

Echocardiography Solutions

at the ESC 2007 in Vienna



Watching the Heart Beat

Live 3D TEE provides real-time images of the mitral valve

At the 2007 annual meeting of the European Society of Cardiology in Vienna, Austria, Philips presented the world's first ultrasound transducer for Live 3D transesophageal echocardiography (Live 3D TEE). Showing multiple perspectives of the heart, Live 3D TEE enables cardiologists, cardiac surgeons, anesthesiologists and echocardiographers to view and access much more detailed information; the images of unprecedented clarity provide hitherto unavailable data for diagnosis, treatment planning, monitoring and assessment.

The Live 3D TEE probe merges two cutting edge technologies: it uses the 3D power of xMATRIX and combines it with the exceptional image clarity of PureWave crystal technology to deliver real-life images that aid cardiologists in diagnoses and planning. Philips Live 3D TEE continues to provide 2D imaging but supplements those with real-time 3D visualization of the heart, in particular the heart's valves, giving clinicians the ability to carry out a complete analysis on images that show the heart as it really is. In addition, Live 3D TEE imaging provides more perspectives of the heart, including the surgeon's view – a perspective of the mitral valve from the left atrium as well as from the left ventricle. Because images are captured closer to the heart, the image quality of 3D TEE is considerably better than with transthoracic 3D. The ability

to see accurate, clear images at the push of a button means that the need to reconstruct pathology from multiple 2D views is minimized, providing clinicians with more diagnostic information in less time. Along with new advanced software for accurate and precise quantification of the mitral valve, surgeons have valuable data for planning and guiding procedures.

"Nowadays, echocardiographers have a lot of practice in reconstructing 2D slices mentally. Live 3D TEE gives more information with regard to a comprehensive evaluation of cardiac morphology and function compared to 2D, thus yielding a quicker and more precise diagnostic information for the clinician," says Prof. Dr. Peter Hanrath, retired director of the department of cardiology at the University Hospital of Aachen, Germany. A pioneer in echocardiography, he was impressed by the potential of Live 3D TEE: "Since the 1960/70s, cardiologists have applied transthoracic echocardiography to assess left ventricular dimensions and performance. After more than 35 years of developing transesophageal echocardiography, Live 3D TEE is now enriching applications such as catheter-guided interventions in specific patients with mitral valve disease for example."

"Philips has enjoyed a long and fruitful development partnership with Prof. Hanrath and the department of cardiology at the University Hospital of Aachen in Germany," says Mike Peszynski,

Project Manager at Philips Research. In addition Prof. Dr. Andreas Franke, Specialist for Cardiology/Internal Intensive Care Medicine at the University Clinic of Aachen worked closely with Philips on driving TEE developments. “Both cardiologists have helped us clearly understand what they, their colleagues and their patients really need,” highlights Mike Peszynski.

Versatile tool for cath lab, OR and EP lab

The Live 3D TEE probe connects to the Philips premium echo system, the iE33. It offers the same functionality as the conventional Omni TEE transducer and the logistics, workflow and handling remain exactly the same. Wherever it is used, Live 3D TEE provides more precise information in a fraction of the time. It is valuable in echo labs for simplifying the diagnosis of valve or chamber problems, in catheter and EP labs for making it possible to monitor interventions, and when communicating with cardiac surgeons and other colleagues. The exceptional image quality provides clear details of cardiac morphology and increases diagnostic confidence.

For the first time, Live 3D TEE imaging allows the left ventricle to be viewed. QLAB quantification with Live 3D TEE provides left ventricular wall motion analysis that is essential for echocardiographers. With the new 3D mitral valve quantification, clinicians have access to a level of information not available with 2D techniques. Live 3D TEE makes it possible to obtain images even during atrial fibrillation and in addition to imaging the valves, Live 3D TEE provides exceptional real-time 3D views of the atrial septum and the left atrial appendage, as well as other structures in the heart. The iE33’s new transducer, the X7-2t, also supports Live xPlane ima-

ging, with two simultaneous live 2D planes and steering capabilities. For peri-interventional use in the cath lab, the new application offers an immediate spatial orientation and easier recognition of pathologies, since clinicians can see in real-time what is happening during monitoring interventions. Prof. Hanrath comments: “The advantage is that they can easily recognize whether the treatment has been successful. Interventional cardiologists have more information for procedures – such as device implantation, closing ASDs and PFOs – as well as improved visualization during guided procedures.” Accurate, reliable, real-time dynamic information for better visibility during guided procedures can increase the interventional cardiologist’s confidence in his treatment. Live 3D TEE allows for real-time evaluation during the procedure and also complements X-ray. “Because the mitral valve can be seen more clearly and quickly, fluoroscopy time may be reduced. This is a major benefit for interventional cardiologists as well as patients”, says Prof. Hanrath.

