KSC 2023 Smart Heart, Smile Life

DAILY

대한심장학회 THE KOREAN SOCIETY OF CARDIOLOGY 심장학연구재단 THE KOREAN CARDIAC RESEARCH FOUNDATION

The 67th Annual Scientific Meeting of The Korean Society of Cardiology

Today's Highlights

Cross Specialty 6:
Heart & Brain Recent Updated Issue
Let's See Heart-Brain Crosstalk
›› 08:30-10:00, Walker 1

기획세션 4: Hot Publications in Korea
Emerging Horizons - Unveiling Korea's Hottest Publications
›› 10:15-11:45, Walker 1

Plenary Session 2 (Keynote Lecture)
›› 12:50-14:30, Walker 1

Ethics Workshop
최신 의료윤리 따라잡기: MZ세대와 챗GPT
›› 14:45-16:45, Grand 1

Cross Specialty 8: Neurology & Cardiology
'All for One, One for All' to Prevent Stroke
›› 16:30-18:00, Walker 2

Intervention

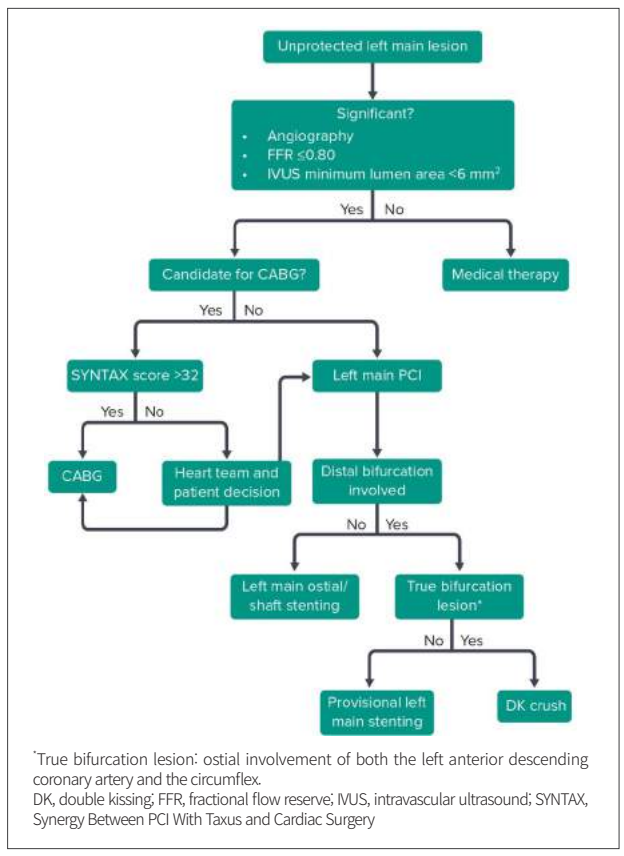
Optimizing PCI in LM & LM Bifurcation Lesions?

Young Bin Song, MD, PhD
Sungkyunkwan University School of Medicine, Korea

Left main coronary artery (LMCA) disease represents a notably high-risk subset within the spectrum of coronary artery disease (CAD). It is associated with substantially compromised myocardium (around 70%) and markedly increased cardiovascular morbidity and mortality compared to other CAD. Both acute coronary syndrome and stable CAD often involve LMCA disease, sometimes with concurrent multivessel issues. Clinical guidelines strongly advocate revascularization for ≥50% LMCA stenosis, emphasizing the critical role of optimal revascularization strategies in managing significant LMCA disease. While coronary artery bypass grafting (CABG) historically stood as the gold standard for LMCA revascularization due to mortality benefits, percutaneous coronary intervention (PCI) emerged as an alternative, primarily for carefully selected patients or those facing hemodynamic instability or heightened surgical risks.

Recent decades have shown significant progress in the field of PCI, including device technology, procedural techniques, and adjunctive pharmacotherapy, making PCI a viable alternative for a substantial portion of LMCA disease patients. Clinical registries and randomized controlled trials compared PCI and CABG for treating LMCA disease and through the collective insights of these studies, the management of LMCA disease now pivots on key clinical and anatomical factors, with an increasing emphasis on the importance of having a collaborative heart team.

Functional and imaging concepts integrated into PCI techniques also reshaped the decision-making process, enhancing procedural precision. **Intravascular imaging and physiologic guidance have become critical in addressing LMCA disease.** Intravascular imaging (ultrasound, optical coherence tomography) aids stent placement, while physiologic guidance (fractional flow reserve, instantaneous wave-free ratio) optimizes treatment strategies by assessing the blood flow and pressure. Combined, these approaches bolster procedural accuracy and LMCA disease outcomes (**Figure 1**).



*True bifurcation lesion: ostial involvement of both the left anterior descending coronary artery and the circumflex.
DK, double kissing; FFR, fractional flow reserve; IVUS, intravascular ultrasound; SYNTAX, Synergy Between PCI With Taxus and Cardiac Surgery

Figure 1. Contemporary management of LM lesions (J Am Coll Cardiol 2017;70(21):2618-20.)

However, despite advancements, unresolved questions persist in LMCA treatment. This lecture endeavors to consolidate recent clinical data, practical implications, as well as unique considerations, and speculates on the future of left main PCI.

Intervention 4
How Can We Properly Optimize in a Complex PCI?
›› Saturday, Oct 14, 13:00-14:30, Walker 2

KSC 2023 DAILY

Program at a glance: Day 2, Oct 14, 2023

	Walker 1	Walker 2	Grand 1	Grand 3	Grand 4	Grand 5	Grand 6	Art	Pine	Oak	Vista
08:30 - 10:00	**Cross Specialty 6: Heart & Brain** Recent Updated Issue: Let's See Heart-Brain Crosstalk	**Intervention 3** Have a Good Look at the CTO PCI: Get Practical	**Arrhythmia 4** How to Make Difficult PSVT Ablation Easy	**Echocardiography 3** Multimodal Evaluation of Myocardium and Valve: When & How?	**Pediatric Cardiology 1** Navigating the Gray Zone 1: Understanding Borderline LV	**Lipid & Atherosclerosis 1** Essence of Recent Trials in Lipid and Atherosclerosis	**CAD 4** 85-92	**ACC-KSC Joint Session** Emerging Tools in Heart Failure	**Women Heart Disease** 93-97	**Heart Failure 2** 98-101	**E-Poster** 1-38
10:15 - 11:45	**기획세션 4: Hot Publications in Korea** Emerging Horizons - Unveiling Korea's Hottest Publications	**Myocardial Infarction 3** Tough Consultation for AMI: Ask the Experts What to Do?	**Arrhythmia 5** How to Make Difficult PVC & VT Ablation Easy	**Echocardiography 4** Decision-making in Severe VHD: Balancing the Multiple Perspectives	**Pediatric Cardiology 2** Navigating the Gray Zone 2: Strategies for Successful Biventricular Repair in Borderline LV	**Lipid & Atherosclerosis 2** Recent Update on the Evidence Based CVD Prevention	**Intervention 2** 102-109	**JCS-KSC Joint Session 1** Links between Heart and Metabolism	**Hypertension** 110-117	**Heart Failure 3** 118-125	
12:00 - 12:40	**Scientific Session [Amgen]** LDL-C Reduction with PCSK9 Inhibition in ACS: Start Early and Stay Low!	**Scientific Session [Viatris]** Tailored Approach on Cholesterol Management in Acute-phase	**Diamond Session [BMS/Pfizer]** Advances in Management of Patients with Atrial Fibrillation	**Scientific Session [Novartis]** ARNI: Earlier is Better, Better Late than Never	**Scientific Session [Celltrion Pharm/ Dong-A ST]** Benefit of Consistent BP Control for Reducing CVD Risk; The Role of Azilsartan						**Mini Oral** **A: CAD 1** 16-20 **B: Heart Failure** 21- 25 **C: Arrhythmia 1** 26- 30
12:40 - 13:00	**Break**										
13:00 - 14:30	**Plenary Session 2** (Keynote Lecture) (12:50-14:30)	**Intervention 4** How Can We Properly Optimize in a Complex PCI? [Case-based Lecture]	**TSOC-KSC Joint Session** Comparison of Nationwide Study on AF between Korean and Taiwan	**Hypertension 1** 2023 European Society of Hypertension/European Society of Cardiology Hypertension Guideline	**Pediatric Cardiology 3** Challenges and Innovations in the Diagnosis and Treatment of Congenital Mitral Stenosis	**Smart Health** Transforming Cardiovascular R&D into Technology Commercialization	**Case 4 Intervention** 22-29	**Heart Failure 1** "State-of-the-Art" Heart Failure Guideline-Directed Medical Treatment	**Case 5 Echo & Imaging** 30-35	**Case 6 Arrhythmia** 36-41	**E-Poster** 1-38
14:45 - 16:15	**Cross Specialty 7: Balancing Heart and Kidney** Frequently Encountered Problems during HF Treatment	**Intervention 5** Frontiers in TAVI	**Ethics Workshop** 최신 의료윤리 따라잡기: MZ세대와 챗GTP (14:45-16:45)	**Hypertension 2** Treatment of Difficult to Treat Hypertension	**Adult Congenital Heart Disease 1** The Vulnerability for Life in ACHD	**Insurance Issues 1**	**Lipid & Atherosclerosis** 126-131	**Heart Failure 2** Cutting-edge Research and Treatment in Heart Failure	**Echocardiography 1** 132-139	**Arrhythmia 3** 140-147	
16:30 - 18:00		**Cross Specialty 8: Neurology & Cardiology** "All for One, One for All" to Prevent Stroke		**Epidemiology 1** Cardiovascular Risk Prediction: Basic Concepts, Current Status and Future Directions	**Adult Congenital Heart Disease 2** Improving Quality of Life in ACHD	**Insurance Issues 2**	**CAD 5** 148-156	**ESC-KSC Joint Session** Transcatheter Mitral and Tricupid Valvular Intervention with ESC	**Intervention 3** 157-164	**Arrhythmia 4** 165-172	
18:10			**정기 총회**								

Scientific Sessions

Scientific Session [Amgen]

LDL-C Reduction with PCSK9 Inhibition in ACS: Start Early and Stay Low!

12:00-12:15	LDL-C Lowering With Evolocumab - How Early is Effective?
12:15-12:30	LDL-C Lowering With Evolocumab - How Low is Safe?
12:30-12:40	Discussion

›› Oct 14, 12:00-12:40, Walker 1

Scientific Session [Viatris]

Tailored Approach on Cholesterol Management in Acute-phase

12:00-12:20	What are the Optimal Treatment Options for Secondary Prevention in Acute-phase Patients?
12:20-12:40	Deep Dive into Mono Statin Therapy: Focus on Safety

›› Oct 14, 12:00-12:40, Walker 2

Diamond Session [BMS/Pfizer]

Advances in Management of Patients with Atrial Fibrillation

12:00-12:20	Consider the Kidney: New Data on Patients with Atrial Fibrillation and Renal Impairment
12:20-12:40	Latest Insight in AF Patients with Recent RWE

›› Oct 14, 12:00-12:40, Grand 1

Scientific Session [Novartis]

ARNI: Earlier is Better, Better Late than Never

12:00-12:20	The Importance of Reverse Remodeling in Short and Long Standing HF Patients
12:20-12:40	Entresto Beyond Early: Meeting the Needs of Hidden HF Patients

›› Oct 14, 12:00-12:40, Grand 3

Scientific Session [Celltrion Pharm/Dong-A ST]

Benefit of Consistent BP Control for Reducing CVD Risk; The Role of Azilsartan

12:00-12:20	Strategy for Perfect 24hr BP Control; The Role of Azilsartan
12:20-12:40	How to Treat Hypertension in the Metabolic Syndrome

›› Oct 14, 12:00-12:40, Grand 4

KSC 2023 정기총회 개최

대한심장학회 제67차 추계학술대회 정기총회를 다음과 같이 개최합니다.
각 분야 시상 및 경품 추첨이 있사오니 많은 참석 바랍니다.

| 일시 2023년 10월 14일 토요일 오후 6시 10분
| 장소 Grand 1

※ 정기총회 후 Presidential Dinner가 Grand 1 로비에서 진행됩니다.
자유롭게 참여 가능합니다.

Heart Failure

Vericiguat and Mevacamten as Second-line Drugs

Chan Joo Lee, MD, PhD
Yonsei University College of Medicine, Korea

Efforts to improve the prognosis of heart failure (HF) are ongoing, and HF treatment is at the center of the current cardiovascular drug development. Among the new treatments for HF with reduced ejection fraction (HFrEF), vericiguat is the drug closest to hand. Vericiguat is an oral soluble guanylate cyclase activator that enhances the effect of nitric oxide to increase cGMP activity (**Figure 1**). In the VICTORIA study published in 2020, vericiguat was found to reduce the composite clinical endpoint of cardiovascular death or first hospitalization for HF when added to the guideline-directed medical treatment (GDMT). **Vericiguat represents a promising second-line medication for HFrEF, offering a new approach to targeting endothelial dysfunction in HF.**

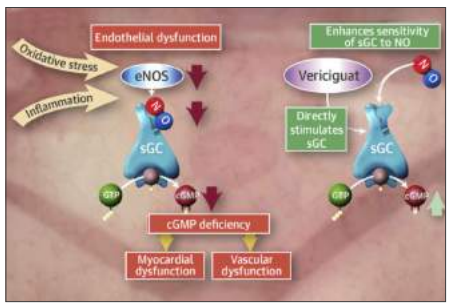


Figure 1. Vericiguat's mechanism of action

Vericiguat has been approved by the FDA for the treatment of adults with symptomatic chronic HF and an EF of less than 45%. The 2022 Korean guidelines recommend it as a Class IIa drug, since Koreans were included in the VICTORIA study, and vericiguat is a drug approved for use in Europe and the United States. In addition, vericiguat is expected to qualify for reimbursement from the Korean National Insurance Service for patients with HF with EF less than 45% under GDMT, who have experienced a recent exacerbation of HF. Therefore, high-risk HF patients in Korea will be able to obtain clinical benefits from vericiguat in the future.

