2nd World Congress on CARDIOLOGY

July 23-24, 2018 | Rome, Italy
Introduction: Repaired congenital heart disease (CHD) patients (pts) often develop early heart failure (HF) simply based on anatomy. Although cardiac resynchronization pacing therapy (CRT) may be an effective alternative to heart transplant (HT), published Implant Guidelines, based on ejection fraction (EF) and QRS morphology, do not include pts with CHD or pacemakers. The purpose of this study was to preevaluate CHD pts with HF based on contractility response (dP/dt) to temporary CRT pacing to determine CRT efficacy prior to implant. Acute CRT benefit was defined as a >15% increase in indices over baseline.

Methods: From 1998-2017, 105 CHD pts including repaired tetralogy of Fallot, transposition of the great arteries, single ventricle, and septal defects, were considered for HT (NYHA 3-4). Of these, 40 (mean age 22y, 27/40 with preexisting pacemakers ) agreed to temporary CRT pacing with contractility measurements. Based on dP/dt response, pts either did or did not receive CRT. All pts were followed from 0.3-12 years (mean 4.5).

Results: Of 40 pts, 26 (62%) had a positive response (mean dP/dt 597 improved to 848mmHg-sec, p<0.006) and received CRT implant. During follow-up (mean 5.3 years), all initially improved in NYHA class and HF symptoms. Of these pts, 4 underwent eventual HT (mean 4.7 years later), 4 died (2 noncompliance (NC), 1 gunshot) and 18 remain clinically stable (NYHA class 1-3), off the HT list (repeat dP/dt mean 843mmHg-sec). Of the 14 pts with a negative acute CRT response (mean dP/dt 635 vs 662mmHg-sec, p=NS), during followup (mean 3.5 years), 2 underwent HT (mean 1 year later), 6 died awaiting HT (3 NC), and 6 remain on the HT list (NYHA 3-4), dededelay need for HT.

Biography
Peter P. Karpawich, MSc, MD, underwent medical training at Hahnemann/Drexel University (Philadelphia), followed by Pediatric Residency at the University of Texas (Dallas) and Cardiology Fellowship at Baylor University (Houston). He holds the academic rank of Professor at Wayne State University School of Medicine and is the Director of Cardiac Electrophysiology Services at The Children’s Hospital of Michigan, Detroit, USA. He has authored/coauthored over 250 scientific publications, as well as 2 textbooks and 11 textbook chapters on cardiac electrophysiology, adult congenital heart diseases and cardiac device therapies. Dr Karpawich currently serves as Editor and is on the Editorial Boards of several internationally-recognized cardiac journals and is routinely asked to review scientific manuscripts for publication. He is a Fellow of the American College of Cardiology, American Heart Association, Heart Rhythm Society and the American Academy of Pediatrics.
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THE ROLE OF LYMPHSTASIS IN ATHEROGENESIS

Gerald M. Lemole
USA

The cardiac lymphatics are responsible for the transport of all the lipoproteins and cholesterol from the extravascular myocardial tissue, although little is known about the filtration and lymphatic clearance of the coronary artery wall. It is postulated that a critical factor in the genesis of arteriosclerosis is lymphstasis, which adequately explains the positive correlation with the known risk factors for coronary artery disease and the negative correlation with high-density lipoproteins. Further research is necessary in this little-known area to better understand the etiology of atherosclerosis.

Gerald M. Lemole, MD served as Chief of Cardiovascular Surgery at Christiana Care Health Services from 1986 through 2006. Subsequently, he served as the Medical Director for the Center of Integrative Health at The Preventive Medicine and Rehabilitation Institute. Dr. Lemole received his undergraduate degree from Villanova and doctor of medicine degree from Temple University School of Medicine. After a residency in general surgery at Temple University Hospital, he did his cardiac training at Baylor College of Medicine in Houston, Texas, from 1967 to 1969. While at Baylor, Dr. Lemole became certified by the American Board of Surgery and the American Board of Thoracic Surgery and began serving as instructor in surgery. In 1968, he was a member of the surgical team that performed the first successful heart transplant in the United States. Dr. Lemole returned to Philadelphia from Texas in 1969 to serve as an instructor in surgery at Temple. That same year, he performed the first coronary bypass in the tri-state area of Pennsylvania, New Jersey and Delaware. At age 32, he was named Chief of Cardiothoracic Surgery at Temple University. He was Chief of Surgery at Deborah Heart & Lung Center, Brown Mills, NJ from 1972 to 1984. In 1975, at age 38, he became a full professor at Temple, an achievement which also made him one of the youngest full professors of surgery in the United States. In 1982, while visiting Turkey, Dr. Lemole performed that nation’s first coronary artery bypass procedure. His major professional memberships include the Society of Thoracic Surgeons, the Society for Vascular Surgeons, and the American Association for Thoracic Surgery. He is also a member of many societies and associated committees related to his profession. Dr. Lemole has lectured extensively and written numerous articles for professional publications. He has also published three books and is currently working on a book for post-cancer treatments. He has been a visiting professor at the Universities of Dublin and Istanbul, the Military Medical College of Ankara, Allegheny General Hospital, Fentai Heart Institute, Beijing, China, People’s Hospital and 2nd Military Medical University, China, and Columbia Presbyterian University Hospital. He is listed in the publication Who’s Who in the United States and the Marquis Who’s Who Directory of Medical Specialists. He is a past recipient of the American Medical Association Physician’s Recognition Award and numerous other awards.
The Framingham Heart Study has determined that the people who develop some form of clinical atherothrombotic disease differ from those who do not by certain characteristics, not in kind, but rather in degree. This presentation will define the characteristics of the people who developed some form of clinical atherothrombotic disease in my family practice of medicine between 4 November 1974 to 1 January 2018. The population characteristics of 869 individuals with atherothrombotic disease will be described.

Methods: The methodology is by chart review.

