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IN THIS ISSUE

RT3DTEE-Guided Fluoroless Ablation of Ventricular Tachycardia Arising from the Perimembranous Ventricular Septum

By Harikrishnan K. N. Kurup, MBBS, MD; Bennett P. Samuel, MHA, BSN, RN; Vishal R. Kaley MBBS, MD; Joseph J. Vettukattil MBBS, MD, DNB, CCST, FRCPC, FRSM, FRCP; Christopher Ratnasamy, MD
~Page 1

Archiving Working Group of the International Society for Nomenclature of Pediatric and Congenital Heart Disease: Ebstein's Malformation

Contributors: Jeffrey P. Jacobs, MD; James St. Louis, MD; Jorge M. Giroud, MD; Charles W. Shepard, MD; Allen Everett, MD; Robert H. Anderson, MD; Vera D. Aiello, MD; Diane E. Spicer, BS
~Page 8

Medical News, Products & Information

~Page 13

MEDICAL MEETINGS

52nd Annual Meeting of the AEPC
May 9-12, 2018; Athens, Greece
www.aepc2018.org

International PDA Symposium
May 18-19, 2018; Memphis, TN USA
pdasymposium.org

7th Annual Scientific Sessions of the Cardiac Neurodevelopmental Outcome Collaborative (CNOC)
Jun. 6-8, 2018; Kansas City, MO USA
www.cardiacneuro.org/upcoming/

ASE 2-18 Scientific Sessions
Jun. 22- 26, 2108; Nashville. TN USA

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RT3DTEE-Guided Fluoroless Ablation of Ventricular Tachycardia Arising from the Perimembranous Ventricular Septum

By Harikrishnan K. N. Kurup, MBBS, MD; Bennett P. Samuel, MHA, BSN, RN; Vishal R. Kaley MBBS, MD; Joseph J. Vettukattil MBBS, MD, DNB, CCST, FRCPC, FRSM, FRCP; Christopher Ratnasamy, MD

Abstract presented at poster session of the 7th World Congress of Pediatric Cardiology & Cardiac Surgery, Barcelona, Spain (July 2017): P1383 – Real Time Three Dimensional Echocardiography guided Electrophysiological Procedures in Pediatric Patients. *Cardiology in the Young*, 2017;27:S199. doi:10.1017/S104795111700110X.

Keywords: Ablation; Echocardiography; Imaging; Mapping; Ventricular tachycardia.

Introduction

Electrophysiological studies and interventions often require access to anatomic locations that are difficult to visualize with conventional imaging methods. Real-time three-dimensional echocardiography (RT3DTEE) has revolutionized interventional procedures by providing accurate visualization of cardiovascular structures. The 3D depth perception offered by RT3DTEE greatly facilitates the intraprocedural guidance of catheters and localization of arrhythmogenic substrates. We discuss the utility of RT3DTEE for guiding catheter ablation of

premature ventricular contractions arising from the perimembranous region of the ventricular septum. The approach to a left ventricular outflow tract focus through the right atrium and left ventricle is also described.

Case Report

A 17-year-old male with history of short episodes of palpitations and occasional dizziness was referred for evaluation of irregular heart beat detected during a routine physical examination. A 12 lead ECG demonstrated monomorphic ventricular arrhythmia (VA) with inferior axis and left bundle branch morphology with transition at leads V2-V3. Lead V1 had a small initial R wave. A 24-hour Holter monitor demonstrated premature ventricular complexes (PVCs) accounting for 29% of the total heart beats. A stress test showed inducible slow ventricular tachycardia reaching a maximum rate of 180 bpm (Figure 1). Structural Heart Disease was ruled out on transthoracic echocardiogram and cardiac magnetic resonance imaging. An ablation procedure was planned due to the symptomatic ventricular tachycardia.

The earliest ventricular electrogram (nearly 30 ms earlier than surface electrogram) was obtained in the superior part of the tricuspid valve annulus along the septal surface very close to the location of the bundle of His (HB). Cryoablation at this site resulted only in acceleration of the ventricular rhythm. During catheter movement it was observed that the

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Potential device-related adverse events that may occur following device implantation include the following: stent fracture, stent fracture resulting in recurrent obstruction, endocarditis, embolization or migration of the device, valvular dysfunction (stenosis or regurgitation), paravalvular leak, valvular thrombosis, pulmonary thromboembolism, hemolysis.

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PVCs were suppressed when the catheter was located on the atrial end of the superior aspect of the tricuspid valve annulus. In this area, there was only a small far-field ventricular electrocardiogram (Figure 2). Cryoablation at that site resulted in acceleration of the ventricular rhythm associated with the termination of the PVCs, but it soon recurred after the cryoablation was stopped. Hence, a decision was made to perform mapping of the ectopic focus from the left side.

The earliest ventricular electrogram was obtained just below the commissure between right and non-coronary aortic cusp. Real-time three-dimensional transesophageal echocardiography (RT3DTEE) (Figure 3; Moving Image 1) in conjunction with 3D electroanatomic mapping (Figure 4) was used to guide the catheter in the aorta and for accurate identification of this site. The ventricular electrogram at this site was also nearly 30 ms prior to the onset of surface electrogram (Figure 2). RT3DTEE confirmed that this location is adjacent to the site of mechanical suppression from the right side. Anatomically, the triangular area just below the right and non-coronary cusps which corresponds to the membranous ventricular septum on the left side lies close to the septal leaflet of tricuspid valve on the right side of the heart, with a portion on the atrial surface.¹ Radiofrequency ablation at that site resulted in acceleration followed by successful elimination of PVCs. No recurrence was noted during follow-up.

Discussion

RT3DTEE has revolutionized interventional procedures by providing accurate visualization of various complex cardiac defects, intraprocedural guidance of catheters and deployment of devices.² Radiofrequency ablation of arrhythmogenic substrates is usually guided by 3D electroanatomic mapping technology and fluoroscopy.³ We demonstrate the utility of RT3DTEE in guiding ablation in an adolescent with PVCs arising from near the perimembranous ventricular septum.

