Changing enhancement patterns over time of small breast cancers in women at high genetic risk of breast cancer

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Introduction:

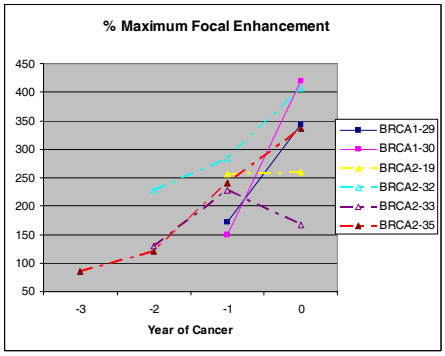
The multicentre UK breast MRI screening trial (MARIBS) has presented an opportunity to review incidence round cancers and to ascertain by retrospective review of earlier screening rounds features that might have allowed earlier identification of these cancers.[1] In a recent report it has been shown that tumour growth rates for tumours with BRCA 1 mutations are faster compared to those with BRCA2 mutations[2]. Breast tumours are distinguishable by their morphology and enhancement characteristics compared to background breast tissue. Tumours typically have irregular margins, non-homogeneous enhancement and rapid, strong enhancement with wash-out. In this analysis we examine whether enhancement of early-stage tumour changes over time by retrospective examination of previous screening MR images and evaluate whether the enhancement characteristics of BRCA1 tumours differ from BRCA2 lesions.

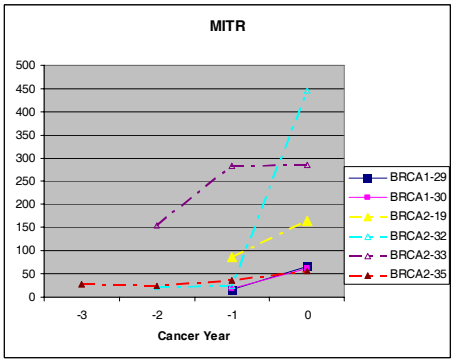
Methodology:

The multicentre UK MARIBS trial recruited women at more than 50% risk of being a gene carrier for breast cancer and compared annual MRI and mammography[1]; the protocol is described elsewhere[3]. Women were tested for gene mutations either prior to the study or during the MARIBS trial and the imaging data of patients was grouped to carriers of BRCA1, BRCA2, p53 mutations and women where gene mutation was not found (FH Ov/Br). The morphological and enhancement criteria used to characterise lesions found on MRI and mammography have been published[3]. Independent double reading of all MRI and mammograms was undertaken prospectively for the trial but for the purpose of this study an additional consensus read of the cancers was undertaken by two experienced breast MRI radiologists (FG & RW). For each cancer identified prospectively, prior MR screening examinations were reviewed to establish if any abnormality could be identified at the site of the tumour. For each lesion, the following MRI features were recorded – background enhancement, lesion type, margins, size, enhancement pattern (homogeneous, heterogeneous, ring-like) and the maximum intensity time rate, the maximum enhancement divided by the time from injection to maximum signal% (MITR) and the overall maximum focal enhancement (MFE)[3].

Results:

39 cancers were found in women undergoing gene testing (BRCA1 (n=13), BRCA2 (n=12), p53 (n=2), FH Ov/Br (n=10)). Two women did not have MRI (BRCA1 (n=1), BRCA2 (n=1). Excluding women of p53 genetic mutation and those did not have MRI, 17 cancers were found in the prevalent round (7 - BRCA1, 5 - BRCA2, 5 - FH Ov/Br), 16 in the incident rounds (5 - BRCA1, 6 - BRCA2, 5 - FH Ov/Br) and 2 interval cancers (1 - BRCA1, 1 - BRCA2). Of the 18 incident and interval cancers, 9 tumours were visible on the retrospective review of previous screening examinations (2 - BRCA1, 4 - BRCA2, 3 - FH Ov/Br) and these cancers form our study cohort MFE of individual tumours shows an increase with time which is most rapid in the two BRCA1 tumours. MITR shows a tendency to increase with time. The 3 cancers in the FH Ov/Br group did not show increasing enhancement over time. No statistical correlation between MFE and tumour size was noted taking all tumours at the time of definitive diagnosis.





Conclusion:

This study suggests that tumours in women at high genetic risk show an increase in enhancement over time but the degree of enhancement is not related directly to lesion size. The two BRCA1 carriers showed the most rapid increase, but there were too few cases to make more detailed observations with regard to differences with genetic. Our observations suggest that in order to detect smaller, early breast cancers, a lower threshold of enhancement may be required when interpreting screening breast MRI examinations, although this has to be balanced against increased recall rates. Further work is required with larger numbers in order to confirm this observation and to examine interactions with tumour grade and size.

References:

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4. Warren RM et al. *Radiology* (2005) 236:779-788.