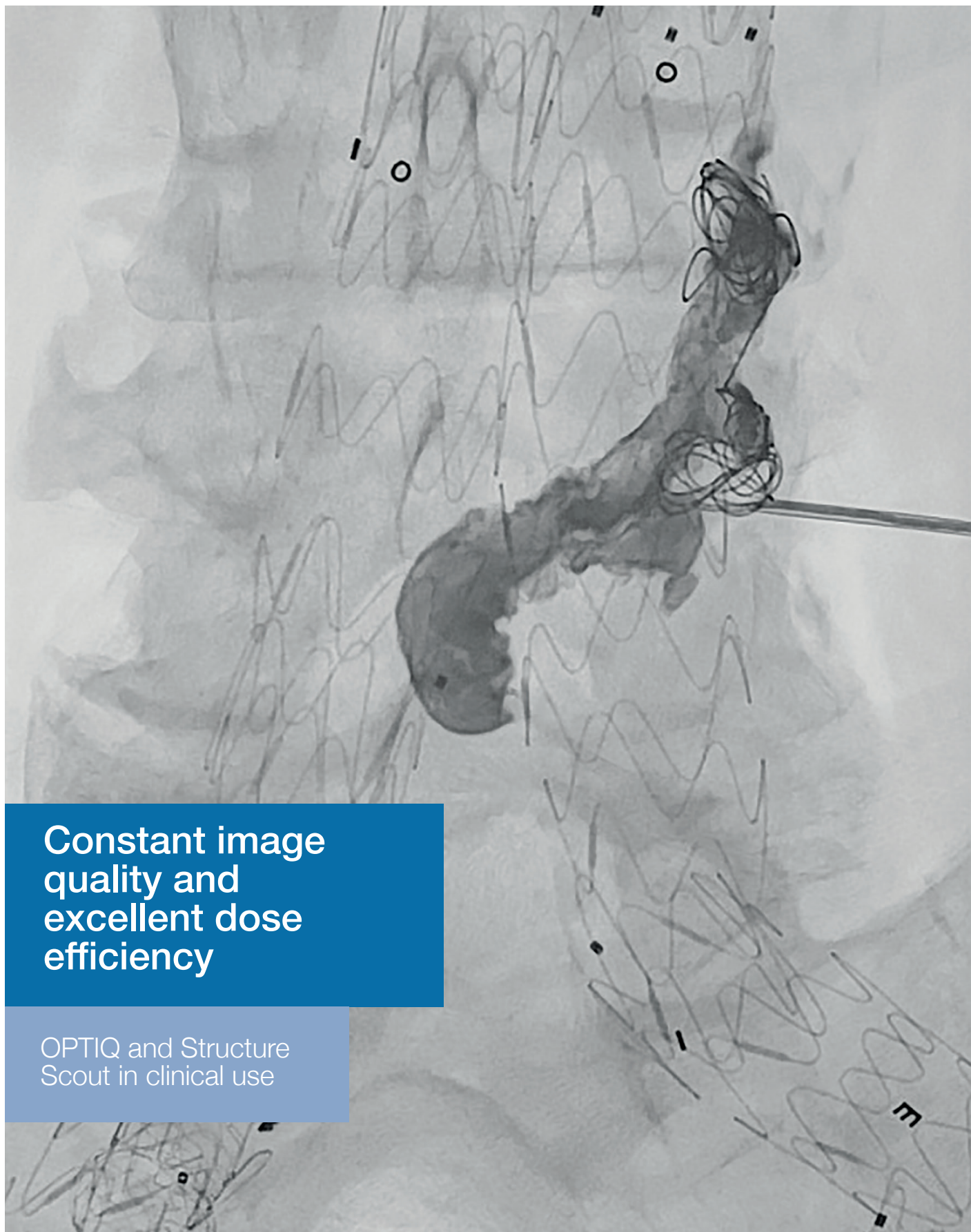


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**Constant image
quality and
excellent dose
efficiency**

OPTIQ and Structure
Scout in clinical use

IO offers “big and bright future” for the treatment of liver malignancies

During minimally invasive procedures it is of central importance that interventionalists have quality imaging to maintain precision and accuracy. Historically, however, difficulties have arisen when attempting to keep consistently high image quality (IQ) while reducing radiation dose to as low as reasonably achievable (ALARA). **Philippe Pereira** (SLK-Clinics GmbH, Heilbronn, Germany) believes that by combining technological innovations like OPTIQ with personalised, multidisciplinary oncological medicine, “we have a big and bright future”.

