WORKSHOP REPORT: ATHENS, MAY 10TH 2018

Invasive Blood pressure measurement in congenital Heart diseases (CHD): From cathlab to MRI

Organizer: Nano4Imaging, Aachen, Germany
Moderator: Prof. dr. Paul Borm
Speakers:
» Dr Aphrodite Tzifa, Mitera Hospital, Athens, Greece
» Dr. Daniel Tanase, DHZ Munich, Germany
» Dr Vivek Muthurangu, GOSH, London, UK

Abstract
On May 10th 2018, a workshop was organized by Nano4Imaging during the European Pediatric Cardiology meeting (AEPC) in Athens (Greece). During the meeting some of our clinical users shared their experience and vision regarding MRI guided procedures to an audience of more than 45 interested pediatric cardiologists. All speakers sent out the message that after more then 15 years of complicated start-up in hybrid scanner environment, their centers have now made this happen with simple tools in a normal CMR environment. Acquisition of accurate flow data from MRI combined with simultaneous pressure measurement provides a robust assessment of patient hemodynamic status. It seems that after two consecutive live-cases on MRI guided caths at SCMR in Washington (2017) and Barcelona (2018) the time seems now ready for use and application in the pediatric community that is the key to this application. The number and variety of participants present at the AEPC workshop showed that awareness is growing, and pediatric cardiologists are now considering this as a next step into better patient care.

Introduction.
Paul Borm, clinical director of N4I, briefly summarized the vision of Nano4Imaging to enable a transfer of invasive diagnostics from this patient group to the MRI. Avoidance of repetitive radiation to a susceptible group, visibility of abnormal structures and combination into functional assessment were specifically mentioned by him and later in the workshop by clinical experts. Borm also disclosed the company's first efforts to move into the interventional field by focusing on dilatation procedures as a next step beyond hemodynamics.

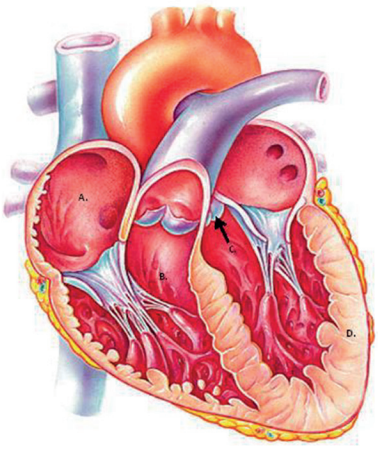
Aphrodite Tzifa (MITERA Hospital, Athens) was one of the first clinicians to do MRI guided procedures while in Evelina's Children's in London (Circ Cardiovasc Interv. 2010 Dec;3(6):585-92). She reconfirmed the absence of radiation and accurate flow data as main reasons to use MRI in pregnancy, congenital cases and pulmonary hypertension. Reviewing the work in London she showed that PVR assessments were performed in 167 studies in 149 congenital heart disease patients by CMR/XMR catheterization. Of those 108 studies were in biventricular circulations and 59 in functionally single ventricles, and 84 patients had a surgical or catheter intervention based on CMR/XMR catheterization findings at a median of 94 days after the study.

Her message to the audience was loud and clear: after initial complicated, hybrid and expensive set-ups we can now do procedures outside the setting of a hybrid XMR suite. MR procedures are extremely important for the management of patients with CHD and pulmonary hypertension. Acquisition of accurate flow data from MRI combined with simultaneous pressure measurement provides a robust assessment of the patient's operability status and type of operation, such as fenestrated defect closure, whilst also guiding the postoperative management in the intensive care unit.