Idiopathic ventricular tachycardia usually originates from specific regions in the heart, including the ventricular outflow tracts, endocavitary structures, and the infra-Hisian conduction system.⁴ Catheter ablation is increasingly being used as the first line therapy for such arrhythmias because of its efficacy.² Detailed knowledge of the arrhythmogenic

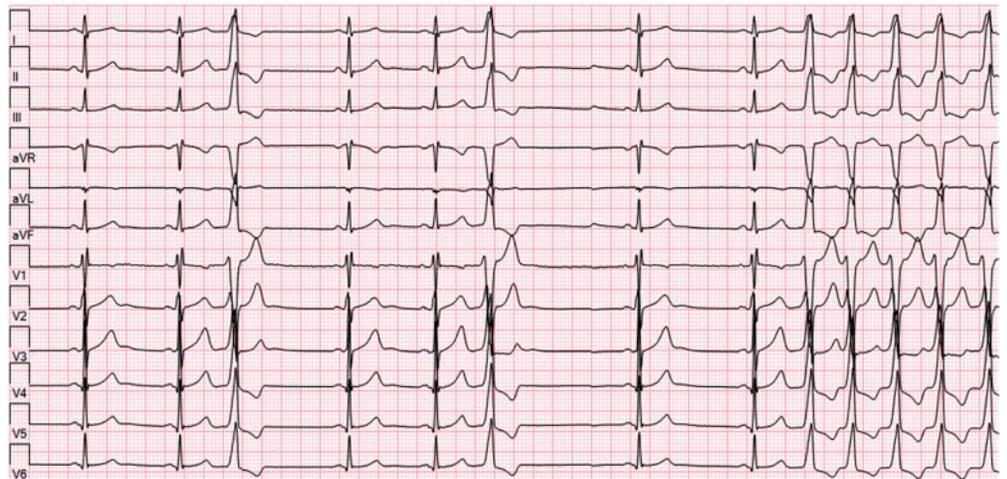


Figure 1. ECG demonstrates PVCs and ventricular tachycardia.

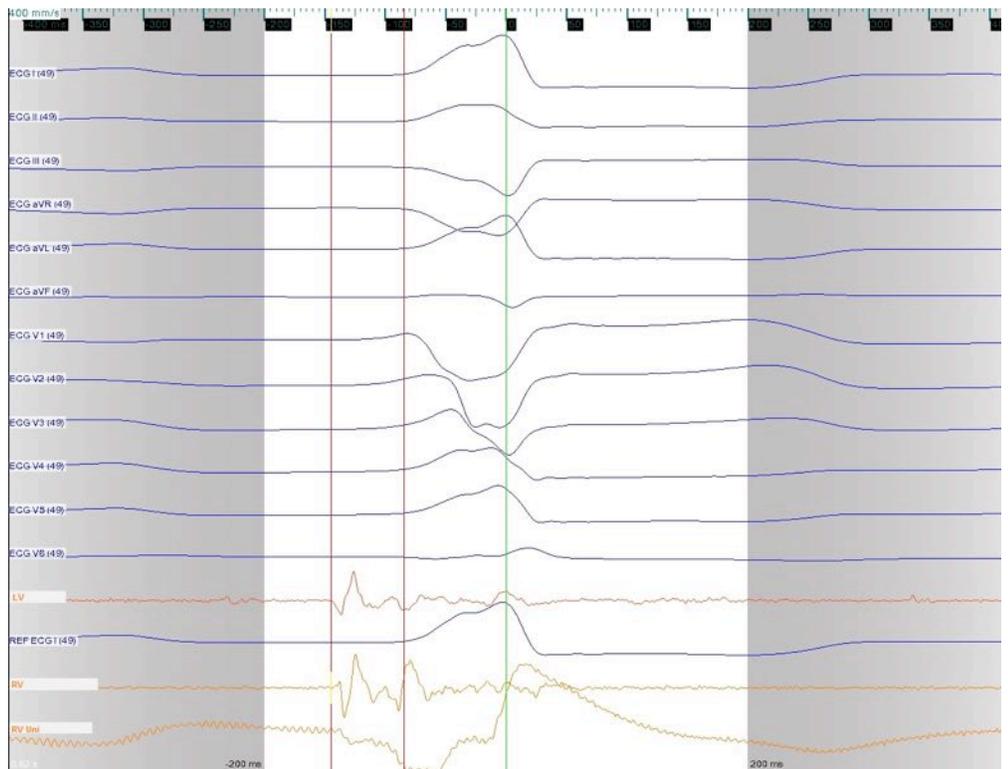


Figure 2. Intracardiac local electrogram from adjacent catheters in the LVOT (LV) and superior tricuspid valve annulus (RV) demonstrates early activation in relation to onset of PVCs in the surface ECG.

myocardial substrates is critical to decide when and how to ablate these arrhythmias. The concept of left ventricle (LV) ostium and an aorto-ventricular membrane covering it, as the site of origin of most VAs, is important for mapping and ablation of these arrhythmias.⁵ Although right ventricular outflow tract is the

most common site of origin of VAs, up to 31% of all VAs and 78% of idiopathic VAs arising from LV originated from the LV ostium.⁶

Advances in imaging modalities and mapping techniques have improved our understanding of the complex anatomic relationships between

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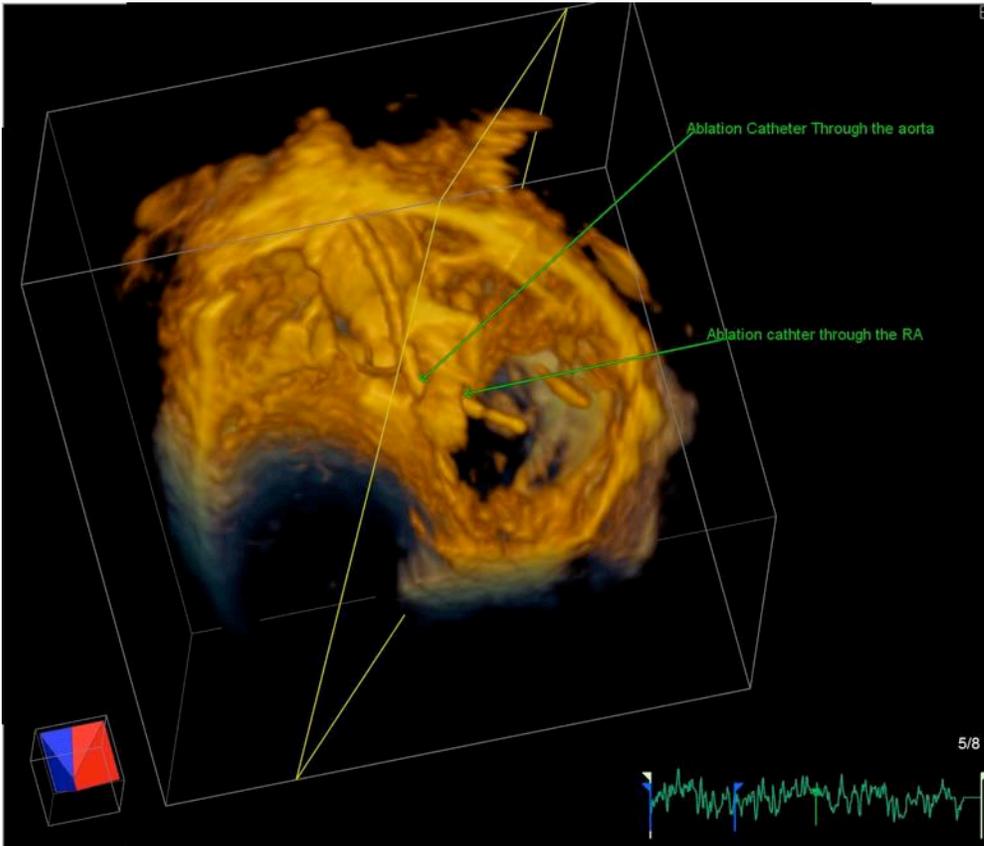


Figure 3. 3DTEE image during ablation confirming the location of the two catheters in adjacent positions in right atrium and LVOT.