A FORERUNNER IN THE development of angiographic imaging and guidance software, Siemens Healthineers’ new ARTIS icono ceiling system, including the radiation exposure control OPTIQ, provides novel dose management while sustaining high-quality imaging. Pereira elaborates on how the ARTIS icono system has transformed their workflow and procedural success.

Last year, the ARTIS icono system was installed in Pereira’s radiology department, replacing the previous Artis zee system. “We were one of the first institutions to have these systems installed worldwide,” he says. “After a few days of training with the new ARTIS icono system, we were able to start comprehensive therapies for all patients—in the first month we had around 120 complex and challenging chemoembolization patients and we were able to continue our work without postponing appointments.”

Regularly performing interventional treatments for cancer patients, Pereira’s department follows “specific pathways” which have a strong multidisciplinary focus. “All cancer patients must first go through the interdisciplinary tumour board—that is a prerequisite not only for



Philippe Pereira

message of his European Conference on Interventional Oncology (ECIO) presidential statement in 2022 and 2023. “Every cancer is personalised, so every treatment should be personalised to that cancer. We perform the complete spectrum of interventional oncology—percutaneous, arterial, and intra-arterial, in all of which we use the ARTIS icono system for palliative, symptomatic and curative treatment,” Pereira explains.

Pereira and his team often perform transarterial chemoembolization (TACE) procedures, alone or combined with systemic treatment. This can be selective or non-selective, he explains: “it depends if you treat primary or metastatic liver cancer.

Mostly these patients will have systemic treatment in parallel with TACE or chemoperfusion while the latter takes two or three hours.” For TACE, high-quality imaging is required to find tumour-feeding arteries which must be embolized. “We need the perfect 2D imaging, which is what we have with the ARTIS icono ceiling system,” Pereira says. “You can recognise tiny arteries when treating, for example, hepatocellular carcinoma”.

With the ARTIS icono ceiling system, Pereira’s team can achieve high-quality 2D imaging at lowered radiation doses. This, he states, was “one of the biggest surprises” following a comparison of IQ and radiation dose between the ARTIS icono and previous system in approximately 80 patients. They found that dose was reduced by 50–80% with the new OPTIQ technology

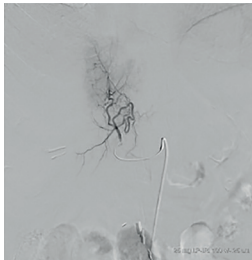
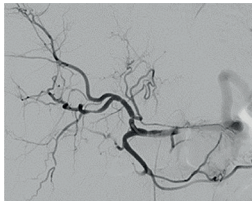
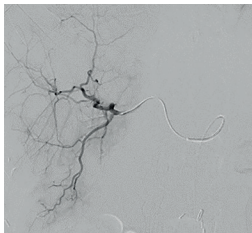
me, but for the surgeon, for the oncologist, for the pathologist,” he states. Pereira’s focus on interdepartmental teamwork when performing cancer treatment was a core

while they were able to maintain the same IQ. “It is fantastic to have this reduction of dose, not only for the patients but also for the team,” he notes, drawing focus to the added importance of dose reduction for female technicians of reproductive age and intent.

Siemens Healthineers’ newly developed OPTIQ exposure control technology also optimises radiation dose for each imaging situation. Using a self-adjusting algorithm which considers source-to-image distance (SID), collimation settings, grid status and patient thickness, the system checks up to 15,000 possible parameter combinations in real-time to select the most dose-efficient settings for the highest quality imaging.

With the new OPTIQ technology, Pereira’s workflow has improved, he states, because “you no longer need to click to change SID to optimise image quality and dose—for patients, if you do not have to move the machine during the procedure, they are much more comfortable and this improves the overall experience for us too, making everything a little bit faster.”

