

Feature Article

Valve Center of Excellence
Offers Innovative Minimally
Invasive and Robotic
Surgical Options p. 12

Expanding Strategies for Transcatheter
Valve Replacement in Complex
Mitral Valve Disease p. 5

Preventing Strokes with Percutaneous
Occlusion of the Left Atrial Appendage p. 7

Recognizing Bicuspid Aortic Valve Disease and
the Need for Expertise in Treatment p. 10



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Dear Colleagues,

It is the ongoing mission of the Heart, Vascular and Thoracic Institute (HVTI) at Cleveland Clinic in Florida to provide the most advanced and innovative treatment options for our patients. And in the mitral valve surgery arena nothing is more cutting-edge than minimally invasive procedures, especially when combined with robotically assisted approaches.

The Heart, Vascular and Thoracic Institute in Florida is proud to be among a handful of centers in the country to offer a robotically-assisted approach to minimally invasive valve repair or replacement. If you would like to learn more, I explain our minimally invasive valve program in more detail on page 12.

Also in this issue, we discuss our approach to managing valvular disease, particularly when the case is more complex in nature (page 4). And, on page 5, we give an overview of what is new on the horizon for treatment of mitral valve regurgitation and stenosis with a summary of our participation in the SUMMIT clinical trial, a study on the use of the Tendyne™ valve in select patients.

Bicuspid aortic valve disease is a common congenital heart condition that requires cardiac imaging specialists with experience in complex valve and aortic diseases to diagnose. Our specialists are leaders in this field in Florida. On page 10, we provide an overview of the disease, its diagnosis and treatment options.

We hope you enjoy all of the articles in this issue of *Cardiac Care*, our first of 2023. We welcome the opportunity to partner with you on specialized care for your patients, should you need the assistance.

Respectfully,

A handwritten signature in blue ink, appearing to read "José L. Navia". The signature is fluid and cursive, with a large loop at the end.

José L. Navia, MD, FACC

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Cleveland Clinic Weston Hospital at Cleveland Clinic in Florida has once again earned the top spot as the #1 hospital in the Miami-Fort Lauderdale metro area for 2022-2023, according to the annual ranking of Best Hospitals by *U.S. News & World Report*. It is the fourth consecutive year Cleveland Clinic Weston Hospital has earned the top ranking, the only hospital to be ranked #1 for four straight years in South Florida.

Table of Contents

An Innovative Patient-Centered Multidisciplinary Approach to Valvular Disease 4

Expanding Strategies for Transcatheter Valve Replacement in Complex Mitral Valve Disease 5

Lower Extremity Edema: Valves are Not Only in the Heart 6

Preventing Strokes with Percutaneous Occlusion of the Left Atrial Appendage 7

Minimally Invasive Aortic Valve Surgery 8

Recognizing Bicuspid Aortic Valve Disease and the Need for Expertise in Treatment 10

Feature Article: Valve Center of Excellence Offers Innovative Minimally Invasive and Robotic Surgical Options 12

Patient Spotlight: Robotically Assisted Mitral Valve Repair Surgery Keeps Joe in the Band 15

Minimizing Radiation Exposure in Cardiac Interventions: Zero-Fluoroscopy Ablations 16

A Message from our CEO and President 18

A Dedicated Surgical Critical Care Team to Enhance Postoperative Recovery 20

New Staff 22

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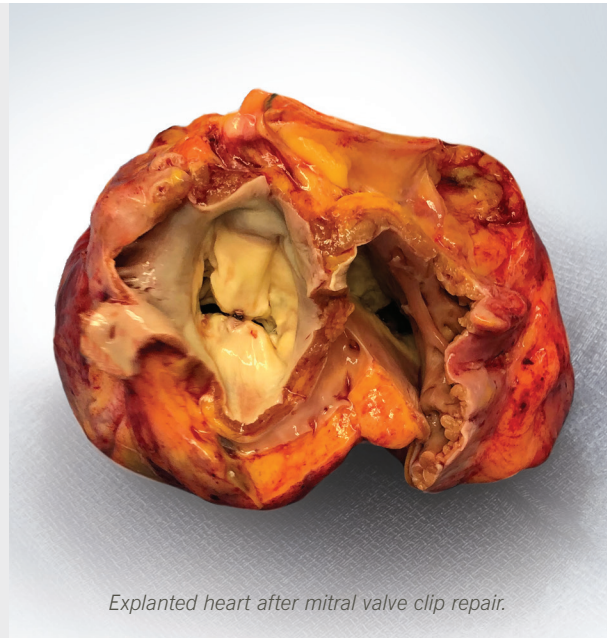
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An Innovative Patient-Centered Multidisciplinary Approach to Valvular Disease

By David Baran, MD
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Explanted heart after mitral valve clip repair.

Management of valvular disease is a fundamental part of cardiovascular medicine. Some issues such as mitral valve prolapse or aortic sclerosis are relatively straightforward. However, when left ventricular function is quite abnormal, it may be fairly challenging to decide on the proper course of treatment. Treatments for valvular disease have greatly evolved in the last decade. What used to be the pure domain of the cardiothoracic surgeon has now become a shared responsibility among the members of the care team as these complex situations are managed.

For example, aortic valve replacement had traditionally been performed via open heart surgery, but now transcatheter aortic valve replacement (TAVR) has been shown to be equivalent to surgical aortic valve replacement for many patients at least in the moderate term time frame. Progressive improvements in the technology have led to the application of TAVR to more and more patients. The same has happened to mitral valve replacement in which initial

transcatheter edge-to-edge repairs were limited to specific cases of degenerative mitral regurgitation. At this time, many kinds of mitral valve disease can be addressed percutaneously not only by “clip” technologies but also by various kinds of transcatheter valve replacement approaches.

Cleveland Clinic has long been on the forefront of innovation in this area. At Cleveland Clinic Weston Hospital, a diverse multidisciplinary team meets weekly to discuss the most complex of valvular cases. Patients receive the benefit of a “meeting of the minds” of cardiothoracic surgeons, interventional cardiologists, structural cardiologists, advanced heart failure specialists, as well as others members of the heart team, along with our expertise in advanced imaging (CT, MRI and transesophageal echocardiography). Often, physicians from Cleveland Clinic Martin Health and/or Cleveland Clinic Indian River Hospital present their complex cases as well and this allows subspecialty expertise from Weston Hospital to be shared

across the clinical enterprise and the Florida region.

Some of the most controversial cases are those with severe left ventricular dysfunction and aortic or mitral valve disease. Examples include low-flow, low-gradient aortic stenosis and mitral regurgitation with left ventricular ejection fraction under 30%. It can be challenging to decide whether to refer to a cardiothoracic surgeon, the heart transplant group, or the structural or interventional cardiologist. When patients are seen at Weston Hospital, regardless of who sees the patient first, all disciplines weigh in on these complex cases to formulate the best treatment options for the patients. Because Weston Hospital has a large heart transplant program as well as a ventricular assist device program, we collaborate with the patient and the referring physician to make the best choice through a patient-centered approach.

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Expanding Strategies for Transcatheter Valve Replacement in Complex Mitral Valve Disease

By Emad Hakemi, MD
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Mitral valve disorders are a common cause of congestive heart failure. Advancements in surgical techniques continue to be the backbone for invasive therapies. Nonetheless, patients frequently are deemed unsuitable for surgery for clinical or anatomical reasons.