Moving Image 1. RT3DTEE during ablation confirming the location of the two catheters in adjacent positions in the right atrium and LVOT.

View this moving image at: <http://www.CongenitalCardiology.com/MovingImage1.mov>

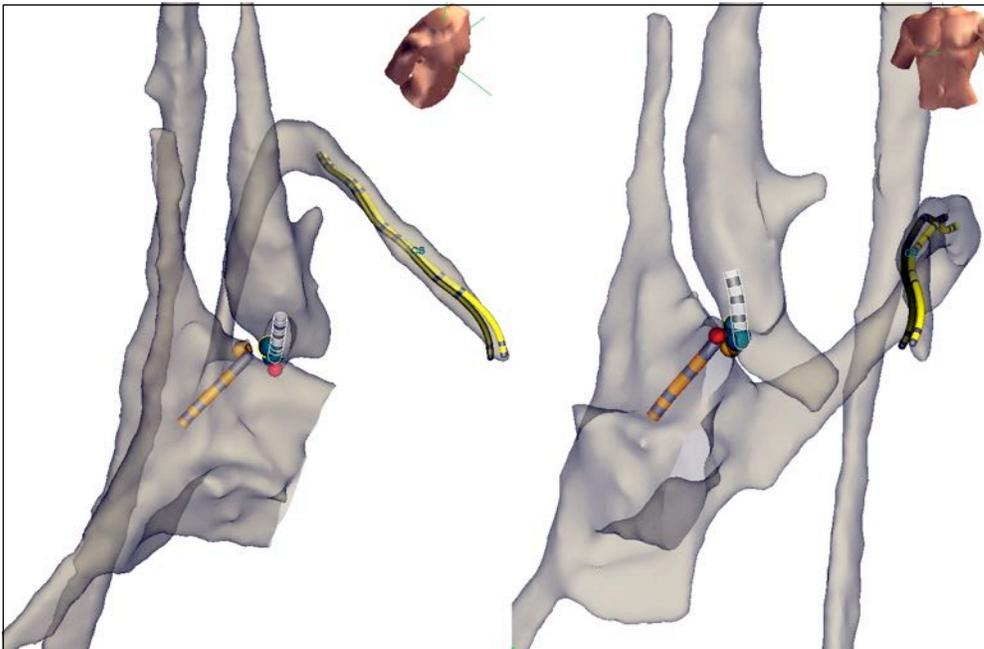


Figure 4. 3D electroanatomic mapping shows ablation catheter in the LVOT and another catheter in the superior tricuspid valve annulus adjacent to each other with green lesions placed from the left side and the yellow lesions placed from the right side. The red dot marks the location of the bundle of His.

ventricular outflow tracts and the adjacent vital structures. Conventionally, ablation techniques utilize electroanatomic mapping combined with intracardiac echocardiography for accurate localization of ablation sites. The PVCs in our patient were mapped to the left ventricular outflow tract (LVOT) area just beneath the junction of right and non-coronary aortic cusps, where the membranous interventricular septum is located. The junction of the valvar attachments of the right and non-coronary leaflets is slightly above the junction of the valvar attachments of the septal and anterior leaflets of the tricuspid valve.³ The membranous septum is divided into the atrioventricular and interventricular components by the hinge-line of the tricuspid valvar attachment. It is the atrioventricular component of the membranous septum where the HB penetrates the left ventricle. Access to this site and visualization of the ablation catheter can be difficult and challenging. The focus of arrhythmia in our patient was in the perimembranous septum. Ablation of this site was successful after ablation from both the right and left sides. This was accurately guided by RT3DTEE. Visualization of both the catheters in the right atrium and the LV OT lying side-by-side at the site of ablation can be accurately made possible only with an imaging modality that allows depth perception.

There are a lot of potential complications with ablation at this site because of the proximity to the coronary arteries, HB and the valvular structures. The enhanced visualization of the catheters and real time depiction of the relationship between structures by RT3DTEE can facilitate the procedure. Potential complications like aortic regurgitation and perforation of the valvar leaflets can also be avoided.

Conclusion

We demonstrate the use of RT3DTEE for guiding and confirming ablation in an area difficult to image with conventional imaging modalities in our patient. The enhanced visualization of the perimembranous Ventricular Septal Defect (VSD) and adjacent structures provided by 3D echocardiography has been shown to closely resemble intraoperative findings during repair of such defects.⁷ RT3DTEE also has the potential to reduce the procedure time and radiation exposure and enhance optimal outcomes in ablation procedures in Complex Congenital Heart Disease.⁸

The authors have no financial relationships or conflicts of interest relevant to this article to disclose.

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International Paediatric and Congenital Cardiac Code (IPCCC): 06.01.34

AEPC Derived Terms: Ebstein's malformation of the Tricuspid Valve

EACTS-STC Derived Terms: Tricuspid Valve Disease, Ebstein's Anomaly

ICD11 Derived Terms: Ebstein malformation of the Tricuspid Valve

Commentary

The figures presented here illustrate the major morphological features of Ebstein's in malformation of the tricuspid valve, both in anatomical specimens and in magnetic resonance imaging. The key for diagnosis is the apical and rotational displacement of the septal and mural (inferior) leaflets' insertion, away from the atrioventricular junction. In contrast, the anterosuperior leaflet is usually redundant and retains its annular insertion (Figures 1, 2 and 3). The distinction between the anterosuperior and the mural leaflets is not so easy to determine, and in most cases, they appear combined as a curtain and the valve is bifoliate. Additional features include: variable degrees of leaflet dysplasia, with short and abnormally attached cords, obliteration of the intercords spaces and irregular thickening. Complete understanding of the malformation requires recognition that the functional tricuspid orifice is displaced anteriorly inside the right ventricle, towards the transition between the inlet and the

