CIBC 2019

Chicago International Breast Course
The Westin Chicago River North
November 1-3, 2019

2019 Chicago International Breast Course
Advancing the Art of Breast Imaging

Countering Breast Density's Limitations: AUS is best

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Disclosures

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Noncorporate member of medical advisory board of Volpara Solutions

European Liaison for DenseBreast-In Europe

Countering Breast Density's Limitations
AUS is best

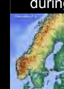
Learning Objectives

- Implications of breast density
- AUS:
  - Screening setting (CDR, recall rate)
  - Diagnostic setting (detectability, accuracy, PPV)
  - Interobserver agreement
- Other applications of AUS:
  - Second look US after MRI
  - Pre-operative staging
- Future perspectiv
  - ✓ CAD
  - ✓ Radiomics
  - ✓ Hybrid A
  - DBT
  - ✓ C lation of
  - ecular subtypes
  - BC

AUS is best

Impa of organized BC screening programs
Fatalities from the disease

omen ed 40 to 69 yrs (Sweden)
during yrs of the screening era (1977-2015)

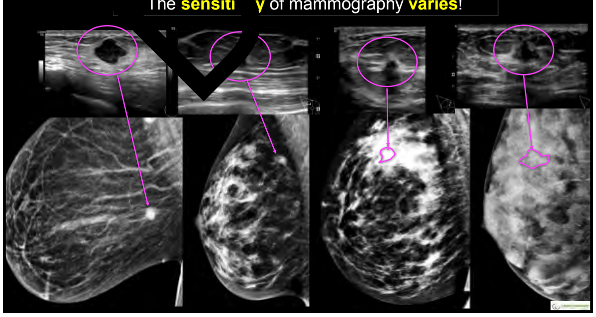


47% lower risk of dying from BC within 20 yrs after diagnosis of the disease

Screening Participation	Incidence of Breast Cancer per 100,000 (No./Total No.)	Fatality rate
No screening	181.7 (524/288,329)	79.1%
Yes screening	221.1 (1482/670,265)	41.6%

Tabar L. et al Cancer 2019; epub 11/9/18.

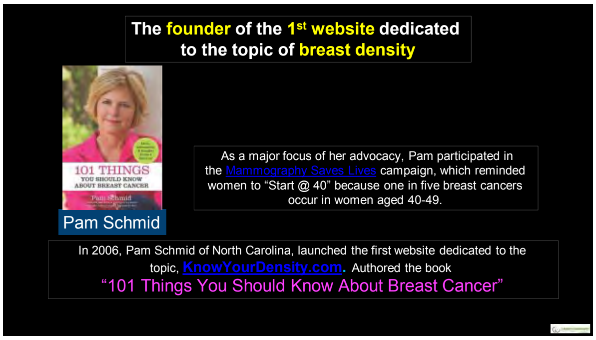
The sensiti y of mammography varies!

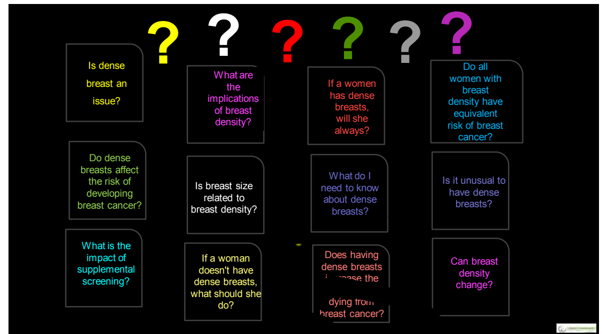


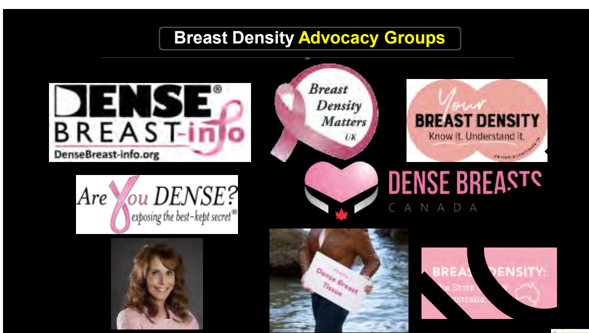
John Wolfe was the 1st to propose the topic of breast density

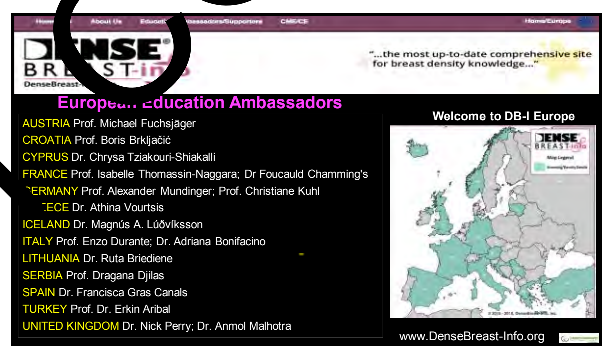
- The concept of mammographic breast density was first proposed by John Wolfe in 1976.
- He described the differences in breast cancer risk associated with variations in the mammographic appearance of the breast.
- The relationship of the most nodular/dense pattern with the risk of developing breast cancer.

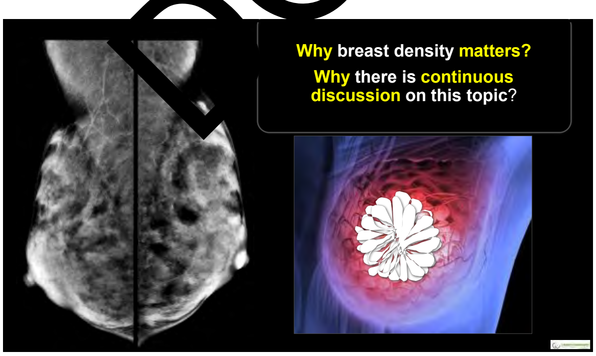
1. Wolfe NN. Cancer 1976;37(5):2486-92.
2. Wolfe NM. AJR 1976;126:1130-1139.