Results: The population with atherothrombotic disease can be defined by the triad of cigarette smoking, dyslipidemia, and hypertension. Dyslipidemia is defined in terms of the Cholesterol Retention Fraction [CRF, or (LDL-cholesterol minus HDL cholesterol)/LDL-cholesterol] and hypertension in terms of systolic blood pressure (SBP). A graph is generated with the CRF placed on the ordinate and SBP on the abscissa. The CRF-SBP plots of 83% of all (869) patients with atherothrombotic disease lie above a threshold line with CRF-SBP loci of (0.74,100) and (0.49,140) based on the precipitation method of HDL-cholesterol measurement but (0.62,100) and (0.40,140) if the enzymatic method is used. Of the patients with atherothrombotic disease whose CRF-SBP plots lie below the threshold line, most are cigarette smokers. Only 6% (52/869) of atherothrombotic disease patients have never smoked cigarettes and have CRF-SBP plots below the threshold line—and their average of atherothrombotic disease onset is 72 years. An alternate method of examining these patients is to group the atherothrombotic disease risk factors into triads based on the presence or absence of cigarette smoking/dyslipidemia/hypertension. In this analysis, those who have never smoked cigarettes and have neither dyslipidemia nor hypertension represent 6% (54/869) of the atherothrombotic disease population, and their average age of atherothrombotic disease onset is 72 years. The cumulative risk of atherothrombotic disease is highest when the CRF is 0.80 or higher and falls off as the CRF decreases. Cigarette smokers manifest atherothrombotic disease some 13 years earlier than do past cigarette smokers and 14 years earlier than never smokers. Hypertension is characteristic of older patients with atherothrombotic disease.

Conclusions: The population who develops atherothrombotic disease is definable in terms of a triad of risk factors: cigarette smoking, dyslipidemia, and hypertension.
Title

THREAT FOR PANDEMIC EMERGENCE OF NEGLECTED CARDIOVASCULAR DISEASE

Name & Country

Helieh S. Oz
USA

Abstract

“Forgotten diseases of poverty and tropical infections” as classified by Center for Disease Control (CDC) affect millions of people in United States alone. As an example, Chagas’ disease is a vector and food-borne as well as sexually transmissible disease which threatens a global epidemic if not eradicated in the near future. Over 300,000 patients are diagnosed in U.S.A, and 6-8 million patients suffer from Chagas’disease in Latin America. Centre for Tropical and Infectious Diseases in Negrar (Verona), in Florence, Italy reported that 4.2% of patients are serologic positive for Chagas’ disease. It is estimated that 4.2% of Latin-Americans in Europe to be affected by Chagas’ disease and a major portion resides in Italy. Contaminated fruit juice and surge of immigrants, blood and organ transplants are responsible for the global spread of the disease. In acute stage patients develop fever, cardiovascular complications and myocarditis. In addition, 30-40% patients progress to chronic cardiomyopathy after 10-20 years, as latent organisms in pseudocysts rupture free to attack and damage neurons and ganglia. The organisms harbor sophisticated molecular and signaling structures; yet actively alter the host cardiomyocytes’ specific G proteins and Ca channels signaling pathways and modulate prostaglandins and cytokines to render them ineffective and to support invasion. MicroPET and MRI studies in models demonstrate cardiac altered structure and dysfunction during acute myocarditis as well as chronic cardiomyopathy. In this presentation, pathogenesis and epidemiology of opportunistic and infectious diseases will be scrutinized with emphasis on cardiovascular complications and possible epidemic and pandemic outbreak.
ROTEM and Human Fibrinogen Concentrate Use in Pediatric Cardiac Surgery

Christopher Tirotta
USA

Human Fibrinogen Concentrate is a purified fibrinogen concentrate derived from the plasma of healthy donors that undergoes virus inactivation and removal for safety purposes. HFC is indicated for the treatment of acute bleeding in patients with congenital fibrinogen deficiency (CFD), including afibrinogenemia and hypofibrinogenemia. Treatment with fibrinogen is also used for acquired fibrinogen deficiency caused by placental abruption, massive transfusion, liver failure, disseminated intravascular coagulation, and cardiac surgery. The ROTEM (Tem International GmbH, Munich, Germany) is an enhanced modification of thromboelastography (TEG) (Haemonetics Corp., Braintree, MA), first described in 1948. Both are point-of-care (POC) coagulation monitoring instruments that test the viscoelastic properties of whole blood. Use of the ROTEM has been shown to reduce the need and amount of transfused blood products in pediatric cardiac surgery patients. Tirotta et al. demonstrated that administering HFC at a dose of 70 mg/kg to neonates and infants undergoing cardiac surgery reduced the need for fresh frozen plasma (FFP) and cryoprecipitate. HFC can also be dosed depending on the actual and target fibrinogen levels using the formula:

\[
\text{Dose (mg/kg body weight)} = \frac{\text{target level (mg/dL)} - \text{measured level (mg/dL)}}{1.7}
\]

Tirotta et al also demonstrated the Maximum Clot Firmness (MCF) of the ROTEM FIBTEM can be used as a surrogate of the fibrinogen level to dose the HFC via the formula: Predicted fibrinogen=78.61+12.38* MCF.

This formula suggests that a 1 mm of increase in MCF will correspond to a 12.38 increase in fibrinogen level. Using this formula and the POC ROTEM device, practitioners can tailor the transfusion therapy to reduce transfusion volume and donor exposure. CPB induced profound perturbations in ROTEM values. The administration of plateletpheresis (25 cc/kg) while on CPB improved the HEPTEM a from 48 to 73 and the FIBTEM MCF from 4.8 mm to 8.3 mm; plasma fibrinogen levels increased from 105 mg/dL to 175 mg/dL. The administration of HFC (55 mg/kg) after termination of CPB improved the FIBTEM MCF from 7.9 mm to 10.3 mm and the plasma fibrinogen level from 175 mg/dL to 240 mg/dL.

Dr. Tirotta has been an active member of Miami Children’s Hospital medical staff since 1991, practicing with the Department of Anesthesiology; he has served as the Director of Cardiac Anesthesia since 2002. He has served as Chief of the Department of Anesthesia since July 2017. He also has a clinical appointment with the Department of Anesthesiology at The University of Miami School of Medicine.

Dr. Tirotta received his BA from Cornell University in 1982 and his MD from New York University School of Medicine in 1986. He also received an MBA degree from Columbia University in 1999. Dr. Tirotta completed his internship in Internal Medicine at SUNY at Stony Brook in 1987. He completed his residency training in anesthesiology at the University of Miami/Jackson Memorial Hospital in 1990; he sub-specialized in pediatric and cardiovascular anesthesia, including heart transplantation.

In 1994, Dr. Tirotta created and produced the widely acclaimed pre-operative educational video titled, “A Hospital Trip with Dr. Bip”. This program, narrated by the endearing animated character Dr. Bip, explains to young children what to expect when they go to the hospital for surgery. It also includes coloring books and stickers. This program was exhibited at numerous national medical conventions and has sold thousands of copies all over the English-speaking world.