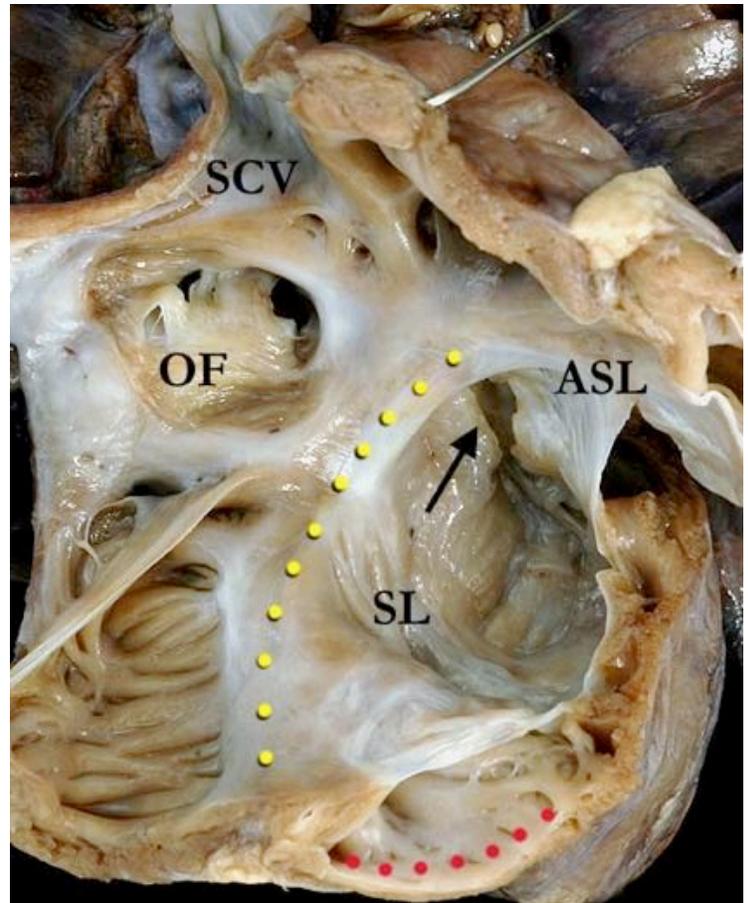


Figure 1.
Modality: Anatomic specimen
Orientation: Right lateral view
Description: This figure illustrates the right ventricle opened to show the rotational displacement of the septal (SL) and mural leaflets of the tricuspid valve from the inner curve of the heart. The yellow dots illustrate where the tricuspid valve annulus should be. The red dots outline the atrialised portion of the right ventricle. The majority of the septal and mural leaflets of the tricuspid valve are adherent to the septal surface of the right ventricle. The anterior superior leaflet (ASL) has been partially cut and is sail-like. The black arrow illustrates the 'keyhole' outlet to the pulmonary outflow. (SCV=superior caval vein, OF=oval fossa)
Contributor: Diane Spicer, BS
Institution: Johns Hopkins All Children's Hospital, St. Petersburg, FL

“Complete understanding of the malformation requires recognition that the functional tricuspid orifice is displaced anteriorly inside the right ventricle, towards the transition between the inlet and the apical trabecular portion (Figures 4 and 5). In some severe cases, the functional orifice may open at the ventricular outlet.^{1,2}”

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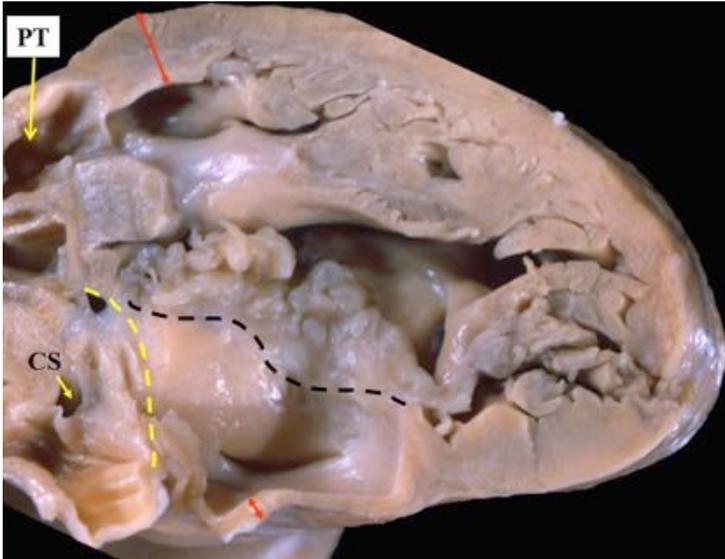


Figure 2. Modality: Anatomic specimen
 Orientation: "En face" view of the right ventricular aspect of the septum
 Description: In this heart specimen the right ventricular free wall was resected to show the atrioventricular transition and the displaced insertion of the septal tricuspid leaflet towards the apex of the ventricle (black dashed line). The yellow dashed line marks the site of the atrioventricular junction. The double-headed red arrows show the myocardial thickness at the inlet and outlet portions of the right ventricle. CS- coronary sinus
 Contributor: Vera D. Aiello
 Institution and Image Source: Heart Institute (InCor), University of São Paulo School of Medicine, Brazil

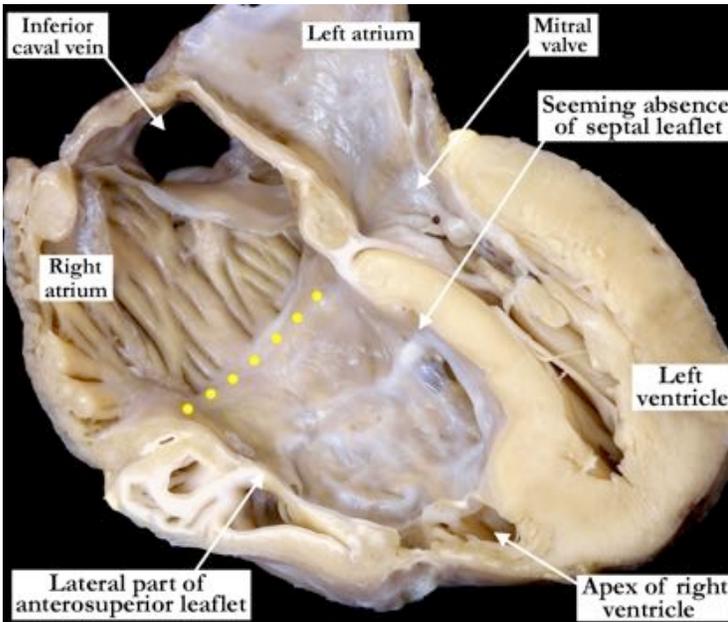


Figure 3.
 Modality: Anatomic specimen
 Orientation: Four-chamber view section
 Description: This section of a heart with Ebstein's malformation shows rotational displacement of the tricuspid valve insertion towards the right ventricular apex, and away from the atrioventricular junction (yellow dots). This projection simulates an echocardiographic view where the septal leaflet seems absent.
 Contributor: Diane E. Spicer
 Institution: Van Mierop Cardiac Archive, University of Florida, Gainesville, FL.

