

EVAR-3D Guidance

How Artis zeego Club Can Help to Facilitate the Exchange of Surgical Workflows

Visionary surgeons around the world are continuously developing new applications for hybrid operating rooms. Translating these new workflows to other surgical sites can be a challenge, because there are hardly any global forums to exchange hands-on know-how. The Artis zeego Club fills this gap as it is illustrated here with the new EVAR-3D Guidance workflow for AAA cases.

At LINC 2012 in Leipzig, Lieven Maene, M.D., vascular surgeon at the OLV Hospital in Aalst Belgium, introduced EVAR-3D Guidance, a new workflow to fuse intra-operative 3D images with live fluoroscopy to guide endovascular procedures utilizing Siemens' Artis zeego and *syngo* iGuide Toolbox. He envisaged and implemented this new workflow



Lieven Maene, M.D.,
OLV Hospital,
Aalst, Belgium.



Johannes Gahlen, M.D. (right)
and Wilko Staiger, M.D. (left),
Ludwigsburg Hospital, Germany.



Siemens application expert Marc Terriere
and marketing manager Thomas Hartkens, PhD
in the hybrid OR at OLV Hospital in Aalst.

Step 1 Placement of the catheter at the Ludwigsburg Hospital



As a member of this club Dr. Gahlen has access to latest technical developments, case spotlights, special event, and chances to network with other users. In addition, he receives privileged advice and assistance from Artis zeego experts. In this case, the support team of the Artis zeego Club from Siemens headquarters came to the Ludwigsburg hospital to support the first case and walked through each individual step of the workflow. The patient presented with an abdominal aortic aneurysm (AAA) requiring a Cook Medical Zenith Fenestrated AAA Endovascular Graft, which needs special care to ensure that the renal ostium remains free from occlusion. The following steps were performed with the help of the Artis zeego Club:

Step 1

Placement of the catheter

In general, stiff catheters deform the iliac arteries and the aorta when advanced into the aorta. Thus, the anatomy in pre-operative images might not exactly match the intra-operative situation. Therefore, information derived from pre-operative images or images acquired before the catheters are inserted might not meet the accuracy required for precise 3D guidance. In contrast, in this workflow the catheter with the endograft is inserted in the aorta, but not released, before the 3D *syngo* DynaCT acquisition. By acquiring the 3D image after inserting the catheter, the deformations are captured and the final overlay of the 3D image matches the live fluoroscopy with minimal distortions.

by himself with the help of a local Siemens' application expert. Dr. Maene presented a patient with ischemia of the bowel and an occlusion of the superior mesenteric artery. "We could go with trial and error: a lot of scraping of the inside of the aorta, trying to find this orificium," said Dr. Maene. A better strategy, he said, would be to utilize EVAR-3D Guidance, via 3D angiography, 3D navigation mapping and a live system that would guide the operator. Dr. Maene's workflow description impressed the audience with its simplicity and efficacy. In response to the presentation, panel member Frank Veith, NYU Cardiac and Vascular Institute, New York, joked:

"It's fantastic – the nurses could do the cases with this [system]."⁴

⁴ "3D mapping for the hybrid operating room" in LINC review 2012, Liam Davenport (editor), MediFore Limited (publisher), page 16-18, 2012.

Sharing surgical workflows

LINC panel member Johannes Gahlen, M.D., head of the Vascular and Endovascular Department at Ludwigsburg Hospital in Germany, did not hesitate and decided to implement this workflow in his hybrid operating room with the help of the Artis zeego Club.

Step 2 3D syngo DynaCT acquisition



Step 3 3D planning at the workstation



Step 2

3D syngo DynaCT acquisition

The 3D syngo DynaCT is acquired with the catheter in place. For instance, a five-second digital subtraction angiography (DSA) protocol with undiluted 6 cc contrast agent injection per second can be chosen. The image is analyzed at the 3D workstation in the control room.

Step 3

3D planning at the workstation

The workstation displays the syngo DynaCT image in three orthogonal slices as well as a 3D volume rendering in the lower right window. The surgeon marks the landing zone or the ostia of the renal arteries in one of the multi-planar views in the form of a guidance ring dis-

played as yellow dots. Later in the OR, the guidance rings help the surgeon to place guidewires into the renal arteries. The automatic outlining is switched on, which provides additional information about the anatomy, including the position of the renal arteries.

