

Maximum performance for high-end cardiac imaging with the SOMATOM Definition Edge

Fig 1: The team around chief radiologist Yves Martin-Bouyer, MD, at the Clinique Bizet in Paris found the ideal solution for their tight spatial conditions but high demands of CT imaging: the SOMATOM Definition Edge with the Stellar Detector.



Abstract

Clinique Bizet had decided to replace their old 64-slice system. They wanted to go for state-of-the-art technology serving their needs in high-end cardiac imaging. With limited space and a team unwilling

to compromise on performance, the clinic found that the Siemens SOMATOM Definition Edge was the perfect solution for their clinical portfolio.

Fig 2: Besides technical specifications and clinical advantages, there was another argument for the SOMATOM Definition Edge. No additional efforts and costs had to be overcome along the replacement for the outdated 64-slice system.



Introduction

Clinique Bizet is a hospital located in the exclusive right-bank 16th arrondissement of Paris, France, serving a cross-section of France's 21st century multi-cultural population. Although the hospital is private, patients are referred from the public system, and fees are subject to the same controls that prevail elsewhere. The World Health Organization places France at the top of its national health-care rankings. However, as anyone who even glances at the headlines can tell, the country is struggling with the same economic and budgetary pressures that plague the rest of the world. The challenge both for national leaders and

hospital administrators is the same: find ways to improve quality, while simultaneously keeping a lid on the costs. The portfolio of Clinique Bizet reaches from thorax and abdominal scans to a three-hour cardiac session twice a week for a total of around 6,000 CT scans per year. On the one hand, Clinique Bizet was searching for new technology; on the other hand, with the facility squeezed into a sliver of prime Parisian real estate, space for the new system was one of the limiting factors. In the end, the decision was made in favor of the SOMATOM Definition Edge with the new Stellar Detector and its outstanding cardiac capabilities.



Challenge

The previous 64-slice system had become old and the hospital decided to replace the old system to improve quality. The challenge was a room with only 23 square meters: the hospital wanted the new system to leave enough space for a patient with his or her complete equipment, a bed from the intensive care unit, and five people working around to organize the scan. The floor added further limitations with OR rooms underneath: the weight of the system should not create additional costs by making it necessary to stabilize the floor before mounting the new system. From a clinical point of view, it was important that the new system had excellent cardiac capabilities for the around 550

cardiac examinations per year performed at Clinique Bizet. "One of my wishes was a better resolution of the interior of a stent. This means you have to freeze the motion of the stent and the movement of the artery," says Philippe Durand, MD, the cardiologist who oversees the cardiac sessions together with Yves Martin-Bouyer, MD (Chief Radiologist at Clinique Bizet). Therefore, a fast rotation speed with a high temporal resolution was one of the basic requirements for the new system next to the wish to improve image quality. Additionally, the new system should be able to reduce dose significantly compared to the previous system. Overall, a tough but not unsolvable challenge.

Fig 3: Although space is restricted and highly valuable in the 16th arrondissement of Paris, there is no problem fitting several people and a patient bed into this small room – even with the complete equipment around the CT system.



