

Comparison of MRI Features between Invasive Ductal Carcinoma, Invasive Ductal Carcinoma with Lobular Involvement and Infiltrating Lobular Carcinoma

J.-H. Chen^{1,2}, H. Liu¹, M.-Y. Su¹, and O. Nalcioglu¹

¹Tu & Yuen Center for Functional Onco-Imaging, University of California Irvine, Irvine, CA 92697, United States, ²Department of Radiology, China Medical University Hospital, Taichung 404, Taiwan

Purpose

Infiltrating lobular carcinoma (ILC), comprising approximately 10% of breast cancers, has higher multiple metastases rate and achieves a lower response to chemotherapy than invasive ductal carcinoma (IDC) [1]. Due to the infiltrating growth pattern of ILC, it is difficult to detect ILC by ultrasonography or conventional mammography. MRI has been proved very useful in the detection of ILC as well as assessment of disease extent. About 20% of IDCs showed lobular involvement (IDCL). The presence of lobular involvement in IDC was correlated with the favorable outcome, therefore it may serve as a prognostic indicator for invasive ductal carcinoma [2]. In this study we compared different MR imaging features among these three types of cancer. More understanding of their different MRI features may further improve the accuracy in early diagnosis. The morphological appearances and kinetic features among IDC, IDCL and ILC lesions were determined using the features defined in ACR BI-RADS MRI lexicon, and compared.

Methods

Historical proven cases of 30 IDC, 30 IDCL, and 29 ILC were included in this study. Breast MRI was performed using a 1.5 T MR scanner with a bilateral breast coil. Both high-resolution pre-contrast imaging and dynamic contrast-enhanced axial imaging were acquired. After the dynamic scan was completed, subtraction images were generated by subtracting the pre-contrast images from the 1 min post contrast enhanced images. The enhancement kinetics was analyzed from pixels of the brightest enhancement region in the lesion and the percent-enhancement time course was calculated for the 12 post-contrast imaging frames. The diagnosis was based on the morphologic and enhancement kinetic features of ACR BIRADS-MRI lexicon. The morphologic criteria included mass and non-mass type enhancements. The evaluation of enhancement kinetic curve was based on initial (within the first 2 minutes or when the curve starts to change), and late phases. The initial enhancement phase is categorized into fast, medium, and slow. The delayed enhancement phase is described as persistent, plateau, and washout.

Results

Regarding lesion morphological appearances, IDCL and ILC patients had more diverse morphological findings than IDC. Most (29/30) IDC, 26 of 30 IDCL, and 22 of 29 ILC had mass type lesions including single focus, multiple foci, and irregular mass with well-defined borders. While only one IDC (1/30) showed segmental clumped enhancement, four IDCL (4/30) and seven ILC (7/29) showed non-mass-like lesion including diffuse reticular or dendritic enhancements, linear enhancement, and small regional enhancements. Kinetic features between these three groups were also different. In each case if there were separately identifiable lesions, more than 1 enhancement kinetics were obtained. Fast early enhancement was found in 34/35 IDC, 36/39 IDCL, and 26/35 ILC. One IDC, 3 IDCL, and 9 ILC showed slow initial and continuous delayed enhancement. Delayed enhancement phase also showed different features in these tumor types. While seen in thirty-two of 34 IDC, only 29 of 36 IDCL and 18 of 26 ILC with fast early phase enhancement demonstrated delayed phase washout. Two IDC, 7 IDCL, and 7 ILC reached plateau. One ILC showed persistent enhancement. Table 1. and Table 2. summarize the morphological and kinetic features of these three kinds of cancer. Fig.1. shows their diverse MRI presentations.

Table 1. Morphological features of IDC, IDCL, and ILC

	IDC (N=30)	IDCL (N=30)	ILC (N=29)
Mass type	29 (97%)	26 (87%)	22 (76%)
Non-mass type	1 (3%)	4 (13%)	7 (24%)

Table 2. Enhancement kinetic features of IDC, IDCL, and ILC

Kinetic features	IDC (N=35)	IDCL (N=39)	ILC (N=35)
Fast-washout	32 (91%)	29 (74%)	18 (51%)
Fast-plateau	2 (6%)	7 (18%)	7 (20%)
Fast-persistent	0 (0%)	0 (0%)	1 (3%)
Med/Slow-persistent	1 (3%)	3 (8%)	9 (26%)

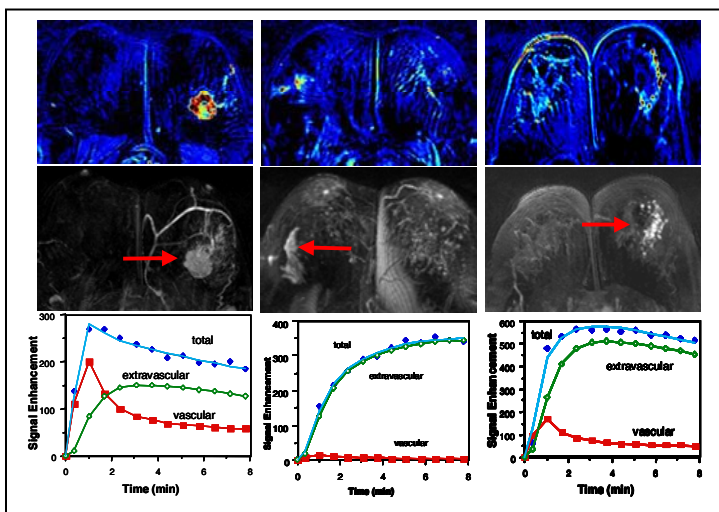


Fig. 1. Diverse morphological and kinetic features for IDC, IDCL, and ILC. Left case: IDC with a solitary mass showing rapid up-slope and washout in kinetics. Middle case: IDCL with non-mass type of patchy enhancements showing slow initial and persistent enhancement in kinetics. Right case: ILC with regional clumped enhancement pattern, showing the malignant type kinetics.

Discussion

IDCL and ILC displayed more diverse morphological appearances than IDC. The frequency of non-mass-like enhancement patterns was higher in IDCL and ILC than in IDC (4/30 and 7/29 vs. 1/30). In cases where there was a main mass, ILC was also more likely to have multiple enhanced foci. Regarding kinetic features, IDCL and ILC had a higher possibility showing moderate or slow enhancement in early phase than IDC (3/39 and 9/35 versus 1/35). While 91% IDC (32/35) demonstrated the typical malignant kinetic pattern with fast early enhancement and wash-out in the delayed phase, this pattern was only seen in 74% IDCL (29/39) and 51% ILC (18/35). Overall, IDCL displayed MR imaging features in-between those of IDC and ILC, which was expected from the mixed histological components of this disease. More understanding of these MRI features may facilitate earlier accurate diagnosis and adequate treatment for different subtype of breast cancer.

References: [1]. Mathieu et al. Eur J Cancer 2004; 40:342-51 [2]. Ishige H. et al. Pathol Int. 1999 Jun;49(6):485-90.

Acknowledgement: This work was supported in part by NIH/NCI CA90437 and California BCRP # 9WB-0020.