Assessment of Pathologic Complete Response of Breast Cancer with Different Molecular Subtypes after Neoadjuvant Chemotherapy with Dynamic Contrast-enhanced MR Imaging

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Target audience: Radiologist, Surgeon in breast, Oncologist.

Purpose: Different molecular subtypes of breast cancer respond differently to neoadjuvant chemotherapy (NAC)[1]. Patients who achieve pathologic complete response (pCR) have better prognosis than non-pCR[2]. Early prediction of breast cancer response to NAC, especially for pCR, by breast MRI is expected. So our purpose is to retrospectively evaluate whether dynamic contrast-enhanced (DCE) MR Imaging could predict pCR to NAC in breast cancer with different molecular subtypes.

Materials and methods: Ninety-seven lesions with pathologically confirmed locally advanced breast cancer and underwent NAC between Sep. 2007 and Dec. 2012 were reviewed. Patients received at least four cycles of NAC before surgery and achieved G4 and G5 post NAC according to the Miller & Payne grading system [3]. Their molecular subtypes were determinate by immune histochemical results [4] and divided into four groups: Luminal A (n=7), Luminal B (n=58), HER2+ (n=14) and Triple negative (n=18). DCE-MR Imaging was performed at 1.5T MRI pre-NAC, after the 2nd and 4th cycle of NAC. Time Intensity Curve (TIC) was obtained by placing ROI (20mm^2) in the mass, avoiding obvious cystic and necrotic area. The Maximum wash-in slpoe (S_{max}) of TIC and its change rate ($\triangle S_{max}$%) were calculated by formula. S_{max} and $\triangle S_{max}$% were compared between G4 and G5 group by Independent-Sameples *t* test in different molecular subtypes, respectively. Then Receiver operating characteristic (ROC) analysis of S_{max} and $\triangle S_{max}$% was performed.

Results: In Luminal A and HER2+ group, S_{max} and $\triangle S_{max}$% between G4 and G5 were not significantly different (P>0.05). In Luminal B group, S_{max} in G5 were significantly lower than those in G4 after the 2nd and 4th cycle of NAC (P=0.001, P=0.005); $\triangle S_{max}$% in G5 were significantly higher than those in G4 after the 2nd and 4th cycle of NAC (P=0.001, P=0.002). In Triple negative group, S_{max} in G5 were significantly lower than those in G4 pre-NAC and after the 2nd cycle of NAC (P=0.008, P=0.003), and others were not significantly different between G4 and G5 (P>0.05). ROC analysis results were listed in FIG 1.

Discussion: Our results show that, in Luminal A and HER2+ breast cancer, S_{max} and $\triangle S_{max}$% in DCE-MR Imaging cannot help predict pCR to NAC in G4 and G5.This result may be associated with the limited patients. But in Luminal B breast cancer, S_{max} and$\triangle S_{max}$% can give more information about tumor blood supply change, especially for $\triangle S_{max}$%. It may help predict pCR in G4 and G5. In Triple negative breast cancer, S_{max} pre-NAC and after the 2nd cycle of NAC performed so well in prediction of pCR in G4 and G5, maybe it is also associated with the limited patients. But Triple negative breast cancer has more pRC rate than other molecular subtypes [1], so further study should be done about functional MRI in pCR prediction of Triple negative breast cancer.

Conclusions: DCE-MR Imaging can become the potential predictor of pCR to NAC in Lumianl B and Triple negative breast cancer.

References:

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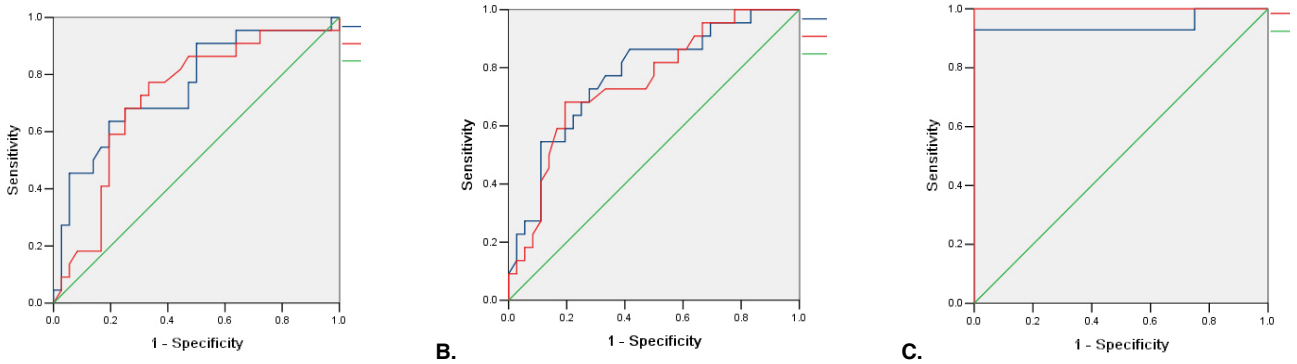

FIG 1 (A) The areas under ROC curve of S_{max} in Luminal B breast cancer in prediction of pCR after the 2nd (blue) and 4th (red) cycle of NAC were 0.757 and 0.720. **(B)** The areas under ROC curve of $\triangle S_{max}$% in Luminal B breast cancer in prediction of pCR after the 2nd (blue) and 4th (red) cycle of NAC were 0.771 and 0.750. **(C)** The areas under ROC curve of S_{max} in Triple negative breast cancer in prediction of pCR pre-NAC (blue) and after the 2nd (red) cycle of NAC were 0.946 and 0.999.