



Interventional Rhythmology with OEC Elite CFD

Dr. Stéphane Combes, Cardiologist and Interventional arrhythmia specialist, Clinique Pasteur, Toulouse (France)

The Clinique Pasteur is the leading cardiology and cardiac surgery institution in France in terms of number of procedures. The recently completed building called La Passerelle - The Bridge, has been designed by and for caregivers, such that all necessary services have been built and organized under one roof. Equipped with high-tech imaging modalities dedicated to complex treatments, it is aimed at optimizing the patient's care pathway. Among the eight cathlabs dedicated to Interventional Cardiology, Electrophysiology and Rhythmology, one room has been equipped with an OEC Elite CFD motorized Cardiac C-arm, dedicated to pacemaker placement and CRT device implantation.



Dr. Stéphane Combes, Interventional rhythmology Cardiologist, explains the needs in image quality and patient access with OEC Elite CFD for these procedures.

Can you explain the organization of the activity of the Interventional Rhythmology department?

There are about 30 cardiologists at Clinique Pasteur. Everyone has a different specialty to cover across the different cardiology domains. Our rhythmology group specializes in placing cardiac stimulators to provide arrhythmia treatments. As a national reference center of excellence, we participate in national and international research studies in rhythmology for cardiac stimulation and the management of ventricular and atrial disorders.

The Pasteur Clinic's department of rhythmology performs more than 1500 ablations per year, as well as the implantation of about 900 pacemaker and multisite cardiac stimulators, and 150 to 200 defibrillators.

What type of procedures are performed in the mobile C-arm room?

The procedures performed in this room are essentially stimulation, including multisite stimulation and defibrillation procedures. We sometimes perform simple ablation procedures in this room, i.e. endocavitary electrophysiological exploration and

ablation of the cavo-tricuspid isthmus or of the HIS junction.

We reserve fixed angiography rooms for complex procedures that are of three types: procedures that require a transseptal puncture in order to realize an ablation into the left atrium, the ablation of ventricular tachycardia, and complex ablation procedures. Complex ablation procedures might involve a higher operating risk for the patient, such as procedures where the positioning of the catheter needs to be very precise like for the ablation of the slow path of the HIS intra-nodal junction. About 50% of these complex procedures are performed under general anesthesia of the patient, and the size of our fixed rooms has been designed to include a large space for the anesthesiologist set-up in case of the need to switch to intensive patient care, that is not the case in our mobile C-arm room. For these procedures, we are using Cartography systems that take up quite a lot of floor space in the operating room and require a dedicated engineer assisting us during the procedure. As our room with OEC Elite CFD is small, we cannot work comfortably with these systems, and cases of acute patient care management require extra space.

What are the challenges in terms of image quality and detector size?

The most complex imaging procedures are multisite stimulation, requiring the precise visualization of very small guidewires (about 0.014 inches or 0.35 mm of diameter) while navigating in the venous vasculature of the back of the heart.

It is also critical to see clearly the heart's venous tree and then the

stimulating probes that are a little larger. We need fluoroscopic coverage large enough in order to get a full cardiac shadow in the image. The patients we treat are in cardiac insufficiency with cardiomegaly. There is always a tradeoff between the size of the flat panel, the coverage of the anatomy in the image and the obstruction of the detector in the working space. We work very close to the detector, unlike vascular surgeons who can work away from the anatomy explored. The 21 by 21 cm flat panel detector size is a good compromise. Indeed, if we took a larger detector field of view, would take up too much space and the ratio between the obstruction of the working space to image benefit would not be advantageous.

