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ultrasound post

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GE Revels its Brand New Line of **Compact Ultrasound Systems**

Waukesha, USA. GE, the world's leading ultrasound company, is introducing four new clinically specialized ultrasound systems to address healthcare providers' growing demand for sophisticated, real-time imaging at the point-of-care. GE's new series of compact ultrasound systems is the world's first and only to place the power and imaging performance of a 400-pound ultrasound system in a laptop-size design. According to Omar Ishrak, president and CEO of GE Healthcare's Clinical Systems division, miniaturization was the first step in bringing basic ultrasound to the point-of-care. **"Until now, the broad adoption of compact ultrasound has been hindered by image quality limitations and the industry's 'one size fits all' approach to compact system design,"** said Ishrak. **"By working with physicians from a wide range of medical specialties, we've learned that image quality, portability and clinical specialization are all essential to expanding ultrasound's role in healthcare. We've developed our new Compact Series to address these needs and bring the benefits of ultrasound to virtually all clinicians and patients – creating a pathway for ultrasound to become as ubiquitous in patient care as the stethoscope is today."**

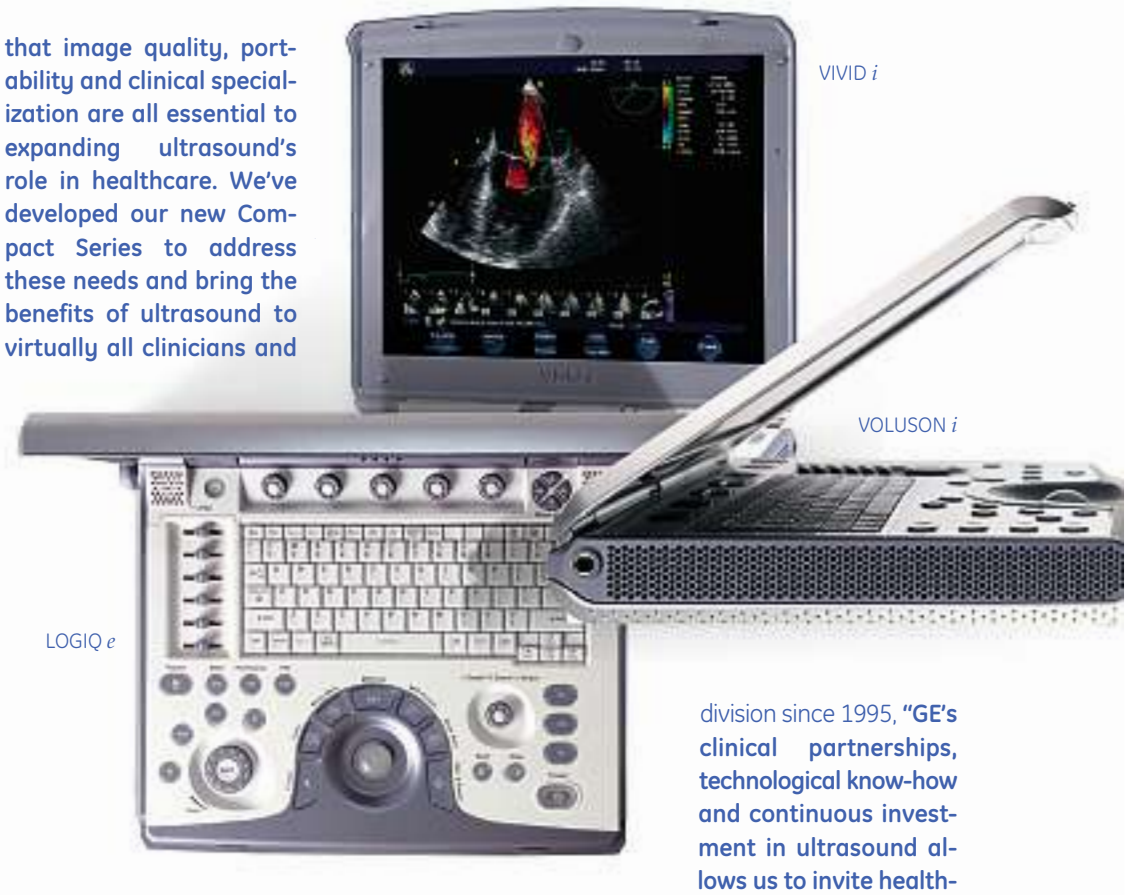
GE has set a new threshold for compact ultrasound imaging performance, according to physicians who have previewed the new systems. The Compact Series builds upon GE's successful introduction of VIVID *i* in 2005, a high-performance cardio-vascular ultrasound system in a compact design.

