**Contrast enhanced mammography: Like MRI - only without the magnet?**

**Kurzzusammenfassung:** Contrast enhanced mammography (CEM) is an emerging technology in breast imaging. CEM allows both a morphologic evaluation comparable to routine digital mammography and a simultaneous assessment of tumor neovascularity as an indicator of malignancy. CEM acquires a low kV image and a high kV image simultaneously before and after the injection of iodinated contrast. Retrospective studies comparing CEM with standard 2D mammography show significant improvement in the sensitivity and specificity for detecting breast carcinomas with CESM; the sensitivity of CESM is 93%–100% compared with 71.5%–93% for mammography and increases the specificity from 42% to 87.7%. The patient populations in all these studies are either symptomatic patients or patients recalled to assessment after an abnormal screening mammogram. In women with heterogeneously of dense breasts (BIRADS C & D), small occult cancers can be seen with CESM due to increased vascularity from tumor angiogenesis and therefore CEM one of supplementary techniques that can be used to avoid overlooking cancer. The diagnostic accuracy in younger women and in those with dense breasts in the symptomatic setting is improved compared with 2D mammography. In the setting of a known breast cancer CEM has the ability to depict additional foci of disease is enhanced hugely in comparison to FFDM and, in many studies, it is comparable to MRI. The low-dose image is virtually as good as a 2D FFDM image and has the same resolution as a conventional image. However, microcalcification due to low-grade DCIS is often not visualized on CESM. Another disadvantage of CEM is that approximately the same dose of iodinated contrast is injected intravenously, and sensitivity reactions can occur at the same rate as with computed tomography (CT) examinations. This means that CESM must be performed in a center with resuscitation facilities in place and caution must be exercised in patients with impaired renal function, patients with allergies and in the elderly.

**Lernziele:** • To understand the information that can be obtained with CEM for the diagnosis and staging of breast cancer.
• To realize the limitations of CEM.
• To understand when and how to use CEM in clinical practice.
Kurzzusammenfassung: Contrast-enhanced MR imaging (CE-MR) has a significantly higher detection rate than mammography and ultrasonography in breast cancer screening, and may be useful for both high-risk and normal-risk subjects. A disadvantage of (repeated) CE-MRI, however, is deposition of gadolinium in the body and environment. Therefore, one may be reluctant to apply CE-MRI for mass screening of people presumed to be healthy. So far, non-contrast enhanced breast cancer screening with diffusion MR (D-MR) has been widely regarded as unrealistic due to insufficient or inconsistent image quality. Nevertheless, a small number of studies showed DWIBS at 1.5T to be comparable to CE-MR. This discrepancy stems from the fact that image quality of D-MR varies tremendously across different scanners and even across different hospitals that use the same MR systems and scan parameters. This means we have to consider image quality rather than MR system or scan parameters as the basic foundation of D-MR.

The purpose of this study was to investigate the feasibility of D-MR for breast cancer screening in a multicenter setting with different MR systems using pre-adjusted harmonized image quality settings.

Materials and methods
The image quality of 12 scanners in 12 hospitals was optimized with regard to right-and-left difference, non-uniformity, and the balance between fat and mammary gland signal by multiple shimming and image-based checks. DWIBS (b=0,1500 s/mm² with ADC calculation), FS-T1WI, and FS-T2WI were obtained. A radiologist applied a 5-point likelihood score for the presence of malignancy (A to E) without knowledge of mammography or ultrasonography results. Grade D or E (>2% possibility of cancer) was considered as a need to recall.

Results
In the 4 hospitals (GE 3T 750Wx2, GE 1.5T Explorer, Philips Ingenia 3T) whose results could be tabulated, 10 cancers were detected (9 IDC, 1 DCIS) in 10 out of 706 subjects. Cancer detection rate, PPV, and recall rate were 1.42%, 17.5%, and 10%, respectively.

Discussion
This is the world's first result of nearly 1000 cases of D-MR screening without reference to either mammography or ultrasonography. Since the number of mammography recipients in Japan is lower (only 45%) than in Western countries (70-80%), many participants in this study may well have undergone their first-time breast screening.

Lernziele: 1. CE-MR has disadvantages in terms of gadolinium deposition in the body and environmental pollution
2. The key point of D-MR is to consider image quality rather than MR system or scan parameters as its basic foundation
3. D-MR with pre-adjusted harmonized image quality may work well for screening