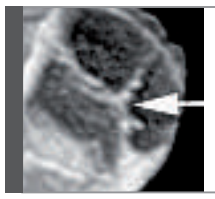
ultrasound post

technical development and medical research –
NEWS and FACTS.

2007 / 4th edition **No. 19**

Mobile Mensana Health one year later 2

Contrast-Enhanced Volume Ultrasound 3



Pancreatic Application of Volume Ultrasound 4

Ultrasonography and Regional Blocks: **A New Concept**

LOGIQ *e*. Peroneal and tibial nerves using the 12L-RS transducer featuring CrossXBeam and Coded Harmonic Imaging

The use of ultrasound as an aid for the accurate placement of local anesthetics is gaining in popularity for regional anesthesia over conventional landmark-based techniques and neurostimulation both in adults and in children.

Ultrasonography allows non-invasive real-time imaging of the relevant anatomical structures while the needle is placed under direct vision. The superiority of ultrasonography-guided block techniques to blind techniques relying on subtle sensations, which may be unreliable even in experienced hands, is clear.

Furthermore, imaging guidance for nerve localization holds the promise of improving block success and decreasing complications. Although it has not yet been sufficiently described empirically, ultrasonographic guidance for a broad spectrum of regional anesthetic techniques results in safe and effective blocks.

Nonetheless, recent publications have illustrated the use of ultrasonography for epidural blocks and peripheral blocks. The initial results have encouraged scientific study groups to increase their efforts to develop new ultrasound-guided regional techniques. However, despite its rapidly increasing popularity, ultrasound guidance requires additional training and good manual skills.

Appropriate education in ultrasonographically guided regional anesthetic techniques is one of the major limitations of the method.

Currently, there is a severe lack of specialists in the field, and only a very few centers worldwide have introduced the technique into their daily clinical practice. The first step in education should be an intensive theoretical training in anatomy and in the physics underlying ultrasonography. The second step is intensive ultrasonographic training. Wherever an ultrasound machine is available, this training can be performed. Specialized workshops including theory, practical needle guidance techniques, and intensive discussion of all topics in the field are useful during the initial education process.

Finally, ultrasonography has many applications in clinical anesthesia, particularly in the area of compact portable units which are already currently available with many of the sophisticated features. Indeed, with appropriate probes, vascular imaging, echocardiography, and nerve imaging can be performed with the same unit. Compound imaging is an advanced feature in some of the cart-based units.

Prof. Claude Ecoffey, MD
Anesthesia and Intensive Care
Department Hôpital de Pontchaillou,
Université de Rennes 1, France

EDITORIAL:

Heinz GLOOR

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

Dear Readers,

All the developments just like the Ultrasound Post, the International Academy of Medical Ultrasound and our online platforms **Voluson**Club and **Vivid**Club, which have been, currently are and will be happening, within our industry would not be possible without close collaboration with you, our customer.

By setting up applications focused on research groups – the Voluson line for Ob/Gyn, the Vivid line for cardiology, the LOGIQ line for General Imaging – GE Healthcare Clinical Systems Ultrasound has increased the speed and the effectiveness of the solutions it brings to market. All of our teams are committed to continuous improvement, for the benefit of both the patient and physician, because in the end, all of us are or can be patients...

Our aim is to build a relationship between you and ourselves, a relationship which is based on a real partnership; we aim to go beyond a supplier – customer relationship. The keyword here is communication.

Five years ago, we introduced the Ultrasound Post. The purpose of this is to keep you informed about the latest innovations in the world of ultrasound. We founded the Internatio-nal Academy of Medical Ultrasound with its first office in Vienna, today known as VISUS, with locations all over Europe.

Thanks to the rapid development of computer technology, we have been able to implement practical real-life online tools, pushing communication to the next level. GE's customer communities include: the **Voluson**Club for obstetricians and gynecologists, and the **Vivid**Club for echocardiologists. Ultrasound users can benefit greatly from various clinically-focused offers, and they are able to exchange and share experiences and to discuss relevant topics with colleagues from all over the world. But as you know, partnership is not a one-way street. This means that our communication tools are just as good as they are useful to you and attract you to use them..

We appreciate feedback from you for improving and enhancing our communication tools. If you would like to share your ideas on how to make our partnership more efficient, and how to increase the communication between you and ourselves, do not hesitate to respond to our editorial contact address: **gepost@med.ge.com.**

We are looking forward to hearing your ideas.

