ELEVATING PERSONALIZED BREAST CARE

Contrast Enhanced Spectral Mammography

BIBLIOGRAPHY 2019/2020

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All of us know someone who's been impacted by breast cancer – a spouse, a parent, friend or co-worker. This is why we are all here today, as we have a common purpose – share and discuss the importance of early detection, as breast cancer continues to be a critical issue globally. It remains the most common cancer in women worldwide today. We all share the same commitment that is the fight against breast cancer.

BIBLIOGRAPHY

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PUBLISHED PAPERS

CESM versus MRI

Potential Cost Savings of Contrast-Enhanced Digital Mammography.
Patel BK., et al, AJR 2017.
Conclusion: That CEDM couples low-energy images (comparable to the diagnostic quality of standard mammography) and subtracted contrast-enhanced mammograms make it a cost-effective modality and a realistic substitute for the more costly breast MRI. Link

Contrast-enhanced spectral mammography (CESM) versus breast magnetic resonance imaging (MRI): A retrospective comparison in 66 breast lesions.
Li L., et al, Diagnostic and Interventional imaging 2017.
Conclusion: CESM has similar sensitivity than BMRI in breast cancer detection, with higher PPV and less background enhancement. CESM is associate with significantly shorter exam time thus a more accessible alternative to BMRI, and has the potential to play an important tool in breast cancer detection and staging. Link

Contrast-enhanced spectral mammography vs. mammography and MRI - clinical performance in a multi-reader evaluation.
Fallenberg EM., et al, European Radiology 2016.
Conclusion: This study showed that CESM, alone and in combination with MG, is as accurate as MRI but is superior to MG for lesion detection. Patients with dense breasts benefited most from CESM with the smallest additional dose compared to MG. Link

Can we apply the MRI BI-RADS lexicon morphology descriptors on contrast-enhanced spectral mammography?
Kamal R.M., et al, British Journal of Radiology 2016.
Conclusion: a first step towards using a common standardized language in reporting CESM to ensure adequate communication between radiologists and clinicians. Link

Preclinical study of diagnostic performances of contrast-enhanced spectral mammography versus MRI for breast diseases in China.
Wang Q. et al, SpringerPlus 2016.
Conclusion: Our study demonstrates that CESM possesses better diagnostic performances than breast MRI in terms of diagnostic sensitivity and lesion size assessment. And CESM is a good alternative method of screening breast cancer in high-risk people. Link

Comparison of Background Parenchymal Enhancement at Contrast-enhanced Spectral Mammography and Breast MR Imaging.
Sogani J. et al, Radiology 2016.
Conclusion: There was substantial agreement between readers for BPE detected on CE spectral mammographic and MR images. Link

Contrast-enhanced spectral mammography (CESM) and contrast enhanced MRI (CEMRI): Patient preferences and tolerance.
Hobbs M.M., et al, Journal of Medical Imaging 2015.
Conclusion: Our data suggest that overall; patients prefer the experience of CESM to CEMRI, adding support for the role of CESM as a possible alternative to CEMRI for breast cancer staging. Link

The quality of tumor size assessment by contrast-enhanced spectral mammography and the benefit of additional breast MRI.
Lobbes M.B., et al, Journal of Cancer 2015.
Conclusion: Quality of tumor size measurement using CESM is good and matches the quality of these measurement assessed by breast MRI. Additional measurements using breast MRI did not improve the quality of tumor size measurements. Link

Comparison between Breast MRI and Contrast-Enhanced Spectral Mammography.
Łuczyńska E., et al, Medical science monitor 2015.
Conclusion: Our results indicate that CESM has the potential to be a valuable diagnostic method that enables accurate detection of malignant breast lesions, has high negative predictive value, and a false-positive rate similar to that of breast MRI. Link

Contrast-enhanced spectral mammography versus MRI: Initial results in the detection of breast cancer and assessment of tumour size.
Fallenberg E.M., et al, European Radiology 2014.
Conclusion: Initial results show a better sensitivity of CESM and MRI in breast cancer detection than MG and a good correlation with postoperative histology in size assessment. Link

Bilateral Contrast-enhanced Dual-Energy Digital Mammography: Feasibility and Comparison with Conventional Digital Mammography and MR Imaging in Women with Known Breast Carcinoma.
Jochelson M., et al, Radiology 2013.
Conclusion: Bilateral dual-energy contrast agent-enhanced digital mammography was feasible and easily accomplished. It was used to detect known primary tumors at a rate comparable to that of MR imaging and higher than that of conventional digital mammography. DE CE digital mammography had a lower sensitivity for detecting additional ipsilateral cancers than did MR imaging, but the specificity was higher. Link

