





The Hannover Medical School, Germany, (left) and the St. Pölten State Hospital, Austria, (right) are already exploring the possibilities of the C-arm.

For many years, image intensifiers were a rarity in the cardiac operating room. *Medical Solutions* presents the experiences of two leading experts who have had the opportunity to work with ARCADIS Avantic, the latest generation in high-performance C-arm systems. The system has clearly impressed the cardiac surgeons.

By Martina Lenzen-Schulte, MD

This C-arm Gets to the Heart of the Matter

In Germany alone, some 70,000 cardiac bypass surgeries are performed annually. In patients with coronary arteries that are severely occluded or show blood clots, stenoses are bridged using vessels from other parts of the body where they are not needed. This technique has been improved over decades, and in the long run, patients benefit from such surgical interventions far more than from opening the occlusion with a balloon catheter. Such a replacement vessel can remain functional for more than 20 years. However, despite the obvious successes with

this type of surgery, which is today considered a routine intervention, quality control is required regardless of the medical discipline. Cardiac and vascular surgeons who attempt to restore the heart to its original vitality using sophisticated methods are increasingly seeing the importance of immediately checking results after the intervention. "I think the ability to immediately check whether the bypass is actually functioning and all desired areas are receiving blood is extremely valuable," says Assistant Professor Omke Teebken, MD, Senior Physician



The Karl Landsteiner Institute for Implementing New Cardiac Surgical Technologies at the St. Pölten State Hospital aims to assist other hospitals with the distribution of modern technologies, such as the use of the ARCADIS Avantic C-arm system.



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Bruno Podesser, MD, Senior Physician, Cardiac Surgery Center, St. Pölten State Hospital, Austria

at the Hospital for Thoracic, Cardiac, and Vascular Surgery at the Hannover Medical School, Germany.

Checking Results Directly and Immediately

The excellent resolution provided by the ARCADIS™ Avantic C-arm system during surgery makes this possible. Normally, the myocardium begins to beat again while still connected to the heart-lung machine – because blood flow has been reestablished where it is needed. The

electrocardiogram also provides evidence regarding regular progress or possible complications. “In case of doubt, however, these are merely indirect indications of a malfunction. If the desired result is not obtained, one has to look for the cause first. Using an image intensifier system for this purpose, I know immediately that the bypass is okay. I can then concentrate on other possible causes of the problem,” says Teebken. “We also have to remember that the conditions for our interventions are going to change significantly,” states Assistant

Professor Bruno Podesser, MD, Senior Physician at the Cardiac Surgery Center of the St. Pölten State Hospital in Austria, as he stresses the importance of sensible quality control. “For example, patients with diabetes represent a growing challenge to us, because they do not exhibit the conventional pattern of stenoses. Their occlusions tend to be found in smaller caliber vessels and are broadly distributed. In such cases, one wants to proceed with certainty, and quickly and reliably evaluate the success of the intervention as well as the patient’s prognosis,” says Podesser,



Bruno Podesser, MD, uses ARCADIS Avantic in the cardiac operating room to create excellent perioperative images.

looking toward the dramatic increase in diabetics expected in the Western World. "ARCADIS Avantic is also of inestimable help in the cardiac operating room when cardiologists are unable to provide us with images from coronary angiography due to difficult circumstances," says Teebken, noting another advantage for cardiac surgery. "Otherwise, we would not know what to expect, but this enables us to create excellent images of the situation prior to surgery."

Cutting-edge Cardiac Surgery

Users also appreciate the benefits of the larger field of view. In Hannover, testing is underway as part of a study to determine how beneficial it is to exclusively use arteries for bypasses instead of using additional venous material. "In this manner, we are not only replacing the

Different Devices for Different Circumstances

Cardiac surgical interventions are becoming increasingly more complex, not only with diabetics, but also due to the increasingly aging patient population undergoing cardiac surgery, those with numerous comorbidities, as well as those who have suffered multiple infarctions. Today, more than 40 percent of those undergoing cardiac surgery are more than 70 years old – and the percentage is increasing. In the meantime, numerous scientific studies have shown that seniors benefit equally and sometimes to a far greater extent from bypass surgery than younger patients. "For this reason, it will become increasingly necessary at many cardiac surgical centers to monitor specific cases with an image intensifier," predicts Dr. Bruno Podesser.

"Here at St. Pölten, as a hospital providing comprehensive maximum care for a large region, we cannot forego the quality-controlled implementation of promising innovations," says Podesser, who immediately adds an important example. "Previously, we approached every severe tearing of the aortic wall, called type A dissections, that

extended from the ascending aorta down to the descending aorta, by using two different operations. This was detrimental for very ill patients, who experienced very slow recovery after the first intervention."