The journey is the reward – let's go together.

Sincerely yours,

Heinz Gloor

Mobile Mensana Health Facility for Body Composition one year later*

October 2006 the Mensana-MCSBR centre took its ambitious mission to treat, optimize and prevent to the next level with the Mobile Mensana Health Facility. Together with Ultrasound Post, Stefaan Poriau (MD) and Christophe Maes (PhD) look back to an amazing first "mobile" year.

FOLLOW-UP INTERVIEW WITH STEFAAN PORIAU (MD) OF MENSANA-MCSBR

How would you describe the first year with the Mobile Mensana Health Facility?
Amazing... and also exciting: At the time we all felt that expanding our centre with the mobile unit was the right step towards realizing our vision, but it was not entirely free of risk. Now we know it was the right thing to do: both impact and feedback are wonderful. Before October 2006 we would have said "we have a dream", now we say "we realize a dream".

Could you portray your dream?
Our vision is to help all in achieving optimum full body metabolic health by means of "safe sports". At Mensana-MCSBR three components herein are key: [1] treatment, in case of medical conditions; [2] optimization, relating to performance and safeguarding a healthy future; and [3] prevention, focusing on awareness and scientific publication.

What is the role of the Mobile Mensana Health Facility in this concept?
Most people including adults, children, seniors and even athletes too, do not really know what their health status is, what risks their lifestyles or gene pool bring along and only see a doctor when it's too late. With the mobile unit we are able to effectively raise awareness while offering full body health evaluation and follow-up even in the remotest places or event-based. As such the mobile unit is a valuable complement to our centre, decisively revolutionizing our concept of clinical care.

What would be the key success factor at Mensana-MCSBR?
Without any doubt the main driver is the successful co-operation between experienced people from multiple disciplines, internally as well as externally. Mensana-MCSBR offers them the framework and the technology, but our great team does the daily work.
Grateful acknowledgements are also owed to our various external partners.

Christophe Maes (PhD) on the use of densitometry in the Mensana Treat+Optimize+Prevent model

A healthy balance starts with knowing about the actual health status of the body and which risk factors one is exposed to. With its gold standard precision in a three-compartment body composition model [ie. bone, fat and lean mass], DXA is one of our key instruments. The DXA device in our hospital [Lunar Prodigy Pro™] is mainly used in our "Treatment" component, whereas we use the Lunar iDXA™ of the mobile unit mainly in the "Optimization" and "Prevention" components.
Portable bone ultrasonometry [Lunar Achilles Solo™] is predominantly deployed as a complement to DXA, but also as a first indication in fracture risk assessment.

Some practical examples where our medical staff applies and interprets DXA measurements:

- Targeted physical exercise, adjustment of nutritional regimen and mental coaching for obese subjects
- Extension of bone health assessment with muscular mass evaluation in our senior population
- Pre-per-post competition optimization of the regional muscular development of our professional cyclists
- Prevention of side-effects of high performance sports on bone health among our female athletes

1/10/2006 Sijsele (B) — C. Maes (PhD), S. Poriau (MD) and E. Cochuyt (PT)

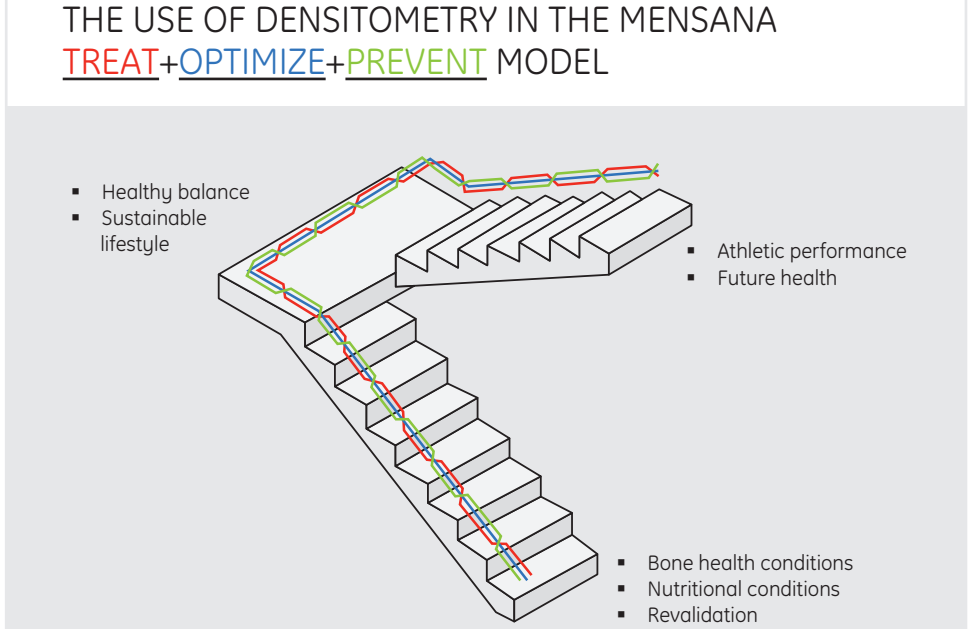
7/04/2007 Meerbeke (B) — Body Composition scans at Amateur Tour of Flanders