Step 4

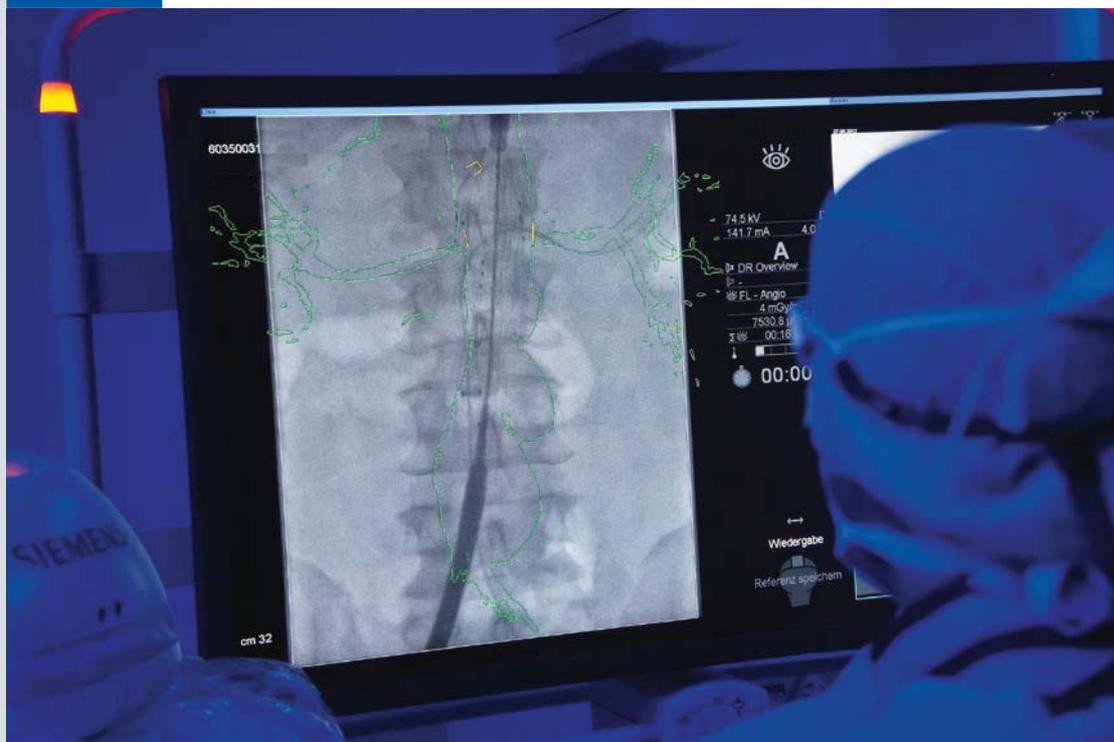
3D guidance on live fluoroscopy

The three-dimensional plan prepared at the workstation is automatically overlaid on top of the fluoroscopy images. It includes the aorta outline and the manually drawn guidance rings. The 3D overlay is linked with the C-arm, i.e. the workstation recognizes any movement of the C-arm and recalculates the overlay accordingly. For example, when the surgeon moves the C-arm so that the ring becomes a line, the C-arm angulation is exactly perpendicular to



The Artis zeego Club support team, Ryan Forth and Penny Vos, explain the EVAR-3D Guidance workflow at the Hospital in Ludwigsburg, Germany.

Step 4 3D guidance on live fluoroscopy



the corresponding vessel which is considered an optimal view of the anatomy. The 3D guidance markers support the surgeon in placing guidewires into the renal arteries. The outline is updated continuously when the C-arm is moved and indicates the actual anatomy without injecting contrast agent.

Altogether, the new EVAR-3D guidance workflow results in optimal C-arm angulation, perpendicular to the vessel of interest, and provides a precise 3D overlay. It helps surgeons to place the catheter in the aorta or navigate guidewires into the ostia of renal arteries, for instance. Finally, this will lead to reduced procedure times, lower X-ray dose, and use of less contrast agent.

The Artis zeego Club

The Artis zeego Club was founded to advance new procedure methods and uses of the Artis zeego system. It is a loose community of Artis zeego users around the world who receive privileged advice and assistance from a dedicated Artis zeego expert team at Siemens' headquarters. They also have access to technical and clinical knowledge through unique video demonstrations, webcasts and

educational programs. Artis zeego members also receive continuous system software updates at no extra charge*. The online platform of the Artis zeego Club is an opportunity to network with peers, share insights and learn from each other via the private Artis zeego discussion forum. Members can learn from peers to enhance their current practice and widen clinical offerings.

* Service and application training not included

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