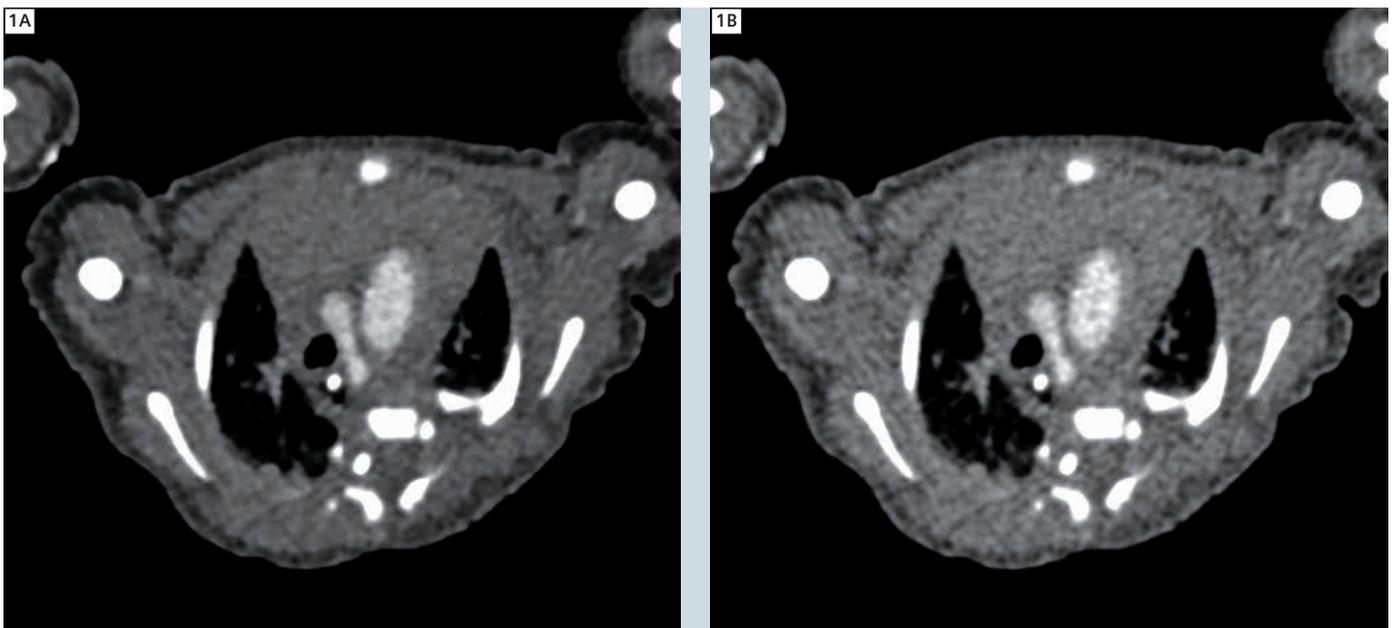


Case 3

Dual Source CT: Assessment of Hypoplastic Arch Associated with Ductus Arteriosus

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1 Two images at the level of the aortic arch demonstrate the decrease in image noise and increase in signal to noise ratio when using SAFIRE (Fig. 1A) versus filtered back projection (Fig. 1B).

