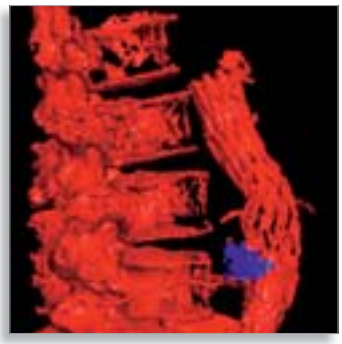


A renewed sense of confidence

Percutaneous vertebroplasty and endovascular aneurysm graft repair using XperCT

Who/where

Dr. Kai Wilhelm, Associate Professor of Radiology, University of Bonn Hospital, Bonn, Germany

Challenge

To treat patients more precisely and more efficiently during interventional angiographic procedures.

Solution

For pre-, peri- and post-intervention evaluation, XperCT enhances visualization by providing CT-like soft tissue imaging.

Dr. Kai Wilhelm demonstrates how physician confidence and procedural efficiency are improved through the use of XperCT.

Dr. Kai Wilhelm

"I think what's revolutionary about XperCT," says Dr. Kai Wilhelm, "is that it combines two imaging methods that interventionalists are already familiar with – fluoroscopy and CT – into a single modality. It's a great improvement in workflow efficiency."

As radiologist and neuroradiologist at University of Bonn Hospital, Dr. Wilhelm has been working hands-on with 3D interventional tools for several years in the field of neuroradiology. He believes three-dimensional rotational angiography (3D-RA) is now rapidly gaining in popularity due to the rising intricacy of interventional procedures in general.

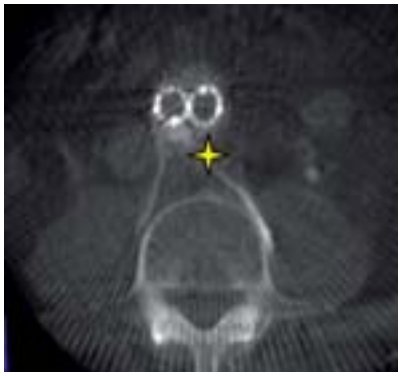
Dr. Wilhelm describes how planning is improved, "3D-RA is very helpful because you can better understand an aneurysm – its size, location, the neck and its relationship to the carrier vessel. And because it is calibrated data, you can take precise measurements of the aneurysm to plan endovascular treatment."

> "XperCT brings the benefits of CT into the angio suite and puts control at tableside"

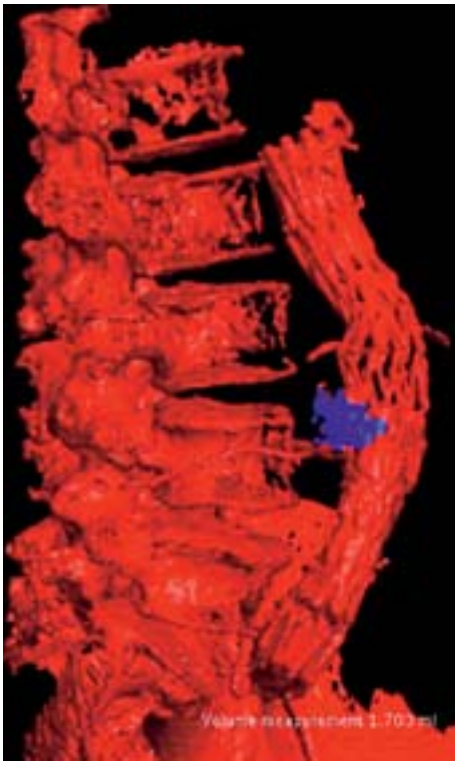
Soft tissue imaging in the angio suite

Now, to complement the intra-vascular precision of 3D-RA, Philips introduces XperCT. For use on Philips Allura Xper FD20 and FD20/10 angiography X-ray systems, XperCT brings the benefits of CT into the angio suite and puts control at tableside. It allows interventionalists to image bone, soft tissue and other body structures while in the midst of an angiographic procedure.