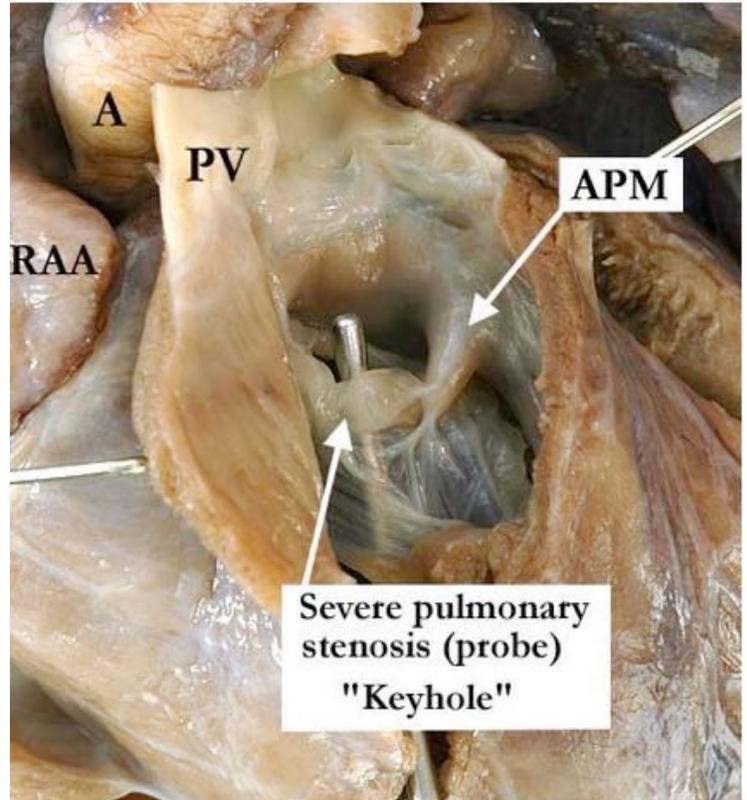


Figure 4.
 Modality: Anatomic specimen
 Orientation: Anterior view
 Description: This figure demonstrates the pulmonary outflow of the heart shown in Figure 1, illustrating the 'keyhole' opening of the valvar orifice towards the pulmonary trunk. The probe extends through this opening; the tricuspid valve slightly thickened in this area. There is an aberrant papillary muscle (APM) supporting this portion of the tricuspid valve.
 Contributor: Diane Spicer, BS
 Institution: Johns Hopkins All Children's Hospital, St. Petersburg, FL

“Ebstein’s malformation occurs frequently in association with discordant atrioventricular connections in the left-sided morphologically tricuspid valve and, since the Most common type of ventriculo-arterial connections in such hearts is also discordant, the tricuspid valve is the systemic one, leading to heart failure and chronic lung congestion.”

apical trabecular portion (Figures 4 and 5). In some severe cases, the functional orifice may open at the ventricular outlet.^{1,2} The pattern of cordal attachment is also highly variable, with tethering, linear or hyphenated attachments, leading to restriction in the leaflet motion. The commonest type of valvar dysfunction is insufficiency, but some combined morphological features may also result in valve stenosis or double dysfunction.

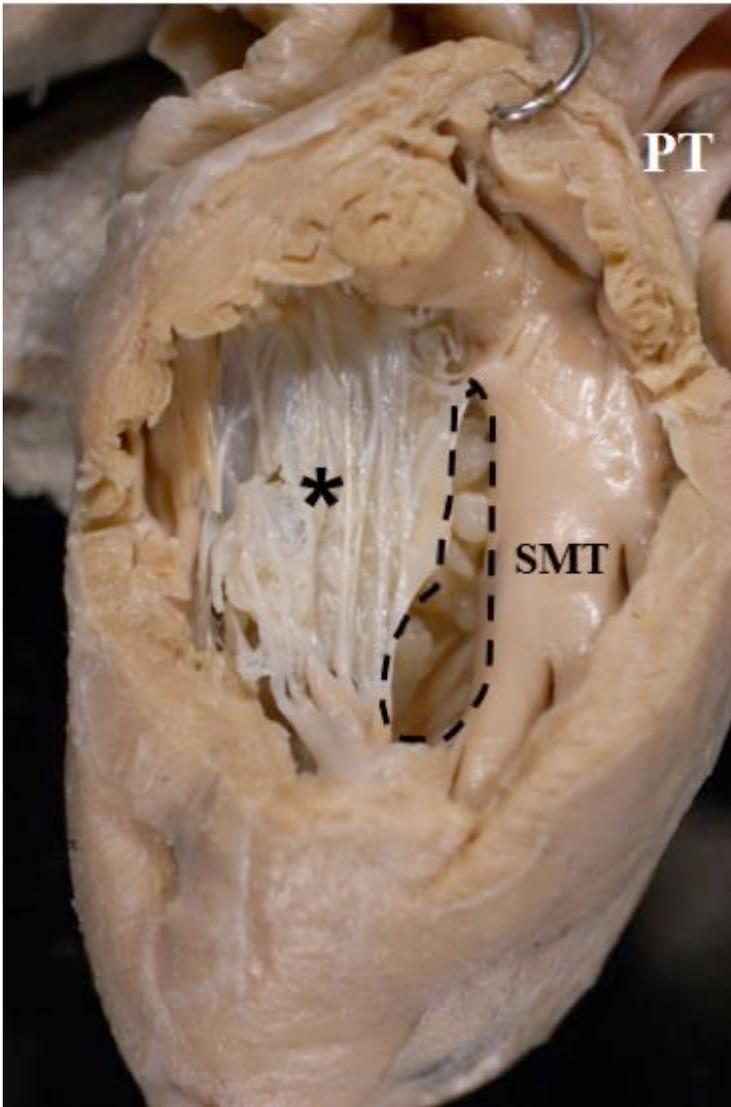


Figure 5.
 Modality: Anatomic specimen
 Orientation: Right anterior view, opened right ventricle
 Description: The figure illustrates the curtain-like appearance of the anterosuperior tricuspid leaflet (*) in Ebstein's malformation, as viewed from the right ventricular outflow tract. The effective valvar orifice (dotted line) opens to the outlet, and is partially bordered by the septomarginal trabeculation (SMT). Note also the abnormal anterior papillary muscle of the right ventricle, where the leaflet adheres by means of very short cords. PT- pulmonary trunk
 Contributor: Vera D. Aiello
 Institution and Image Source: Heart Institute (InCor), University of São Paulo School of Medicine, Brazil

As a consequence of the valvar orifice displacement, the right ventricular inlet component becomes a functional part of the right atrium, usually named as "atrialised portion of the right ventricle" and the inlet myocardial wall at this point is considerably thinned.