23/04/2007 Budapest (H) — European Congress on Obesity (ECO) with GE Healthcare

24/09/2007 Doornik (B) — Cardiovascular Week with the Belgian League of Cardiology

13/10/2007 Ruddervoorde (B) — Cardio/Respiratory testing at various intensities

21/10/2007 Bruges (B) — World Osteoporosis Day with industry partners



*See also Ultrasound Post no.15 (2006, 4th edition, p. 4)
Images courtesy of Mensana-MCSBR ©2007

This article in an excerpt of an extensive scientific work for GE's White Paper Collection. If you are interested in the full version you can order it at gepost@med.ge.com totally free of charge.

Contrast-Enhanced Volume Ultrasound

LOW MI CONTRAST-ENHANCED ULTRASOUND TECHNIQUES (CEUS)

Coded Phase Inversion (CPI) and TruAgent Detection (TAD)

Since the second-generation ultrasound contrast agents were introduced to the market, Ultrasound manufacturers have also adapted their software and their algorithms to the non-linear acoustic effects of these micro bubbles. A flexible shell that allows them to vibrate in response to an ultrasound pulse, which is generated with low acoustic power, the so-called low MI technique, characterizes these micro-bubbles.

GE Healthcare's low MI, which are adapted to the harmonic properties of these new ultrasound contrast agents, are called Coded Phase Inversion (CPI) and TruAgent Detection (TAD). Both are based on GE's proprietary Digital Encoded Ultrasound Technology, which is a special digital beam forming technique.

The Encoding in the transmission phase enables the creation of a coded pulse sequence from a single pulse, transmitted into the patient body, and decoded upon reception. This Encoding – Decoding Technique increases the signal-to-noise ratio (SNR) by enhancing weak signals and suppressing unwanted signals. In CPI two consecutive short pulse sequences with inverted phase are transmitted. The Phase Inversion Technique removes the linear tissue fundamental signal while enhancing the 2nd Harmonic signal from the contrast bubbles. Each pulse may contain multiple frequency components to achieve stronger bubble resonance and to increase the contrast signal strength. The length of the pulse sequence allows an increase in the energy, delivering improved penetration.

CPI technique improves the SNR and the Contrast-Tissue-Ratio (CTR) as well by intensifying the bubble nonlinear signal without intensifying the tissue nonlinear signal followed by high image resolution. CPI provides very good penetration with its stronger SNR. TAD (TruAgent Detection) is the recent low MI development using the CPI. Simultaneous split screen technique provides a side-by-side display of the baseline gray scale image and the contrast-enhanced image in real time. This important possibility allows the clinician to obtain the fundamental image during the contrast examination to keep the studied lesion in the proper position. Due to the Digital Encoded Ultrasound Technique, adjusting the frequency separately for the baseline fundamental image provides a perfect ratio between penetration/resolution (Fig. 1).