After the recent success of SGLT2i use in HF with preserved EF (HFpEF), one of the next-generation drugs for HFpEF that is receiving the most attention is mavacamten. Mavacamten is a novel, oral, allosteric inhibitor of cardiac myosin that is being developed for the treatment of hypertrophic cardiomyopathy (HCM). It has been shown to reduce actin-myosin cross-bridge formation, thereby reducing myocardial contractility and improving myocardial energetic consumption in experimental HCM models (**Figure 2**). The recently published phase III, placebo-controlled, randomized EXPLORER-HCM trial demonstrated the efficacy and safety of mavacamten in reducing left ventricular outflow tract obstruction and ameliorating exercise capacity, NYHA functional class, and health status in patients with obstructive HCM.

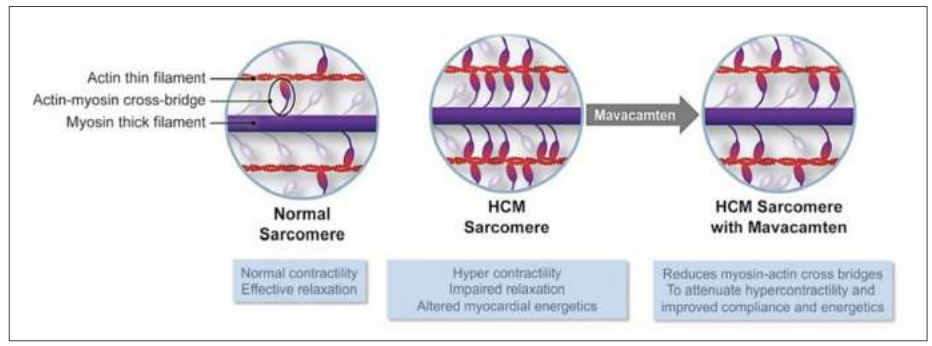


Figure 2. Mavacamten's mechanism of action

Mavacamten is currently being tested in HFpEF patients. Emerging evidence suggests that mavacamten may not only modulate contractility but may also myocardial relaxation. A study of mavacamten in participants with HFpEF and elevation of NT-proBNP is currently underway. It is still too early to call mavacamten a second-line drug in HFpEF, but it has a theoretical background that is sufficiently promising, so it will be worth looking out for the results of various future studies.

Heart Failure 1
'State-of-the-Art' Heart Failure Guideline-directed Medical Treatment
›› Saturday, Oct 14, 13:00-14:30, Art

JCS-KSC Joint Session

The Role of the Innate Immune System Regulated by DNA Sensors in the Development of Vascular and Metabolic Diseases

Daiju Fukuda, MD, PhD
Osaka Metropolitan University Graduate School of Medicine, Japan

Sterile chronic inflammation causes cardiometabolic disorders. However, the mechanisms still remain obscure. Exogenous DNA fragments, such as those from pathogens, strongly induce inflammation by activating DNA sensors, which function as a self-defense system in the innate immune system. Meanwhile, DNA sensors also recognize self-derived DNA fragments, contributing to the progression of inflammatory diseases. Recent studies have demonstrated DNA damage and release of the endogenous DNA fragments are induced under excessive nutrient levels, such as those in hyperglycemia and hyperlipidemia.

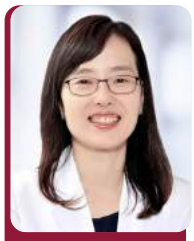
There are several types of DNA sensors. Toll-like receptor 9 (TLR9) recognizes DNA fragments in the endosome. Also, the stimulator of the interferon gene (STING) recognizes cyclic GMP-AMP (cGAMP) generated from the DNA fragments in the cytosol. Both TLR9 and STING are known to play pivotal roles in defending the host, as the innate immune system.

However, recent studies have indicated that the activation of these DNA sensors in immune cells, such as macrophages, promotes inflammation leading to the development of vascular and metabolic diseases. Revealing the mechanism of sterile chronic inflammation regulated by DNA sensors might provide new insights into developing therapeutic strategies for these disease conditions. During this session, recent advances in determining the roles of DNA sensors in these diseases will be discussed.

JCS-KSC Joint Session 1
Links Between Heart and Metabolism
›› Saturday, Oct 14, 10:15-11:45, Art

Adult Congenital Heart Disease

Increased Cesarean Section Rate and Premature Birth in Pregnant Women with ACHD



이승미 교수
서울대의대

선천성 심기형에 대한 치료의 발전으로 생존율이 증가하게 되면서 가임기 여성 중 선천 심기형을 가진 여성의 비율이 증가하고 있다. 선천 심기형을 가진 여성은 그렇지 않은 여성에 비해 모성 사망률이 높은 것으로 알려져 있다. 이는 선천 심기형을 가진 여성에서는 임신으로 인한 심혈관계 부담의 증가로 부정맥이나 심부전, 혈전색전증의 위험이 증가하는 것으로 보고된 바 있고 산과적으로는 유산, 조기 양막파수, 산후출혈이 증가한다는 보고도 있다. 따라서 적절한 산전관리 및 임신 예후에 대한 상담이 중요하다.

선천 심기형을 가진 여성의 경우 태아의 성장지연이나 사망, 조산, 및 낮은 아프가(Apgar) 점수 등의 위험이 높은 것으로 보고되기도 하였다. **특히 여러 연구에서 선천 심기형을 가진 여성에게서 그렇지 않은 경우에 비해 조산의 비율이 더 높은 것으로 보고하였다.** 한 연구에서는 선천 심기형을 가진 여성을 폐동맥고혈압 여부에 따라 나누어 분석하였는데 폐동맥고혈압이 동반된 선천 심기형의 경우 그렇지 않은 경우에 비해 조산이 유의하게 증가하였다. 또한 선천 심기형의 중증도 및 증상(NYHA functional class)이 높을수록 조산이 유의하게 많이 발생한 것으로 보고되어 있다. 조산의 원인에 따라 분석한 결과에 따르면 자연적으로 발생한 조산을 59%, 의학적 필요에 이른 분만을 결정한 경우를 41%로 보고하기도 하였다.

분만 방법에 대해서는 대부분의 심장 질환을 가진 여성에게서 질식분만이 권고되며 이는 선천 심기형을 가진 여성에게서도 마찬가지이다. 산과적으로 제왕절개를 필요로 하는 경우가 아니라면 질식분만이 권고되며 대부분의 경우 안전하게 분만을 할 수 있는 것으로 알려져 있다. 질식분만을 시행하는 경우 제왕절개를 시행하는 경우에 비해 출혈량이 적고 감염, 정맥혈전, 색전의 위험이 낮으며 선천 심기형이 있다는 이유만으로 제왕절개를 하는 것은 산모 및 아기에게 이득이 없다. 다만 일부의 경우 제왕절개가 우선 권고되는데 이런 경우로는 심각한 형태의 폐동맥고혈압(예. 아이젠멩거 증후군[Eisenmenger's syndrome]), 대동맥 확장을 동반한 대동맥병증, 심각한 좌심폐쇄, 심각한 심실기능부전 등이 있다. 심장 기능의 보상기전이 상실된 경우 최대한 짧은 시간 동안에 분만이 이루어져야 하므로 제왕절개가 권고된다. 또한 산모가 경구 항응고제를 복용하고 있는 경우 제왕절개를 시행하는 것이 태아의 뇌내출혈 위험을 줄일 수 있기에 이러한 경우 제왕절개가 선호된다.

그러나 실제 의료 현장에서는 선천 심기형을 가진 여성들의 제왕절개율이 그렇지 않은 경우에 비해 높은 것으로 보고되어 있다. 이는 선천 심기형의 정도가 심할수록 증가하였다.

The Effect of Sildenafil on Maternal Mortality in PAH Associated with ACHD

Ja Kyoung Yoon, MD
Bucheon Sejong Hospital, Korea

Pulmonary arterial hypertension with congenital heart disease (PAH-CHD) represents a significant concern especially for women considering pregnancy due to the poor tolerance of physiological changes during pregnancy. Considering the high risk of adverse events, pregnancy is generally considered contraindicated for these patients.

Historically, reports up to 2,000 indicated a maternal mortality rate of 30 to 50% for those with PAH-CHD. However, studies from 2009 to 2014 showed a decline to 23-33%, and more recent data from 2000-2018 demonstrated further improvement with rates between 3.6% and 6.8%. These positive trends can be attributed to advancements in targeted PAH treatments. It is worth noting, however, that pregnancies affected by PAH and Eisenmenger's syndrome present significant risks to both mother and child. Treatment strategies should be tailored based on disease severity, point of diagnosis during pregnancy, and fetal health.

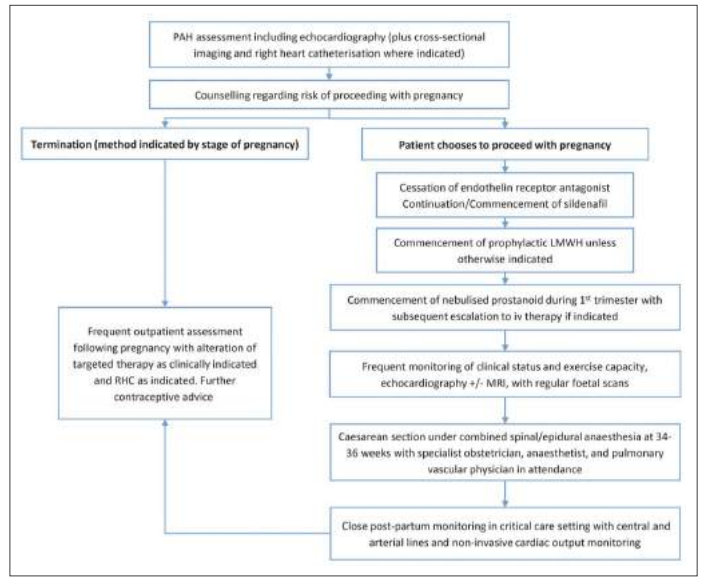


Figure 1. Typical management of the patient with PAH who choose to proceed with pregnancy (BJOG 2010;117:565–74).

The American College of Chest Physicians (ACCP) recommends bosentan (endothelin receptor antagonists, ERAs) as the only PAH-specific treatment proven effective for PAH-CHD patients. However, ERAs are generally discouraged during pregnancy due to potential embryonic hazards. Instead, the use of PDE5 inhibitors, epoprostenol, and selexipag is recommended.

Sildenafil, a PDE5 inhibitor, works by targeting an enzyme predominant in the smooth muscle cells of pulmonary arteries. It may counteract endothelial dysfunction, prevent vascular smooth muscle changes, and selectively increase blood flow by promoting vascular smooth muscle relaxation. **With the advent of these pulmonary hypertension medications, there seems to be a decline in maternal mortality post-childbirth and associated cardiac complications.** It is important to note that while it is categorized as Class B concerning fetal safety, its use among pregnant PAH patients lacks extensive documentation. All treatments aimed at dilating pulmonary vessels should continue post-partum, and regular monitoring of the right ventricle's functionality through echocardiography is crucial (**Figure 1**).

The decline in maternal mortality is attributed to factors such as prompt multi-disciplinary interventions, early diagnosis, pre-pregnancy counseling, elective termination of pregnancies, when necessary, premature deliveries, and specialized pulmonary hypertensive therapies. However, there are no standardized guidelines specifically addressing PAH-CHD management during pregnancy. Experts emphasize the importance of exercising caution when advising PAH-CHD patients on pregnancy and advocating for an individualized strategy based on the severity of PAH-CHD, rather than universally recommending termination of the pregnancy for all PAH-CHD patients.

Adult Congenital Heart Disease 1
The Vulnerability for Life in ACHD
›› Saturday, Oct 14, 14:45-16:15, Grand 4

Evaluating the Safety and Long-term Efficacy of Triple Vasodilator Therapy for PAH Associated with ACHD

Sung A Chang, MD, PhD
Sungkyunkwan University School of Medicine, Korea

PAH associated with adult congenital heart disease (ACHD) is notably intricate due to irregular vascular and cardiac anatomy, persistent myocardial disease, postoperative alterations, and frequent shunting.

Continued on page 5

ACC-KSC Joint Session

Remote Monitoring in Heart Failure

Troy Leo, MD, MHCM, FACC
Atrium Health Sanger Heart & Vascular Institute, USA

Cardiovascular disease remains the leading global cause of mortality. In particular, heart failure (HF) continues to be a significant contributor to morbidity and mortality, impacting approximately 60 million individuals worldwide. In South Korea, the prevalence of HF has been on a steady increase, affecting an estimated 2.2% of the population. Furthermore, the economic burden of treating HF has nearly doubled since 2002, primarily due to the escalating hospitalization costs. As our population continues to grow and age, the impact of HF on our communities is poised to intensify. To combat this impending surge, innovative approaches to diagnosing and treating HF are imperative.

Remote monitoring has been an essential tool in HF management for over 25 years. However, the COVID-19 pandemic greatly accelerated the use of virtual and remote technology to diagnose and manage the disease, with increased adoption throughout the world. There is a wide range of remote monitoring techniques, including assessing weight, symptoms, lung water, pulmonary artery/left atrial/right ventricular pressures, and speech tone as a surrogate for congestion. Additionally, smart clothing and wearable devices are emerging as valuable tools for gathering patient data, enhancing our understanding and management of the disease. Artificial intelligence (AI) has also made significant strides, enabling the prediction and management of HF exacerbations. **Studies have demonstrated the effectiveness of remote monitoring, with reductions of 16% in all-cause mortality, 19% in first HF hospitalizations, and 15% in total HF hospitalizations.**

However, technology alone cannot address the escalating costs associated with HF. As we amass an increasing volume of patient data, it is imperative that we establish an infrastructure and clinical pathways that facilitate rather than hinder clinicians in managing the disease. Given the heterogeneity of HF, a tailored personalized approach is essential to optimize resource utilization and alleviate the burden on patients.