Ebstein's malformation occurs frequently in association with discordant atrioventricular connections in the left-sided morphologically tricuspid valve and, since the most common type of ventriculo-arterial connections in such hearts is also discordant, the tricuspid valve is the systemic one, leading to heart failure and chronic lung congestion. In the setting of discordant atrioventricular connections, however, the thinning of the atrialised inlet is much less marked. That is why the valvar abnormality is often described as "Ebsteinoid", rather than true Ebstein's malformation (Figure 6).

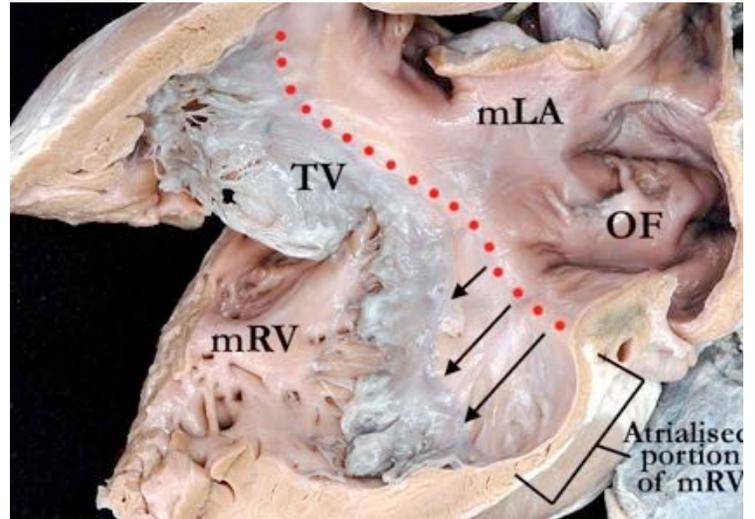


Figure 6.
 Modality: Anatomic specimen
 Orientation: Left posterior view
 Description: This anatomic view of the left side of the heart with congenitally corrected transposition demonstrates the discordant atrioventricular connection. The morphologically left atrium (mLA) is connected to the morphologically right ventricle (mRV) on the left side of the heart with the tricuspid valve (TV) in the inlet portion. The left-sided, morphologically tricuspid valve exhibits an Ebstein malformation (arrows) that is sometimes associated with congenitally corrected transposition. There is atrialization of the left-sided morphologically right ventricle. (OF- oval fossa)
 Contributor: Diane Spicer, BS
 Institution: Van Mierop Cardiac Archive, University of Florida, Gainesville, FL

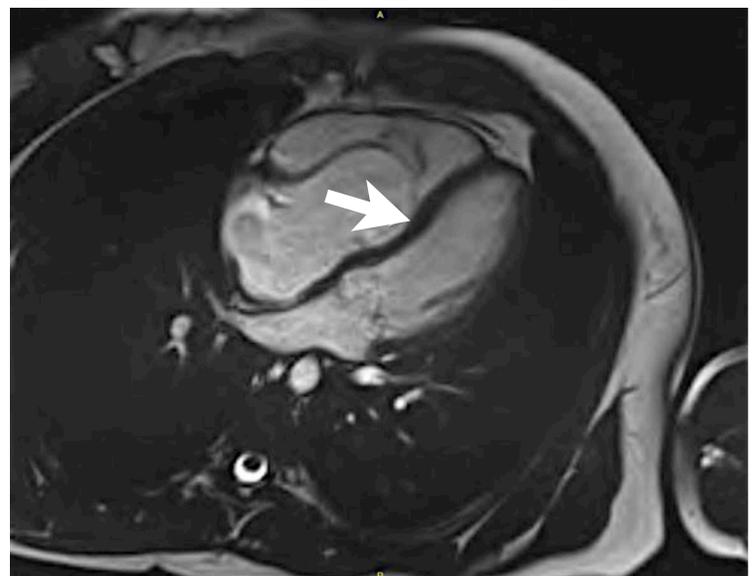


Figure 7.
 Modality: Magnetic Resonance Image
 Orientation: Four-chamber section
 Description: This image demonstrates the apical displacement of the septal leaflet of the tricuspid valve (arrow) with a displacement index of 20 mm/m² consistent with Ebstein malformation of the tricuspid valve.
 Contributor: Charles W. Shepard
 Institution: Minneapolis Heart Institute, Abbott Northwestern Hospital

Echocardiographic and Magnetic Resonance Imaging (Figure 7) diagnosis of Ebstein's malformation relies on the finding of an exaggerated offsetting between the hinges of the atrioventricular valves in the four-chamber view. Measurement of the distance between the hinge points can be divided by the body surface area, providing the so-called "displacement index" which, when greater than 8mm/m² indicates the presence of Ebstein's malformation.

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Medical News, Products & Information

Compiled and Reviewed by Kate Baldwin, Special Projects Editor

Abbott Initiates Groundbreaking Study to Assess Superiority of High-Resolution Imaging Versus Standard-of-Care Angiography in Treating Coronary Artery Disease

PRNewswire/ -- On April 11th, Abbott announced the initiation of a clinical trial evaluating long-term outcomes of patients who undergo stent implantation guided by high-resolution light-based imaging technology—called Optical Coherence Tomography (OCT)—compared to a common X-ray-guided technique called angiography. The trial (ILUMIEN IV) is the first large-scale randomized global study using Abbott's OCT imaging in patients with high-risk, complex coronary artery disease. Patients in the study will be randomized to either OCT-guided or traditional angiography to guide placement of one or more XIENCE everolimus-eluting coronary stents.