Dr. Tirotta is a member of numerous professional societies and has served on a number of hospital committees, including the Heart Program Executive Committee. He previously served as the CoChair of the Miami Children’s Hospital Physician Hospital Organization. He is also responsible for giving numerous medical lectures nationally and internationally and is actively engaged in clinical research. He has been the Principal Investigator on a number of clinical drug/device trials, including on the ONQ Pain Buster, the muscle relaxant Zemuron, the procoagulant RiaSTAP, the Cardiotronic NICOM device and the ClearLine. He will also be the Principal Investigator in Merck’s Sugammadex pediatric trial and Pacira Pharmaceuticals pediatric Exparel trial.
Aortic fistulas into the airways may develop after unpredictable periods after surgery and are often the consequence of pseudoaneurysms. They are more common after descending thoracic aorta (DTA) procedures. Postoperative aortic pseudoaneurysms (PSAs) may arise from disruption of one or more arterial wall layers with extravasation of blood into the surrounding spaces. The hematoma is then held by the remaining vascular layers, fibrous tissue, and sometimes the parietal pericardium. A neointima may develop. Disruption may be related to different sites depending on the type of operation. A PSA is not the only possible cause of bronchopulmonary damage, which may also be due to neoaneurysms involving the native aortic wall next to suture lines. In other cases slow but continuous damage to lung parenchyma is caused by strictly adjacent foreign material such as graft substance, remnant of temporary bypass, silk knots and suture material, endobronchial expandable metal stents, or kinking of an aortic stent-graft. Hemoptysis is the first (and often the only) symptom of aortic fistulas into the bronchial tree or lung parenchyma. It may be massive or intermittent, depending on the size of the opening. If left untreated, ABPFs are uniformly fatal. Management of the airways must be immediate and must first include bleeding control by selective endotracheal intubation. The inflated cuff of a Carlens tube or a Fogarty embolectomy catheter may be positioned into the bleeding side of bronchial tree to protect the contralateral side from hemorrhage. Otherwise a single-lumen endotracheal tube may be positioned in the healthy main stem bronchus. Various approaches have been described, either surgical or endovascular. When the fistula is located in the ascending aorta, femoral–femoral cannulation should be established before opening the sternum, as the false aneurysm may potentially rupture during sternotomy.
The cardiac lymphatics are responsible for the transport of all the lipoproteins and cholesterol from the extravascular myocardial tissue, although little is known about the filtration and lymphatic clearance of the coronary artery wall. It is postulated that a critical factor in the genesis of arteriosclerosis is lymphstasis, which adequately explains the positive correlation with the known risk factors for coronary artery disease and the negative correlation with high-density lipoproteins. Further research is necessary in this little-known area to better understand the etiology of atherosclerosis.
RESYNCHRONIZATION PACING FOR EARLY HEART FAILURE AMONG YOUNG ADULTS WITH REPAIRED CONGENITAL HEART DISEASE BASED ON CONTRACTILITY NOT EF OR QRS

Peter Karpawich
USA

Introduction: Repaired congenital heart disease (CHD) patients (pts) often develop early heart failure (HF) simply based on anatomy. Although cardiac resynchronization pacing therapy (CRT) may be an effective alternative to heart transplant (HT), published Implant Guidelines, based on ejection fraction (EF) and QRS morphology, do not include pts with CHD or pacemakers. The purpose of this study was to preevaluate CHD pts with HF based on contractility response (dP/dt) to temporary CRT pacing to determine CRT efficacy prior to implant. Acute CRT benefit was defined as a >15% increase in indices over baseline.

Methods: From 1998-2017, 105 CHD pts including repaired tetralogy of Fallot, transposition of the great arteries, single ventricle, and septal defects, were considered for HT (NYHA 3-4). Of these, 40 (mean age 22y, 27/40 with preexisting pacemakers) agreed to temporary CRT pacing with contractility measurements. Based on dP/dt response, pts either did or did not receive CRT. All pts were followed from 0.3-12 years (mean 4.5).

Results: Of 40 pts, 26 (62%) had a positive response (mean dP/dt 597 improved to 848mmHg-sec, p<0.006) and received CRT implant. During follow-up (mean 5.3 years), all initially improved in NYHA class and HF symptoms. Of these pts, 4 underwent eventual HT (mean 4.7 years later), 4 died (2 noncompliance (NC), 1 gunshot) and 18 remain clinically stable (NYHA class 1-3), off the HT list (repeat dP/dt mean 843mmHg-sec). Of the 14 pts with a negative acute CRT response (mean dP/dt 635 vs 662mmHg-sec, p=NS), during followup (mean 3.5 years), 2 underwent HT (mean 1 year later), 6 died awaiting HT (3 NC), and 6 remain on the HT list (NYHA 3-4).

Conclusions: CRT implant guidelines lack criteria for CHD pts including preexisting pacemakers. Pre-selecting pts by acute contractility response assures greater CRT efficacy and can delay need for HT.
PERSONALIZED AND TRANSLATIONAL MEDICINE AS A MODEL OF THE HEALTHCARE SERVICES AND ARMAMENTARIUM TO GET THE MODEL ARMED: MYTH OR THE REALITY?

Sergey Suchkov
USA

A new systems approach to diseased states and wellness result in a new branch in the healthcare services, namely, personalized medicine (PM). To achieve the implementation of PM concept into the daily practice including clinical cardiology, it is necessary to create a fundamentally new strategy based upon the subclinical recognition of bioindicators (biopredictors and biomarkers) of hidden abnormalities long before the disease clinically manifests itself.

Each decision-maker values the impact of their decision to use PM on their own budget and well-being, which may not necessarily be optimal for society as a whole. It would be extremely useful to integrate data harvesting from different databanks for applications such as prediction and personalization of further treatment to thus provide more tailored measures for the patients and persons-at-risk resulting in improved outcomes whilst securing the healthy state and wellness, reduced adverse events, and more cost effective use of health care resources. One of the most advanced areas in cardiology is atherosclerosis, cardiovascular and coronary disorders as well as in yocarditis. A lack of medical guidelines has been identified by the majority of responders as the predominant barrier for adoption, indicating a need for the development of best practices and guidelines to support the implementation of PM into the daily practice of cardiologists!
The new theory of the emergence of multiple sclerosis, proposed in 2009 by the Italian scientist Paolo Zamboni, literally exploded the scientific world. The hypothesis of Paolo Zamboni suggests that the manifestations of multiple sclerosis are closely related to the structural changes in the vessels through which the outflow of venous blood from the brain and spinal cord occurs [1]. Professor Zamboni believes that in cases of blood flow disorders in the jugular and unpaired veins, caused by their stenosis (constriction), there is an increased pressure in the venous system of the brain and spinal cord, hypoxia (oxygen starvation) and metabolic disturbance. One of the main metabolic abnormalities in the brain tissues is the deposition of iron in them, which, according to Paolo Zamboni, starts an autoimmune process that leads to the defeat of the myelin sheaths of the nerves.

