

EUSOBI
european society of breast imaging



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ABSTRACT SYLLABUS

In cooperation with the Breast Diagnostics Section
of the Hungarian Society of Radiologists



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ABSTRACTS

MAMMOGRAPHY & DBT

Synthetic mammograms, what can you see?

A. Athanasiou; Athens/GR

BODY

Digital Breast Tomosynthesis DBT has been approved by U.S Food and Drug Administration FDA in 2011, both as a screening and as a diagnostic tool. Multiple studies have confirmed the added diagnostic value of DBT. DBT reduces tissue overlap, thus facilitating lesion depiction and differentiation between true lesions and normal variants. The combination of DBT with 2D full-field digital mammography FFDM has shown better sensitivity and specificity for cancer detection than FFDM alone. However, this combination comes at an expense of increased examination time and increased radiation dose (even if it is under the MQSA limit of 3mGy per view, still it is more than FFDM view alone).

Synthetic mammograms SM refer to 2D images reconstructed from DBT data; reconstruction algorithms and post-processing procedures depend of the different manufacturers. Because they are processed by the already acquired DBT images, SM require no further acquisition time and no further radiation dose, thus "palliating" the aforementioned inconvenience of "combo" mode DBT+FFDM.

Synthetic mamograms have been approved by FDA on May 2013. They aim to replace FFDM views in the screening setting, resulting in a DBT+SM mode. Studies have shown comparable sensitivity and specificity for the detection of cancer between FFDM+DBT and SM+DBT. Some studies have shown that SM could increase conspicuity of calcifications, architectural distortions and spiculated masses, this is subject however to the vendor-specific SM algorithm design. Small isodense masses and subtle asymmetric densities might still be better depicted on FFDM views.

SM might suffer from tissue blurring, artifacts from clips/foreign bodies, pseudocalcifications and decreased axillary contrast resolution.

As with every emerging technique, strengths and weaknesses should be considered before implementing SM in routine practice. Further improvement of the processing algorithms is mandatory.

TAKE HOME POINTS

- SM are reconstructed from DBT Data.
- They require no further acquisition time and no further radiation dose.
- They aim to replace FFDM in routine practice, thus potentially permitting a SM+DBT mode instead of the current FFDM+DBT combo mode.
- Synthetic Image quality depends upon the vendors specific algorithms and post-processing procedures.

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MAMMOGRAPHY & DBT

DBT in screening

A. Frigerio; Torino (TO)/IT

BODY

Mammography screening (MS) is an evidence-based, effective and efficient means of significantly reducing breast cancer (BM) mortality by as much as 50% in regularly attending women. The biggest challenge has then become to expand its impact on BC mortality - and immediately the idea would be of overcoming mammography well-known limitations, especially in dense breasts, by supplementing it with different techniques, more capable to read through all the different breast patterns. Digital breast tomosynthesis (DBT) has stood out in the last decade as the most promising development of MS, due to the wealth of research that have proven its potential to dramatically increase cancer detection rates, and to the fact of being in fact a special development of the mammography technique. This implies that, apart from a major demand on radiologists' reading times, DBT screening would not require significant changes to the screening organization, as would be the case with two other extremely interesting technical alternatives, ie automated whole breast ultrasound (AWBUS) and breast MRI. On this basis, the implementation of DBT in the screening protocol has actually started in a few organized programs in Europe. Early concerns about higher radiation exposures have largely been overcome by the introduction of the "synthetic" 2-D projection. However, recent evidence raised strong issues for scientific debate, including the possibility of substantial overdiagnosis, as the still relatively sparse data on DBT impact on interval cancer (IC) rates have not proved as yet the significant benefits expected on the basis of the very high detection rates achieved.

DBT role in MS has to be viewed within a broader concept of screening evolution that should take into account: (1) proper validation of the new technologies (DBT, AWBUS, MRI), focused primarily on their impact on IC and advanced cancer rates; (2) cost-effectiveness and practical feasibility analyses, in a context of tailorization of screening where one or more technologies may be offered alone and/or in combination/sequence depending on stratification of personal characteristics; and speaking of resources, a breakthrough is to be expected through AI and CAD systems dedicated to the new tomographic technologies; (3) the huge potential of these new techniques to cope with the denser breasts and thus to offer an enhanced means to expand the age target of MS to younger women; (4) a new paradigm of screening where concerns on 'overdiagnosis' will be set against the urgent need of a clear perception of the conspicuous 'overtreatment' already present in our standard MS practice: the solution has to come by substantially reducing the treatment burden in the small, unifocal, screen-detected cancers, which in turn requires a closer collaboration between Pathologists and Radiologists (the "Alliance of the Iconologists").

TAKE HOME POINTS

- Mammography screening can reduce breast cancer mortality by 50% in attending women.
- DBT has stood out in the last decade as the most promising development of screening, due to its being a sort of 'enhanced' mammography with a potential to dramatically increase cancer detection rates.
- Recent evidence raised the issue of potential overdiagnosis, as the data on DBT impact on interval cancer rates have not proved as yet the significant benefits expected.
- A broader concept of screening evolution should take into account the proper validation of the new technologies (DBT, AWBUS, MRI), focused primarily on their impact on advanced cancer rates; cost-effectiveness and practical feasibility analyses; in a context of tailorization of screening based on the stratification of personal characteristics.
- Concerns on potential 'overdiagnosis' should be set against the clear perception of the conspicuous 'overtreatment' already present in our standard MS practice, of the small, unifocal, screen-detected cancers.
- A closer collaboration between Pathologists and Radiologists is warranted (the "Alliance of the Iconologists").

MAMMOGRAPHY & DBT

Tomo guided biopsy

D. Bernardi; Milan/IT

BODY

Following the diffusion of screening mammography in asymptomatic women, the number of non-palpable suspicious breast abnormalities that need to be assessed increased by the time. More over, after the introduction of Digital Breast Tomosynthesis (DBT), due to the detection of some abnormal findings seen only at DBT this number is further increased [1]. As well as those detected by mammography, suspicious breast lesions identified by DBT require histologic evaluation to define whether they are benign or malignant. Also in such cases needle biopsy should be the first option instead of open surgery because of the several advantages that this minimally invasive procedure offers: besides reducing costs, needle biopsy reduces the impact on the patient in terms of physical and psychological stress; lastly it overcomes the problem of scarring after a surgical biopsy which may impair future imaging [2]. Since it is well accepted, quick, readily accessible and less costly, an ultrasound-guided biopsy should be done first in case of lesions visible by ultrasound. Any lesions sonographically occult should instead undergo stereotactic biopsy, which will be guided by Digital Breast Tomosynthesis in case they are identified only by DBT [3].

Most DBT-guided needle biopsies are achieved by devices added onto DBT units which allow to perform needle biopsies on patients sitting upright or recumbent; an alternative to these "add-on" systems is represented by a prone-table with an integrated DBT detection system on which the patients should be placed lying down in a prone position.

Compared to stereotactic biopsy, DBT approach has several advantages. Firstly, the target lesion localization phase is much more accurate because its depth inside the compressed breast (i.e. the Z axis) is defined simply scrolling through the DBT-scout view. This allows the easy identification also of those lesions (such as distortions) not always clearly visible in the pair of stereotactic views. The procedure is consequently faster: a significant reduction in time required for biopsies performed using DBT guidance compared to those for stereotactic ones has been reported from some Authors. Lastly, DBT-guided seems to be safer for patients who usually tolerate it well, showing a lower risk of vasovagal reactions, such as malaise, nausea, vomiting and even fainting [4-6].

This justifies the increasing use of DBT-guided needle biopsies also for lesions identified by standard mammography that usually underwent to stereotactic approach.

TAKE HOME POINTS

- The introduction of Digital Breast Tomosynthesis (DBT), through the detection of some abnormal findings seen only at DBT, increased the number of non-palpable suspicious breast abnormalities that require histologic evaluation.
- Needle biopsy is the first option before open surgery. If sonographically occult, any suspicious lesions should undergo stereotactic biopsies which will be guided by Digital Breast Tomosynthesis when identified only by DBT.
- DBT-guided needle biopsies are done using devices added onto Tomosynthesis units and/or a prone-table with an integrated DBT detection system
- DBT-guided needle biopsy, compared to the stereotactic-guided one, showed several advantages which led to the increasing use of this guidance system.

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ULTRASOUND

Second look ultrasound

P. Clauser; Vienna/AT

BODY

It is common knowledge that contrast enhanced magnetic resonance imaging (MRI) is able to detect lesions in the breast that are not visible with other non contrast-enhanced imaging modalities. This can be seen in more than one fourth of the examinations. After a careful analysis of these lesions, if the findings are suspicious, methods for further characterization are needed. Second look ultrasound plays a leading role in the further characterization of MRI-only lesions. Before performing second look ultrasound, it is important to accurately define on MRI lesion position, size and characteristics, as well as be aware of the surrounding anatomy. All MRI lesions should be evaluated with ultrasound, as it is currently not possible to state from the MRI characteristics, which lesions will be detected and which not. Additional ultrasound features, such as Doppler, tissue harmonic imaging and elastography, should be used as additional tools to help in the identification of the MRI lesions. Second look ultrasound can be used to target the biopsies and avoid a MRI-guided biopsy, and - in some selected cases - it could be also used to avoid biopsy for probably benign findings. The experience of the radiologist with all breast imaging modalities is of outmost importance to perform second look ultrasound, as currently there is not a wide variety of new technologies to help in this task.

TAKE HOME POINTS

- Additional, unexpected findings are common in breast MRI - irrespectively of the indication.
- Management starts with a careful interpretation of the MRI image.
- Second look ultrasound is the first line examination to characterize and eventually biopsy additional MRI finding.
- It is always worth it to perform Second look ultrasound, irrespectively of lesion type and dimensions

ULTRASOUND

Elastography

S. Gultekin; Ankara/TR

BODY

Breast ultrasonography (US) is widely used in breast imaging, however it has lower specificity. Ultrasound elastography (USE) is the most important complimentary US technology to improve the specificity of US. USE is an imaging method for the assessment of tissue stiffness, and allows noninvasive characterization of breast masses. The known high stiffness of most cancers compared with both the normal breast and with benign lesions forms the basis of elastography. Currently, there are two types of USE; strain and shear wave elastography (SWE). Strain elastography measures longitudinal displacement of tissue caused by a real time mechanical stress. Several parameters have been used for characterization of benign and malignant breast masses by strain imaging. The most common parameters are the Tsukuba score (elasticity score), E/B ratio, and the strain ratio (fat-to-lesion ratio FLR). In shear wave elastography, short-duration acoustic radiation forces that impart small localized displacements in the tissue are generated. SWE is less operator-dependent than free-hand elastography and provides an objective quantitative values. Both point-SWE and 2D-SWE have been used to evaluate breast lesions. The studies show that USE has a high potential to increase the specificity, which eventually helps to reduce false-positive and, therefore is useful in avoiding unnecessary breast biopsies. There are also other studies investigating the potential role of elastography in the monitoring of neoadjuvant chemotherapy, in the differential diagnosis of suspicious axillary lymph nodes and breast microcalcifications. In addition, the correlations between the elastic values and histological subfeatures of breast cancers are also being studied. The qualitative USE elasticity measurements (soft, intermediate, or hard) have been added to the last addition BI-RADS lexicon in 2013 as an associated finding. The current applications of clinical USE are also stated in the WFUMB and EFSUMB guidelines.

TAKE HOME POINTS

- Elastography is an important sonographic technology used as a complimentary tool to B-mode US for further characterization of breast masses.
- There are two types of USE; strain and shear wave elastography. Each technique has its own advantages and limitations.
- The addition of USE to a conventional breast US will decrease the number of benign biopsies.
- The other potential clinical applications of USE have been investigated.

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ULTRASOUND

Hybrid - ABUS and DBT

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BODY

Digital mammography is currently the standard method of breast cancer screening. Methods to improve breast cancer screening have been developed. Digital breast tomosynthesis (DBT) is one method using multiple low-dose images obtained from predefined angles under compression and reconstructed as a 3D-image of the breast. DBT enables to reduce false-positive findings as results of overlapping tissue and false-negative findings in women with dense breast tissue [1-3]. Dense breast tissue limits sensitivity of standard digital mammography and is known to be an independent risk factor of developing breast cancer. Studies have shown that combining ultrasound with mammography in screening settings can significantly improve the rate of found lesions [4-6]. To address weaknesses of hand held ultrasound like operator dependence and time investment automated breast ultrasound (ABUS) has been developed.

Approaches of obtaining DBT and ABUS to improve screening for breast cancer have been reported [7]. First attempts to combine the two modalities without change of position of the breast have been made since 1997 [8-10]. We tested the FUSION-X-US prototype (Siemens Healthcare GmbH, Forchheim, Germany) in 23 patients with an indication for DBT and found that it offered a technically reliable method. We pointed out several shortcomings like image quality and coverage of the breast [10]. A new FUSION-X-US-II prototype (Siemens Healthcare GmbH, Forchheim, Germany) addressing the shortcomings of prior systems has been developed. We tested the prototype in 30 healthy women and found an improvement in image quality and breast coverage. The workflow and lesion assessment of the FUSION-X-US-II is currently under evaluation in 100 patients with indication for tomosynthesis in a monocentric prospective pilot study of explorative character.

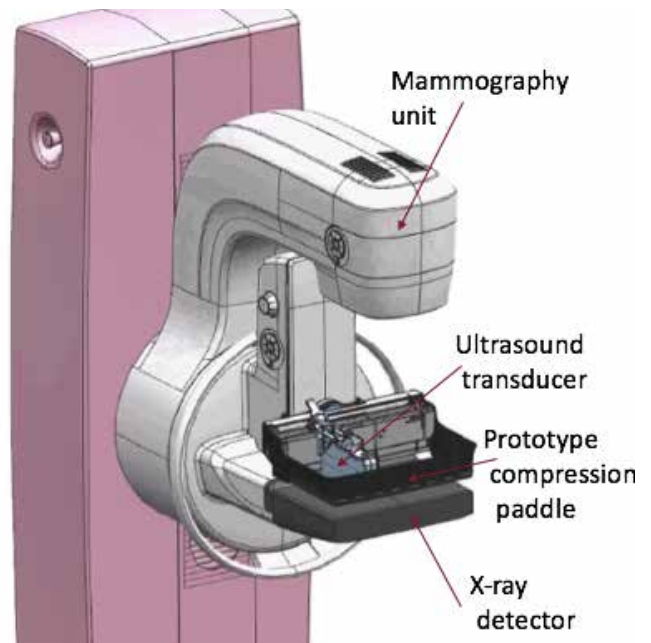
Disclaimer: The presented method is part of a research project and is not commercially available.