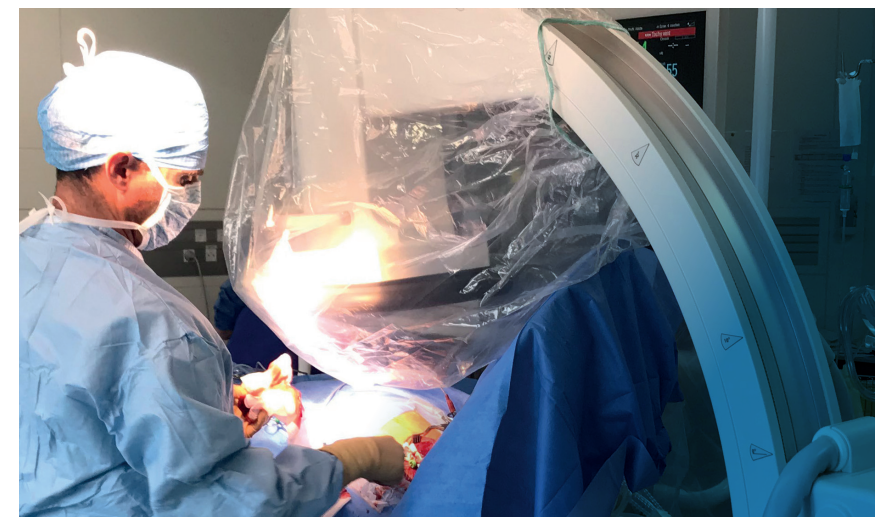
What fluoroscopy modes do you use during your procedures?

In our department, we want to optimize the amount of radiation dose during the procedure, so we are working with low-dose modes: decreasing the image rate using the pulsed mode (8 pulses per second

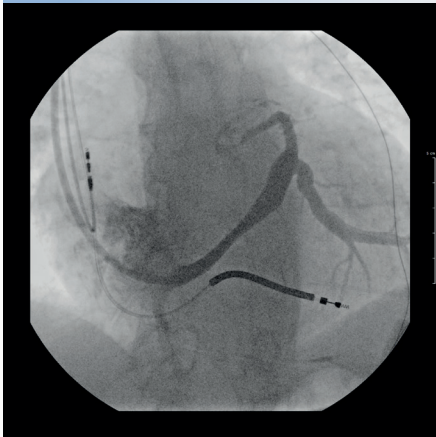
– pps) and decreasing the level of radiation dose using the low-dose mode. Of course, we modify these parameters during the procedure to manage the image quality depending on the complexity of the step of the procedure. It is very easy to improve the image quality by increasing the pulse mode rate from 8 to 15 pps, removing the low-dose mode or setting up the collimation from the Remote User Interface during the procedure.

When performing multisite stimulations, we inject contrast media into the cardiac venous tree, and record the sequence using the dynamic recording mode. We inject the coronary sinus vein to position the probe at the level of the left ventricle in such a way as to safely anchor the probe at the level of a bifurcation. The dynamic recording allows us to visualize the full venous tree in the image in order to select the optimum site to anchor the lead.

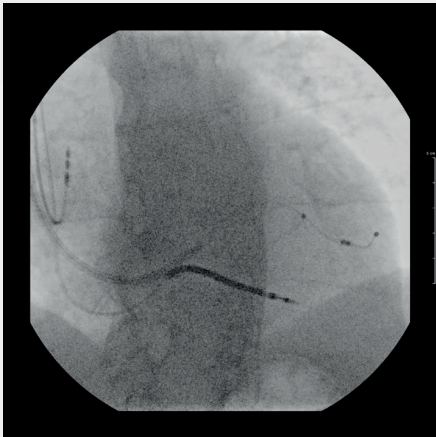
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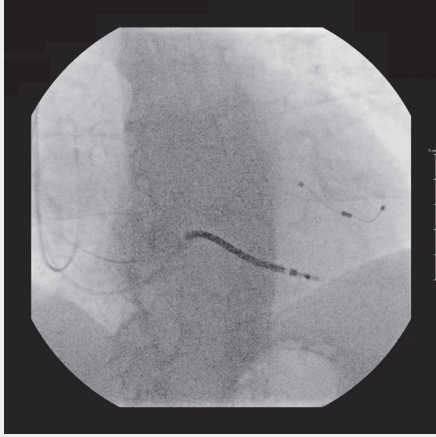
CASE 1 | Defibrillator implantation



