Difference of Apparent Diffusion Coeffcient in Breast Mass and Non-mass Like Enhancement Lesions

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INTRODUCTION

DWI-ADC has a potential for clinical application in differentiating benign and malignant lesions with good accuracy. Previous studies showed that the cutoff point of ADC between benign and malignant differed from each other so that the diagnostic performance varied. In this study, we are going to investigate whether the MRI types of lesions, mass or non-mass-like enhancement (NMLE), should be weighted when predicting the malignancy using ADC value.

MATERIAL AND METHODS

193 pathologically confirmed lesions on 178 patients were retrospectively reviewed. MRI examinations were performed on 1.5T GE MRI scanner and 4-channel phase-array breast coil. The MRI protocol included axial DWI, T1WI, T2WI and multiphase contrast imaging using VIBRANT. The DWI protocol are: spin echo-echo planar imaging sequence (SE-EPI), TR 8400ms, TE 93.8ms，ASSET factor 2，b value 0 and 1000/mm2，matrix 128×128, 2NEX. For ADC measurement, ROI was drawn on DW images and corrected on the spatially matched T1WI, T2WI and DCE images and only the minimum ADC was taken. The lesions were classified as mass and NMLE types according to ACR BI-RADS MRI. The ADC values of the each pathological types and MRI types were compared. The pathology was obtained by biopsy or surgical resection and determined by the pathologist.

RESULTS

The table below listed the ADC values of different MRI types and pathological types. There were significant difference between mass and NMLE, benign and malignant, benign mass and NMLE, benign and malignant mass, benign and malignant NMLE, where $P<0.05$. But there is no significant difference between malignant mass and NMLE. Different pathological types had different ADC values but overlap between each other except for between IDC and the other benign. On ROC curves, the optimized cutoff point ADC value for mass lesion is $1.05\times10^{-3}mm^2/s$, which is lower than the NMLE where ADC=$1.35\times10^{-3}mm^2/s$ and different than the benign and malignant without MRI types differentiation (ADC=$1.25\times10^{-3}mm^2/s$). The sensitivity and specificity was 0.85 and 0.70 for mass, 0.74 and 0.83 for NMLE, and 0.68 and 0.82 for without MRI types classification. The optimized ADC value had a higher sensitivity for mass lesions while it has higher specificity for NMLE.

DISCUSSION and CONCLUSION

Since in clinical investigations, the ratio of non-mass lesions has been described as between 23.7%~40% among all visible lesions. In our study, it was found that the partial volume effect on NMLE lesion, which had fat or normal fibrograndular tissue interposing in the lesions, was the cause for increasing the ADC measurement. ROC curve revealed that for different MRI types, the diagnostic performance was different. It would be helpful for malignancy prediction using different ADC cutoff points for different MRI types of the lesions. This finding was different than the others studies whose ADC measurement was not affected by the lesion size.

Table The ADC values and its variances of mass and NMLE, benign and malignancy. (×10-3mm2/s)

MRI types	Pathology		
	Benign	Malignant	Benign+Malignant
MASS	1.34±0.30 (0.09)	1.02±0.29 (0.09)	1.12±0.33(0.11)
NMLE	1.54±0.45 (0.20)	1.11±0.32 (0.10)	1.44±0.41(0.17)
MASS+NMLE	1.41±0.36(0.13)	1.05±0.30(0.09)	-

Numbers in ( ) were statistical variance.

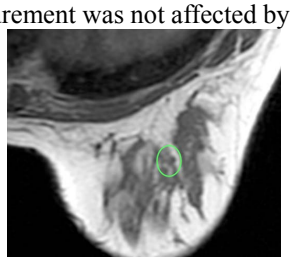

Figure 1 The spatially matched ROI drawing on T1WI showed the fat component inside the ROI which obviated the measurement.

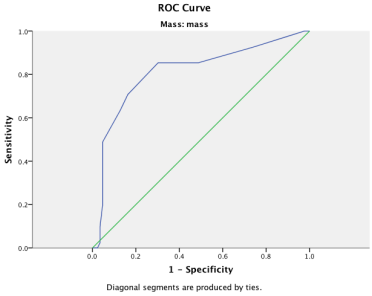

Figure 2 For mass lesions, the area under curve was 0.81. The optimized cut-off point was $1.05\times10^{-3}mm^2/s$ where sensitivity was 0.85 and specificity is 0.70.

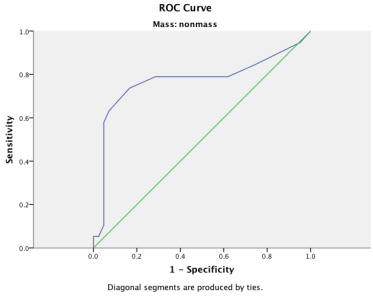

Figure 3 For NMLE lesions, the area under curve was 0.77 and the optimized cut-off point was $1.35\times10^{-3}mm^2/s$ where sensitivity was 0.74 and specificity is 0.83.

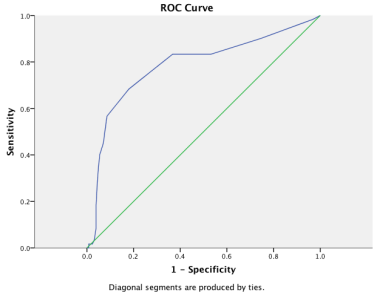

Figure 4 For differentiating benign and malignant regardless of mass or NMLE lesions, the area under curve was 0.79 and the optimized cut-off point is $1.25\times10^{-3}mm^2/s$ where sensitivity is 0.68 and specificity is 0.82.