TAKE HOME POINTS

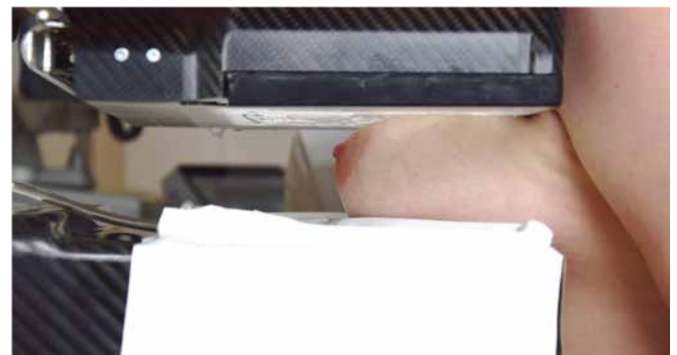
Breast cancer screening could be improved by a combination of digital breast tomosynthesis and automated breast ultrasound in one workflow. Technical advancements and further studies are needed for implementation of hybrid systems in the future.

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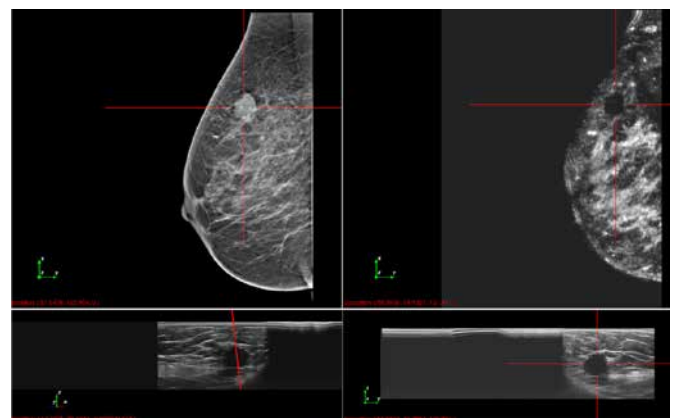
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FUSION-X-US-II prototype



Breast under compression



DBT and ABUS of a patient with invasive breast cancer

Hybrid - ABUS and DBT

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MRI

Ultrafast breast MRI

I. Thomassin-Naggara; Paris/FR

BODY

Currently, breast MRI is indicated as a screening examination of breast cancer for women at high risk women and the complexity of standard protocols could rapidly become a limitation : The number of mutations responsible of high risk increases each year and several studies suggest MR accuracy to screen intermediate risk women. Abbreviated, or FAST, protocols have the same sensitivity as conventional (FULL) protocols to detect breast cancer. However, the specificity of FAST protocols is variable and decreases when used for women with a lower risk of breast cancer.

An ULTRAFAST sequence consists of high temporal resolution dynamic contrast-enhanced MRI and provides early enhancement of lesion characteristics that optimize the characterization of the FAST protocol, increasing predictive positive values without increasing time.

These new abbreviated protocols imply that breast MRI could constitute a viable screening tool both for women at high risk of breast cancer and perhaps in the next future for those at intermediate risk with high breast density.

TAKE HOME POINTS

- Most studies demonstrate a consistently high sensitivity of abbreviated protocols compared with FULL breast MRI protocols, with considerably shorter scan time
- Data from additional ULTRAFAST sequences can provide early enhancement lesion characteristics, which could help increase specificity.

RISK

How to define risk groups

M. Broeders; Nijmegen/NL

BODY

Breast screening programmes today generally offer a mammographic examination every two years to women in a specified age range. Ongoing research is exploring the added value of risk-based screening, i.e. screening strategies tailored to a woman's individual risk of breast cancer. This is expected to improve the current balance of benefits and harms of screening, both for women at higher and lower risk. There are many risk factors for breast cancer, but very few are routinely registered in screening and no single risk factor explains the majority of breast cancer cases. The only single risk factor that might be considered to stratify the screening population is mammographic breast density. This is because mammographic breast density can contribute to risk prediction, but will also play a role in finding the optimal imaging modality for women at varying levels of risk. Most likely though information on several risk factors for breast cancer will be combined. This can be done in a breast cancer risk prediction model, such as the GAIL, BOADICEA, or Tyrer-Cuzick model. However, these initial prediction models were generally developed for a different setting, e.g. women with a family history of breast cancer in a clinical genetics setting. Over the last decade therefore much effort has been put into the development of comprehensive breast cancer risk prediction models that can be used in the screening setting. This has already resulted in the addition of e.g. mammographic breast density and an increasing number of genetic variants (single-nucleotide polymorphisms (SNPs)) to existing models. Ongoing research is being performed to identify additional risk factors, such as mammographic image features and blood-based biomarkers, to further improve the models. The overall aim is to develop a breast cancer risk prediction model that can sufficiently distinguish low-risk women from high-risk women in the context of risk-based screening.

TAKE HOME POINTS

- Risk-based breast cancer screening, based on a woman's individual risk of breast cancer, is envisioned to be the screening strategy of the future.
- Risk assessment will most likely be based on a breast cancer risk prediction model combining information on various risk factors.
- Ongoing research aims to improve the discriminative accuracy of breast cancer risk prediction models for use in the screening setting.

RISK

Risk based screening

R.M. Mann; Nijmegen/NL

BODY

Current screening programs are largely one-size fits all approaches, only incorporating the major risk factors “female sex” and “age”. However, some women qualify for screening outside of these programs based upon other risk factors. Most famous are hereditary risks for the development of breast cancer presented by mutations in BRCA, CDH1, PALPB2 and other genes. Female carriers of these genes are generally screened from younger age and with other techniques, particularly breast MRI. Other women at increased risk, such as those with positive family histories, women with epithelial atypias on biopsy and women with a personal history of breast cancer, are usually also screened outside the screening programs using intensified evaluation schemes, albeit screening here is still mostly based on mammography.

Supplemental screening techniques invariably show additional cancer detection, which shows that mammographic detection of breast cancer is limited to relatively large lesions. Ultrasound adds about 4 cancers per 1000 women screened with dense breast tissue. Breast MRI has been shown to add between 15 and 20 per 1000 additional cancers in women with various risk factors. The use of MRI requires a paradigm shift, as the yield is so much higher than with mammography, that mammography should be regarded as the supplemental technique. Still, the gain of mammography over MRI alone is modest and varies over age groups and risk factors.

Since there is only a modest difference in accuracy of the various screening techniques between women with varying risk factors it is not possible to define the use of screening modalities by risk profile alone. However, selection might be based on the short term risk to develop breast cancer, the growth speed of cancers and the risk of individual women to die from the disease. In such risk based programs not only the screening modality might be varied, but also the screening frequency.

RISK

Additional MRI screening in women with extremely dense breasts the DENSE trial C. van Gils; Utrecht/NL

BODY

MRI is the most sensitive breast cancer imaging technique currently available and recommended for screening women with high breast cancer risk. Women with dense breasts have a moderately increased breast cancer risk. In addition, their dense tissue limits the detection of a tumor with mammography and therefore additional screening with MRI could provide a solution for these women as well. However, MRI is not included in screening recommendations for women with dense breasts. The effects of MRI, and also those of other supplemental imaging methods, on breast cancer outcomes remain as yet unclear due to a lack of comparative studies with interval breast cancer rates, stage at diagnosis or breast cancer mortality as the outcome.

In this presentation I will give an overview of the results of the first round of the DENSE (Detection of Early Neoplasms in Screening) trial. In the DENSE trial we investigated the effect of supplemental MRI for women with extremely dense breasts within a population-based screening program. Between 2011 and 2015, we randomized 40,373 screening participants (aged 50-75) with a negative screening mammography and extremely dense breasts (ACR category 4 by Volpara software) to (an invitation for) supplemental 3.0-T MRI at 8 sites (intervention arm; n=8,061) or mammography screening only (control arm; n=32,312). The primary outcome will be presented, which is the difference in interval cancers, during the two-year screening interval. This is considered to be the best proxy for a difference in breast cancer mortality. This difference was investigated by intention-to-treat (ITT) analysis, and by complier-average causal effect (CACE) analysis to account for noncompliance. Other outcomes that I will present are: participation rate, supplemental cancer detection rate by MRI, recall rate, biopsy rate, positive predictive value, and distribution of tumor characteristics of the cancer patients diagnosed in both trial arms.

RISK

Risk stratification

P. Pharoah; Cambridge/UK

BODY

Large-scale, genome-wide association studies have identified hundreds of germline genetic variants that are common in the population and are associated with an increased risk of breast cancer. In addition, rare, loss-of-function variants in multiple genes that confer moderate to high risks of breast cancer have now been identified. I will discuss how these variants can be combined into polygenic risk scores and how polygenic risk scores can be combined with other risk factors into a comprehensive risk model. The implications for using such models for personalised screening programmes will then be described.

EUSOBI AWARD FOR THE MOST QUOTED BREAST IMAGING PAPER PUBLISHED IN EUROPEAN RADIOLOGY IN 2016

Editorial policies of ER - How to write a successful paper?

R. A. Kubik-Huch¹, K. Deininger², S. Bolldorf³, Y. Menu⁴; ¹Baden/CH, ²Munich/DE, ³Vienna/AT, ⁴Paris/FR

BODY

European Radiology (ER) is the flagship journal of the European Society of Radiology (ESR) and the official journal of a number of subspecialty societies, including the European Society of Breast Imaging (EUSOBI). ER is a scientific, peer-reviewed radiology journal that publishes original articles, technical development communications, guidelines and state-of-the-art review articles on a monthly basis. It has a high impact factor (2018: 3.962) ranking at 20 of 129 journals in the category "Radiology, Nuclear Medicine and Medical Imaging".

The journal is subscribed to by all members of the ESR and thus reaches a regular audience of several thousand readers worldwide as evidenced by nearly 800,000 article downloads in 2018.

In 2018, Yves Menu (Paris, France) was appointed Editor-in-Chief. He is supported by the team of the editorial office, the scientific Editorial Board as well as three Deputy Editors, with Rahel Kubik being the handling editor for breast and male/female pelvic imaging.

Submissions to ER have increased tremendously over recent years. In 2018, 3324 manuscripts were submitted to the journal, 53 % of which came from Asia, followed by European countries (34%) and North America (9%). After an initial plagiarism check with the iThenticate software, an external peer review process, and in selected cases additional statistical review, 604 papers (8% breast imaging) were published in 2018. The overall acceptance rate of manuscripts is currently 22 %. The average time between manuscript submission and the initial editorial decision is currently 32 days.

The ever increasing number of submissions necessitates a high rejection rate, which means competition is fierce and only publications of high scientific quality and novelty can be accepted.

The aim of the presentation is to show how authors can increase the chances of having their publication accepted in ER.

Before submitting their manuscript, authors should take some time to select the appropriate journal for their work. The goal should be to get the research published in the best possible journal and as fast as possible. Choosing the right journal from the start will save time and frustration.

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All manuscripts have to be submitted via our online submission

system (Editorial Manager, <https://www.editorialmanager.com/eur>).

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They should write a sensible cover letter explaining the rationale behind their study and highlighting the findings and novelty of their submitted work.

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The manuscript should be easy to comprehend. If a reviewer struggles to understand the introduction and scope of the research, they might be annoyed before even getting to the findings.

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Scientific validity is crucial. This includes a clear explanation of valid methodology, ethical approval by the relevant bodies, accurate biostatistical analysis of data, concise and comprehensive presentation of the results, accompanied by high quality figures and informative tables. Materials & Methods and the Result sections should not be confused.

Last but not least, the article should conclude with a meaningful discussion (not an entire review!) presenting an overview of the existing literature and the advances in knowledge as well as the limitations of the study. Conclusions need to be supported by the results.

TAKE HOME POINTS

- European Radiology (ER) is the Journal of the European Society of Radiology (ESR) and the official journal of EUSOBI.
- ER has a high impact factor (2018: 3.962) compared with other radiological journals.
- 8% of all published articles in 2018 were about breast imaging.
- With a current rejection rate of 78%, competition is high.

Editorial policies of ER - How to write a successful paper?

R. A. Kubik-Huch¹, K. Deiningner², S. Bolldorf³, Y. Menu⁴; ¹Baden/CH, ²Munich/DE, ³Vienna/AT, ⁴Paris/FR

- To avoid disappointment, time should be taken to select the appropriate journal for each research work. Only publications of high scientific quality and novelty and a topic of interest to the ER readership will have a chance to get accepted.
- Authors should always remember: The aim of an article is not to be published, it is to be read!
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- A catchy title and key points are instrumental in drawing in the reader's attention.
- Manuscripts need to be easy to understand with the findings and novelty of the work being highlighted.
- Limitations should be discussed. It is important that conclusions are supported by the results.
- Sloppy mistakes are to be avoided: Proofreading is important.

EUSOBI AWARD FOR THE MOST QUOTED BREAST IMAGING PAPER PUBLISHED IN EUROPEAN RADIOLOGY IN 2016

Performance of one-view breast tomosynthesis as a stand-alone breast cancer screening modality

K. Lang; Malmö/SE

BODY

Mammography is currently the established method in breast cancer screening, although the sensitivity is known to be affected by overlapping tissue concealing tumours. Breast tomosynthesis takes advantage of multiple exposures at different angles reducing the negative effect of obscuring tissue. The aim of the presented study was to investigate the use of tomosynthesis in breast cancer screening. The paper was based on 7,500 women comprising the first half of the Malmö Breast Tomosynthesis Screening Trial (MBTST): a prospective population-based single arm study including randomly invited women 40–74 years old eligible for the screening programme in the City of Malmö, Sweden. Women underwent one-view tomosynthesis with reduced compression force as well as mammography. The images were read and scored separately in a blinded double-reading procedure. The increase in cancer detection rate (6.3 to 8.9/1,000) and recall rate (2.6% to 3.8%) using tomosynthesis was statistically significant ($p < 0.0001$). The additionally detected cancers were mainly invasive, with a tendency of downstaging. In conclusion, one-view tomosynthesis, with reduced compression force, could be sufficient as a stand-alone screening modality.

