



Breast DCIS: Role of preoperative MRI in assessment of disease extent

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PURPOSE

Pure ductal carcinoma in situ (DCIS) is a pathologic non-invasive lesion spreading exclusively intraductally without disruption of basal membrane. There is no access to lymphatic and vascular structures and no infiltration of the surrounding tissue. The common sign of DCIS is formation of microcalcification clusters but 10-15% of DCIS don't develop microcalcifications (MCs) and 40% form extensive intraductal component without MCs what results in mammographically occult finding.

Occult parts of DCIS are often reason of positive resection margins and reoperation. Information about DCIS real extent is crucial for resection planning as the breast sparing surgery is preferred currently. This study compares accuracy and benefits of contrast-enhanced breast MRI with digital mammography in DCIS extent assessment. Under- or overestimation of both methods was also calculated and compared.

METHODS

114 cases of DCIS were diagnosed between 10/2013 and 09/2015. Patients (median age 55.5 years) were examined at digital mammography (Hologic, Dimensions, USA) and ultrasound (Philips iU22, Belgium). Suspicious lesions were verified by core cut biopsy or stereotactic navigated vacuum assisted biopsy (S-VAB). Patients with histopathologically proven DCIS underwent breast MRI (3T Magnetom Verio, Siemens, Belgium). Patients with proven BRCA 1 or 2 mutation had breast MRI as a part of their surveillance prior to biopsy. Lesions extent in digital mammography, in MRI and in definitive histopathology were compared. Difference ± 5 mm between the histopathological diameter and modality measured diameter was considered as over- or underestimation of size. Finally statistical analysis was performed (chi-square test, $p < 0.05$) (StatCalc, Version 7.1.2, Excel 2010).

RESULTS

DCIS in digital mammography	Total (n=114)	%
With microcalcifications	85	74.56
Cluster of polymorphic microcalcification	31/85	27.19
Linear ductal or segmental	54/85	47.37
Without microcalcifications	29	25.44
Opacity	17/29	14.91
No pathology	12/29	10.53

TABLE 1. Morphologic characteristics of bioptically proven DCIS (n=114) in digital mammography.

Lesions diameter (mm)	Digital mammography			MR- mammography		
	Occult	Underestimated lesions	Overestimated lesions	Occult	Underestimated lesions	Overestimated lesions
0-10		1	6		-	2
11-20		2	4		-	2
21-50		18	3		-	13
> 50		15	-		-	11
Total	12	36	13	8	0	28

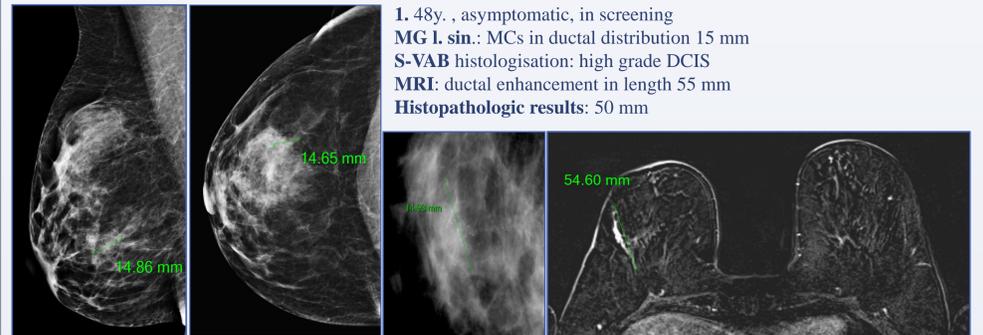
TABLE 2. Stratification of mammographically and MRI occult, underestimated and overestimated DCIS according to real histopathological diameter.

Modality	Occult lesions (%)	Underestimated lesions (%)	Overestimated lesions (%)	Accuracy (%)
Digital mammography	12/114 (10.53)	36/102 (35.29)	13/102 (12.75)	53/102 (51.96)
MRI	8/114 (7.02)	0/106	28/106 (26.42)	78/106 (73.58)
P	0.3521	0.0009	0.0150	< 0.0001
Odds Ratio	1.56	116.91	0.41	0.21
95% CI	0.61-3.97	7.06-1937.09	0.20-0.84	0.11-0.40

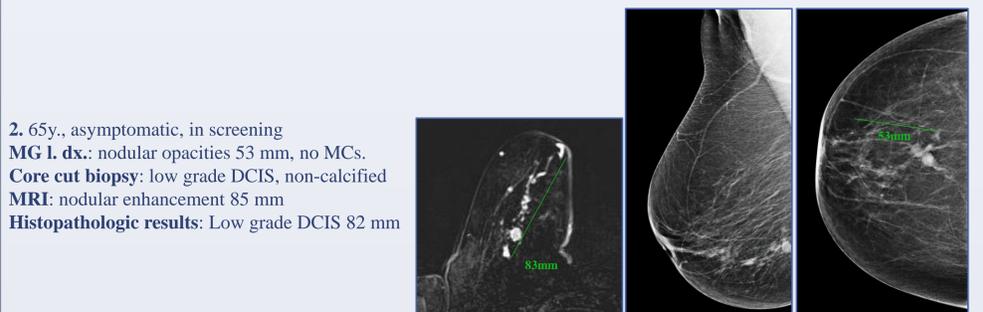
TABLE 3. Assessment of DCIS extent and its occult component in MRI with comparison to digital mammography (n=114)

Sensitivity of digital mammography for DCIS extent assessment was 89.47%, sensitivity of contrast-enhanced breast MRI was 93.44%.