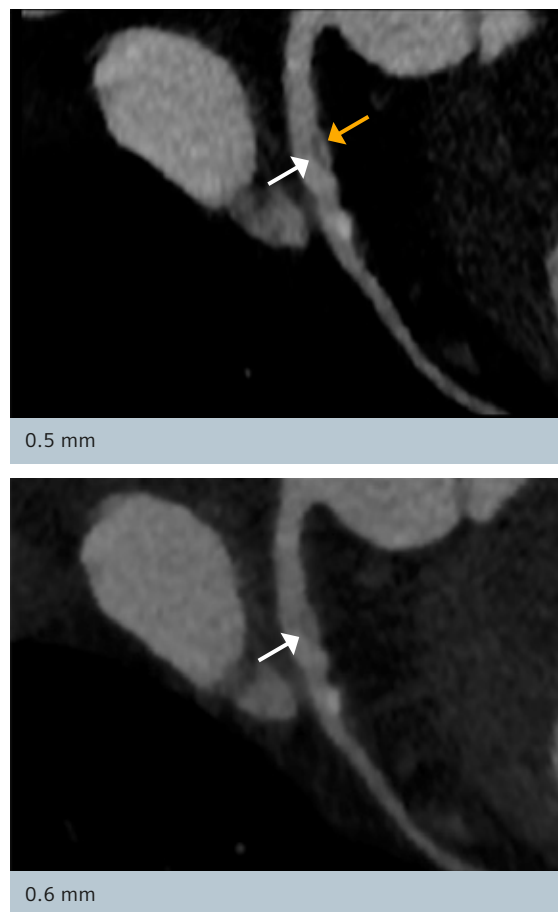
Solution

Yves Martin-Bouyer analyzed the pros and cons of all high-end machines of the major manufacturers. One was rejected right away because its equipment was just too big for the space it was supposed to occupy. Other vendors were more or less equal in price. Finally, the SOMATOM Definition Edge with the first fully-integrated detector made the race. The main interest was raised with the Stellar Detector. Besides the fact that the detector is capable of generating 0.5 mm slices in clinical routine, another strength of the system is dose saving. Combined with Siemens' iterative reconstruction solution SAFIRE*, the new system lowers dose by up to 60%. For cardiac imaging in particular, the chief radiologist liked

the high rotation speed (0.28 seconds) with a real native temporal resolution of 142 ms. The fast pitch of 1.7 covering up to 230 mm/seconds was another point that was taken into account positively – especially for long range runoffs for vascular radiography. From an economic point of view, the fact that there was no need to change the scanning room and only change the scanner instead was considered even more important than the purchasing price. To sum it up: Other vendors either had no new detector technology, could not offer equally fast pitch and high rotation speed, or were not able to deliver 0.5 mm slices. All these factors made the final decision easy: go for the SOMATOM Definition Edge.

* 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.

Fig 4: The images show a comparison between 0.6 mm slices and the 0.5 mm slices generated with the Edge technology that comes with the SOMATOM Definition Edge and the Stellar Detector. The white arrow reveals the soft plaque; the 0.5 mm slices clearly show the fibrocalcified plaque (orange arrow) and overall sharper contours of the left coronary artery (LAD).



collimation: 128 x 0.6 mm
 spatial resolution: 0.30 mm
 scan time: 6.0 s
 scan length: 146 mm
 rotation time: 0.28 s
 tube setting: 80 kV, 75 mAs
 CTDIvol: 4.38 mGy
 DLP: 72.65 mGy cm
 1.0 mSv
 HR: 67 bpm

Outcomes

The SOMATOM Definition Edge has fulfilled what the users at Clinique Bizet expected from their new high-end imaging system. Besides its advantages in routine imaging, they are especially excited about its cardiac capabilities. "There is not a single image that I cannot interpret," Philippe Durand points out. "Before, there was at least on per session." "There are no discussions with colleagues any more. The results are very good and the quality is the best you can image," adds Yves Martin-Bouyer. However, not only image quality has improved, dose has also been significantly reduced, as is shown in a case of follow-up cardiac stent imaging (see Fig. 5). "You get great images, even with people who have rapid arrhythmias," Philippe Durand explains. In addition to these positive experiences, the Stellar Detector delivers clinical value with its 0.5 mm slices. A direct comparison of slices from a cardiac case from Clinique

Bizet shows that the 0.5 mm slices reveal two layers of plaque consisting of calcium on the base surrounded by fibrous tissue. This kind of plaque is not prompt to rupture and therefore perceived as "safer." With the 0.6 mm slices, there is no clear distinction between these two layers of plaque. From a workflow point of view, the system comes along with FAST CARE technology and has improved the overall throughput. "The system is very quick," says Yves Martin-Bouyer. He adds that the speed of the machine also helps patients who have trouble holding their breath for prolonged periods, which is often the case for people with heart conditions. This does not generally translate into fitting more examinations into a workday. However, Philippe Durand reports boosting the number of examinations he can oversee during his three-hour cardiac slots from between seven and eight to ten.