TAKE HOME POINTS

- One-view breast tomosynthesis increased the cancer detection rate significantly compared with conventional mammography screening.
- The recall rate increased significantly but was still low.
- Breast cancer screening with one-view breast tomosynthesis as a stand-alone modality seems feasible.

Get the full abstract:

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IMAGING IN THE ROLE OF BREAST CANCER TREATMENT

Preoperative staging

F. Sardanelli; Milan/IT

BODY

Breast conserving treatment has been universally accepted as the option of choice for operable breast cancers (BCs), being comparable to mastectomy in terms of overall survival. Nevertheless, it is associated with a not negligible incidence of loco-regional recurrences and new primary ipsilateral or contralateral BCs, from 1.0–1.5% during 15–20 years [1] and with a rate of positive margins and incomplete excision leading to re-operation, further wider local excision, or conversion to mastectomy in nearly 20% of cases [2].

Among breast imaging methods, contrast-enhanced magnetic resonance imaging (MRI) is the most sensitive tool in diagnosing BC. When MRI was compared to double-reading mammography using 5-mm slicing mastectomy specimens as a reference standard in 99 breasts of 90 women, its sensitivity for 188 malignant lesions was significantly higher (81%) than that of mammography (66%), with a positive predictive value not significantly different (69% and 79%, respectively) [3]. The clinical diagnostic performance of preoperative breast MRI is out of discussion, as also shown by the report regarding two international multicenter studies for a total of 903 patients [4], with local investigators obtaining up to 96% sensitivity and 97% specificity.

The frequency of additional cancers on preoperative breast MRI has been shown to be 16% in a meta-analysis published in 2008 [5] in 20% in a meta-analysis published in 2012 [6]. MRI has also been shown to detect additional BCs in the contralateral breast, in 3.1% in a large prospective study [7], in 4.1% [8] and 5.5% [6] of patients in meta-analyses. These results were somehow expected in consideration of the relatively high frequency of multifocal and multicentric nature of BCs, as already shown by old pathological studies on mastectomy specimens [9]. The clinical relevance of additional cancers detected at breast MRI has been investigated [10], showing among patients with MRI-detected additional malignant lesions, lesions larger than the index cancer in 23% and more biologically important in 5% of the cases.

Thus, breast MRI has been advocated as a method for improving surgical outcome, reducing ipsilateral local recurrences, and anticipating contralateral cancers, with a potential for improving survival. However, these expectations were not confirmed. Using the reduction of re-intervention rate as a proxy of clinical effectiveness, randomized controlled trials [11–14] gave conflicting and also controversial results, not allowing for drawing reliable conclusions [15]. Of note, studies that were not in favor of MRI were criticized for the lack of specific experience, in particular regarding second (targeted) ultrasound and MR-guidance for biopsy/localization. Both of them are now considered a “must” for a good clinical practice

of breast MRI, in particular in the preoperative setting [16, 17]. A meta-analysis [18] did not find any evidence for preoperative MRI to improve surgical outcomes such as re-excision or positive margins. Moreover, an increased odd for ipsilateral mastectomy (odds ratio [OR] 1.39) and contralateral prophylactic mastectomy (OR 1.91) was reported. In addition, an individual patient data meta-analysis published in 2014 [19] showed that the 8-year local recurrence-free survival did not significantly differ between patients locally staged with or without MRI. Of course, meta-analyses cannot overcome limitations of the original studies included and the debate is far from being closed.

In this context, the current scenario is characterized by two opposite tendencies. On the one side, associations such as The American Society of Breast Surgeons said in June 2016 in the context of a “Choosing Wisely” campaign [20]: “Don’t routinely order breast MRI in new breast cancer patients”, based on the “lack of evidence that routine use of MRI lessens cancer recurrence, death from cancer or the need for re-operation after lumpectomy surgery” while it is “associated with an increased need for subsequent breast biopsy procedures, delays in time to treatment and higher cost of care”. They also add that “increased mastectomy rates can occur if the MRI finds additional cancers or indeterminate findings cause patient anxiety, leading to patient requests for mastectomy” [20].

On the other side, breast MRI continues to be increasingly applied and its use is highly variable worldwide depending on local policies and surgeons’ confidence, primarily. Interestingly, a survey sent to the American Society of Breast Surgeons [21], showed that of 1,012 surgeons who responded (45.5% of a total of 2,274), 41% declared a routine breast MRI use for newly diagnosed patients with higher rates among surgeons from high-volume practice, high specialization, and private practice and in the case of high mammographic density, strong family history of breast cancer, and invasive lobular carcinoma. Another survey among surgeons in the United States reported data from 289 surgeons (154 breast surgeons and 135 general surgeons) [22] showed a propensity for requesting preoperative breast MRI in the case of (decreasing order): BRCA mutations; familial or personal breast cancer history; extremely dense breasts; age below 40; axillary nodal involvement; mammographically occult tumor; multifocal or multicentric disease at conventional imaging; invasive lobular pathology; triple negative cancer; T2 or T3 stage; patient candidate to mastectomy requesting conservative surgery; radiologist’s recommendation. In addition, breast surgeons referred to MRI more than general surgeons for BRCA mutation carriers and tumors smaller than 1 cm, less than general surgeons for

Preoperative staging

F. Sardanelli; Milan/IT

multifocal/multicentric disease. The authors rightly concluded that selection bias could affect analyses of observational studies regarding preoperative breast MRI [22].

In this complex scenario, an international group of radiologists developed the idea of a large observational multicenter study to be performed at highly qualified high-volume institutions aimed at verifying the impact of preoperative breast MRI: "Preoperative Breast MRI in Clinical Practice: Multicenter International Prospective Analysis (MIPA) of Individual Woman Data". The study population is composed of two concurrent cohort of patients that receive or did not receive preoperative breast MRI according the usual practice. Women aged from 18 to 80 years newly diagnosed with a BC amenable to upfront surgery were eligible for enrollment. Indication to neoadjuvant chemotherapy, pregnancy, personal history of invasive or in situ BC, personal history of non-breast cancer at any site, evidence of distant metastases, mental disability precluding informed consent to participate were exclusion criteria. MRI studies were performed following a standard protocol, including at least T2-weighted sequences and a contrast-enhanced dynamic study.

Up to June 2018, over 6,500 patients were recruited in 30 centers worldwide. Data from 2,425 patients were as follows [23]: 1,201 (49.5%) received MRI, 1,224 (50.5%) did not. Of these 1,224 MRIs, 210 (17%) were performed for screening (4%) or diagnostic purposes (13%). Of 1,014 MRIs performed as preoperative studies, 59% were ordered by radiologists alone, 32% by surgeons alone; radiologist and surgeons were involved in the request in 68% and 40% of cases, respectively. Mastectomy rate planned at mammography/ultrasound was 185/1,201 (15.4%) in the non-MRI-group, 245/1,224 (20.0%) in the MRI-group ($p < 0.001$). In the MRI group, 21 additional mastectomies (1.7%) were planned after MRI, while 25 patients planned with mastectomy shifted to conservative surgery (CS). Of the 1,004 patients planned for CS before MRI, MRI did not change surgery in 733 (73%), while prompted a wider CS in 143 (12.5%), a less extensive CS in 128 (12.7%). Mastectomy rate was 192/1,201 (16%) in non-MRI-group and 257/1,224 (21%) in MRI-group ($p < 0.001$). Per-patient reoperation rate for close/positive margins were 135/1009 (13.4%) and 80/967 (8%), respectively ($p < 0.001$). Most mastectomies were already planned at mammography/ultrasound, using MRI as a confirmation tool. This patient selection also contributed in determining a lower reoperation rate in women undergoing MRI. Additional mastectomies were compensated by mastectomies shifted to CS and CS surgery was modified by MRI according to disease extent, balancing increased and decreased tissue removal. No net increase breast tissue removal has been determined by MRI.

To summarize, preoperative breast MRI remains a controversial topic for many reasons, including the controversial and conflicting result of randomized trials. In addition, we have to consider that surgeons had a relatively long learning curve for making the best use of preoperative MRI data and an intrinsic selection bias made many observational studies not useful for understanding the real role of preoperative breast MRI. New studies, such as the MIPA, are now enlightening this hot topic. In this scenario, contrast-enhanced mammography is gaining an increasing role as a tool for preoperative staging. When compared to MRI [24], it appears to be faster, cheaper, preferred by the women [25], not limited by contraindications, with similar diagnostic performance and easier to be interpreted and translated to surgical practice by non-radiologists.

TAKE HOME POINTS

- Breast MRI is highly sensitive and accurate for ipsilateral and contralateral staging in women with newly diagnosed breast cancer, allowing to detect biologically relevant additional cancer lesions in a substantial proportion of patients.
- Randomized controlled trials using the reoperation rate as surgical endpoint gave controversial and conflicting results.
- Observational studies are burdened by selection bias, as confirmed by surveys showing the criteria guiding surgeons for requesting preoperative MRI.
- Availability of target ultrasound and MR-guidance for biopsy/localization of additional suspect lesion are mandatory requirements for state-of-the-art preoperative MRI
- When preoperative MRI is used in high-volume specialized centers, the rate of additional mastectomies prompted by MRI is very low (about 2%) and conservative surgery is tailored according the disease extent shown by MRI, compensating a more extended conservative treatment in about 13% of patients with a less extended conservative treatment in about 13% of patients.
- Contrast-enhanced mammography is gaining an increasing role as a breast cancer staging tool.

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IMAGING IN THE ROLE OF BREAST CANCER TREATMENT

Omission of RT based on MRI findings

B. Mann; Parkville/AU

BODY

Demonstration that wide excision plus adjuvant radiotherapy was at least equivalent to total mastectomy was a major advance in the management of early breast cancer in the second half of the 20th century, allowing the majority of women to safely choose breast conserving therapy. As more cancers are detected at an early stage, and as systemic therapies have become more effective and more targeted, it seems logical that selective radiotherapy would be possible.

Attempts to identify a large group of patients based on age and routine pathology have been disappointing. Rates of local recurrence in the absence of radiotherapy are lower than they were in original trials of BCT, but in most groups there is still a reduction in LR with adjuvant radiotherapy, making it standard in the majority of situations.

A number of national and international trials are testing the hypothesis that more intensive analysis of the index lesion using molecular assays may be able to identify low risk patients in whom radiotherapy may be safely omitted. Of note, imaging requirements in these trials are not well defined.

Breast MRI as local staging for women diagnosed with breast cancer is known to identify additional malignant lesions in a substantial number of patients, but including MRI in the workup of patients treated along conventional lines has not been shown to lead to improved outcomes.

We hypothesized that the reason that identification of occult lesions is not associated with improved outcomes is that the routine use of RT and systemic therapy effectively treats these lesions. A corollary of this is that in the absence of occult lesions, that RT may be able to be safely omitted.

ANZ 1002 : Post-operative Radiotherapy Omission in Selected Patients with Early breast Cancer Trial (PROSPECT) was developed to test this hypothesis.

Between September 2011 and May 2019, 443 patients aged 50 or over with apparently unifocal early breast cancer consented to take part in PROSPECT and underwent screening MRI. 201 patients with unequivocally unifocal cancer on MRI and low risk pathology are being treated with standard systemic therapy but no adjuvant radiotherapy. The IDSMC consented to the trial remaining open until full accrual, and the primary analysis will be in May 2021 when the 100th patient has reached 5 years of followup.

While a proportion of potentially eligible patients chose standard treatment, a substantial majority agreed to participate, and many were very disappointed if found ineligible for the main trial.

In addition to the primary protocol-defined analysis, plans are underway to present to radiology findings of the total cohort, and also to perform economic and quality of life analysis on study participants.

Future trials will be needed to further explore the promise of using imaging findings to tailor the extent of local therapy for early breast cancer.

TAKE HOME POINTS

- Adjuvant radiotherapy remains standard after breast conserving surgery for invasive breast cancer.
- Various clinical trials are assessing whether molecular assays of the index cancer can identify a group of patients in whom radiotherapy may be safely omitted
- PROSPECT is testing whether MRI can achieve this aim.

IMAGING IN THE ROLE OF BREAST CANCER TREATMENT

Using imaging to do less

A. Rose; Fitzroy/AU

BODY

The role of staging breast magnetic resonance imaging (MRI) of apparently localised breast cancer is controversial. Few studies demonstrate improved outcomes associated with MRI. We hypothesized that more sensitive imaging may allow tailoring of radiotherapy in early breast cancer. ANZ 1002 : Post-operative Radiotherapy Omission in Selected Patients with Early breast Cancer Trial (PROSPECT) is a prospective single-arm study using preoperative MRI to identify a group of patients with early breast cancer in whom radiotherapy may be safely omitted. Inclusion criteria include nil/minimal or mild background parenchymal enhancement (BPE), unifocal pT1N0 invasive cancer, not TNBC, no LVI. Since September 2011, 443 patients have undergone MRI and 201 have had radiotherapy omitted. Primary analysis of ipsilateral local recurrence is due in May 2021. Here we report some initial imaging experience.

METHODS

All patients who underwent PROSPECT MRI in addition to mammogram (MMG) and ultrasound (US) were included. Imaging findings on MMG, US and MRI were documented. Breast Imaging-Reporting and Data System (BIRADS) 4 or higher lesions on MRI were subject to biopsy with US or stereo/tomo guidance if possible, or MRI or surgical biopsy if not. Pathologic results of lesions identified by MRI were described and the extent of surgery was documented. For patients on trial, an additional MRI scan was performed at 18 months post treatment.