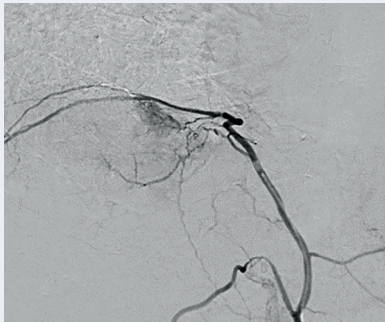
Reflecting on the importance of innovation within the field of interventional oncology and TACE, Pereira notes that the combination of a “good machine, image quality, standardisation, a multidisciplinary tumour board and interventional oncologist” is central to providing successful treatment. “Oncology is an area of medicine with the highest improvement, but unfortunately as populations age, more people will become cancer patients. No specialty alone has the solution for a cancer patient—not the surgeon, the oncologist, or the interventional radiologist.” Pereira imparts that by combining innovations like the OPTIQ technology with personalised, multidisciplinary oncological medicine, “we have a big and bright future”.



TACE procedure in multiple sessions to embolize liver metastases

Transarterial chemoembolization

In a 75 year old female patient with hepatocellular carcinoma



DSA with 2.4F catheter in phrenic artery (diameter <1mm). The feeders for the lesion are further branches of the phrenic artery, both tumor blush and the feeding arteries are well visible

PAE and UAE: Promising minimally-invasive procedures gain efficacy with new precision image-guidance technology

In recent years, prostate artery embolization (PAE) and uterine artery embolization (UAE) have emerged as encouraging minimally-invasive options often deployed to treat benign prostate hyperplasia and myoma. To gain the essential anatomical knowledge needed in order to navigate and identify target arterial branches, high-quality imaging is paramount. Speaking to *Interventional News*, **Bernhard Gebauer** (Charité University Hospital, Berlin, Germany) expands on the “excellent effect” of the new ARTIS icono technology in helping to realise the potential benefits of these challenging procedures.

“WE ARE BECOMING LESS INVASIVE and are trying to be more selective,” says Gebauer, to him the recent shift toward less invasive treatments like PAE and UAE when treating eligible patients requires “more sophisticated interventional radiologists—but also more sophisticated materials, smaller catheters, better imaging techniques and improved angiographic machines to carry out.”

As the head of interventional radiology at Charité University Hospital, Gebauer has formed the foundations of their angiography suite’s workflow when performing PAE or UAE, “typically beginning with a magnetic resonance imaging (MRI), as we then could evaluate the vascular anatomy of these patients before the procedure”.

Gebauer adds that for males presenting for treatment, syngo DynaCT will typically be carried out “from the start, to have an idea where exactly the prostate artery is,” whereas in younger females where radiation may affect fertility, alternative options are considered. To this end UAE is often carried out under 2D guidance only, to keep dose at

its lowest level and define the best angulation for device navigation.

The conscientious steps Gebauer and his team take to monitor and protect against radiation are twofold—achieving dose reduction at no detriment to the overall success of the procedure, Gebauer states, is key “not only for the patients, but for staff also”. “It is very important if you are involved in regular procedures. As a member of staff you are subject to a significant amount of radiation. We really try to take care, and with the ARTIS icono system we were positively surprised that we could reduce radiation dose considerably and still achieve good image quality—that is an excellent effect of the new Siemens Healthineers’ system,” Gebauer says.

Critically, the ARTIS icono system is able to draw from a vast database containing 300 million entries which allows for the selection of the most appropriate, dose-efficient parameters for each individual patient. For patients attending Gebauer’s angiography clinic for PAE and UAE procedures, the



Bernhard Gebauer

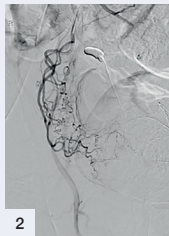
ARTIS icono system provides their team “access to different fluoroscopy protocols that allow for lower radiation dose, but equally enable higher doses for better image quality depending on the severity of the intervention”.

In redefining the principles of automatic exposure control while providing consistent image quality independent of the source-to-image distance, interventionalists can now create some space between patient and machine, making it “much easier to communicate” with patients, Gebauer adds. For him, this update is essential—“If you have been practicing for 20–22 years, each time you must bring the detector as near to the patient as possible. Now however, with OPTIQ things are different.” The new technology reaps “significant benefits to patients” both current and future, he says, providing enhanced comfort and state-of-the-art efficiency throughout complex procedures.