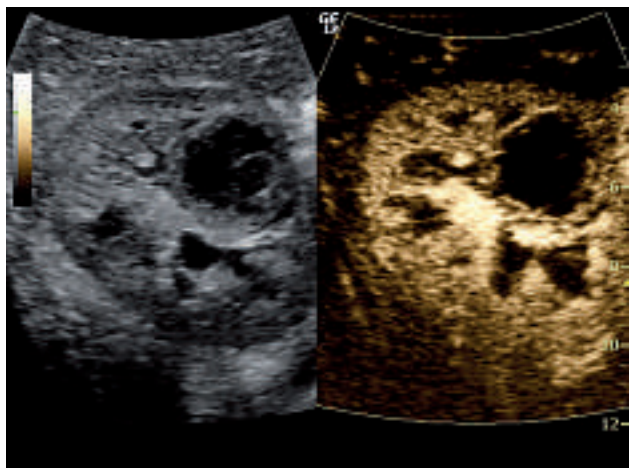


Figure 1

CLINICAL BENEFITS

3D CEUS may contribute greatly in characterizing liver lesions and in planning interventions by exploiting all three contrast phases. The major advantage during the arterial phase is a better understanding of the intra-tumoral vessel architecture and the number and branching of its supplying arteries. During the portal venous and late phase, the topographic relation to surrounding vascular structures can be visualized. It is a perfect tool for comparative studies especially in the follow up of tumor patients after chemotherapy during all three phases, but mostly during the portal or late phase. From 3D tumor images its volume, shape and localization can be defined. It thus helps to optimize the planning of ablative procedures.

CLINICAL CASES

DR. WESKOTT, CASE 1

3-D images of a carcinoid metastasis during the early arterial phase in segment IVa, at the diaphragm (2.4 ml SonoVue® bolus, 10ml saline flush). The supplying arteries are clearly visible (Fig. 2). The TUI images from the same tissue volume show additionally a small rim of enhanced tumor at the thoracic side of the diaphragm (Fig. 3). This finding was confirmed intraoperativly.

PROF. DIETRICH, CASE 3

This 62 year-old male patient had an incidental finding of a bilateral kidney tumor (right 11 x 10 cm, left 6 x 5,5 cm) with retroperitoneal (8 x 3 cm) and cervical lymphadeno-pathy.

CT-guided biopsy of the right tumor provided necrosis. CEUS showed an almost completely necrotic tumor on the right side, whereas the main parts of the left tumor were vascularized. CEUS-guided biopsy of the left kidney tumor was performed from definitive vascularized tissue. The histological diagnosis confirmed a papillary renal cell carcinoma. The 3D Rendered Image displays the tumor with vascularity and non-vascularized areas. Anti-angiogenic treatment was initiated and therapeutic response was observed using TIC Analysis (Time – Intensity – Curve Analysis). The clinical benefit of the 3D Reconstruction is the visualization and differentiation between the vascularized and necrotic tumor areas, which is not only important for planning and controlling the ultrasound guided biopsy but also monitoring the therapeutic response (Fig. 4 and 5).

Dr. Hans Peter WESKOTT, MD
Prof. Christoph Frank DIETRICH, MD
Alexandra ROSSKNECHT,
GE Healthcare