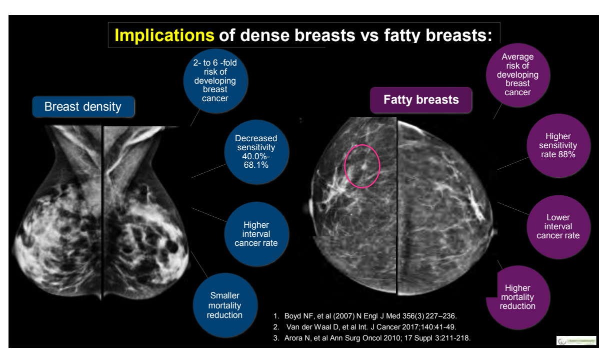

The founder of the 1st website dedicated to the topic of breast density
101 THINGS YOU SHOULD KNOW ABOUT BREAST CANCER
Pam Schmid
As a major focus of her advocacy, Pam participated in the Mammography Saves Lives campaign, which reminded women to "Start @ 40" because one in five breast cancers occur in women aged 40-49.
In 2006, Pam Schmid of North Carolina, launched the first website dedicated to the topic, KnowYourDensity.com. Authored the book
"101 Things You Should Know About Breast Cancer"


Is dense breast an issue?
What are the implications of breast density?
If a women has dense breasts, will she always?
Do all women with breast density have equivalent risk of breast cancer?
Do dense breasts affect the risk of developing breast cancer?
Is breast size related to breast density?
What do I need to know about dense breasts?
Is it unusual to have dense breasts?
What is the impact of supplemental screening?
If a woman doesn't have dense breasts, what should she do?
Does having dense breasts
dying from breast cancer?
Can breast density change?


Breast Density Advocacy Groups
DENSE BREAST-info
DenseBreast-info.org
Breast Density Matters UK
Your BREAST DENSITY Know it. Understand it.
Are You DENSE? exposing the best-kept secret
DENSE BREASTS CANADA


"...the most up-to-date comprehensive site for breast density knowledge..."
Education Ambassadors
AUSTRIA Prof. Michael Fuchsjäger
CROATIA Prof. Boris Brkljačić
CYPRUS Dr. Chrysa Tziakouri-Shiakalli
FRANCE Prof. Isabelle Thomassin-Naggara; Dr Foucauld Chamming's
ERMANY Prof. Alexander Mundinger; Prof. Christiane Kuhl
ECE Dr. Athina Vourtsis
ICELAND Dr. Magnús A. Lúðvíksson
ITALY Prof. Enzo Durante; Dr. Adriana Bonifacino
LITHUANIA Dr. Ruta Briediene
SERBIA Prof. Dragana Djilas
SPAIN Dr. Francisca Gras Canals
TURKEY Prof. Dr. Erkin Aribal
UNITED KINGDOM Dr. Nick Perry; Dr. Anmol Malhotra
Welcome to DB-I Europe
www.DenseBreast-Info.org


Why breast density matters?
Why there is continuous discussion on this topic?


Implications of dense breasts vs fatty breasts:
Breast density
Fatty breasts
2- to 6 -fold risk of developing breast cancer
Decreased sensitivity 40.0%-68.1%
Higher interval cancer rate
Smaller mortality reduction
Average risk of developing breast cancer
Higher sensitivity rate 88%
Lower interval cancer rate
Higher mortality reduction
1. Boyd NF, et al (2007) N Engl J Med 356(3):227–236.
2. Van der Waal D, et al Int. J Cancer 2017;140:41-49.
3. Arora N, et al Ann Surg Oncol 2010; 17 Suppl 3:211-218.

Breast Cancer Risk Factors and Relative Risk

One of the strongest predictors!

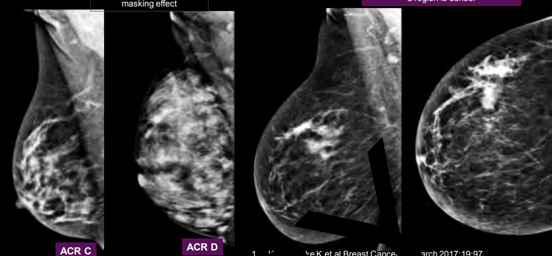
Risk Factors	Relative Risk
BRCA mutation	20
Lobular carcinoma in situ	8-10
Dense breast parenchyma	2-6
Previous benign biopsy	4-5
Geographical location	5
Cancer in the other breast	> 4
Exposure to ionizing radiation	3
Age at 1st full pregnancy	3
Family history 1st relative	>2
Age at menopause	2
Socioeconomic group	2
Taking exogenous hormones	1.2-2
Diet	1.5
Post-menopausal obesity	1.5
Alcohol consumption	1.3

McPherson K. et al BMJ 2000;321(7261)624-628.
Onega T. et al Cancer. 2014;120(19):2955-64.

Breast density and masking effect

Patterns ACR C, D have been associated with masking effect

"Masking effect" even in breasts where a region is dense!



1. ke K et al Breast Cance arch 2017;19:97.
2. al American College o logy, Reston, VA .

Breast density and "Masking effect"

Author	Journal	Total No. of cancers missed	No. of cancers missed due to density
Bird, 1993	Radiology 184:613-617	320	77 (24%)
Bae, 2014	Radiology 270;369-277	335	263 (78%
Ikeda, 2003	Radiology 226:494-503	172	18 (31%

Mamm graphic Density and the Risk and etection of Breast Cancer

Detection <12 Mo after Negative Screening

Mammographic Density	Case (N=124)	Control (N=124)	Odds Ratio	95% CI
< 10%	12	35	1.0	-
10 to <25%	22	29	2.1	(0.9, 5.2)
25 to <50%	33	29	3.6	(1.5, 8.7)
50 to <75%	32	23	5.6	(2.1, 15.3)
≥ 75%	25	8	17.8	(4.8, 65.9)
P value‡			<0.001	

Boyd NF, et al NEJM 2007;356:227-36.

Incr sed mortality rate
opparberg R ndomized Controlled Trial

Chiu SY . Cancer Epidemiol Biomarkers Prev; 19(5); 1219–28. 2010.

25-year follow-up

Effect of baseline breast density on the incidence, stage, and mortality, and also the natural course of the disease

Material and methods: n= of 16,703 women

Dense breast tissue

Women with dense breasts have about double risk of dying from BC compared to the general population!

Results:
- Higher incidence of BC
- Increased mortality rate of the disease
- Higher rate of IC
- More advanced cancer at diagnosis

Screening effect across breast density strata: A case-control study

Biennial screening ages 50-74 years old

Dutch screening program 1975-2008

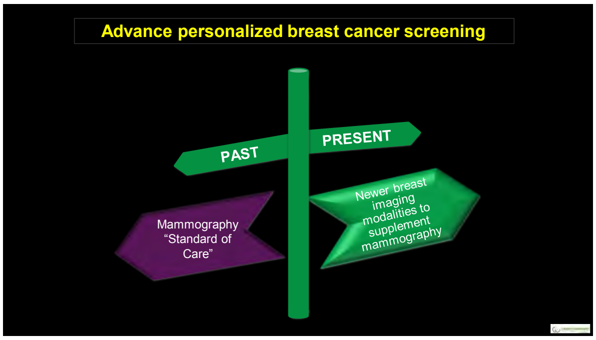
Objective: To assess the effect of screening on BC mortality in women with dense and fatty breasts

Results:

	Fatty breasts	Dense breasts
Sensitivity	75.7%	57.8%
Mortality reduction	41% (RR, 0.59) [95% CI 0.44-0.79]	13% (RR 0.87) [95% CI 0.52-1.45]

Mortality reduction was less in women with dense breasts compared to women with fatty breast!