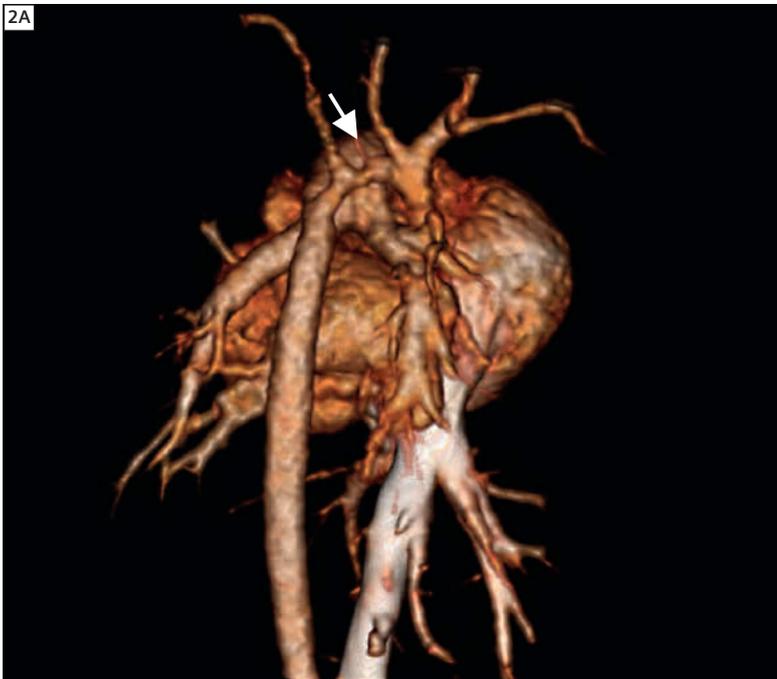
HISTORY

A 13-day-old male baby, with numerous congenital abnormalities including left lateral displacement of the left nipple and umbilicus, digital abnormalities that were attributable to amniotic bands, displaced anus and spinal dysraphism was referred for CT Angiography (CTA) of the chest for detailed evaluation of an aortic arch anomaly.

DIAGNOSIS

The volume rendered images, using the SAFIRE reconstructed images, showed a hypoplastic arch with a patent ductus arteriosus (Figs. 2). The ascending aorta measured 7 mm in diameter and the aortic arch demonstrated diffuse narrowing down to between 2.4 and 2.6 mm. This was most pronounced in the pre-ductal segment. The left vertebral artery

originated directly from the aortic arch. The ductus arteriosus was patent and measured 4.5 mm. The descending thoracic aorta measured 5.3 mm distal to the patent ductus arteriosus.



2 Two volume rendered images using the SAFIRE reconstructed images show a hypoplastic arch (Figs. 2, arrow) with patent ductus arteriosus (Fig. 2B, dashed arrow).

In clinical practice, the use of SAFIRE may reduce CT patient dose depending on the clinical task, patient size, anatomical location, and clinical practice. A consultation with a radiologist and a physicist should be made to determine the appropriate dose to obtain diagnostic image quality for the particular clinical task. The following test method was used to determine a 54 to 60% dose reduction when using the SAFIRE reconstruction software. Noise, CT numbers, homogeneity, low-contrast resolution and high contrast resolution were assessed in a Gammex 438 phantom. Low dose data reconstructed with SAFIRE showed the same image quality compared to full dose data based on this test. Data on file.

COMMENTS

The scan was performed employing the X-CARE scan mode, CARE Dose4D and CARE kV on a SOMATOM Definition Flash scanner. Reference mAs was set at 125, reference kV at 120 kV, and the CARE kV slider set to 7. CARE kV automatically selected 80 kV and an average effective mAs of 32. Radiation dose could further be reduced by using SAFIRE level 3 iterative reconstructions, resulting in an extremely low age adapted effective dose of 0.37 mSv for this fully diagnostic CTA scan of the chest.

Pediatric patients with congenital abnormalities often require multiple imaging exams over their lifetime. This makes it critical to keep cumulative radiation dose as low as possible while maintaining diagnostic accuracy. In addition to being fully diagnostic, the rapid acquisition time of only 1.2 seconds obviated the need for breath-holding and sedation. A comparison of two images (Figs. 1A and 1B) at the level of the aortic arch reconstructed with both filtered back projection and iterative reconstruction, demonstrated the decrease in image noise and increase in signal to noise ratio achieved with SAFIRE.

EXAMINATION PROTOCOL

Scanner	<i>SOMATOM Definition Flash</i>
Scan area	<i>Thorax</i>
Scan length	<i>75 mm</i>
Scan direction	<i>Cranio-caudal</i>
Scan time	<i>1.2 s</i>
Tube voltage	<i>80 kV</i>
Tube current	<i>32 eff. mAs</i>
Dose modulation	<i>CARE Dose4D</i>
CTDI_{vol}	<i>0.51 mGy</i>
DLP	<i>4.2 mGy cm</i>
Effective dose	<i>0.37 mSv</i>
Rotation time	<i>0.28 s</i>
Pitch	<i>0.6</i>
Slice collimation	<i>128 x 0.6 mm</i>
Slice width	<i>0.6 mm</i>
Reconstruction increment	<i>0.4 mm</i>
Reconstruction kernel	<i>130f (SAFIRE)</i>
Contrast	
Volume	<i>4 mL</i>
Flow rate	<i>Hand injection iv in left saphenous vein at approx. 0.5 mL/s</i>
Start delay	<i>2 s</i>