At present, chronic cerebro-spinal venous insufficiency (CCSVI) is considered to be a syndrome when venous outflow from the central nervous system is impaired due to a narrowing of the veins. As before, the hypothesis that this syndrome plays a significant role in the pathogenesis of multiple sclerosis dominates. The popular treatment: the expansion of the neck veins, balloon angioplasty, the installation of stents. Unfortunately, for the Zamboni team and for patients, the effectiveness of the technique, namely, some improvement in the condition, was not more than 50%, repeated stenosis was possible after a few months. There were no cardinal cures. In some countries Zamboni's hypothesis was not recognized from the very beginning and such experimental treatment was not allowed. But Dr. Zamboni continued all these years research and operations to expand the cervical veins, at least until the end of 2017.
**ELECTROMAGNETIC PROPERTIES OF THE ARTERIAL BLOOD FLOW**

**Merab Beraia**
USA

**Abstract**

Blood flow acceleration increases from the left ventricular outflow tract, to the sinotubular junction and the ascending aorta, while it must be decreasing due to the flow turbulences in the Valsalvae sinuses. Energy of the pulse wave in the arterioles is 7.2 times high than in the ascending aorta, while it must be low due to the energy dissipation with the distance.

Purpose of the study is identifying the additional possible energy source, for the arterial blood flow.

Methods and materials: 12 healthy volunteer students (male) underwent contrast echocardiography, ECG gated MRI of the heart for the visualization intracavitary flow in the ventricles, MR Angiography of the aorta. Blood flow velocities and acceleration were studied in the different sites of the heart and aorta.

Results: With the DU in the left ventricular outflow tract blood acceleration is $1010\pm220$ cm/sec$^2$, in the sinotubular junction and ascending aorta $2395\pm295$ cm/sec$^2$, at the aortic arch $1390\pm225$ cm/sec$^2$, isthmus of aorta $2180\pm235$ cm/sec$^2$, middle thoracic aorta $1260\pm160$ m/sec$^2$. With the MRI, blood acceleration from the left ventricular outflow tract to the sinotubular junction is 3.5 times higher and to the ascending aorta – 2.5 times higher. Systolic blood pressure from the ascending aorta to the femoral and saphenous elastic arteries increases 1.3 times, increasing the work for the blood displacement.

Relation between the transient inertial force and the viscous force (Womerslay’s number) from the aorta to the arteries decreases - 2.5 times, to the arterioles -28.9 times, to the capillaries – 55.9 times. Direction of the magnetic fields from the oscillating ECG signals and the rotating negatively charged particles in the blood, are coincident.

Conclusion: Availability of the heart, as the possible single tool for the blood flow, looks imperfect. Electric oscillate field from the heart dipoles can be impact to the erythrocytes forming the naturally ultrasound vibration and associated with this the colloid vibration current propagating distally accompanying with the ac electric field and so on.

Blood motion in the heart chambers and arteries has the additional basis: rotating blood particles in the heart chambers and in the arterial branching sites, with the concomitant oscillating electric field triggered from the heart, forms additional electromagnetic repulsing force providing to the flow.

Besides the flow, with the additional energy source, entropy of the blood at the arterial end of the capillaries increases, enabling the spontaneous chemical reactions to proceed across the cell membrane.
Title: To study the role of polymorphism in CAD in the north Indian population. We hypothesized that ESR1 gene polymorphism may influence the susceptibility to CAD through variation in ERα expression. In order to assess the veracity of this concept, we evaluated ERα mRNA expression in peripheral blood leucocytes of our cohort of CAD patients.

Mamta P Sunil, India

Title: SHAH vs BACKMAN vs ABBOT’S cut off for HsTnI showed different possibilities in patients with chest pain profile?

Marta Noemi Monari, Italy

Title: Hospital outcome of acute hyperglycemia and TNF-α in patients with ST-elevation myocardial infarction

Taha Ahmed Al-Maimoony, Yemen

Title: Estimate pulmonary arterial hypertension by heart sound

Hamza cherif Lotfi, Algeria

Title: Familial Sudden Cardiac Death Caused by a DSG2 p.F531C Mutation as Genetic Background When Carrying with Heterozygous KCNE5 p.D92E/E93X Mutation

Yubi Lin, China

Title: Reconstruction of coronary artery with Internal Mammary Artery and Vein Patch Grafting

Almasri H. Hatem, Saudi Arabia

Title: Compound and Heterozygous Mutations of DSG2 Identified by Whole Exome Sequencing in Arrhythmogenic Right Ventricular Cardiomyopathy/Dysplasia with Ventricular Tachycardia

Ting Zhao, China

Title: Out of hospital cardiac arrest: Does age and Gender affect the association between delay to treatment and 30 Day Survival?

Nooraldeen Al-Dury, Sweden

Title: Connection of metabolic syndrome with other human diseases

Vladimir I Ermoshkin, Russia

Title: The challenges in Managing Heart Failure with Preserved Ejection Fraction (HFpEF)

Samer Ellahham, United Arab Emirates

Title: Role of 3D Strain in Prevention of Dilated Cardiomyopathy Secondary to Systemic Diseases in Pediatrics

Osama A T El Razaky, Egypt

Title: Mutation occurrence in TP53 and CTNNb1 genes in hepatocellular carcinoma associated with Echinococcus granulosus infection

Nazar Sh. Mohammed, Iraq

Title: Heart Rate Pressure Product and blood pressure variability during orthostatic stress associates with functional capacity and clinical outcome in patients with dilated cardiomyopathy

Wilhelm Grander, Austria

Title: Why is venous blood donation good for the body?

Vladimir I Ermoshkin, Russia

Title: Novel Compound heterozygous Mutations of KCNQ1 in Long QT Syndrome with Familial History of Unexplained Sudden Death: Identified by analysis of Whole Exome Sequencing and Predisposing Genes

Ting Zhao, China

Title: Massive Cerebral Infarction in an Arrhythmogenic Cardiomyopathy caused by Homozygous DSG2 p.F531C mutation

Yubi Lin, China

Title: Implementation of Coronary Artery Phantom with Hyperemia

Soohong Min, South Korea
TO STUDY THE ROLE OF POLYMORPHISM IN CAD IN THE NORTH INDIAN POPULATION. WE HYPOTHESES THAT ESR1 GENE POLYMORPHISM MAY INFLUENCE THE SUSCEPTIBILITY TO CAD THROUGH VARIATION IN ERα EXPRESSION. IN ORDER TO ASSESS THE VERACITY OF THIS CONCEPT, WE EVALUATED ERα mRNA EXPRESSION IN PERIPHERAL BLOOD LEUCOCYTES OF OUR COHORT OF CAD PATIENTS.

