

Cardiac and Respiratory CT Evaluation in a Neonate Prior to Pulmonary Balloon Valvuloplasty

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History

A neonate, born with cyanosis and tachypnea, was presented to the hospital. An echocardiography revealed an atrial septal defect (ASD), a pulmonary valve stenosis (PVS), a patent ductus arteriosus (PDA) and a tricuspid regurgitation. Pulmonary balloon valvuloplasty (PBV) was indicated and a CT examination was requested to confirm the echocardiography findings and to evaluate the respiratory system prior to the intervention.

Diagnosis

CT images showed a significantly enlarged right atrium, an ASD (Fig. 1), a PVS with an infundibular stenosis and a PDA (Fig. 2). The three-dimensional reconstruction of the airways (Fig. 3) appeared normal. Hyperdense patchy shadows (Fig. 3) were seen locally in the left lower lung hereby suggesting exudative lesions.

A PBV guided by transesophageal echocardiography (TEE) was successfully performed and the differential pressure of the pulmonary valve was significantly reduced, as shown in a color Doppler ultrasound (CDU) examination performed directly after the intervention.

Comments

Echocardiography is traditionally the technique of choice for the evaluation of congenital heart diseases. However, with advances in technology,

CT imaging is increasingly playing an important role in the evaluation of these disorders.[1] Higher spatial resolution and isotropic multiplanar data reconstruction are major advantages of cardiac CT. Prior CT evaluations of

Examination Protocol

Scanner	SOMATOM Force		
Scan area	Thorax	Rotation time	0.25 s
Scan mode	Turbo Flash	Pitch	3.2
Scan length	106.8 mm	Slice collimation	192 × 0.6 mm
Scan direction	Cranio-caudal	Slice width	0.75 mm
Scan time	0.15 s	Reconstruction increment	0.4 mm
Tube voltage	70 kV	Reconstruction kernel	Bv40 (ADMIRE 3)
Effective mAs	104 mAs	Heart rate	117–122 bpm
Dose modulation	CARE Dose4D™	Contrast	370 mg/mL
CTDI _{vol}	0.3 mGy	Volume	6 mL
DLP	4.6 mGy cm	Flow rate	0.4 mL/s
Effective dose	0.48 mSv	Start delay	Bolus tracking with 100 HU at ascending aorta +4 s

the airways and the lungs are necessary when planning an intervention or surgery. In neonates, artifacts caused by higher heart rates and breathing rates, as well as reduced radiation dose are major challenges. In this case, a prospective ECG-triggered Turbo Flash Spiral scanning mode was performed to obtain a complete thoracic acquisition in 0.15 s within a single heart beat while the baby was breathing freely. The image quality was superb for the evaluation of the heart, the airways,

and the lungs. A 70 kV setting was used to assure an excellent enhancement although only 6 mL contrast agent was applied. In addition, advanced modeled iterative reconstruction (ADMIRE) was integrated to achieve an effective dose as low as 0.48 mSv. ●

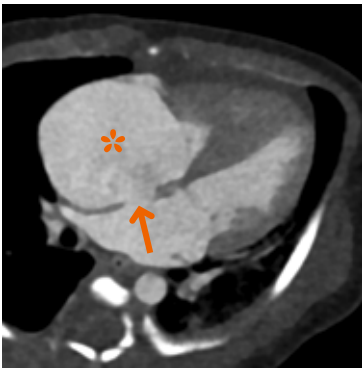
References:

[1] Saremi F, Gera A, Ho S Y, et al. CT and MR imaging of the pulmonary valve. *Radiographics*, 2014, 34(1):51-71.

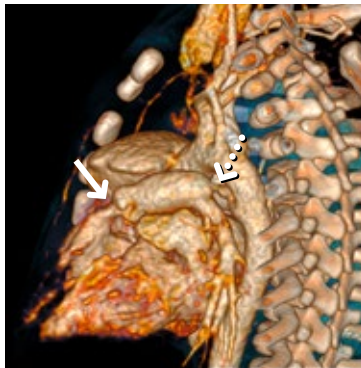
The outcomes by Siemens' customers described herein are based on results that were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist (e.g., hospital size, case mix, level of IT adoption), there can be no guarantee that other customers will achieve the same results.

In clinical practice, the use of ADMIRE 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.

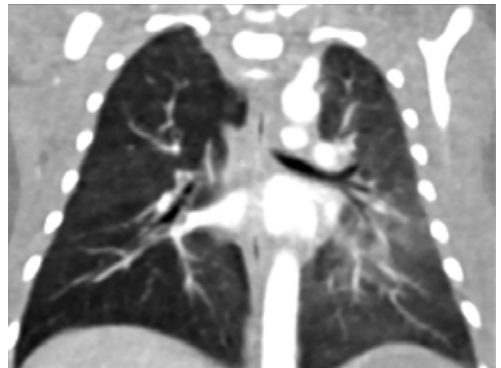
1a



2a



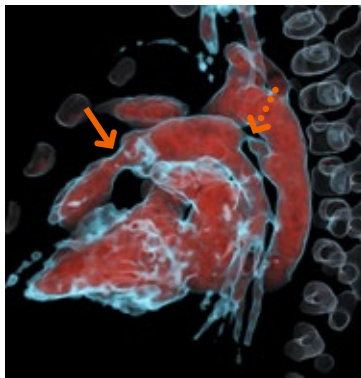
3a



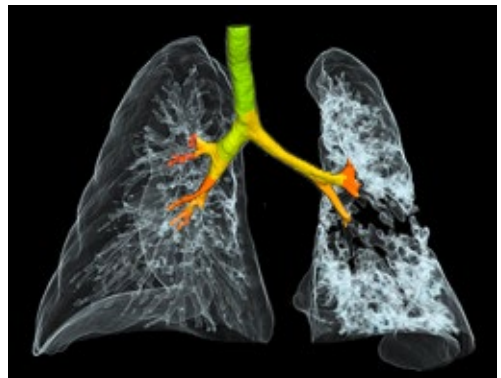
1b



2b



3b



1 MPR images show a significantly enlarged right atrium (asterisk) and an ASD (arrows).

2 VRT images show a PVS with an infundibular stenosis (arrows) and a PDA (dashed arrows).

3 Coronal MPR (Fig. 3a) and VRT (Fig. 3b) images reveal hyperdense patchy shadows in the left lower lung suggesting exudative lesions. The airways appear normal.