Van der Waal D et al Int. J. Cancer 2016: 00,00-00.



Combined screening with mammography and US in a population-based screening program

Austrian US screening: Tyrol 2008-2012

No. 176,957 screening examinations
76.2% - Supplementary ultrasound

Purpose:

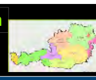
To compare the performance of screening with mammography combined with ultrasound versus mammography alone in women at average risk for BC

Main outcome measures:

- cancer detection rate
- sensitivity
- recall rate
- biopsy rate
- PPV of biopsy for combined screening with r   ‑raphy   s ultrasound versus mammography alone

Geiger-Gritsch S. e‑   ‑ral European Journal o‑   ‑ine;2018:130(3-4):92-99.

Austrian US screening: Tyrol screening program



CDR= 3.7 per 1000 screens
ICR was 0.33 and 0.47 per 1000 screens

	Dense breasts	Non-dense breasts
Overall Sensitivity Mammography alone	61.5%	86.6%
Overall Sensitivity Mammography and US	**81.3%**	95.0%
Recall rate	13.1 per 1.000 screens	10.5 per 1.000 ‑ ‑ens
Positive predictive value of biopsy	55.5% (95% CI 50.6%–60.3%)	43.3 (95% CI ‑ 4%–47.3%)

Supplemental US improves CDR in screening of women at a‑ ‑ge risk ‑BC.
Recall rates and biopsy rates can be kept within accep‑ ‑ limits

Geiger-Gritsch S. et al The Central European Journal of Me‑ ‑2018:130(3-‑).

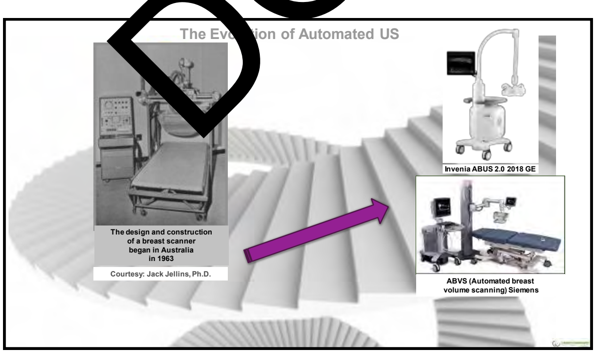
Results of HHUS studies

HHUS
- is operator dependent
- is not reproducible

Author	US examinations	US only detected cancers	Invasive cancers	Mean size, mm	CDR per 1000	Node negative %
Gordon 1995	12,706	44	44	11	2.4	N/R
Buchberger 2000	8103	35	35	9.1	3.9	33/35
Kolb 2002	[illegible]	37	36	9.9	2.7	25/28(89.3)
Corsetti 2008	9157	37	36	N/R	4	253/282 (89.7)
Berg 2012	7473	32	30	10	4.2	29/30 (96.7)
Bae 2014	106829	282	282	N/R	3.1	253/282 (89.7)
Weigert 2017	10810	25	25	10.9	2.8	20/25 (80.0)

363,866 women

Vourtsis A., Berg WA, Eur Radiol. (2018) 28:592-601.



The new generation of AUS

ABVS (Automated breast volume scanning) Siemens

Supine scanners

FDA approved

Invenia ABUS 2.0 (Automated Breast Ultrasound System) GE

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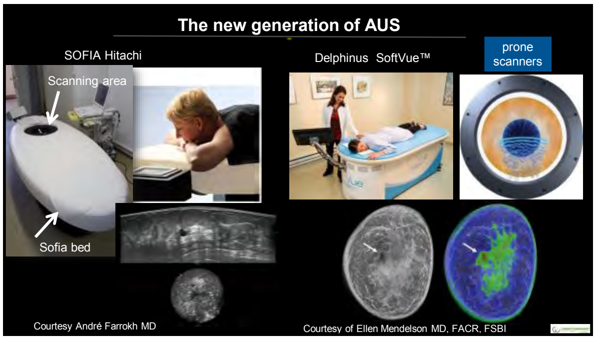
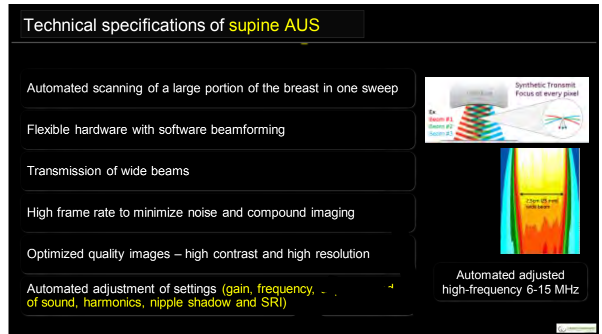
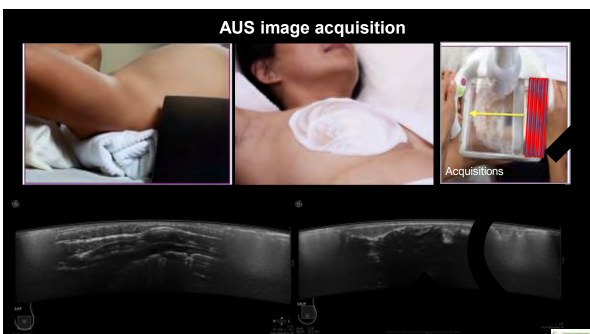
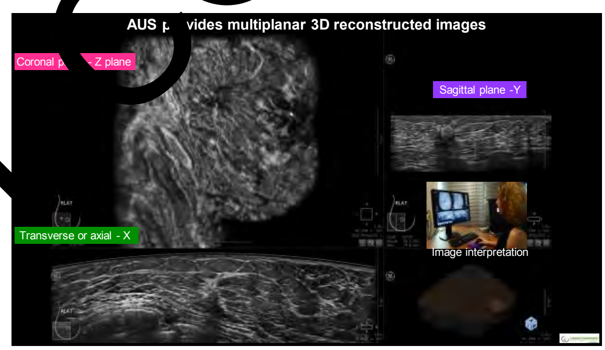
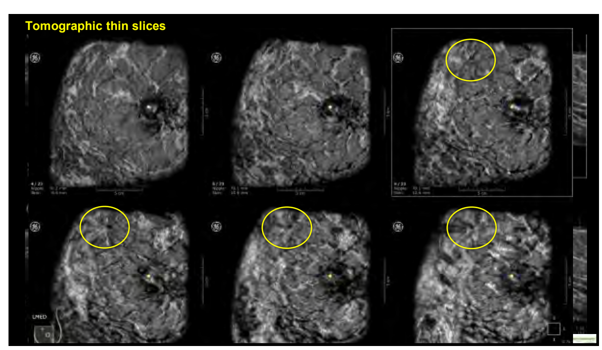
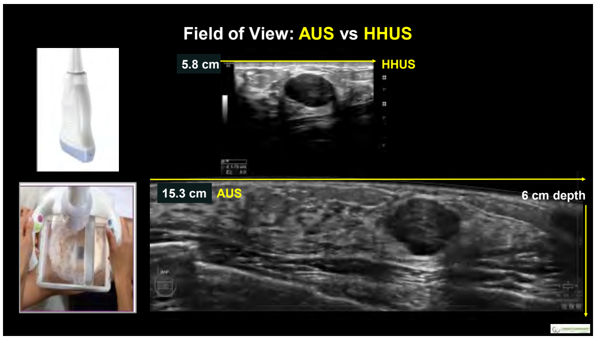


