Artis zeego – A Real Imaging Innovation in the OR

Since minimally invasive therapy has conquered spinal surgery, the target of the intervention is no longer visible to the surgeon. A challenge that can be elegantly met using the Artis zeego. Spinal implants for patients with unstable vertebrae are one example. But that is only the beginning.

By Wiebke Kathmann
For Christian Raftopoulos, MD, PhD, Head of the Neurosurgery Department at the University Hospital Saint-Luc in Brussels, Belgium, these are exciting times in spinal surgery. He has finally found a way to improve the outcome in patients undergoing osteosynthesis of vertebrae, a delicate procedure that requires utmost precision. The vertebrae first have to be fixed in place with screws through the pedicles of each vertebra. The angle and depth of insertion have to be exactly right in all pinnacles in order to achieve maximal stability when attaching the screws to the metal rod on either side of the vertebrae. In the era of percutaneous spinal surgery improved image guidance is needed in these patients. It supports pre-operative planning, intra-operative navigation, confirmation of the accurate localization of the pedicle screws and visualization of special anatomical structures or artifacts from prior interventions.

In general, neurosurgeons around the world use 3D imaging only before and 48 hours after the surgery. For the insertion of the pedicle screws they rely on 2D fluoroscopy systems. With the 2D approach clinical screw misplacements can occur in up to 7%.

Quality Control Right on the Table

In his search for ways to spare patients, surgeons and hospitals avoidable and costly reoperations, Dr. Christian Raftopoulos has come to use the unique robot-supported, fixed-mounted Artis zeego C-arm system in the OR. It provides exceptional 3D image quality right in the OR, allowing for quality control during the procedure. “If we want to be better tomorrow than today, we have to introduce quality control into the OR. We build cars and motorcycles very precisely and check the quality of what we are doing during the set-up of the machine. We should do the same in the OR. So far surgeons control what they are doing 48 hours after the intervention. With Artis zeego we can do it right there on the operating table.”

In his experience integrated intra-operative imaging in the OR not only provides comprehensive diagnostic and therapeutic support. It also saves time.
and costs, he states. “In spinal implants, using Artis zeego saves money because we avoid second operations. That way the patient is happy, the surgeon is happy and the hospital is happy. Avoiding second surgeries and medical-legal problems is a big plus. Especially here in Brussels, being the capital of Europe, patients are very demanding. They want the best result immediately.”

More Flexibility in the OR

So far Dr. Raftopoulos has used intra-operative MRI in spinal osteosynthesis procedures. “Artis zeego, however, is the future in minimally invasive spine surgery,” he states. “The patient does not have to go into the tube. You have full access to the patient and you can move the C-arm out of the surgical field if required. That gives you maximal space in the OR.”

For Dr. Raftopoulos the most important feature of the system is its integrated robotic technology. “You can program it to do the same movement ten times without errors. Mobile C-arms require manual positioning with less reproducibility. With zeego it is always the same move with the precision of a robot.”

Another argument in favor of Artis zeego is its high quality 3D imaging, which is essential for spatial orientation during the procedure. “The pedicle screw must be implanted with the best precision possible if you want to achieve the best possible stability.”

Asked why he prefers Artis zeego to O-arm systems in spinal surgery Dr. Raftopolous states that the O-arm was too bulky for him. He was on the verge of getting the Artis zee system when he discovered Artis zeego. “The standard Artis zee system does not use robotic technology. To find the perfect position for the pedicle screw you need to carefully re-position the machine to find the optimal fluoroscopic view. If you have to fixate three vertebras that means you have to find six views for the pedicle screws. Sometimes you need to repeatedly move the machine to the same views to correct the position of the pedicle perforator. With Artis zeego we store the fluoroscopic views once and the system travels to these views fully automatically just by pressing the control.”
New Indications

So far Dr. Raftopoulos has a limited access to Artis zeego. In spinal surgery Dr. Raftopoulos uses it mainly on elderly patients and those with complex spines. “For example this morning we implanted four pedicle screws. One of them had to be implanted in a compact dense pedicle. So in order to enter into it I had to hammer on my pedicle perforator with more force than usual. Intraoperative 3D imaging reconfirmed the special situation created by a prior intervention and kept the stress level down during the intervention.” Dr. Raftopoulos believes he is faster when using 3D imaging before and during surgery because he has a better 3D perception of the patient’s spine. He sees the future of Artis zeego less in vertebroplasty and kyphoplasty but more in the minimally invasive placement of stabilizing implants, not just for the spine but also of the head and in neuromodulation technologies for essential tremor, Parkinson’s or psychiatric diseases. “The future of Artis zeego can be very bright and the potential is much greater than it appears even now.”

Artis zeego in the Hybrid Room

It takes about 10 to 20 procedures to familiarize oneself fully with the system in order to get the most out of robot-assisted intraoperative 3D imaging using the Artis zeego. All surgeons at the table need to be fully trained and have to familiarize themselves with the workflow, according to Dr. Raftopoulos. “Doing six cases per month we have a satisfactory experience with this intervention. And we already have a backlog of four months.” Dr. Raftopoulos shares the OR with the vascular surgery department in his hospital, giving him access to Artis zeego one day every two weeks. Therefore, he is eager to get his own OR with an Artis zeego. Several treated patients were so conscious of the need for such a system they made donations for a new system in order to give more patients access to the same quality intervention. By 2012 this pioneer of 3D intraoperative imaging in spinal surgery hopes to have his own Artis zeego, under full control of his neurosurgical team. His goal is to maximize its use by designing a new double OR. “I am pretty sure that in one or two years, using Artis zeego full-time, we should be able to recoup our investment.”

Medical writer Wiebke Kathmann is a frequent contributor to medical publications. She holds a Master in biology and a PhD in theoretical medicine and worked as an editor for many years before she became a freelancer in 1999. She is based in Munich, Germany.

Contact

thomas.hartkens@siemens.com
Advantages of the Fixed C-Arm System

- CT-like images (syngo DynaCT) due to high precision and speed of detector movement around the patient
- Fluoroscopic views can be stored and the robotic C-arm travels into these exact positions, reducing human interaction, therefore speeding up the procedure.
- Imaging of the whole spine and from both sides of the patient
- Exceptional image quality
- Fast 3D reconstruction
- Roadmapping by merging 3D images with 2D fluoroscopic live images (syngo iPilot)
- Large display
- Support of the workflow due to synchronized movements of C-arm and table
- Flexibility during the procedure (park positions)

“Surgeons do things and verify what they have done 48 hours after the intervention. In up to 7% of the cases they have to tell the patient: ‘It’s not perfect. We have to operate on you again.’ We want to reduce those numbers through intraoperative 3D imaging with the Artis zeego.”

Christian Raftopoulos, MD, Head of Neurosurgery Department, University Hospital Saint-Luc, Brussels, Belgium