Given the rising prevalence and costs associated with HF, there is an urgent need to adapt our healthcare systems to better serve patients with HF and enhance the overall health and survival of our population. Remote monitoring is an indispensable tool in achieving this goal. As technology continues to evolve, providing an array of tools to combat HF, our delivery of care must evolve in tandem to effectively reduce the global impact of this condition.

ACC-KSC Joint Session
Emerging Tools in Heart Failure
›› Saturday, Oct 14, 08:30-10:00, Art

Continued from page 4

The advancement of targeted therapies for PAH has positively impacted survival and quality of life, including within Group 1 PAH encompassing ACHD cases.

Recent guidelines advocate for a thorough assessment of cardiovascular (CV) and pulmonary comorbidities to guide treatment choices, including considerations for early or sequential combination therapy and potential progression to triple combination therapy in high-risk patients (**Figure 2**). CV comorbidities mean an increased risk of left ventricular diastolic dysfunction and include obesity, hypertension, diabetes mellitus, and coronary heart disease. However, these guidelines do not specifically address factors like previous cardiac surgery, shunt lesions, or the chronicity of disease progression in the context of PAH associated with ACHD.

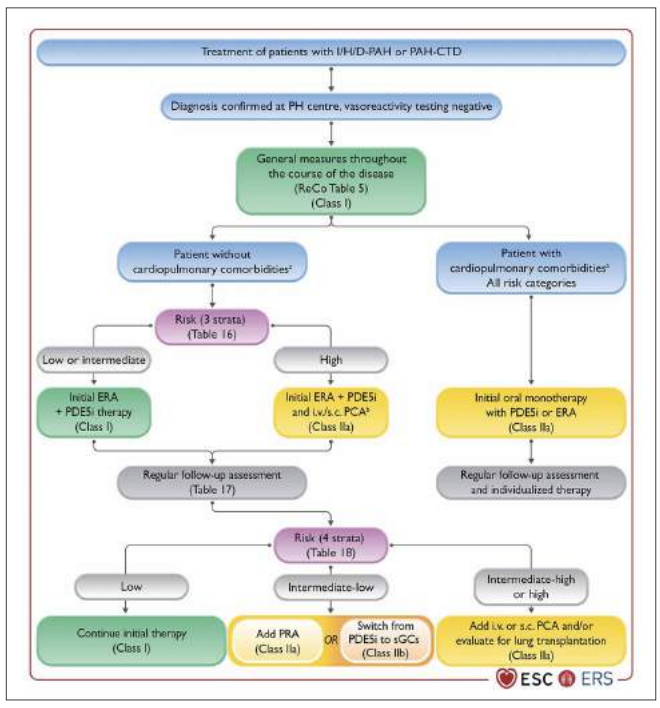


Figure 2. Treatment algorithm for PAH: ESC/ERS 2022 Pulmonary Hypertension Guideline (Eur Heart J 2022;43:3618–731.)

Evaluating the safety and long-term effectiveness of triple vasodilator therapy for PAH-ACHD remains limited in clinical data compared to other types of Group 1 PAH. The classification of patients based on cardiovascular comorbidities is essential due to their vulnerability and potential for combined pre- and post-capillary pulmonary hypertension. Pulmonary vasodilator therapy's potential to increase blood flow to pulmonary vessels could induce hazardous pulmonary edema, impacting both ventricles. These therapies also influence systemic blood pressure, critical in patients with shunt hemodynamics. Therefore, **PAH-ACHD patients should be considered with CV comorbidity, favoring sequential combination therapy.** Early triple combination therapy might suit high-risk patients, but monitoring for recent progression, altered hemodynamics, and adverse reactions is vital.

The long-term effectiveness of triple vasodilator therapy for PAH, including PAH associated with ACHD, has been evidenced by post-hoc analyses of clinical trials and registry data. While this therapy notably improves survival, particularly in high-risk patients, real-world data highlights limited triple combination usage. The initiation and continuation of triple combination therapy are predominantly reliant on prostacyclin. The success of triple therapy heavily hinges on optimal prostacyclin dosage and adept management of adverse reactions. In this presentation, the practical use of prostacyclin will be discussed alongside relevant case examples.

Lifestyle Modification for Adult Congenital Heart Disease (ACHD)

Lucy Youngmin Eun, MD, PhD
Yonsei University College of Medicine, Korea

Patients with ACHD are living longer due to significant advances in medical and surgical care. As a result, these patients are now experiencing morbidities that are common in the general population, such as myocardial infarction, heart failure, and arrhythmias. Acquired lesions with aging, such as hypertension, diabetes mellitus, and obesity can negatively influence their original CV disease. In addition, atherosclerosis may become an additional health problem for people with ACHD as they age and reach the age at which atherosclerosis becomes clinically relevant.

Often, these problems can be attributed to the underlying ACHD. However, a patient's poor lifestyle choices only increase his or her risk for these life-threatening comorbidities. Particularly in patients with complex congenital lesions, certain behaviors related to tobacco smoking, alcohol consumption, substance abuse, dental care, and physical activity can have serious consequences.

The benefits of physical activity and exercise in the management of one's heart disease are well established. However, the therapeutic role of exercise in the ACHD population has been understudied. In fact, patients with ACHD have traditionally been discouraged from moderate or vigorous exercises due to safety concerns.

Exercise training is an effective therapy for improving the well-being and cardiorespiratory fitness, likely impacting the prognosis in ACHD. Hence, exercise has become an increasingly important adjunct to medical therapy in the management of ACHD patients. Therefore, **ACHD patients should be screened for metabolic syndrome and eliminate risk factors** for aggravating their CV diseases. The appropriate recommendations encompass the **importance of proper caloric intake, methods of weight control (including behavioral therapy, drugs, and surgeries)**, practical recommendations for **optimal physical activity and exercise**, and the implications of substance abuse. **Being proactive and addressing important lifestyle choices in this ACHD population can reduce comorbidities.**

Adult Congenital Heart Disease 2
Improving Quality of Life in ACHD
›› Saturday, Oct 14, 16:30-18:00, Grand 4

Lipid & Atherosclerosis

Strict BP Management in the Digital Era

Hae-Young Lee, MD, PhD
Seoul National University College of Medicine, Korea

In the contemporary landscape of healthcare, the advent of digital technologies has opened new avenues for managing and monitoring chronic conditions. One such critical area is the management of blood pressure (BP), a pivotal factor in determining cardiovascular (CV) health. However, BP value is a highly variable parameter, fluctuating over 30 mmHg in systolic BP in 24 hours. Thus, with a critical need to improve ways to correctly measure BP without stress, the integration of digital tools and platforms into healthcare has paved the way for a more proactive and personalized approach to BP management. This session emphasizes the impact of wearable devices, smartphone applications, and telehealth services in empowering individuals to monitor their BP levels regularly and conveniently. These technologies not only provide real-time readings but also enable data tracking and sharing with healthcare providers, fostering a collaborative environment for informed decision-making.

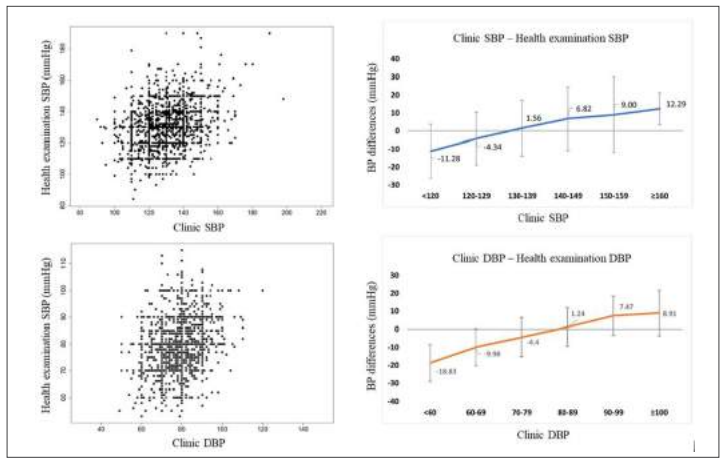


Figure 1. BP differences between (usual) clinic and (standard) health examination

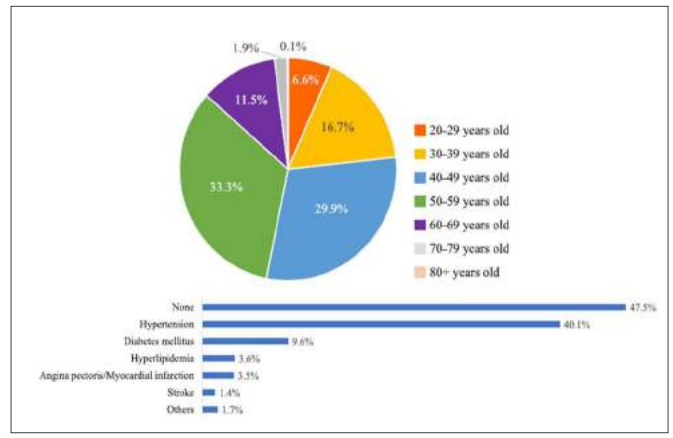


Figure 2. Feasibility, credence, and usefulness of out-of-office cuffless BP monitoring using smartwatch- a population survey (Clin Hypertens 2023;29(1):15.)

Current CV prevention strategy invariably emphasizes stricter risk factor control than previous guidelines. However, "the lower, the better" strategy might not always be true in hypertension control. Unfortunately, this is due to the lack of consistency in available data, where the incremental benefit of lowering SBP to <130 mmHg has been shown by some randomized controlled trials and meta-analyses but not clearly demonstrated in major trials. Recent European guidelines cautiously mentioned an increased risk in the general trial population or in a limited number of patients when exposed to intense BP lowering treatment, that is, a J-shaped relation with BP values of <120/70 mmHg. Thus, the importance of precise BP measurement is becoming more critical.

Cuffless BP devices hold promise for increasing the use of home BP monitoring as part of hypertension management. Clinicians and patients are becoming more familiar with the concept of white-coat hypertension and the limitations of relying on office BP measurement alone to guide hypertension management (**Figure 1**). Contrary to the common thought that the young population will be the main users of wearable BP devices, a survey reported that the largest user group was the 50-59 age group, followed by the 40-49 age group, who have economic power and are interested in their health (**Figure 2**). The major concern regarding the clinical use of cuffless devices is accuracy. However, the calibration process might induce substantial fluctuation of 10 mmHg of systolic BP in individuals with hypertension. **This suggests that more meticulous calibration of the device (e.g. performed by a healthcare professional) might be more advantageous over entrusting self-calibration to individual users.**

In this session, the current status, pitfalls and the future perspective of BP measurement using cuffless devices will be discussed.

Lipid & Atherosclerosis 2
Recent Update on the Evidence Based CVD Prevention
›› Saturday, Oct 14, 10:15-11:45, Grand 5

Arrhythmia

Update on VF Ablation

Mélèze Hocini, MD
University of Bordeaux, France

Idiopathic ventricular fibrillation (VF) is a common cause of sudden death in young adults. Recent studies have shown the high incidence of microstructural cardiomyopathic areas, which act as the substrate of VF re-entries. These subclinical alterations require high-density endo- and epicardial mapping to be identified using electrogram criteria. Small areas are involved and located individually in various sites (mostly epicardial). Their characteristics suggest a variety of genetic or acquired pathological processes affecting cellular connectivity or tissue structure, such as cardiomyopathies, myocarditis, or fatty infiltration. Purkinje abnormalities manifesting as triggering ectopy or providing a substrate for re-entry represent a second important cause. The documentation of ephemeral Purkinje ectopy requires continuous ECG monitoring for diagnosis. A variety of diseases affecting Purkinje cell function or conduction are potentially at play in their pathogenesis. Comprehensive investigations can therefore allow the great majority of idiopathic VF to ultimately receive diagnoses of a cardiac disease, likely underlain by a mosaic of pathologies. **Precise phenotypic characterization has significant implications for the interpretation of genetic variants, risk assessment, and individual therapy.** The study reviewed the diagnostic value of systematic investigations and the new insights provided by detailed electrophysiological mapping.

Arrhythmia 5
How to Make Difficult PVC & VT Ablation Easy
›› Saturday, Oct 14, 10:15-11:45, Grand 1

Cross Specialty 7: Balancing Heart and Kidney

Clinical Implications of an Acute Dip in eGFR after SGLT2 Inhibitor Initiation: Deep Meditation on the Immediate and Remote Renal Function

Sung-Hee Shin, MD, PhD
Inha University College of Medicine, Korea

Landmark clinical trials have shown that SGLT2i improved clinical outcomes in patients with heart failure (HF) regardless of ejection fraction. This clinical benefit is reported to occur early, within days to weeks after initiations of SGLT2i. Because of their safety and tolerability, SGLT2i are given priority in HF management. The pathophysiology between HF and chronic kidney disease (CKD) is bidirectional, involving shared risk factors and common mechanisms. **SGLT2i can cause an initial drop in estimated glomerular filtration rate (eGFR), which is often referred to as the eGFR dip. This initial dip is generally small with an average of 3-5 mL/min-1.73cm^2, followed by preservation of eGFR as compared with placebo (Figure 1).** Natriuresis and glucosuria by SGLT2 inhibition will increase sodium delivery to macula densa of the distal nephron, which can eventually lead to vasoconstriction of the afferent renal arteriole. This vasoconstriction is secondary to adenosine-mediated myogenic activation and results in a reduction of intraglomerular pressure, renal flow and eGFR. **Nevertheless, this initial dip is not associated with worsened outcomes.** In the DAPA-HF trial, the initial decline in eGFR following the initiation of SGLT2i was associated with an even better outcome when compared with placebo. However, an increased risk was noted after the initial eGFR dip in the placebo group. Thus, the initial dip, within a certain range, should not be a reason to stop medication. However, if patients experience a pronounced decrease in eGFR, other potential causes of this decline should be evaluated, such as volume depletion, deterioration of clinical status, and medication that affects renal hemodynamics. Temporary discontinuation of SGLT2i can be considered if there are no other causes for a pronounced increase in eGFR after careful investigation, with rechallenge after 2-4 weeks once renal function has improved. Over the long-term follow-up, the change in eGFR decline was slower in patients taking SGLT2i than those on placebo, suggesting a renoprotective effect. Furthermore, in large clinical trials, SGLT2i improved renal outcomes in patients with CKD, regardless of the presence of diabetes. **Therefore, an initial drop in eGFR should not be a decisive factor for initiating or discontinuing SLGT2i unless other adverse side effects occur.**

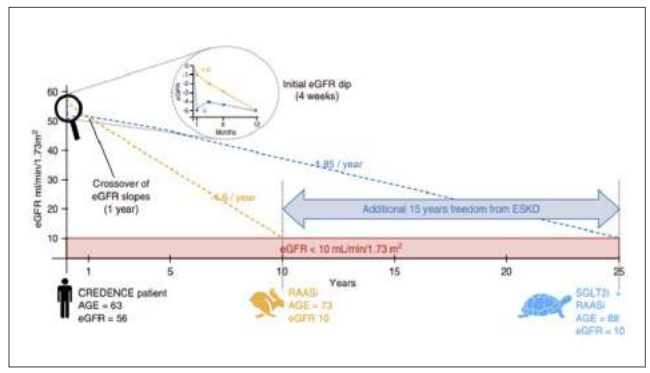


Figure 1. SGLT2is may delay ESKD by 15 years (Kidney360 2021;2(6):1042-7.)