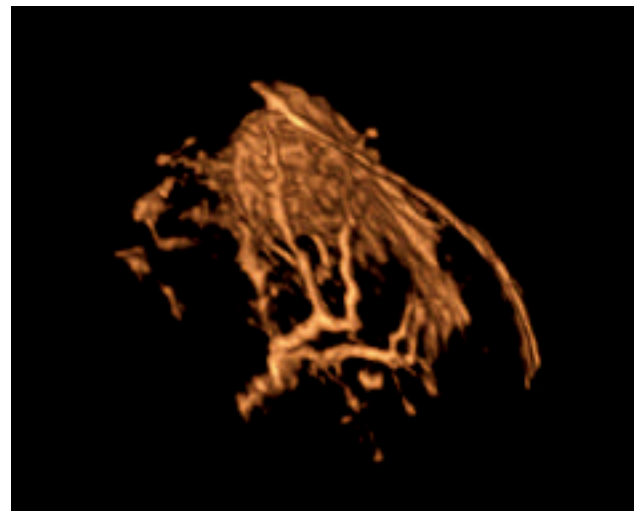


Figure 2

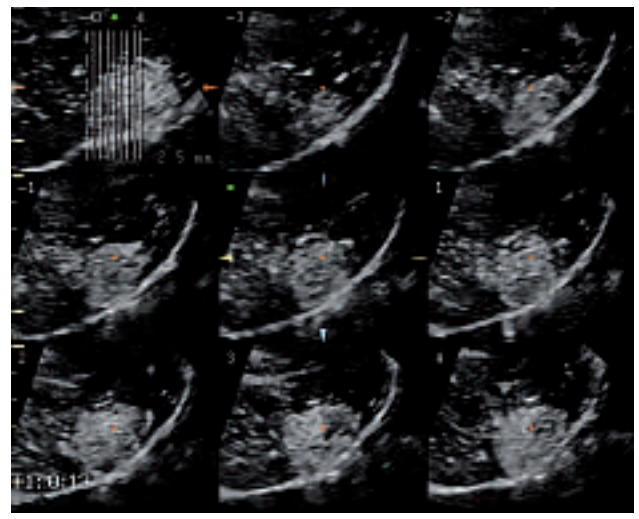


Figure 3

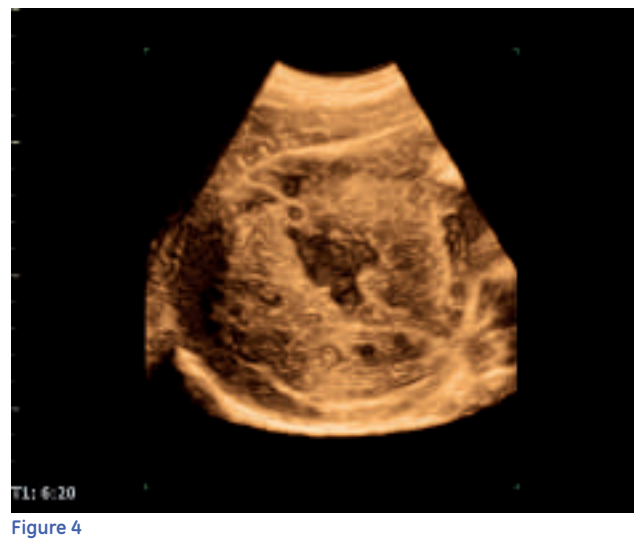


Figure 4

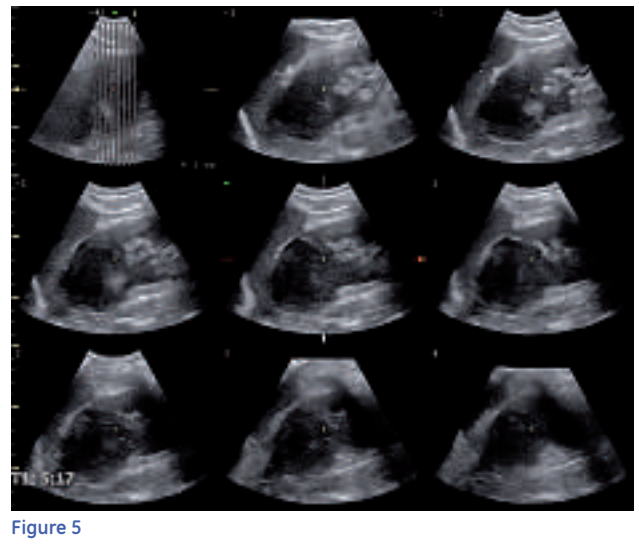


Figure 5

WORLDWIDE NEWS:

Vivid S6 introduced in Cologne

Cologne. The German Society of Cardiology held its annual autumn meeting Oct 4-6, in Cologne. 2000 participants listened to lectures dealing with the latest proceedings in cardiology. A hot topic among doctors was the question, how to fund scientific work. So the general motto of this meeting was "cardiology between innovation and budget".

Concerning echocardiography specialists in this field realized that tissue Doppler, CRT, Volume Ultrasound and Compact Ultrasound systems are still the top issues discussed among physicians. GE's new product in its cardio port-folio, Vivid S6, which was introduced at the meeting for the first time, seems to be the solution for those physicians and scientists who try to find a compromise between price and performance. Vivid S6 offers all necessary application to be the right ultrasound system not only in hospitals, but also in scientific labs.

GE succeeded at ISUOG 2007

The GE Ultrasound team participated in the 17th World Congress of Ultrasound in Obstetrics and Gynecology (ISUOG) as the Platinum Plus sponsor. Over 2000 leading obstetricians and gynecologists from around the globe have participated to the event. A highlight of the show was the introduction of GE's Breakthrough 2008 on the Voluson E8 and Voluson 730 product line.

Additionally to new product breakthrough presentations, GE has organized a very successful lunch symposium. Three top scientists and specialist in their fields – Pr. D. Paladini, Dr. B.Benoit and Pr. A. Abuhamad – presented to an audience of 1000 attendees the clinical applications of Voluson E8's latest features, such as SonoAVC – the new volume calculation method, especially useful in evaluation of size and volume of follicles in reproductive medicine, or assessment of the shape and size of brain cavities in early fetal diagnosis.