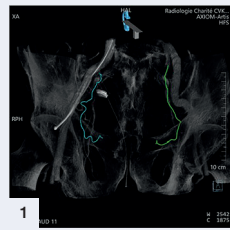
“With the ARTIS icono system we were positively surprised that we could reduce radiation dose considerably and still achieve good image quality.”

Prostatic artery embolization

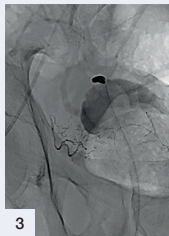
In a 72 year old male patient with prostate hyperplasia



2. DSA of right prostatic artery before embolization



1. Bilateral prostatic arteries found on syngo DynaCT

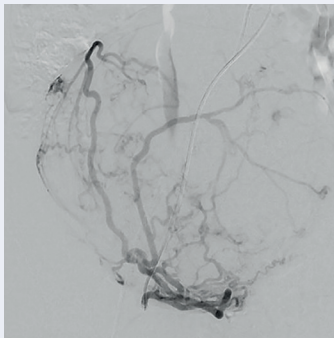
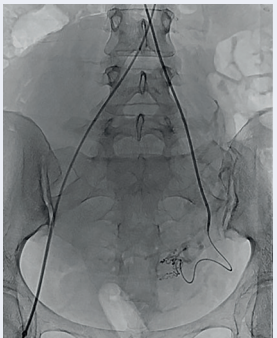


3. Single angiogram after right prostatic artery embolization

Uterine fibroid embolization

In a 35 year old female patient with myoma.

The whole procedure conducted with only 590µGym², with sufficient image quality even at ultra-low dose.

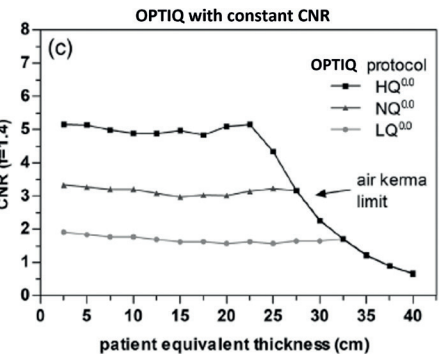
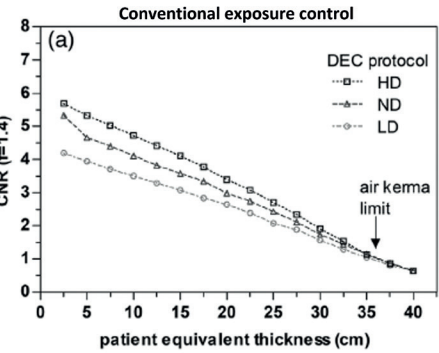


Data reveals “much lower” radiation dose and sustained image quality with novel dose regulation technology

Medical physicist and physician **Thomas Werncke** (Hanover Medical School, Hanover, Germany) speaks to *Interventional News* about his research into imaging quality (IQ), radiation dose reduction and material-specific imaging variables when using Siemens Healthineers' OPTIQ and Structure Scout technology. Among the benefits of using the system, Werncke conveys how its adaptive contrast-to-noise ratio (CNR)-driven exposure control using OPTIQ, is the “first” to allow users to specify image quality (IQ) preferences based on patient characteristics. Using OPTIQ's predefined IQ protocols, interventionalists gain the advantage of intuitive exposure control while maintaining constant high-quality image guidance.

WERNCKE ET AL'S FIRST PHANTOM study sought to verify whether OPTIQ can maintain target CNR when performing angiography compared to conventional detector-dose-driven exposure control (DEC). Secondary to this, the authors estimated that the difference between incident air kerma—the measure for radiation dose—produced by OPTIQ and DEC respectively, when both exposure controls reach equivalent CNR.

Their findings showed that when using DEC, CNR reduced continuously with increasing attenuation, whereas OPTIQ, within physical limits, maintained a predefined CNR level (*see figures below*). The mean estimated dose of OPTIQ compared to DEC was up to 40% lower in fluoroscopy, and up to 55% lower in digital radiography while maintaining CNR.



“Our first step was to show that you can define image quality, and we showed you can,” Werncke says of their results; continuing, he states “the second step was to investigate whether you can reduce radiation dose to the patient while maintaining comparable image quality. We investigated several parameters and we found that image quality was comparable for OPTIQ and DEC, while radiation dose was much lower with the new ARTIS icono system,” Werncke adds.