RESULTS

Over 8 years, 443 patients were identified as potentially suitable; the majority recruited from our population-based breast screening program. All patients over 50 with apparently unifocal cancer <20mm on conventional imaging were considered for the study, and a majority consented to screening MRI. Initially, patients over 70 were excluded on the basis that they may not require radiotherapy, but this was changed when it became apparent that most were receiving radiotherapy. A large majority of the patients were 50-69yo. All tumour grades were eligible, but the majority were grade 1 or 2. MRI showed nil/minimal or mild BPE in 336 patients and moderate or marked BPE in 107.

Additional occult ipsilateral and contralateral malignant lesions were found in accordance with previously reported incidence at the expense of a relatively high benign to malignant biopsy ratio (1.7:1). Early follow up of additional BIRADS 3 lesions identified on MR was not feasible in the setting of potential radiotherapy omission and these lesions were biopsied, contributing to the relatively high number of benign occult lesions. Women with additional malignant lesions were excluded from the trial.

Many of the index lesions were small with benign features on the MR scans, similar to surrounding nodular BPE or fibroadenomata. Most initial pre-recruitment diagnostic biopsies were performed with 14g US guided core and these produced obscuring hematoma in a small proportion further hindering the assessment.

BPE was a relatively frequent cause for exclusion. In the final 6 months of the accrual an ultrafast sequence was inserted into the first 60 seconds of the protocol. We believe that ultrafast sequences may overcome the masking effect of BPE in future iterations allowing more women to participate.

Delays in treatment caused by the MRI and subsequent interventions was kept to a minimum. In our routine MR practice, we have largely switched to abbreviated protocols which include an early ultrafast sequence and believe that this will further improve access and capacity, and reduce expense and delays.

Patients with additional malignant lesions were off trial and were treated with multiple local excisions or segmentectomies where feasible, helping to minimise mastectomies.

CONCLUSION

Breast MRI in patients at population risk over 50 years old, with low risk, apparently unifocal cancer, has allowed prospective selection of a group of 200 patients in whom radiation has been omitted. Primary analysis of PROSPECT in 2021 will help define the clinical utility of these findings.

IMAGING IN THE ROLE OF BREAST CANCER TREATMENT

Minimally invasive excision and treatment

E. O'Flynn; Sutton/UK

BODY

Large bore vacuum-assisted biopsy devices became available in the late 1990's and are now commonplace in most breast units. Vacuum assisted biopsy (VAB) was developed to address the limitations of core biopsy and fine needle aspiration cytology, but its use has evolved and developed to encompass excision and treatment of certain lesions within the breast via a minimally invasive approach which obviates the need for surgery. There are many devices available each with their own minor technical differences which are adaptable to be used under either ultrasound, stereotactic or MR guidance. Percutaneous excision and treatment instruments are also available involving techniques such as electrocautery, cryotherapy and radiofrequency ablation, but are not widely in use.

Standard VAB is generally performed with 10 or 11G needles, however 8 and 7G needles are used for larger lesions and therapeutic excisions. The volume of tissue removed through the probes varies and is dependent on the number of cores taken. Each core volume however is significantly higher than that obtained from a 14G core biopsy and has the benefit of larger specimens, sometimes equivalent to a small surgical excision, as well as lower underestimation rates. The technique rates highly on patient acceptance and satisfaction, safety, cost and efficacy with minimal complications. It is a valuable alternative to surgery in obtaining a definitive diagnosis and increasingly now for therapeutic excision.

In practice, VAB is commonly used for diagnostic sampling of microcalcification, but is also used for sampling soft tissue abnormalities such as papillomas and complex sclerosing lesions and in cases of equivocal B3 core biopsy results to obtain a larger volume of tissue for diagnosis instead of surgical excision. Therapeutically it can be used for excision of some breast lesions such as fibroadenomas and papillomas without atypia and can be used for drainage of large complex breast abscesses. Both in the UK and Europe there has been a recent shift towards a more conservative approach to the management of some B3 lesions to avoid open surgical excision and offer minimally invasive therapeutic excision with VAB as an acceptable alternative with short term follow up (1-3).

The current trend towards de-escalating surgery is also being evaluated in the neoadjuvant setting, to determine whether complete pathological response could be determined by VAB following the completion of therapy, and this will also be discussed (4).

TAKE HOME POINTS

- Vacuum assisted biopsy (VAB) addresses the limitations of core biopsy and its use has evolved and developed to encompass excision and treatment of certain lesions within the breast via a minimally invasive approach which obviates the need for surgery.
- VAB has the benefit of larger specimens, sometimes equivalent to a small surgical excision, as well as lower underestimation rates.
- VAB can be used therapeutically for excision of some breast lesions such as fibroadenomas and for drainage of large complex breast abscesses.
- There has been a recent shift towards a more conservative approach to the management of some B3 lesions to avoid open surgical excision and offer minimally invasive therapeutic excision with VAB as an acceptable alternative with short term follow up.
- The current trend towards de-escalating surgery is also being evaluated in the neoadjuvant setting, to determine whether complete pathological response could be determined by VAB following the completion of therapy.

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AXILLA

Diagnostics

M.B.I. Lobbes; Sittard-Geleen/NL

BODY

After the initial diagnosis of breast cancer, all patients need to undergo further staging as part of the preoperative evaluation. This mainly consists of additional axillary nodal staging, which is predominantly being performed by using ultrasound, as it is cheap, easy to perform, patient friendly and widely available.

In the past, only the detection of axillary lymph node metastases was important (i.e., cN+), but recent studies such as the ACOSOG 2011, IBCSG 23-01 and AATRM 048/13/2000 trials have shown that completion axillary lymph node dissection (cALND) after the detection of limited axillary nodal disease (i.e., 1-3 positive lymph nodes) does not improve prognosis of these patients [1-3]. Hence, it is becoming more and more important to not only detect axillary lymph node metastases, but also to accurately assess the number of suspicious lymph nodes using different imaging modalities.

Different imaging techniques can be used to evaluate the axillary lymph nodes. The most commonly used approach is axillary ultrasound (US), but imaging can also be performed with using MRI, PET-CT or the combination of PET-MRI. Regardless of the technique used, the imaging characteristics of abnormal lymph nodes are comparable: irregular margins, inhomogeneous cortical lining, perifocal edema, absent fatty hilum, asymmetry in the number and size of the lymph nodes between the two axillae, rim enhancement or peripheral vascularisation instead of a hilar vascularisation. By using these criteria, the radiologist should try to assess the presence and number of suspicious lymph nodes and target the tissue sampling (either through core needle biopsy or fine needle aspiration cytology) accordingly [4].

In this way, clinical axillary nodal staging should be scored as being: none (cN0), limited (cN1, or 1-3 suspicious lymph nodes) and advanced (cN2-3, or >3 suspicious lymph nodes).

Despite the variation of imaging modalities available to us, it remains challenging to differentiate between the clinically relevant axillary stages: cN1 versus cN2-3 [5]. In theory, less invasive treatment could be considered in patients with limited axillary lymph node burden, but until now no single imaging modality is able to determine these stages with sufficient confidence. Consequently, there is an ongoing search for more advanced imaging techniques to further increase the diagnostic accuracy of imaging for the assessment of axillary lymph node metastases.

TAKE HOME POINTS

- It is clinically relevant to not only evaluate for the presence of any suspicious lymph nodes, but also to assess the number of these;
- Different imaging modalities can be applied to stage the axilla in breast cancer patients;
- None of the currently available imaging modalities is accurate enough to differentiate between no, limited or advanced axillary lymph node disease to refrain from less invasive treatment of the axilla.

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AXILLA

Biopsy and intervention in the axilla

F. Kilburn-Toppin; Cambridge/UK

BODY

Evaluation of regional lymph node status is important for staging, treatment planning and prognosis in breast cancer patients. Pre-operative axillary ultrasound and ultrasound-guided biopsy are routinely used to detect nodal metastases, allowing patients to proceed directly to axillary lymph node dissection thereby avoiding sentinel lymph node biopsy (SLNB). Whilst some reluctance may exist over use of core needle biopsy (CNB) due to potential greater complications, CNB has been shown to yield a higher success rate for tissue diagnosis than fine needle aspiration (FNA), as well as being less operator dependent. Clear anatomical understanding of the axilla and good technique can help avoid complications.

Pre-operative ultrasound guided CNB can identify 50% of patients with metastatic lymph nodes, with a false negative rate of 25%. To improve pre-operative identification of lymph nodes, intradermal injections of microbubbles and contrast enhanced ultrasound can be used. Minimally invasive techniques including vacuum excision and radiofrequency-assisted breast lesion excision (BLES) have been investigated for use on sentinel lymph nodes to determine whether current SLNB procedures could be replaced.

Sentinel lymph node mapping after neo-adjuvant chemotherapy has gained acceptance in recent years. Removal of pre-treatment marked positive lymph nodes has shown to decrease false negative rates of sentinel lymph node mapping after chemotherapy. Biopsied nodes may be marked with a metallic marker clip, however this requires the surgeon or radiologist to pre or intra-operatively identify the clipped node, and so other types of markers have been developed as an alternative to clips. These include radioactive seeds, magnetic seeds and carbon tattooing of lymph nodes, each of which have their own benefits and drawbacks.

TAKE HOME POINTS

- Core needle biopsy of axillary lymph nodes has higher success rates than fine needle aspiration
- Knowledge of axillary anatomy and biopsy technique can improve diagnosis and minimise complications
- Pre-operative identification of lymph nodes can be improved with use of microbubbles and contrast enhanced ultrasound
- Marking axillary lymph nodes with a variety of methods can decrease false negative rates of SLNB after chemotherapy

AXILLA

Pathology of lymph nodes

G. Cserni; Kecskemet/HU

BODY

This is a brief review lecture limited by the 15 minutes allocated to it. It covers an introductory note on the prognostic impact of lymph nodes, goes through the different methods of nodal assessment, including naked eye (gross) examination, aspiration and imprint cytology, histology of frozen and permanent sections, immunohistochemistry and molecular methods. The role of surgeons and pathologists is discussed, along with their influence on the number of lymph nodes assessed in axillary clearance specimens. The upstaging potential of sentinel lymph node biopsy is also summarized together with the obvious consequence of stage migration. Steps aiming at reducing the stage migration artefact are briefly mentioned with the introduction of isolated tumour cells in the staging terminology and the paradigm shift in pathological axillary staging. Instead of trying to identify as much nodal involvement as possible with ultrastaging procedures, one should aim at identifying all significant metastases (currently the macrometastatic category) and leaving a node-negative category that contains no metastases of this size or greater (but acknowledging that it may contain smaller ones). Finally, a possible tailoring of nodal assessment according to possible treatment options is sketched.

AXILLA

Radiotherapy of the axilla

C. Polgar; Budapest/HU

BODY

In invasive breast cancer, the risk of axillary recurrence in the untreated axilla varies from about 10% to 40%. For women with early stage breast cancer sentinel lymph node biopsy should be offered for pathological staging and to guide adjuvant systemic therapy. Clinical evidences (e.g. NSABP-B04) suggest that axillary irradiation is as effective as axillary dissection in preventing regional recurrence. Prospective randomized trials (ACOSOG-Z-11, AMAROS, OTOASOR) proved, that in selected patients with clinically negative axilla and limited axillary involvement (1-2 positive sentinel lymph nodes) axillary dissection can be safely omitted. However, in the axillary dissection arm of these studies, the rate of positive non-sentinel lymph nodes was in the range of 27% to 38.5%. The management of breast cancer patients undergoing mastectomy with positive sentinel lymph nodes has evolved over time with decreased use of axillary dissection and increased use of radiation. However, some patient subsets are underrepresented in recent clinical trials. The safety of omitting axillary dissection for patients with a higher risk of additional positive non-sentinel lymph nodes is unclear and further prospective trials are suggested to address this issue. Until further clinical evidence, axillary radiotherapy is indicated for these patients to maintain regional tumor control. The benefits of axillary treatment in prolonging survival are unclear. Studies have reported different effects on survival. Until evidences remain insufficient, the risk of axillary recurrence has to be minimized. Therefore, in case of positive sentinel lymph nodes, either axillary dissection or axillary radiotherapy should be indicated. In case of clinically positive axilla, studies (e.g. the SAKK TAXIS trial) are ongoing to explore the efficacy of tailored axillary surgical treatment and axillary radiotherapy.

TAKE HOME POINTS

- Clinical evidences suggest that axillary irradiation is as effective as axillary dissection in preventing regional recurrence.
- Prospective randomized trials proved, that in selected patients with clinically negative axilla and limited axillary involvement axillary dissection can be safely omitted.
- The safety of omitting axillary dissection for patients with a higher risk of additional positive non-sentinel lymph nodes is unclear and further prospective trials are suggested to address this issue. Until further clinical evidence, axillary radiotherapy is indicated for these patients to maintain regional tumor control.

EUSOBI MEETS AUSTRALIA

Breast cancer screening in Australia

H. Frazer; Victoria/AU

BODY

BreastScreen Australia (BSA) is the national breast cancer screening program. BSA aims to reduce mortality and morbidity from breast cancer through an organized approach to the early detection of breast cancer in women. Early detection provides an opportunity for early treatment. The target audience is women aged between 50-74 years however women aged 40 and over are eligible to attend for free 2D mammograms every 2 years. In 2015-2016, more than 1.7 million women participated in breast screening. This represented 55% of women aged 50-74.

Breast cancer is the most common cancer affecting Australian women and the second most common cause of cancer-related death in Australian women, behind lung cancer. Breast cancer mortality has decreased since BreastScreen Australia began in 1993- from 74 deaths per 100,000 women aged 50-74 in 1991 to less than 50 deaths/100,000 since 2010.

In 2015, the International Agency for Research on Cancer (IARC) conducted a full review of high-quality observational studies. The study determined that women who attended breast cancer screening had a 40% reduction in the risk of death from breast cancer. These mortality benefits align with the women targeted by BSA (that is, those aged 50-74 years).

Provision of high-quality service to women is of great importance to BSA. For this reason, services accredited under BSA are expected to operate according to the National Accreditation Standards (NAS) of BSA, along with national policies and protocols. The accreditation system intends to drive continuous quality improvement in the delivery of breast screening services to ensure women receive safe, effective and high-quality care.