In parallel to the official ISUOG program, GE has offered two full days of educational lectures with live scanning, led by luminaries such as Pr. G. Pilu, Pr. R. Chaoui, Dr. G. DeVore, Dr. N. Fenning.

This article in an excerpt of an extensive scientific work for GE's White Paper Collection. If you are interested in the full version you can order it at gepost@med.ge.com totally free of charge.

Pancreatic Applications of **Volume Ultrasound Imaging**

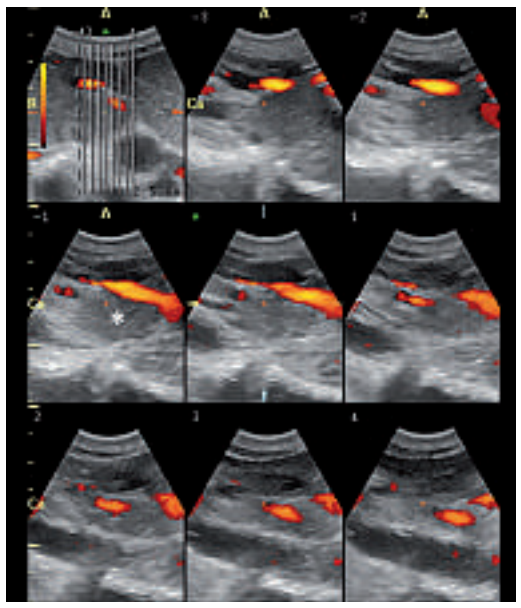


Fig. 1: Tomographic Ultrasound Imaging (TUI). Unresectable pancreatic tumour: the sagittal planes show that the tumour (asterisk) is located in the uncinate process of the pancreas with infiltration of the superior mesenteric vein and artery.

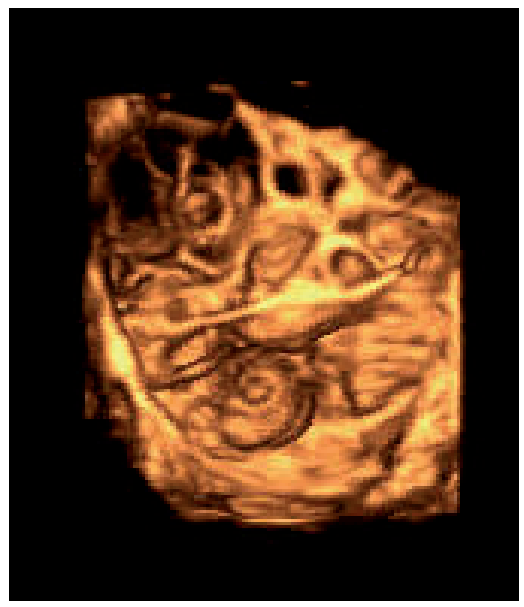


Fig. 2: Volume Rendering. Mucinous cystic pancreatic neoplasm: the volume reconstruction of the lesion is cut in the middle thus providing a perfect representation of the intralesional architecture.

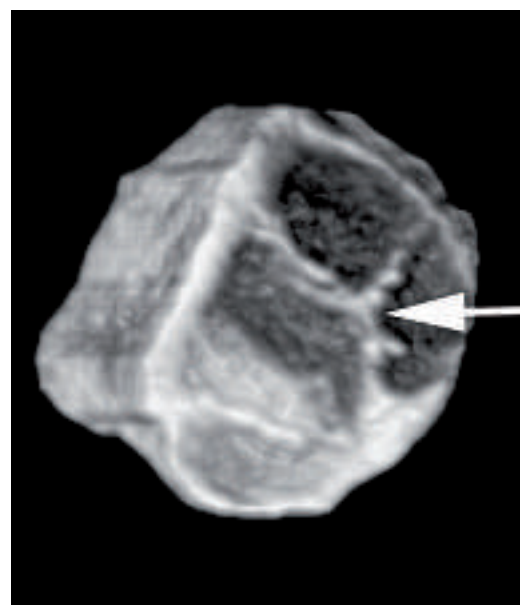


Fig. 3. Volume Rendering. Mucinous cystic pancreatic neoplasm: the volume reconstruction of the lesion is cut in the middle thus providing a perfect representation of the intralesional septa (arrow) related to the enhancement shown during the contrast-enhanced examination (CEUS).