Coronary sinus venogram - Digital Cine Pulse 15 pps - AP view - Cardiac profile

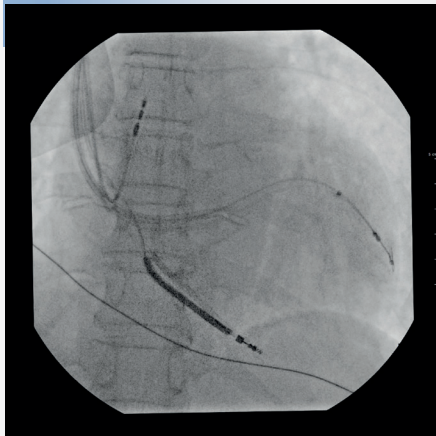


Defibrillator lead placement control - standard fluoroscopy low dose 8 pps - AP view - Cardiac profile



Final control - standard fluoroscopy Low dose 8 pps - AP view - Cardiac profile

CASE 2 | Multisite pacemaker implantation



Final control standard fluoroscopy 8 pps - AP view - Cardiac profile

How did you set up the C-arm in the room with space constraints?

As the C-arm is very deep, we placed it along the axis of the patient table, at the patient head. This position allows us to perform both right and left sub-clavicular accesses very easily. During our procedures, we often angulate the C-arm in order to get right or left oblique views. With this set up it is very easy to modify the angulation of the C-arm without interfering with our working space.

We optimize the space in our operating room. We selected the OEC Elite CFD C-arm in order to avoid the congestion of this operating room.

The remote user interface is very easy to install and remove from the table-side rails. Its ergonomics are quite simple and robust. The interface possesses the essential functionalities,

we do not need more than this. The buttons are easy to activate. We also use it to modify the position of the C-arm from the sterile field. This interface allows the integration of staff into the procedure workflow such that they actively participate in the procedure.



Also the laser aimer is a very interesting tool that can assist in positioning the detector and may limit the number of images taken.

How do you think fluoroscopic imaging is going to evolve as rhythmology techniques progress?

In rhythmology, we have two main domains of activity: Electrophysiology/ablation and cardiac stimulation. In Electrophysiology, we are moving towards developing integrated systems without fluoroscopic imaging. We are using cartography systems. They were developed for complex procedures, but now we are using them for simpler procedures. These systems are still expensive, but as they contribute to reduce radiation exposure, we are driving our activity to extend their use.

In cardiac stimulation, we are very far away from working without fluoroscopic imaging. We need fluoroscopic guidance. The evolution of the C-arm needs to go in the direction



of miniaturizing the footprint and reducing X-ray dose.

Today, the cost of cardiac stimulation procedures has been reduced making them accessible to more centers. The OEC Elite CFD mobile C-arm is well

suited to cardiac stimulation procedures. Nothing prevents using the C-arm with a cartography system, only the size of the room determines if we can add an additional system and personnel for the procedure. □



Dr. Stéphane Combes is an Interventional Cardiologist specialized in Interventional Rhythmology, after a fellowship in cardiology. He has worked at Clinique Pasteur for the last 11 years, in Toulouse. He is a member of the French cardiology society and of the European Heart Rhythm Association.

Dr. Combes is involved in the RETAC (European network for the Treatment of Arrhythmias in Cardiology), which promotes sharing

experiences to improve the management of cardiac arrhythmias, particularly in the field of radiofrequency catheter ablation¹. With the rhythm group of Clinique Pasteur, he participates in national and international multicentric studies in the field of arrhythmia and stimulation/defibrillation.

¹ <http://www.retacgroup.com/about-us/>

The statements by GE's customers described here are based on their own opinions and on results that were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist, i.e. hospital size, case mix, etc., there can be no guarantee that other customers will achieve the same results.