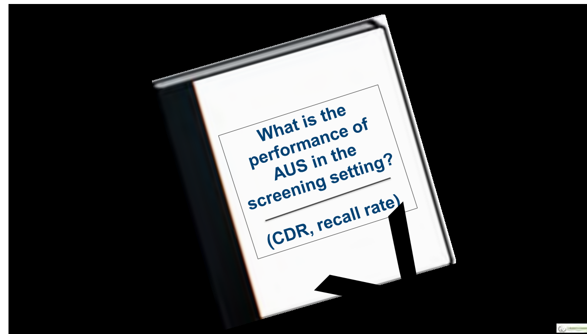


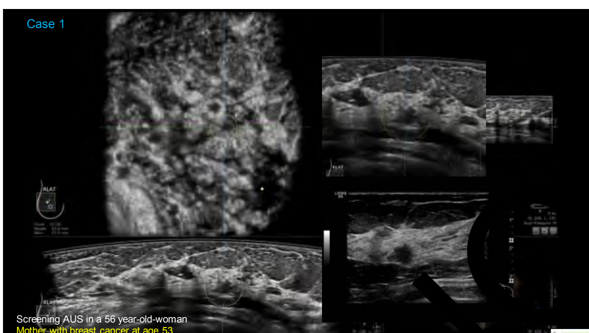


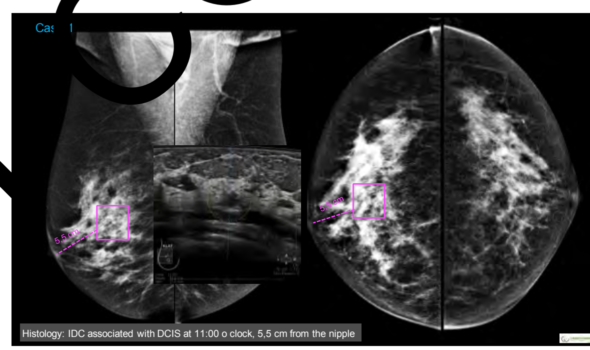












›sults of Sup‚ ›mental Screening with AUS

Author, Year	No c… screens with cancer outcome	…umber of …reens	…DR per 1000 screens	Net added recalls due to US % of screens	PPV3 of biopsies prompted only by US (%)	N invasive Total (%)	N Node Negative (%)
Kelly, 2010	23	6425	3.6	557 (8.7)	23/75 (30.7)	22/23 (95.7)	NR
Choi, 2014	7	1866	3.8	48 (2.6)	NR	4/7 (57.1)	4.4 (100)
Brem, 2015	30	15318	2	2063 (13.5)	30/551 (5.4)	28/30 (93.3)	25/27 (92.6)
Wilczek, 2016	4	1668	2.4	15 (0.9)	NR	4/4 (100)	2/4 (50)
Vourtsis, 2018	5	1886	2.7	NR	NR	5/5 (100)	5/5 (100)
OVERALL AUS	69	27,163	2.5	2683/25277 (10.6)	53/626 (8.5)	63/69 (91.3)	36/40 (90.0)

Berg WA. Vourtsis A. Journal of Breast Imaging. Accepted for publication.

AUS has equivalent performance in CDR to HHUS

Author, Year	Number of screens with Cancer Outcome	Number of Screens	CDR per 1000 screens	Net Added Recalls due to US (% of Screens)	PPV3 of biopsies prompted only by US (%)	N Invasive / Total (%)	N Node Negative (%)
OVERALL Physician-Performed HHUS (23 studies)	738	361,562	2.0	12,898/169,258 (7.62)	357/3313 (10.8)	631/719 (87.8)	497/554 (89.7)
OVERALL Technologist performed HHUS (7 studies)	144	64,018	2.7	4420/58,584 (7.54)	78/864 (9.0)	124/144 (86.1)	102/123 (82.9)
OVERALL AUS (5 studies)	69	27,163	2.5	2683/25,277 (10.6)	53/626 (8.5)	63/69 (91.9)	36/40 (90.0)
Kelly, 2010	23	6425	3.6	557 (8.7)	23/75 (30.7)	22/23 (95.7)	NR
Choi, 2014	7	1866	3.8	48 (2.6)	NR	4/7 (57.1)	4/4 (100)
Brem, 2015	30	15318	2.0	2063 (13.5)	30/551 (5.4)	28/30 (93.3)	25/27 (92.6)
Wilczek, 2016	4	1668	2.4	15 (0.9)	NR	4/4 (100)	2/4 (50)
Vourtsis, 2018	5	1886	2.7	NR	NR	5/5 (100)	5/5 (100.0)

Berg WA. Vourtsis A. Journal of Breast Imaging. Accepted for publication.

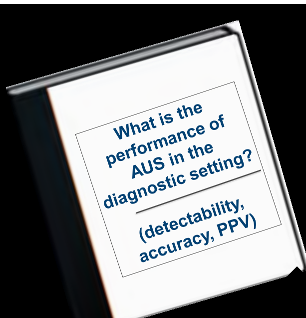
Technical advancements of AUS

1. Advantages of AUS vs HHUS
   - Operator independent
   - Large field of view / multiplanar / tomographic thin slices
   - Uncoupling between the operator and the interpreter – Saving physician's time
   - Less training
2. High reproducibility of images
3. Batch reading and double reading
4. Virtual review of volumetric data
5. Coronal plane: provides information on the extent of the disease and demonstrates the "retraction phenomenon sign"

The impact of MPR images compared to the transverse plane

- AUC from 0.82 (transverse reading solely) to 0.87 (transverse + MPR).
- Downgrade of 3-18% of the biopsied benign lesions to BI-RADS 2 after MPR evaluation.
- Retraction pattern visualized in the coronal plane in all infiltrating carcinomas.
- MPR provided specificity 100% and sensitivity 80% for detection of breast cancer.
- Inter-reader agreement of the BI-RADS final assessm   nt improved from 0.367 to 0.536 after MPRs.
- Retraction pattern can be completely absent in fast g   wing-carcinomas (triple-negative.