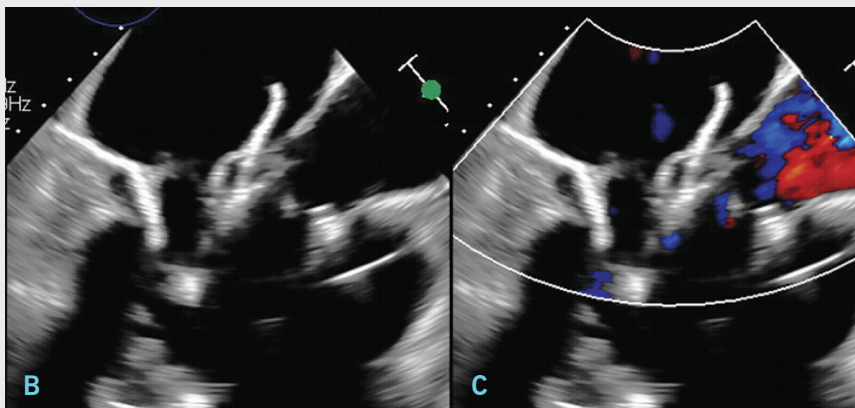
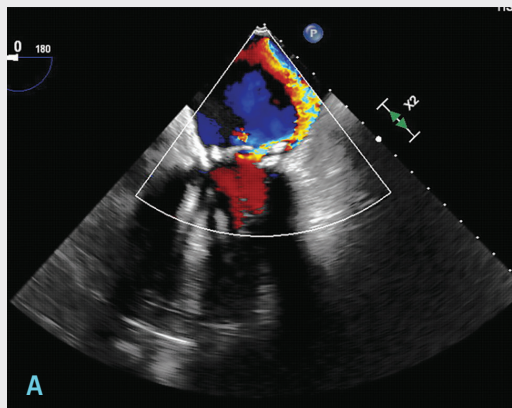
Certain disorders are deemed amenable for less invasive transcatheter therapies. For example, rheumatic mitral stenosis has been successfully treated with mitral valve balloon valvuloplasty since the 1980s, and more recently, functional and degenerative mitral valve regurgitation have been successfully treated with transcatheter edge-to-edge repair in highly selected patients. However, some patients are deemed not good candidates even for transcatheter therapies because of anatomical limitations facing transcatheter edge-to-edge repair attempts. This is especially relevant in patients with severe mitral annular calcification and heavily calcified mitral valve leaflets.

As part of our commitment to providing advanced therapies for our patients, Cleveland Clinic in Florida is an active member in the ongoing SUMMIT clinical trial that utilizes the Tendyne™

valve for treatment of mitral valve regurgitation and stenosis in a well-selected patient population. Candidacy for enrollment is decided following careful and detailed analysis of cardiac computed tomographic reconstruction and transesophageal echocardiographic data. If successfully enrolled, patients can undergo transcatheter mitral valve replacement using the transapical approach through a small left thoracotomy under general anesthesia. The valve is delivered into position using a guiding catheter, and then slowly deployed into the mitral annulus maintaining appropriate orientation. This is followed by anchoring the valve to the left ventricular apex to ensure adequate stability. Patients are monitored in the hospital for a few days following the procedure and are placed on short-term oral anticoagulation therapy.

Though it remains under research protocols and is only available in highly selected and advanced cardiovascular centers of excellence, this unique therapy provides a less invasive solution for patients with mitral valve disorders (regurgitation and stenosis).

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Intraoperative transesophageal images showing baseline severe mitral regurgitation (A), and newly implanted Tendyne™ transcatheter mitral valve (B-C)

Lower Extremity Edema: Valves Are Not Only in The Heart

By Carmel Celestin, MD
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Lower extremity edema (swelling caused by fluid trapped in the body's tissues) is present in about 20% of the population. Though often due to heart disease, it also can be caused by valve disease of the veins (venous insufficiency) and/or lymphatics (lymphedema). Once the lower extremities receive oxygen from the arteries, the veins return the blood back to the lungs to obtain the oxygen, and the lymphatics filter the blood of excess fluids and "toxins" to be eliminated. These systems function by way of valves. The muscles of the lower limbs also assist the valves by functioning as a pump, like the heart, to propel blood and fluid upward (Figure 1).

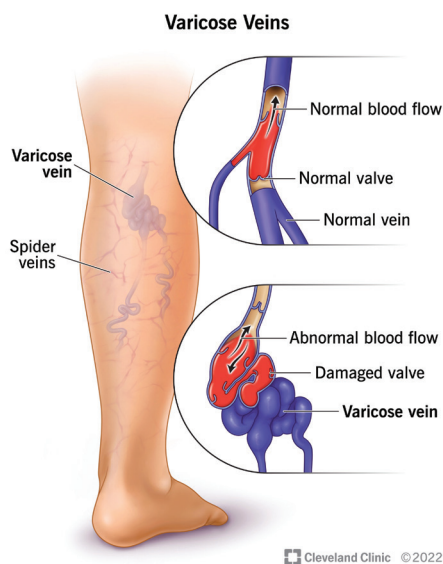


Figure 1

When the valves do not function properly, varicose veins (Figure 2) and/or edema can occur, resulting in pain and heaviness in the limbs, especially at the end of the day. This tends to worsen over time and

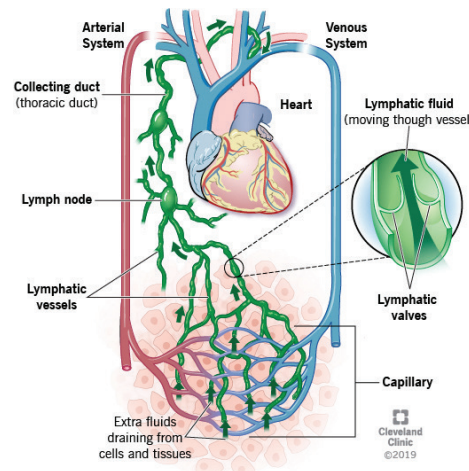


Figure 2

can result in skin discoloration, hardening or thinning of the skin, ulceration and infection. It can turn into a vicious cycle of more pain and less mobility, which further worsens the disease. Common causes of nonfunctioning valves include hereditary predisposition, age, sitting or standing for prolonged periods of time (causing pressure on the valves from gravity), previous history of deep venous thrombosis (which can damage the valves), trauma, and limited mobility or gait disturbance.

Medical history and examination will lead to the diagnosis of venous insufficiency and lymphedema. A baseline venous ultrasound helps to exclude acute deep venous thrombosis and may show evidence of chronic post thrombotic changes.

The management of venous insufficiency and lymphedema involves daily maintenance and is geared towards assisting the valves, which helps symptoms and prevents

complications. This involves three components:

1. The use of compression garments. There are various types and grades and they should be tailored to the severity of edema and the ability to get them on and off. A physical therapist specialized in lymphedema also may assist with swelling reduction prior to the use of compression.
2. Walking or exercising the lower limbs with dorsiflexion and plantarflexion exercises or foot circles.
3. Not sitting or standing for prolonged periods of time and elevating the legs as much as possible.

There are no medications to treat the valves, and diuretics are usually not helpful or indicated. Surgery to close or remove the diseased veins may be indicated in very symptomatic patients with varicose veins or those with complications associated with venous disease. In these cases, a venous reflux study is needed to map out the incompetent venous valves for surgical planning. Highly specialized microsurgery can be done to bypass nonfunctioning lymphatics (lymph venous bypass) or transfer healthy lymphatics to the area of diseased lymphatics.