Diagnostic multi-modality breast imaging has undergone tremendous technological advancement globally, including in Australia. In addition, artificial intelligence, specifically deep learning, holds great promise in the field of breast imaging. Vast digital data sets, powerful computers and the availability of image recognition software has led to significant advancements in the field of breast cancer detection and treatment.

In this session, I will present the history of breast cancer screening in Australia; provide an up-to-date account of current screening practices and controversies; discuss current practices in diagnostic radiology in Australia including an update on research involving the use of deep learning algorithms to aid in breast cancer detection in Australia.

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EUSOBI 2019 GOLD MEDAL TO THOMAS H. HELBICH

Curriculum Vitae

Thomas H. Helbich MD, MSc, MBA, Professor of Radiology



Thomas H. Helbich MD, MSc, MBA, Professor of Radiology, finishes his medical degree at the Medical University of Vienna in 1989. From 1990 until 1996 he was trained as a radiologist at the Department of Radiology at the Medical University of Vienna. He was a research fellow at the Department of Radiology, Center of Molecular Imaging of the University of California in San Francisco from 1996 to 1998. In 1999 he became Associate Professor of Radiology. In 2005 he became Vice Department Chair of the Department of Radiology / Surgical Division. In 2007 to 2008 he became Division Head of the Breast Imaging Department of the University of Toronto and Full Professor of Radiology of the University of Toronto. Since October 1st, 2008 he is Professor of Molecular Imaging and Vice Chair of the Department of Biomedical Imaging and Image guided Therapy at the Medical University of Vienna. The main field of research interest are clinical and experimental investigation on a cellular and sub-cellular level to diagnose cancer, in particular breast cancer, earlier, more accurate, minimal and/or non-invasively. His working group developed and optimized several methods on the basis of MRI, different molecular imaging tools, as well as minimal invasive diagnostic techniques. He is author/coauthor of more than 260 scientific articles and received numerous grants from the EU. He has been an advisor to the Minister of Health of Austria and the mayor of the city of Vienna for the breast screening program. He was honored with several national and international awards. He was president of the European Society of Breast Imaging (EUSOBI) and the Austrian Senology Society.

EUSOBI 2019 GOLD MEDAL TO THOMAS H. HELBICH

Breast Imaging: Quo vadis?

T. Helbich; Vienna/AT

There will be about 2.1 million newly diagnosed female breast cancer cases per year worldwide, accounting for almost 1 in 4 cancer cases among women. This increase in breast cancer cases and technological advancements are the main driver for the breast imaging market, which is growing at a Compound Annual Growth Rate of 9.9% and estimated to reach \$5.8 Billion by 2023. Value-based healthcare is the new paradigm that focuses on disease prevention, early diagnosis, prediction and prognosis of treatment taking advantage of advances in medical imaging technologies and image analysis. Functional and molecular imaging provides insights into multiple aspects of tumor biology better known as "Cancer Hallmarks" that cannot be obtained with traditional morphologic imaging such as mammography. Advanced technologies including but not limited to MRI, PET or hybrid imaging technologies, consider that breast cancer is a heterogenous disease reflecting inter- and intra-tumoral clonal diversity which results in different imaging phenotypes. In this lecture I will review how the field of breast imaging has moved beyond morphology towards more functional and molecular approaches to achieve the ultimate of precision medicine in breast cancer. Examples of new technologies under development as well as new clinical trials will be highlighted.

NOVEL DEVELOPMENTS

Hyperpolarised ^{13}C -MRI in Breast Cancer

R.A. Woitek; Cambridge/UK; Vienna/AT

BODY

^{13}C -MRI after the injection of hyperpolarised [$1\text{-}^{13}\text{C}$]pyruvate (HP ^{13}C -MRI) is currently entering the field of clinical imaging research to image tumour metabolism. This presentation is going to cover the basics of the technique, first results regarding technical feasibility and the first results of ^{13}C -label exchange between pyruvate and lactate based on HP ^{13}C -MRI in patients with different subtypes of breast cancer. Metabolic inter- and intratumoral heterogeneity could be demonstrated using HP ^{13}C -MRI and correlations of the extent of ^{13}C -label exchange between pyruvate and lactate with transcriptomics indicate important roles of transmembrane transporter expression and hypoxia for the metabolic phenotype of these tumours. An outlook on future developments will be given especially regarding promising preclinical results from early response assessment using HP ^{13}C -MRI.

TAKE HOME POINTS

- Clinical HP ^{13}C -MRI is feasible in patients with early breast cancer.
- Metabolic inter- and intratumoral heterogeneity could be demonstrated in breast cancer using HP ^{13}C -MRI.
- Tumour volume, hypoxia and transmembrane transporter expression may play important roles in determining metabolic tumour phenotype.

NOVEL DEVELOPMENTS

Mammi-PET and PET MRI

L. Grana Lopez¹, M. Herranz²; ¹Lugo/ES, ²Santiago de Compostela/ES

BODY

Recent advances in technology allow improved nuclear medicine-based breast devices to image breast cancer with high sensitivity and specificity, using a wide range of radiotracers with a lower dose. Currently, it have been developed dedicated-breast positron emission tomography (PET) cameras using, among others, ¹⁸F-FDG. Some of these equipment have also the advantage that the reconstruction device generates 3D images that allow accurate fusion the MRI 3D T1-weighted fat-suppressed sequences, increasing the diagnostic confidence.

It has been studied the role of metabolic-imaging in breast cancer diagnosis, assessing local extent of the disease, monitoring response to therapy or their value as a screening tool in patients with dense breasts. Moreover, in the era of molecular imaging and being radiomics an emerging research topic, breast-dedicated metabolic imaging, specially PET, has an enormous potential for use in cancer imaging in near-future clinical settings. It demonstrates intratumoral heterogeneity, information useful not only for correct guidance of biopsy, but also as a prognostic marker that facilitates appropriate personalized treatment and accurate response evaluation. Besides, recently, we have shown that dedicated-breast PET may help to differentiate indolent and potentially aggressive ductal carcinoma in situ (DCIS). Furthermore, new specific radiotracers are being developed such as estrogen receptor biomarker, radiolabeled trastuzumab or angiogenesis markers that will likely play an important role in directing more specific and individualized breast cancer treatment.

NOVEL DEVELOPMENTS

Advanced post-processing and AI

K. Pinker-Domenig; New York/US; Vienna/AT

BODY

One of the most promising areas of health innovation is the application of artificial intelligence (AI) in biomedical imaging. With the possibility to use AI for image analysis to identify findings either detectable or not by the human eye, radiology is now moving from a subjective perceptual skill to a more objective science. Out of the myriad proposed use-cases for AI in radiology, breast cancer screening is perhaps the best known and most researched. Mammography was one of the first imaging modality to incorporate AI techniques. Traditional computer-aided detection (CAD) in mammography that is familiar to breast radiologists, was an early example of an AI application. CAD systems have been available for over a decade, meaning that the application of more recent machine/deep learning techniques to mammography already has a benchmark against which to compete. Traditional computer aided detection (CAD) systems for breast cancer screening relied on machine learning with human-coded feature-engineering. Advances in machine learning (such as deep learning) are on the cusp of providing more effective, more efficient, and even more patient-centric breast cancer screening support than ever before. AI tools are constantly improving, and now offer a variety of applications. This presentation will provide an overview of the history of CAD for mammography, explain the concept of AI, demonstrate how novel AI tools may address the limitations of the early CAD systems, and show how AI may be incorporated into mammography and other breast imaging modalities.

TAKE HOME POINTS

Upon completion of this lecture, participants will be able to:

- Understand the concept of AI
- Realize the limitations of traditional CAD systems
- Recognize how AI may aid breast screening and diagnosis with mammography
- Discuss how AI may be incorporated into other breast imaging modalities

FROM THE US SOCIETY OF BREAST IMAGING (SBI)

Contrast Enhanced Mammography Update

M. L. Zuley; Pittsburgh, PA/US

BODY

Contrast enhanced mammography (CEM) is an emerging technology that will likely prove to be disruptive to current breast imaging paradigms. Early data suggests that this modality can improve diagnostic accuracy and efficiency over traditional evaluation techniques, improve screening sensitivity and reduce biopsy of benign lesions. It appears to compete with MRI for multiple applications and is relatively easily implemented and cost effective. This lecture will review the current data and demonstrate why the technology may alter breast imaging practice.

TAKE HOME POINTS

- CEM is comparable to MRI for extent of disease evaluation after a diagnosis of breast cancer.
- CEM may significantly improve PPV of biopsy.
- CEM likely will alter routine diagnostic evaluations.

STAGING AND FOLLOW-UP

Breast imaging in follow up after breast cancer treatment

M.S. Jochelson; New York/US

BODY

We spend a great deal of time discussing breast imaging for the detection of breast cancer and far less in the discussion of the ideal approach to patients after they have received treatment; for example: Does every woman whose cancers presented with microcalcifications require an early post-lumpectomy mammogram to look for residual calcifications? Should we be doing supplemental imaging studies such as MRI in these women? My presentation will address these issues to include immediate and subsequent breast imaging follow up of the breast cancer patient who has undergone a lumpectomy with curative intent. We have evaluated the use of post lumpectomy mammograms in women with microcalcifications and found them useful in a larger population of women than expected. According to ASCO and NCCN guidelines the only standard imaging follow up after conserving treatment in average risk women is yearly mammography which has been demonstrated to reduce breast cancer mortality by 27-47% and certainly women at high risk should have MRI. More recently there are data to suggest that supplemental imaging including MRI may be beneficial to a greater proportion of breast cancer survivors than previously thought. The role of Contrast Enhanced Mammography in this setting will also be addressed.

TAKE HOME POINTS

Appropriate follow up of women after breast conserving therapy includes post lumpectomy mammography in women who presented with microcalcifications, yearly mammography and possible supplemental imaging with MRI and/or Contrast Enhanced Mammography

STAGING AND FOLLOW-UP

Whole body staging - which patients and how

M. Herranz¹, L. Grana Lopez², M. Vázquez Caruncho²; ¹Santiago de Compostela/ES, ²Lugo/ES

BODY

In the majority of breast cancer patients, a clinical stage of the disease must be defined, this staging will determine both the local and systemic treatment. Conventional techniques of breast imaging such as mammography, ultrasound and magnetic resonance imaging help in this staging process in a very precise way for the extension of the local disease, while bone scan, computed tomography or MRI, and PET / CT with FDG play a role in systemic staging.

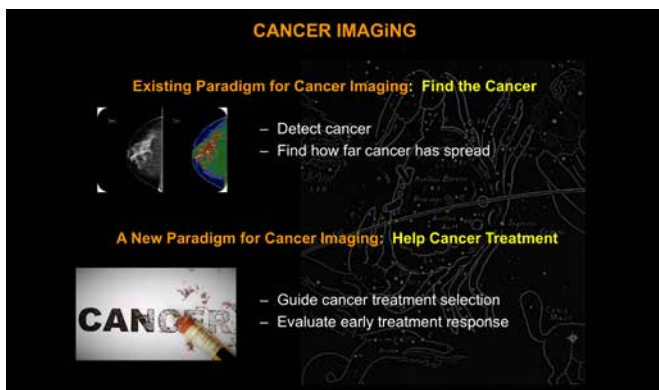
The National Comprehensive Cancer Network (NCCN), among others, recommends the use of PET / CT, especially with 18FDG, as the most common radiotracer, for staging breast cancer from stage IIIA (T3, N1, M0). Other studies indicated that the contribution of 18F-FDG PET / CT increases with the stage and use in stages IIB and IIIA could be highly interesting for patients.

Staging variation was performed in the presence of loco-regional extra-axillary nodes, including internal mammary, infra-clavicular and supraclavicular nodes, and / or distant metastases. In addition to the detection of axillary lymph nodes, the number and location of metastatic nodes are

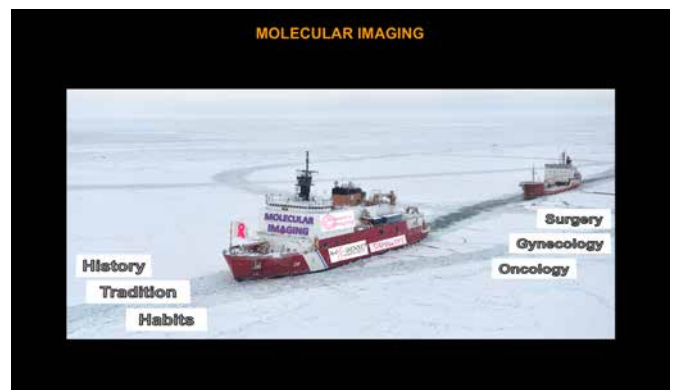
also important in cancer staging and therapy planning. The status of axillary lymph nodes is one of the main prognostic factors in breast cancer. It is currently accepted that SLNB is the main technique of use for this because it is capable of detecting even micrometastasis (<2 mm). However, the size of the metastatic deposit in a lymph node is a limiting factor for PET / CT.

Although PET / CT with FDG is currently the most commonly used PET modality in clinical routine of patients with breast cancer, the appearance of new radiotracers and the technological development of new diagnostic systems based on molecular images continue to expand the usefulness of PET for patients with breast cancer.

