The burden of acquired heart disease in adults and children presents a very real healthcare challenge across the world. Philips Healthcare’s commitment to improving access to healthcare infrastructure in Africa was emphasised through the hosting of and participation in dialogues, discussions and workshops at the sixth World Congress on Paediatric Cardiology and Cardiac Surgery that recently took place in Cape Town, South Africa.

‘Philips is committed to providing innovative solutions to the challenges that the African continent currently faces in the management of cardiology diagnoses and treatment’, commented Jose Fernandes, district manager, Philips Healthcare, Southern Africa. ‘At the World Congress, we e our extensive portfolio of products and solutions for cardiology. These will provide clinicians a continuum of solutions for 21st-century cardiac care, customised for them and the needs of their community.’

Discussions centred on how innovations in interventional radiology treatment are helping to transform the future of patient care. These were a platform for experience-sharing on minimally invasive cardiology procedures.

**Structural heart disease interventions: the growing wave of new therapies**

The standard imaging procedure for endovascular interventions is invasive biplane (2D) angiography. Three-dimensional reconstructions from pre-procedural computed tomography (CT)/magnetic resonance (MR) angiography are regarded as major advances in non-invasive cardiac imaging.

However, with the advent of three-dimensional rotational angiography (3DRA) and real-time tomographic reconstruction of the acquired images, a volumetric view of the vascular anatomy can be created. This may optimise decision making for treatment planning and may provide improved guidance during the intervention.

At one of the Philips breakfast symposia, Dr Thomas Fagan, Children’s Hospital Colorado in Denver, shared his experience with multi-modal cardiac imaging in trans-catheter interventional paediatric cardiology. He performed 3DRA with the 3DRA Philips Healthcare system, employing a 4.1-second rotation of the C-arm. From his experience with more than 100 patients, he concluded that in the majority of cases, 3DRA provides additional clinically useful information compared with planar biplane angiography.

Dr Fagan also reported on the use of the Philips HeartNavigator, an interventional planning tool. With this tool he was able to segment the anatomy of interest and plan the procedure with measurements, optimal view selection and landmarks. He then registered this dataset to the live fluoroscopy in order to obtain live overlays of the anatomy, enabling him to perform the procedure under guidance.

Contrast volume could be reduced and a decrease in need for additional angiography was observed. This modality also appeared to improve confidence in the guidance of catheters. It is envisaged that 3DRA availability will become of increasing importance in paediatric cardiology and that these tools will afford virtual training in endovascular procedures.

Finally, Dr Fagan presented his recent experience with EchoNavigator, the new Philips platform, which for the first time ‘makes fluoroscopy smart’ by combining two live imaging modalities: fluoroscopy and transoesophageal echocardiography (TEE). The platform registers the two modalities and re-orients the live 3D echocardiographic view to match the fluoroscopic projection angle.

It also gives control to the interventionalist of the 3D TEE display, using a tableside mouse to interrogate the anatomy, rotate and crop the 3D volume, as well as place markers on the soft tissue, which then appear on the fluoroscopy screen. The tool facilitates communication between interventionalist and echocardiographer, increases interventional confidence and enables the placement of targets and reference anatomy directly on the fluoroscopy screen.

Philips Healthcare then introduced their revolutionary new interventional X-ray system: AlluraClarity. The system, built upon an unprecedented...
Multi-dimensional imaging in children with congenital heart disease: an end to neonatal catheterisation?

Another breakfast symposium hosted by Prof Gerald Greil, consultant paediatric cardiologist and director of the Congenital Cardiac Magnetic Imaging Service at Evelina Children’s Hospital in London. Prof Greil considered the application of multidimensional imaging in children with congenital heart disease. The thrust of his discussion centred on how magnetic resonance imaging (MRI) is replacing invasive X-ray-dependent cardiac catheterisation as a diagnostic tool, providing valuable clinical information regarding cardiovascular anatomy and physiology.

Retrospective analysis of paediatric data from elective diagnostic cardiac catheterisation or MRI in the Cardiology Department of the Evelina Children’s Hospital indicates that replacing catheterisation with cardiovascular MRI results in reduced rates of complication and shorter hospital stays, without a significant impact on surgical outcome. These conclusions were based on the outcome measures of indication, length of stay and incidence of complication. In cases where the procedures were used to plan surgery, 30-day survival following the procedure was recorded. Surgical outcomes were compared between the two groups, and those using MRI were compared with national outcomes from the Congenital Cardiac Audit Database.

MRI imaging for delineating extra-cardiac vasculature in newborns with congenital heart disease is not widely used. Current MR angiographic techniques lack the temporal resolution to assess complex cardiac anatomy within a single breath-hold, due to fast circulation times. Prof Griel shared his experiences of four-dimensional time-resolved keyhole angiography (4D TRAK) to confirm diagnoses not fully resolved by echocardiography in newborns. MR keyhole angiography permits rapid acquisition of three-dimensional datasets with high temporal resolution. Within a single breath-hold, the sequential filling of arterial and venous vessels can be visualised, overcoming the limitations of temporal resolution that existing MR angiography presents.

A retrospective review of nine neonates (< 28 days old) undergoing cardiac MR imaging with 4D TRAK performed on a commercial Philips Achieva 1.5-T scannerT assessed indication for referral, diagnosis made from the MRI scans and correlation with surgical findings. Seven patients proceeded to surgery based on the MRI, where findings were confirmed. One required no further interventions and one required diagnostic catheterisation to assess multiple aorto-pulmonary collateral arteries.

The use of 4D TRAK confers high diagnostic accuracy vital for surgical planning. 4D TRAK is appropriate where diagnostic uncertainty remains following echocardiographic assessment and should be considered in place of invasive diagnostic cardiac catheterisation or X-ray-dependent computed tomography.

Prof Greil summarised, ‘We combine X-ray, MRI and echocardiography within one procedure for each patient, depending on the complexity of the cardiovascular condition. This provides tremendous benefit due to availability of more comprehensive clinical data. Therefore, replacing catheterisation with cardiovascular MRI has resulted in reduced rates of complication and shorter hospital stays, without a significant impact on surgical outcome. It also reduces costs for healthcare systems.’

R Delport, G Hardy