The use of computer-aided detection in evaluation of suspicious microcalcifications in screening mammography

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Background: The first FDA approval of a computer-aided detection device was in 1998. Computer-aided detection (CAD) for mammography applies calcification and mass algorithms to highlight areas of suspicious findings for reviewers to consider and intended to reduce false negatives. This study aimed to assess the sensitivity of CAD in detecting malignant and high-risk lesions presenting as microcalcifications in opportunistic screening population and to analyze the characteristics of missed microcalcifications.

Materials and methods: During 1 April 2016 to 30 June 2018, patients diagnosed of malignant and high-risk lesions (atypical ductal hyperplasia, papillary lesions, lobular neoplasia, mucocele-like lesion and cellular atypia) of breast through stereotactic guided biopsy in Kwong Wah Hospital were identified. Those referred from Well Women Clinic (WWC) for suspicious microcalcifications on full-field digital mammography (FFDM) were included. Patients with history of breast cancer were excluded. The FFDM images, CAD reports, biopsy records and pathology results were reviewed. Patient's age, breast density, the span, location, morphology and distribution of the microcalcifications and BI-RADS category were recorded. The FFDM images were processed with CAD software version 9.2 of Hologic SecurView system and the microcalcifications were categorized into CAD-detected and CAD-missed groups. Statistical analysis with Fisher's exact test and independent t-test was performed to identify any difference between the groups with SPSS software and $p<0.05$ was taken as statistically significant.

Results: A total of 260 female patients had undergone stereotactic guided biopsy with subsequent diagnosis of malignancy or high risk lesions. 143 patients were excluded due to cases not referred from WWC where CAD was not available. 117 patients with 121 sites of high- risk or malignant microcalcifications were included. Seventeen sites (8 malignant and 9 high-risk lesions, including ADH, papillary lesions, lobular neoplasia and flat epithelial atypia) were missed by CAD. Overall sensitivity of CAD was 85.9%, with sensitivity in detection of high-risk and malignant microcalcifications being 78.6% and 89.8% respectively. The morphology of microcalcifications was a factor with statistically significant difference between the two groups (p=0.007). Amorphous microcalcifications was identified as the most commonly missed morphology (p=0.011).

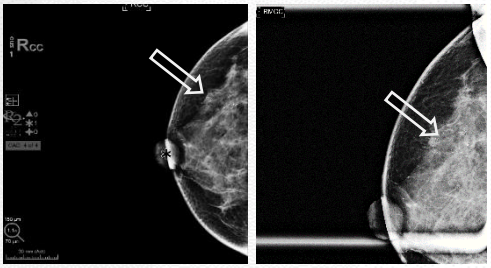
Conclusion: The sensitivity of CAD in detecting malignant and high-risk breast lesions presenting as microcalcifications was 85.9%. Amorphous microcalcifications was identified as the most commonly missed lesions.

Reference:

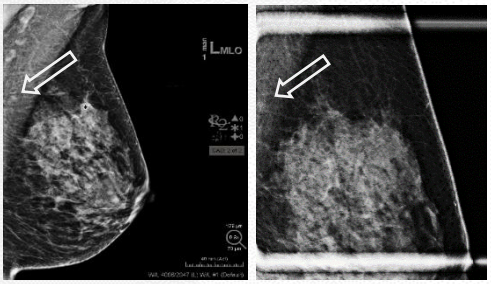
Dromain C, Boyer B, Ferre R, et al. Computed-aided diagnosis (CAD) in the detection of breast cancer. EJR 2013;82:417-423.

Table showing the span, morphology, distribution, tumour type of microcalcifications in CAD-missed and detected groups.

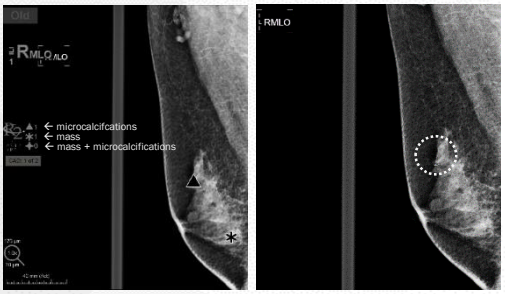
		Missed	Detected	P-value
Span	(mm +/- SD)	8.6 +/-5.4	11.5 +/-9.5	0.220
Morphology	Amorphous	11	32	0.007
	Punctate / round	3	23	
	Fine pleomorphic	2	37	
	Coarse heterogeneous	0	12	
	Fine linear branching	1	0	
Distribution	Group	13	88	0.480
	Segmental	4	16	
Tumor type	High risk lesions	9	33	0.313
	DCIS	7	58	
	Invasive CA	1	13	



Figures showing CAD missed fine linear branching microcalcifications in segmental distribution that was subsequently biopsied to be DCIS.



Figures showing CAD missed amorphous microcalcifications that was subsequently biopsied to be DCIS.



Figures showing CAD detected a group of coarse heterogeneous microcalcifications that was subsequently biopsied to be ADH.