“In cardiothoracic surgery, Live 3D TEE makes it easier for surgeons to understand what is happening,” says Mike Peszynski. “Before the operation, they can see precisely the problem they are trying to solve, for example, to see the mitral valve before it stops moving and perform geometric measurements to preplan the operation.” With the X7-2t, cardiologists can see the entire mitral valve from multiple perspectives – views which are not available once surgery begins and which facilitate assessment of the valvular function. During surgery, the heart is displayed in motion, in real time, and anesthesiologists can easily monitor patients, perform analysis for surgeons and assess procedure outcomes to determine if they have been fully successful. If necessary, further repairs can be carried out immediately, before completing the procedure.

Electrophysiologists at the University Clinic of Aachen have successfully used Live 3D TEE to navigate to the coronary sinus vessel and to study the pulmonary veins, which are not visible with X-ray. “In the future, we will be able to apply this technology in electrophysiology to help guide the ablation,” says Mike Peszynski.

Improving patient communication

In addition to providing more information for diagnostic and decision-making steps, the clear-cut images generated through Live 3D TEE can also facilitate communication with patients and family. “Patients will immediately benefit from Live 3D TEE,” comments Mike Peszynski. “If cardiologists find a general defect in the valve in a young adult they can show a Live 3D TEE image to the patient and his or her parents and the cardiologists can easily explain the diagnosis and therapy. The new 3D picture is clearer and much easier for a layman to understand than the 2D picture that clinicians are trained to study.”

With Live 3D TEE, cardiologists, interventional cardiologists, cardiac surgeons, anesthesiologists and echocardiographers have access to more information throughout the entire patient care cycle, from initial presentation and diagnosis through to planning, treatment, assessment and follow-up care.

¹ xMATRIX transducer technology provides volume acquisitions of the beating heart and also enables Live xPlane imaging – the ability to acquire two planes simultaneously from the same heartbeat.

² PureWave crystal technology is a transducer technology using piezocrystals which are purer, more uniform, have lower losses, and are able to transfer energy with greater precision and efficiency than commonly used PZT-composites.

“Patients are the real Beneficiaries”

ESC visitors impressed by Live 3D echocardiography



New perspectives with Live 3D TEE

Echocardiographers

- view left ventricle and perform ventricular wall motion analysis
- run 3D mitral valve quantification

Interventional cardiologists

- gain immediate spatial orientation
- perform real-time evaluation during procedures
- reduce fluoroscopy time

Cardiac surgeons

- view multiple perspectives of the entire mitral valve

Anesthesiologists

- easily monitor patients, perform analyses for surgeons and assess procedure outcomes

Electrophysiologists

- navigate to the coronary sinus vessel
- study the pulmonary veins

All clinicians

- use Live 3D TEE as a communication tool among colleagues
- improve communications with patients and family

One of the satellite symposiums at the recent European Society of Cardiology congress focused on Philips Live 3D echocardiography. Prof. Roberto M. Lang MD from the University of Chicago, USA, discussed principles and first results of real-time 3D transesophageal echocardiographic (TEE) in the assessment of cardiac structures, while Prof. Dr. Andreas Franke from the University Clinic of Aachen, Germany, presented his findings on the peri-interventional use of real-time 3D TEE.

Having examined approximately 400 patients using the new Live 3D TEE probe, Prof. Lang, Director of Cardiac Non-invasive Imaging Laboratories at the University of Chicago, says that the technology offers a “new perspective for the patient” and is going to have “a major impact on planning, mitral valve surgery and

guiding procedures.” Prof. Lang was particularly impressed by the flexibility of the probe. “Not only can you see real-time 3D images, but this probe has all the functionalities of a multiplane transducer.” According to the US cardiologist, patients are the real beneficiaries of Live 3D TEE imaging. “I firmly believe that this allows us to carry out our current jobs more effectively. I’m sure that those who will benefit most are the patients, because healthcare providers will have better information and will be much more certain about what needs to be done.”

