



Low-dose Aorta, Iliac and Femoral Angiography with Prospective ECG-gated CT

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Every week, the Bichat Hospital (Paris) sees its share of patients with heart and aortic disease. To further address both this growing incidence of cardiovascular disease and concern about dose reduction, the hospital upgraded its LightSpeed® VCT scanner to a LightSpeed VCT XT configuration. One of the key features of the LightSpeed VCT XT is GE Healthcare's SnapShot™ Pulse, a prospective ECG-gated CT acquisition.

Aortic diseases such as aortic dissection (type A and B) or Marfan syndrome require coverage of the entire aorta, iliac, and femoral arteries with clear delineation of vessel wall and intimal flap during the study acquisition. Cardiac non ECG-gated Computed Tomography has been proposed for these types of examinations but results in a higher radiation exposure to the patient, which is a consideration in clinical use. As a consequence, most aorta CT studies are currently performed using conventional retrospectively gated helical acquisitions.

SnapShot™ Pulse, GE Healthcare's step-and-shoot technique, has been successful in acquiring small thoracic volumes to assess coronary arteries at a low radiation dose. This method, based on the acquisition of 40 mm thick volumes, is ideal in patients with a heart rate (HR) at or lower than 65 beats per minute (BPM).

After conducting an accommodation and suitability study, we decided to use this low dose acquisition mode for aorta, iliac, and femoral angiography. The results were a drastic dose reduction and an improvement of image quality in regions subject to heart rate motions.

Over the last five months, we have used this sequence to image 32 patients with the following conditions: an aortic dissection (type A and B); aortic valve stenosis requiring vascular cartography before aortic valve stenting with mechanical valve; and, thoraco-abdominal aneurismal pathology. This acquisition mode can be performed on a wide array of patients.

Clinical case

Helical Protocol (Patient A) versus SnapShot™ Pulse Protocol (Patient B)

Patient A

62-year old man presents with a suspicion of aortitis (Figure 1).

Acquisition protocol

Scanner	LightSpeed® VCT XT*
Scan type.....	Helical
Gantry rotation speed	0.6 sec
Pitch.....	0.984
Detector configuration	64 x 0.625 mm
Slice thickness.....	0.625 mm
kVp.....	120
mA	Modulated
Coverage	55.25 cm

Contrast protocol

Contrast	Iodinated contrast 350 mg/ml
Contrast injection rate	3 cc/sec
Total contrast amount	90 cc
Saline flush	40 cc, 3 cc/sec

Dose

DLP	1203.05 mGy-cm
CTDI _{vol}	20.09 mGy
Effective dose.....	18.04 mSv†

Clinical findings

The CT exam revealed mediastinal adenopathy, thickening of the aortic wall and infiltration of the mediastinal fat, all compatible with an aortitis and mediastinitis (Figures 2 and 3).

*A premium LightSpeed VCT configuration.



Figure 1

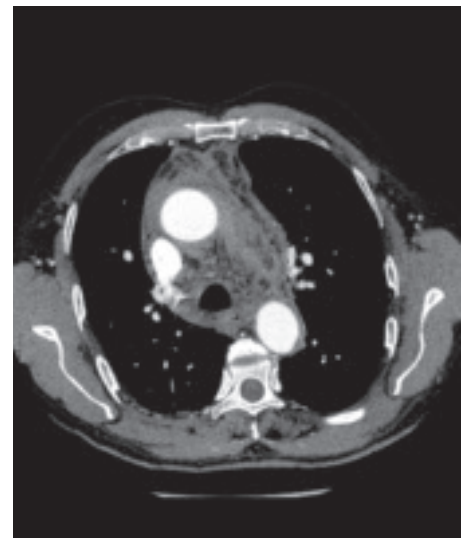


Figure 2



Figure 3

†Obtained by EUR-16262 EN, using an abdominal factor of 0.015 * DLP.

Patient B

56 year-old woman with aortic valve stenosis receives aorto-iliac cartography before endovascular treatment (Figure 4).

Acquisition protocol

Scanner	LightSpeed® VCT XT*
Scan type.....	SnapShot™ Pulse
Gantry rotation speed	0.35 sec
Detector configuration	64 x 0.625 mm
Slice thickness.....	0.625 mm
kVp.....	120
mA	600
Coverage	56 cm

Contrast protocol

Contrast.....	Iodinated contrast 350 mg/ml
Contrast injection rate	3 cc/sec
Total contrast amount	90 cc
Saline flush	40 cc, 3 cc/sec

Dose

DLP	721.91 mGy-cm
CTDI _{vol}	12.89 mGy
Effective dose.....	10.82 mSv†

*A premium LightSpeed VCT configuration.



Figure 4

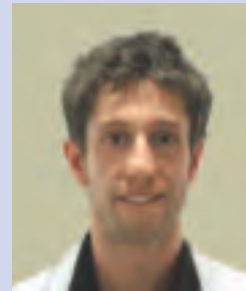
†Obtained by EUR-16262 EN, using an abdominal factor of 0.015 * DLP.