Novel functional methods in the evaluation of breast lesions.
Barra FR, et al, Radiologia Brasileria 2012.
Conclusion: Novel techniques for functional evaluation of breasts are currently available, presenting promising results and, in some cases, a performance similar to MRI. Their indications might be the same as for MRI, with the advantage of lower cost. Further results should be expected in order to define a procedure flowchart and thus making a good use of the advantages of each technology with minimum injury and risk for the population. Link

Contrast enhanced spectral mammography: better than MRI?
Thibault F., et al, European journal of radiology 2012.
Conclusion: CESM allows imaging the effect of tumor angiogenesis. This technology thus holds the potential for better depiction of malignant lesions within dense breast tissue. Link

CESM articles

Mammography: an update of the EUSOBI recommendations on information for women.
Sardanelli F., et al, Insights Imaging 2017.
Conclusion: CESM provides useful information of suspicious lesions, increasing the visibility of malignant lesions, in particular in women with dense breasts, and can be an alternative to contrast-enhanced MRI, especially in the case of contraindications to MRI or to gadolinium-based contrast injection as well as of difficult MRI availability. Link

Contrast-Enhanced Digital Mammography in the Surgical Management of Breast Cancer.
Ali-Mucheru M., et al, Annals of Surgical Oncology 2016.
Conclusion: Among patients undergoing surgical therapy for breast cancer, CEDM was highly sensitive, had size measurements that correlated well with histologic size, and produced a relatively low rate of false-positive additional biopsy findings. CEDM appears to be promising as an alternative to magnetic resonance imaging in the surgical planning of these patients. Link

Adding the power of iodinated contrast media to the credibility of mammography in breast cancer diagnosis.
Tsigginou A., et al, Breast Journal of Radiology 2016.
Conclusion: MPS (Malignancy Potential Score) empowers the credibility of the digital mammography BIRADS score and our proposed type of enhancement in dual-energy CESM and is a diagnostic tool that increases the accuracy rate in early breast cancer diagnosis. Link

Contrast enhanced dual energy spectral mammogram, an emerging addendum in breast imaging.
Kariyappa KD., et al, British Journal of Radiology 2016.
Conclusion: CEDM has a useful role in identifying occult lesions in dense breasts and in triaging lesions. In a mammographically visible lesion, CEDM characterizes the lesion, affirms the finding and better demonstrates response to treatment. Hence, we conclude that CEDM is a useful complementary tool to standard mammogram. Advances in knowledge: CEDM can detect and demonstrate lesions even in dense breasts with the advantage of feasibility of stereotactic biopsy in the same setting. Hence, it has the potential to be a screening modality with need for further studies and validation. Link

Degree of Enhancement on Contrast Enhanced Spectral Mammography (CESM) and Lesion Type on Mammography (MG): Comparison Based on Histological Results.
Łuczyńska E., et al, Medical Science Monitor 2016.
Conclusion: Strong or medium enhancement on CESM and mass or mass with microcalcifications on MG were strong indicators of malignant transformation. However, we found no combination of MG and CESM characteristics helpful in defining false-positive lesions. Link

Dual-Energy Contrast-Enhanced Spectral Mammography: Enhancement Analysis on BI-RADS 4 Non-Mass Microcalcifications in Screened Women.
Cheung YC., et al, PlosOne 2016.
Conclusion: DE-CESM might provide added value in assessing the non-mass screened breast microcalcification, with enhancement favorable to the diagnosis of cancers or lack of enhancement virtually diagnostic for non-malignant lesions or noninvasive subgroup cancers. Link

Comparison of the Mammography, Contrast-Enhanced Spectral Mammography and Ultrasonography in a Group of 116 patients.
Łuczyńska E., et al, Anticancer Research 2016.
Conclusion: CESM permitted better detection of malignant lesions than both MG and US, read individually. CESM found lesion enhancement in some benign lesions, as well, yielding a rate of false-positive diagnoses similar to that of MG and US. Link

Diagnostic performance of contrast-enhanced spectral mammography: Systematic review and meta-analysis
Tagliafico AS., et al, The Breast 2016.
Conclusion: CESM has a high sensitivity but very low specificity. The source studies were based on highly selected case series and prone to selection bias. High-quality studies are required to assess the accuracy of CESM in unselected cases. Link

A Case of a Concurrent and Co-Located Invasive Carcinoma and a Fibroadenoma to Illustrate the Potential of Dual-Energy, Contrast-Enhanced Digital Mammography on the Diagnosis of Complex Breast Lesions.
Travieso Aja MD., et al, Iran Journal of Radiology 2016.
Conclusion: This case reveals the potential of CESM as an easy, rapid and inexpensive new technique for the diagnosis of malignancies that might easily remain occult to mammography plus breast ultrasound (BUS). Link

Added Value of Contrast-Enhanced Spectral Mammography in Postscreening Assessment
Tardivel A., et al, The Breast Journal 2016.
Conclusion: CESM can be performed easily in daily practice and may change significantly the diagnostic and treatment strategy in post-screening assessment for patients with newly diagnosed breast cancer or with unclear findings on conventional imaging. Link

