EUSOBI Breast MRI vs Contrast Enhanced Mammography Webinar 1: Radiomics for tumor characterization

Abstracts

Breast MRI (Katja Pinker-Domenig)

Magnetic resonance imaging (MRI) is established valuable technique in breast imaging with multiple clinical indications, such as preoperative staging, response assessment to neoadjuvant therapy, scar vs. recurrence, assessment of breast implant integrity, evaluation of patients with cancer of unknown primary and screening of high-risk patients (1). Dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI) provides high-resolution breast morphology and enhancement kinetics to depict angiogenesis as a tumor-specific feature. Undisputedly DCE-MRI is the most sensitive modality for breast cancer detection with a pooled sensitivity of 93%; in terms of specificity, it has good pooled specificity of 71% (2).

In preoperative staging, multiple studies confirm the superiority of MRI to other imaging modalities for tumor size estimation and detection of additional tumor foci in the ipsilateral and contralateral breast. Ongoing studies show that in experienced hands this can be used to improve breast cancer surgery, although there is currently no evidence of improved long-term outcomes.

In women who are at high risk for breast cancer, several studies have demonstrated that DCE-MRI is the superior screening modality compared with conventional imaging techniques (3, 4). Therefore, adjunct screening with DCE-MRI is recommended for women with a high (>20%) lifetime risk of breast cancer (1, 5), facilitating earlier cancer detection and reducing interval cancers (6) in this population. This has also prompted a most recent similar recommendation for its use in women with an intermediate (>15%) lifetime risk of breast cancer (7). To manage the associated costs for screening, the use of abbreviated protocols is gaining momentum (8, 9).

In patients treated with neoadjuvant chemotherapy, MRI is used to document response. It is essential to realize that oncologic and surgical response are different, and evaluation should be adapted to the underlying question.

While the basis of breast MRI consists of T1-weighted contrast-enhanced imaging to overcome limitations in DCE-MRI specificity and assess more functional data, additional MRI parameters such as T2-weighted, ultrafast, and diffusion-weighted imaging can be combined with DCE-MRI. This approach is known as multiparametric MRI (MP MRI). In this context, diffusion-weighted imaging (DWI) with apparent diffusion coefficient (ADC) mapping has emerged as the most robust and valuable parameter with a reported sensitivity of up to 96% for breast cancer detection and a specificity of up to 100% for breast tumor characterization and is therefore increasingly implemented in clinical routine (10).

Conclusion:

- Upon completion of this lecture, participants will be able to:
- Understand the indications of breast MRI
- Identify the benefits and limitations of a preoperative breast MRI

- Assess the role of breast MRI for screening
- Recognize the principle of multiparametric MRI
- Use multiparametric MRI of the breast in clinical practice

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Contrast-enhanced Mammography (Maria Adele Marino)

Contrast enhanced mammography (CEM) is an emerging breast imaging technique which allows both morphologic and vascular assessment of a breast lesion. In the diagnostic setting, CEM has a sensitivity of 96%–100% for the detection of breast cancer similar to Dynamic Contrast Enhanced-MRI (DCE-MRI). Radiomics analysis is a new and rapidly evolving field of research which extracts and mines imaging features in a non-invasive and cost-effective way—with the central premise that these imaging features in their entirety quantify phenotypic characteristics of the tumor and may accurately reflect the underlying tumor biology. To date, radiomics research in breast imaging has been dominated by DCE-MRI but lately some new evidences have been investigated in the field of radiomics and CESM. The aim of this talk is to provide the reader with a comprehensive overview on the recent evidences concerning the potential and current applications of the radiomics analysis in CESM for tumor characterization.

Learning Objective

- To learn the potential of CEM and radiomics analysis for tumor characterization
- To learn current clinical and research applications of radiomics analysis with CEM