Blending image quality and portability with clinical applications, reporting tools and a user interface designed specifically for cardiac imaging, VIVID *i* has been rapidly adopted by the medical community, and today is transforming the way heart disease is detected, diagnosed and managed at more than 1,000 sites around the world. GE's Compact Series includes the VIVID *i*, and the new VOLUSON *i* and LOGIQ *i* (which will be introduced in September 2006) systems – each designed to bring specialized, console-quality imaging performance and portability to traditional applications in Cardiology, Obstetrics & Gynecology, and Radiology respectively.

Expanding ultrasound's reach to new clinical areas, GE's new LOGIQ *e* was uniquely designed with the speed and imaging applications to support real-time clinical decisions in emergency and surgical settings.

GE's new VIVID *e* provides a dedicated cardiac ultrasound imaging solution for the physician's office in a practical, easy to use design. According to Ishrak, who has more than 20 years of experience in ultrasound technology development and has been a central figure in the industry as the leader of GE's ultrasound division since 1995, **"GE's clinical partnerships, technological know-how and continuous investment in ultrasound allows us to invite healthcare's top physicians 'to the drawing board' to rethink ultrasound.**

Together, we're developing innovative ultrasound systems to help address some of today's most pressing healthcare issues such as improving access to quality care in rural communities and developing regions of the world, and in developed regions, shifting to an 'early health' model where technologies like ultrasound can be used to help detect diseases earlier when they can be more effectively treated."



EDITORIAL:

Heinz GLOOR
Vice President / General Manager
GE Healthcare Technologies
Ultrasound & PCD
Europe, Middle East & Africa

Dear Reader,

Technological progress is here to make our life easier. At the same time, technological progress changes our way of life. Just consider how cellular telephones have changed our way of communication since they first appeared on the market and became affordable to the general public within a span of less than 10 years. Today life without cell phones seems practically impossible.

Another success story regarding technological progress can be observed in the entertainment industry. In the seventies Sony introduced the world's first Walkman, a portable cassette player. From that moment on people could be seen wearing headphones in the streets, subways or just about anywhere listening to their favorite music. In the nineties Sony introduced the Discman, a portable CD player, and just a few years ago Apple introduced the iPod, the highly popular MP3 player. Thanks to the MP3 standard format for music, today it is easy for anyone to access their entire music library anytime and anywhere right from their pocket.

As we can see in these examples, technologically based changes to our way of life are often linked to mobility and flexibility. Mobility and flexibility are also key words in medicine: as a matter of fact, they are part of the requirements of medical equipment. With the launch of our new Compact Ultrasound line, GE Healthcare provides an ultrasound product line that allows for high levels of flexibility and mobility in patient care, sets new standards in patient monitoring systems and is therefore shaping a new age of patient care.

For the first time a lightweight, compact ultrasound range of systems with uncompromised image quality for every application is available on the market. And, in much the same way that technological achievements in other branches have changed our way of life, we are convinced that GE's Compact Ultrasound line will change the way ultrasound is performed today. With the devices LOGIQ *e*, VIVID *i*, VIVID *e* and VOLUSON *i* we are able to offer a Compact Ultrasound system for every specialized field in medicine regardless of whether in the areas of Radiology and General Imaging, Cardiology or Ob/Gyn. First trials by renowned specialists from around the globe verify the excellent image quality and the outstanding flexibility of the systems.

Therefore, they strengthen our commitment to helping clinicians re-imagine new ways to predict, diagnose, inform and treat disease, so their patients can live their lives to the fullest. This issue of the Ultrasound Post is primarily dedicated to our new Compact Ultrasound line and I invite you to see for yourself by reading about the initial clinical trials of Compact Ultrasound.