Currently working on new molecular imaging devices dedicated to breast cancer such as dbPET or PEM, and use of PET/MR technology may also have great interest in the study of this pathology, combining these two kind of techniques with an unquestionable potential for the study of cancer, diagnosis and therapy follow-up. Applications based on next-generation technological development can include not only approaches with prognostic value, which



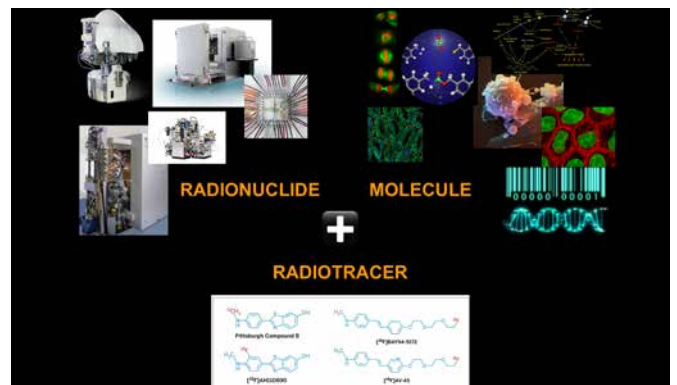
IMAGING IN BREAST CANCER



MOLECULAR IMAGING MISSION



HALLMARKS OF CANCER



RADIOTRACERS

Whole body staging - which patients and how

M. Herranz¹, L. Grana Lopez², M. Vázquez Caruncho²; ¹Santiago de Compostela/ES, ²Lugo/ES

can distinguish tumors from benign pathologies, but also those with a novel predictive character, such as determining which therapies will be effective and in what way at very early times in an individual patient. The new radiotracers agents, targeting ER, progesterone receptor and HER2 can help select optimal therapies, in addition to the growing technology in radiopharmacy and cyclotrons, which are also allow us to label and the visualize compounds such as mAbs (Trastuzumab, for example).

In summary, the usefulness of molecular imaging and nuclear medicine techniques in breast cancer staging are continually changing their indications as technologies and radiopharmacy are associated with an increasingly precise knowledge of tumor biology. At the same time, the development of new technological approaches with more resolution and specificity and the combination by fusion of conventional techniques with new developments, together with the new radiotracers, are allowing us to use more and better, molecular imaging in staging of breast cancer patients.

TAKE HOME POINTS

- Breast mammography, ultrasound, and magnetic resonance imaging help to precisely stage the extent of local disease, while bone exploration, CT or MRI of the abdomen, CT scan of the chest and PET / CT with FDG they play a role in systemic staging
- Guidelines endorses the use of PET / CT for staging breast cancer from stage IIIA (T3, N1, M0) and suggests that the role of 18F-FDG PET / CT from stage IIB and operable IIIA would be valuable.
- Loco-regional axillary nodes and distant metastases are other uses of PET / CT in staging, however there are still technological problems to be resolved such as the size of the tumor that can be visualized.
- New technological equipment, new reconstruction algorithms, new fusion software and especially new radiotracers more precise to specific biological pathways will help in the very near

STAGING AND FOLLOW-UP

Whole body MRI, anatomic and diffusion sequences

F. Lecouvet; Brussels/BE

BODY

Whole body MRI (WB-MRI) has emerged in the field of clinical radiology for the metastatic screening in a wide variety of cancers. This results from years of tuning and refining image acquisition protocols, and accumulating evidence from preclinical research and metaanalyses on the value of the technique. Recent efforts have resulted in standardization of acquisition, reading, response categorization. The minimization of acquisition times (now below 30 minutes) also contribute to a growing popularity.

WB-MRI examinations should include anatomic sequences, typically STIR and T1, now often consisting in high resolution 3D sequences, and functional diffusion weighted imaging (DWI) sequences. Based on this combination, the technique offers the perspective of a one-step staging, extending the detection from its historical target, the bony skeleton, to lymph nodes and parenchymas, outperforming imaging tools used in the past (bone scintigraphy and CT) for the detection of metastases from solid cancers, challenging PET/CT with its most specific tracers. The technique plays a role in disease staging by the time of diagnosis, allows the evaluation of response of metastases to treatment, and provides the clinician with prognostic information. It allows the recognition and specific management of new patient subgroups, i.e. those with bone only metastatic disease, and those with oligometastatic disease which raised recent interest in clinical trials of specific personalized therapeutic approaches

In breast cancer, bone is the most frequent site of metastasis, with bone metastases present in 70% of metastatic breast cancer (MBC) patients, being the first metastatic site in 25–40% of MBC. MBC with bone only metastasis (BOM) has specific characteristics, including longer survival and predominance of HR+/HER- tumoral subtype. Beside bone, breast cancer metastases affect the lymph nodes, liver, lung and brain. Regardless the location, early diagnosis, adequate treatment and evaluation of the therapeutic response are cardinal to improve survival and delay complications. But these objectives face unmet needs...as historical imaging modalities, bone scintigraphy and CT, present major limitations for lesion detection and assessment of response to treatment. WB-MRI offers the perspective of a one-step TNM staging.

There is a growing interest in modern imaging methods to optimize the detection and response assessment in metastases in their different locations. Two techniques have emerged, combining anatomical and functional information: [18F]-fluorodeoxyglucose (FDG) positron emission tomography/computed tomography (PET/CT), and

WB-MRI including diffusion-weighted sequences (DWI). WB-MRI detects, quantifies the extent of metastatic disease, and evaluates the response on the basis of morphologic, i.e. lesion number, size, signal intensity, and functional criteria, i.e. the effect of cell density on average diffusion coefficients (ADC), probing changes in water diffusivity within tissues. Recent works have demonstrated the ability of WB-MRI to disclose progressive disease earlier than CT and PET/CT, allowing early treatment adaptation. WB-MRI and FDG PET/CT are being compared in MBC patients for lesion detection and response assessment, and for the confident diagnosis of oligometastatic disease. WB-MRI is also the modality of choice for the staging of breast cancer diagnosed during pregnancy.

Figure: Concordant whole body MRI and PET/CT findings in a patient with MBC.

A, B: Coronal T1 (A) and high b value DWI (inverted grayscale, $b = 1000 \text{ sec}\cdot\text{mm}^2$) (B) MR images show evident foci of marrow replacement corresponding to metastases within the spine and left femur (arrows).

C, D: Corresponding reformatted coronal PET (C) and fuse PET/CT (D) images show the same foci (arrows).

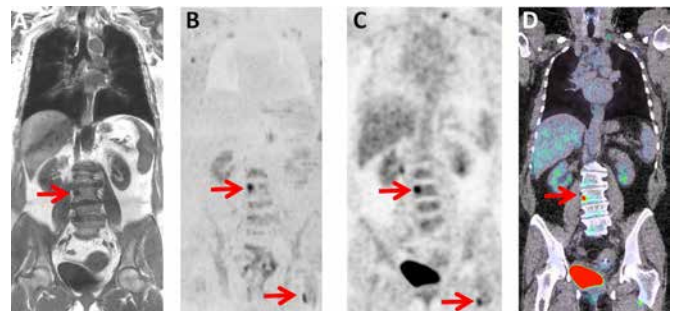


Figure: Concordant WB-MRI and PET/CT findings in MBC patient. A, B: Coronal T1 (A) and high b value DWI (B) MR images show bone metastases within the spine and left femur (arrows). C, D: Corresponding PET (C) and PET/CT (D) images show same lesions.

TAKE HOME POINTS

- WB-MRI has come to clinical practice.
- Guidelines provide recommendations for acquisition techniques, image reading and evaluation of lesion response to treatment.
- Examinations should include anatomic and DWI sequences.
- Metastatic breast cancer benefits from WB-MRI for early detection of metastases in their different locations, therapeutic decisions and disease monitoring.

YOUNG SCIENTISTS' SESSION, CARLA BOETES YOUNG INVESTIGATOR AWARD AND AWARDING OF THE BEST SUBMITTED ABSTRACT – YOUNG PHYSICIAN-SCIENTIST GRANT

Conventional CT vs dedicated CT-angiography in DIEP flap planning: a feasibility study

S. Mercogliano, A. D'angelo, A. Cina, D. Barbieri, P. Belli, R. Manfredi; Rome/IT

PURPOSE

Deep inferior epigastric perforator (DIEP) flaps are currently the state of the art in autologous breast reconstruction. Often patients candidate for DIEP flaps have in the recent history a conventional CT exam (cCT) performed for oncologic follow-up. We investigated the accuracy of cCT compared to a dedicated CT-angiography (CTa) in obtaining information required for DIEP flap planning.

METHODS

Thirty-three women underwent blind evaluation between 64-slice CTa (reference standard) and conventional venous phase-CT acquired respectively at 0.65 mm and 1.25 mm thickness. We evaluated accuracy in identification and localization of artery perforator on volume rendering reconstruction of abdominal surface; measurement of their intramuscular course (IMC); assessment of superficial venous communications (SVC) between the right and the left hemi-abdomen (score 1-4); identification of deep inferior epigastric artery (DIEA) branching according to Taylor's classification; assessment of the superficial inferior epigastric artery (SIEA) caliber (inferior, equal, or superior to the dominant perforator) and superficial inferior epigastric vein (SIEV) integrity.

RESULTS

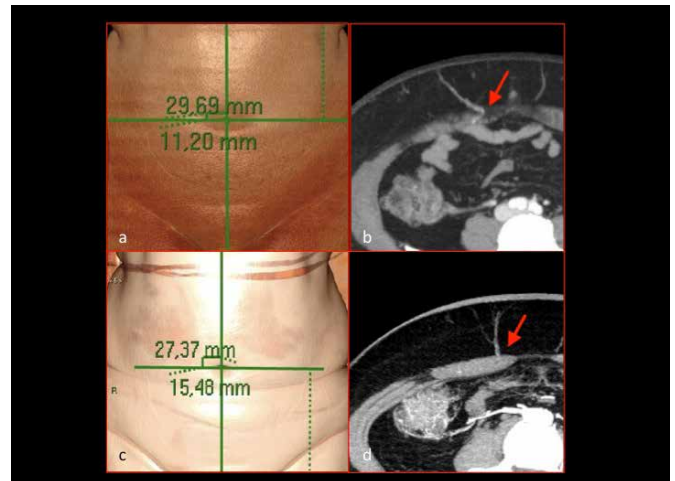
Accuracy of cCT in identifying the 3 largest perforators of the abdomen was 95%, and 100% for the dominant perforator. The mean error in topographic localization was 4.8 ± 3.8 mm along Y axis and 2.6 ± 3.8 mm along X axis. Accuracy in assessing perforator IMCs was 93%. SVC were correctly evaluated in 90.6% of cases, DIEA branching type in 85% and SIEA caliber in 90%. Integrity of SIEV was correctly identified in 96.8%. The total X-Rays dose potentially spared from CTa would be 788 ± 225 mGy/cm.

CONCLUSION

To strongly reduce radiation exposure, time and costs for DIEP surgery workup, a previous recent cCT available may be a valuable option for DIEP flap planning, due to high concordance with CTa findings.

SUMMARY STATEMENT

Conventional venous phase-CT, often performed for oncological purposes in patients candidate to DIEP flap planning, may substitute the dedicated CT-angiography due to high concordance in findings.



Dominant artery perforator identification and localization on volume rendering reconstruction of abdominal surface in CTa (a) and cCT (b). Artery perforator (red arrow) on the axial view of CTa (b) and cCT (d) maximum intensity projection reconstruction.

YOUNG SCIENTISTS' SESSION, CARLA BOETES YOUNG INVESTIGATOR AWARD AND AWARDING OF THE BEST SUBMITTED ABSTRACT – CARLA BOETES YOUNG INVESTIGATOR AWARD

Adjunct screening with tomosynthesis or ultrasound in women with mammography-negative dense breasts. The ASTOUND experience.

A. Tagliafico; Genoa/IT

BODY

Debate on adjunct screening in women with dense breasts has followed legislation requiring that women be informed about their mammographic density and related adjunct imaging. Ultrasound or tomosynthesis can detect breast cancer (BC) in mammography-negative dense breasts, and these modalities have been directly compared in ASTOUND prospective trials. We conducted two trials of adjunct screening to compare, within the same participants, incremental BC detection by tomosynthesis and ultrasound in mammography-negative dense breasts.

In the first part of the study we recruited in five centres asymptomatic women with mammography-negative screens and dense breasts. Eligible women had tomosynthesis and physician-performed ultrasound with independent interpretation of adjunct imaging. Outcome measures included cancer detection rate (CDR), number of false-positive (FP) recalls, and incremental CDR for each modality. Among 3,231 mammography-negative screening participants 24 additional BCs were detected (23 invasive): 13 tomosynthesis-detected BCs (incremental CDR, 4.0 per 1,000 screens; 95% CI, 1.8 to 6.2) versus 23 ultrasound-detected BCs (incremental CDR, 7.1 per 1,000 screens; 95% CI, 4.2 to 10.0), P = .006. Incremental FP recall did not differ between tomosynthesis (FP = 53) and ultrasound (FP = 65), P = .26.

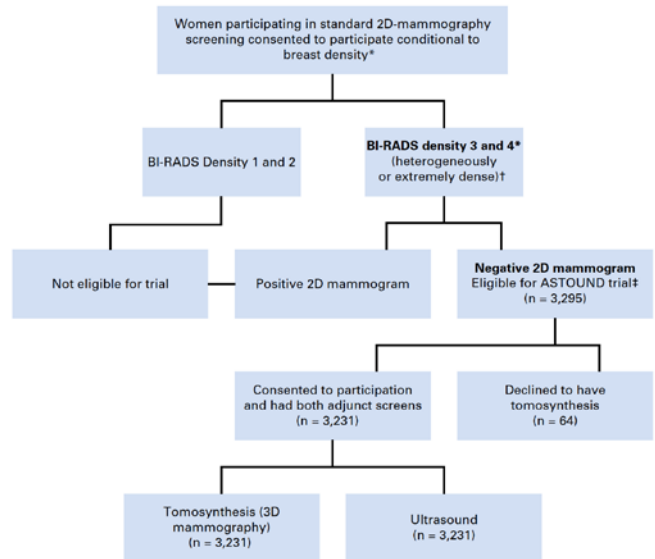
In the second part of the study (seven centres), in 5300 screening participants who had negative mammography and dense breasts, adjunct screening detected 29 additional BCs (27 invasive, 2 in-situ): 12 detected on both tomosynthesis and ultrasound, 3 detected only on tomosynthesis, 14 detected only on ultrasound. Incremental CDR for tomosynthesis (+15 cancers) was 2.83/1,000 screens (95%CI: 1.58-4.67) versus ultrasound (+26 cancers) which was 4.90/1,000 screens (95%CI: 3.21-7.19), P= 0.015. Incremental false-positive recall was 1.22% (95%CI: 0.91%-1.49%) and differed significantly between tomosynthesis (0.30%) and ultrasound (1.0%), P <0.0001.