Building on their findings, Werncke *et al* conducted a second phantom study analysing the impact of material-specific imaging when using OPTIQ and Structure Scout compared to that with DEC, on radiation exposure. “The conventional approach does not take into account material-specific changes,” Werncke says, which led the investigators to create a three-dimensional (3D) phantom containing iron, tantalum and platinum foils and cavities filled with iodine, barium and carbon dioxide, developed to measure the CNR. Fluoroscopy and digital radiography were then conducted for each material.

“We found that material-specific image quality was variable for the conventional exposure control as expected,” he states, though OPTIQ provided predictable CNR. “Structure Scout can achieve similar image quality/CNR at lower dose,” Werncke says, opening a “new dimension in imaging” with its “ability to define image quality and save dose to the patient using material-specific features for iodine, tantalum and platin”.

This secondary phantom study revealed the substantial effect of imaging materials with higher K-edges, which can be beneficial in long-lasting embolization procedures. For example, with tantalum-based embolization material for “younger patients, treatment of the brain, the abdominal region or due to physical specificity,” Werncke explains. Developing this finding, Werncke and his team conducted an animal study comparing fluoroscopic IQ and radiation dose using OPTIQ's tantalum



Thomas Werncke

(Ta)- specific protocol and DEC when performing abdominal angiography.

Of their results, the researchers found that, compared to DEC, OPTIQ “significantly improved fluoroscopic depiction of tantalum, while maintaining the dose”. They reported that, alternatively, dose can be considerably reduced by using OPTIQ, while also maintaining equivalent IQ.

“Our findings could influence two things; First, fluoroscopy, which is of central importance in interventional radiology to monitor your handling, work with guidewires and so on. In this sense, our results mean we could define the image quality we would like to achieve and render this constant,” Werncke expands.

“Secondly, especially if you perform embolization procedures with tantalum, you can dramatically reduce radiation dose for patients. Embolization procedures normally take a considerable amount of time as you must inject embolics, wait, and look to see what is happening in the patient.”

Werncke and his team underline how OPTIQ's material-specific imaging has significantly improved procedural ease: “With the ability to define image quality, you can now think more about what you want to image, if you want to save dose, or what material you would like to utilise. With the number of imaging options the ARTIS icono system provides, you can ask ‘How can I image most effectively?’ and adjust accordingly to the ALARA principle.”

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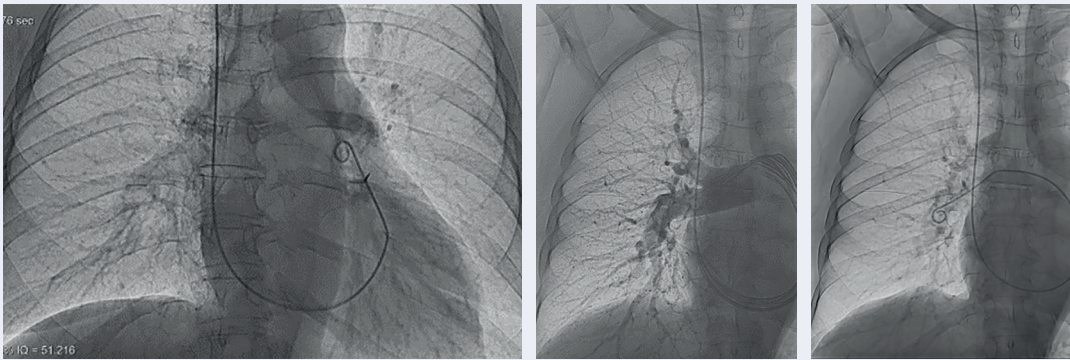
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Constant image quality and excellent dose efficiency – QPTIQ and Structure Scout in clinical use

