IMMREVIEW

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CT SCAN AT IMMR :

preoperative planning and anatomical insight



IMMR Accelerating your innovative research

Computed tomography (CT) has been shown to provide crucial information concerning anatomy and pathology in many surgical and medical specialties and is a very useful adjunct in preparing the optimal procedural strategy (which approach, what size of implanted device). CT-based custom-made prostheses are also quite common in orthopedics, reconstructive and oral/maxillofacial surgery.

In cardiology, among the imaging modalities available for the evaluation of patients prior to TAVI or any other structural heart intervention, computed tomography (CT) plays a central role in patient selection. CT reliably visualizes the dimensions of the aortic root, pulmonary veins or left atrium and allows a proper choice of the prosthesis size. In "real patients" the morphology of the access path and relevant comorbidities can also be assessed. in preclinical research, CT preoperative planning allows to find the proper animal model for whichever device is assessed, in particular when there is only one size available!

Computed tomography___

Further, magnetic resonance imaging, echocardiography, and rotational angiography can surely be used to fabricate life-sized models of anatomy and pathology, as well as patient-specific implants and surgical guides, but computed tomography is the preferred 3D approach with the highest resolution to obtain solid 3D reconstructions such that surgeons and interventionalists can have the operated organ in their hands before the procedure.



As regards preclinical research, adequate preoperative planning enables a better model selection. Therefore refining the animal model and following the rules of the 3Rs in accordance with recommendations of ethics committees.

We currently use a 64-slice system. Our images are quite spectacular and they have provided extremely insightful information for many groups. Do not hesitate to ask for more information.

Nicolas Borenstein, DVM, PhD Scientific Director - Founding Partner - Board Member We use our own Brilliance CT 64 system by Philips with a dedicated software enabling cardiovascular reconstructions and ECG gating.

In the specific world of structural heart interventions, in order to perform cardiovascular recontructions and have a 3D approach to preoperative planning, we use 3mensio by Pie Medical Imaging.

This software has tremendous reconstruction algorithms and we thought that this newsletter would be a relevant opportunity to present what this software can do.



Maaike Randsdorp Training Manager at Pie Medical Imaging.

Hello Maaike, can you tell us a little bit about your company Pie Medical and your software H3Mensio?

Pie Medical Imaging (PMI) has over 30 years' experience in cardiovascular imaging. Back in the 80s PMI launched its well-known Cardiovascular Angiographic Analysis System (CAAS), which is integrated in the Cath lab systems of major OEM companies nowa-days. Since then PMI's product portfolio has further matured with cardiac MR diagnosis and IVUS/OCT post procedural software. In 2011 the 3mensio CT pre-procedural planning pac-kage became part of their portfolio as well.

3mensio Structural Heart™ Aortic Valve is CT planning and sizing software for trans-aortic valve replacements (TAVR) and is used worldwide. The software has the unique ability to make high complicated medical imaging accessible for a large group pro-fessionals, like interventional cardiologists, radiolologists and field specialists of medical device companies.

What are the features that make it a unique tool for preoperative planning? Why would a cardiologist/imager use your software while there are open-source solutions out there?

Minimally invasive transcatheter mitral valve implantation (TMVI) strongly relies on pre-procedural imaging. Therefore the assessment of mitral annular dimensions by cross-sectional imaging such as CT is of increasing relevance. Using the extensive experience in pre-planning of TAVR and collaboration with TMVI medical device





Philips Brilliance 64 CT Scanner Product Features

The Philips Brilliance 64 CT scanner is one of the most adanced, powerful and versatile systems on the market today. With 64-channel configuration, this system is capable of handling cardiac, trauma, pulmonary and pediatric imaging applications to name just a few.

- MRC X-ray tube
- DoseWise design
- 40mm coverage
- 3-D cone beam reconstruction
- Spiral Groove Bearing
- NanoPanel tile detectors

companies, 3mensio has developed a dedicated workflow for pre-procedural planning for TMVI. Over the years 3mensio developed a reproducible tracing method resulting in a 3-dimensional saddleshaped mitral annulus.

This annulus can be used for visualization and automatically calculates important mitral annular parameters. Alternative models for sizing the mitral annulus, such as the D-shape proposed in the literature, are also included in the software.



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"WE CHOSE TO PARTNER UP WITH IMMR BECAUSE THEY ARE INVOLVED IN THE EVALUATION AND ASSESSMENT OF UPCOMING DEVICES."

Another important aspect to take into account for patient and device selection is the possibility of LVOT obstruction. 3mensio allows to assess possible obstruction via implementing a virtual device and automatic calculation of the aortic-mitral angle. Using the virtual device a simulation of any heart valve device can be performed, and a "neo-LVOT" can be determined.

Pre-procedurally assessment of a suitable C-arm orientation for the mitral annulus is important for optimal placement of the device. The 3mensio pre-planning tool has the option to overlay the mitral annulus onto a virtual angio to assess possible optimal C-arm angles.

Lastly, the approach route towards the mitral annulus is of great importance when performing a transcatheter mitral procedure. Depending on the device, the maneuverability and size of the catheter and the anatomy or pathophysiology of the patient (e.g. extensive arterial calcification) it can be decided whether the procedure can be performed or not. Access routes can be calculated and visualized using dedicated workflows present in 3mensio. One example is a Septal Crossing workflow that visualizes the access point though septum and calculates the distance and angle towards the mitral annulus. The 3mensio Structural Heart™ platform is now evolving in an all-round pre-planning tool for all transcatheter structural heart procedures.

Why did you choose to partner up with IMMR?

The key to creating intuitive and functional software is a close collaboration with the medical field, like physicians and TMVI companies. We chose to partner up with IMMR because they are involved in the evaluation and assessment of upcoming devices. Through their extensive network we get a better understanding of what is needed on medical imaging analysis. And finally, IMMR can demonstrates the state-of-the-art possibilities of CT analysis to TMVI companies. This is important when they take the next step and go from pre-clinical to the clinical phase.



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