Cross Specialty 7: Balancing Heart and Kidney
Frequently Encountered Problems During HF Treatment
›› Saturday, Oct 14, 14:45-16:15, Walker 1

Smart Health

Digital Transformation 시대에서의 의사 창업 A to Z

권준명 대표
Medical AI

권준명 메디컬에이아이 대표는 응급의학과 전문의이자 인공지능 개발자로 연구하던 중, 의료기술 기업은 의료를 기반으로 하고 있어야 한다는 생각으로 심전도 인공지능 전문 기업인 "메디컬에이아이"를 2019년 설립하였다. 이후 임상 전문의, 공학자와 소프트웨어 개발자들도 합류했다. **메디컬에이아이를 창업한 이유이기도 했던 12유도 심전도를 인공지능 분석하여 좌심실수축기능부전의 진단을 보조하는 소프트웨어 의료기기인 AiTiALVSD를 올해 세상에 내놓았다. AiTiALVSD는 2023년 인허가 되었을 뿐 아니라 보건복지부 혁신의료기기 지정 및 National Entertainment Collectibles Association (NECA) 신의료기술평가에서 혁신의료기술로 지정되었으며 2023년 하반기 비급여로 처방이 가능하다.** 이 창업 과정을 간략하게 요약하면 아이디어 도출, 특허 출원, 기업 설립, 초기 개발, 투자 유치, 인력 채용, 임상연구, 임상시험, 인허가, 수가 인정, 영업과 마케팅, 판매와 유지보수이다(Figure 1).

의사 창업의 장점은 그 분야를 가장 정확하게 이해하는 전문가가 창업자라는 점을 강조하면서 의료 내에서 불충족 수요를 도출해낼 수 있고, 새로 개발한 기술이 임상에 실제 적용되었을 때의 파급력과 반작용을 예상할 수 있다. 이를 기반으로 기업 방향성에 대한 중요한 결정을 내릴 수 있다. 또한 기술 연구 및 제품 개발에 필요한 기반 기술을 포함하여 인적 네트워크를 활용할 수 있다는 장점이 있다. 전문 지식을 기반으로 임상시험과 인허가를 진행할 수 있는 부분도 의사 창업의 큰 무기이다. 의사 창업의 단점으로는 회계, 재무, 인사, 법률 등 기업을 운영하는 데 있어 필수적인 지식을 끊임없이 찾아보고 배워야 하며 그 과정에서 잘못된 판단을 할 위험이 있다는 점이다. 실제 기업이 운영되기 위해서는 비즈니스모델을 만들고 영업과 마케팅을 통해 실행해야 하는데 의사로서는 경험하지 못한 새로운 영역의 일이기 때문에 시행착오를 겪는다. 환자를 실제로 진료하며 사람의 생명을 다루는 의료의 본질을 이해하는 의사가 의료기술기업에서 중심이 되어야 한다는 생각은 변함이 없다. 첫 번째, 기업을 경영하며 마주치는 선택의 순간에 '해야 하는 일'보다 동료 의사, 환자에게 해를 끼칠 수 있는 '하지 않아야 하는 일'을 더 중요하게 판단하고 주체적으로 결정할 수 있기 때문이다. 메디컬에이아이의 최우선 가치(value)의 첫 번째가 "Do no harm"인 이유이다. 두 번째, 하나의 기술이 의료에 사용되기 위해서는 다양한 임상 환경에서 끊임없이 검증하고 중요한 근거를 창출하는 임상연구를 하며 최종적으로 진료 가이드라인으로 포함되는 과정을 거치는데 이의 중요성을 이해하고 있는 사람은 의사이기 때문이다.

Figure 1. 인공지능 전문 기업 메디컬에이아이의 창업부터 AiTiALVSD 기술의 개발까지

Smart Health
Transforming Cardiovascular R&D into Technology Commercialization
›› Saturday, Oct 14, 13:00-14:30, Grand 5

Epidemiology

Implementing Cardiovascular Risk Prediction in Clinical Practice

Donald M. Lloyd-Jones, MD, ScM
Northwestern University, USA

The current paradigm for primary prevention of cardiovascular disease (CVD) in contemporary clinical practice guidelines involves matching the intensity of prevention efforts to the absolute risk of the patient. In order to do so, 10-year risk prediction equations are used to quantify absolute risk. **Recent guidelines recommend the use of the risk estimate as part of a clinician-patient discussion, in which the clinician and patient personalize the 10-year risk estimate through consideration of "risk-enhancing factors," and address patient preferences.** If there is clinical uncertainty or patient indecision after this process, further testing can be used to reclassify risk and refine the risk scenario. This current approach, termed "Prevention CPR (Calculate-Personalize-Reclassify)" can lead to smarter decision-making for the use of preventive drug therapies, and help lead to greater patient satisfaction and adherence.

This session will present the CPR approach and how it can be implemented in clinical practice. Also, currently available risk equations and risk-enhancing factors as well as tools will be reviewed. In addition, the value of further testing, including imaging tests (coronary artery calcification, carotid intima-media thickness, etc.) and biomarkers will be discussed. Further, the future of CV risk prediction will be explored, including efforts to include HF risk prediction and possibly polygenic risk scores or machine learning/AI algorithms in risk assessment.

Lifetime ASCVD Risk Prediction in Korea

Hokyou Lee, MD, PhD
Yonsei University College of Medicine, Korea

The current international guidelines on the primary prevention of CVD recommend individualized assessment of risk scores as thresholds. However, the guidelines primarily focus on middle-aged to older individuals and 10-year risk scores are largely driven by older age. As the majority of CVD events occur after mid-life, younger adults are unlikely to exceed 10-year risk thresholds for treatment recommendations even with multiple risk factors and potentially high lifetime risk. The ACC/AHA Pooled Cohort Equation (PCE) is the most established 10-year CVD risk prediction model. The model also calculates 30-year risk as a proxy for lifetime risk. However, this method does not allow estimation of CVD-free life expectancy. The QRISK2 and the similar LIFEtime-perspective CardioVascular Disease (LIFE-CVD) models provide competing risk-adjusted lifetime risk and CVD-free life expectancies as young as 30 or 45 years, but the models are localized for use in the UK or Europe.

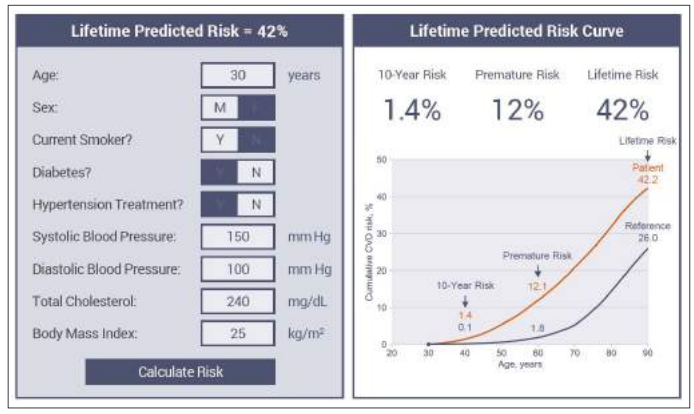


Figure 1. Example of predicted 10-year, premature, and lifetime CV risk of a 30-year-old male, non-diabetic smoker. The reference is a non-diabetic, non-smoking male of the same age with body mass index 20 kg/m^2, untreated blood pressure 110/70 mmHg, and total cholesterol 160 mg/dL.

Recently, sex- and age-specific, competing risk-adjusted lifetime CVD risk prediction models for the Korean population were developed and validated in multiple cohorts with good discrimination and calibration (**Figure 1**). **The lifetime risk model could be used to communicate CVD risk to patients, especially of younger age but with high-risk factor burden, for whom early lifestyle changes or pharmacological intervention could lead to significant life-year gains.** The worked patient-level examples in this study suggest marked differences in lifetime risk for patients with good versus poor control of risk factors, especially for younger patients. At the general population level, assessment of the lifetime risk may identify patients eligible for potential preventive therapy at younger ages despite a low 10-year risk. The lifetime CVD risk remains relatively stable across the life span, whereas the 10-year risk exponentially grows with age. Accordingly, a large discordance between the lifetime risk and the 10-year risk is expected when identifying high-risk patients using these estimates. While early risk modification in patients with high lifetime risk may result in greater lifetime therapeutic benefits, it remains to be studied whether the benefit outweighs the possible harm or increased cost from lifelong pharmacological treatment in this population.

In conclusion, a short-term estimate of the absolute CVD risk is largely driven by age and rarely surpasses a clinically informative threshold among younger adults. The potential underappreciation of risk may lead to undertreatment of risk factors or low treatment adherence in these individuals. Although several assumptions and limitations require caution in interpreting the predicted results, **the lifetime risk models can be useful for primary prevention guidance in apparently low-risk patients whose 10-year risk may not fully reflect potential lifetime benefit from CVD prevention.**

Epidemiology 1
Cardiovascular Risk Prediction: Basic Concepts, Current Status, and Future Directions
›› Saturday, Oct 14, 16:30-18:00, Grand 3

TSOC-KSC Joint Session

Integrated Care and Holistic Management of AF: Evidence from Korean Nationwide Studies

So-Ryoung Lee, MD, PhD
Seoul National University College of Medicine, Korea

In accordance with contemporary guidelines and consensus statements, the emphasis on lifestyle factors in the optimal care of atrial fibrillation (AF) patients has grown. Among those receiving anticoagulation therapy, smoking is associated with a twofold higher risk of stroke - even in those deemed at genuinely low risk for stroke - underlining the importance of recommending smoking cessation immediately following AF diagnosis. Notably, 15% of AF patients continued to smoke based on the Korean Nationwide Health Insurance Service (KNHIS) database, and current smokers exhibited elevated risks of stroke and mortality compared to those who never smoked. However, quitting smoking after AF diagnosis significantly reduced the risk of stroke compared to those who continued smoking.

Alcohol consumption is closely tied to AF incidence and recurrence, with alcohol intake correlating with left atrial electrical remodeling. While alcohol abstinence is associated with reduced AF recurrence, its impact on stroke risk remains uncertain. Analysis of KNHIS data revealed that abstainers had a 15% lower risk of ischemic stroke compared to current drinkers.

Regarding physical activity, evidence linking exercise to stroke in AF patients remains limited. Nevertheless, the KNHIS-based analysis suggests that engaging in 1,000 to 1,499 MET-min/week of physical activity may reduce the risk of ischemic stroke, heart failure, and all-cause mortality in AF patients.

Patients frequently exhibit combinations of both healthy and unhealthy lifestyle factors.

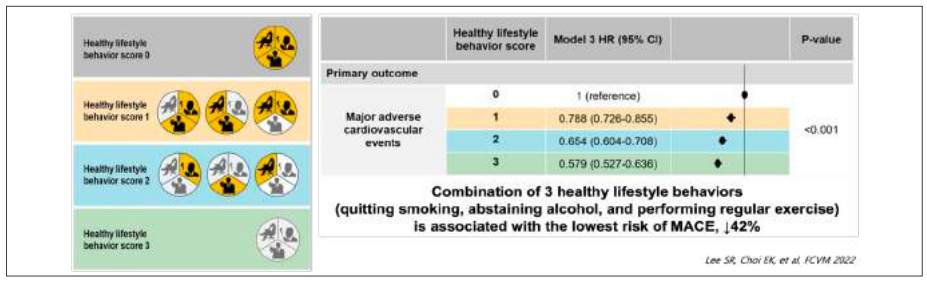


Figure 1. Effect of smoking, alcohol, and lifestyle behaviors on the risk of cardiovascular events

The impact of three lifestyle behaviors was evaluated: smoking, alcohol consumption, and exercise. Adopting healthy lifestyle behaviors, assessed via a composite score, was associated with a significantly lower risk of major adverse cardiovascular (CV) events. Specifically, with regard to stroke risk, patients adhering to all three healthy lifestyle behaviors had about 40% lower stroke risk compared to those exhibiting all three unhealthy lifestyle behaviors (**Figure 1**).