1. Van Zels   et al Acad Radiol 2016.
2. Van Zheng   et al EJR 2017.



Detectabili   of breast lesions in AUS vs. HHUS

Stu	mber of patients	Number of lesions	Positive predictive value (%)	3D AUS detection rate (%)	HHUS detection rate (%)
Kim et al. 2013	38	66	NR	84.8 to 86.3 across three radiologists	93.9
Lin et al. 2012	81	95	NR	100	100
Wang et al. 2012a	213	239	73	99.6	98.7
Wang et al. 2012b	155	165	94.2	97.6	95.8
Xiao et al. 2015	300	417	NR	100	78.2
Zhang et al. 2012	81	99	NR	89.9 to 100 across the two examiners	60.6 to 85.9 across the two examiners

Vourtsis A. Diagn Interv Imaging 2019;100(10):579-592.

D   ectability of   reast lesions in AUS vs. HHUS

Lesions missed were less than 5 mm in size on both AUS and HHUS

Number of Studies	No of Lesions	Detectability Rate		No of lesions
13	2384	AUS	94.2%	2246/ 2384
		HHUS	91.0%	2169/ 2384

1. Vourtsis A. Diagn Interv Imaging 2019;100(10):579-592
2. Vourtsis A. Berg WA, Eur Radiol. 2018;28:592-601.

Detectability of breast lesions at AUS

Variables affecting detectability
- mass size
- shape
- surrounding tissue

1. Vourtsis A. Diagn Interv Imaging 2019;100(10):579-592.
2. Chang JM.et al Acta Radiol 2015 Oct;56(10):1163-70.

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The performance of ABUS versus HHUS in the visualisation and BI-RADS characterization of a cohort of 1,886 women

Athina Vourtsis & Aspasia Kachulis
Eur Radiol (2018) 28:592-601.

N= 1,886 women with dense breast
ABUS and HHUS

This study aimed to evaluate (ABUS) compared to (HHUS) in the visualisation and BIRADS characterisation of breast lesions.

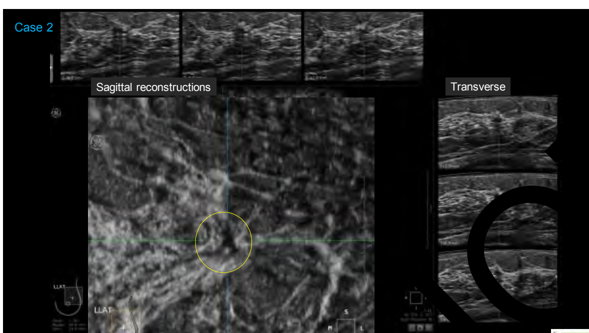
ABUS seemed to outperform HHUS in the detection of architectural distortion on the coronal plane and can supplement mammography in the detection of non-calcified carcinomas in women with dense breasts.

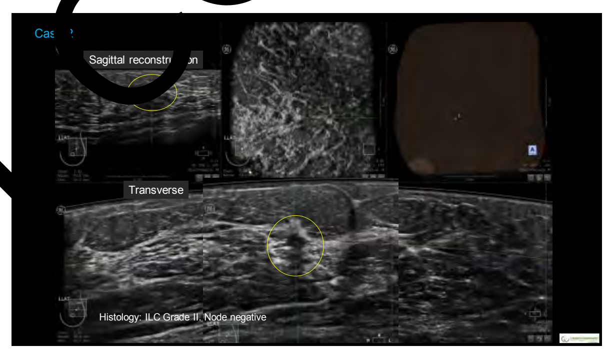
Reliability of AUS: Reproducibility and consistency of breast lesions across multiple readers

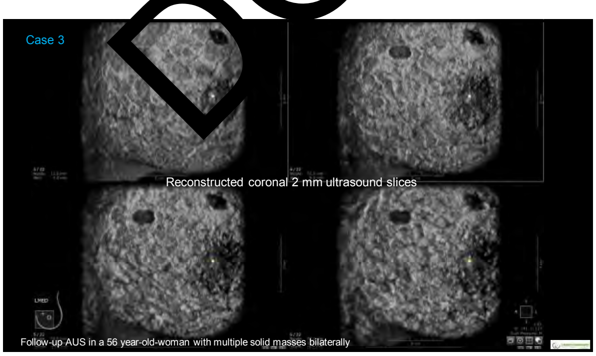
- Lesion visibility
- Reproducibility of documented location (clockface location distance from nipple, and lesion depth)
- Size of the lesion
- Lesion characteristics

AUS provided reproducible images for mass localization, size measurement and characterization

Chang J.M. et al European Journal of Radiology 78 (2011) 99-103.







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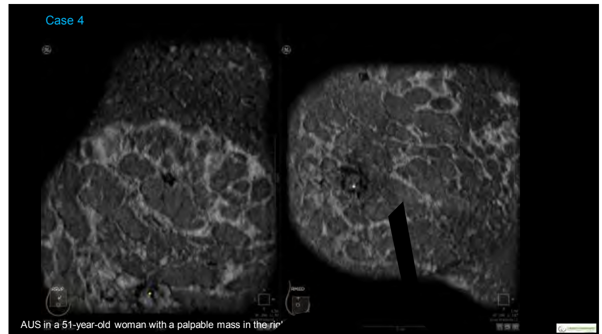
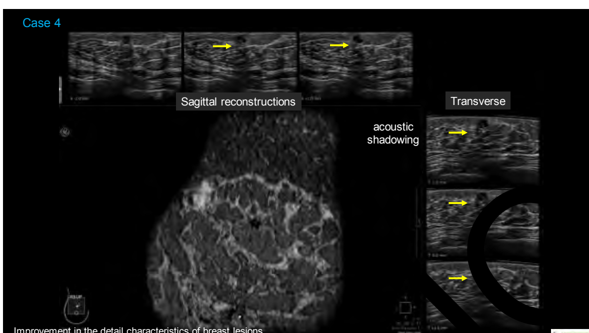
Accuracy in the differentiation of malignant versus benign lesions with AUS

Study	Number of patients	Sensitivity (%)	Specificity (%)	Positive Predictive Value (%)	Comparative evaluation versus HHUS
Kim 2013a	38	88.0 to 96.0, across three radiologists	81.3 to 93.8, across three radiologists	NR	No significant differences
Kotsianos-Hermle 2009	97	96.5	92.3	NR	No significant differences
Lin 2012	81	100	95	NR	3D ABUS had a higher diagnostic accuracy than HHUS for breast neoplasms, but no statistical tests were presented for this comparison
Wang 2012a	213	95.3	80.5	73	No significant differences
Wang 2012b	155	96.1	91.9	95.2	No significant differences

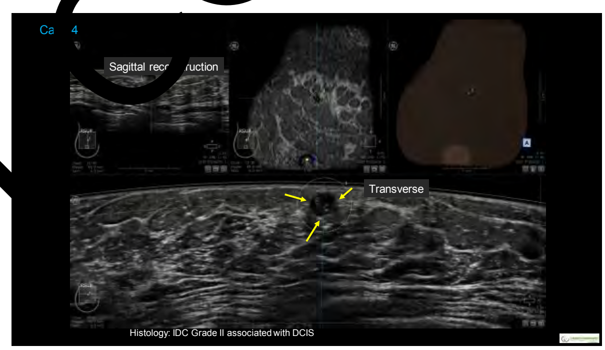
Vourtsis A. Diagn Interv Imaging 2019;100(10):579-592.