Mamta P Sumi
India

100 clinically confirmed CAD patients and normal healthy controls were included in this study. DNA and RNA from both CAD patients and healthy controls was extracted using Gene Aid DNA extraction kit and trizol RNA isolation method. We employed PCR-RFLP technique to characterize -397 T>C ESR1 gene polymorphism. Quantitative Real Time was carried out for measurement of ERα expression on a Rotor-Gene Instrument. The frequency of -397T>C ESR1 SNP of mutant homozygous (CC) plus heterozygous (TC) genotype was higher (78% vs 49%) in CAD as compared to control subjects (p<0.0001). Moreover, the ESR1 mRNA expression was highest in CAD patients with wild type homozygous TT genotype (2-Δct = 0.28) as compared to homozygous CC genotype (2-Δct = 0.09), and intermediate expression level in heterozygous TC genotypes (2-Δct = 0.14) subgroups of CAD patients. As compared to wild type TT genotype taken as reference, the fall in TC genotype (2.02 fold) and CC genotype (2.96 fold), was statistically significant (p=0.001 and 0.008 respectively). Our data associates significant involvement of ESR1 polymorphism genotypes with under expression of its mRNA which consequently results in high-risk of developing CAD. However, further research is warranted on the differences of these functional polymorphisms and their impact on ESR1 gene expression and their correlation with the development of CAD.
Title

SHAH VS BACKMAN VS ABBOT’S CUT OFF FOR HsTnI SHOWED DIFFERENT POSSIBILITIES IN PATIENTS WITH CHEST PAIN PROFILE?

Name & Country

Marta Noemi Monari

Italy

Abstract

Chest pain is a common cause of worldwide hospital admission and is a major burden on health-care resources. Cardiac troponin has substantially improved the accuracy of diagnosis and prognostic assessment of patients with suspected acute coronary syndrome (ACS). We wanted to investigate the use of a high sensitive assays for cardiac troponin (hsTnI) in the emergency department and its influence in patients admission or discharge (according to assigned color code and pain during triage), in order to identify the best one in terms of accuracy between the gap from the cut off and the need of hospitalization.

METHODS: We have conducted a retrospective analysis based on 1758 (3 month) accessions in Emergency Department (ED). We have focused our attention between 1014 patients (534 men, 480 women) having cardiological profile, excluding thoracic trauma or other non cardiological pain. We compared three different possible scenario to ruled in chest pain patients to interpretate the hsTnI: from literature Shah 12 ng/L, for Abbott hsTnI 34 ng/L for men, 15 ng/L for woman; and Beckman Coulter hsTnI 19.8 ng/L for men and 11.6 ng/L for woman.

RESULTS: The need of hospitalization was associated with a value above the cut-off of each method taken into in a statistically significant way (Abbott, p < 0.001; Beckman, p < 0.001; Shah, p < 0.001). Moreover, the gap from the cut-off is associated with an increased probability of admission, corrected for age, gender and color code (Abbott OR 7.74, 95% CI 2.89-20.75, p<0.001; Backman 3.93, 95%CI 1.89-8.18, p < 0.001; Shah 5.06, 95% CI 2.51-10.22, p < 0.001). The hospitalization is highly associated with the color code (p<0.001) given during the triage.

CONCLUSION: In this population, there is not a statistically significant difference between the three different interpretative cut off taken into consideration in identifying hospitalized patients. There is a statistically significant association between the color code given during the triage, the hsTnI level and the hospitalization, so the real key of the use of this marker is strongly related to the correct diagnosis.
Title

HOSPITAL OUTCOME OF ACUTE HYPERGLYCEMIA AND TNF-α IN PATIENTS WITH ST-ELEVATION MYOCARDIAL INFARCTION

Name & Country

Taha Ahmed Al-Maimoony
Yemen

Abstract

Increased blood glucose level and more severe inflammation are often observed in the acute phase of myocardial infarction (MI). It was shown that the risk of adverse cardiovascular outcomes is increased in patients with ACS and acute hyperglycemia, and this effect is seen both in established diabetics and patients without previous diagnosis of diabetes. (1)

Tumor necrosis factor-α (TNF-α) is a cytokine derived from endothelial and smooth muscle cells as well as macrophages associated with coronary atheroma, it is up regulated in the myocardium in response to both transient myocardial ischemia and reperfusion and it has been hypothesized that over expression of TNF-α after ischemia might lead to adverse coronary outcomes.(2)
ESTIMATE PULMONARY ARTERIAL HYPERTENSION BY HEART SOUND

L. Hamza Cherif received her PhD in Biomedical Electronics from the Faculty of technology, University of Aboubekr Belkaid Tlemcen, Algeria in 2013. He is currently a researcher in audible and ultrasonic processing physiological signals in the Genie-Biomedical Laboratory (GBM), Department of Genie-Biomedical, University of Tlemcen, Algeria. His current interests include, phonocardiogram signal processing by applying the transform discrete wavelet transform and wavelet packet and spectro-temporal internal components of the first and second heart sound.

Stenosis and mitral insufficiency may induce pulmonary arterial hypertension. The underlying mechanisms depend on the intrinsic characteristics of the pulmonary circulation and the acute or chronic character of left atrial hypertension. Since the main complication is right heart failure, treatment of left pathology (valve replacement) is aimed at reducing pulmonary pressures and decreasing the post-load of the right ventricle. Finally, various treatments, mainly medications, can be considered to reduce the effect of pulmonary hypertension and correct its symptoms. The results obtained show the clinical utility of our extraction methods for the recognition of heart sounds (or PCG signal), the estimation of pulmonary arterial hypertension. The results obtained also show that the severity of mitral stenosis involves severe pulmonary arterial hypertension.
FAMILIAL SUDDEN CARDIAC DEATH CAUSED BY A DSG2 p.F531C MUTATION AS GENETIC BACKGROUND WHEN CARRYING WITH HETEROZYGOUS KCNE5 p.D92E/E93X MUTATION

Sudden cardiac death (SCD) induced by malignant ventricular tachycardia (MVT) among young adults with arrhythmogenic right ventricular cardiomyopathy/dysplasia (ARVC/D) is a devastating event. Parts of ARVC/D patients have a mutation in genes encoding components of cardiac desmosomes, such as desmoglein-2 (DSG2), plakophilin-2 and desmoplakin.