Considering these findings, it is recommended to integrate proactive CV risk factor management, including lifestyle modifications, into AF treatment regimens alongside anticoagulation therapy. **Addressing patients' CV comorbidities while emphasizing healthy lifestyle behaviors such as smoking cessation, reduced alcohol intake, and regular exercise is essential for mitigating stroke risk in AF patients.**

Stroke Prevention in Atrial Fibrillation - Evidence from "Big Data" in Taiwan

Yi-Hsin Chan, MD
Chang Gung Memorial Hospital, Taiwan

The real-world data have substantiated the long-term consistency of both the efficacy and safety of novel oral anticoagulants (NOACs) when compared to warfarin in non-valvular atrial fibrillation (NVAF) patients in real-world medical practices observed in Taiwan. Notably, there is a substantial prevalence of lower-dosage NOAC prescriptions for stroke prevention in atrial fibrillation (SPAF) within the Taiwanese real-world clinical setting. The empirical evidence from the real-world data contradicts the perception that off-label use of lower-dose NOACs is a safer alternative. On the contrary, it reveals that this practice is associated with a higher risk of stroke when compared to on-label NOAC administration. Conversely, the utilization of off-label overdose NOACs does not exhibit superior efficacy in stroke prevention but rather incurs a higher risk of bleeding when juxtaposed with on-label NOAC administration, as deduced from the real-world data gathered in Taiwan.

Dr. Chan recommends the adoption of the Cockcroft-Gault (CG) formula, as opposed to the Modification of Diet in Renal Disease (MDRD) or the Epidemiology Collaboration (EPI) formula, to estimate renal function and determine the appropriate dosage of NOACs in line with established guidelines and randomized controlled trial outcomes. Furthermore, the real-world data validate the efficacy and safety of NOACs relative to warfarin in high-risk NVAF patients characterized by factors such as advanced age, a history of intracranial hemorrhage, advanced liver disease, thyroid disease, anemia, thrombocytopenia, cancer or a high burden of atherosclerosis, as encountered within the Taiwanese real-world clinical context.

It is noteworthy that in patients with AF aged 80 years or older who are not suitable candidates for standard-dose NOACs, a reduced-dose formulation known as EDOX 15 has been approved for SPAF in Taiwan as part of the ELDERCARE-AF study. However, the comparative efficacy and safety of Very Low-Dose NOACs (EDOX 15) versus Reduced-Dose NOACs (EDOX 60/30) warrant further investigation and evaluation.

TSOC-KSC Joint Session
Comparison of Nationwide Study on AF Between Korean and Taiwan
›› Saturday, Oct 14, 13:00-14:30, Grand 1

Echocardiography

Cardiac Amyloidosis

Seung-Pyo Lee, MD, PhD
Seoul National University College of Medicine, Korea

Cardiac amyloidosis (CA) presents to cardiologists for evaluation of dyspnea and/or increased left ventricular (LV) wall thickness. However, it is frequently misdiagnosed as hypertrophic cardiomyopathy or hypertensive heart disease and is often masqueraded in a variety of diseases, such as aortic stenosis. These are situations where multimodal evaluation comes in handy (**Figure 1**).

These patients should be analyzed with speckle tracking imaging on top of the conventional 2D-echocardiography. Although not pathognomonic and the global strain has decreased, a characteristic 'cherry-on-top' or 'apical sparing' pattern of longitudinal strain strongly suggests CA. Biatrial enlargement also provides clues, as most CA demonstrates advanced diastolic dysfunction.

The 12-lead ECG provides useful clues to suspicion. Despite increases in the LV wall thickness, low-voltage in the limb leads or pseudo-Q waves are findings highly suspicious of CA.

There are also additional useful blood tests. B-type natriuretic peptide and troponin levels are both useful for staging and suspicion. Amyloid light chain (AL) type CA may easily be discernible with a simple free light chain assay of both light chains. When the free light chain assay turns out abnormal, it should be followed by serum immunofixation electrophoresis.

Advanced imaging other than echocardiography includes cardiovascular magnetic resonance (CMR) and radionuclide imaging. CMR may reveal a characteristic subendocardial ring enhancement pattern, but findings such as patchy infiltration or difficulty in myocardial nulling may be observed. Parametric imaging, such as T1 mapping or even T2 mapping, may enable precise quantification of the myocardial amyloid deposits. Radionuclide imaging using bone-seeking tracers are enough to diagnose transthyretin (ATTR) CA, provided that there is no concomitant disease to explain the finding.

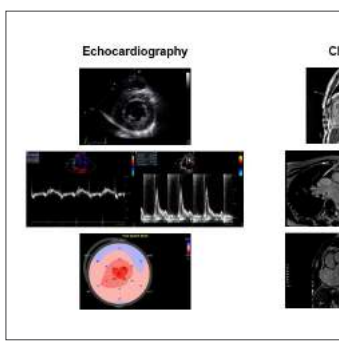


Figure 1. Multimodal evaluation of cardiac amyloidosis

Notwithstanding these multimodal evaluations, it is most important to look out for findings that suggest CA. **Suspicion is always the first step to CA, a disease that has a distinct treatment option compared to other cardiac diseases presenting a thick LV wall.**

Echocardiography 3
Multimodal Evaluation of Myocardium and Valve: When & How?
›› Saturday, Oct 14, 08:30-10:00, Grand 3

Severe MR: Before Class I Indication of Surgery

Jah Yeon Choi, MD, PhD
Korea University College of Medicine, Korea

Degenerative mitral regurgitation (DMR) characterized by mitral valve prolapse (MVP) is the most common type of organic mitral valve disease. Volume overload is a common consequence of DMR and is associated with significant morbidity and mortality. **Although MVP is highly amenable to surgical intervention, the condition is significantly undertreated in clinical practice. This suggests the need for additional data to guide the surgical correction of DMR.**

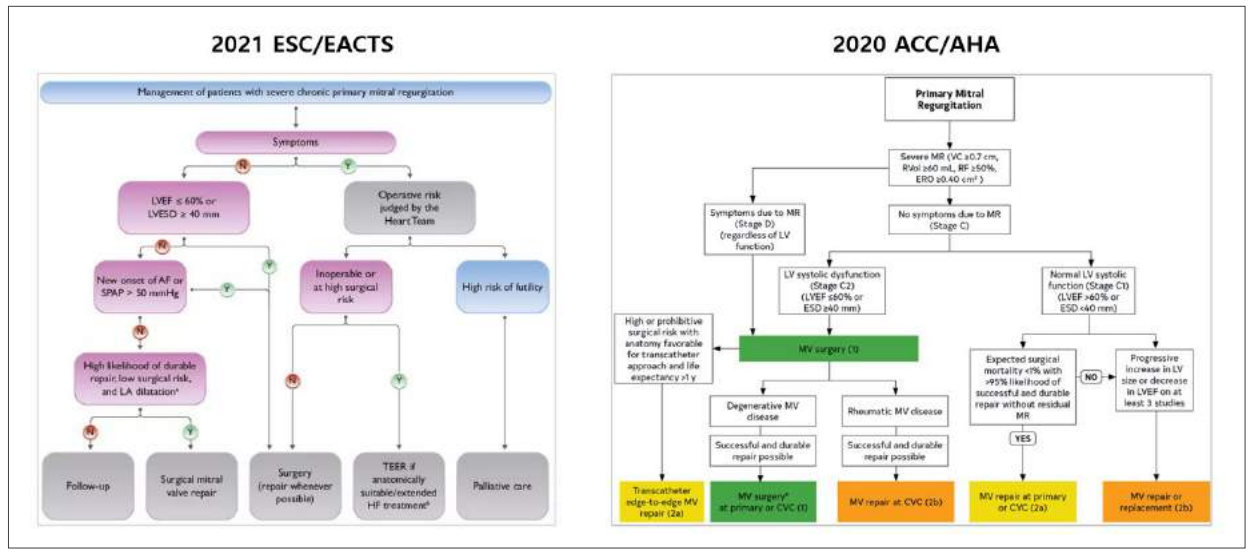


Figure 2. Management of patients with severe chronic primary mitral regurgitation in AHA and ESC guidelines (Circulation 2021;143(5):e72-227; Eur Heart J 2022;43(7):561-632.)

Indications for surgery in patients with asymptomatic DMR include evidence of LV systolic dysfunction defined by an ejection fraction (EF) ≤60% and LV end-systolic diameter (LVESD) ≥40 mm (**Figure 2**). Currently, these are considered Class 1 criteria for MV surgery or transcatheter repair. However, there is still a lack of evidence or consensus regarding the significance of other determinants, such as left atrial volume index, atrial fibrillation, pulmonary hypertension and moderate to severe tricuspid regurgitation, and their impact on postoperative outcome is largely undefined.

Surgery before symptom onset or irreversible volume overload may preserve normal life expectancy. However, we should always consider the perioperative risk, especially in asymptomatic patients with non-cardiovascular comorbidities, as well as the quality of surgery performed at each Heart Valve Center. In this presentation, current evidence regarding the indications of mitral valve surgery and points to consider when deciding between watchful waiting and early surgery will be reviewed.

Severe AS – Before Class I Indication of Surgery

최홍미 교수
서울의대

대동맥판협착증은 고령화 사회에서 급속히 증가하며 진행 억제 약물이 없어서 판막 교체만이 근본적 치료법이다. 과거에는 증상이 있는 심한 대동맥판협착증에서만 수술이 권장되었으나 경피적대동맥판치환술과 최소침습수술의 발달, 수술의 합병증 감소 등으로 판막 교체의 적응증이 확대되고 있다.

Continued on page 11

Cross Specialty 6: Heart & Brain

Heart-Brain Interactions: Is Small Vessel Disease a Link?

C. Noel Bairey Merz, MD, MACC, FAHA, FESC
Cedars-Sinai Medical Center, USA

Small vessel diseases of the brain and the heart have far-reaching clinical implications and billions of dollars in annual healthcare costs. From a pathophysiological perspective, both organs share common risk factors (e.g., hypertension, diabetes, dyslipidemia, aging, etc.) and are affected to a similar extent by systemic inflammation, ischemia due to atherosclerosis, vasospasm, micro-emboli and neuroendocrine dysfunction. Additionally, there is increasing awareness that sex differences develop and modify the interaction between the heart and the brain.

A recent review summarizing parallels between coronary microvascular disease (CMD) and cerebral small vessel disease (CSVD) using MRI notably did not include investigations where both conditions were simultaneously studied. CMD is indeed associated with an increased risk of stroke, and Dr. Bairey-Merz has preliminarily linked retinal microvascular structure and peripheral vascular function to CMD, suggesting concomitant research may be useful. Given that CMD therapeutic investigation is now underway, concurrent study with CSVD may provide novel treatment targets. Dr. Bairey-Merz's parent National Heart, Lung, and Blood Institute (NHLBI)-funded Women's Ischemia Syndrome Evaluation (WISE) Pre-HFpEF (1R01HL146158) is testing the hypothesis that CMD-related ischemia is a precursor of features of HFpEF, in 180 women and men. The WISE subjects are deeply phenotyped, undergo repeated testing, and are followed for at least 10 years. An additional parent National Institute on Aging (NIA)-funded MAE-WEST SCORE* Project 2 (1U54AG065141) adds retinal photography, peripheral microvascular reactivity, and cognitive function to the NHLBI WISE cohort to evaluate the hypothesis that microvascular disease burden is related across major organ systems. Dr. Bairey-Merz's study will: 1) establish an at-risk cohort to allow future prospective study of heart, brain and cognitive trajectories; 2) evaluate a variety of brain MRI markers to identify those of potential use in future prospective work; and 3) provide a platform for future clinical trial planning. Specifically, should relations be identified, microvascular disease potential prevention treatment targets can be considered in CSVD-related dementia prevention trials.

Dr. Bairey-Merz's application will concurrently and efficiently investigate small vessel disease of the brain and heart. Understanding that dementia is likely the product of both vascular dysfunction and Alzheimer's dementia and related dementias pathology (so-called two-hit model) suggests that concurrent heart and brain study may provide insight into treatments.

*MAE-WEST SCORE: The Microvascular Aging and Eicosanoids - Women's Evaluation of Systemic aging Tenacity (MAE-WEST) Specialized Centers Of Research Excellence (SCORE)

Brain-Hematopoiesis-Vascular Axis

Dong Oh Kang, MD, PhD
Korea University College of Medicine, Korea

The pathophysiology of atherosclerotic cardiovascular disease (ASCVD) involves complex interactions among diverse biological systems. The "brain-hematopoiesis-vascular axis" has gained recent attention for its role in ASCVD. Advanced molecular imaging, specifically "18F-FDG-PET/CT," has emerged as a valuable tool for studying these interactions. A landmark study by Tawakol, et al. (2017) used 18F-FDG-PET/CT to identify amygdalar activity (AmygA) as an independent predictor of future major adverse cardiovascular events, linked to increased hematopoietic activity (HEMA) and arterial inflammation (AI). However, the precise connection between emotional brain activity and acute plaque instability in humans remains unclear. To answer these questions, we prospectively estimated the relationship between AmygA, AI and macrophage HEMA in acute myocardial infarction (AMI) as compared to controls.

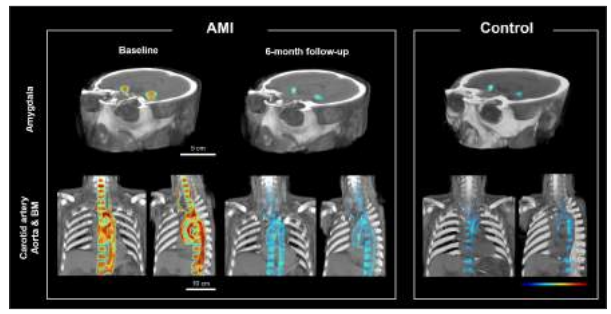


Figure 1. 3D-rendered 18F-FDG-PET/CT images representing "brain-hematopoiesis-vascular axis" (Eur Heart J 2021;42(19):1883-95.)