AUS in a 51-year-old woman with a palpable mass in the ri[illegible]



Improvement in the detail characteristics of breast lesions



Histology: IDC Grade II associated with DCIS

Accuracy i[illegible] differenti[illegible]ing malignant from benign lesions

No of studies	No of [illegible]ers	Detectability Rate		
20	1405	AUS	94.3%	1325/ 1405
		HHUS	93.3%	1311/ 1405

Vourtsis A. Diagn Interv Imaging 2019;100(10):579-592.

Meta-analysis of the diagnostic performance of the ABVS and HHUS

Technology	Sensitivity (95% CI)	Specificity (95% CI)
ABVS	90.8% (88.3%-93.0%)	82.2% (80.0%-84.2%)
HHUS	90.6% 88.1%-92.8%	81.0% 78.8%-83.0%

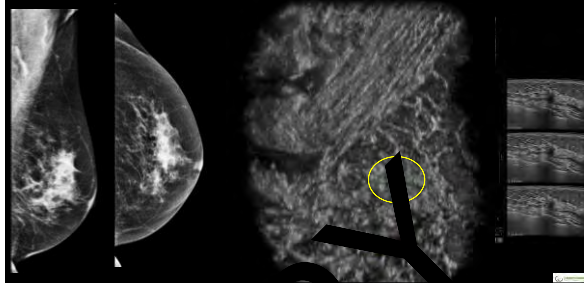
Wang L. Qi. et al 2019; Ultrasound Med Biol 45 (8)1874-81.

Studies examining the between-observer agreement in AUS BI-RADS categorization

Study	Number of patients	Number of examiners	BI-RADS categories used in the study	Kappa for the between-observer agreement in 3D AUS
Golatta 2013	42	6	Two categories: BI-RADS 1-2; 4-5	0.52
Kim. 2013a	38	3	Five categories: 1; 2; 3; 4; 5	0.57
Shin 2011	55	5	Six categories: BI-RADS 1-2; 3; 4A; 4B; 4C; 5	0.63
Skaane 2015	90	5	Five categories: BI-RADS 1; 2; 3; 4; 5	0.07-0.34, across participating radiologists
Vourtsis 2018	1886	2	Five categories: BI-RADS 1; 2; 3; 4; 5	0.99
Wang 2012b	155	2	Two categories: BI-RADS 1-3; 4-5	0.44
Wojcinski 2013	100	2	Two categories: BI-RADS 1/2; 0/3/4/5	0.36
Zhang 2012b	208	2	Three categories: BI-RADS 3; 4; 5	0.70

Vourtsis A. Diagn Interv Imaging 2019;100(10):579-592.

Improved diagnostic performance using combined AUS and mammography interpretation



Interpretation of (ABUS) with and without knowledge of mammography: a reader performance study

Per Skaane et al. Acta Radiol. 6 (4):404-412.

Purpose:

To compare reader performance and inter-observer variation of ABUS alone and in combination with mammography.

Retrospective study. One hundred and fourteen breasts in 90 women examined by digital mammography and ABUS were interpreted by five radiologists using BI-RADS categories.

Results:

There was a considerable inter-observer variability for ABUS alone and combined reading, respectively.

Conclusion:

Observer agreement was higher and all radiologists improved diagnostic performance using combined ABUS and mammography interpretation.

Other applications of AUS

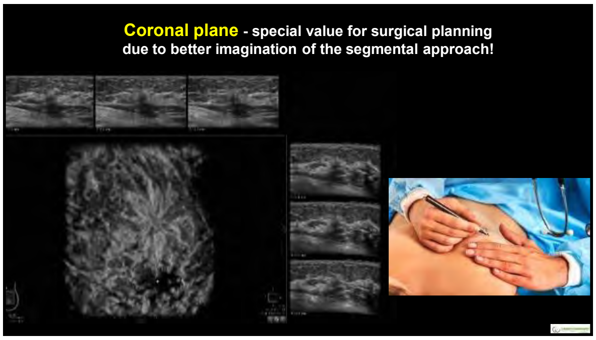
- Utilization of AUS as a second look US after MRI
- Pre-operative staging

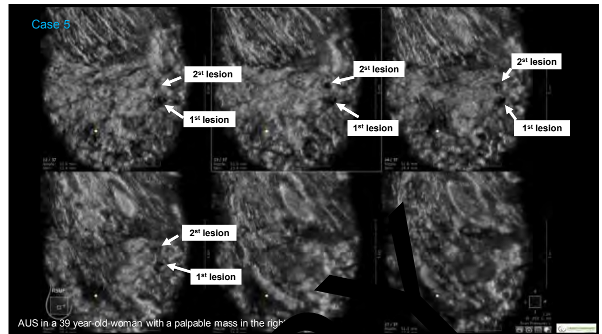
Utilization of AUS as a second look US after breast MRI

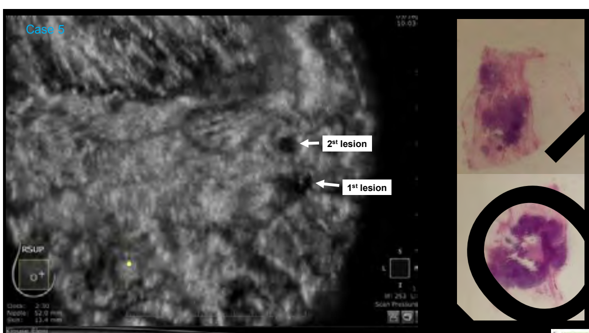
Studies	Lesions detected with AUS	Lesions detected with HHUS	Comments
Chae EY, et al 2013	70/80	65/80	10% of AUS detected lesions were not detected on HHUS
Girometti R, et al 2018	Comparable results (69.3 vs. 71.5%)		AUS showed better agreement with histology
Kim Y, et al 2016	94.7%	86.8%	Higher values of detection rate for AUS

AUS had significantly higher accuracy than those determined by HHUS

	Volumetric measurement		
	AUS	HHUS	Comments
Tozaki M, et al 2010	98% accurate with a length deviation of <2 cm	Not reported	Promising results in the extent of cancer assessment
Hu C, et al 2016	Higher accuracy	Lower accuracy	Measurement of largest tumor diameter, tumor volume and tumor surface area
Li N, et al 2013	64%, 15% and 21%	42%, 15% and 42%	AUS performed better than HHUS
Huang A, et al 2016	2.5±0.8 cm	2.0±0.9 cm	AUS more accurate than HHUS