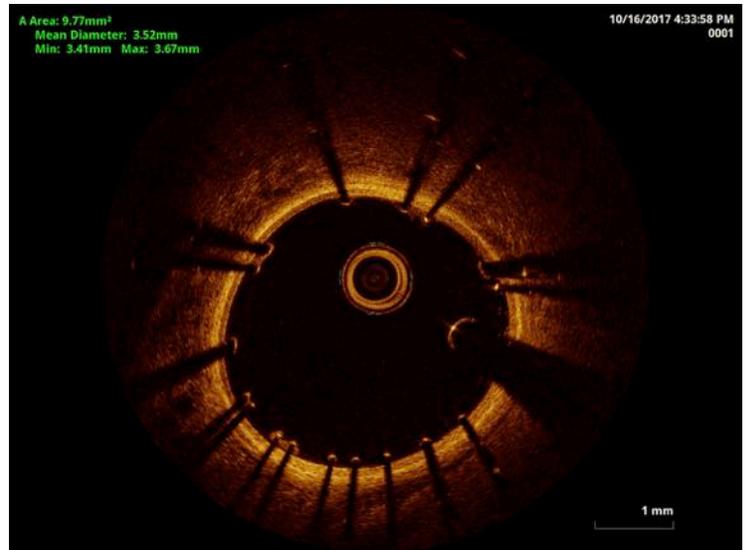
The first patient was enrolled by Franco Fabbiocchi, MD, Director of Invasive Cardiology Unit IV at IRCCS Centro Cardiologico Monzino in Milan, Italy.

During stent implantation guided by one of Abbott's OCT platforms, physicians used high-resolution images taken directly inside the patient's vessels to accurately measure dimension and choose a stent that best fits the vessel. OCT is also used to help physicians ensure the stent is fully expanded and is flush against a vessel wall, which are both important factors in reducing stent failure.^{1,2}

The ILUMIEN IV trial will enroll up to 3,650 patients with high-risk, complex disease at 125 centers in North America, Europe and Asia to determine if OCT-guided stent procedures result in larger vessel diameters — thus, allowing increased blood flow — and whether this will improve clinical outcomes for patients compared to stent procedures guided by angiography. Patients with complex disease may have multiple, or totally blocked arteries, or other diseases such as diabetes; and these patients account for an increasing number of cases.

"Today, most of the world uses angiography for stent implantation using a two-dimensional view of the coronary artery to assess a complex three-dimensional structure. Physicians need new technology to help optimize percutaneous coronary intervention, and OCT provides just that, the ability to look at the artery from the outside-in and the inside-out," said Ziad A. Ali, MD, Director of Intravascular Imaging and Physiology at Columbia University Medical Center's Center for Interventional Vascular Therapy and co-principal investigator of the study. "I'm confident this technology will have a positive impact on clinical practice around the world and we hope to provide evidence for leading medical organizations to update clinical guidelines for stent implantation based on the results of this study."

"Abbott is committed to providing doctors and patients with life-changing technology, and there is a growing body of evidence that OCT-guided stent implantation may result in better outcomes for patients," said Charles Simonton, MD, Chief Medical Officer and Divisional VP of Medical Affairs for Abbott's Vascular Business. "We're excited to initiate this trial to generate the groundbreaking



data that would support use of OCT over angiography to achieve better outcomes for patients with high-risk disease."

The ILUMIEN IV trial's focus on high-risk patients will build on findings from the previous ILUMIEN series of trials which showed stent procedures using OCT imaging resulted in superior stent expansion and greater rates of procedural success compared to angiography, and non-inferiority to intravascular ultrasound (IVUS) in post-procedure minimal stent area (MSA).³ Those trials also showed that use of the OCT high-resolution imaging enabled physicians to better detect damage to artery walls, called dissection, which sometimes happens during the placement of a stent compared to IVUS or angiography, which could then be repaired as necessary.⁴

ILUMIEN IV is a prospective, single-blind, multi-center, randomized study that will evaluate OCT-guided vs. angiography-guided coronary stent procedures in complex and high-risk patients. The primary endpoints are superiority of OCT-guided vs. angiography-guided stent implantation in achieving a larger vessel opening (post procedural lumen dimension) and improved clinical cardiovascular outcomes out to two years, defined by target vessel failure (a composite endpoint of cardiac death, target vessel myocardial infarction and ischemia-driven target vessel revascularization).

The study is:

- Largest-ever randomized trial to evaluate superiority of light-based, three-dimensional imaging (optical coherence tomography (OCT)) versus X-ray-based angiography in patients with complex coronary artery disease who receive a stent.
- Trial will assess if stent procedures guided by high-resolution imaging result in larger vessel diameters and improved patient clinical outcomes versus stent procedures that use standard-of-care imaging
- Use of OCT imaging may help doctors be more precise in stent implantation.

OCT is an intravascular imaging platform that uses light-based technology to help doctors see and measure arteries from inside the

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vessel with high precision. Physicians can assess and understand the degree of disease and take necessary steps to treat it. With automated, highly accurate measurements, OCT guides stent selection, placement and deployment.

For U.S. Important Safety Information, visit: <https://www.vascular.abbott/content/dam/bss/divisionalsites/av/products/optis-integrated-and-mobile-software-isi.pdf>.

XIENCE first received CE Mark in 2006 and FDA approval in 2008. Its safety profile is unprecedented with consistent low rates of stent thrombosis, even in complex cases. A special coating on XIENCE interacts with proteins in the blood to reduce the risk for blood clots in the stent. For more information, visit www.XienceStent.com/US.

For U.S. Important Safety Information, visit: <https://vascular.abbott.com/Xience-Stent-Safety.html#isi>

For more information about Abbott: www.abbott.com

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FDA Approves GORE® CARDIOFORM Septal Occluder for PFO Closure to Prevent Recurrent Ischemic Stroke

Following the unprecedented Gore REDUCE Clinical Study conclusion that closure of patent foramen ovale (PFO) can prevent recurrent ischemic strokes, W. L. Gore & Associates, Inc. (Gore) has received approval from the U.S. Food and Drug Administration (FDA) for an expanded indication for its GORE® CARDIOFORM Septal Occluder. The device, already approved for closure of atrial septal defects (ASDs) up to 17 mm, is now also approved for the closure of PFO to reduce the risk of recurrent ischemic stroke in certain patients.*

"The FDA approval of the GORE CARDIOFORM Septal Occluder for PFO closure marks a significant milestone in the long journey to confirm the heart-brain relationship connecting PFO and stroke," said John Rhodes, MD, Medical University of South

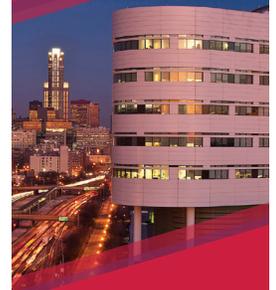
Carolina, and U.S. Interventional Cardiologist National Principal Investigator for the REDUCE Study. "The soft and conformable design of Gore's device is ideal for providing long-term repair of PFOs of any shunt size. I am pleased that a device I have grown to trust for ASD closure is now FDA approved for PFO closure as well. I am also impressed with the rate of serious adverse events in the REDUCE Study, which showed no significant difference in risk between closure and medical therapy alone. The clear reduction in recurrent ischemic stroke provided by PFO closure far outweighs the low risk of serious adverse events."