TAKE HOME POINTS

Ultrasound has better incremental BC detection than tomosynthesis in mammography-negative dense breasts, may cause more false-positives. Future applications of adjunct screening should consider tomosynthesis or ultrasound.

MAIN REFERENCES OF THE PRESENTER RELATED TO ASTOUND:

Alberto S Tagliafico, Massimo Calabrese, Giovanna Mariscotti,



Dominant artery perforator identification and localization on volume rendering reconstruction of abdominal surface in CTa (a) and cCT (b). Artery perforator (red arrow) on the axial view of CTa (b) and cCT (d) maximum intensity projection reconstruction.

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UNUSUAL BREAST PATHOLOGIES

Implants and breast reconstruction

S. Perez Rodrigo; Madrid/ES

INTRODUCTION

The standard treatment of breast cancer is conservative surgery plus radiotherapy (RT), which has shown similar survival rate than mastectomy. However, mastectomy rates have increased recently due to multiple reasons. In a similar way, the reconstructive techniques have increased and have evolved, finding actually multiple types as for example heterologous techniques (mainly those implants based) and autologous techniques. We will describe their types, their indications, the characteristics of each of them and the way of recognizing them.

DISCUSSION

We will classify the different techniques into two groups:

- 1) Heterologous reconstruction: the most commonly used. Exogenous materials are used to reconstruct the breast. We can find other 2 different groups:
 1. Implant-based reconstruction (IBR): expanders, implants, and meshes.
 2. Injection of different substances (hyaluronic acid, free silicone...)
- 2) Autologous reconstruction: a more complex technique, with 2 different groups:
 1. Flap reconstruction: different types of flaps, with different characteristics depending on the origin and the components (LD, DIEP, pedicled TRAM, free TRAM, SIEA, TDAP, SGAP, IGAP, and from other parts of the body)
 2. Lipofilling, fat grafting or free fat injection: especially used in cases of partial defects.

We will review the different types of complications and how to recognize them, but moreover, we will review the finding that will suggest a recurrence and the way to diagnose it.

TAKE HOME POINTS

- To be familiarized with the different types of breast reconstructions
- To know the main characteristic of each reconstructive technique.
- To identify the normal appearance of the operated and the reconstructed breast.
- To identify the possible complications of the implants, flaps, and lipofilling
- To know that even despite a mastectomy, the recurrence is possible, so it is essential to differentiate one from the other

UNUSUAL BREAST PATHOLOGIES

Male breast

M.A. Marino; Messina/IT

BODY

Male breast anatomy differs greatly from the female breast: men breast tissue is closer to the skin and pectoral fascia compared to women.

Gynecomastia is a common benign entity of male breast and is defined as a benign proliferation of rudimentary breast tissue in men.

Male breast cancer represents < 0.5% of cancer diagnoses in men. The etiology of male breast cancer is poorly understood, but several risk factors are involved, including genetic disorders.

Breast cancer is also present in transgender patients and commonly presents at a younger age with a palpable mass.

Currently, there are no national or international guidelines recommending mammography screening in men patients, but recent studies are exploring the need of a screening test in these patients.

An overview on male breasts, including anatomy, benign and malignant diseases will be given. Challenges in diagnosis and differences in prognosis compared to female patients will be presented.

TAKE HOME POINTS

- Anatomical differences are present between male and female breasts
- Men breast cancer is a deadly but rare disease and represents less than 0.5% of cancer diagnoses in men
- Screening mammography might be useful in a selected high-risk population of men

UNUSUAL BREAST PATHOLOGIES

Inflammatory carcinomas: A Unique and Aggressive Disease Entity

C. Colin; Lyons/FR

BODY

The most aggressive breast cancer

Inflammatory breast cancer (IBC) represents the most aggressive breast cancer with distinct clinical and pathological features, with a high risk of metastasis and relapse. The population-based incidence varies widely from <1% to 10%, depending upon various diagnostic criteria reported in the literature (1). Risk factors are suspected to be associated with IBC such as black race, body mass index, age and region (2). In Western Africa, or Egypt, malignant occurrence is as high as 10% (3). This justifies a collective international effort to better understand this unique disease entity.

A “clinico-pathologic” entity

Both characteristic clinical features and tissue diagnosis of malignancy are required to confirm the diagnosis of IBC (4). Symptoms of IBC develop within 3 months or less (4). Clinical findings include rapid onset of breast skin erythema with edema and “peau d’orange”, a French term meaning “skin of an orange” that describes the pitted, dimpling skin caused by tumor emboli that obstruct the dermal lymphatics. At presentation, 20%–40% of patients will have distant metastases, often to the lungs, liver, bone, or brain, a finding that reflects the very aggressive nature of IBC (5).

IBC is not considered as a specific histological subtype of breast carcinomas, and it has no specific diagnostic pathological criteria. In the context of inflammatory breast with a suspicious lesion, the diagnosis of IBC is based on breast biopsy and punch skin biopsy to detect infiltration of cancer cells within dermal tissue. Dermal lymphatic emboli are present in approximately 75% of cases (6). The absence of dermal emboli does not exclude the diagnosis. Analogous to non-IBC, IBC has five molecular subtypes based on their gene expression profile: luminal A, luminal B, human epidermal growth factor receptor 2 (HER2) over-expression, basal, and normal-breast like (1). Most IBC are ductal carcinoma with a high histological nuclear grade, about 17 % to 30% of IBC cases are triple negative and 18% to 44% are epidermal growth factor receptor 2 (HER2) positive (2). Molecular biology and genomics may play an important role in the diagnosis and management of IBC towards new targeted therapeutic strategies (2).

Inflammatory breast: Which radiological features evoke malignancy?

Because of the painful limits the optimal compression and the increased mammographic density from global edema obscures visualization of an underlying breast mass, authors reported a lack of sensitivity of mammograms. Mammography

is still recommended to provide screening of the contralateral breast.

US and MRI detect a mass, parenchymal changes or skin thickening in patients with IBC better than mammography with reported sensitivity 92-96% (3) and MRI 98% (7). The discrimination between benign mastitis and IBC remains a diagnostic challenge because of overlapping imaging features. Both inflammatory breast cancers and benign mastitis may exhibit similar MRI morphological features such as skin thickening, edema and presence of mass lesions or non-mass like enhancement. Among all causes of mastitis, IBC are more likely to show solid mass lesions and MR imaging is the most accurate imaging technique to identify a biopsy target (4,8). Global skin thickening with enhancement, heterogeneously enhancing confluence of multiple lesions / multifocal diseases and extensive non-mass enhancement are key MRI features of IBC (7,9). The combination of multiple dynamic and morphological MRM criteria seems to have the potential for a differential diagnosis. Differences were described by taking into account their enhancement characteristics (10,11). Masses in IBC tend to display greater initial enhancement and more frequent subsequent washout. The following criteria were also observed more often in IBC: T2-hypointensity of masses, blooming sign, and infiltration of pectoralis major muscle with interruption of fat plane, perifocal prepectoral and intramuscular pectoral oedema; malignant lesions tend to occur either centrally or dorsally within the breast tissue when lesions in benign mastitis tend to occur in a subareolar location (11). Authors reported that segmenting T2 bright areas in the lesions for ADC mapping may distinguish benign from malignant lesions (12).

Whatever the contribution of US and MR imaging modalities, any non-lactating patient with mastitis that does not respond to antibiotic therapy should undergo biopsy to exclude presence of malignancy taking into account the aggressiveness of IBC.

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Inflammatory carcinomas: A Unique and Aggressive Disease Entity

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01	Single-reading of AI-labeled likely normal screening mammography cases: a simulation study on the impact on sensitivity, specificity and workload	<i>A. Rodriguez Ruiz</i> ¹ , K. Lang ² , M. Broeders ³ , G. Gennaro ⁴ , P. Clauser ⁵ , T. Mertelmeier ⁶ , M.G. Wallis ⁷ , S. Zackrisson ² , R.M. Mann ¹ , I. Sechopoulos ¹ ; ¹ Nijmegen/NL, ² Malmö/SE, ³ Eindhoven/NL, ⁴ Padua/IT, ⁵ Vienna/AT, ⁶ Erlangen/DE, ⁷ Cambridge/UK
02	Improve the outcome of incidental breast lesions detected on CT scan: Clear Approach and guidance for radiologists	<i>I.A.H. Ahmed</i> , N. Awad, M. Hajaj; Doha/QA
03	Breast Implant-Associated Anaplastic Large Cell Lymphoma: What the Radiologist Should Know	N.P. Burute ¹ , <i>D. Kuroweckj</i> ² , G. Gohla ² , C.E. Boylan ² , A. Alabousi ² , F. Al-Douri ² ; ¹ Thunder Bay/CA, ² Hamilton/CA
04	Multimodal artificial intelligence for breast cancer detection in a population of women with dense breasts	T. Tan ¹ , <i>A. Rodriguez Ruiz</i> ¹ , N. Karssemeijer ¹ , R.M. Mann ¹ , L. Bao ² ; ¹ Nijmegen/NL, ² Hangzhou/CN
05	Gadoteridol-enhanced MRI of the breast: comparative evaluation of BPE between different rates of contrast administration.	<i>F. Marzocca</i> , F. Galati, E. Collalunga, G. Panzironi, F. Pediconi; Rome/IT
06	Management of Lesions Identified by Contrast Enhanced Mammography and Not detected by Ultrasound	<i>P. Fani</i> ¹ , I. Ben Nachum ² , A. Kornecki ² ; ¹ Burlington/CA, ² London/CA
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09	Optoacoustic imaging features correlate with breast cancer clinicopathological prognostic factors	B.E. Dogan ¹ , <i>G. Menezes</i> ² , R. Butler ³ , E. Neuschler ⁴ , P. Lavin ⁵ , R. Aitchison ⁵ , F.L. Tucker ⁶ , P. Otto ² , S. Grobmyer ⁷ ; ¹ Dallas/US, ² San Antonio/US, ³ New Haven/US, ⁴ Chicago/US, ⁵ Framingham/US, ⁶ Wirtz/US, ⁷ Cleveland/US
10	Early prediction of pathological response to neoadjuvant chemotherapy in breast cancer: the Automated Breast Volume Scanner could play a role?	<i>A. D'Angelo</i> ¹ , S. Mercogliano ² , D.A. Orlandi ¹ , P. Belli ¹ , R. Manfredi ¹ ; ¹ Rome/IT, ² Caserta/IT
11	Radiomic signatures extracted from contrast enhanced magnetic resonance and diffusion weighted imaging for the assessment of breast cancer molecular subtypes	<i>D. Leithner</i> ¹ , M.E. Mayerhöfer ² , B. Bernard-Davila ³ , M.S. Jochelson ³ , J.V.M. Horvat ⁴ , M.A. Marino ⁵ , D. Martinez ³ , S. Thakur ³ , E.A. Morris ³ , K. Pinker-Domenig ³ ; ¹ Frankfurt am Main/DE, ² Vienna/AT, ³ New York/US, Sao Paulo/BR, ⁵ Messina/IT
12	Clinical evaluation of the effectiveness of a nonradioactive microimpulse radar technology for breast localization: single institution experience	<i>D. Suleimenova</i> ¹ , M. Eghtedari ¹ , R. Rakow-Penner ¹ , A. Hosseini ¹ , S. Blair ¹ , A. Wallace ¹ , H. Ojeda-Fournier ² ; ¹ San Diego/US, ² La Jolla/US
13	Prediction of MRI size underestimation of small invasive and in situ ductal carcinomas of the breast based on patient and tumor characteristics	<i>W. Sanderink</i> , L.J.A. Strobbe, P. Bult, I. Sechopoulos, N. Karssemeijer, R.M. Mann; Nijmegen/NL
14	Artificial Intelligence for breast cancer detection in mammographic screening: does it detect the cancers that matter?	<i>M. Halling-Brown</i> ¹ , A. Rodriguez-Ruiz ² , M.G. Wallis ³ , N. Karssemeijer ² , K. Young ¹ ; ¹ Guildford/UK, ² Nijmegen/NL, ³ Cambridge/UK
15	Interval cancers after the first screening round of Tomosynthesis plus Digital Mammography vs. Digital Mammography Breast Cancer Screening in the RETomo Trial.	<i>V. Iotti</i> ¹ , C. Campari ¹ , P. Giorgi Rossi ¹ , A. Nitrosi ¹ , R. Vacondio ¹ , V. Ginocchi ² , C. Coriani ¹ , S. Caffarri ³ , M. Pescarolo ⁴ , P. Pattacini ¹ ; ¹ Reggio Emilia/IT, ² Castelnovo ne monti/IT, ³ Guastalla/IT, ⁴ Reggio Emilia, RE/IT