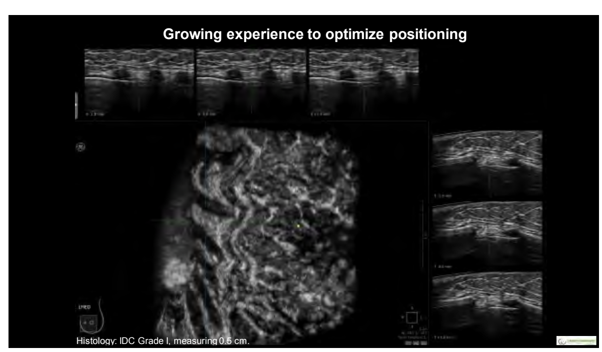


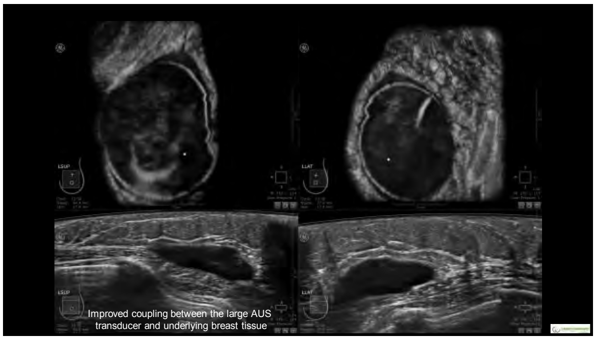


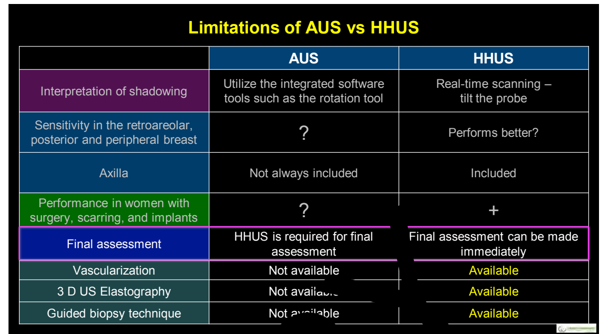


Limitations of AUS vs HHUS

	AUS	HHUS
Interpretation of shadowing	Use the integrated software tools such as the rotation tool	Real-time scanning – tilt the probe
Sensitivity in the retroareolar, posterior and peripheral breast	?	Performs better?
Axilla	Not always included	Included
Performance in women with surgery, scarring, and implants	?	+
Final assessment	HHUS is required for final assessment	Final assessment can be made immediately
Vascularization	Not available	Available
3 D US Elastography	Not available	Available
Guided biopsy technique	Not available	Available







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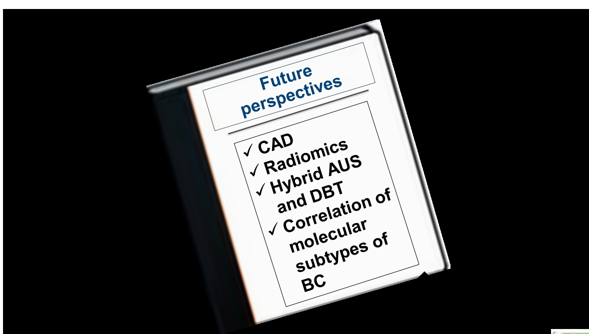
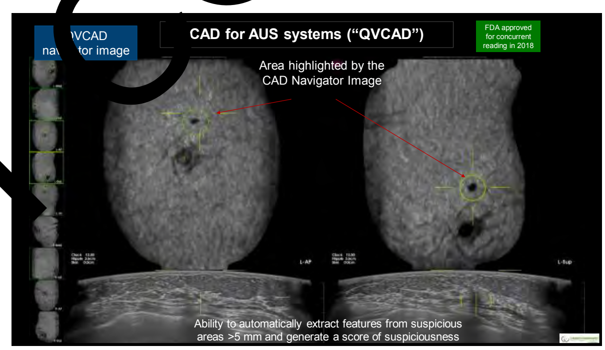
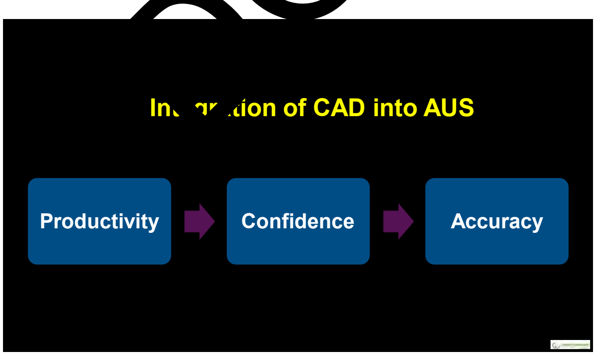
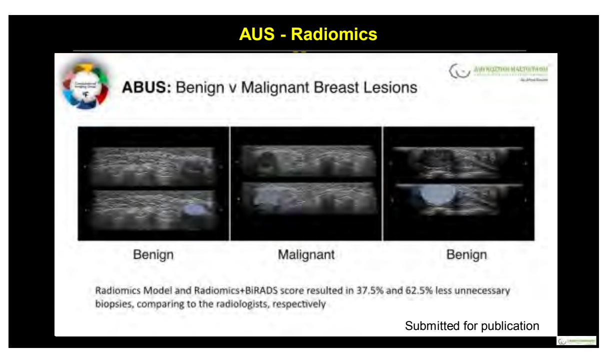
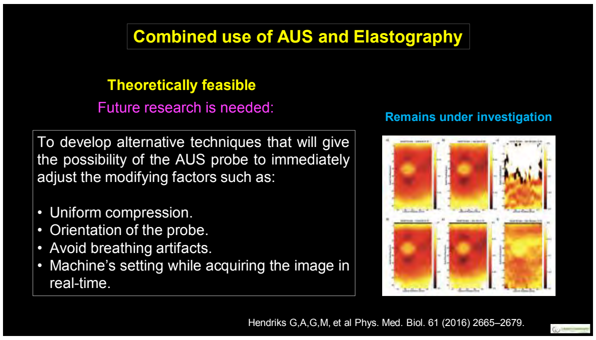
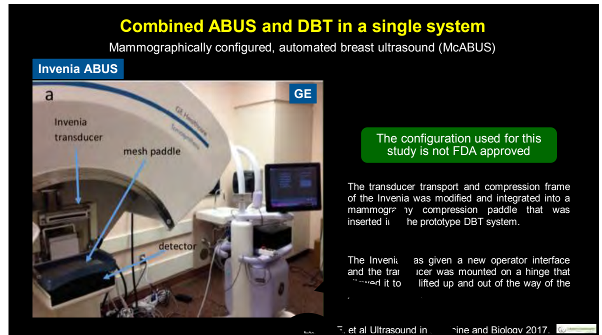