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Preventing Strokes with Percutaneous Occlusion of the Left Atrial Appendage

By Mistyann-Blue Miller, MD
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Between 2.5 and 6 million people in the United States live with atrial fibrillation (AF). Patients diagnosed with AF are at five-fold increased risk of ischemic stroke compared to those without AF. Treatment with oral anticoagulants including direct oral anticoagulants and the vitamin K antagonist, warfarin, is the standard of care for these patients to prevent thrombus formation in the left atrial appendage (LAA), where more than 90% of blood clots form due to stagnant blood flow. However, these agents confer a significantly increased risk of both major and minor bleeding events, which range from bruising or bleeding from everyday abrasions to catastrophic gastrointestinal bleed or intracranial hemorrhage. Moreover, labile international normalized ration (INR), medication noncompliance, affordability of medications, and lifestyle and occupational habits have made it increasingly difficult for patients to adhere to their treatment regimen.

Left atrial appendage occlusion (LAAO) is a procedure developed to address the needs of many patients with nonvalvular AF at high risk for ischemic events, who encounter obstacles to taking oral anticoagulants (OAC). The most widely implanted LAAO devices include the WATCHMAN FLX™ and Amplatzer™ Amulet™ devices. Both occluders are designed to fit into the LAA, thus excluding it from systemic circulation and preventing the formation of thrombus and potential embolization.

Under transesophageal echocardiography (TEE) and

fluoroscopic guidance, the device is delivered via catheter and sheath through a small transeptal puncture that is made from the right atrium into the left atrium by the implanting physician. Once the appropriate-sized device is selected and several intraprocedural safety parameters are met, the occluder is released from the delivery catheter, and deployed securely in the LAA.

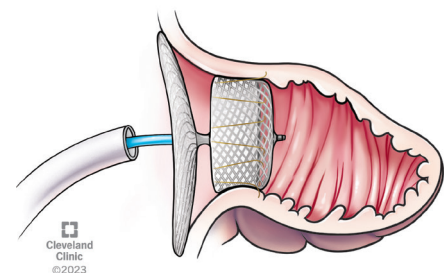
At Cleveland Clinic Indian River Hospital, patients stay one night or less in the hospital post-implant. If the WATCHMAN device is used, patients remain on their OAC in addition to 81 to 100mg aspirin for at least 45-days post-procedure, at which time a follow-up TEE is performed to confirm device stability, adequate endothelialization, and to ensure no peri-device leak. If these criteria are met, OAC is discontinued, and the patient is treated with dual antiplatelet therapy with baby aspirin and P2Y12 inhibitor (e.g., clopidogrel) until six months post-implantation. At six months the P2Y12 inhibitor is discontinued and aspirin monotherapy is continued indefinitely. In the Amulet™ studies, patients were treated only with dual antiplatelet therapy post-device implant, eliminating the need for anticoagulants.

Potential complications from the LAAO implant include device embolization, pericardial effusion and ischemic stroke. However, implantation of the WATCHMAN FLX™ device is proven safe and effective with high procedural success

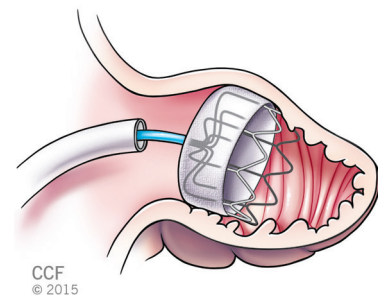
and very low complication rates across several trials. Clinical studies from the LAAO registry also have demonstrated overwhelming success of this procedure in real-world clinical practice across the United States, with device success rate of 98% and complication rate of 0.37%, and randomized clinical trials comparing both devices have reported similar safety and effectiveness at preventing ischemic strokes.

Implantation of the LAAO device is clinically safe and effective in preventing ischemic stroke in patients with nonvalvular AF and is a viable alternative for those who are at high bleeding risk or who have difficulty adhering to OAC treatment regimens.

Amplatzer™ Amulet™ device



WATCHMAN FLX™ device



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Minimally Invasive Aortic Valve Surgery

By Edward Savage, MD
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Patients with severe, untreated symptomatic aortic stenosis face a grim prognosis with a mean survival of approximately 2 to 3 years.

Surgical aortic valve replacement (SAVR) is an effective treatment to relieve symptoms and improve long-term survival approximating that of the general population.

SAVR has been performed for more than 50 years and extensive scientific evidence supports its use. Historically, SAVR has been done by opening the chest with a full sternotomy. This

traditional approach, which is still used today, includes dividing the entire breastbone (sternum) to expose the heart (Figure 1A).

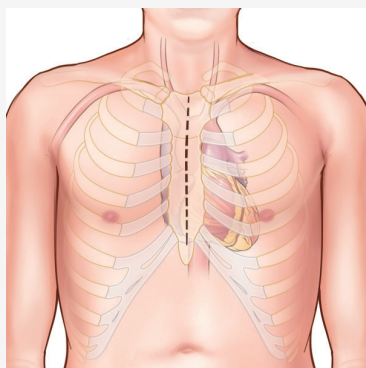
The patient is placed on a cardiopulmonary bypass (i.e., heart-lung machine), which supports the circulation of blood while the heart is arrested to perform the operation. The blood flow is diverted from the right atrium to the machine and returned to the aorta. The aorta is then clamped to isolate the heart from the circulation to allow the surgeon to

work inside the heart and replace the aortic valve (Figures 2 and 3).

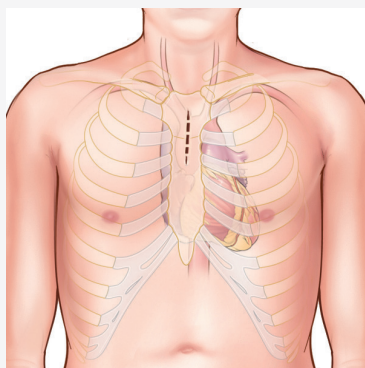
We've discovered that complete exposure of the heart is not necessary. Rather, only the portions of the heart on which the surgeon works need to be exposed. This finding led to the evolution of the minimally invasive surgical approach to aortic valve replacement that was first introduced at Cleveland Clinic in 1996.

Minimally invasive approaches to valve surgery allow the surgeon to

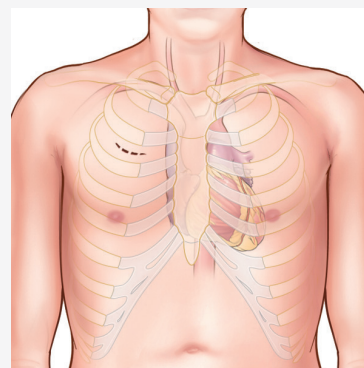
Figure 1



A) This image diagrams the traditional incision.



B) This image demonstrates the Mini Upper Sternotomy approach. Only the upper half of the breastbone is divided, allowing maintenance of stability.



C) This image demonstrates the Mini Right Thoracotomy approach. The breastbone is spared and the heart is approached between the ribs.