In Dr. Kang's prospective cohort study, 18F-FDG-PET/CT imaging was performed in 62 patients (45 AMI and 17 controls). Serial 18F-FDG-PET/CT imaging was performed after 6 months to estimate the temporal changes. AmygA, carotid AI, and HEMA were significantly higher (all p<0.001) in AMI patients compared to controls. AmygA correlated significantly with those of the carotid artery (r=0.350; p=0.005), aorta (r=0.471; p<0.001), and bone marrow (r=0.356; p=0.005). Psychological stress scales (Patient Health Questionnaire-9 [PHQ-9] and Perceived Stress Scale-10 [PSS-10]) and AmygA correlated well (p<0.001). Six months later, AMI, AmygA, carotid AI, and HEMA decreased to a level comparable to the controls. Taken together, AmygA, AI, and HEMA were concordantly enhanced in patients with AMI, showing concurrent dynamic changes over time (**Figure 1**). **These results suggest that stress-associated neurobiological activity is linked with acute plaque instability via augmented macrophage activity and could be a potential therapeutic target for plaque inflammation in AMI.**

Cross Specialty 6: Heart & Brain
Recent Updated Issue: Let's See Heart-Brain Crosstalk
›› Saturday, Oct 14, 08:30-10:00, Walker 1

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2020년 ACC/AHA 진료지침에서는 증상이 있는 심한 대동맥판협착 및 증상이 없더라도 좌심실박출률이 50% 미만이거나 다른 심장 수술을 하는 경우 Class I으로 판막 교체를 권한다(**Figure 3**). 무증상의 심한 대동맥판협착 중 운동 부하검사에서 혈압이 감소하거나 운동능력이 저하된 경우, 대동맥판막의 협착이 매우 심한 경우(V_{max}>5 m/s), 뇌나트륨이뇨펩티드(brain natriuretic peptide)가 정상의 3배 이상인 경우, 대동맥판협착이 빠르게 진행하는 경우 수술의 저위험군이면 대동맥판 교체를 Class IIa로 권고한다.

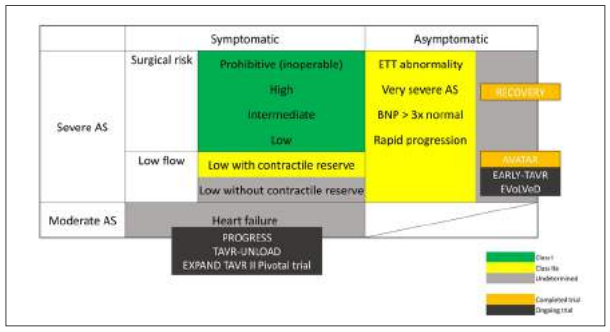

Figure 3. 대동맥판 교체의 적응증과 현재 진행중인 임상시험

최근 연구들에서 무증상의 심한 대동맥판협착 및 심기능 저하를 동반한 중등도 대동맥판협착 환자들의 사망률 또는 입원율이 높다는 점이 밝혀지면서, 아직 Class I 적응증은 아니지만 예후가 나쁜 상기 환자군에 대한 연구도 진행되고 있다.

무증상의 매우 심한 대동맥판협착에서 판막 교체가 도움이 되는 환자군을 선별하고자 2020년 RECOVERY 연구가 진행되었다. V_{max} 4.5 m/s를 초과하는 대동맥판협착에 대해 조기 수술과 관찰을 비교한 무작위배정 연구로, 조기 수술군에서 사망률이 유의하게 낮음을 보여주었다. 현재 진행 중인 EVoLVeD 연구는 무증상 대동맥판협착(V_{max}>4 m/s) 중 심장 MRI에서 중벽에 지연조영증강(late gadolinium enhancement)을 보이는 환자들을 대상으로 무작위배정을 통해 대동맥판 교체가 환자의 예후를 개선시킬 수 있는지 보여줄 것이다. 최근에 무증상의 심한 대동맥판협착 (V_{max}>4 m/s) 전체에서 조기 개입이 예후 개선 여부를 본 연구들이 진행되었는데 AVATAR 연구는 좌심실 박출률이 정상인 무증상 중증 대동맥판협착에서 조기 수술군이 임상 경과가 유의하게 좋음을 보여주었으며, 비슷한 환자군에서 경피적 대동맥판치환술과 경과 관찰을 비교하는 EARLY-TAVR 연구가 2024년 초에 결과를 보여줄 것이다.

중등도 대동맥판협착(V_{max} 3-4 m/s)에서도 조기개입의 예후 개선 여부를 보는 연구가 진행되고 있다. 심부전 동반 환자들에서 경피적 대동맥판치환술군과 표준 심부전 치료군을 비교하는 TAVR-UNLOAD와 EXPAND TAVR II Pivotal 연구가 진행 중이며, 증상이 있거나 심근 손상이 있는 환자 대상의 PROGRESS 연구도 있다. 이러한 대규모 무작위배정 연구들의 결과가 발표되면 대동맥판협착의 치료지침이 다시 변화될 것으로 예상된다. 질병 진행으로 인한 급사, 심부전으로 인한 사망 및 입원 증가 등을 고려한다면 조기 판막 교체로 환자의 예후를 개선할 수 있다는 장점이 있겠으나 조기 판막 교체에 따르는 수술 합병증, 인공판막 합병증, 항응고치료의 불편함 및 재수술 위험성도 함께 고려하여 이상적인 판막 교체 시기를 결정해야 한다.

Echocardiography 4
Decision-making in Severe VHD: Balancing the Multiple Perspectives
›› Saturday, Oct 14, 10:15-11:45, Grand 3

Hypertension

Use of Out of Office BP

이은미 교수
원광의대

정확한 혈압 측정은 고혈압의 진단과 치료에 가장 중요한 것으로 2023년 유럽고혈압학회(European Society of Hypertension, ESH) 진료지침에서는 다음을 강조하였다(**Table 1**). **첫째, 올바른 혈압 측정을 위한 혈압계 조건을 제시하고 권고 등급을 부여하였다.** 기존 지침에서와 달리 이번 지침에서는 진료실 혈압뿐 아니라 진료실 밖 혈압 측정도 모두 검증된 혈압계를 사용하도록 하였으며(IB), 진료실 혈압 측정은 검증된 비수은 혈압계인 자동 혈압계와 청진형인 하이브리드와 아네로이드 혈압계를 권고하였고(IB), 임상 진료현장에서 cuffless 혈압계는 사용하지 않도록 하였다(IIIC). 정확한 혈압 측정을 위하여 자동 혈압계는 공인된 기관에서 검증된 혈압계를 사용해야 한다. **둘째, 진료실 밖 혈압 측정 방법인 24시간 활동 혈압 측정과 가정 혈압 측정의 적응증을 강조하였다.** 활동 혈압은 기존의 백의 고혈압과 가면 고혈압의 진단뿐 아니라 야간 고혈압 및 진성 저항성 고혈압의 진단에 사용하도록 하였으며, 재현성이 낮아 반복 측정을 하도록 하였고(IB), 혈압 값의 오류를 최소화하기 위하여 주야간 모두 20분마다 측정할 것을 제시하였다(IC). 가정 혈압 측정도 기존의 백의 고혈압과 가면 고혈압의 진단뿐 아니라 환자 교육과 상담을 병행하면 조절률을 향상시킬 수 있어 장기 추적 관찰에 사용하도록 하였으며(IB), 진료실 방문 일주일 전(최소 3일) 이상 1분 간격으로 아침저녁에 측정하고 첫날 값은 버리도록 하였다(IC). 또한 활동 혈압과 가정 혈압 모두 심혈관 질환의 위험도 예측에 진료실 혈압에 부가적으로 사용을 고려할 수 있다(IIB). **셋째, 야간 혈압의 진단과 치료의 중요성을 강조하였다.** 활동 혈압으로 측정한 야간 혈압이 ≥120/70 mmHg인 야간 고혈압 및 non-dipping과 reverse dipping은 심혈관 질환의 위험도를 증가시키므로 주간 혈압 측정뿐 아니라 활동 혈압 측정을 통해 진단을 하도록 하였으며(IB), 재현성이 낮아 반복 측정을 권고하였다(IB). 일반적인 인구에서 아침 또는 저녁 시간대 약 투여의 임상 효과는 유사하였으며(IB), 높은 저녁 혈압은 항고혈압제 투여를 고려할 수 있다고 제시하였다(IIC). **넷째, 치료를 받지 않는 대상자에서는 백의 고혈압과 가면 고혈압으로, 치료를 받는 대상자에서는 동일 현상을 백의 비조절 고혈압과 가면 비조절 고혈압으로 용어를 분리 기술하고 각각의 진단과 치료에 대한 지침을 제시하였다.** 백의 고혈압에서는 심혈관 질환의 위험도와 말단 장기 손상에 대한 사정을 하고 활동 혈압 또는 가정 혈압을 이용하여 진성 고혈압으로 변경되는지 추적 관찰하며 적극적인 생활요법의 시행을 권고하였다(IB). 백의 비조절 고혈압과 가면 비조절 고혈압은 백의 고혈압과 가면 고혈압의 권고 지침을 따르도록 하였다(IC). **다섯째, 적극적 선별검사를 권하였다.** 이번 지침에서는 18세 이상의 모든 일반 인구에서 고혈압의 선별 검사를 권고하고 40대 이상이나 고혈압 위험도가 높은 인종, 높은 정상 혈압 범위를 가진 경우, 과다 체중이나 비만, 폐경기 여성, 임신 고혈압의 기왕력이 있는 경우 등에서는 정기적 혈압 측정, 특히 고위험군은 매년 혈압 선별검사를 권고하였다.

항목	2018년 지침	2023년 지침	권고등급과근거수준
신규 항목			
야간 고혈압의 진단과 치료	기술 없음	활동 혈압 측정으로 야간 고혈압과 비정상 dipping 패턴 진단	IB
		야간 고혈압에서 아침 약 투여와 저녁 약 투여의 효과는 유사	IB
		높은 저녁 혈압에는 항고혈압제의 투여를 고려	IIC
권고 등급을 신규로 제시하고 강조한 항목			
혈압계의 조건	검증된 진료실 혈압계를 사용	검증된 혈압계를 사용해야 함	IB (IC: ABPM, HBPM)
활동 혈압 측정			
저항성 고혈압 진단	적응증으로 기술	진성 저항성 고혈압의 진단을 위하여 활동 혈압을 사용해야 함	IB
가정 혈압 측정			
고혈압 환자에서 장기 추적 관찰을 위해 사용	적응증으로 기술	치료 중인 환자에서 가정 혈압의 장기 추적 관찰을 해야 함	IB
심혈관 위험도 예측을 위한 활동 혈압과 가정 혈압의 사용	진료실 혈압보다 예후 예측력이 좋음 기술	진료실 혈압에 부가적으로 사용 고려	IIB
변경 항목			
백의 고혈압과 가면 고혈압	백의 고혈압과 가면 고혈압으로만 분류하여 기술	백의 고혈압과 가면 고혈압을 치료를 받는 대상자 및 치료를 받지 않는 대상자로 분류하여 용어를 정리하고 동일한 권고 사항을 적용함	IC
백의 고혈압	고혈압으로 진단하기 위해 진료실 밖 혈압(활동 혈압 및/또는 가정 혈압)을 측정하여 혈압을 모니터링 해야 함	백의 고혈압을 확인하기 위해 추적 관찰 기간 동안 진료실 밖 혈압(활동 혈압 및/또는 가정 혈압)을 반복적으로 측정해야 함	IC → IB (근거 수준 상향)
	백의 고혈압이 있는 환자에서 생활요법을 적극적으로 시행해야 함	백의 고혈압이 있는 환자에서 생활요법을 적극적으로 시행해야 함	IC → IB (근거 수준 상향)
고혈압의 선별검사	혈압 구간에 따라 다른 검사 주기 권고	18세 이상 모든 일반 인구에서 고혈압의 선별검사를 시행해야 함	IC
		고위험군은 매년 혈압 선별검사를 시행해야 함	IC

Table 1. 2023 ESH 고혈압 진료지침 신구 대비표(J Hypertens 2023 [PMID: 37345492]; J Hypertens 2018;36(10):1953-2041.)

Evaluation of Target Organ Damage and Risk Stratification

Hyun-Jin Kim, MD, PhD
Hanyang University College of Medicine, Korea

The ESH recently unveiled its 2023 Guidelines, which represent a significant step forward in the management of hypertension. These guidelines placed a strong emphasis on the assessment of hypertension mediated organ damage (HMOD) and risk stratification in hypertensive patients to guide HCPs in providing optimal patient care and achieving therapeutic success (**Table 2**).

Basic screening tests for HMOD recommended for all hypertensive patients	Aim
12 lead ECG	Measure HR and AV conduction, detect cardiac arrhythmias, myocardial ischemia and infarction, screen for LVH
Urine albumin : creatinine ratio (UACR)	Detect and classify CKD
Serum creatinine and eGFR	Detect and classify CKD
Extended screening for HMOD	
Echocardiography	Evaluate structure and function of the ventricles and left atrium, detect valvular disease, aortic root diameter and ascending aortic aneurysm
cfPWV or baPWV	Evaluate aortic/large artery stiffness
Carotid artery ultrasound	Determine carotid intima-media thickness, plaque and stenosis
Coronary artery calcium scan	Determine the presence and extent of coronary calcium to predict CAD events
Abdominal aorta ultrasound	Screen for aortic aneurysm
Kidney ultrasound	Evaluate size and structure of kidney, detect renovascular disease, determine RRI (by spectral doppler ultrasonography)
Spectral doppler ultrasonography	Diagnosis of renovascular disease and determination of RRI
ABI	Screen for LEAD
Retina microvasculature	Detect microvascular changes
Cognitive function testing (MMSE, MoCA)	Screen for early stages of dementia
Brain imaging (CT, MRI)	Detect structural brain damage

Table 2. Assessment of HMOD (J Hypertens 2023 [PMID: 37345492])

HMOD refers to the damage to the organs caused by prolonged hypertension, commonly affecting organs such as the heart, kidneys, brain, and blood vessels. **The presence, persistence or progression of HMOD serves as a robust indicator of a patient's cardiovascular (CV) and renal risk, underscoring the critical importance of its assessment in the management of hypertension.** Hence, assessment of HMOD plays a critical role at several stages of hypertension management. After the initial diagnosis of hypertension, it is critical to assess HMOD to refine the patient's CV and renal risk stratification. This assessment provides a clearer understanding of the patient's overall health and potential complications, which in turn guides the choice of treatment. During the follow-up, regular assessments of HMOD are essential to measure the effectiveness of ongoing therapy. A reduction or stabilization of previously identified HMOD is a positive sign indicating successful treatment. Conversely, persistence or worsening of HMOD may necessitate a reevaluation of the treatment strategy. Often, medication nonadherence is identified as the primary reason for the persistence or worsening of HMOD.