Case presentation: Here we report a potentially pathogenic mutation in the DSG2 gene, which was identified in a family with ARVC/D using Whole Exome Sequencing (WES) and Sanger Sequencing. In all, Patient III:1 with ARVC/D carried the compound heterozygous mutations of DSG2 p.F531C and KCNE5 p.D92E/E93X, which were both inherited from her mother (II:2), who died of SCD. Carriers of DSG2 p.F531C showed various phenotypes, such as ARVC/D, SCD, MVT and dilated cardiomyopathy. For III:1, there were significant low-voltage regions in the inferior-apical, inferior-lateral wall of the right ventricular epicardium and outflow tracts of the right ventricle. Under the guidance of a three-dimensional mapping system, MVT was successfully ablated with an epicardial–endocardial approach targeting for late, double or fragmental potentials after implantable cardioverter-defibrillator electrical storms. No VT recurrence was observed during the one year of follow-up.
Title

RECONSTRUCTION OF CORONARY ARTERY WITH INTERNAL MAMMARY ARTERY AND VEIN PATCH GRAFTING CARDIOMYOPATHY/DYSPLASIA WITH VENTRICULAR TACHYCARDIA

Name & Country

Almasri H. Hatem

Saudi Arabia

Abstract

An increase in the numbers of patients with diffuse coronary artery disease who are referred to cardiac surgeons had necessitated the need of developing new techniques to establish the revascularization of specially young patients or elderly with high risks to undergo future re-do surgeries. Long-segmental reconstruction of the diffusely diseased left anterior descending (LAD) coronary artery with the left internal thoracic artery (LITA) and or venous patch has been shown to be beneficial for patients with diffuse coronary artery disease. In this retrospective study, we analysed the long-term outcomes obtained with this technique. Between September 2012 and October 2018, 1000 coronary artery bypass grafting (CABG) operations were performed by our team. Of these cases, a number of patients were found to have diffusely diseased coronary arteries (mainly LAD) underwent a long-segmental reconstruction procedure with a LIMA graft or saphenous venous patch with or without endarterectomies. Coronary artery reconstructions with exclusion of plaques or associated with endarterectomy when plaques are too calcified or stiff produce good stable results in the long run. Coronary endarterectomy should be reserved for arteries that are truly inoperable by other procedures including exclusion. Patients with diffuse coronary artery disease present a major challenge for cardiovascular surgeons. The long-term results of long-segmental coronary artery reconstruction are very encouraging, and this approach may be used safely in this subgroup of patient of plaques out of the lumen of a new reconstructed coronary vessel using coronary artery reconstruction technique.

Biography

Dr. Hatem Al-Masri is a cardiac critical care intensivist and consultant of cardiac surgery. Dr. Al-Masri completed his medical degree (M.D.-Doktorate) at Charles University – Faculty of Medicine, holds a degree in biochemistry from the University of Waterloo - Canada, completed his residency training in Germany (Leading Facharzt) and holds training fellowships in Cardiac Surgery from IJN KL Malaysia, Switzerland, and Canada. Dr. Al-Masri is the author of an award-winning medical research paper titled “Hemodynamic Support Requires Integrated Approach Comparing pl.VAD vs. IABP in Patients Experiencing Left Ventricular Failure” (Best Paper of Young Cardiac Surgeon) at the 8th International Congress of Update in Cardiology and Cardiovascular Surgery (UCCVS 2012) awarded by European Society for Cardiovascular Surgery, World Society of Arrhythmias (WSA ) and the Society of Cardiology and the International Academic of Vascular and Endovascular Surgery (ISCP). Dr. Al-Masri is a member of the Medical German Association, Malaysian Medical Association and the Saudi Medical Council.
Title

COMPOUND AND HETEROZYGOUS MUTATIONS OF DSG2 IDENTIFIED BY WHOLE EXOME SEQUENCING IN ARRHYTHMOGENIC RIGHT VENTRICULAR CARDIOMYOPATHY/DYSPLASIA WITH VENTRICULAR TACHYCARDIA

Name & Country

Ting Zhao
China

Abstract

This study was designed to identify the pathogenic mutation in two Chinese families of arrhythmogenic right ventricular cardiomyopathy/dysplasia (ARVC/D) using Whole Exome Sequencing (WES). Methods and Results: The proband 1 (Family 1, II:1) and proband 2 (Family 2, II:1) underwent WES of DNA from peripheral blood, and were analyzed the genes susceptible to arrhythmias and cardiomyopathies. The both probands carried the same exonic mutation of DSG2 p.F531C (NM_001943, exon 11: c. T1592G). The proband 1 also carried the splicing mutation of DSG2 (NM_001943: exon 4: c.217-1G >T), and proband2 carried the intronic mutation of DSG2 (NM_001943: exon 6: c.524-3C>G) that potentially influenced the splicing function predicted by Human Splicing Finder, as a compound heterozygous pattern. The heterozygous mutations of two probands both came from their father and mother without ARVC/D phenotype, respectively. Conclusions: The compound heterozygosity of DSG2 p.F531C and splicing or intronic mutation that potentially affecting splicing function, served as genetic dosage increasing, were significantly associated with ARVC/D and ventricular arrhythmia.
Title
OUT OF HOSPITAL CARDIAC ARREST: DOES AFE AND GENDER AFFECT THE ASSOCIATION BETWEEN DELAY TO TREATMENT AND 30 DAY SURVIVAL?

Name & Country
Nooraldeen Al-Dury
Sweden

Abstract
Gender and age have been shown as independent factors for survival after OHCA. A shorter delay to call the Emergency Medical Service (EMS) and start of cardiopulmonary resuscitation (CPR), and rapid defibrillation in shock-able rhythm (ventricular fibrillation or ventricular tachycardia); are well-identified factors impacting survival.

Women suffering from OHCA are usually older and present less frequently with shock-able rhythm. Data are conflicting whether they receive bystander CPR more or less often than men. Most reports have shown that advanced age is associated with poorer survival. However, the effects of age and gender on the association between delay to treatment and survival have not been examined.

There was no significant interaction between either age or gender and the association between delay to call for EMS and survival. However, there was a significant interaction between gender and the association between delay to start of CPR and survival being stronger among men. Furthermore, there was a significant interaction between age and the association between delay to defibrillation and survival being stronger among the elderly.

