The Connecticut Experiment: The Role of Ultrasound in the Screening of Dense Breasts

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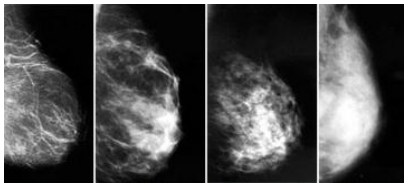
Purpose

To determine if screening breast ultrasound in women with mammographically normal but dense breasts is useful for the detection of breast cancer

Background

Breast cancer is the most common female malignancy and the 2nd leading cause of cancer related death in females in the U.S.



Mammography detects 98% of cancers in women with fatty breasts but only 48% in women with dense breasts. A 2007 study in JAMA showed that breast cancer risk is increased by a factor of 5 in women with dense breasts. ACRIN study showed that u/s detected an additional 4.2 cancers per 1000 high risk females. A 2004 study found that 90% of cancers detected by ultrasound alone were stage 0 or 1.

Methods

Retrospective chart review of 6 Radiology groups covering 12 sites in Connecticut Ultrasounds were performed by certified Ultrasound technologists using hand-held high resolution transducers (12-5 MHz). Images were taken at 12, 3, 6, and 9 o'clock sites in the radial and anti-radial position. Also requested information on positive biopsies including stage/ lymph node status, age of patient, and risk status of patient.

Results

A total of 78,778 screening mammograms and 8651 screening ultrasounds over the course of one year (10/09-10/10). Of the ultrasounds 86% were BIRADS 1 or 2, 9% were BIRADS 3, and 5% were BIRADS 4 or 5. There was 1 false negative and 28 cancers found on biopsy.

Sites	screening mammograms	screening ultrasounds	BIRADS 1 or 2	BIRADS 3	BIRADS 4 or 5	Cancers found	FN	Lost to f/u
1a	6807	334	271	40	23	7		u
1b	10,003	766	630	77	59	0		u
1c	4561	267	207	35	25	1		u
1d	9299	1339	1269	22	44	3	1	u
2a+b	8540	1125	946	156	23	1		2
2c	3057	747	562	135	50	1		u
3a+b	9943	512	386	42	84	4		9
4	8725	1703	1493	110	100	9		u
5	8845	1753	1591	142	20	2		u
6	8998	166	35	8	1	0		u
Total	78778	8651	7451	767	429	28		11

PPV:6.5% (28/429) NPV:99.9% (7450/7451)
Sensitivity: 96.6% (28/29) Specificity: 94.9% (7450/7852)

Site	Type	grade	size (cm)	Age	Fam. History
1	Invasive ductal carcinoma	2/3	1.5	48	Mat. grandma
1	Invasive lobular carcinoma	2/3	2.5x2	78	No
1	Infiltrating ductal carcinoma	2/3	2.2	50	No
1	Invasive lobular carcinoma	2/3	3X3	50	No
1	DCIS papillary intracystic	2/3	1.2	50	No
1	Invasive ductal/lobular carcinoma	2/3	1.2x0.8	58	No
1	Ductal/lobular carcinoma	3	1.5	57	No
1	DCIS	2/3	3.7x3.0	50	No
1	Mucinous/colloid	2/3	8	45	No
1	Invasive ductal/lobular carcinoma	2/3	1.2	61	Neg
1	Invasive ductal carcinoma	½	1.5	57	Mat. cousin
2	Invassive papillary	2	0.8		personal hx.
2	Infiltrating ductal carcinoma	2/3	2.2	50	No
3	Ductal carcinoma	2/3	0.7x0.4	62	
3	Ductal carcinoma		1.1x0.8	42	
3	Ductal carcinoma	2/3	0.8x0.5	49	
3	Ductal carcinoma	3/3	0.6x0.6	67	
4	Invasive lobular carcinoma				
4	Invasive lobular carcinoma				
4	Lobular carcinoma in situ				
4	Ductal carcinoma in situ				
4	Invasive				
4	Invasive ductal carcinoma				
4	Ductal carcinoma in situ				
4	Atypical ductal hyperplasia				
4	Atypical ductal hyperplasia				
5		3a		71	No
5		2a		44	Maternal aunt

Cost Analysis

The average cost of bilateral screening breast ultrasound in CT is $360 but average insurance reimbursement is $72. Using $250 for an ultrasound and $2,400 for each biopsy, 8617 screening breast ultrasounds would cost $2.15 million and find 28 cancers.
Approximately $110,000 per cancer found.
*This cost assumes that 10% of women with BIRADS 4 or 5 will elect not to have a biopsy performed

Conclusions

Screening breast ultrasound in women with dense breasts detects mammographically occult malignancy.

Limitations of the study include:

- Only about 50% of women with dense breasts received follow-up ultrasound and less then half of CT groups participated in the study
- Loss to follow up
- Only the 1st years worth of data was analyzed. There is likely a learning curve

Future Directions:

Potential use of Dedicated Whole Breast Ultrasound Screening Technology

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Resources

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