Even in the cases where HMOD is not detected at the initial assessment, it is important to monitor for its potential emergence at subsequent assessments. New developments in HMOD typically indicate increased risk, underscoring the importance of periodic assessment. In addition to HMOD assessment, the guidelines emphasize the importance of risk assessment using the SCORE2 and SCORE2-OP systems. Utilization of these systems is particularly recommended for hypertensive patients who do not fall into the high or very high-risk categories due to other factors. These factors may include established CV disease (CVD), chronic kidney disease (CKD), long-standing or complicated diabetes, severe HMOD (e.g., left ventricular hypertrophy), or significantly elevated individual risk factors (e.g., cholesterol or albuminuria).

The SCORE2 system provides a comprehensive risk assessment based on several parameters including sex, age, systolic blood pressure, smoking status and non-HDL cholesterol levels. This risk stratification is particularly important for patients with high normal blood pressure or grade 1 hypertension, as it can influence the decision to initiate or accelerate antihypertensive drug treatment. For patients with more severe hypertension, drug treatment is usually recommended regardless of the CV risk. However, understanding the patient's risk level remains essential for tailoring treatment and follow-up strategies.

Hypertension 1
2023 European Society of Hypertension/ European Society of Cardiology Hypertension Guideline
›› Saturday, Oct 14, 13:00-14:30, Grand 3

A Patient with Supine Hypertension During Sleep and Daytime Hypotension

정미향 교수
가톨릭의대

낮에는 저혈압을 보이나 밤에는 혈압이 올라가는 경우는 여전히 치료가 어렵다(**Figure 1**). 누운 자세 고혈압(supine hypertension)은 누운 자세에서 5분 이상 안정을 취한 후 측정한 혈압이 140 mmHg 이상인 경우로 주로 야간 고혈압 환자가 이에 해당된다. 기립 저혈압은 기립 후 3분 이내 측정하였을 때 수축기 혈압이 20 mmHg 이상(누운 자세 고혈압 환자의 경우 30 mmHg 이상) 또는 이완기 혈압이 10 mmHg 이상 감소하는 경우이다. 이는 주로 자율신경계 이상과 관련 있고 특히 파킨슨병 환자의 절반가량에서 야간 누운 자세 고혈압이 동반된

Continued on page 13

Plenary Session 2 (Keynote Lecture)

Cardiovascular Health Across the Life Course: A New Prevention Paradigm

Donald M. Lloyd-Jones, MD, ScM
Northwestern University, USA

In 2010, the AHA formally defined a novel construct of "cardiovascular health (CVH)" in order to be able to measure it in individuals and populations, monitor it over time, and modify it through science, programs, as well as advocacy. The definition of CVH was based on principles of health promotion and disease prevention across the life course and the emerging concept of primordial prevention. The original CVH construct included 7 health behaviors and health factors, termed "Life's Simple 7," which served as metrics: diet, physical activity, cigarette smoking, BMI, blood pressure, blood glucose, and blood cholesterol levels. Since 2010, there have been numerous scientific papers that have evaluated the CVH construct and evaluated its strengths and limitations. In 2022, the AHA updated the CVH construct to incorporate more granular scoring of CVH metrics as well as overall CVH, and expanded the metrics to include healthy sleep.

In this talk, Dr. Lloyd-Jones will review the genesis of the CVH construct and its links to upstream determinants (social determinants, maternal health), cross-sectional correlates (biomarkers of CVH), potential mechanisms (epigenetics), and downstream health outcomes (chronic diseases of aging, healthcare costs, compression of morbidity) across the life course. The associations between midlife CVH and health outcomes will be highlighted. Next, the progression from healthy, young adulthood to loss of CVH and its consequences will be explored, with an eye to strategies that preserve CVH as long as possible. Finally, early life strategies that launch children into healthier trajectories of CVH for lifelong health benefits will be reviewed. Underlying these observations is intriguing data suggesting specific molecular and pathophysiologic mechanisms for the preservation of CVH at different life stages. **Implementation of the CVH construct in clinical practice and public health strategies is the current frontier in individual and population health promotion.**

The Molecular Diagnosis of Rejection in Heart Transplantation

Jon Kobashigawa, MD
Cedars-Sinai Medical Center, USA

Despite the overall success of heart transplantation as a definitive treatment for end-stage heart failure, cardiac allograft rejection remains an important cause of morbidity and mortality. Endomyocardial biopsy (EMBx) has been the standard of care for rejection monitoring but is associated with several diagnostic limitations and serious procedural complications. Over the past decade, the use of molecular diagnostics has emerged as a tool to potentially circumvent some of these limitations. Dr. Kobashigawa will present an update on the novel molecular approaches focusing on 3 categories: gene expression profiling (GEP), cell-free DNA (cfDNA), and intragraft mRNA transcripts.

GEP of the peripheral blood mononuclear cells can provide information regarding the recipient's alloimmune response to the donor's heart. Commercially available GEP testing monitors the expression of 11 genes to identify cardiac allograft recipients at low risk for acute cellular rejection (ACR). A clinical trial showed that patients who were monitored with GEP and those who underwent routine biopsies had similar 2-year cumulative rates of the composite primary outcome (rejection with hemodynamic compromise, graft dysfunction due to other causes, death, or re-transplantation). The GEP group underwent fewer biopsies per person-year of follow-up. A limitation of GEP is that it was developed and validated only for ACR but not antibody-mediated rejection (AMR).

Donor-derived cfDNA (ddcfDNA) can serve as a non-invasive biomarker for disease, infection, and tissue injury/rejection. ddcfDNA has shown excellent agreement with clinical rejection, and importantly, serial measurement of ddcfDNA predicted clinically significant outcomes after treatment for rejection (De Vlamineck, et al.). A multicenter, prospective study showed a significant increase in ddcfDNA for patients with AMR and ACR. The performance of ddcfDNA assessed against EMBx had an area under curve (AUC) of 0.9. A limitation of ddcfDNA is that it does not differentiate between AMR and ACR.

The measurement of intragraft gene expression in EMBx samples - mRNA transcripts - has a significant potential to improve biopsy interpretation. These mRNA transcripts can be assessed using a variety of platforms. For this testing, genes are grouped into pathogenesis-based transcripts (i.e., endothelium, cytotoxic T-cell, interferon-gamma, and macrophage associated) to diagnose ACR and AMR. The molecular microscope (MMDx) is a central biopsy diagnostic system that compares the biopsy against the reference set, using ensembles of predefined machine-learning-derived algorithms. MMDx correlates with histology, despite frequent discrepancies. MMDx suggests mechanisms of rejection and is an adjunct to the histology read to better characterize the findings of EMBx.

It is believed that the use of these molecular tests to detect rejection will offer a non-invasive means to detect rejection while MMDx will more accurately detect the presence and type of rejection in EMBx.

Future Cardiology

Joseph A. Hill, MD, PhD
UT Southwestern Medical Center, USA

Cardiovascular diseases (CVDs) and our tools to diagnose and treat them are evolving rapidly before our eyes. For example, in many parts of the world, the acutely lethal, atherothrombotic manifestations of CVDs are being replaced by chronic manifestations, viz. heart failure (HF). Within the heterogeneous syndrome of HF, upwards of 50% is marked by a normal ejection fraction, so-called HF with preserved ejection fraction (HFpEF). **Whereas we have numerous efficacious agents to treat HF with reduced ejection fraction, our HFpEF toolbox is empty (or nearly so depending on the interpretation of recent clinical trials).**

In this lecture, the rapidly evolving, global landscape of CVDs will be reviewed. Just as we have benefited from numerous meaningful successes, new challenges have emerged. At the same time, the tools at our disposal have never been more prodigious and powerful. The past, present, and future of the speaker and his colleague's profession and the diseases they treat will be contemplated.

Plenary Session 2 (Keynote Lecture)
›› Saturday, Oct 14, 12:50-14:30, Walker 1

Continued from page 12

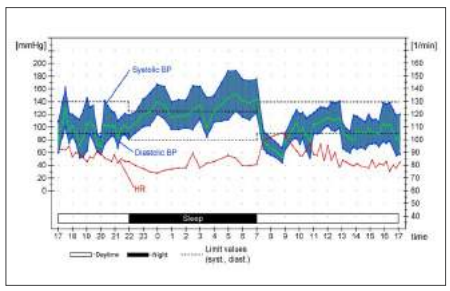

Figure 1. ABPM에서 확인된 불안정한 혈압 양상: 수면 중 누운 자세 고혈압과 주간 저혈압(Clin Auton Res 2018;28:355-62.)

다고 보고된다. 진단에는 24시간 활동혈압 측정(ambulatory blood pressure monitoring, ABPM)과 함께 기립 검사가 필요하여 진단이 어려우나 간단하게 진료실 또는 가정에서 편하게 눕고 5분 뒤 혈압을 측정하고 기상 이후 1분 및 3분째 혈압을 측정해 볼 수 있다. 또한 기립 저혈압을 일으킬 수 있는 약제에 대한 검토가 필요하다.

치료는 쉽지 않다. **치료 원칙 중 첫 번째가 혈압을 정상화할 수 없다는 점을 받아들이고 치료에 대하여 현실적인 기대를 갖게 하는 것이다.** 하지만 치료를 통하여 삶의 질을 충분히 향상시킬 수 있다. 크게 나누어 야간 고혈압과 저혈압에 대해서 나누어서 치료 방침을 생각해 볼 수 있다(**Figure 2**).

야간 고혈압의 경우 반감기가 긴 약제들을 쓰는 것이 좋고 배경 항고혈압 약제로는 ARB 또는 ACE 억제제가 추천된다. 이뇨제는 자율신경기능이 저하된 경우 혈액량의 변화에 민감하기 때문에 피하는 것이 좋다. Nitrate 혹은 CCB 계열의 혈관확장제는 간혹 상당히 혈압을 떨어뜨릴 수 있어 주의를 요한다. 관상동맥질환이 동반된 환자에서는 베타차단제 추가가 필요하며 가능하면 ARB 또는 ACE 억제제를 쓴 이후 사용한다.

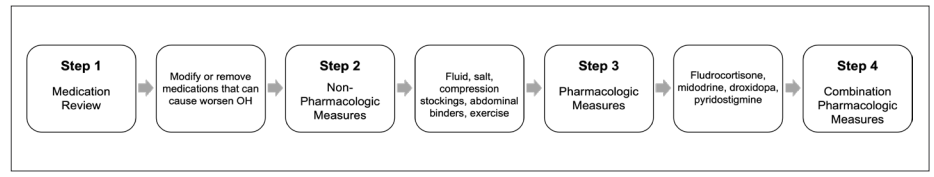

Figure 2. 야간 누운 자세 고혈압과 주간 저혈압이 같이 있는 환자의 관리 전략(J Neurol 2017;264:1567-82.)

저혈압의 경우 충분히 수분을 섭취하도록 격려하고 염분에 대해서 제한을 두지 않는 것이 좋다. 필요한 경우 midodrine 또는 fludrocortisone 사용을 고려해 볼 수 있다.

Hypertension 2
Treatment of Difficult to Treat Hypertension
›› Saturday, Oct 14, 14:45-16:15, Grand 3

Pediatric Cardiology

LV Hypoplasia: Possible Causes and Mechanisms

Ju Ae Shin, MD
The Catholic University of Korea School of Medicine, Korea

Hypoplastic left heart syndrome (HLHS) is a complex anomaly characterized by variable hypoplasia of left heart structures, resulting in insufficient support for systemic circulations. HLHS can occur in Turner's syndrome, Noonan's syndrome, microdeletion of chromosome 22q11, Holt-Oram syndrome, Edward's syndrome, trisomy 13, and deletions of chromosomes 4q, 4p, 11q and 18p, but the exact genetic precursor is unknown. However, recent studies suggest that a basic helix-loop-helix transcription factor may play a role. **The most widely accepted etiology is that the vascular structures are dependent on the relative quantity of blood flow during fetal development.** In the fetus, it is possible to observe diminished inflow or obstruction to outflow, associated with the impaired growth of the left ventricle (LV) in HLHS. Patency of the oval foramen is essential to enable the filling of the left heart in the fetus as the pulmonary venous return is low. When mitral stenosis or mitral atresia is the primary lesion and increases the pressure in the left atrium (LA), blood flow from the inferior vena cava (IVC) via the patent foramen ovale (PFO) is a hole between the left and right atria (upper chambers PFO to the LA will decrease, resulting in LV hypoplasia and aortic hypoplasia). Severe aortic stenosis may develop LV hypertrophy or secondary to LV dilation and dysfunction. Endocardial fibroelastosis, where the endocardial lining of the LV becomes fibrotic, may also be present. As the disease progresses, LA pressure gradually increases, the direction of flow in the PFO becomes left to right, and the LV growth ceases, resulting in a hypoplastic left heart. Importantly, HLHS is an evolving, progressive disease (**Figure 1**), and intervention treatment with fetal aortic valvuloplasty halted this progression. Fetal aortic valvuloplasty can be performed at midgestation in an attempt to prevent the progression to HLHS and allow postnatal survival with biventricular circulation. Significant changes in LV function and improved growth of aortic and mitral valves have been observed after successful fetal aortic valvuloplasty.

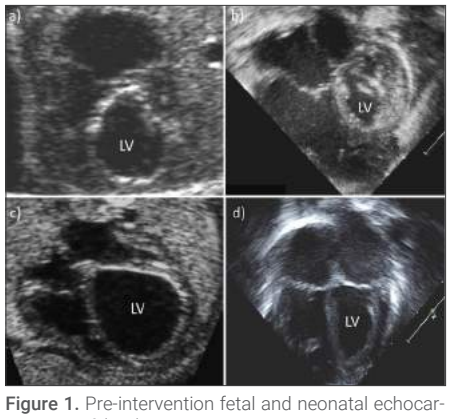

Figure 1. Pre-intervention fetal and neonatal echocardiogram of (a, b) a patient who underwent technically unsuccessful fetal aortic valvuloplasty and (c, d) a patient who underwent technically successful fetal aortic valvuloplasty (Circulation 2014;130(8):638-45.)

