

Association between automated, volumetric breast density measures and breast cancer in a large screening population

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1. Introduction

- The association between breast density and breast cancer risk has been established with semi-automated, area based measurement of breast density
- In this work we investigate the performance of a fully automated, volumetric method to predict breast cancer in a large screening population

2. Data

- 108,245 digital screening exams from 48,858 women
- Acquired between 2003 and 2012
- Mean age 59.2 years
- Hologic Selenia FFDM
- Cases: 729 biopsy proven malignant breast cancers (screen detected)
 - 361 only mammogram of detection available
 - 368 also priors available --> selected oldest exam (average time between exam and diagnosis 3.5 years)
- Controls: 107,516 mammographic exams
- Data on interval tumors not available from cancer registry yet

3. Breast density measurement

- Volpara 1.4.0: fully automated, volumetric method to measure breast density
- Averaged volume of fibroglandular tissue over MLO and CC and over left and right breast
- In case exam contained pathology: only averaged over non affected side



4. Data analysis

- Four density categories, based on dense volume
- Group sizes equal group sizes one would obtain with Volpara Density Grade scoring (four points scale analog to BI-RADS density scores)
- Logistic regression to adjust for age at mammography and breast volume, which served as a surrogate marker for BMI

5. Results

- An increase of one standard deviation in dense volume (34.31 cm³) corresponds to an adjusted OR of 1.23 (95% CI: 1.15-1.31) (*)

	V _{dens} (cm ³)	Controls	Cases	%	OR*	95% CI
1	0-36.5	13623	62	12.64	REF	-
2	36.5-65.8	51800	312	48.14	1.42	1.08-1.88
3	65.8-116.4	34203	280	31.86	2.07	1.53-2.81
4	>116.4	7890	77	7.36	2.64	1.80-3.88
(sum)		(107,516)	(729)	(100)		

- A sub analysis, in which we included only the 368 priors, and left out the 361 mammograms in which a cancer was detected, shows ORs of 1.33 (0.89-1.99), 1.87 (1.21-2.90), 2.26 (1.30-3.96) for category 2, 3, and 4 respectively (*)

(*): adjusted for age and breast volume

6. Conclusion

- High volume of fibroglandular tissue, as assessed by a robust, automated method, is associated with breast cancer, and may hence offer opportunities for personalised breast cancer screening
- Future analyses that will include interval tumors as well, are expected to provide even stronger risk estimates, as it is known that breast density is more strongly related to interval tumors than to screen-detected cancers