Biography
Nooraldeen Al-Dury published latest article in The American journal of emergency medicine entitled Characteristics and outcome among 14,933 adult cases of in-hospital cardiac arrest: A nationwide study with the emphasis on gender and age.
In official medicine, there are several definitions of metabolic syndrome (MetS). Several—means, there is no the right. Typically, in the pathological condition of MetS include: insulin resistance, abdominal obesity, arterial hypertension, atherogenic dyslipidemia, coronary heart disease etc. The aim of our study is to find a global mechanism that leads not only to MetS, but also to many other human diseases. Participation in scientific conferences, discussions with leading Russian cardiologists, retrieval of information search in the literature. Our team of researchers found that many of the changes in the cardiovascular system starts, due to improper operation of large arteriovenous anastomoses (AVA). Direct driver of violations of the capillary circulation is the presence of open AVA, excessive leakage of arterial blood into the venous bed, the rise of venous pressure. Opening/closing AVA in the human vascular system due to the need for emergency reduction of blood pressure due to stress. After the overflow of hollow veins, mechano-induced arrhythmia, including ventricular tachycardia, can begin. After damage to the venous valves, the excess pressure transmitted through the AVA can reach small veins and venules, primarily pelvic organs and legs. There are problems: swelling, varicose veins, thrombosis, necrosis, etc. Known, cases of large AVA between the mesenteric artery and portal vein. This means that a person is in the sitting or standing positions to the liver via the portal instead of the veins venous blood will receive a mixture of arterial and venous. This mixture will be overly saturated with oxygen. At the same time, some groups of working cells of the pelvic and intestinal organs will experience acute ischemia and stagnation for a long time (before taking a horizontal position by the body). This condition violates the conditions for optimal blood circulation and cellular metabolism of fats, proteins, carbohydrates, disturbed delivery to the addresses of hormones, enzymes. This leads to a state of “metabolic syndrome”. Our group was able to show analytically that due to venous plethora there are many CVD and some types of cancer. Healthy lifestyle plus periodic extraction of venous blood and interstitial fluid from areas of stagnation can improve people’s health. This is confirmed, among other things, by donor practice. The New theory of the CVD finds more and more positive arguments and facts. At this stage, it is necessary to confirm the universality of the New theory in special experiments.
The challenges in managing heart failure with preserved ejection fraction (HFpEF)

Samer Ellahham
United Arab Emirates

Approximately half of all patients with heart failure have preserved ejection fraction (HFpEF) and, as life expectancies continue to increase in western societies, the prevalence of HFpEF will continue to grow. In contrast to heart failure with reduced ejection fraction (HFrEF), no treatment has been proven in pivotal clinical trials to be effective for HFpEF, largely because of the pathophysiological heterogeneity that exists within the broad spectrum of HFpEF. This syndrome was historically considered to be caused exclusively by left ventricular diastolic dysfunction, but research has identified several other contributory factors, including limitations in left ventricular systolic reserve, systemic and pulmonary vascular function, nitric oxide bioavailability, chronotropic reserve, right heart function, autonomic tone, left atrial function, and peripheral impairments. Multiple individual mechanisms frequently coexist within the same patient to cause symptomatic heart failure, but between patients with HFpEF the extent to which each component is operative can differ widely, confounding treatment approaches. This lecture focuses on our current understanding of the pathophysiological mechanisms underlying HFpEF, and how they might be mechanistically related to typical risk factors for HFpEF, including ageing, obesity, and hypertension.
Role of 3D Strain in Prevention of Dilated Cardiomyopathy Secondary to Systemic Diseases in Pediatrics

Osama A T El Razaky
Egypt

New echocardiography imaging modalities (Tissue Doppler echocardiography, speckling tracking imaging, and real time 3 dimensional echocardiography) offer new methods to predict early asymptomatic myocardial insult in extracardiac systemic diseases. Oxidative stress plays a critical role in development of cardiomyopathy secondary to systemic diseases. Antioxidant drugs as carvedilol and alpha lipoic acid may have a role as cardioprotective agents. This presentation aimed to delineate the feasibility of recent echo technique in detection of asymptomatic myocardial dysfunction in systemic diseases and explore the role of some antioxidant drugs in prevention of these insult.

Group of Systemic diseases:
(Type 1DM, Bronchial asthma, ALL, Thalassemia, Sickle cell anemia, Iron deficiency anemia, Chronic Liver diseases, Protein Energy Malnutrition, Critically Ill children, Severe Motor and Intellectual Disabilities, Neonatal Sepsis, and Infant of Diabetic Mother)

All studied patients were subjected to a full medical history, thorough clinical examination, Conventional Doppler echocardiography as well as Tissue Doppler imaging, Speckling tracking and real time 3 Dimensional Echocardiography(3D Strain). Alpha lipoic acid was used for prevention of diabetic cardiomyopathy and Carvedilol was used for prevention of Adriamycin induced cardiomyopathy in children with ALL.

The use of newer echocardiographic techniques, including tissue Doppler, speckling tracking and RT3DE, showed great potential benefits in detection of silent cardiac disorders and antioxidant drugs (alpha lipoic acid and carvedilol) had a significant role in prevention of this cardiac dysfunction.
Mutation occurrence in TP53 and CTNNB1 genes in hepatocellular carcinoma associated with Echinococcus granulosus infection

Nazar Sh. Mohammed

Iraq

Echinococcus granulosus is one of the small tap worms that causes Hydatid cyst. This study was planned for detection of the incidence among cancer patients at Tumor unit in Baghdad medical city. A total of 11 samples of liver biopsy taken from patients with liver cancer in this study. All patients were suffering from Hydatid cyst infection. The present study showed that the predominance of hydatidosis was in the patients whose ages ranged between (≤20-60) years. The majority incidence was recorded between (50-60) years. The study showed that the predominance of hydatidosis was higher in females 7(70%), than males 3 (30%). Analysis of the gene sequence showed that there were genetic mutations occurred in the hepatic cells, and several locations underwent change in genetic sequence including TCC to TCT in exon 147(5), GGT to AGT in exon 152(5), ACT to CCT in exon 160(5), TAT to TGT in exon 203(6), ATG to CTG in exon 235 (7).
HEART RATE PRESSURE PRODUCT AND BLOOD PRESSURE VARIABILITY DURING ORTHOSTATIC STRESS ASSOCIATES WITH FUNCTIONAL CAPACITY AND CLINICAL OUTCOME IN PATIENTS WITH DILATED CARDIOMYOPATHY

Left ventricular function is weakly correlated with exercise capacity in heart failure patients. We hypothesized that rate pressure product and rate pressure product reserve during orthostatic stress predicts functional capacity and clinical outcome. We studied 28 patients with dilated cardiomyopathy (DCM) who are on high dose of neuro humoral blockers. Patients were dichotomized into high and low performance groups according to their exercise capacity assessed by a six minute walk test. Beat-to-beat autonomic and hemodynamic modulations were assessed non-invasively during supine rest and orthostatic stress. Patients in the high performance group had higher blood pressures, higher power spectral density of blood pressure variability (in normalized units), as well as higher rate pressure products (RPP) in supine and orthostatic position (for all p<0.05). In multivariate analysis, rate pressure product reserve (RPPres) is independently associated with functional capacity and heart failure worsening. Heart rate pressure product in orthostatic stress directly associates with functional capacity and clinical outcome. Identification of this quickly available measurements may help in creating prognosis of heart failure patients with DCM.
WHY IS VENOUS BLOOD DONATION GOOD FOR THE BODY?