PHILIPS



The relation between the stent-graft, endoleak (arrow) and feeding lumbar arteries (star) is nicely shown.



Three-dimensional rotational angiography (3D-RA) and Xper-CT during endovascular abdominal aortic aneurysm repair. Image from the right lateral view shows extend of the leak (blue, translucent)

"It's the first time we at the University of Bonn Hospital, have soft tissue information right in the angio suite," notes Dr. Wilhelm. "We've been using it on our Allura Xper FD20 for about a year now and have found there are a lot of procedures where it's very helpful not only to have information about the vessels, but about the surrounding soft tissue structures as well."

"XperCT images can be made with or without additional contrast medium"

AAA repair

After treating an abdominal aortic aneurysm (AAA) interventionalists can use XperCT to check for endoleaks and to see if the stent has been fully deployed. Dr. Wilhelm explains, "On occasion the stent graft is implanted, but the aneurysm is still widening. Typically if you have clinical indication of re-bleeding it would be helpful to do a CT but usually you would have to move the patient to the CT room and that's not always practical."

"We had an instance where a 67-year old male patient who had undergone a stent graft for an abdominal aortic aneurysm developed a type II endoleak. In this particular case we were able to see with 3D-RA that there was still some flow in the aneurysm due to retrograde inflow of blood from the lumbar arteries."

To identify the precise location of the leakage, Dr. Wilhelm performed an XperCT scan in the angio suite – a rotational scan to the 3D volume on display in less than 1,5 minute. Upon acquisition and reconstruction, Wilhelm was able to overlay an XperCT slice on the 3D vessel image and view the stent in relation to surrounding structures.

"Using XperCT we were able to find out quickly and exactly where the leakage was," says Dr. Wilhelm. "The relationship between the stent graft, the endoleak and the feeding lumar arteries was nicely shown. And therefore it was easy for us to do our embolization."

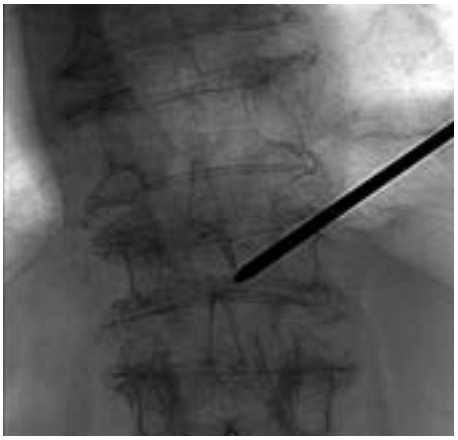
Vertebroplasty

XperCT images can be made with or without additional contrast medium application so clinicians can instantly refer to high spatial and contrast resolution images before, during and after procedures. Dr. Wilhelm describes how XperCT assists in therapy planning and treatment control in percutaneous vertebroplasty.

"You can perform a pre-interventional XperCT scan to plan your procedure," suggests Dr. Wilhelm, "and to see whether you have a fracture only of the vertebral endplate, or whether the posterior wall is involved."

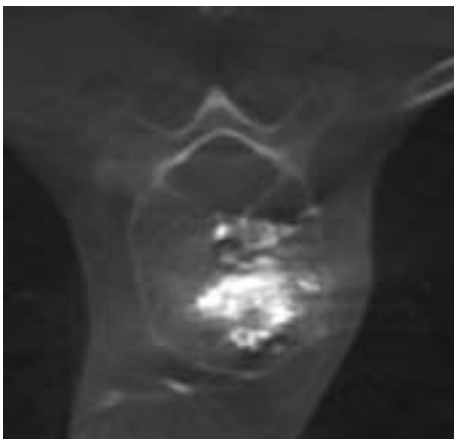
Three-Dimensional Reconstruction Xper-CT and imaging fusion for therapy planning and control in Percutaneous Vertebroplasty (PV)

68-year-old female patient who was presented with severe and focal back pain related to osteoporotic endplate fracture of TH12. Unilateral transpedicular approach was used for PV



Fluoroscopy (PA projection) shows needle placement for unilateral transpedicular approach.