The new procedure, which is not yet a standard, but for which a special prosthesis – the Haverich-Chavan Prosthesis – was developed, can be performed in a single session. The ascending, torn section of the aortic wall is cleaned, and a stent is inserted to hold the descending section so that the tear in the wall does not widen. "In these situations, a broad overview of the heart and adjacent vessels is needed, and this is provided by ARCADIS Avantic," says Dr. Omke Teebken, recognizing the benefit of the 33-centimeter-image intensifier. "The difference compared to a conventional image intensifier feels almost like having a wide-screen monitor instead of an old television set, with optimal viewing, no learning curve, and a much more comfortable working environment," states Podesser, praising the impressive clarity provided in these delicate situations. "Last but not

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least, the combination of amazing image quality and the larger anatomical image segment were the reasons we selected this unit for our hospital."



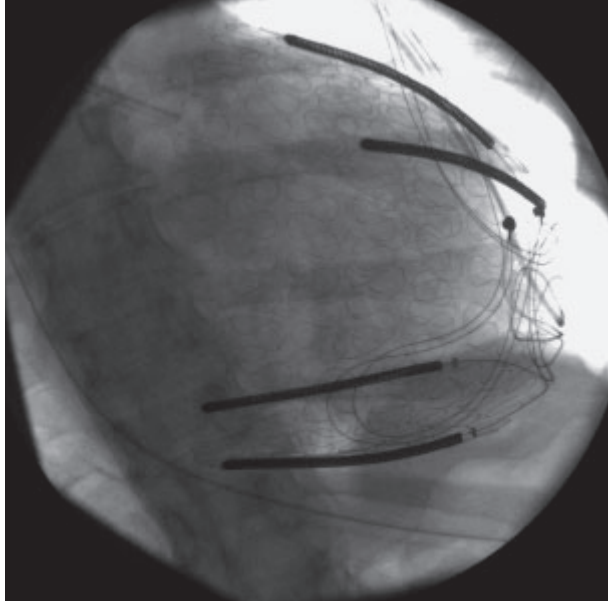


Image of the fine wire network that acts as a mechanical backing for an insufficient heart and supports the worn-out heart wall. The image results from a Hannover study in collaboration with Ventricular Support Systems, the manufacturer of Paracor HeartNet™.

commonly bypassed RIVA (descending artery) of the left coronary artery using a blood vessel sourced from an artery," explains Teebken, "we are also supplying the lateral and posterior myocardial walls. When using angiographic control, a good overview of those areas is another benefit of ARCADIS Avantic." This also applies to procedures that surround the insufficient, weakened myocardium with a type of supporting mesh hose made of very fine wire netting in order to improve the pumping capacity of the heart. In these cases, it is also important to see a

collaborate on the difficult intervention. Both disciplines are extremely pleased with the excellent visual details provided by the large image segment of ARCADIS Avantic. Podesser also draws attention to the future development of ever smaller tools: "The extremely thin catheters of one to one-and-a-half millimeters in diameter that we presently use – and this is a relatively new development – require image intensifiers with high resolution capabilities." Initially, the catheters used were three to four millimeters in diameter. As

heart. Using a conventional system, surgeons would have to deal with choppy images.

A Word on Workflow

The 25-kilowatt generator enables ARCADIS Avantic to stay in top form even during long interventions. "For me and my team, this contributes significantly to a good and relaxed working environment. Workflow is not only improved temporally because pauses are eliminated, but also mentally," notes Podesser. Previously, the many alarms – due to overloads of the conventional image intensifier – and the thereby required wait times clearly placed a great deal of stress on the operating room (OR) team.

The powerful unit maintains its excellent resolution when used for fluoroscopy (including pulsed fluoro) or subtraction angiography. "Even here," states Podesser with certainty, "ARCADIS Avantic maintains image quality." The 'roadmapping' function additionally enables tracking of the catheter route within the contrast agent. The contrast agent is converted to a light gray, while the catheter is displayed dark and clearly visible. Teebken notes the intuitive ease of use of the large C-arm. OR personnel are impressed that



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complete overview of the heart. "The fine wire netting would be difficult to detect using conventional systems," says Teebken, noting another subtle difference in image quality.

Smaller, Narrower, Thinner

Whenever an additional electrode is positioned to stimulate the left ventricle during implantation of a pacemaker (known as biventricular pacing), cardiologists and cardiac surgeons have to

a result of the new catheters, the risk of causing defects has been greatly reduced, for example, when routing a pacemaker probe through the tricuspid valve from the right atrium to the right ventricle. However, "You also want to see exactly where you are," adds Podesser. In this case, the Digital Cine Mode (DCM) of ARCADIS Avantic is a proven solution, enabling frame rates of up to 30 images per second. The heart remains in motion during most interventions, and many procedures are performed on the beating

everything works at the push of a button – from locking into position to adjustments using the integrated light marker. The implementation of their wishes works as well as if they had made all the settings manually. The two experts summarize: "It is a C-arm system that better meets our requirements as cardiac surgeons than we thought theoretically possible."

Martina Lenzen-Schulte, MD, is a physician, author, and medical journalist. She is a frequent contributor to medical magazines and the scientific pages of German-speaking public media.