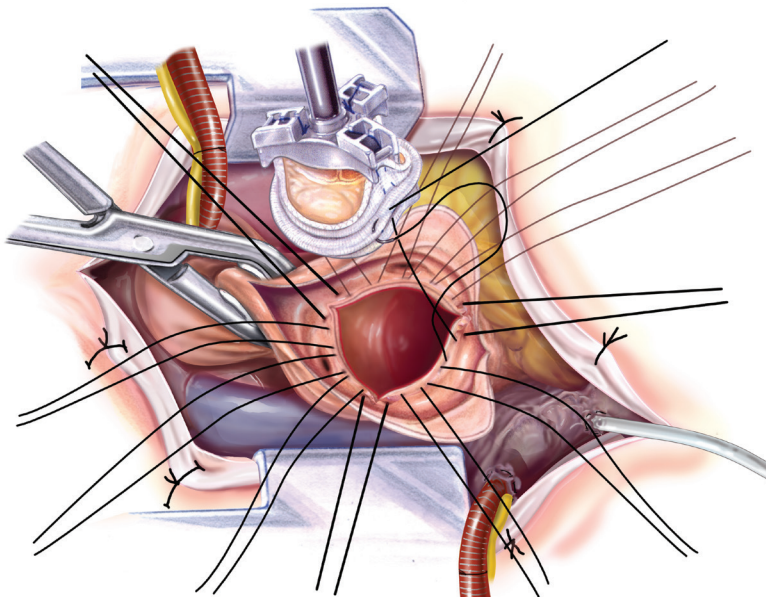


Figure 2: Surgical exposure of the aortic valve.

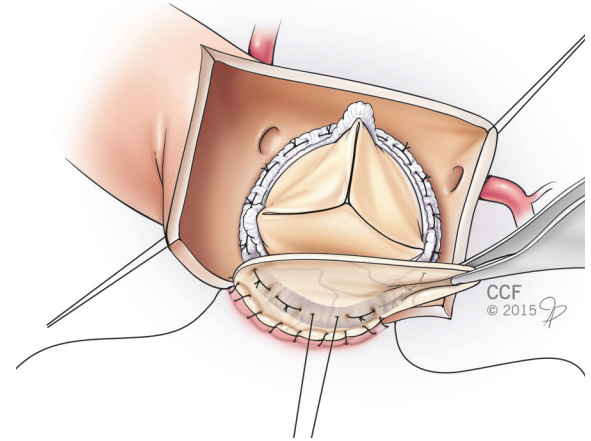


Figure 3: A bioprosthetic valve is implanted to replace the aortic valve.

use smaller incisions to perform the same operation. There are two basic approaches, as demonstrated in Figure 1B and Figure 1C, that provide adequate surgical exposure to perform the operation with less surgical trauma.

The benefits of minimally invasive aortic valve surgery

Patients undergoing minimally invasive aortic valve surgery (MIAVS) report less pain after surgery, and require lower doses of pain medication in the first 2 to 3 days following surgery. Patients receive fewer blood and blood product transfusions and are discharged from the hospital earlier than those with traditional median sternotomy approaches.

Of note, there is also a significant benefit to pulmonary function, as measured by bedside spirometry, in the first 24 to 48 hours after MIAVS. This may be one reason why patients with worse preoperative pulmonary function gain the most from MIAVS in comparison to sternotomy (Figure 4).

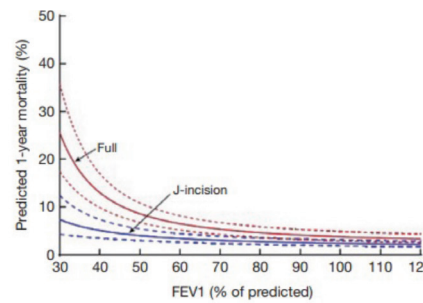


Figure 4: Predicted 1-year risk-adjusted mortality according to preoperative forced expiratory volume in 1 second stratified by surgical approach.

Why is there still a need for surgical aortic valve replacement now that transcatheter aortic valve replacement (TAVR) is available?

How to choose the optimal treatment modality (surgical or TAVR) for each individual patient is an ongoing debate. It is true that TAVR has had profound impact on the treatment of aortic stenosis, which is the predominant abnormality affecting the aortic valve. However, some patients require aortic valve replacement for aortic regurgitation (a leaking valve). There are no approved TAVR valves that can be used for regurgitation, so these patients require surgery.

Surgery may be preferable for young patients as well, as the TAVR valve will likely wear out in their lifetime and require repeat replacement. For this reason, the American Heart Association/American College of Cardiology currently recommend surgery in patients younger than 65 years or who have a life expectancy >20 years. The incidence of structural deterioration of a bioprosthesis is greater in younger patients, supporting the recommendation to use a mechanical valve in patients younger than 50 years of age who can tolerate oral anticoagulation, as these valves should last the rest of their life. Patients with a small aortic annulus may benefit from surgery, which gives the option of expanding the aortic root to implant a larger bioprosthesis, as shown in Figure 3.

At Cleveland Clinic in Florida every aortic valve patient is assessed by a team comprised of cardiologists and cardiothoracic surgeons who recommend the best approach based on the patient's individual needs.

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Recognizing Bicuspid Aortic Valve Disease and the Need for Expertise in Treatment

By Gian Novaro, MD
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Cleveland Clinic Weston Hospital



Coronal CT scan image of a dilated ascending aorta in setting of a bicuspid aortic valve.

Bicuspid aortic valve (BAV) disease is one of the more common congenital heart conditions encountered in clinical practice. The estimated prevalence in the general population is 1-2%, with a predominance in males at a 4:1 ratio. Most BAV disease occurs in isolation, although a small fraction of patients may have other associated congenital heart diagnoses. It is important to recognize the presence of BAV disease as most patients will suffer related complications in their lifetime. Our team at Cleveland Clinic Weston Hospital in Florida is proud to be among the leaders in our state in the field of BAV disease research.

BAV disease is a malformation resulting in an aortic valve with only two leaflets, or cusps, compared to the three found in a normal aortic valve. Because of the structural abnormality the valve is subject to greater mechanical trauma over time. Most commonly, the valve accumulates calcium and cholesterol deposits, which, over time, limits its mobility and leads to stenosis. This condition usually begins to affect patients in their 50s and 60s. In about 20% of BAV disease cases, the valve opens but fails to close properly, leading to aortic valve regurgitation, or backflow, into the left ventricle. When present in

isolation, this condition often presents in younger patients in their 30s and 40s.

About 40 to 50 percent of BAV disease patients develop a dilatation of the aortic root and ascending aorta. In a minority of these cases, an aortic aneurysm is present, requiring ongoing surveillance and possible eventual repair. The aortic segments of dilatation can vary in BAV disease patients with the mid ascending region being the most common. Other phenotypes of aortic aneurysm exist, including aortic root predominant and a diffuse dilatation pattern. Rates of

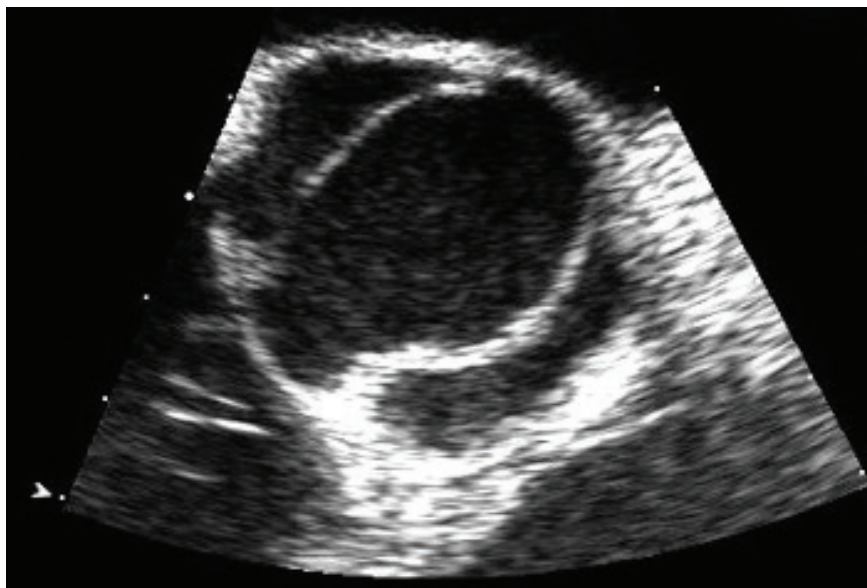
aortic growth vary but are unreliable to predict an upcoming aortic event. The current recommendation for elective aortic repair is an aortic diameter of 50-55 mm, with a threshold based on risk factors of family history of aortic instability or signs of rapid aortic growth.