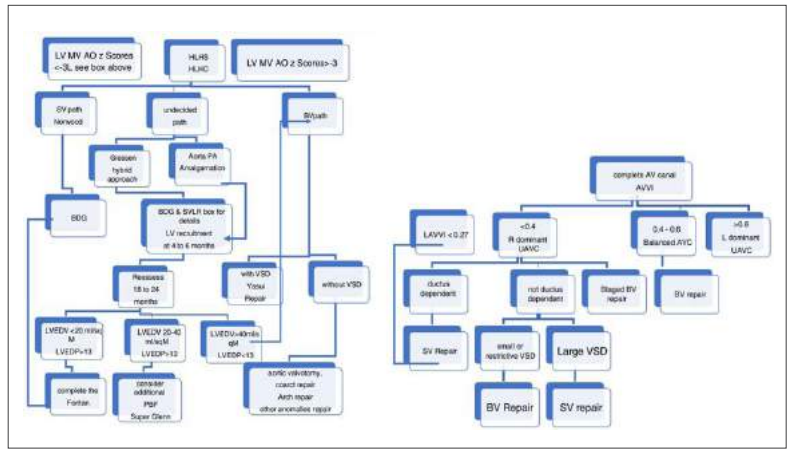

Figure 2. Schema for hypoplastic LV and unbalanced AVSD (Indian J Thorac Cardiovasc Surg 2021;37(Suppl 1):111-22.)

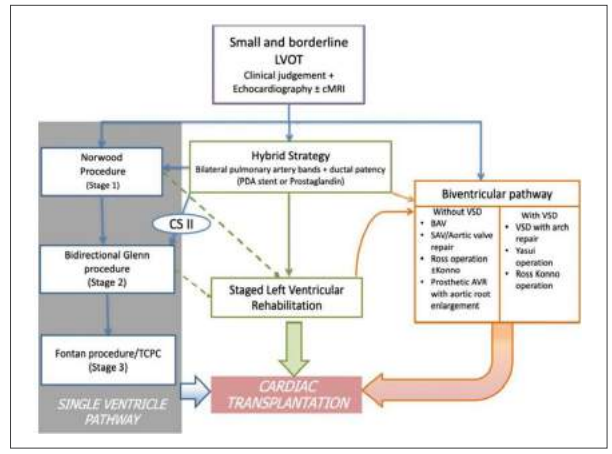

Figure 3. Flow chart for patients with small and borderline LV outflow tract obstruction (Indian J Thorac Cardiovasc Surg 2021;37(Suppl 1):123-30.)

Pediatric Cardiology 1
Navigating the Gray Zone 1: Understanding Borderline LV
›› Saturday, Oct 14, 08:30-10:00, Grand 4

How Can We Predict Successful Biventricular Repair for Arch Hypoplasia with Small LV?

Jinyoung Song, MD, PhD
Sungkyunkwan University School of Medicine, Korea

Despite the lack of a precise definition, borderline LV is frequently observed with conditions such as severe aortic stenosis, coarctation of the aorta, hypoplastic left heart complex, or atrioventricular septal defect (AVSD) with right dominance. In right heart volume or pressure overloading conditions such as total anomalous pulmonary venous drainage or severe pulmonary hypertension, the LV appears hypoplastic as well. It is important to note that LV hypoplasia is not solely a condition of the LV itself. Instead, it can develop due to decreased preload contributing to overall outflow hypoplasia. Most LV hypoplasia can naturally be resolved when LV preload is restored and LV outflow obstruction is corrected. However, when accompanied by LV fibroelastosis, achieving recovery is more challenging.

The investigation into whether a hypoplastic LV can contribute to biventricular circulation had begun with critical aortic stenosis. After LV cross-sectional area ≥1.6 cm^2 or LV end-diastolic volume (LVEDV) ≥20 mL/m^2 was proposed in the 1980s, various criteria including LV inflow dimension were published. In 1991, the Boston group introduced the Rhodes Score, and hemodynamic criteria were also introduced later in 1998. If antegrade flow prevailed in the ascending aorta and transverse arch, biventricular repair was considered feasible. Since then, Discriminant Score, CHSS2 and 2V Score were published. The situation grew more intricate when LV hypoplasia was associated with AVSD. In 1997, the concept of potential LV volume emerged, yielding positive outcomes for more proactive biventricular repair. Surgical innovations like Ross-Konno procedures, LV recruitment through active resection of LV fibroelastosis or staged ventricular recruitment in AVSD have also contributed toward further expanding the possibilities for biventricular repair (**Figure 2, 3**).

The growing negative perception of univentricular repair is making more assertive pursuits of biventricular repair. However, the debate persists on whether complex biventricular repair surpasses univentricular repair from a long-term perspective. Recently, adopting a strategy of observing borderline LV over time through the Giessen procedure instead of hastily opting for treatment, yields promising outcomes in transitioning to biventricular repair.

Continued on page 15

Continued from page 14

In conclusion, a definitive index for treatment guidelines in borderline LV remains elusive. Moreover, the approach should be tailored based on each patient's unique anatomy and hemodynamics.

Pediatric Cardiology 2

Navigating the Gray Zone 2: Strategies for Successful Biventricular Repair in Borderline LV

›› Saturday, Oct 14, 10:15-11:45, Grand 4

Etiology and Pathophysiology of Congenital Mitral Stenosis

Eun-Young Choi, MD, PhD
Bucheon Sejong Hospital, Korea

Heart valve development is regulated by complex interactions between different cardiac cell types and is subject to blood flow-driven forces.

In the process of the atrioventricular valve formation through the endocardial cushion and endothelial-to-mesenchymal transition, some neural crest as well as myocardial cells are involved, and blood flow and biomechanical force have an effect.

Congenital mitral valve stenosis (CMVS) covers a diverse spectrum, from underdeveloped left heart to isolated CMVS, resulting in obstruction of the LV inflow. **CMVS presents various symptoms depending on the degree of obstruction** with or without mitral regurgitation, secondary pulmonary hypertension, accompanying lung disease, and associated cardiac lesions.

In 1978, Ruckman and Van Praagh classified CMVS for anatomic and morphologic abnormalities. In 1990, Carpentier and Chauvaudad made functional classification with papillary muscle involvement and major lesion. The neonatal CMVS includes mitral ring, parachute mitral valves, and mitral arcade.

Obstruction of the mitral valve results in restriction of flow to the LV, increasing the LA filling pressure. The increase in LA, pulmonary venous, and pulmonary capillary wedge pressures result in increased interstitial and alveolar fluid which could induce pulmonary venous congestion. **Late signs and symptoms of mitral valve obstruction include pulmonary artery hypertension, right ventricular (RV) hypertrophy, and RV dysfunction.** In right-sided failure, cardiac output is further reduced, and peripheral signs of heart failure, including end-organ damage become evident.

Since LV filling occurs during diastole, the diastolic time decreases with rapid heart rate, and LA contractility increases to maintain cardiac output. Due to the increased demands on the LA in severe mitral obstruction, it fails to compensate for the decreased diastolic times during tachycardia, resulting in acute pulmonary congestion. Prolonged mitral stenosis increases the risk of LA dilatation and arrhythmia. Atrial fibrillation is particularly bad due to the loss of atrial contractility and the decreased diastolic filling times with rapid ventricular response.

Challenges and Strategies in Neonatal and Infant Mitral Stenosis

Hyungtae Kim, MD, PhD
Pusan National University Medical School, Korea

CMVS in neonates and infants most commonly exists with left heart underdevelopment, LV outflow tract obstruction, and Shone's complex. A clinically useful classification of the CMVS is divided into the 4 following types: typical mitral stenosis (MS), hypoplastic congenital MS, supravalvar MS (ring), and parachute mitral valve. Another category is subvalvular stenosis, such as mitral arcade or Hammock valve. For practical and prognostic reasons, CMVS can be categorized into neonatal and non-neonatal.

CMVS in neonates requires suitability for biventricular repair. Thorough evaluation of the left heart includes mitral annular size, mitral leaflet pliability, leaflet dysmorphism, subvalvular apparatus mobility, LV volume, LV compliance, endocardial fibroelastosis, aortic outlet size, the morphology of the aortic valve, aortic arch size, presence of coarctation, and the possibility of a supramitral ring. **Figure 4** shows the decision algorithm.

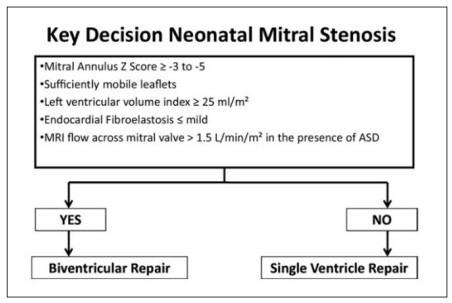

Figure 4. Work in progress decision algorithm 1: Surgical strategy for neonatal congenital mitral stenosis (Oper Tech Thorac Cardiovasc Surg 2010;15(4):273-81.)

Beyond the neonatal period, CMVS is categorically different from the neonatal presentation. Mitral valve intervention for CMVS usually is limited to those having significant pulmonary hypertension, symptoms related to CMVS, or requiring intervention for other lesions, such as a small arch and coarctation or a ventricular septal defect.

Surgical management of CMVS in neonates and infants is challenging to maximize the chances of repair. For surgery, mitral repair is the preferred option to provide better outcomes and survival. There are various repair techniques for patients with CMVS which is shown in **Table 1**.

Resection of supramitral ring
Commissurotomy
Splitting of papillary muscle in parachute mitral valve
Fenestration of subvalve hammock/arcade
Thinning of papillary muscles
Replacing papillary muscles with polytetrofluoroethylene chordae
Resection of secondary papillary muscles and secondary muscle attachments
Resection of secondary chordae
Adjustable atrial septal defect
Pericardial leaflet augmentation

Table 1. Different techniques of mitral valve repair for congenital mitral valve stenosis (Oper Tech Thorac Cardiovasc Surg 2010;15(4):273-81.)

However, **when the repair is no longer feasible, replacement may become inevitable, then the size of the annulus should be the choice of the device.** With annuli between 8 and 12 mm, alternative techniques such as the intra-annular valved conduit or home-made technique should be attempted; with annuli <15-16 mm, replacement with a valved stented conduit (Melody®, Medtronic, Inc, Minneapolis, Minn) seems to be a reasonable bridge; with annuli ≥15-16 mm, a mechanical valve replacement should be performed.

Pediatric Cardiology 3

Challenges and Innovations in the Diagnosis and Treatment of Congenital Mitral Stenosis

›› Saturday, Oct 14, 13:00-14:30, Grand 4

2024 춘계심혈관통합학술대회

2024. 4. 19(Fri.) - 20(Sat.), 경주 HICO

2024 Annual Spring Scientific Conference of the KSC with Affiliated Cardiac Societies

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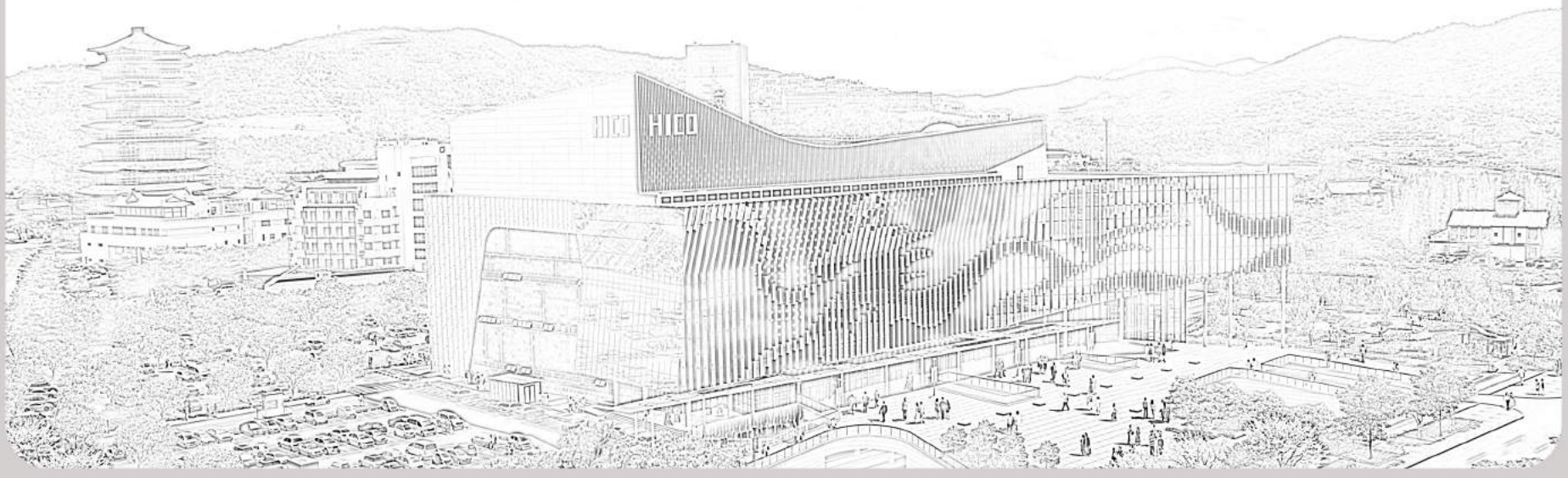

Smart Heart, Smile Life
KSC 2024

Smart Heart, Smile Life
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THE KOREAN SOCIETY OF CARDIOLOGY

The 68th Annual Scientific Meeting of The Korean Society of Cardiology

2024.10.18 Fri. - 20 Sun.

Grand Walkerhill , Seoul, Korea