The Dissolving Aspirin Sign: An aid in Differentiating Benign and Malignant Lesions detected during Gadolinium-enhanced Breast MRI

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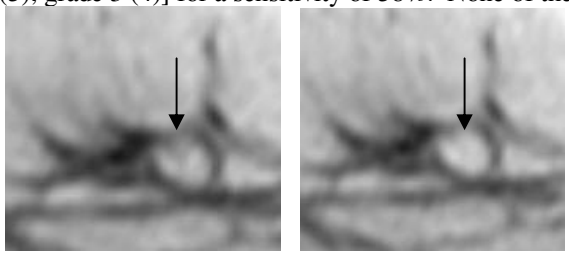
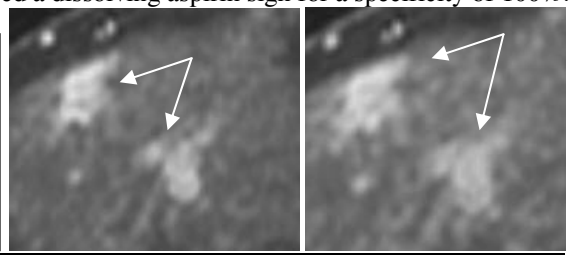
Introduction: In a prior poster (1) we qualitatively described the "dissolving aspirin sign," and suggested that it might be helpful in diagnosing malignancy in lesions detected during gadolinium-enhanced breast MRI. This sign is based on the observation that for some tumors, in the first 30 – 120 seconds after contrast injection, the lesion edges are sharply etched, yet immediately fade and become indistinct, an appearance similar to that of an aspirin tablet dropped into a glass of water and viewed from above (2). A recent publication included discussion of this sign (designated as the "blooming sign") among others, but nevertheless, this sign has received very little attention. The purpose of this study is to propose and test a graded scale for assessment of the dissolving aspirin sign and to establish its potential utility.

Methods: We retrospectively reviewed our breast MRI database and recently instituted Breast Imaging and Pathology conference cases for patients in whom diagnosis of benign or malignant lesion was either certain (by biopsy with concordant results) or virtually certain (no biopsy, but 2 year follow-up without change in mammography or MRI). The patients had been scanned using our usual breast MRI protocol, at 1.5 T, which included a sagittal 3D GRE dynamic contrast enhanced sequence (8 - 16 phases, temporal resolution of either 30 - 60 sec). Two readers, blinded to diagnosis, observed the dynamic contrast enhanced image set as well as the derived subtracted image set on a work station (GE Advantage Windows 4.1, Waukesha, WI, USA) using dedicated manufacturer software (Functool) capable of rapidly displaying the time course of lesion enhancement at a fixed slice location. Images were also graded using standard MRI BI-RADS assessment categories. Lesions were scored positive for the "dissolving aspirin" sign if the readers discerned a very sharp lesion margin on the first or second post contrast images, that, on subsequent images, became less well defined, with an apparent diffusion of contrast into surrounding breast tissue. The prominence of the sign was assigned on a scale of 0 (absent), 1 (weakly present), 2 (moderately present), or 3 (strongly present).

Results: 63 patients were initially selected, but 3 patients were eliminated due to either movement or artifact, leaving a total of 60 patients with 66 lesions. Effective in-plane lesion size $(L1xL2)^{1/2}$ ranged from 3.3 – 66.0 mm (mean 13.6 mm, median 10.9 mm). Diagnosis distribution was as follows: 31 malignant (25 invasive ductal cancer, 5 invasive lobular cancer, 3 ductal cancer in situ), 33 benign (15 fibroadenomas, 18 "benign other"). 19 of 33 malignant lesions displayed a dissolving aspirin sign [grade 1 (10); grade 2 (5); grade 3 (4)] for a sensitivity of 58%. None of the 35 benign lesions displayed a dissolving aspirin sign for a specificity of 100%.



2 & 7 min post Gd images
Left: benign: absent aspirin sign
Right: cancer: moderate aspirin sign



Discussion: Intuitively the dissolving aspirin sign might be thought to simply be a reflection of lesion washout. However, 5 of 19 malignant lesions (26%) with a dissolving aspirin sign displayed a Type 2 curve. Furthermore, 5 of 33 benign lesions (15%) showed a Type 3 curve, yet none displayed the dissolving aspirin sign. Thus, this small study shows that the dissolving aspirin sign does seem to offer new information, not completely correlated with enhancement curve profile, that can be used to improve accuracy of diagnosis. Malich et. al. (3) showed a similar sensitivity (63%) to that shown in our study, but specificity was lower (86%). Our imaging protocol had higher spatial resolution (3 mm slice, 0.6 – 0.9 mm in plane, vs. 4 mm slice, 1.4-1.7 mm in plane) which might have resulted in reducing false positives.

Conclusion: The "dissolving aspirin" sign should be sought during careful examination of lesion edges during contrast enhanced breast MRI. Although the sign is not a sensitive indicator of malignancy, it nevertheless was only seen in malignant lesions and may be most valuable in avoiding misassignment of some lesions with benign morphology and Types 1 or 2 curves into the benign or short term follow-up categories.

References:

1. F. Kelcz. Breast MRI: Techniques for Improving Accuracy of Diagnosis and Biopsy. RSNA 2003, Chicago, IL
2. We wish to acknowledge Dr. Pamela Propeck, Univ of Wisconsin, Madison for suggesting the name for this observation.
3. A. Malich, et. al. Potential MRI Interpretation Model: Differentiation of Benign from Malignant Breast Masses. AJR 2005;185:964-970.