Volume Ultrasound imaging (VUI) is a relatively new technology based on the acquisition of volume datasets of anatomical structures. Volume Ultrasound has been changed by the introduction of automated 3D sweep acquisitions.
Automated VUI allows overcoming the low reproducibility of the previous volume freehand sweep acquisition, introducing higher standards, accuracy of data and lower scanning times. More in general, automated Volume Ultrasound Imaging introduced in the field of ultrasound the extremely important concept of reproducibility thanks to the possibility of a standardized and objective acquisition during the study.

VOLUME ULTRASOUND FEATURES:

Tomographic Ultrasound Imaging (TUI)

TUI is a feature that enables the user to reslice the acquired volume dataset in multiple parallel slices in a selected plane, looking like a CT or MRI. Number of slices (up to 9 at the same time), distance between slices (from a minimum of 0,5 mm), relative positioning within the volume dataset and axis rotations are fully user selectable, in order to obtain the best visualization of the region of interest.
This representation can result in particularly useful e-valuation of pancreatic masses relationship with adjacent structures in different planes (axial, coronal, sagittal, oblique). The use of this Visualisation Mode is recommended to better evaluate the perilesional vessels. Judgement of resectability (Fig. 1) or vascular infiltration of the pancreatic masses can be improved, obtaining images more objective on the vascular infiltration and more detailed on the extension of vascular infiltration (Fig. 2), which is information that is useful to the surgeon. This evaluation could help decide the best patient management.

Volume Rendering

This representation allows the volumetric visualization of pancreatic pathology. It can be useful for a better representation of pancreatic masses and their relationship with adjacent vessels (Fig. 3). It can also be possible to fly through structures if completely included in the volumetric acquisition, for instance; this is the case of the main pancreatic duct providing an ultrasound "virtual wirsungoscophy". This Visualisation Mode could be useful to better depict the scenario to surgeons as in the case of this complicated intralesional architecture (Fig.2)

3D Static and Contrast-Enhanced Ultrasound

The volume acquisition could be also performed during a second-generation micro-bubbles contrast medium injection. The advantage of 3D Static CEUS Imaging derives from the possibility of an accurate and objective re-evaluation of the dynamic study from a second operator by using the Volume Review application. The contrast-enhanced volume acquisition can be also visualized by using all the previous discussed applications (VR, TUI, ROI, Rendering Mode, Sectional Planes, VOCAL) in order to obtain more accurate information to characterize solid and cystic pancreatic masses (Fig. 3). This tool could help decide the best lesion treatment, such as resection for potentially malignant lesions (i.e. mucinous cystic neoplasm).
Furthermore, the VOCAL quantification capabilities enable a precise monitoring of the liver metastasis under treatments.

CONCLUSION

Thanks to the full package of reported capabilities, Volume Ultrasound of abdominal organs, in particular if focused on the pancreas, faces a new step further to the well established CT and MRI permitting comparison with multiplanar information of all these techniques, thus improving the pancreatic lesions work-up.

Dr D'Onofrio MIRKO
Radiologist
University Researcher
Department of Radiology,
G. B. Rossi Hospital
University of Verona

CONGRESSES 2007/2008

TOPIC	LOCATION	DATE
EUROECHO 2007	Lisbon, Portugal	5 - 7 December 2007
MEDIZIN 2008	Stuttgart, Germany	25 - 27 January 2008
ARAB HEALTH	Dubai	28 - 31 January 2008
ECR	Vienna, Austria	7 - 10 March 2008
DEUTSCHER KARDIOLOGENKONGRESS	Mannheim, Germany	27 - 29 March 2008

IMPRINT:

Publishers:
GE Healthcare
Marketing Department Europe
Beethovenstraße 239
42655 Solingen

Editor–in-chief:
Pierre Radzikowski
gepost@med.ge.com
Tel: +48 2275 14103

Concept and Production:
ICS Media GmbH
A-4860 Lenzing, Austria
E-mail: office@ics-media.at

Printing:
Kroiss & Bichler GmbH & CoKG
Römerweg 1
A-4844 Regau
office@kb-offset.at

GE ULTRASOUND OFFICE ADDRESSES:

AUSTRIA
General Electric Austria GmbH
Filiale GE Healthcare Technologies
EURO PLAZA, Gebäude E
Wienerbergstrasse 41
A-1120 Vienna
Phone: (+43) 1 97272 0
Fax: (+43) 1 97272 2222