Yours

LOGIQ *e*
Convinces in Clinical Trial

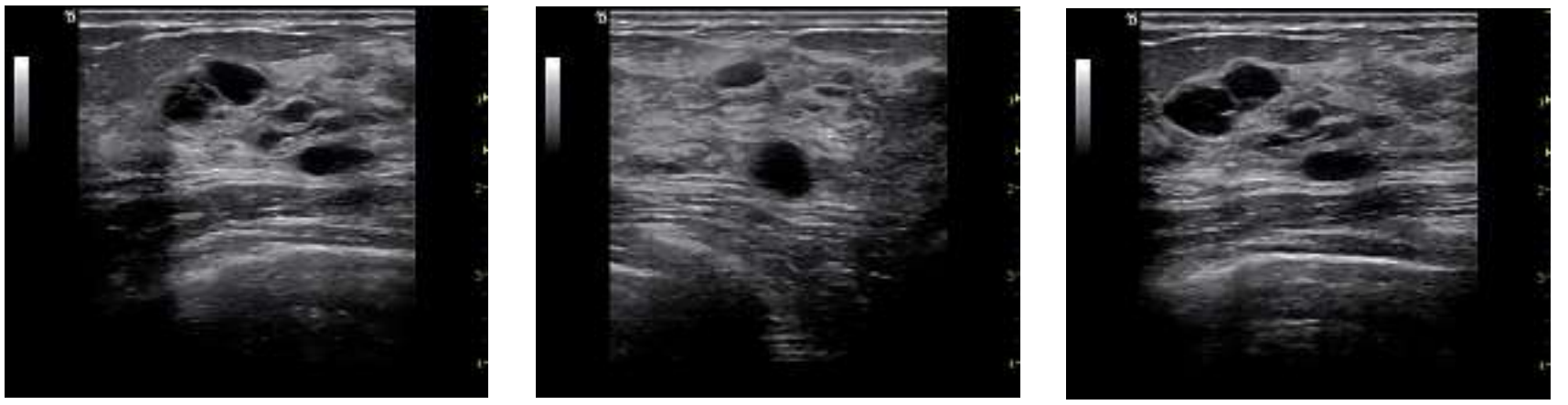
Our initial experience with the new General Electric Healthcare Ultrasound device LOGIQ *e* for breast imaging was conducted in two ways. We evaluated it in US-guided biopsy sessions first. The lesions had been diagnosed on US units from different origins and were sent to us for US-guided core needle biopsies. In every case, we were able to identify even the smallest lesions (3 mm), analyze their characteristics and successfully conduct the biopsies. The biopsy needle could be seen perfectly from the point of entry to the lesion in every case.

The second part of our evaluation was performed in a diagnostic session, where US was released after the mammogram. Indications for US were: non palpable abnormalities found only by mammography, palpable lumps with non specific radiological appearances or with no radiological signs, US screening was performed in very dense breast tissue (BI-RADS category 3 and 4) and on high risk patients.

We noted that the quality of the images obtained in all cases was excellent, exceeding that of our current equipment. In particular, the detectability of the lesions was higher than that which we had noted with our normal equipment. The contrast resolution is excellent and the contributions of compounding and harmonics imaging are optimized compared to the previous equipment. The analysis of the lesions appeared excellent for all description items of the BI-RADS US lexicon, in particular in terms of analysis of margins. It is a major criterion for the analysis of small lesions where the description of microlobulations and spiculations is essential. The Doppler sensitivity was excellent.

The apparatus is very light and can be transported easily. Software initialization is extremely fast, making it possible to exit the program when it is not being used without having to fear exceedingly lengthy restarting periods. The ergonomics are identical to that of a traditional US unit and the ease of use is not affected by the compact size. The exceptionally light probe also demonstrates very simple handling. The quality of the LCD screen is remarkable, allowing handling equal to that of traditional CRT screens after a short training period. Many connections options are available. WiFi is an interesting option that offers perspectives on truly mobile applications.

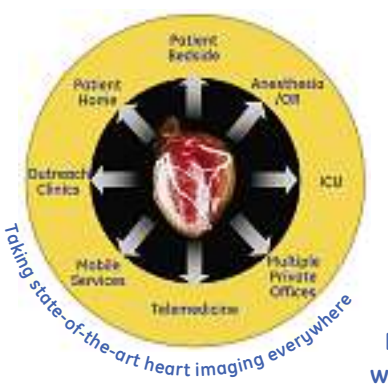
The devices we tested previously offered portability by sacrificing many qualitative elements essential to reliable diagnostic use. This apparatus does not neglect any of the essential options. On the contrary, it succeeds in providing higher quality analyses than some of our traditional equipment. The possibility of finally benefiting from portable US equipment of very high quality - higher than that of most standard equipment - undoubtedly affected our way of thinking with regard to the implementation of both diagnostic examinations and biopsy rooms.