Need for imaging specialists for detection, surveillance and family screening

BAV disease cases often require referral to cardiac imaging specialists who bring experience in complex valve and aortic diseases. Transthoracic echocardiography (TTE) is the standard diagnostic test when evaluating patients with a suspected aortic valve abnormality. TTE allows for accurate assessment of aortic valve anatomy and function, and the potential associated condition of aortic dilatation. Left ventricular size and function are defined by 2D and 3D volumes and ejection fraction. Transesophageal echocardiography can be used to complement TTE in cases where the diagnosis is in question or when the valve lesion requires more quantitation. In BAV disease patients with related aortic dilatation or aneurysm formation,



3D CT reconstruction shows a bicuspid aortic valve and the thoracic aortic segments.



Transthoracic short-axis image of a bicuspid aortic valve in systole, with fusion of the right and left cusps.

we obtain a CT angiogram or cardiac MRI to better define aortic anatomy and baseline dimensions.

Once a BAV disease is diagnosed, it is important to recognize that among families, as many as 10-15% of first-degree relatives may harbor a BAV disease. Because of this prevalence, the screening of first-degree family members is recommended. Screening usually is done with a TTE to assess aortic valve anatomy and its function, as well as screen for dilatation of the ascending aorta.

Referral to a comprehensive heart valve center is recommended

Decision-making and management strategies in BAV disease patients, particularly those with aortic aneurysm, can be challenging and often require a second opinion. Referral to a comprehensive heart valve center is beneficial when the time comes to consider treatment options. Cleveland Clinic Weston Hospital's multidisciplinary heart valve team offers the expertise and experience needed for tailoring the appropriate treatment strategy for each patient,

and includes advanced cardiovascular imaging specialists, cardiologists and interventional cardiologists specializing in aortic valve disease, and surgeons with extensive experience repairing cardiac valves.

For younger patients with BAV disease with aortic regurgitation, the option of valve repair is available. Carefully selected patients with pure aortic regurgitation and preserved valve architecture often can be successfully repaired and spared from a valve replacement. If an aortic aneurysm is present, the surgery may involve ascending aortic repair in combination with valve repair, referred to as a valve-sparing approach. For those with mainly aortic valve stenosis, the options of surgical valve replacement versus transcatheter aortic valve replacement (TAVR) exist. Patient-specific risk factors, anatomic considerations, age, and preferences are taken into consideration when determining the candidacy of a surgical approach versus TAVR.

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Valve Center of Excellence Offers Innovative Minimally Invasive and Robotic Surgical Options

By Jose L. Navia, MD, FACC
Director, Cleveland Clinic Florida Regional Heart, Vascular and Thoracic Institute
S. Donald Sussman Distinguished Chair in Heart and Vascular Research

Open-heart surgery has long been the standard of care for most patients with valve disease. More recently, however, minimally invasive procedures have emerged as safe and effective alternatives for patients with advanced and complex valve disease. The most common minimally invasive procedures are those performed on the aortic and mitral valves.

The minimally invasive valve treatment program at Cleveland Clinic in Florida offers a comprehensive treatment approach from experts in various diseases and conditions such as acute and chronic heart valve disease, heart valve insufficiency, stenosis, endocarditis, and heart failure non-responsive to medical therapies. Our program also provides long-term care toward the prevention of future occurrences.

Our goal is to provide the highest quality cardiovascular care by implementing the latest minimally invasive technology.

Last year, Cleveland Clinic Florida performed more than 500 minimally invasive heart operations, including transcatheter aortic valve replacements (TAVR) and MitraClip™ procedures.

Along with only a few other centers in the country, Cleveland Clinic Weston Hospital in Florida is proud to offer a robotically assisted approach to minimally invasive mitral valve repair or replacement. This is the most advanced approach available. Cleveland Clinic Weston Hospital surgeons use a state-of-the-art robotic surgical system that has been approved by the FDA for use in many surgical procedures.

Why a robotic approach to mitral valve repair or replacement is beneficial

Robotically assisted valve surgery provides the surgeon with an undistorted, three-dimensional view of the valve, leaflets and subvalvular structures using a special camera. This approach enables surgeons to

perform complex mitral valve repairs or valve replacements without the need for division of the breastbone (sternum) or spreading of the ribs.

The surgeon uses a specially designed computer console to control surgical instruments on thin





robotic arms. The robotic arms are introduced through a 1- to 2-inch incision in the right side of the chest. The surgeon's hands control the movement and placement of the endoscopic instruments to open the pericardium and perform the procedure. The enhanced view of the anatomy provided by the specialized camera makes the surgical process easier. Surgeons can access the heart valves with greater precision and less of a physical impact on the patient, which allows for considerably lower time in post-op than with most procedures.

Because robotic surgery utilizes fewer and smaller incisions to introduce the instruments than an open surgery, patients typically experience less pain after the procedure, as well as reduced opportunity for bleeding or infection after the surgery. Some patients are discharged from the hospital sooner than they would be with the traditional surgical approach.

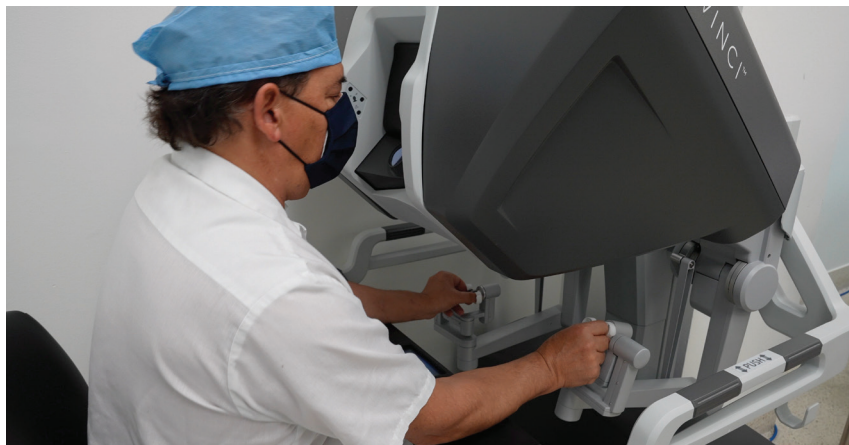
The majority of our patients stay in the hospital only three to five days after the surgery and, when they go home, they are usually capable of