BELGIUM
GE Medical Systems Ultrasound
Eagle Building, Koutervelds traat 20
1831 DIEGEM
Phone: (+32) 2 719 7204
Fax: (+32) 2 719 7205

CZECH REPUBLIC
GE Medical Systems Ultrasound
Vyskocilova 1422/1a
140 28 Praha

DENMARK
GE Medical Systems Ultrasound
Park Allé 295, 2605 Brondby
Phone: (+45) 43295 400
Fax: (+45) 43295 399

FINLAND & ESTONIA
GE Medical Systems
Kuortaneenkatu 2, 000510 Helsinki
P.O.Box 330, 00031 GE Finland
Phone: (+358) 10 39 48 220
Fax: (+358) 10 39 48 221

FRANCE
GE Medical Systems Ultrasound
and Primary Care Diagnostics France
F-78457 Velizy
Fax: (+33) 13 44 95 202

- **General Imaging**
  Phone: (+33) 13 449 52 43
- **Cardiology**
  Phone: (+33) 13 449 52 31
- **Luna**
  Phone: (+33) 13 449 53 65
- **Service:**
  8, Rue Paul Dautier
  F-78140 Velizy-Villacoublay
  Phone: (+33) 1-69-18-54-02
  Fax: (+33) 1-64 46 32 48

GERMANY
GE Medical Systems Ultrasound
Beethovenstr. 239, 42655 Solingen
Phone: (+49) 212 28 02-0
Fax: (+49) 212 28 02-47

GREECE
GE Medical Systems Hellas
156 Kyprou Av.& 91 Konstantinoupoleos
Str. Argyroupolis, 164 51 Athens
Phone: (+30) 210 9690990
Fax: (+30) 210 9625931

ITALY
GE Medical Systems Italia spa
Via Galeno, 36, 20126 Milano
Phone: (+39) 02 2600 1111
Fax: (+39) 02 2600 1599

NETHERLANDS
De Wel 18 B, 3871 MV Hoevelaken
PO Box 22, 3870 CA Hoevelaken
Phone: (+31) 33 254 1290
Fax: (+31) 33 254 1292

NORTHERN IRELAND
G.E. Healthcare
Victoria Business Park,
9, Westbank Road,
Belfast BT3 9JL.
Phone: 028 90229900

NORWAY
GE Medical Systems Ultrasound
Tasenveien 71, 0873 Oslo
Phone: (+47) 2202 0800

NORWAY
GE Medical Systems Ultrasound
Strandpromenaden 45,
P.O. Box 141, 3191 Horten
Phone: (+47) 33 02 11 16

POLAND
GE Medical Systems Ultrasound
Al. Wilanowska 372
02-665 Warszawa
Phone: (+48) 330 83 00

PORTUGAL
General Electric Portuguesa,
SA. Avenida do Forte, n° 4,
Fraccao F
2795-502 Carnaxide,
Phone: (+351) 21 425 1309
Fax: (+351) 21 425 1343

REPUBLIC OF IRELAND
G.E. Healthcare
Unit F4, Centrepoint Business Park,
Oak Drive, Dublin 22
Phone: 01 4605500

RUSSIA
GE Medical Systems Ultrasound
Kosmodamianskaya nab., 52
113045 MOSCOW

SPAIN
GE Medical Systems España
Avda. Europa 22
(Parque Emp.La Moraleja)
28108 Alcobendas-Madrid
Phone: (+34) 91 663 2500
Fax: (+34) 91 663 2501

SWEDEN
GE Medical Systems Ultrasound
PO Box 314, 17175 Stockholm
Phone: (+46) 0855950010

SWITZERLAND
GE Medical Systems Ab
Europastrasse 31,
8152 Glattbrugg
Phone: (+41) 1 809 92 92
Fax: (+41) 1 809 92 22

U.A.E
GE Healthcare Holding
Suite 1101, 11th Floor City Tower 2
Sheik Zayed Rd. Dubai,
U.A.E
Phone: (+971) 4 3131 207
Fax: (+971) 4 3321802

UNITED KINGDOM
GE Medical Systems Ultrasound
2, Napier Road
Bedford MK41 0JW
Phone: (+44) 1234 340881
Fax: (+44) 1234 266261

Printed in Austria - 300-07-U025E