Breast Cancer Screening and Diagnosis

Recent Advances in Imaging and Current Limitations

Alison R. Gegios, MD[a], Molly S. Peterson, MD[a], Amy M. Fowler, MD, PhD[a,b,c,*]

KEYWORDS

• Mammography • Digital breast tomosynthesis • Ultrasound • Breast magnetic resonance imaging • Molecular breast imaging • Positron emission mammography • Breast cancer screening

KEY POINTS

- Mammography is the primary imaging modality used for breast cancer screening and is associated with a significant decrease in breast cancer mortality. Although screening guidelines vary by professional society, annual screening mammography starting at age 40 years for average-risk women is associated with the greatest reduction in mortality.
- Supplemental screening can be considered as an adjunct to mammography for women at high and intermediate risk for breast cancer, as well as in women with dense breasts. The 2 most prevalent modalities for supplemental screening are contrast-enhanced breast MR imaging and ultrasound.
- Molecular breast imaging also can be used to detect mammographically occult breast cancer, particularly in patients with contraindications to MR imaging, and provides functional metabolic data.

INTRODUCTION

Breast cancer detection has improved over decades with increasingly advanced technology, including digital breast tomosynthesis, breast MR imaging, and ultrasound. Breast imaging modalities with high diagnostic accuracy have a significant impact on population health, as breast cancer has surpassed lung cancer as the most commonly diagnosed nonskin cancer globally and accounts for 1 in 8 cancer diagnoses overall.[1] Breast cancer also remains the second leading cause of cancer-related mortality in women.[2]

Treatment of breast cancer has greatly improved over the past several decades, and increased emphasis has been placed on the molecular and genetic features of breast cancer. However, the size of the malignant tumor (T stage), number of nodal metastases (N stage), and presence or absence of distant metastatic disease (M stage) at the time of diagnosis also directly affects patient prognosis.[3] Imaging plays a key role in determining overall clinical stage.

This article highlights traditional breast imaging techniques, advances in imaging, as well as emerging technologies and potential future directions. Mammography, ultrasound, and breast MR imaging are the most common tools used not only for screening and diagnosis but also for preoperative locoregional staging for newly diagnosed

[a] Section of Breast Imaging and Intervention, Department of Radiology, University of Wisconsin School of Medicine and Public Health, 600 Highland Avenue, Madison, WI 53792-3252, USA; [b] University of Wisconsin Carbone Cancer Center, Madison, WI, USA; [c] Department of Medical Physics, University of Wisconsin-Madison, Madison, WI, USA

* Corresponding author. Section of Breast Imaging and Intervention, Department of Radiology, University of Wisconsin School of Medicine and Public Health, 600 Highland Avenue, Madison, WI 53792-3252.
E-mail address: afowler@uwhealth.org

PET Clin 18 (2023) 459–471
https://doi.org/10.1016/j.cpet.2023.04.003