

Courtesy

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Symptoms

To determine the interventional
treatment strategy for re-coarctation
of the aorta.

Patient history

A 14-year-old male, 55kg with
re-coarctation of the aorta after
surgical repair of type B aortic
arch interruption, systemic arterial
hypertension and multiple previous
percutaneous interventions
(four balloon aortoplasties and
one unsuccessful stenting of
re-coarctation).

System information

Allura Xper FD10/10, Rotational
angiography and Allura 3D-RA.

Findings

The Allura 3D-RA facilitated the
visualization of an aneurysm on the
superior-posterior aspect of the distal
aortic arch in the aortic segment
between the origin of the subclavian
artery and the re-coarctation. The
distal arch had a circumscriptive
narrowing with a significant pressure
gradient between the proximal and
distal segments.

Conclusion

It was difficult to judge the
circumscribed narrowing and the size
and location of the aneurysm from
the 2D x-ray angiogram. The ideal
projection to delineate the stenosis
and aneurysm would have been
impossible to obtain with 2D
angiography. The Allura 3D-RA
provided the ability to access that
missing information.

Congenital Heart

Severity of coarctation and location of aneurysm clearly visible facilitated by using Allura 3D-RA

Background

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Prof. F. Berger¹

The German Heart Institute Berlin (DHZB) is a hospital noted for its treatment of cardiac, thoracic and vascular disease, artificial heart implantations, and transplantations of the heart and lungs. At DHZB, about 3,500 open heart surgeries are performed annually and more than 1,000 other heart and blood vessel operations are carried out. This includes approximately 100 heart and/or lung transplants and 500 heart operations in premature infants, neonates, infants and children.

DHZB also performs around 200 diagnostic and 450 therapeutic intervention procedures for congenital heart diseases per year.

Case

Patient: A 14-year-old male (weight: 55 kg) with re-coarctation of the aorta after surgical repair of type B aortic arch interruption, systemic arterial hypertension and multiple previous percutaneous interventions (four balloon aortoplasties and one unsuccessful stenting of re-coarctation)
Diagnosis: Patient was to undergo a diagnostic catheterization for re-evaluation and possible reintervention.

Clinical challenge

Evaluate the patient condition and determine

treatment strategy. Then, depending on the evaluation perform a reintervention.

Solution

Allura 3D-RA was used to provide a better visualisation of the 3D anatomy of the aorta which facilitated the course of the treatment strategy. It was also used by the clinician to provide better insight to plan the optimal therapeutic approach.

The Allura 3D-RA provides fast, high resolution 3D images of the anatomy from any angulation and rotation, visualizing complex vascular anomalies to facilitate decision making for treatment strategy.

Method and materials used

An Allura 3D-RA acquisition was made to enhance insight of the complex spatial relationships between the aortic arch and its branching vessels.

X-ray system: Allura Xper FD10/10

Acquisition protocol: A 4 sec, 240 degree (120 LAO - 120 RAO), rotational angiogram at 30 frames/sec at 20 cm field of view.

Material: Contrast was injected in the ascending aorta using an injector at 10 ml/sec for a total of 60 ml, with an injection delay before acquisition of 1 sec.

During acquisition, rapid right ventricular pacing with 200/min was used. The patient was sedated, while maintaining spontaneous respiration. The 3D reconstructed data was displayed almost instantaneously after end of acquisition.

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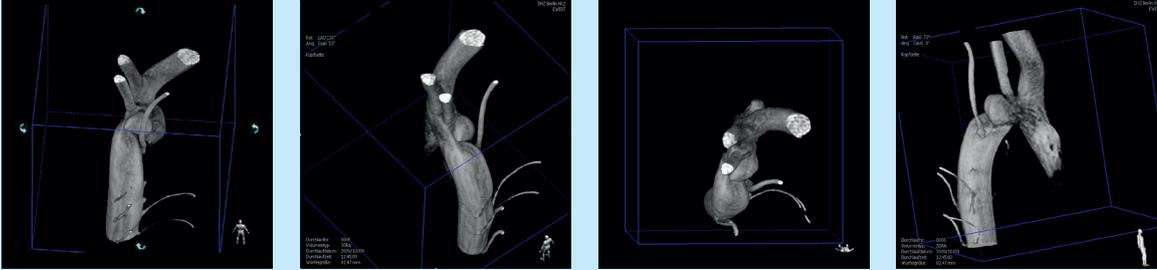


Figure 1: 3D reconstruction of the aorta. Note the discrete coarctation of the aorta in close proximity to the origin of the left subclavian artery and the aneurysm on the superior wall of the aortic arch between the subclavian artery and the coarctation. The 3D images showed a collateral vessel from the right subclavian artery to the descending aorta as well as prominent intercostal arteries.

Results

The Allura 3D-RA reconstructed image helped to identify the aortic arch with slight narrowing at the region of earlier anastomosis between the brachiocephalic trunk and the subclavian artery (Figure 1). The distal arch had a circumscriptive narrowing after origin of the subclavian artery with a significant pressure gradient between the proximal and distal segments. The 3D-RA showed an aneurysm on the superior-posterior aspect of the distal aortic arch in the aortic segment between the origin of the subclavian artery and the re-coarctation.

The 3D-RA also showed a collateral vessel from the right subclavian artery to the descending aorta as well as prominent intercostal arteries. The aneurysm and the circumscribed narrowing were not seen clearly on conventional 2D x-ray angiogram, because the ideal projection to delineate the circumscribed stenosis and the aneurysm would have been a 90° cranial tilt, which is impossible with conventional angiography (Figure 2).

Conclusion

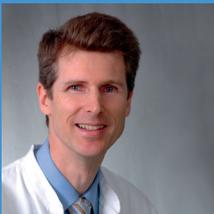
The patient was originally scheduled for re-intervention of the coarctation, however

3D-RA images provided clear information to support the conclusion of a surgical repair instead of an intervention. With traditional 2D angiography, the severity of the coarctation was not as clear as on 3D, and though the aneurysm was visible, it was difficult to judge size and location. Therefore, the Allura 3D-RA provided information to support the optimal therapeutic approach.

In this case, the patient did not have to be transported to the Computed Tomography (CT) or Magnetic Resonance Imaging (MRI) suite to obtain this information.

Comments from Professor Berger

Dr. med. Peter Ewert,
Deputy Director



This is a good example of where we can get critical insight that was not possible to get with any conventional angiography. When we tried to get an impression of where this aneurysm really lay, especially in relation to the branching arteries, we were not quite sure where it was located. There was no possibility to get the proper information with a standard biplane angiography because to see the location, the spatial relationship of the aneurysm to the aortic arch well, it would have required a projection which you simply cannot obtain.

After 3D-RA, when we looked directly from above, then we saw a view that was not possible to get normally. We could then clearly decide that there was no way to put in a covered stent without exclusion of the carotid artery.

Figure 2: 2-D angiogram of the aortic arch



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