Unrivaled image quality of LOGIQ *e* allows to identify, characterize and biopsy even the smallest lesions (3 mm) in difficult to scan, dense breast tissue.

Dr. Laurent LÉVY, Institut de Radiologie de Paris, France

VIVID *i* & VIVID *e*
New Compact-Echo Family
State-of-the-art Heart Imaging ... everywhere



Shortly after VIVID *i* was first introduced, users and the industry alike realized it wasn't just a new product ... but the beginning of a new era for echocardiography. This was the first time such a device was truly delivering on the statement of "uncompromising performance".

VIVID *i* was immediately recognized as a completely new product category, able to beat most of the console systems currently being used in hospitals, while providing outstanding mobility and convenience. As part of GE's annual Breakthroughs commitment, we now take another major step, introducing the new Breakthrough 2006 (BTO6) release of the acclaimed VIVID *i* as well as a brand new compact-echo platform: the extraordinary VIVID *e*. Our Compact-Echocardiography family is growing, yet it continues to maintain the same commitment of "uncompromising performance".

New VIVID *i* BTO6

This new VIVID *i* release represents the evolution from a premium Compact-Echo system into a complete portable high-end Echolab. Firstly, the new i^2 Performance Package adds an impressive array of advanced processing technologies that boost its already impressive image quality to new heights: Speckle Reduction (SRI), Compound Imaging, Coded Phase Inversion (CPI), and Automatic Spectrum Optimization (ASO). All this translates into higher diagnostic confidence and faster exams, particularly for the difficult-to-image patients. Secondly, VIVID *i* extends its reach with the addition of advanced applications resulting from migrating advanced tools from our VIVID 7 leadership platform: the powerful SmartStress protocol, Tissue Velocity Imaging (TVI), Tissue-Tracking (TT), as well as GE's fully integrated "Intima Media Thickness" (IMT) automated tool. In addition, advanced quantification is possible offline in GE's EchoPAC workstation.

Finally, 5 new probes complement the already comprehensive array of transducers (including a 9 Mhz multiplane Pediatric TEE, 12 MHz linear, etc). With this new release, VIVID *i* demonstrates the power behind it's high-end miniaturized system architecture, proving capable of things that even most "big machines" can't do, and becoming the system of choice for those who want top high-end capabilities in a fully portable/compact solution.

New VIVID *e*

This new platform leverages GE's state-of-the-art miniaturization technology to deliver in just 4.5 kg a truly high-performance workhorse echocardiography system that's easy-to-use, efficient and available everywhere, with undisputed top performance for its size and price. VIVID *e* comes standard with all Cardiac imaging modes (2D, Color, PW, CW, PW-TDI, Anatomical MMode), featuring a large 15" LCD, Coded Phase Inversion (CPI), one-button auto optimization, 40 GB archive, full DICOM connectivity, wireless functionality, 1hr battery operation, and more ...

Available transducers include adult cardiac, linear, convex and intra-operative probes. During the development phase, VIVID *e* was evaluated and fine-tuned with some of the world-wide leaders in Cardiac Imaging, such as "Clinico San Carlos Hospital" in Madrid (Spain), where Dr. Zamorano and his team challenged and helped optimize the system with real-life patients, including many very challenging cases.

Dr. J.L. ZAMORANO: **"We were impressed with its image quality, especially 2D and Color Doppler. It's a major step forward in the new concept of compact echo, giving us full diagnostic confidence, even with technically difficult patients. The idea of moving outside the lab becomes a reality with the new VIVID *e*. I can also envision VIVID *e* helping in the multi-modality cardiac approach."**

VIVID *e* is an excellent solution for many environments looking for a fully portable, high-performance workhorse echo system with uncompromising performance and exceptional value.