The expanded FDA indication was supported by the REDUCE Study, the first and only study to demonstrate that closure of PFO can significantly prevent recurrent ischemic strokes, regardless of PFO anatomy. The results were published in the September 2017 *New England Journal of Medicine*, and was presented at the *European Stroke Organisation Conference (ESOC)* last May.

"The groundbreaking results of the REDUCE Study changed the neurology community's perspective on PFO closure when they were announced," said Scott Kasner, MD, Neurologist in the Perelman School of Medicine at the University of Pennsylvania, and U.S. Neurology National Principal Investigator for the REDUCE Study. "The REDUCE Study was the first U.S. Investigational Device Exemption (IDE) study to show a statistically significant reduction in stroke recurrence in the primary intent-to-treat analysis. It was also the first study to show PFO closure reduces new brain infarct. I am excited that the GORE CARDIOFORM Septal Occluder is now FDA approved for PFO closure and believe these data prove the value of closing PFOs to prevent recurrent ischemic stroke when utilized in an appropriate patient population."

The REDUCE Study is the only PFO U.S. IDE study to meet its primary endpoint in the primary intent-to-treat analysis. Results showed a statistically significant, 77%, reduction in recurrent ischemic stroke in patients who underwent PFO closure with a Gore device in conjunction with antiplatelet therapy, versus those who underwent antiplatelet therapy alone, after an average of 3.4 years of follow-up. The study also met its other primary endpoint of reduction of new brain infarct, inclusive of clinically evident and clinically silent brain infarct, through PFO closure, yielding a 49% relative risk reduction.

"With the FDA approval of the GORE CARDIOFORM Septal Occluder for PFO closure, we can now provide physicians with one device that can be used for both ASDs and PFOs," said David Abeyta, Leader of the Gore Medical Products Division. "The value of closing PFOs has historically been debated, mainly due to a lack of sufficient data. We are enthusiastic that our positive REDUCE Study results allowed us to obtain an expanded FDA indication for this device and strongly believe the data show this is a prevention strategy for reducing the risk of recurrent ischemic stroke in patients with a PFO."



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The catheter-delivered GORE CARDIOFORM Septal Occluder* leverages Gore's more than 15 years of experience in endovascular structural heart devices and more than 35,000 occluder implants worldwide. It comprises two independent conformable discs that span and cover the heart's anatomy to close defects. Gore's proprietary ePTFE film covers the minimal wire frame, which provides optimal apposition to surrounding anatomy and enables rapid tissue ingrowth for immediate closure and lasting long-term performance.

**For complete indications and other important safety information for Gore commercial products referenced herein, refer to the applicable Instructions for Use (IFU).*

In the U.S., stroke is the leading preventable cause of long-term severe disability and the fifth-leading cause of death. One third of ischemic strokes are cryptogenic, or due to unknown cause. Most people with a PFO — a hole occurring in the upper wall between the left and right atria of the heart — do not experience any issues when blood flows from one atrium to the other; however, serious problems such as stroke can arise if a blood clot passes from the right to left atria through a PFO and then to the brain. Studies have shown that PFO can be found in up to 40% to 50% of patients who have had a cryptogenic stroke.

Gore builds on its legacy of improving patient outcomes through research, education and quality initiatives. Product performance, ease of use and quality of service provide sustainable cost savings for physicians, hospitals and insurers. Gore is joined in service with clinicians and through this collaboration we are improving lives. www.goremedical.com.

New MRI Technology Could Help Doctors Detect Heart Disease, Other Inflammatory Diseases with Better Accuracy

Newswise — Doctors might be able to better detect any disease or disorder that involves inflammation thanks to a new MRI imaging technology co-developed by faculty at Binghamton University, State University of New York. Amber Doiron, Research Assistant Professor in the Biomedical Engineering Department at Binghamton University, along with a fellow researcher at Temple University, has developed a new MRI imaging technology that, when injected, could help doctors detect inflammation in the body that is indicative of heart disease.

"Doctors use factors like blood pressure and cholesterol level to get an idea of a patient's risk. Then they use plaque size as a general measure of whether a person has the disease," said Doiron. "But there's a fairly poor correlation between plaque size and heart attack or stroke." "We created a nanoparticle-based contrast agent for MRI," added Doiron. "It can theoretically be injected and, when

activated, we can actually see areas of inflammation on the MRI scan."

Being able to detect inflammation is how Doiron's study will help doctors predict the effects of heart disease with better accuracy. However, the nanoparticle can also be used to pick up other types of inflammation throughout the body. Inflammation is a common factor in many other diseases, so potentially, "any inflammatory disease could be detected in this way," said Doiron.

The list of diseases or disorders related to inflammation is a long one. It includes common ones like allergies and asthma, as well as the more complex like hepatitis and transplant rejection. With continued research, this study could help doctors detect inflammatory diseases sooner and pinpoint where the inflammation is in the body via the MRI scan, said Doiron. Doiron and her collaborator received a two-year, \$418,000 grant from the National Institute of Biomedical Imaging and Bioengineering to support this research.

The study, "Activatable interpolymer complex-superparamagnetic iron oxide nanoparticles as magnetic resonance contrast agents sensitive to oxidative stress," was published in *Colloids and Surfaces B: Biointerfaces*.

The Children's Cardiomyopathy Foundation Announces the Availability of One-Year Research Grants for Studies Focused on All Forms of Pediatric Cardiomyopathy

The Children's Cardiomyopathy Foundation (CCF) is pleased to announce the availability of one-year research grants for studies focused on all forms of pediatric cardiomyopathy (Dilated, Hypertrophic, Restrictive, Left Ventricular Non-Compaction, or Arrhythmogenic Right Ventricular Cardiomyopathy).

CCF's research grant program aims to advance medical knowledge on the causes and mechanism of pediatric cardiomyopathy and to develop diagnostic guidelines and targeted therapies.

Eligibility: Principal investigators must hold an MD, PhD or equivalent degree, reside in the United States or Canada, and have a faculty appointment at an accredited U.S. or Canadian institution.

Funding: US \$25,000 to US \$50,000 for one year of total direct costs.

Application Process: CCF requires a letter of intent in advance of the grant application. *The 2018 deadline is Wednesday, June 13, 2018 by 5:00 pm eastern standard time.* Only investigators who have submitted a letter of intent and have been invited to submit a

formal grant application will be considered for CCF funding.

Visit Children's Cardiomyopathy Foundation www.childrenscardiomyopathy.org for application guidelines, and to view past grant awards (click on Research/Grants & Awards).

For more information, contact Lisa Yue, CCF's Founding Executive Director, at lyue@childrenscardiomyopathy.org.

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² "The Nit-Occlud® Lê VSD Registry", publication in preparation.