to 74 years with individualized screening decisions for women aged 40 to 49 years.[6] These recommendations were based on a systematic review of available data, including 8 randomized prospective trials that convincingly showed a 20% to 35% reduction in breast cancer mortality for women screened between 50 and 69 years of age.[7–9] There is considerable controversy about how to interpret the available data. Consequently, several influential organizations, including the American Cancer Society, the American Congress of Obstetricians and Gynecologists (2009), and the American College of Radiology, have recommended that yearly screening mammography begin at 40 years of age.[10,11] There is no arbitrary age above which screening should cease. Women should have a life expectancy of 5 to 10 years to realize a mortality benefit from screening mammography.[12]

The Breast Cancer Screening Controversy

Much of the breast cancer screening controversy centers on interpretation of 8 randomized prospective trials,[7,13,14] but there are also concerns that the natural history of certain types of breast cancer may limit the utility of early detection. Successful population-based cancer screening depends as much on the nature of the cancer being screened for as it does on the technical performance characteristics of the selected screening test. The natural history of the cancer must be such that treatment is more effective, or significantly less morbid, for a screen-detected than a clinically apparent cancer. By the eighteenth century, breast cancer progression was envisioned as an orderly process beginning in the breast, spreading to nodal basins and then disseminating to distant sites. If this conceptual framework is accurate, then it is obvious that detecting and treating breast cancer early in the process will interrupt progression and save lives. An opposing view was articulated by Bernard Fisher and colleagues[15] in 1980 who asserted that "…breast cancer is a systemic disease, likely at its inception."[15] If this view is correct, then earlier detection of primary breast cancers would be unlikely to impact survival.

Breast cancer is a very heterogeneous disease, and the truth is somewhere in the middle. Indolent, slow-growing breast cancers are the cancers most likely to be detected by periodic screening (length bias) and also the cancers least likely to cause mortality. Screening may also detect a small primary breast cancer that is already occultly metastatic. In that case, screening will have been judged effective because it will have seemed to have increased survival by whatever time period would have been required for the cancer to become symptomatic (lead-time bias). Screening is only effective for the subset of tumors that pose a mortality risk and whereby early intervention is capable of interrupting progression. Debate centers on the size of this subset and the acceptable risk of harm from screening. Harms from screening can include cancer treatment of lesions that would never pose a mortality threat (overdiagnosis) as well as physical harm, anxiety, or financial costs imposed by false-positive screening tests.