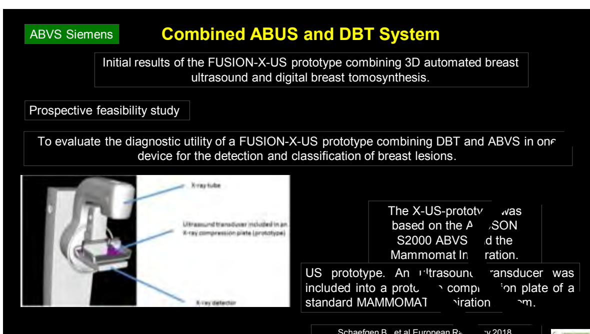


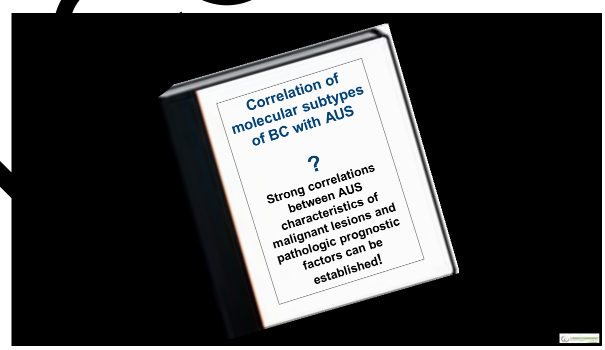


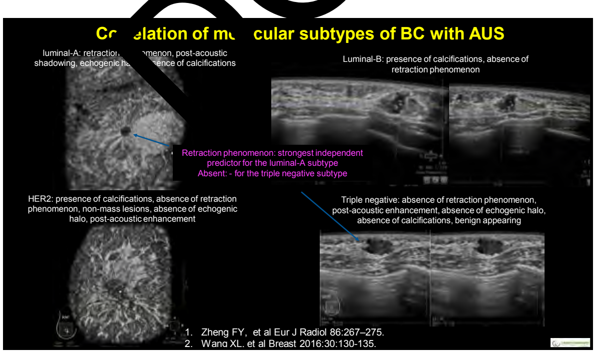


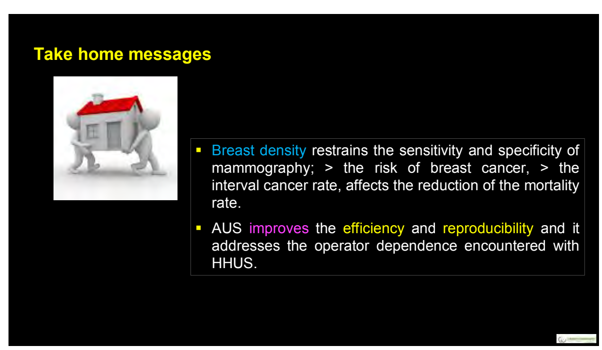

Combined use of AUS and Elastography
Theoretically feasible
Future research is needed:
To develop alternative techniques that will give the possibility of the AUS probe to immediately adjust the modifying factors such as:
• Uniform compression.
• Orientation of the probe.
• Avoid breathing artifacts.
• Machine's setting while acquiring the image in real-time.
Remains under investigation
Hendriks G,A,G,M, et al Phys. Med. Biol. 61 (2016) 2665–2679.


Combined ABUS and DBT in a single system
Mammographically configured, automated breast ultrasound (McABUS)
Invenia ABUS
GE
a
Invenia transducer
mesh paddle
detector
The configuration used for this study is not FDA approved
The transducer transport and compression frame of the Invenia was modified and integrated into a mammogra y compression paddle that was inserted i he prototype DBT system.
The Inveni as given a new operator interface and the tra icer was mounted on a hinge that lifted up and out of the way of the
et al Ultrasound in ine and Biology 2017.


ABVS Siemens
Combined ABUS and DBT System
Initial results of the FUSION-X-US prototype combining 3D automated breast ultrasound and digital breast tomosynthesis.
Prospective feasibility study
To evaluate the diagnostic utility of a FUSION-X-US prototype combining DBT and ABVS in one device for the detection and classification of breast lesions.
X-ray tube
X-ray detector
The X-US-prototy was based on the A SON S2000 ABVS d the Mammomat In ration.
US prototype. An ltrasoun ransducer was included into a prot compi on plate of a standard MAMMOMAT iration m.
Schaefgen B. et al European R 2018.


Correlation of molecular subtypes of BC with AUS
?
Strong correlations between AUS characteristics of malignant lesions and pathologic prognostic factors can be established!


Cr elation of m cular subtypes of BC with AUS
luminal-A: retraction menon, post-acoustic shadowing, echogenic h ence of calcifications
Luminal-B: presence of calcifications, absence of retraction phenomenon
Retraction phenomenon: strongest independent predictor for the luminal-A subtype
Absent: - for the triple negative subtype
HER2: presence of calcifications, absence of retraction phenomenon, non-mass lesions, absence of echogenic halo, post-acoustic enhancement
Triple negative: absence of retraction phenomenon, post-acoustic enhancement, absence of echogenic halo, absence of calcifications, benign appearing
1. Zheng FY, et al Eur J Radiol 86:267–275.
2. Wang XL. et al Breast 2016;30:130-135.


Take home messages
▪ Breast density restrains the sensitivity and specificity of mammography; > the risk of breast cancer, > the interval cancer rate, affects the reduction of the mortality rate.
▪ AUS improves the efficiency and reproducibility and it addresses the operator dependence encountered with HHUS.

Bright Future!

Why is AUS Best?

Technological Advances	
HHUS	**AUS**
Operator variability	Non-operator dependent
Inconsistent scanning technique	Standardized – reproducible - consistent
Small FOV	Large FOV
Physician performed in Europe	Performed by technologists
Images captured by technologists	Virtual reading by radiologists
> training	< training

Bright Future!

Why is AUS Best?
Clinical aspects of AUS

- AUS has equivalent performance in CDR compared to HHUS.
- Similar performance in diagnostic accuracy. AUS outperformed as a second look US after MRI. Higher accuracy in the extend of the disease.
- Standardized BI-RADS lesion reporting and characterization.
- Batch reading and double reading is feasible.
- Ability to apply different applications– sc[illegible]stic, second look after MRI, preoperative assessment.

Thank you!

Herodion Theater, Athens GR

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Director of Diagnostic Mammography Center, Athens Greece
Founding President of the Hellenic Breast Imaging Society
European Liaison and Member of the Medical Advisory Board of DenseBreast[illegible]org