

Syngo DynaCT Cardiac from Siemens: 3D images for cardiovascular imaging

At the ESC (European Society of Cardiology) Congress 2009, Siemens will be demonstrating a new cardiac application for the syngo DynaCT Cardiac imaging application. During transfemoral aortic valve replacement, a heart valve prosthesis gets implanted via peripheral artery access. To position aortic valve prostheses accurately, the cardiologist must have very precise knowledge of the individual anatomy of the patient's aorta. That's where syngo DynaCT Cardiac comes in: During the intervention, it generates CT-like cross-sectional images on an angiographic C-arm system and offers 3D reconstruction of the aortic root. These 3D images can be overlaid on actual fluoroscopic images and provide a kind of three-dimensional roadmap for the examiner. Thus, with syngo DynaCT Cardiac, the cardiologist can position the valve prosthesis more accurate and more quickly than before.

For most patients worldwide, open heart surgery is performed for the placement of an aortic valve prosthesis. The most frequent reason for this intervention is the constriction of the valve, so-called aortic valve stenosis, which occurs primarily in elderly persons. In the course of time the valve loses elasticity and no longer fully opens. This decreases the flow of blood, and the organs no longer receive a sufficient supply of oxygen. Normally, the operation requires opening the sternum. The heart has to be temporarily stopped and its function taken over by a heart-lung machine. Especially for elderly and severely ill patients with accompanying diseases such as heart failure, renal failure and diabetes, such an intervention is risky.

Recently, new procedures have been developed in which the the aortic valve prosthesis is implanted in the heart using a catheter rather than through the usual open heart surgery. This involves an intervention often performed jointly by the cardiologist and the heart surgeon. First, through a small incision in the groin artery, a special balloon catheter is guided to the heart to dilate the stenosed aortic valve. Then, a collapsed heart valve is also inserted up to the valve

level via a balloon catheter; there it is unfolded and attached to the surrounding tissue with a so-called "stent".

For such complex transcatheter techniques, high-performance angiographic systems like those in the Siemens Artis zee family are used, since they provide the best possible imaging, even in a completely sterile OR environment. With these systems physicians can follow the minimally invasive intervention on an X-ray screen while directly monitoring the function of the valve prosthesis, which can possibly spare the patient postoperative measures.

Prior to such interventions it is imperative that the cardiologist gets a comprehensive picture of the heart and vessels. Previously, this normally required imaging with CT scanners or MRI systems, which led to additional costs. For this reason, Siemens (as the first company in the medical field in 2004) developed an application that can generate CT-like 3D images directly on an angiography system: Syngo DynaCT. The application has been continually fine-tuned and developed, so that today it combines the advantages of three-dimensional CT imaging with live X-ray imaging of the beating heart in one examination and on a single system. The CT-like images of the heart are produced by rotating the C-arm at high speed around the patient. In this way, several hundred images are acquired and reconstructed as 3D volumes. If the acquisition is triggered via the patient ECG, even time-dependent 3D volumes can be generated for visualization of the beating heart. The complete 3D image is available in less than a minute. Anatomical structure segments are overlaid with the live X-ray image, allowing the physician to navigate with the catheter quickly and confidently without the use of a contrast medium.

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