Speaker 1: Dr Aphrodite Tzifa, Mitera Hospital, Athens, Greece

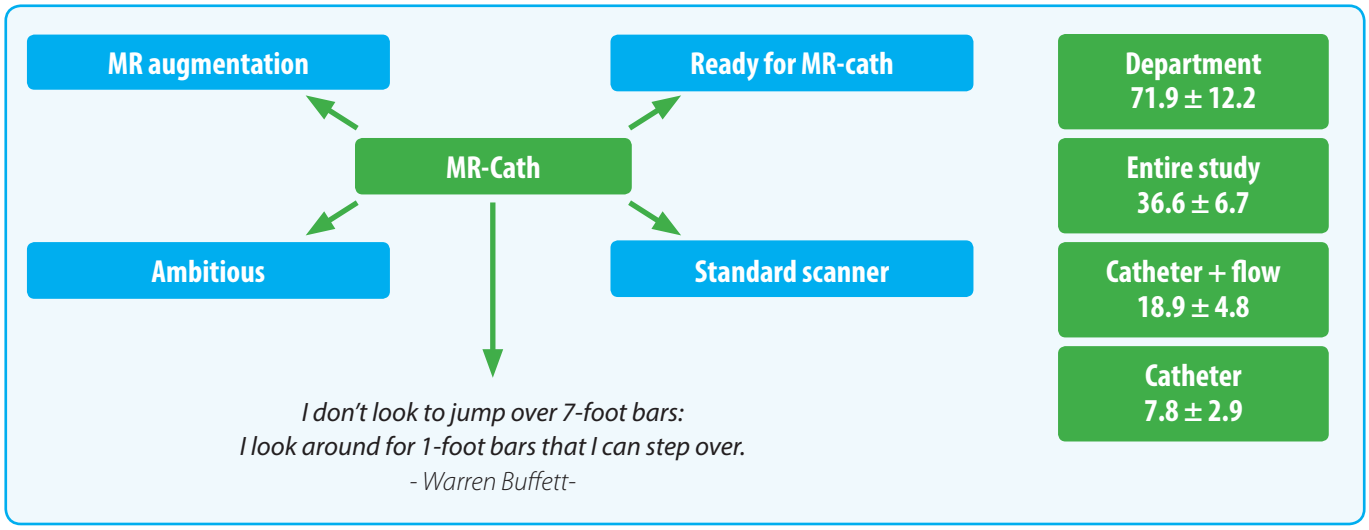
Daniel Tanase from the German Heart Centre in Munich (DHZM) is a typical interventional cardiologist, trained in the cathlab and used to have all tools available for complete procedures in this environment. Dr Tanase recently joined the MRI team at DHZM, which has been a reference site for Nano4Imaging for several years now. Munich has conducted clinical work and was the first to use our guidewire in 2016 and conducted a post-marketing study with our new guidewire in 2017 (see expert report) in 25 patients with structural heart diseases. The Munich approach guided by prof. Peter Ewert has always been pragmatic: MRI should be able to function as a stand-alone cathlab and hybrid suites will only inhibit further routine use. In Munich so far 27 patients have been investigated at a 92 % success rate, and able to reach different targets in the heart to measure hemodynamic properties. Dr Tanase warned that braided catheters cannot be used in MRI, since they usually contain metal. Most wedge balloon catheters have no such braiding. Some Cook and Edwards catheters have an MRI safety label. Munich uses a 1.5 T Siemens system, an In Vivo in room monitor and has now a a beamer and screen installed to allow better vision during intervention. During questions Dr Tanase also entered into an epidemiological study which is being completed at DHZM showed increased cancer risk in patients who underwent cathlab X-ray at young age.

RA 2 pts.
RV 15 pts.
PA 5 pts.
Aortic arch 3 pts.
TCPC 2 pts.



Reached positions:
92% (25/27 patients) successful examination with iMRI

Vivek Muthurangu from University College London(UCL) and Great Ormond Street Hospital (GOSH) has been involved with MR guided cardiac catherization since its inception and authored the first validation study of MR guided right heart catheterization. He reminds the audience that the reason to do MR augmented procedures lies indeed in better structural and functional information at the absence of radiation. However, he also points out that initial work, also involving Aphrodite Tzifa, took several hours per patient when first performed at Guys Hospital. However, in some clinical indications such as PH he shows that current catheter time to measure wedge pressure in the pulmonary artery is around 8 min, while total department time of patients is around 70 min (meaning from coming into department until leaving). The latter example is that of Royal Free Hospital where Dr Dan Knight and interventionalist Dr Gerry Coghlan are now doing adult 3 patients/afternoon and one afternoon per week to screen adult patients to assess PVR. The MR augmented right heart catherization will be routine in this hospital after 50 patients which will be reached by end of 2018. In conclusion, MR catherization may have been ambitious a decade ago, but it is now possible on a standard scanner and making its way into routine hospital care.



Phantom demonstrations.

After the workshop several intervention specialists came up to the booth to have further hands-on experience with our MRI compatible guidewire and some (MR compatible) balloons. The phantom has been proved to be a great demonstration tool, but also vital in making the step from cathlab into MRI. It allows people to practice a virtual procedure in the MRI with both optical and MRI imaging as guidance. With the words of Vivek Muthurangu, simple 1-foot steps are needed to get this going.

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