Mario LOIS, Business Manager Compact Echocardiography

VOLUSON *i* – Compact Volume Ultrasound Equipment

Introduction

I was recently given the opportunity to test the VOLUSON *i*, a high-resolution 3D and 4D ultrasound system with the dimensions and weight of a laptop computer. Apart from being quite compact – an advantage that is not to be overlooked - I suggest that there are many other potential benefits from the availability of light, portable 3D ultrasound equipment of high quality in an obstetric and gynecologic department.

Fig.1: Lateral cerebral ventriculomegaly in an 18 week-old fetus. Standard harmonic imaging (left panel) is compared with Speckle Reduction Imaging (SRI) (right panel)

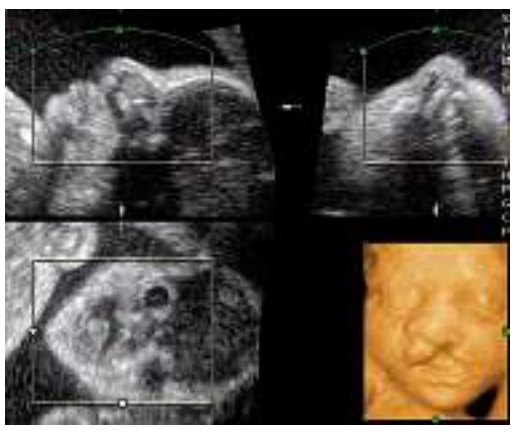


Fig.2: Static 3D imaging with surface rendering in a midtrimester fetus with unilateral cleft lip/palate.

Performance of VOLUSON *i*

VOLUSON *i* uses the same type of probes as the VOLUSON line, and the commands are contained on a keyboard which is no bigger than that of a laptop, yet succeeds in maintaining the same arrangement and principles of the larger units. Despite increased economy due to reduced space, commands are intuitive and easy to use from the beginning. I was surprised by the quality of the LCD screen (often a major shortcoming of ultrasound equipment), which is luminous and unusually sharp. A few examples of images that were easily obtained during the very first days I used the equipment are provided. Fig.1 demonstrates the typical clean and crisp appearance of images obtained with the use of Speckle Reduction Imaging (SRI) for artefact reduction. Static 3D and 4D imaging has the same speed and quality typical of the VOLUSON lines, shown in Fig.2 and 3.

Potential application of a light, portable high resolution compact 3D unit in a busy obstetric gynecologic service

Ultrasound has become the cornerstone in the diagnosis and management of many obstetric and gynecologic patients, with continually increasing use in many clinical settings. But high resolution systems have been limited mostly to outpatient clinics. In emergency rooms, inpatient wards and labor and delivery, ultrasound instrumentation has become no less valuable, but examinations have necessarily always been performed thus far with portable equipment that is generally of low or very low quality. There is little need to stress the value that high-resolution sonography may have in difficult clinical cases, particularly with suboptimal conditions of visualization. Three dimensional sonography may also represent one important added value. Fig.4 illustrates one such case. This patient, primigravida at 26 weeks' gestation, visited the emergency unit complaining of intermittent and mild abdominal pain since the previous evening. Prior to the digital examination, a 3D sonogram was performed demonstrating clearly one singleton fetus in transverse lie with the spine down and a dilated cervix with a vaginal prolapse of the amniotic sac. A volume was rapidly obtained and the cervical dilatation was easily measured and found to be 3 cm. After the patient was admitted, a vaginal examination was eventually performed. However, to my surprise it proved much less informative than I had expected. The soft amniotic sac could be palpated, but the cervix was relatively posterior and was not easily reachable.

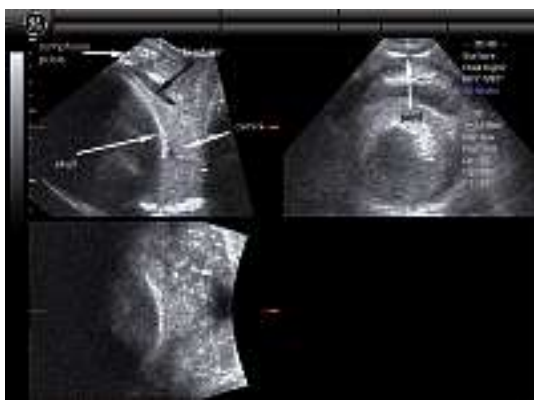


Fig.6: 3D infrapubic scan. After obtaining the scan, the planes were rearranged to standardize the evaluation. In A, the symphysis was brought into a horizontal position to better appreciate the direction of the fetal head. The B plane was used to position the A plane exactly in the midsagittal section of the pelvis, using the unossified joint in the middle of the pubic bones.

