

Advancing Aneurysm Treatment with ARTIS icono 3D imaging and the combination of Sim&Cure Device Simulation

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Meeting summary

This article is based on a presentation delivered during an Industry Symposium held as part of the 16th Congress of the European Society of Minimally Invasive Neurological Therapy (ESMINT) 2004. The Industry Symposium was sponsored by Siemens Healthineers, and took place on 6th September 2024 in Marseille, France.¹

Dr Markus Holtmannspötter, Head of Neuroradiology at Nuremberg University Hospital & Paracelsus Medical University, presented 'Advancing Aneurysm Treatment with ARTIS icono 3D imaging and Sim&Cure aneurysm treatment simulation.

KEYWORDS: ARTIS ICONO, CONEBEAM CT (CBCT) IMAGING, DIAGNOSIS, 3D IMAGING, BIPLANE 3D IMAGE OVERLAY, SIM&CURE

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Background

Current aneurysm treatment and angiography technology has seen considerable advancements over the past 25 years, driven by the need for more accurate detection and diagnosis of neurovascular diseases. The field has experienced a diversification in treatment options, allowing for more targeted and lower-risk procedures.^{2,3} Modern angiography suites have evolved to offer improved image quality, reduced radiation exposure, and advanced features such as 3D, 4D, technologies. Computed tomography (CT) and CT angiography (CTA) remain primary diagnostic tools, but image artefacts can affect their accuracy, particularly in areas with complex bony structures.

High-resolution imaging has become crucial for accurate diagnosis and treatment planning, especially for minimally invasive interventional procedures.^{2,3}

Recent advancements in aneurysm treatment and angiography technology have concentrated on improving image quality and spatial resolution, with a particular focus on 3D imaging integration to enhance the detection and diagnosis of neurovascular diseases. Incorporating high-resolution, non-invasive imaging techniques and simulation software in 3D workflows is crucial for more effective procedure planning and clinical decision-making.

An Overview of the ARTIS icono angiography System and the combination of Simulation Software

The ARTIS icono system, developed by Siemens Healthineers, marks a significant advancement in angiography technology for neurovascular interventions, offering high-resolution imaging, reduced radiation exposure, and enhanced workflow efficiency.^{4,5} This biplane angiography system incorporates several key features, such as the OPTIQ imaging chain, which enhances image quality by optimising contrast-to-noise ratios regardless of patient size or angulation, and syngo Dyna3D HighSpeed, which accelerates 3D imaging acquisition up to 2,5 seconds. The system also includes TwinSpin technology for effortless switching between 2D biplane and 3D imaging and a Lateral Plane switch for flexible detector repositioning. Additionally, advanced software features like Case Flows standardise procedures across different laboratories, further improving workflow efficiency.

The ARTIS icono system is engineered to optimise precision in interventional procedures, particularly for complex neurovascular cases. It offers superior visualisation of challenging structures, such as the cranial base and skull cap, improving diagnostic accuracy and therapeutic outcomes for conditions like cerebrovascular accident (CVA). A notable advancement in the ARTIS icono workflow is the combination with simulation software, such as Sim&Size™, which facilitates pre-procedural planning and device selection an essential aspect for aneurysm treatments. This software allows the visualisation of device placement in patient-specific 3D anatomical models, enabling the simulation of various treatment strategies prior to the procedure. Additionally, it ensures precise device sizing tailored to individual patient anatomies, reducing procedure time and minimising radiation exposure.

Combining simulation software directly with the ARTIS icono system creates a more seamless workflow, allowing interventionalists to focus entirely on the procedure without switching between multiple systems. This integrated approach has demonstrated benefits in reducing fluoroscopy duration and radiation dose, while enhancing the precision of device placement. With the diversification of aneurysm treatment options over the past 25 years, the combination of advanced imaging systems, such as the ARTIS icono with simulation

software, marks a substantial advancement toward more personalised and efficient interventional procedures.

Clinical Advantages of ARTIS icono System with 3D Integration

Dr Markus Holtmannspötter has over two years' experience with the ARTIS icono system. The clinical advantages of using the ARTIS icono system with integrated 3D imaging are numerous, enhancing both treatment planning and precision in neurovascular procedures. The combination of simulation software allows for comprehensive pre-procedural planning and evaluation of multiple treatment strategies. The use of 3D objects and 3D image overlays on both planes to live imaging aids in identifying optimal projections and landing zones for devices. This approach improves the accuracy of interventions and decreases radiation exposure by utilising 3D imaging. Also, previous DSA runs throughout the whole procedure can be used for the DSA Roadmap feature (2D imaging based), thus minimising additional contrast injections. Additionally, the system's improved workflow efficiency contributes to shorter procedure times, leading to further reductions in radiation exposure for both patients and interventionists.

Enhanced device visualisation is another key benefit, offering superior visibility of small devices which is crucial for complex procedures. The software provided by the ARTIS icono system produces a detailed representation of device placement within patient-specific 3D anatomical models. The combination of simulation software from Sim&Cure with the ARTIS icono angiography system directly in the angiography suite optimises aneurysm workflows by minimising distractions and enhancing focus to the procedure. The support of a more intuitive user interface further improves efficiency, enabling a seamless progression through procedures such like the possibility of planning the perfect working projection in biplane mode and ultimately moving the angiography system automatically into this projection. The ARTIS icono system also offers versatility, supporting a broad range of procedures from diagnostic angiographies to complex aneurysm treatments.

