Overlying Fluoroscopy and Preacquired CT Angiography for Road-Mapping in Cerebral Angiography

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OVERLAPPING FLUOROSCOPY AND PREACQUIRED CT ANGIOGRAPHY FOR ROAD-MAPPING IN CEREBRAL ANGIOGRAPHY

SUMMARY: We describe our preliminary experience using a road-mapping procedure that involves combining preacquired CTA with real-time fluoroscopy. This maneuver facilitates navigation in supra-aortic vessels from the arch to skull base levels. It requires less contrast than is used for traditional road-mapping while potentially reducing the hazard of thromboembolic events associated with direct catheterization. The accuracy of registration between the 2 volume datasets seems satisfactory for clinical practice.

ABBREVIATIONS: AP = anteroposterior; CTA = CT angiography; 3DRA = 3D rotation angiography; MIP = maximum intensity projection.

Technique and Comprehensive Cases

Three patients who were suspected of having intracranial arterial diseases based on previous explorations with aortic CTA were referred to our department for diagnostic angiography. We used a C-arm angiographic unit (Allura Xper FD20; Philips Healthcare) connected to a 3D workstation (XtraVision Rel 6; Philips Healthcare) to create a static projection. Different projections are usually mandatory for a better delineation of tortuous vessels in neuroradiologic angiograms, and this typically requires extra contrast administration for a new roadmap with different working projections.

The introduction of dynamic 3D road-mapping offers a way to avoid the problems associated with both of the above procedures. In this method, road-mapping is generated through fusion of a preacquired volume of the arterial tree (isotropic CTA) and a noninjected 3DRA generated by the 3D workstation (XtraVision Rel 6; Philips Healthcare, Best, the Netherlands). Images can be adjusted to different angles by altering the C-arm position to provide multiple working projections.

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motion compensation techniques, may make 3D road-mapping algorithm that balances the 2, or adds a novel maneuver such as faster and more stable results but less tomographic accuracy compared to the different depth of the aortic arch and the proximal common carotid artery in the AP projection. After manual adjustment of the depth of the MIP, the road-mapping of distal vasculature until bifurcation is available again for further navigation of the catheter. Arrows indicate the tip of the catheter, and the arrowheads indicate the tip of the wire.

Discussion
Catheterization of the supra-aortic arch might be cumbersome in some patients because of vessel tortuosity. Moreover, these vessels are predisposed to atherosclerotic plaques, and intra-arterial navigation is associated with a high incidence of thromboembolic events. Use of 2D road-mapping can improve the navigation of wires more distally to support catheterization, but a large amount of contrast medium might be required to provide acceptable image quality in this region, which contains 3 major branches and thick soft tissues. Conventional 3DRA-based road-mapping (which would require a high-volume injection at the aortic arch) does not seem relevant in clinical routine. We, thus, chose to use coregistration of preacquired CTA isotropic datasets with fluoroscopy suggesting that it is a feasible technique for navigation in areas ranging from the aortic arch level to the proximal internal carotid arteries. The accuracy of road-map registration is satisfactory for clinical practice. The potential to lower contrast media use and reduce the risk of thromboembolic events is clinically relevant. Improvements in registration and manipulation of angiographic volumes and live catheterization are prompted.

Conclusions
Our preliminary experience with road-mapping by combining preacquired CTA isotropic datasets with fluoroscopy suggests that it is a feasible technique for navigation in areas ranging from the aortic arch level to the proximal internal carotid arteries. The accuracy of road-map registration is satisfactory for clinical practice. The potential to lower contrast media use and reduce the risk of thromboembolic events is clinically relevant. Improvements in registration and manipulation of angiographic volumes and live catheterization are prompted.

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