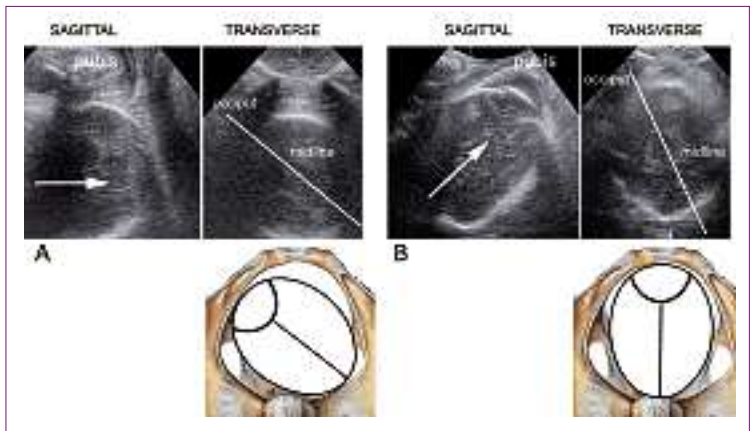


Fig.7: A comparison of sagittal and coronal planes obtained by 3D ultrasound to evaluate the engagement and descent of the fetal head. In A, the sagittal plane indicates that the direction of the fetal head is parallel to the symphysis (white arrow), while the transverse plane demonstrates that the midline echo of the brain is directed with an angle that slightly exceeds 45° with regard to the antero-posterior axis of the pelvis. These two observations suggest that the fetus is in the midportion of the pelvis and that the largest part of the head has not yet reached the ischiatic spine. Extraction with vacuum or forceps would present a high risk of failure and trauma in such a case. In B, the sagittal plane demonstrates that the direction of the head forms an acute angle with the symphysis, while the transverse plane indicates that the midline is almost vertical. This suggests that the largest circumference of the fetal head has passed the ischiatic spine and that fetal extraction, if necessary, can be safely performed with virtually no added risk over a spontaneous delivery. The position of the occiput is not obvious from these images and was identified by the standard supra-pubic scanning and identification of the fetal spine.

Fig.4: Multiplanar imaging in a patient in premature labour. The A plane demonstrates that the cervix is dilated, with protrusion of the amniotic sac in the vagina. In the B plane, the open cervix is demonstrated and measured. The C plane demonstrates the same findings of the A plane as well as the transverse lie of the fetus.

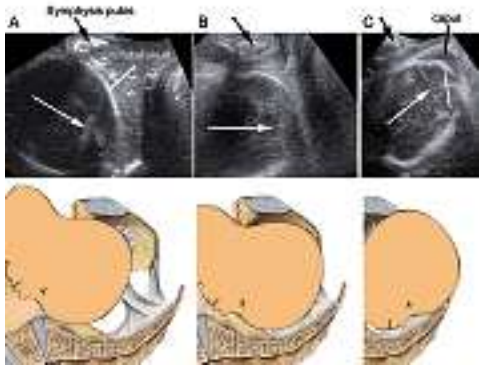


Fig.5: A sequence of sonographic images obtained with infrapubic translabial ultrasound in labor. The main anatomic landmarks of the fetal skull and symphysis pubis allow personnel to assess the progression at a glance . A was obtained during the first stage and demonstrates that the head is in the superior part of the pelvis. B was obtained during the second stage. Clinically, the fetal head had reached 1 cm below the ischiatic spines. C was obtained at the very end of the second stage, when clinically, the head was 4 cm below the ischiatic spines. Moulding of the fetal head and a considerable caput can be seen. The fetus was delivered 8 minutes after the scan was obtained. Note the direction of the fetus with regard to the symphysis in each panel (white arrows)