Boosting 3D technology

Prof. Franke, Specialist for Cardiology/Internal Intensive Care Medicine at the University Clinic of Aachen, believes that Philips Live 3D TEE will give new impetus to 3D technologies in cardiology.



“Now we can even see catheters move in real time on a 3D image and we don’t need as much time as before. At the push of a button you can switch from 2D to 3D and you can instantly watch the heart in 3D.” The German cardiologist continues: “All clinicians are trained in using 2D images, and seeing the heart in 3D is something you first have to get used to. But for everyone using echocardiography extensively, this new technology will be very attractive. I’m sure that at this congress, Live 3D TEE is one of the most important topics for cardiologists using echocardiography.”

Despite the fact that the auditorium used for the Philips-sponsored presentations had a seating capacity of 500, approximately 700 cardiologists attended the satellite symposium. Many of the cardiologists standing at the back of the room were impressed by the cardiac Live 3D images.

Modality of choice

One Italian cardiologist participating in the symposium confessed that she had never seen real-time images like these before. Another Italian cardiologist was convinced that this technology represented a major step forward, especially in terms of the preoperative management of patients. Dr. Ninios Vlassis, cardiologist from Thessaloniki, Greece said after the presentations: “Apart from delivering beautiful pictures, it offers a new level of quality in terms of the information available for improving clinical practice. The Live 3D TEE probe seems to be the same size as the traditional probe and appears to be quite easy to use, with just the push of a button. For me, Live 3D TEE is one important tool that I am very excited about.”

While symposium guests were particularly impressed with the high image quality and the new way of viewing the mitral valve, Dr. Lang emphasized another aspect of his experience with the new tool. “This probe is not only a new window to the heart, it is also instrumental in getting a team of cardiologists and surgeons to discuss cases.” Dr. Lang is convinced that Live 3D TEE will soon become the standard method: “This is the modality of choice that people around the world will be using to view the mitral valve.”

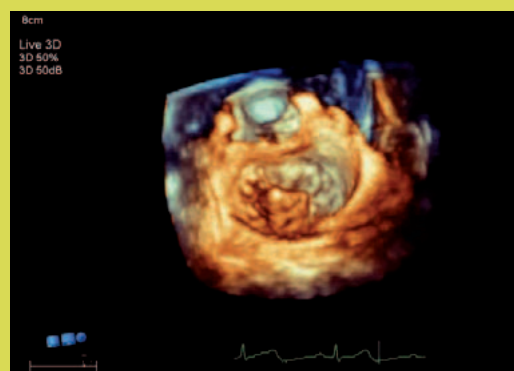
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Live 3D TEE – available for the first time

Since 2002, Live 3D Echo has been bringing new and additional data to cardiologists to aid in diagnosis and planning. Now the same technology is available in TEE format. The X7-2t transducer combines and miniaturizes two cutting-edge technologies – the 3D power of xMATRIX and the exceptional image clarity of PureWave crystal, into a fully functional TEE transducer for 2D AND Live 3D imaging. The X7-2t provides new views of cardiac structure, pathology and function which provide additional information for cardiologists, cardiac surgeons, anesthesiologists and interventional cardiologists for diagnoses, planning treatment, monitoring and assessing during procedures.

Surgeons and anesthesiologists can see the complete valve from multiple perspectives while it’s beating, facilitating planning and decision making. These are views not available once surgery begins – more perspectives of the heart, the surgeon’s view, and the view from inside the left ventricle (impossible before Live 3D TEE). It’s fast and easy to display the 3D view, without the pressure of reconstructing pathology from multiple 2D views. Function can be assessed before closing, and if needed, further repairs can be done immediately before completing the procedure.

In the Cath and EP labs and OR, Live 3D TEE provides views never seen before and increases visualization during guided procedures. It’s more information for the interventional cardiologist, increasing confidence in the treatment and providing real-time evaluation during the procedure.



While Live 3D TEE provides views seen for the first time, QLAB’s new Mitral Valve Quantification plug-in (MVQ) provides quantification data available for the first time. MVQ offers three use-models/protocols to assist clinicians in defining 3D landmarks on MPR views and build a 3D model, step by step, of the mitral valve annulus, anterior and posterior leaflet coaptation line, as well as mitral valve spatial relationships with the papillary muscles and aortic valve.