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21	Optoacoustic Imaging (OA/US) and Gray Scale Ultrasound (US) Features of Breast Cancers: Correlation with Molecular Subtypes.	B.E. Dogan ¹ , <i>G. Menezes</i> ² , R. Butler ³ , E. Neuschler ⁴ , P. Lavin ⁵ , R. Aitchison ⁵ , F.L. Tucker ⁶ , P. Otto ² , S. Grobmyer ⁷ ; ¹ Dallas/US, ² San Antonio/US, ³ New Haven/US, ⁴ Chicago/US, ⁵ Framingham/US, ⁶ Wirtz/US, ⁷ Cleveland/US
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36	Association of the Kaiser Score with invasiveness of breast cancer: Could it provide actionable information?	M. Dietzel ¹ , E. Wenkel ¹ , S. Ellmann ¹ , R. Schulz-Wendtland ¹ , M. Uder ¹ , P. A. T. Baltzer ² ; ¹ Erlangen/DE, ² Vienna/AT
37	False negative in digital mammography with tomosynthesis in clinically appreciable nodular lesions over one centimeter in size: histo-pathological correlation	F.D.T. Di Tosto ¹ , C. Di Stefano ¹ , D. Ferrari ¹ , A. Ricci ¹ , E. Beninati ¹ , I. Coco ² , V. Fiaschetti ³ , R. Floris ¹ ; ¹ Rome/IT, ² Catania/IT, ³ Ciampino/IT
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51	Diffusion weighted imaging with simultaneous multi-slice echo-planar technique for the diagnosis of breast MRI.	<i>Y. Machida</i> ¹ , K. Nomura ² , Y. Katou ³ , E. Fukuma ⁴ ; ¹ Chuo Ward Tokyo/Jp, ² Tokyo/Jp, ³ Chiba/Jp, ⁴ Kamogawa City/Jp
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58	Our Experience of Management of Breast Lesions of Uncertain Malignant Potential on Core Biopsy (B3 lesions).	<i>S. Lam</i> , C. Brook, A. Grima, C. Rubin, R.S. Oeppen, M. Stahnke, R. Walker; Southampton/UK
59	Ultra-low Dose Molecular Breast Imaging using ClearMBI	<i>M. O'Connor</i> , K. Hunt, A.L. Connors, D. Rhodes, C. Hruska; Rochester/US
60	Transfer learning methods performance in identification of breast lesions on 1st post contrast MRI sequences	H. Bougias ¹ , <i>C. Chinake</i> ² , A. Ghiatas ³ , K. Veliou ¹ , A. Christou ² ; ¹ Ioannina/GR, ² Brighton/UK, ³ Athens/GR
61	Quantitative diffusion-weighted MRI of tumor-associated breast edema	<i>N. Radovic</i> , G. Ivanac, I. Biondic Spoljar, E. Divjak, B. Brkljacic; Zagreb/HR
62	Evaluation of radiologists' perceived ability to detect and assess lesions in mammograms with varying image quality	<i>J. Boita</i> ¹ , R. van Engen ¹ , A. Mackenzie ² , A. Tingberg ³ , H. Bosmans ⁴ , M.A.S.L.A. Bolejko ⁵ , S. Zackrisson ³ , M.G. Wallis ⁶ , M. Broeders ¹ , I. Sechopoulos ¹ ; ¹ Nijmegen/NL, ² Guildford/UK, ³ Malmö/SE, ⁴ Leuven/BE, ⁵ Lund/SE, ⁶ Cambridge/UK

SCIENTIFIC POSTERS

Poster ID	Poster Title	Authors
63	Discordant double-read screen-detected breast cancer: mammographic features and pathological correlation	<i>V. Bonello</i> , S. Mohammadi, V. Scott, S. Dumonteil, R. Given-Wilson; London/UK
64	Evaluating the prediction value of multiparametric MRI in patients with advanced breast cancer undergone to neoadjuvant chemotherapy (NACT)	<i>C. Costanza</i> , M. Durando, G. Mariscotti, E. Regini, V. Ruggeri, I. Castellano, P. Fonio; Turin/IT
65	Digital Breast Tomosynthesis-guided breast biopsy: Experiences and comparison with Stereotactic-guided breast biopsy in an Asian population	<i>M. Cheung</i> , C.S.Y. Lo, T.P. Lam; Hong Kong/HK
66	Role of Strain elastosonography in differentiating benign from malignant focal breast lesions	<i>G. Milia</i> , A. Orlando, L. Spatafora, M. Dimarco, M.I. Schillaci, S. Messina, M. Midiri, R. Ienzi, T.V. Bartolotta; Palermo/IT
67	Breast Implants: An Imaging Review	<i>T. Rashid</i> ¹ , D. Kadosh ¹ , D. Sadowsky ¹ , J. Wu ¹ , O. Furusato-Hunt ¹ , J. Drinane ² , P. Gerard ¹ , M. David ³ ; ¹ Valhalla/US, ² Albany/US, ³ Scarsdale/US
68	Unprovoked thromboembolic events in women: Is it necessary to perform mammography to exclude occult malignancy?	<i>F.C. Daley</i> , N. Healy, R. Sinnatamby; Cambridge/UK

POTENTIAL CONFLICT OF INTEREST DISCLOSURES

It is the policy of the European Society of Breast Imaging to ensure balance, independence, objectivity, and scientific rigour in the congress programme. Knowledge of possible relationships with sponsors of any kind is mandatory in order to reinforce the educational and scientific message and to relieve any suspicion of bias.

Any potential conflict of interest involving EUSOBI speakers should be made known so that the audience may form their own judgements about the presentation with a full disclosure of the facts. It is for the audience to determine whether the presenter's external interest may reflect a possible bias in either the work carried out or the conclusions presented.

Dr. Julia Camps Herrero, head of the Scientific and Organising Committee, did not disclose any relationships.

Dr. Alexandra Athanasiou, member of the Scientific and Organising Committee, did not disclose any relationships.

Dr. Pascal A. Baltzer, member of the Scientific and Organising Committee, did not disclose any relationships.

Prof. Gabor Forrai, member of the Scientific and Organising Committee, disclosed the following relationships:

Receipt of honoraria or consultation fees: Kheiron Ltd

Prof. Fiona J. Gilbert, member of the Scientific and Organising Committee, disclosed the following relationships:

Receipt of grants/research supports: Hologic, GE Healthcare and GSK

Receipt of honoraria or consultation fees: Google DeepMind.

Prof. Michel Herranz, member of the Scientific and Organising Committee, did not disclose any relationships.

Dr. Ritse M. Mann, member of the Scientific and Organising Committee, disclosed the following relationships:

Receipt of grants/research supports: Siemens Healthineers, Bayer Healthcare, Medtronic, BD, Screenpoint Medical, Seno Medical, Koning

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Dr. Laura Martincich, member of the Scientific and Organising Committee, did not disclose any relationships.

Dr. Katja Pinker-Domenig, member of the Scientific and Organising Committee, did not disclose any relationships.

INDUSTRY SYMPOSIUM ABSTRACTS

Friday, October 4, 12:15

INDUSTRY-SPONSORED LUNCH SYMPOSIUM BY SYSMEX EUROPE GMBH

Wire-free, non-radioactive lesion and lymph node localisation – clinical experiences

Transformative changes in the field of breast cancer treatment have led to improved patient outcomes and shifts in surgical management. The Magseed® magnetic marker has been specifically designed to overcome the limitations associated with current techniques for lesion and lymph node localisation. This tiny seed has already been used throughout the world to help thousands of women have better outcomes for their breast surgery. It promotes seamless operation room scheduling, highly accurate localisation and high patient satisfaction.

This lunch-symposium will include discussions on pioneering concepts of Sentimag®-Magseed® in neoadjuvant settings, its impact versus conventional wire-guided surgery, and its use in non-palpable lesion localisation versus radio-occult lesion localisation (ROLL).

Friday, October 4, 15:15

INDUSTRY-SPONSORED SYMPOSIUM BY KHEIRON MEDICAL TECHNOLOGIES

Impactful AI: From research to deployment

Join Kheiron Medical and clinical partners as they share the next phase of their journey, taking Mia™ from development to deployment. Mia™, the company's first AI product, has solved one of the hardest cancer detection tasks, identifying breast cancer malignancies in the context of double read breast screening programmes. Hear from some of the doctors and breast screening experts who are on the frontline of evaluating Mia™ in everyday practice: find out about the challenges as well as the opportunity for Mia™ to help solve the workforce crisis and improve outcomes for patients globally. There will be a short Q&A session at the end of this symposium.

Friday, October 4, 15:45

INDUSTRY-SPONSORED SYMPOSIUM BY SCREENPOINT MEDICAL

What do I want AI to deliver and how far have we got?

M.G. Wallis; Cambridge/UK

AI is developing fast and can already almost match the performance of a single reader but is this enough? Currently most screen readers are recalling and biopsying large numbers of normal women at great cost to both the individual and the system as a whole and potentially over diagnosing 2 of 3 cancers. Can or should we be asking more than just mimicking current practice and how far have we actually got?

Friday, October 4, 16:00

INDUSTRY-SPONSORED SYMPOSIUM BY MAMMOTOME

Mammotome Biopsy Suite experience incl. VABB ST 2D/3D biopsy, MConfirm Specimen Radiograph Solution and marker placement

K. Gieraerts; Bruges/BE

The gold standard for breast biopsy is currently an ultrasound (US)-guided core needle biopsy (CNB) of the suspected lesion in the breast when a mass is seen on ultrasound. Unfortunately, some types of breast cancer are more difficult to find on ultrasound when they present as calcifications or as an architectural distortion on mammography or tomosynthesis. Therefore, other techniques like 2D stereotactic- or 3D tomosynthetic-guided vacuum breast biopsies (VABB), are mandatory. Regarding the type of biopsy, no system proved to be superior in the literature up to now. Nevertheless, each type of biopsy has its advantages and disadvantages and the operator will have to decide which system he will use for the biopsy. After collection of the biopsy specimen, a quality control is mandatory. Herefore the clinical description of protocol and usage of the MConfirm will be explained.

INDUSTRY-SPONSORED LUNCH SYMPOSIUM BY GE HEALTHCARE ELEVATING PERSONALIZED BREAST CARE: TAKE ADVANTAGE OF MULTI-MODALITY APPROACHES

Personalized and risk-stratified screening with ABUS 2.0 using latest cutting edge technology A. Vourtsis, Athens/GR

Risk stratification has the potential to identify women and recommend tailoring screening by accounting the individual risk level of developing breast cancer; which could improve screening outcomes by reducing the interval cancer rates, the cost of therapy and the burden of the disease. Mammographic density is one of the strongest risk factors for breast cancer. Women with heterogeneously dense and extremely dense breasts have a relative risk of 2-fold and 4-fold to develop invasive breast cancer compared to women with predominantly fatty breasts. Breast density has been recently incorporated into Tyrer-Cuzick and Breast Cancer Surveillance Consortium risk models. Additionally breast density decreases the sensitivity of mammography, due to "masking" of non-calcified cancers; yielding an increase of the interval cancer rates and delaying diagnosis with worse outcomes.

Automated Breast Ultrasound (ABUS) is a new imaging modality that has become integrated into breast imaging practice as an adjunct to mammography to improve breast cancer detection in women with dense breasts (heterogeneously or extremely dense). Studies have shown that ABUS improves the detection of small invasive cancers in women with dense breasts with the incremental cancer rate (ICDR) ranging between 1.9/1000 to 3.6/1000. Comparing the two modalities (ABUS and HHUS) an equivalent sensitivity has been observed for ABUS averaged to 90.6% and HHUS to 90.8%. Additionally ABUS may provide higher specificity in the characterization and differentiation of breast lesions by perceiving the presence of an architectural distortion that is described as "retraction phenomenon" displayed on the coronal reconstruction plane, a sign commonly seen in malignancy and the "hyper-echoic rim" observed more in benign lesions. Moreover, ABUS improves the efficiency and reproducibility and it addresses the operator dependence encountered with HHUS.

The Invenia ABUS 2.0 was recently developed to provide an a. improvement in the scanning technique b. software and c. interpretability of studies. ABUS 2.0 offers patient comfort and the acquisition of images obtained by the medical staff have been improved. The option to lock or unlock the transducer during scanning allows to apply additional compression against the breast so the transducer optimizes its contact with the scanning surface; improving the quality of image, which could significantly reduce the frequency of the recall rate and false-positive interpretations. Furthermore, ABUS 2.0 pertains a higher contrast and higher resolution compared to ABUS 1.0. The penetration is also improved and that is mainly observed in large and very dense breasts which can enhance the diagnosis of cancer and radiologists can feel more confident in their reading and reporting. An upgrade of the image processor has been achieved; improving its integration into high demand workflow by offering an efficient and faster image interpretation. Additionally the auto prior compare option is very helpful because it easily allows to compare a region of interest to prior examinations.

TAKE HOME POINTS

- ABUS 2.0 is an efficient, reproducible and comprehensive technique for supplemental breast screening.
- Newer technical developments of ABUS will help increase the sensitivity and specificity and will lead to more accurate diagnosis of cancers.

ABBREVIATIONS

ABUS - Three-dimensional automated breast sonography

HHUS – Hand-held ultrasound

ICDR- Incremental cancer detection rate

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Saturday, October 05, 2019, 12:30

INDUSTRY-SPONSORED LUNCH SYMPOSIUM BY GE HEALTHCARE ELEVATING PERSONALIZED BREAST CARE: TAKE ADVANTAGE OF MULTI-MODALITY APPROACHES

A Six-year prospective evaluation of second-look US with volume navigation for MRI-detected additional breast lesions

A. Fausto; Siena/IT

Second-look US with V Nav US/MRI Fusion Imaging can be effective in detecting a large number of additional breast lesions occult at second-look US and to biopsy a significant number of malignant lesions safely and irrespective of distance from skin or lesion position.

Saturday, October 05, 2019, 12:30

INDUSTRY-SPONSORED LUNCH SYMPOSIUM BY GE HEALTHCARE ELEVATING PERSONALIZED BREAST CARE: TAKE ADVANTAGE OF MULTI-MODALITY APPROACHES

Extent of disease, management decisions, new tools – the One stop Unit for breast diseases

C. Balleyguier; Villejuif/FR

Digital mammography allowed the development of new techniques to improve breast disease management, tomosynthesis and contrast-enhanced spectral mammography (CESM).

Both techniques may be used in a post-screening assessment to improve treatment strategy. We organized a post-screening One Day visit 14 years ago, with more than 12.000 women explored until today. A multidisciplinary team composed of radiologists, oncologist, breast surgeon and pathologist are working together in different separate rooms and examine women referred for a post-screening assessment. Ultrasound is one of a key examination for diagnosis. Our diagnosis is also mainly based on tomosynthesis and CESM. Two major questions are asked during this visit: breast cancer staging, when a cancer is diagnosed, especially in dense breasts, and inconclusive mammograms. For breast cancer staging, we prefer the use of CESM which seems to be more accurate in tumor size evaluation, and detection of additional lesions. The use of CESM may decrease the use of MRI and is more easily applied in a One Day assessment. CESM may change treatment strategy in approximately 20 % of cases, as MRI. Tomosynthesis is more used in focal density assessments with a normal ultrasound or architectural distortion evaluations, in non-conclusive mammograms. Decision to use one technique or other may also be discussed according age and history of contra-indication to iodine injection.

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