In everyday practice, two clinical situations continue to present significant difficulties in the management of labor: on the one hand, when and how to diagnose obstructed labor in the second stage, and on the other hand, in the second stage of labor, when there is failure to progress or fetal distress and a decision must be made on whether to deliver the fetus by caesarean section or by a vaginal operation, such as vacuum or forceps application. Particularly the second decision is often problematic because it depends on the engagement of the fetal head, and palpation is by common consensus imprecise in this assessment. Yet, the decision is critical. Any operative delivery in labor, whether by caesarean section or vaginal extraction, carries some risk of trauma to the fetus. But the risk is maximal when an attempt at vaginal extraction fails. Ultrasound evaluation of the position and rotation of the fetal head by using infrapubic translabial ultrasound has been recently described and a series of images are illustrated in Fig.5. Thus far, a conventional ultrasound system has been employed. However, 3D ultrasound offers a considerable advantage by allowing the position and station of the fetal head to be reconstructed in simultaneous planes. As can be seen from the images, the approach is promising and may help in the near future to better standardize the progression of labor, extremely valuable information that will assist the clinician in everyday practice.

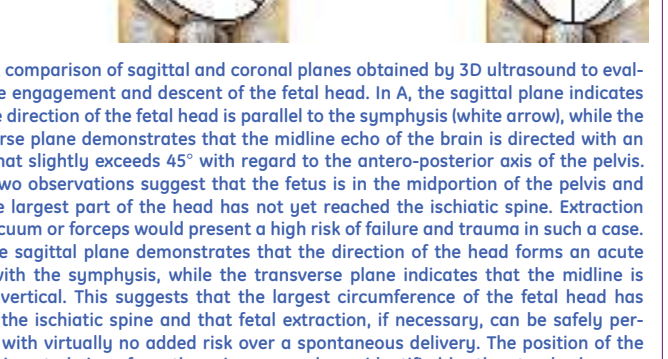


Fig.3: 4D sonogram in a 19 week-old fetus.

Prof. Gianluigi PILU, M.D. Department of Obstetrics and Gynecology University of Bologna, Italy

New Tools in 3D/4D Volume Ultrasound Breast Imaging - Part 2

As promised in the previous issue of the Ultrasound Post, I will continue to describe valuable new applications in 3D/4D Volume Ultrasound:

STATIC VOLUME CONTRAST IMAGING (VCI)

Static volume contrast imaging offers the study of a static three-dimensional dataset with preselected slice thickness (4D view: 1-20 mm) at the same time in all three planes with different rendering algorithms in a multiplanar display mode (Fig.1). The benefit of this technique is that it enhances the contrast between the lesion and the background structures with the aim of optimizing the contours in order to make accurate measurements and a correct differential criteria analysis. The multiplanar representation uses the 3D US information from the three planes (A, B and C plane) that cut the voxel and that are orthogonal to each other (1, 2).

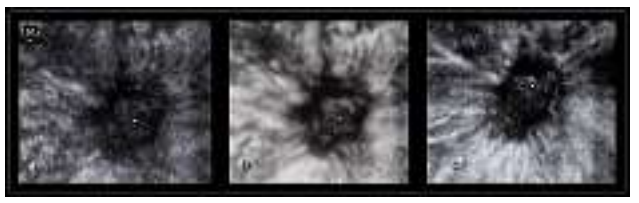


Fig.1: Coronal plane (C plane) of an invasive ductal breast cancer with retraction pattern sign, a: Conventional C plane, b: Static VCI 1 mm slice with surface smooth and X-ray mode rendering, c: Static VCI 1 mm slice with surface mode rendering

The A plane shows the original scanning plane during typical 2D US investigation and volume acquisition. The B plane is orthogonal to A and C and offers the typical rectangular US information of two-dimensional scanning, for example, the sagittal or transversal plane. Completely new diagnostic information is obtained by the coronal plane (C plane), which is orthogonal to A and B (1, 2, 3, 4, 5).

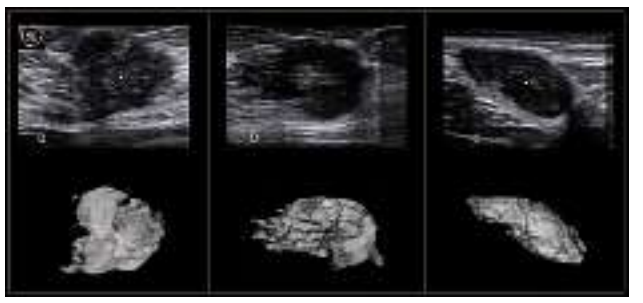


Fig.2: Inversion mode rendering of 2 US volumes of invasive ductal breast cancers in a and b and of a fibroadenoma in c

