Lesion detectability in digital mammography and digital breast tomosynthesis: A phantom study

Angelo Taibi
Dipartimento di Fisica, Università di Ferrara

S. Vecchio and N. Lanconelli
Dipartimento di Fisica, Università di Bologna

A. Albanese, V. Salomoni, And P. Vignoli
IMS s.r.l. (Bologna)
e-mail: taibi@fe.infn.it
What do we need to detect a lesion?

- The lack of conspicuity is the ultimate limitation to breast cancer detection.

- This is particularly important in dense breasts where the overlying fibroglandular structures (structure noise) may either obscure or simulate disease.

- So-called “advanced applications” of digital mammography aim to increase lesion conspicuity by reducing the contribution of structure noise.

A. Taibi, Eur. J. Radiol. 72, 2009
Advantages of Tomographic Imaging

- Improves *conspicuity of structures*
- Allows *depth localization*
- Restricts *dynamic range*

CIRS Mammography Phantom
(Model 020 BR3D)
DBT vs Mammo

MGD = 3.2 mGy  MGD = 1.6 mGy
CIRS phantom without details
CIRS phantom without details
The IMS approach to DBT
The IMS approach to DBT

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Variable dose & central exposure

One special implementation of IMS’s optimised variable dose geometry uses sufficient dose in the central projection for that image to be a 2D mammogram.

The reconstruction algorithm makes full use of the extra information provided by this high contrast central image.
Reconstruction algorithm by DEXELA

DBT central projection vs Mammo

DBT projection (no grid)
MGD = 0.78

Digital mammography
MGD = 1.6
DBT central projection vs Mammo

DBT projection

Digital mammography
Constant dose vs Variable dose
(same total MGD)
Constant dose vs Variable dose
(image difference)
A breast phantom made of heterogeneous tissue-equivalent material is a useful tool to evaluate lesion detectability in digital mammography and digital breast tomosynthesis.

Variable dose geometry is a novel approach with potential advantages over standard DBT (dose saving, speed of acquisition, patient comfort, ...)

Clinical trials are needed!