Challenges in contrast-enhanced spectral mammography interpretation: artefacts lexicon
Yagil Y., et al, Clinical Radiology 2016.
Conclusion: Two main artefacts commonly seen on CESM are rim and ripple artefacts. They do not hamper with image interpretation. It is important to be aware of them and prevent misinterpretation of these artefacts as real breast pathology. Link

Contrast-enhanced spectral mammography improves diagnostic accuracy in the symptomatic setting
Tennant S.L., et al, Clinical Radiology 2016.
Conclusion: CESM provides immediately available, clinically useful information in the symptomatic clinic in patients with suspicious palpable abnormalities. Radiologist sensitivity, specificity, and size accuracy for breast cancer detection and staging are all improved using CESM as the primary mammographic investigation. Link

Contrast-enhanced spectral mammography in recalls from the Dutch breast cancer screening program: validation of results in a large multireader, multicase study.
Lalji C.U., et al. Eur Radiol 2016.
Conclusion: CESM is superior to conventional mammography, with excellent problem-solving capabilities in women referred from the breast cancer screening program. Previous results were confirmed even in a larger panel of readers with varying CESM experience. Link

Diagnostic accuracy of contrast-enhanced spectral mammography in comparison to conventional full-field digital mammography in a population of women with dense breasts
Mori M., et al. Breast Cancer 2016.
Conclusion: "These findings suggest that CESM offers superior clinical performance compared to MMG. Use of CESM may decrease false negatives especially for women with dense breasts." Link

Clinical utility of dual-energy contrast-enhanced spectral mammography for breast microcalcifications without associated mass: a preliminary analysis.
Yun-Chung Cheung, et al, European Radiology 2016.
Conclusion: "DE-CESM provides additional enhancement information for diagnosing breast microcalcifications and measuring cancer sizes with high correlation to surgicohistology" Link

Contrast enhanced digital mammography: Is it useful in detecting lesions in edematous breast?
ElSaid N.A.E., et al, The Egyptian Journal of Radiology and Nuclear Medicine 2015.
Conclusion: Dual-energy contrast-enhanced digital mammography is a useful technique in identification of lesions in mammographically dense edematous breasts and proved to be a useful tool in the follow-up of cases presenting by edema after conservative breast surgery and chemotherapy. Link

Contrast-enhanced spectral mammography: Impact of the qualitative morphology descriptors on the diagnosis of breast lesions.
Kamal R.M., et al, European Journal of Radiology 2015.
Conclusion: The assessment of the morphology and enhancement characteristics of breast lesions on CESM enhances the performance of digital mammography in the differentiation between benign and malignant breast lesions. Link

Evaluation of low-energy contrast-enhanced spectral mammography images by comparing them to full-field digital mammography using EUREF image quality criteria.
Lalji C.U., et al, European Radiology 2015.
Conclusion: Low-energy CESM images are non-inferior to FFDM images. From this perspective FFDM can be omitted in patients with an indication for CESM. Link

Dual-energy contrast-enhanced spectral mammography (CESM).
Daniaux M., et al, Archives of Gynecology and Obstetrics 2015.
Conclusion: Imaging with contrast agents in breast cancer was already known from previous magnetic resonance imaging and computed tomography studies. However, high costs, limited availability-or high radiation dose-led to the development of contrast-enhanced spectral mammography (CESM). Link

Contrast-enhanced spectral mammography: Does mammography provide additional clinical benefits or can some radiation exposure be avoided?
Fallenberg E.M., et al, Breast Cancer Research Treatment 2014.
Conclusion: CESM alone has the same sensitivity and better size assessment as CESM + MG and was significantly better than MG with only 6.2 % increase in AGD. The combination of CESM + MG led to systematic size overestimation. When a CESM examination is planned, additional MG can be avoided, with the possibility of saving up to 61 % of radiation dose, especially in patients with dense breasts. Link

Use of contrast-enhanced spectral mammography for intramammary cancer staging: preliminary results.
Blum K. S., et al, Academic Radiology 2014.
Conclusion: CESM is accurate in size measurements of small breast tumors. On average CESM leads to a slight overestimation of tumor size, whereas US tends to underestimate tumor size. Assessment of the breast tissue can be limited by the scattered radiation artifact and background enhancement of breast tissue. CESM seems to be helpful in the characterization of breast tissue around microcalcifications. Link

Diagnostic performance of dual-energy contrast-enhanced subtracted mammography in dense breasts compared to mammography alone: inter observer blind-reading analysis.
Cheung Y. C., et al, European Radiology 2014.
Conclusion: CESM provided additional information with consistent improvement of the cancer diagnosis in dense breasts compared to MX alone. The prediction of the diagnosis could be improved by the interpretation of a significant number of cases in the presence of 6 % benign contrast enhancement in this study. Link