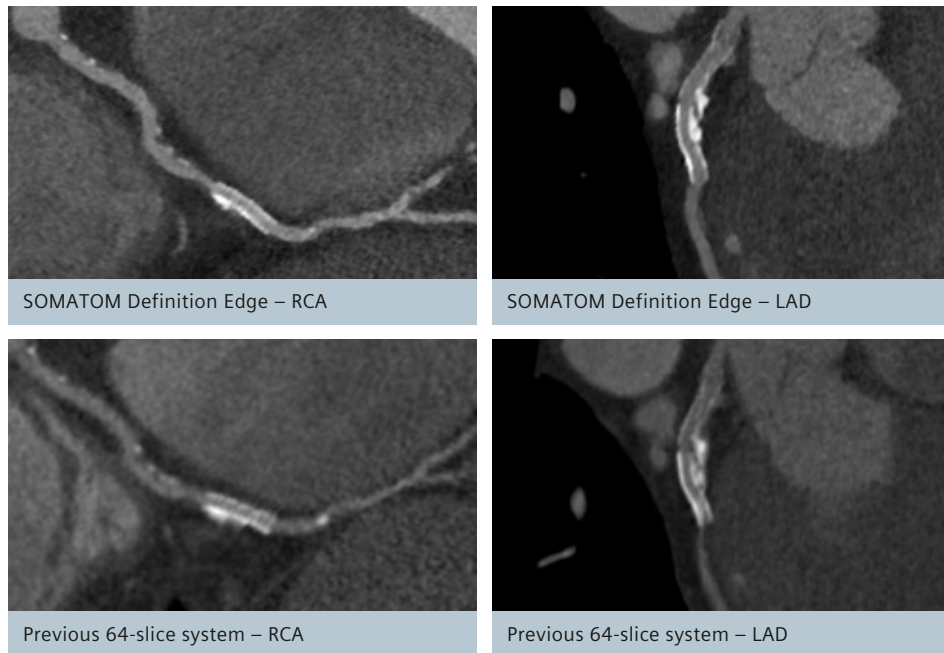


Fig 5: Cardiac follow-up: the SOMATOM Definition Edge delivers better image quality almost 10 seconds faster and with a dose reduction of over 12 mSv compared to the previous 64-slice system.

	SOMATOM Definition Edge	64-slice
Scan time	4.0 s	13.53 s
kV-setting	100 kV, 86 mAs	120 kV, 733 mAs
Scan length	147 mm	138 mm
DLP	217 mGy cm	1137 mGy cm
Dose	3.04 mSv	15.91 mSv

Conclusion

For the Clinique Bizet, the challenge to exchange their old 64-slice system with a new system turned out to be an easy replacement with no additional construction costs. Their wishes for an improvement in image quality and significant reduction in dose were fulfilled. With its high rotation speed and the new Stellar Detector technology, the system is delivering excellent images both in clinical routine and in settings

where the CT system's hardware is challenged by fast moving vessels with or without stents in cardiac imaging. The SOMATOM Definition Edge has shown where users can see the unseen with its 0.5 mm slices (see Fig. 4) and where they can get more from less with higher image quality at lower dose (see Fig. 5). In total, the SOMATOM Definition Edge is a cost-sensitive high-end scanner that doesn't need too much space.

* The statements 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



SOMATOM Definition Edge

Detector	Stellar Detector
Number of acquired slices	128
Number of reconstructed slices	384
Spatial resolution	0.30 mm
Rotation time	0.28 s
Temporal resolution	142 ms
Generator power	100 kW
kV steps	70, 80, 100, 120, 140 kV
Max. scan speed	230 mm/s
Table load	up to 307 kg / 676 lbs*
Gantry opening	78 cm

* Optional

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