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Gregoire Avignon received an engineering degree from Mines de Nancy school in 2007 and a marketing master degree from HEC (High Commercial Studies), Paris. He began working for GE Healthcare in September 2007.

About the facility

The Hospital Bichat is one of 37 hospitals within the APHP (Public Assistance – Paris Hospital). With 956 beds, the hospital has a dual mission: to ensure a proximal location for healthcare throughout the north Paris population and to deliver high-quality, specialized patient care in six fields – vascular pathology and cardiology, emergency resuscitation, lung pathology, specialized medicine, surgery, and tropical diseases.

Clinical findings

Figure 5 shows the ascending aorta, aortic valve, and aortic annulus (where the valve prosthesis will be implanted), and origin of the left coronary artery (which shows no atherosclerotic infiltration), with no artifact related to the sequential acquisition mode.

Figure 6 (VR thoracic reconstruction), Figure 7 (curved reconstruction), and Figure 8 (flat reconstruction for measurement of aorta, iliac, and femoral artery diameters) display a mild tortuosity of the right iliac artery with a minimum diameter of 8 mm in the common femoral artery, providing the required clinical data to authorize the endovascular heart valve prosthesis implantation procedure.

Discussion

The benefits of the LightSpeed® VCT XT* configuration with the SnapShot™ Pulse prospectively ECG-gated imaging technique are apparent with these clinical cases. The technique demonstrated a 40% reduction in radiation dose for the same Z-axis coverage as the helical technique.

Among the 32 patients included in this study, we obtained lower doses using 100 kVp with either the helical or the SnapShot Pulse protocol, with excellent image quality as well.

We therefore recommend the use of the SnapShot Pulse prospectively gated imaging technique when exploration of the full aorta, iliac, and femoral artery is needed. ■

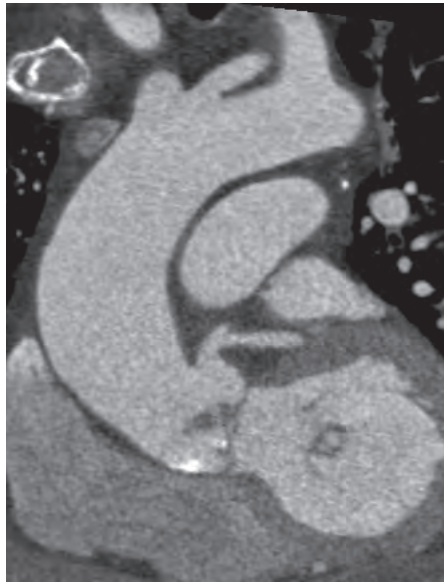


Figure 5



Figure 6

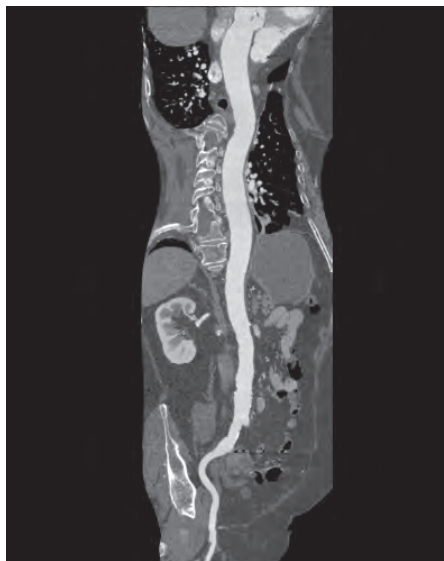


Figure 7

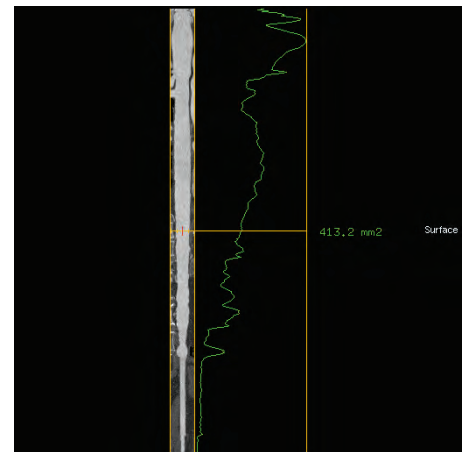


Figure 8

	Helical Protocol	SnapShot Pulse Protocol	Percent Reduction
Dose Length Product (DLP)	1203.05 mGy-cm	721.91 mGy-cm	40.0%
CTDI _{vol}	20.09 mGy	12.89 mGy	
Z-Axis Coverage	55.25 cm	56 cm	
mA	Variable	600	
kVp	120	120	

Figure 9. Radiation dose comparison.

*A premium LightSpeed VCT configuration.