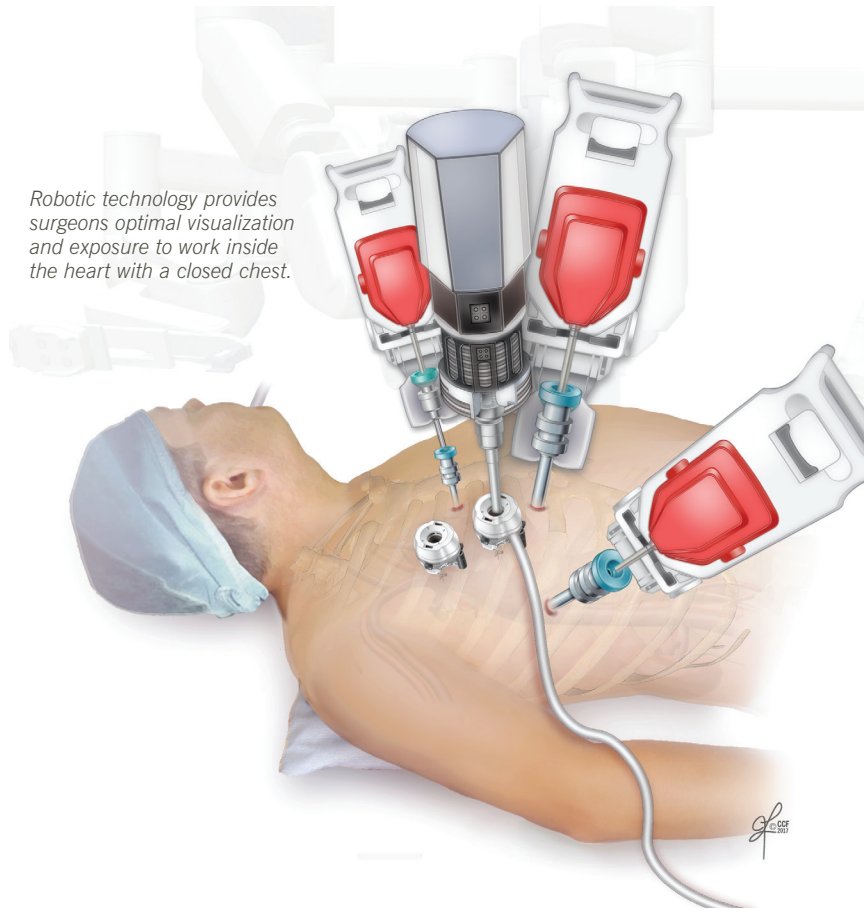
independent living. They go back to work within two to three weeks after the operation. That is obviously a significant advantage compared to the recovery after standard operations, which takes almost twice as much time.

Robotic surgery today also can be used for the performance of coronary artery bypass grafting as well as pacemaker surgery for patients who have advanced congestive heart failure.

What types of patients are candidates for minimally invasive heart operations?

Most patients who require operations only on the aortic or only on the mitral valve are likely to be candidates for minimally invasive approaches. Those patients however, who require operations that involve the heart valves as well as bypass surgery are probably going to require a standard approach with the standard incision.





Robotic technology provides surgeons optimal visualization and exposure to work inside the heart with a closed chest.

achieve better than expected results for all types of valve surgery, including reoperations and complex disease. Our outcomes are among the best in the world.

Through our clinical expertise, cutting-edge research and innovative program we assure patients from all over Florida, Latin America and the Caribbean have access to the best care for heart valve disease.

By following Cleveland Clinic's principles of excellence, The Heart Valve Center at Cleveland Clinic Weston Hospital strives for the finest standard of quality in cardiac care, education, research, and innovation, which is available to our patients and to a new generation of healthcare leaders around the world. We are focusing on unmet clinical needs in the field of cardiovascular medicine with the ultimate goal of improving patient care and outcomes.

The results from minimally invasive approaches are comparable to those with the standard incisions. However, the recovery is much faster and, therefore, this approach is advantageous to our patients.

echocardiography are increasingly important in contemporary practice.

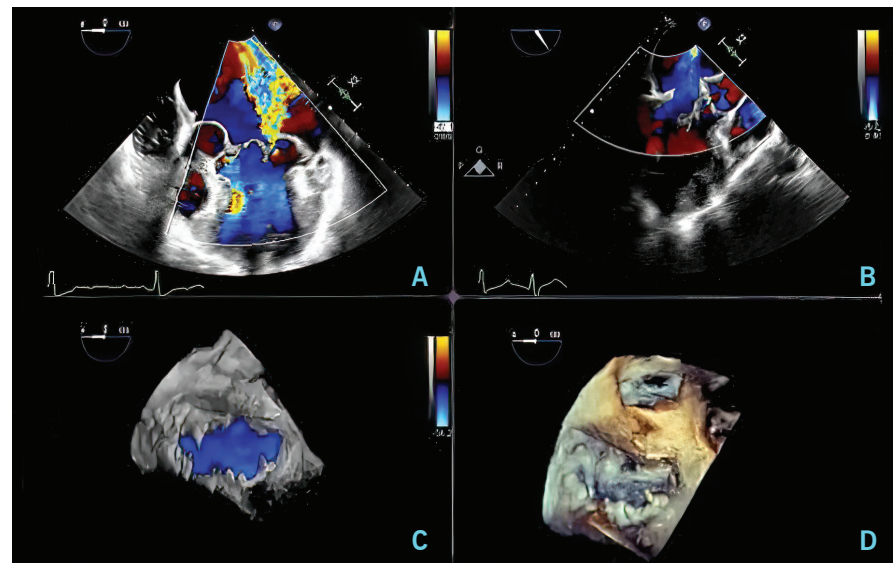
Our expertise

Cleveland Clinic treats more patients with valve disease than any other hospital in Florida. Our surgeons

Dr. Navia
naviaj@ccf.org

Advanced diagnostic capabilities

In addition to our clinical expertise, our advanced diagnostic and treatment capabilities distinguish The Heart Valve Center at Cleveland Clinic Weston Hospital as a center of world-class care for heart valve disease patients. Imaging is used for diagnosis, pre-procedural planning, procedural guidance, and surveillance after repair. Transthoracic and transesophageal echocardiography are the traditional mainstays of imaging, but computed tomography and three-dimensional



Transesophageal echocardiogram reveals bileflet severe mitral valve regurgitation (A) and a completely competent valve after robotic repair (B, C, D).



PATIENT SPOTLIGHT

Robotically Assisted Mitral Valve Repair Surgery Keeps Joe in the Band



Joe Santoro, 57, had been dealing with mitral valve disease for almost a decade when his cardiologist told him the new symptoms he had were caused by an additional heart condition – atrial fibrillation. His doctor advised him to undergo a procedure to treat the valve disease. Joe, a first-grade teacher and musician, decided to get a second opinion. He chose Cleveland Clinic Weston Hospital, where he met with Jose L. Navia, MD, Director of the Cleveland Clinic Florida Regional Heart, Vascular and Thoracic Institute and Minimally Invasive Valve Program.

“After seeing Dr. Navia, I knew there were more options,” Joe says.

He chose a robotically-assisted approach to his mitral valve repair surgery because it was less invasive than traditional open-heart surgery and he would heal faster.

During the robotically-assisted procedure, the surgeon sits at a console in the operating room. The

console provides a high-definition, 10x magnified view of the patient’s valve. From the console, the surgeon directs robotic arms to move surgical instruments through a small incision. The surgical instruments are sized to

Three weeks after Joe’s robotically-assisted valve repair surgery he was back to normal activities. His band played a gig – and he played right along with them.

“I was jumping around, playing guitar and singing. I felt perfectly fine. It was amazing,” Joe says. Thanks to this new approach to valve repair, Joe was able to get back to doing the things he loved faster than if he had undergone a more traditional heart surgery.

allow for more precise movements. The patient benefits from less trauma to the chest, which allows for a better, faster healing process.