In order to be active and healthy, one must lead a healthy lifestyle, avoid gluttony, do not abuse alcohol and tobacco, sleep for 8 hours, work in the office to get up from the computer every 40 minutes. It is necessary to accustom yourself to correctly respond to various nervous and psychological upheavals and disorders. The authors of the New Theory suggested that long experiences, elements of dissatisfaction with life, can lead to the growth and discovery of ABA. Almost always, the flow of blood from the arteries into the veins occurs imperceptibly for people. Apparently, in a mentally depressed person who leads a sedentary lifestyle, ABA can be closed after opening with longer delays or they do not completely close. People say: "All diseases from nerves." We can correct: "All diseases from nerves, tk. psychological long-term stresses lead to the discovery of ABA. " Apparently, in theories about the causes of hypertension and in stress theory, for example, in the works of G.F. Lang [21] and Hans Salje [22] lacked the main links, namely, the "invisible" ABA and the blockages of capillary circulation caused by them.

Is it possible to cardinally cure modern tablets, for example, from chronic heart failure? Usually not, because the region of blood stasis and the pathology of organs, and the heart, including, over the years, gradually can only increase. A treatment should be aimed at restoring the proper functioning of large ABA. So far, the only effective "treatment" can be only a "lifestyle change" and special training, in which the areas of stagnation of venous blood are reduced and the correct work of the ABA is restored.

In the future, the option is possible with the installation of artificial electronic more sensitive AVA.
Title

NOVEL COMPOUND HETEROZYGOUS MUTATIONS OF KCNQ1 IN LONG QT SYNDROME WITH FAMILIAL HISTORY OF UNEXPLAINED SUDDEN DEATH: IDENTIFIED BY ANALYSIS OF WHOLE EXOME SEQUENCING AND PREDISPOSING GENES

Name & Country

Ting Zhao
China

Abstract

This study aimed to identify the pathogenic mutation in a Chinese family with long QT syndrome (LQTs) and unexplained sudden death (USD). Whole exome sequencing was conducted for the proband. The genetic data was screened using the 1000 genomes project and SNP database (PubMed), and the identified mutations were assessed for predicted pathogenicity using the SIFT and Polyphen-2 algorithms. We identified the compound heterozygous mutations in the KCNQ1 gene at c. G527A (p.W176X) and c.G1765A (p.G589S) predicted as “damaging”. The in-silico analysis showed that when compared to the characteristics of mRNA and protein of wild-type KCNQ1, the mRNA of c.G527A mutation was significantly different in the centroid secondary structure; the subunit coded by W176X would lose the transmembrane domains S3-S6 and helices A-D; the protein secondary structure of G598S was slightly shortened in helix structure; the protein physics-chemical parameters of W176X and G589S significantly and slightly changed, respectively. Conclusions: The compound heterozygous mutations of W176X and G589S coexisting in KCNQ1 gene of homologous chromosomes, resulting in more severe phenotype, are the likely pathogenic and genetic risks of LQTs and USD in this Chinese family.
Title

MASSIVE CEREBRAL INFARCTION IN AN ARRHYTHMOGENIC CARDIOMYOPATHY CAUSED BY HOMOZYGOUS DSG2 P.F531C MUTATION

Name & Country

Yubi Lin

China

Abstract

According to previous researches, arrhythmogenic right ventricular cardiomyopathy/dysplasia (ARVC/D) would increase the risk of systematic thromboembolism. A case of ARVC/D, carrying a rare homozygous p.F531C mutation of DSG2 (desmoglein-2), and showing global cardiac motion abnormality and left ventricular aneurysm, suddenly occurred with massive cerebral infarction induced by the occlusion of the left middle cerebral artery caused by cardiogenic thrombus, without anticoagulation. For patients of ARVC/D induced by homozygous mutation of desmosome (DSG2, for example) and complicated with ventricular aneurysm and cardiac motion abnormality, preventive anticoagulation should be considered, although it still needed a large scale of clinical evaluations.
IMPLEMENTATION OF CORONARY ARTERY PHANTOM WITH HYPEREMIA

Soohong Min
South Korea

Fractional Flow Reserve (FFR) and Coronary Flow Reserve (CFR) are the indices to diagnose ischemia in coronary artery diseases. To obtain these indices, hyperemia, the increased blood flow through vasodilation, is used as a reference and this occurs when adenosine is injected in vivo. However, for phantom models in previous studies, most researchers didn’t consider hyperemia condition. This study aims to implement hyperemia in coronary artery phantom.

We have constructed a circulation phantom to mimic coronary flow system. A coronary artery pressure consists of forward and backward waves. Hyperemia was simulated by the total occlusion of backward flow when the pressure was decreased and flow velocity was increased. Doppler test fluid was used as the flow medium. A reservoir was made to implement the venous system. To realize the coronary artery stenosis, area ratios of 40, 70, and 88% stenosis model were made. The pressure and the flow velocity inside the tube were measured with a catheter (ComboWire XT, Philips Volcano, USA). When the mean pressure of the vein was 10mmHg, FFR values were 0.93, 0.74, and 0.53 with back flow, and 0.80, 0.63, and 0.42 in hyperemia state, CFR values were 2.2, 1.5 and 1.2 at the stenosis rates of 40, 70, and 88%, respectively. When the mean pressure of the vein was increased to 30mmHg, FFR values were 0.99, 0.95, and 0.69 with back flow, and 0.89, 0.85, and 0.59 in hyperemia state, CFR values were 2.5, 1.6 and 1.2 at the stenosis rates of 40, 70, and 88%, respectively.

We successfully implemented an in vitro coronary artery system that can measure FFR and CFR values according to pressure of the vein and the degree of stenosis. It is expected that phantom model helps to understand the physiology of a coronary artery diseases.