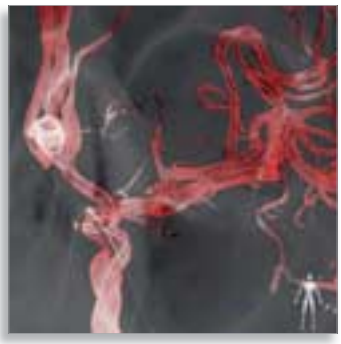


Live 3D Guidance with Dynamic 3D Roadmap

Improved catheter guidance in neuro angiography

Who/Where

Dr. Michael Söderman, Chief of Stereotaxy and Neuroangiography, Department of Neuroradiology, Karolinska University Hospital, Stockholm, Sweden

Challenge

View real-time vascular anatomy in an efficient manner with enough clarity to allow effective guidewire and catheter advancement.

Solution

Optimize guidance with Philips Dynamic 3D Roadmap – precluding the need for multiple contrast runs.

Dr Michael Söderman demonstrates how Dynamic 3D Roadmap facilitates intravascular neuronavigation during aneurysm and arteriovenous malformation (AVM) treatment.

"The major advantage of Dynamic 3D Roadmap," says Dr. Michael Söderman "is that you can go back and forth between different positions of the c-arm and all the time have the help of a correct roadmap, without having to inject fresh contrast media. It's like having access to an unlimited number of roadmaps an indefinite number of times."

Efficiencies are key

At the Karolinska University Hospital, Dr. Söderman and his team perform approximately 250 neuro-angiographic interventions each year, the far majority being AVM and intracranial aneurysms. They require technology that facilitates quick and accurate visualization and accurate microcatheter navigation in the stenting/coiling of intracranial aneurysms or embolization of AVMs.

To assist, innovative 3D interventional tools including 3D-RA and XperCT (soft tissue imaging) are used with regularity at Karolinska. New to the mix however, is the Philips Dynamic 3D Roadmap. This real-time 3D guidance feature greatly improves a clinician's ability to navigate guidewires and catheters through tortuous vasculature. And it is activated tableside at the touch of a button.

> "It's like having access to an unlimited number of roadmaps an indefinite number of times."

Many views with a single contrast injection

"Intracranial vessel anatomy doesn't have to be anatomically difficult, but sometimes it's tortuous and difficult to navigate with a microcatheter and you need to see views from several directions to find your way," says Dr. Söderman.

Digital 2D roadmapping has been routinely used to visualize vessel pathology and plan for catheterization, but as Dr. Söderman indicates, the need for multiple views of the target vessel reveals shortcomings of this single-plane static roadmap. "You may begin with a lateral view of the vessel, and then wish to move to an AP view, followed by an oblique view and so on. Every time you do that you may have to inject more contrast and each time you move, you loose your conventional 2D roadmap.

PHILIPS

Dr. Michael Söderman

"With 3D Roadmap, if you change angulation your roadmap goes with you."

Eventually you end up in an angle you don't really like because you don't want to lose a good roadmap. All this can be avoided. With 3D Roadmap, if you change angulation your roadmap goes with you."

The Philips Dynamic 3D Roadmap helps clinicians find and follow the optimal route for advancing the catheter, while at the same time allowing for changes in rotation and angulation. Integrated 3D-RA functionality rapidly reconstructs a rotational angiography X-ray run into a 3D volume. 3D Roadmap overlays this 3D volume with live 2D fluoroscopic images, which remain aligned in real time regardless of a new c-arm arc position, source-to-image distance or magnification. Remarkably, only one contrast injection is required to create this useful overlay.

Dynamic 3D Roadmap is available as an option on the Philips Allura Xper FD20 and FD20/10 systems. The Department of Neuroradiology at Karolinska has both systems and employs 3D Roadmap on each.

Making aneurysm treatment more efficient

The preponderance of aneurysms that Dr. Söderman treats are located around the circle of Willis (a group of arteries surrounding the base of the brain), and the general approach to each is similar – but getting past the bends and bifurcations can be a challenge. The benefits of 3D Roadmap are well demonstrated in this situation.

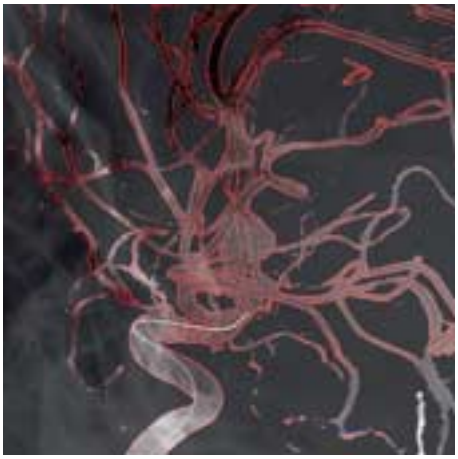
"If you are going to catheterize an anterior communicating artery aneurysm, for example, it can occasionally be difficult," says Dr. Söderman, "because you generally try to avoid the posterior communicating artery, the anterior choroidal artery and the other branches on your way up. It can also be a challenge to get around the bend to the A-1." Now Dr. Söderman has assistance. "What we do, using 3D Roadmap, is to move between the lateral view, the AP view and the oblique view, and work ourselves up toward the aneurysm, all the time still being very certain where we have the catheter and where we have the guidewire. And we never have to do any new runs."