Lateral view after needle placement in TH 12 during cement application.



Xper-CT obtained during percutaneous vertebroplasty displays the bony structures and the paravertebral soft tissue without any cement extravasation.

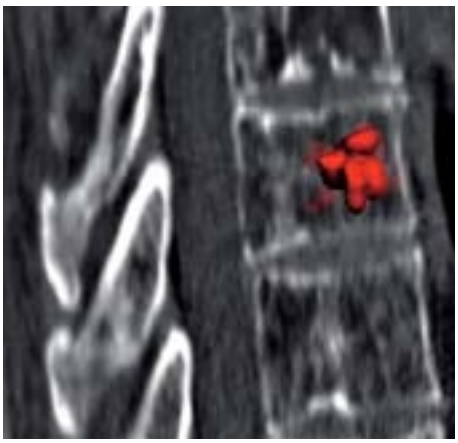


Image fusion of the segmented 3D-RA dataset and pre-interventional obtained CT (MPR sagital reconstruction) demonstrates cement distribution overlaid with the bony structures.

Once vertebral analysis is complete and the approach planned, XperCT assists Dr. Wilhelm in his effort to establish the correct access route and to avoid cement leakage. "What we do before we inject the cement," says Dr. Wilhelm, "is an intra-osseous venography. Many physicians do this in 2D fashion to see whether there is contrast medium passage to the paravertebral or the epidural veins. But a single lateral view can be limiting. With XperCT you have a very nice set of 3D images to demonstrate the way the contrast medium passes and to identify any potential leakage areas. Knowing these areas helps to avoid complications. This is something we always do before injecting the cement."

Viewing the flow of contrast also allows Dr. Wilhelm to understand the structure within the vertebral body itself. "When you do the XperCT during the contrast injection you simulate the flow of the cement. For instance you may see the liquid spread to only the left hand side of the vertebra. That suggests you need to fill the contralateral side with contralateral access. So XperCT can help you decide if you need to do the procedure from one side or bilaterally."
With the cement in place, an XperCT scan can be done peri – or post interventionally to assess the efficacy of the final procedure. "If you think a patient has a problem for example due to a leakage, you can do the XperCT run, look at the multi-planar formatted images and pinpoint the leakage. This is much less time consuming than taking the patient, who is perhaps under general anesthesia, through the CT. With XperCT you can do it immediately during or after the intervention. This," says Dr. Wilhelm "is one of XperCT's best advantages."

"With a renewed sense of confidence interventionalists can make critical evaluations on the spot."

Workflow efficiency

Use of XperCT in the angio suite allows for instant CT-like feedback during interventions. With a renewed sense of confidence interventionalists can make critical evaluations on the spot. With the ability to identify possible complications faster, corrective action can be taken immediately.

Procedure time can be shortened and resources maximized when a single modality covers all imaging demands. Dr. Wilhelm suggests vertebroplasty is a classic example, "Many colleagues do vertebroplasty using fluoroscopic control in the CT room. They place a mobile c-arm in front of the CT and use it for needle placement. Then they put the patient in the CT, do a CT run to get the soft tissue view, then take the patient out and use fluoroscopic control for cement injection. This is really complicated and time consuming."

"Here in Bonn, we have restrictions on our resources. With XperCT you don't need to tie up both CT and fluoro. You can do it all in one room, in shorter time, with fewer staff and without moving the patient."

Great Expectations

XperCT has become an important feature in Dr. Wilhelm's toolset. He uses it during almost every intervention. And his expectations for the future are very positive. "The acquisition of this 3D dataset opens wide a whole new field of potential uses. I think we're only at the beginning of some extraordinary applications."

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