Dual-energy contrast-enhanced mammography.
Travieso A.M.M., et al, Radiología 2014.
Conclusion : Dual-energy contrast-enhanced mammography is a new, apparently promising technique in breast cancer that provides information about the degree of vascularization of the lesion in addition to the morphological information provided by conventional mammography. Link

Contrast-enhanced spectral mammography in patients referred from the breast cancer screening programme.
Lobbes M.B., et al, European radiology 2014.
Conclusion: CESM increases diagnostic performance of conventional mammography, even in lower prevalence patient populations such as referrals from breast cancer screening. Link

Dual-energy contrast-enhanced digital mammography in routine clinical practice in 2013.
Badr S., et al, Diagnostic and interventional imaging 2014.
Conclusion: Dual-energy contrast-enhanced mammography is a recent, seemingly promising technique, in the management of breast cancer. The main advantages consist of its easy installation, the good tolerance and the comfort in the interpretation of difficult to read mammograms. However, the indications and the role of dual-energy contrast-enhanced mammography still have to be determined within the diagnostic strategy of breast tumors. New studies are expected, especially to compare dual-energy contrast-enhanced mammography with breast MRI. Link

Dual-energy contrast-enhanced digital mammography: initial clinical results of a multireader, multicase study.
Dromain C., et al, Breast Cancer Research 2012.
Conclusion: Dual-energy contrast-enhanced digital mammography as an adjunct to MX ± US improves diagnostic accuracy compared to MX ± US alone. Addition of iodinated contrast agent to MX facilitates the visualization of breast lesions. Link

Dual-energy contrast-enhanced digital mammography: initial clinical results.
Dromain C., et al, European Radiology 2011.
Conclusion: Initial clinical results show that CEDM has better diagnostic accuracy than mammography alone and mammography+ ultrasound. Link

Contrast-enhanced digital mammography.
Dromain C., et al, European Journal of Radiology 2009.
Conclusion: The potential clinical applications of CESM are the clarification of mammographically equivocal lesions, the detection of occult lesions on standard mammography, particularly in dense breasts, the determination of the extent of disease, the assessment of recurrent disease and the monitoring of the response to chemotherapy. CEDM should result in a simple way to enhance the detection and the characterization of breast lesions. Link

Dual-energy contrast-enhanced digital subtraction mammography: feasibility.
Lewin J.M., et al, Radiology 2003.
Conclusion: Contrast Enhanced Spectrum Mammography was performed in 26 subjects with mammographic or clinical findings that warranted biopsy. Of the 26 subjects, 13 had invasive cancers. Eleven of these tumors enhanced strongly, one enhanced moderately, and one enhanced weakly. The duct in one patient with ductal carcinoma in situ was weakly enhancing. In the other 12 patients, benign tissue enhanced diffusely in two and weakly focally in two. These results indicate that the technique is feasible and worthy of further study. Link

Initial Clinical Experiences with Contrast Enhanced Mammography

Evaluation of contrast-enhanced digital mammography.
Diekmann F., et al, European journal of radiology 2011.
Conclusion: The addition of dynamic digital subtraction mammography to conventional mammography can significantly improve diagnostic quality. The increased sensitivity is particularly pronounced in the case of dense breast tissue. Link

Evaluation of tumor angiogenesis of breast carcinoma using contrast-enhanced digital mammography.
Dromain C., et al, American journal of Roentgenology 2006.
Conclusion: Contrast-enhanced digital mammography is able to depict angiogenesis in breast carcinoma. Breast compression and projective images acquisition alter the quantitative assessment of enhancement parameters. Link

Digital mammography using iodine-based contrast media: initial clinical experience with dynamic contrast medium enhancement.
Diekmann F., et al, Investigative Radiology 2005.
Conclusion: The results of this preliminary study suggest that contrast-enhanced digital mammography is a potentially useful tool for the detection and the differentiation of benign and malignant breast lesions. Link

Use of iodine-based contrast media in digital full-field mammography--initial experience.
Diekmann F., et al, Fortschr Röntgenstr 2003.
Conclusion: Contrast-enhanced digital mammography has a potential for improving the visualization of breast tumors in mammography using special beam filtering, adjusted x-ray parameters, proper timing, and suitable subtraction software. Link

Contrast-enhanced digital mammography: Initial clinical experience.
Jong R.A., et al, Radiology 2003.
Conclusion: The results of this preliminary study suggest that contrast-enhanced digital mammography potentially may be useful in identification of lesions in the mammographically dense breast. Further investigation of contrast-enhanced digital mammography as a diagnostic tool for breast cancer is warranted. Link

NOTES

SenoBright is intended to be used as an adjunct following mammography and ultrasound exams to localize a known or suspected lesion.

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