“A robotically assisted approach for valve repair surgery is the ultimate new use for technology,” Dr. Navia says. “This approach provides the patient with a better option to have a durable repair or replacement of the valve.”

“I was jumping around, playing guitar and singing. I felt perfectly fine. It was amazing,” Joe says.

Thanks to this new approach to valve repair, Joe was able to get back to doing the things he loved faster than if he had undergone a more traditional heart surgery.

Minimizing Radiation Exposure in Cardiac Interventions: Zero-Fluoroscopy Ablations Become Standard of Excellence at Cleveland Clinic Weston Hospital

Yasser Rodriguez, MD, MBA
Cardiac Pacing and Electrophysiology
Cleveland Clinic Weston Hospital

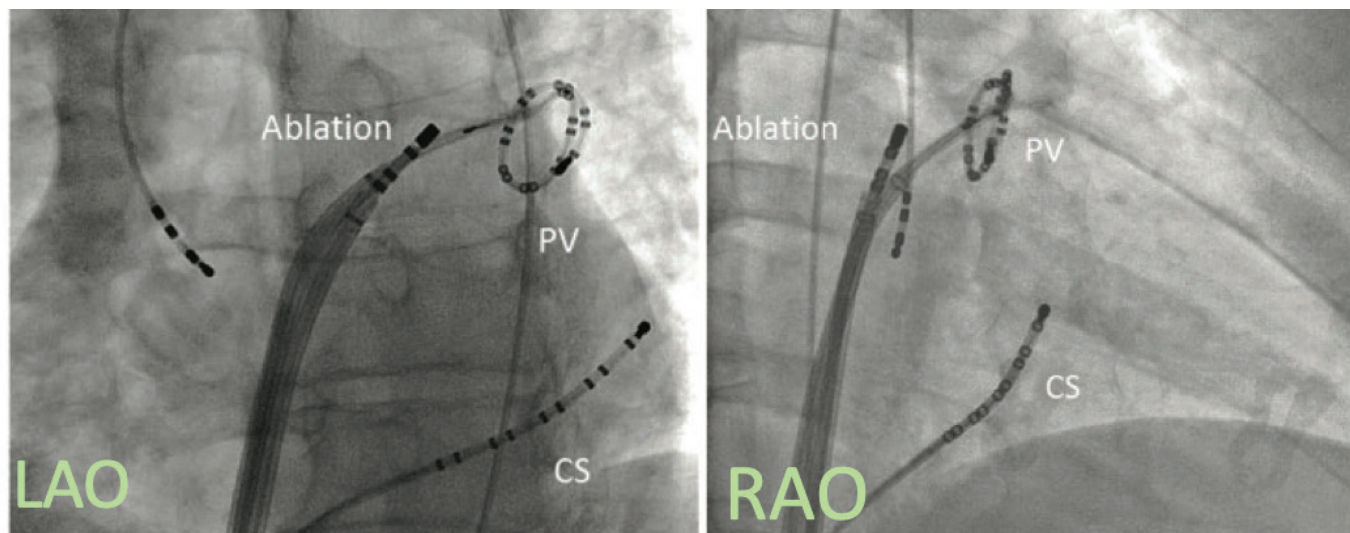


Image 1: Use of fluoroscopy during a traditional ablation in order to visualize the heart. Left anterior oblique (LAO). Right anterior oblique (RAO).

Catheter ablation procedures for cardiac arrhythmias were first undertaken in the 1970s and 1980s. Traditionally, these procedures required the use of ionizing radiation (fluoroscopy or continuous X-rays) to visualize the catheters in the heart (Image 1). Patients could receive anywhere from 9.5 – 41 minutes of continuous radiation, or



the equivalent of 830 chest X-rays during a single ablation. Exposure to such radiation has been linked to the prevalence of malignancy later in life (Image 2).

The role of cardiac ablation as a treatment option continues to increase gradually with improving technology and techniques and changing demographics. Age is the most common risk factor for the development of certain cardiac arrhythmias. The prevalence of arrhythmias such as atrial fibrillation (AF) has increased three-fold in the past 50 years, and it is projected that anywhere from 6 to 16 million

individuals will develop AF by the year 2050. These changes place an increased importance on the development of safer, more efficient and effective workflows to perform cardiac ablations.

Advances in technology have facilitated the elimination of fluoroscopy in cutting edge approaches to ablation, thus ushering in the era of “zero-fluoroscopy ablations.” Rather than traditional reliance on radiation to position cardiac catheters, a combination of intracardiac ultrasound (ICE; Image 3) and electroanatomic mapping (EAM; Image 4) is used

Image 2: Patient with a malignancy presenting 5 years after an ablation for atrial fibrillation that utilized 90 minutes of fluoroscopy.

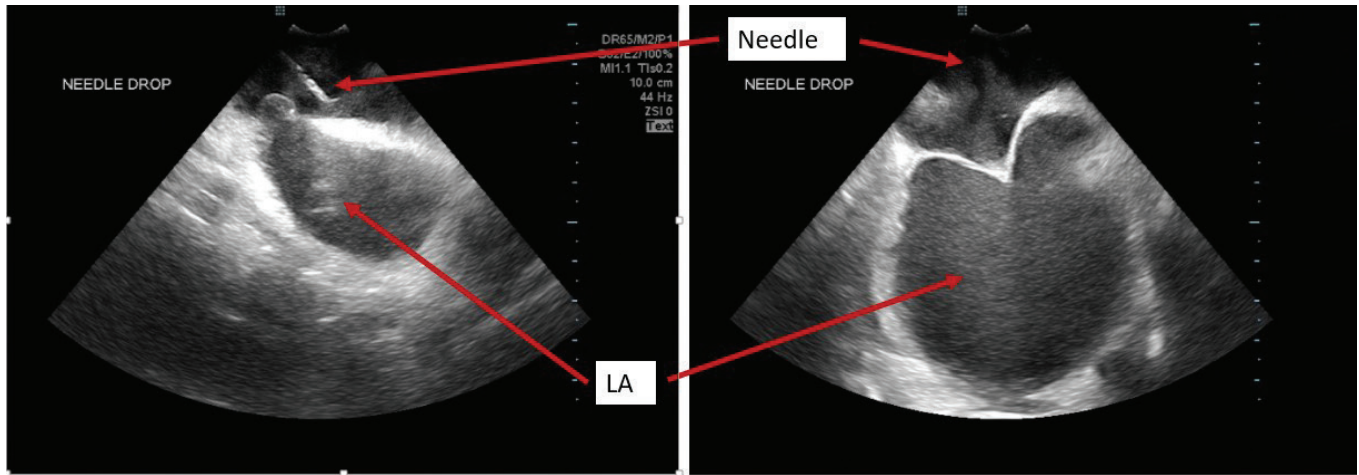


Image 3: Intracardiac ultrasound (ICE). Use of ICE allows for true real-time visualization of anatomy during transeptal puncture.

to perform these procedures. The two modalities are further combined with tactile feedback to enhance the safety of the procedure. The use of intracardiac echocardiography allows for continuous, real time monitoring throughout the entirety of the procedure in addition to an overall enhancement of the safety of the ablation.

Zero-fluoroscopy ablations also have ushered in a drastic reduction in the length of the procedure. Traditionally, ablations could take as long as 4 to 6 hours, and require a brief hospitalization. At Cleveland Clinic Weston Hospital, these procedure times have been drastically reduced to 45 to 60 minutes, and patients are often discharged the same day.