"In fact we can go all the way into an aneurysm without injecting more contrast than we did when we did the original 3D run."

He continues, "The process of stenting or coiling aneurysms is fairly standard so it's easy to appreciate how much we actually gain by regular use of 3D Roadmap. The impression is that it allows us to work faster and in addition it decreases the amount of contrast used. In fact we can go all the way into an aneurysm without injecting more contrast than we did when we did the original 3D run. Consequently it simplifies the workflow."

'Selective roadmap for AVMs

While the logistics for aneurysms may be clear, arteriovenous malformations are more complex. "It's sometimes hard to sort out anatomy in the sylvian fissure," notes Dr. Söderman. "You have lots of overlapping vessels that may be tortuous and you want to go into a particular one. It can be hard to find the origin of this vessel."



Live 3D guidance through tortuous vessel structure with Dynamic 3D Roadmap

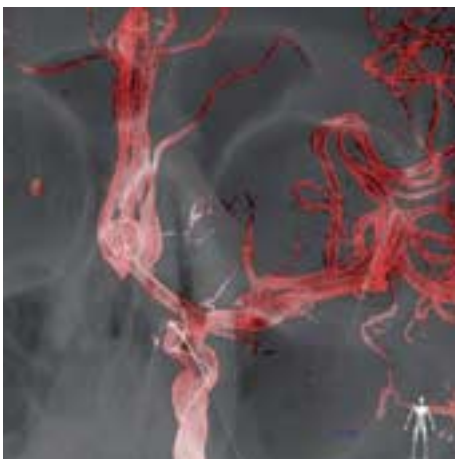
"3D roadmapping with AVMs saves time. Maybe more importantly 3D Roadmap may help manage patient risk."

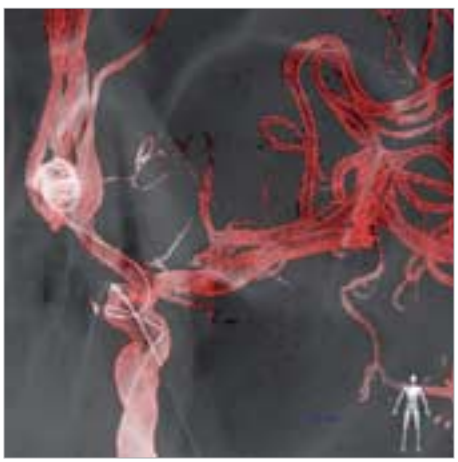
"What we occasionally do is to use Philips' 3D-RA 'virtual stenting' software to color the vessels that we are interested in. We can mark the beginning of the middle cerebral artery and then mark the end of the vessel where it enters the AVM – and that vessel will be highlighted. Then we can rotate the 3D roadmap until we have a good view of exactly the way we want the catheter to go. It's kind of a selective roadmap."

"Similar to aneurysm applications, 3D road-mapping with AVMs saves time. Maybe more importantly 3D Roadmap may help manage patient risk. If you catheterize for a long time, there is always a risk from embolic complication during the catheterization itself."

Advantages of a flat detector

A restriction of the 3D roadmap is its limited field of view and the prerequisite that the patient and tabletop has to be fixed in position. This can complicate the repositioning of a guiding catheter. The Allura FD20 system can overcome this problem, even when the 3D roadmap is in use. Dr Söderman explains "Sometimes during a procedure the guiding catheter can be pushed down. If you have a wide tortuous aorta and the position is unstable, you might lose your position. We've discovered that an advantage of the big FD20 detector is that you can actually do a re-catheterization from the aortic arch without moving the patient – due to the detector's large field of view (FOV)."





Live 3D guidance of aneurysm coiling

He explains, "You really want to be able to see the guiding catheter and the aortic arch in one image without moving the patient. If you move him, you'll lose your roadmap. But the 3D Roadmap has too small a FOV to accomplish this. What you can do is use ordinary fluoroscopy, increase the FOV to maximum and see the aortic arch. Then you can get everything back into position by doing a re-catheterization without moving the patient. Your 3D roadmap is preserved and the procedure can continue. This is very convenient."

"You can actually do a re-catheterization from the aortic arch without moving the patient – due to the detector's large field of view."

Control and confidence

By providing a real-time 3D reference, dynamic 3D Roadmap reveals pathways through complex vasculature. In neuro interventions it improves workflow, saves contrast and makes catheterizations safer.

Dr. Söderman concludes, "3D Roadmap clearly improves workflow and reduces the quantity of contrast medium during the procedure. It is useful in both common and complex procedures, and gives me full tableside control of all features – angulation, rotation, zoom and archiving. It can be very helpful in difficult anatomical circumstances."

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