

Congenital Heart Disease: Advancements in Imaging and Diagnostic Accuracy

By Christian Rayr

The pioneering role and experience of the Marie Lannelongue Surgical Center (CCML) in caring for congenital cardiac malformations have contributed, among other areas of excellence, to its international reputation. *Medical Solutions* sat down to speak with Claude Angel, MD, Head of the center's Imaging Department.

Dr. Angel, what has changed at CCML since its beginnings in the 1970s?

ANGEL: Progress has affected the number, nature, and quality of interventions. We have been able to extend the field of indications and to focus on techniques providing us with the best possible results. As it became applicable, we were also able to limit the use of surgery and develop interventional radiology. This progress rests mainly on improved image quality and diagnostic accuracy. What also needs to be emphasized is the far better understanding of the physiopathology of heart disease, the development of ultrasound imaging, and finally, the steady increase of endovascular navigation via catheterization.

What does diagnostic imaging of these malformations involve today?

ANGEL: While magnetic resonance imaging [MRI] initially seemed to take the lead, our interest is in computed tomography [CT] and its most recent developments, in particular for very young patients, including babies. Due to the extraordinary speed of image acquisition with the latest systems, highly precise images of the chest are obtained in one or two seconds, depending on the size of the infant. The surgeon who operates on a baby weighing three or four kilos [6.6 to 8.8 lbs] does not see the full defect. With a surgical cut measuring only a few centimeters, his

field of operation is very limited. However, the use of the four-slice scanner already provided us with a view of the malformation from any angle. Complex diagnoses were possible, and surgical interventions could be anticipated in a much more precise manner. Today, we are utilizing the acquisition speed provided by our dual source SOMATOM® Definition scanner and obtain images in 83, or even 42 milliseconds, instead of the previous 165 milliseconds.

What is the role of interventional radiology and surgery in treating congenital heart disease?

ANGEL: Last year, we performed approximately 800 surgeries and 630 diagnostic catheterizations. Of these, 330 were interventions, with half of them involving cases of congenital heart disease in adults. The therapeutic choice depends on the indication. Interauricular communication [IAC] for instance, one of the most common malformations, always called for surgical intervention until a few years ago. Today, surgery has become the exception, and IAC closures are performed via catheterization. Of course, there are vascular malpositions, such as Fallot's tetralogy or the transposition of the large vessels, for which our center has become famous by developing corrective interventions that restore anatomic integrity. Vascular radiology, which was seemingly pushed aside by the emergence of noninvasive explorative methods, is seeing a rebirth largely due to the success of endovascular interventions. At present, more than 40 percent of the catheterizations performed in the department are interventional in nature and respond to the effort of reducing the number of serious operations. Our center is certainly known for per-



The Marie Lannelongue Surgical Center is located southwest of Paris.

forming the most interventional catheterizations for congenital malformations.

Is this extension of interventional radiology indications also based on progress in imaging?

ANGEL: Most certainly, according to our experience. Our level of technology comprises three interventional imaging rooms with coronary angiography and angiography equipment, among them a biplane AXIOM® Artis dBC, which is not a mandatory system, but nevertheless highly recommended for cases of congenital heart disease. I insisted that these three rooms be equipped by Siemens because the company was the only manufacturer to comply with our rather divergent technical specifications with regard to the treatment of children and adults. The choice of a single provider is also useful for both maintenance and ergonomics: For the operators, it is important to be working with similar equipment, including



Three cath labs support care for patients with congenital heart disease.

the same user interface. Finally, Siemens is undeniably one of the leaders in cardiac imaging, where images are among the most difficult to acquire. In fact, we have shown the same trust in Siemens when it comes to MRI, which we expect to be delivered soon, a technology where consistently good image quality is not always a matter of course.

Which hopes do you have for congenital heart disease?

ANGEL: That we continue to offer the earliest and most curative treatments possible before the consequences of these defects appear. One of our recent challenges involves imaging coronaries in infants, and extending the indication of the dual source scanner, for example, to the

exploration of arteries in Fallot's tetralogy. These arteries, often poorly positioned, required diagnostic catheterization with concomitant risk. Our first results with the Dual Source CT scanner led to the consideration of replacing invasive coronary angiography in one-day- to four-month-old infants and to examine them with an image quality that is simply exceptional.



With the new Dual Source SOMATOM Definition scanner, Claude Angel, MD, and his staff (here pictured: Chief of CT Unit Jean-François Paul, MD) hope to replace even more diagnostic catheterizations with noninvasive imaging in, for example, small infants with Fallot's tetralogy.

Are there many 'resistant' malformations that remain?

ANGEL: There are those where surgical or radiological interventions are palliative only, and which require constant monitoring and repeated actions. Here as well, we are ready for the development of a new subspecialty: treating adult patients who have been suffering from congenital

cardiac malformations since childhood. This may imply surgery, catheterization, and cardiac rhythm studies, as well as obstetrics or even psychosocial assistance. Today, these patients represent about ten percent of our activities. However, their numbers are growing due to the greater life expectancy of patients suffering from congenital heart disease.

The interview with Dr. Angel was held by Christian Rayr, medical journalist, at the Marie Lannelongue Surgical Center of Plessis-Robinson, near Paris, France.