An illustrative example (Figure 1.) is provided by a case involving a 55-year-old woman undergoing elective treatment for an MCA aneurysm. The procedure demonstrated rapid 3D imaging acquisition, the use of simulation software from Sim&Cure (Figure 2.) for selecting an appropriate device,

precise device placement guided by 3D overlays onto both planes to live imaging, and post-procedure evaluation with syngo DynaCT Micro 3D imaging (Figure 3.) and multi-planar reconstructions. This example highlights how the combination of both systems enables comprehensive planning, precise execution, and thorough post-procedure evaluation, potentially leading to improved patient outcomes.

Summary

The ARTIS icono system by Siemens Healthineers represents a significant advancement in angiography technology, offering high-resolution 3D imaging, minimised radiation exposure, and the combination of simulation software for precise pre-procedural planning.⁶ These features collectively enhance the diagnosis and treatment of neurovascular diseases. By improving workflow efficiency and device visualisation, the system supports a wide range of procedures, ultimately leading to more personalised and effective patient care. The ARTIS icono system's 3D simulation capabilities enhance precision in complex neurovascular cases by providing superior visualisation of intricate anatomical structures and improving device placement accuracy. The combination of simulation software with the angiography suite streamlines workflow, reduces distractions, and decreases fluoroscopy duration and radiation dose, benefiting both patients and interventionalists.^{2,7} This versatile system supports a wide range of procedures, from diagnostic angiographies to complex aneurysm treatments, and offers improved outcomes through more personalised and efficient care. In a case involving a 55-year-old woman undergoing elective treatment for an MCA aneurysm, the ARTIS icono demonstrated the ability to deliver rapid 3D imaging, ensure precise device placement guided by 3D overlays of the landing zone, and facilitate comprehensive post-procedure evaluation, highlighting the potential to substantially improve patient outcomes.^{3,7}

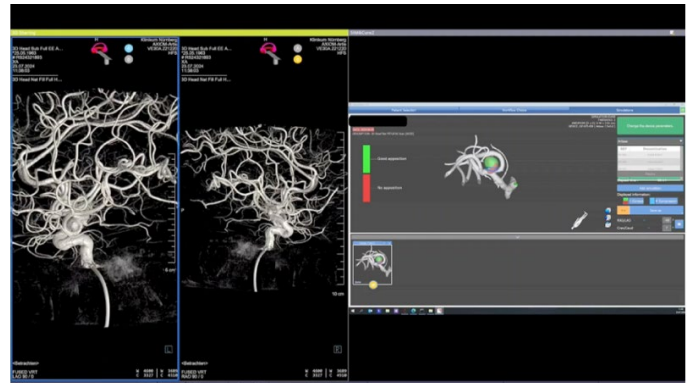


Figure 1. 3D angiogram in biplane mode
Side by side visualisation on the large display in the examination room: 3D angiogram for perfect working projection planning in biplane mode and Sim&Cure's Sim&Size device simulation software.

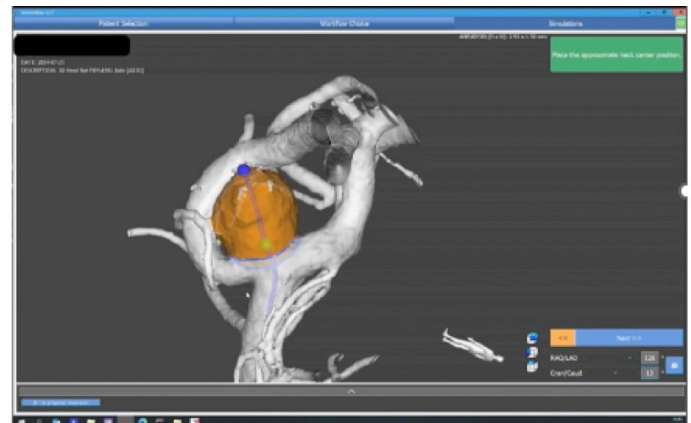


Figure 2. Sim&Size by Sim&Cure
Sim&Size by Sim&Cure for an accurate device simulation in the case of an MCA aneurysm.

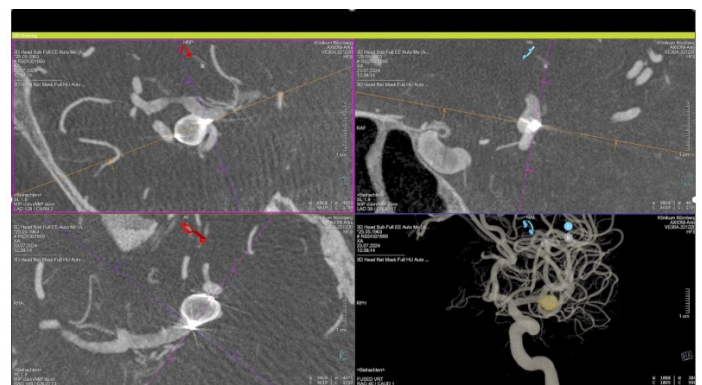


Figure 3. Control 3D angiogram
syngo DynaCT Micro for high-resolution device imaging after the procedure for treatment success documentation.

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