INVERSION MODE

Echopoor breast lesions are suitable for rendering using the inversion mode technology (Fig.2). The volume of interest (VOI) must cover the entire lesion. The inversion rendering mode shows the lesion in a 50% mixed smooth surface and 50% gradient light algorithm as a white colored 3D model. The threshold level "low" has to be customized, on the one hand to suppress the echogenic constituents in the VOI, on the other hand to present the echopoor lesion in a 3D surface algorithm. The additional echopoor structures not related to the lesion can be removed by the electronic scalpel. To understand which structures are not related to the lesion, the entire rendered VOI must be rotated, e.g., around the y- and/or the x-axis.

The inversion mode is a tool which offers quick access to the three-dimensional morphology of the investigated breast mass. The shape of a lesion is an important diagnostic criterion in differentiating between benign and malignant.

TOMOGRAPHIC ULTRASOUND IMAGING (TUI)

Tomographic ultrasound imaging (TUI) presents the diagnostic information of a static 3D dataset in a two-dimensional documentation, e.g. thermoprint or laserprint, comparable with CT or MR scans. A topogram indicates the exact spatial position of the slices obtained from the 3D dataset and the customized distance between the different slices.

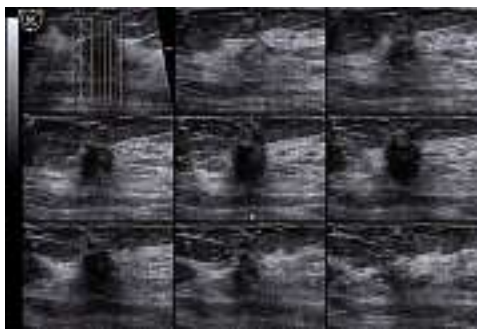


Fig.3: Invasive ductal breast cancer presented with TUI; the topogram of the A plane shows the slice positions and the slice distances (in this case: 1.4 mm)

TUI is the primary basis for offering comprehensive diagnostic information of the three-dimensional extent of a lesion on the basis of a two-dimensional display (Fig.3). To optimize the information transfer TUI enables slicing and documentation of the lesion in all three planes.

CONCLUSION

According to the above mentioned new tools in ultrasound volume scanning, 3D/4D ultrasound of the breast is a helpful imaging technique, suitable for daily diagnostic practice and an important addition to two-dimensional breast ultrasound offering new diagnostic aspects to differentiate benign from malignant breast lesions. 3D US datasets provide a reliable basis for follow-up investigations of breast lesions.

C.F. WEISMANN, Diagnostic and Interventional Breast Department, Private University Institute of Diagnostic Radiology, St. Johanns Hospital, Landeskliniken Salzburg, Austria

International Academy of Medical Ultrasound DATES for 2006

TOPIC	CHAIRMAN	LOCATION	DATE
VISUS 3D/4D (engl.)	Prof. A. Kratochwil	Vienna, Austria	**26 - 29 June 23 - 26 Oct.**
MAMMASONOGRAPHY (engl.)	Dr. C. Weismann	Salzburg, Austria	**29 June - 1 July**
3D/4D ULTRASOUND IN CLINICAL PRACTICE (engl.)	Prof. Dr. M. Momtaz	Cairo, Egypt	**11 - 13 Sept.**
ECHOCARDIOGRAPHY AND MYOCARDIAL VELOCITY IMAGING (engl.)	Prof. G. Sutherland	Vienna, Austria	**5 - 6 Oct.**

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CONGRESSES 2006

TOPIC	LOCATION	DATE
ANNUAL EUROPEAN CONGRESS OF RHEUMATOLOGY - EULAR	Amsterdam, THE NETHERLANDS	**21 - 24 June**
5TH WORLD CONGRESS IN FETAL MEDICINE	Barcelona, SPAIN	**25 - 29 June**
15TH WORLD CONGRESS OF CARDIOLOGY 2006	Barcelona, SPAIN	**2 - 6 Sept.**
16TH WORLD CONGRESS ON US IN OBSTETRICS AND GYNECOLOGY - ISUOG 2006	London, GREAT BRITAIN	**3 - 7 Sept.**
EUROSON/SIUMB 2006	Bologna, ITALY	**15 - 19 Sept.**

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