Pulmonal vessels

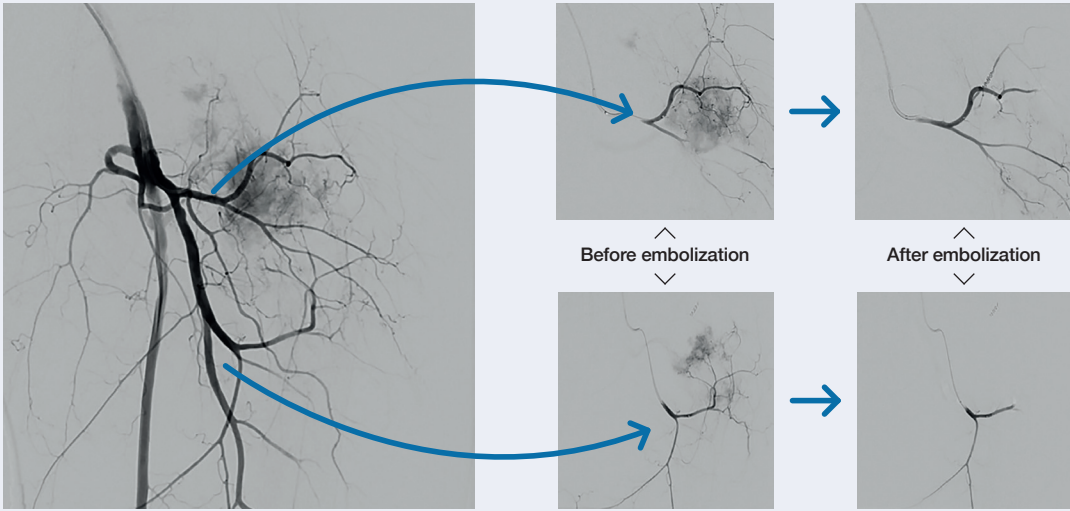
DSA with 2k imaging – native displayed

Prof. Bernhard Meyer, MD, Hannover Medical School, Hannover, Germany



Peripheral tumor embolization

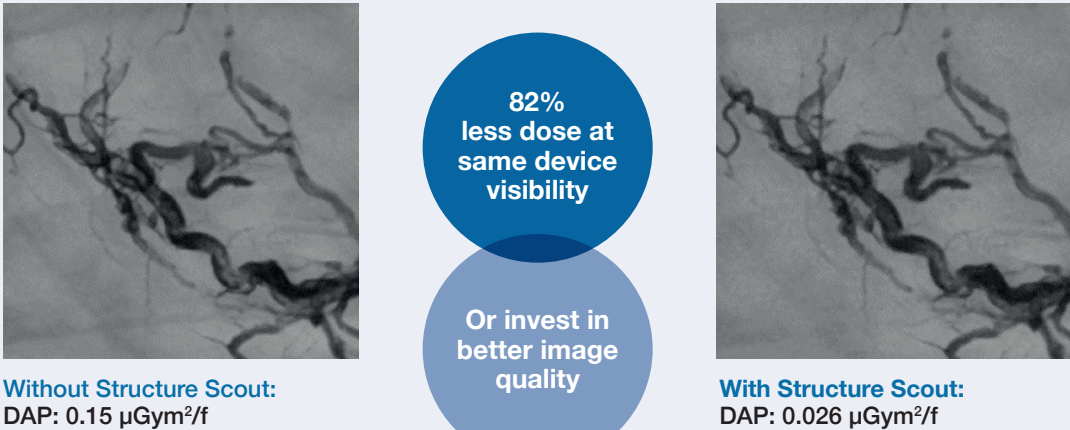
Prof. Bernhard Gebauer, MD, Dirk Schnapauff, MD, Charité University Hospital, Berlin, Germany



AVM treatment using material containing tantalum

Structure Scout – optimised visibility of details and devices

Prof. Bernhard Meyer, MD, Hannover Medical School, Hannover, Germany



OPTIQ and Structure Scout

A new approach to image quality and dose



Based on big data, OPTIQ delivers constant image quality throughout a procedure, independent of angulation or patient size, while also significantly reducing dose. Structure Scout automatically optimizes the visibility of different devices and materials, based on their individual dose absorption property. This material-specific imaging is based on preset values. As a result, the system automatically adapts its exposure control parameters to the material used. Find out more how it supports you in expanding precision medicine.



ARTIS icono ceiling



ARTIS icono floor



ARTIS icono biplane



ARTIS pheno

OPTIQ:



ARTIS icono:



ARTIS pheno:



The products/features (mentioned herein) are not commercially available in all countries. Their future availability cannot be guaranteed.