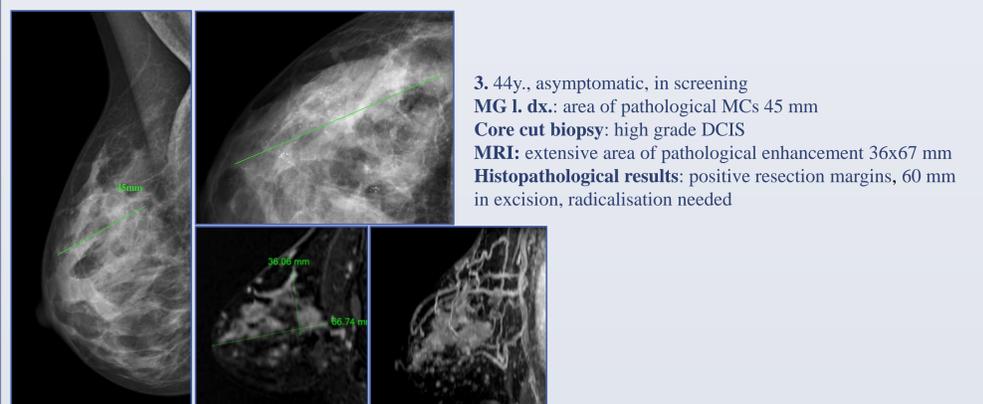
CASES



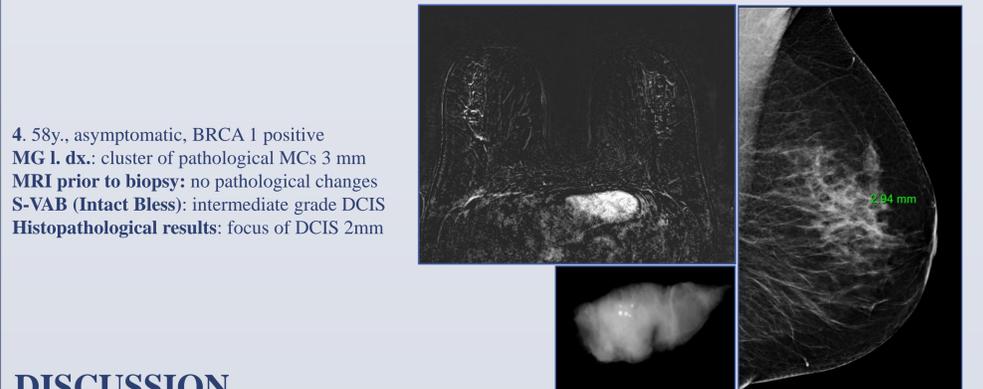
1. 48y., asymptomatic, in screening
MG l. sin.: MCs in ductal distribution 15 mm
S-VAB histology: high grade DCIS
MRI: ductal enhancement in length 55 mm
Histopathologic results: 50 mm



2. 65y., asymptomatic, in screening
MG l. dx.: nodular opacities 53 mm, no MCs.
Core cut biopsy: low grade DCIS, non-calcified
MRI: nodular enhancement 85 mm
Histopathologic results: Low grade DCIS 82 mm



3. 44y., asymptomatic, in screening
MG l. dx.: area of pathological MCs 45 mm
Core cut biopsy: high grade DCIS
MRI: extensive area of pathological enhancement 36x67 mm
Histopathologic results: positive resection margins, 60 mm in excision, radicalisation needed



4. 58y., asymptomatic, BRCA 1 positive
MG l. dx.: cluster of pathological MCs 3 mm
MRI prior to biopsy: no pathological changes
S-VAB (Intact Bless): intermediate grade DCIS
Histopathologic results: focus of DCIS 2mm

DISCUSSION

DCIS is an entity with tendency to multifocal and discontinual spreading and a variable imaging presentation. According our observations 25.44% of DCIS produced no MCs and 10.53% of these remained mammographically completely occult and therefore missed. These facts reduce sensitivity of digital mammography according our observations to 89.47%. MRI is the only modality capable to detect non-calcified DCIS. In our study MRI missed 7.02% of lesions – all were smaller than 5 mm (in MRI presented by non specific sublimit nodules) and reached sensitivity of 93.44%.

Underestimation occurred in 35.29% at digital mammography and was caused by non-calcified parts, while MRI didn't underestimate any lesion but it has tendency to overestimation of DCIS extent. It is caused by desmoplastic changes surrounding pathologic process which enhance stronger due to higher capillary density. In MRI it appeared in 26.42%, more often in case of lesions bigger than 21 mm. Digital mammography overestimated DCIS in 12.75% (predominantly lesions smaller than 20 mm). After the analysis of our outcomes, accuracy of digital mammography in assessment of DCIS extent is 51.96% while accuracy of MRI is 73.58%.

CONCLUSION

There are still many controversies about the role of MRI in preoperative management of DCIS. The basic limitation of MRI is the risk of disease extent overestimation resulting to more radical resection. On the other side complete extirpation of DCIS with ensuring of free resection margins is the only way to prevent the recurrence of the disease, which manifests often as invasive carcinoma. The unique character of DCIS behaviour, its presentations in imaging methods and the potential to multiplicity and discontinuity in spreading makes the diagnostics a challenge. According our study results we consider the combination of digital mammography and MRI in preoperative management of patients with DCIS as the crucial. We see great potential in improving of imaging technologies, especially in MR functional imaging, that might help to reduce the risk of overestimations of DCIS extent.

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