Historically, zero-fluoroscopy ablation workflows were created targeting ablations for atrial fibrillation – the most common arrhythmia affecting the U.S. population. However, workflows have been created and adopted for other arrhythmias such as supra ventricular tachycardia, ventricular tachycardia, and atrial flutter. Multiple studies have demonstrated comparable or improved safety and efficacy for these “fluorless” approaches.

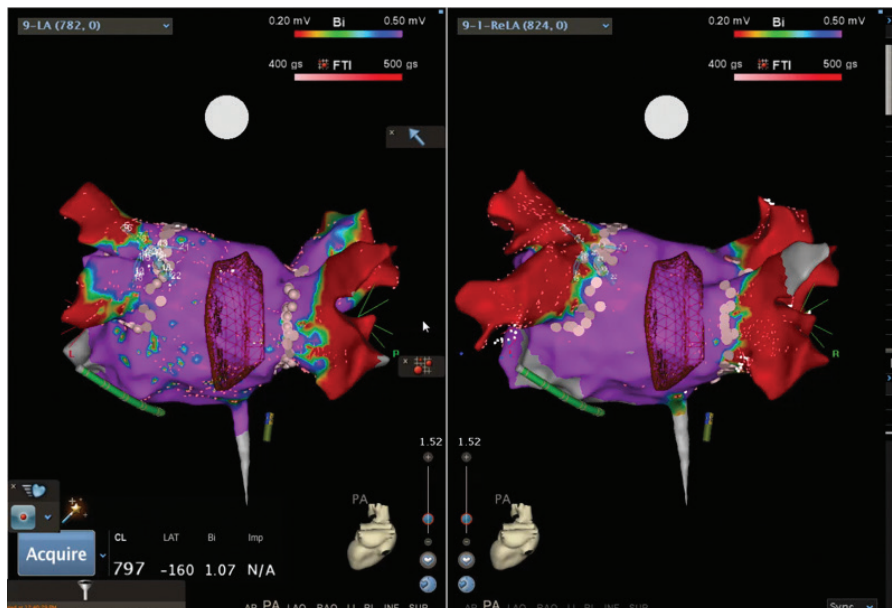


Image 4: Electroanatomic mapping (EAM). Detailed, accurate anatomic rendering creates a detailed “road map” during an ablation.

“Fluorless” ablations have emerged as a safe option with no increase in complication rates when compared to the traditional approach. At Cleveland Clinic, we have paired this approach with force-sensing and ablation indexes for improved patient outcomes and results. Ablation indexes are measures of the quality of the lesions we apply during a radiofrequency ablation, and superior values have been linked to improved long-term results for the patient.

Ablations have evolved into an effective and safe tool in

the management of cardiac arrhythmias. Ultimately, the most effective management strategies require a multi-disciplinary approach. Consultation with an electrophysiologist early in the diagnosis of cardiac arrhythmias is preferred and ultimately leads to better patient care and improved outcomes.

Dr. Rodriguez
Rodrigy9@ccf.org

A Message from our CEO and President

Conor P. Delaney, MD, PhD
CEO and President
Cleveland Clinic Florida



In 1988, Cleveland Clinic first expanded its footprint outside Ohio and into Florida by opening an outpatient facility in Fort Lauderdale. In the ensuing 35 years, Cleveland Clinic has grown throughout South Florida and up through the Treasure Coast to now include five hospitals and numerous outpatient centers in Broward, Palm Beach, Martin, St. Lucie and Indian River counties.

With the growth of Cleveland Clinic, which includes the acquisition in 2019 of Indian River Hospital and Martin Health, our Heart, Vascular and Thoracic Institute (HVTI) has increased its capabilities and services to offer this region more of and better access to the world-class heart and vascular care for which Cleveland Clinic is known.

By combining a patient-centered approach to care with

multidisciplinary collaboration and unparalleled staff experience and expertise, Cleveland Clinic Florida's HVTI has achieved extraordinary volumes and outcomes.

For example, our cardiac surgeons perform nearly 1,500 cardiothoracic procedures each year for a broad spectrum of cardiovascular and thoracic diseases, resulting in one of the largest dedicated cardiothoracic surgery programs in Florida. Our Cardiac Amyloidosis Center is the largest of its kind in the Southeast United States. Through this center we provide the most advanced care and long-term management of cardiac amyloidosis to more than 300 patients. Our electrophysiologists have conducted more than 10,000 procedures since 2010, and our transplant center at Weston Hospital has performed more than 200 adult heart transplants since the program launched in 2014.

Our state-of-the-art heart valve center, on which we focus this issue of *Cardiac Care*, now offers a robotically assisted approach to minimally invasive mitral valve repair or replacement. In addition, we offer subspecialty centers for cardio-oncology, cardiac amyloidosis, cardiac sarcoidosis, and hypertrophic

cardiomyopathy.

Our hospitals and outpatient centers across the region are integrated to provide patients access to the appropriate level of care in all aspects of cardiovascular medicine including cardiology, cardiovascular and thoracic surgery, vascular medicine and surgery, heart failure, transplantation, structural heart and interventional cardiology, electrophysiology, prevention, rehabilitation and imaging.

By combining a patient-centered approach to care with multidisciplinary collaboration and unparalleled staff experience and expertise, The Heart, Vascular and Thoracic Institute in Florida has achieved extraordinary volumes and outcomes.

Cleveland Clinic Weston Hospital continues to be our hub for the most complex cases, and our focus is steady on expediting patient care as needed – from access for an initial visit in an outpatient setting

to expeditious hospital-to-hospital transfer for the sicker patients, through a thorough evaluation and ongoing support.

Both Jose L. Navia, MD, Director of the Florida HVTI and Chairman of Cardiothoracic Surgery, and Jerry D. Estep, MD, Chairman of Cardiology, are working to build the appropriate staffing and underlying structure of our program to ensure we're best positioned to provide the timeliest access to consistent quality care for our patients across the Florida region.

That care includes innovative and scientifically based treatments. As an academic medical center, Cleveland Clinic Florida is at the forefront of new and emerging heart and vascular research. We develop and test new cardiovascular disease treatments and therapies and make them available to our patients as soon as possible.

Our physicians publish in peer-reviewed journals and present at major academic conferences. Some research achievements include:

- Thoracic endovascular graft implantation: Zenith Alpha™ Thoracic Endovascular Graft
- COMMENCE trial of an aortic valve bioprosthesis
- Tataru Vascular guide wires used for angioplasty procedures
- NaviGate stent for tricuspid valve repair
- Intraoperative positioning system
- Less invasive transcatheter repairs of the ascending aorta

All of our work is done in collaboration with the with Cleveland Clinic in Ohio, which has been ranked #1 in cardiac care in the nation since 1995 by *U.S. News & World Report*. Our own accolades include, among several others, *Newsweek* rankings

for The World's Best Specialized Hospitals 2023, which places Cleveland Clinic Weston Hospital's cardiac surgery program 85th out of

the top 150 hospitals in the world, and the cardiology department 68th out of the top 250 hospitals in the world.

Thank you for the trust and confidence you place in Cleveland Clinic in Florida. We are delighted to continue to partner with you in your patients' care.

World-Class Care in Florida



Cleveland Clinic Weston Hospital



Cleveland Clinic Martin Health



Cleveland Clinic Indian River Hospital



A Dedicated Surgical Critical Care Team to Enhance Postoperative Recovery

By Edward Noguera, MD
Associate Director, CVICU
Cleveland Clinic Weston Hospital

Since 2014, Cleveland Clinic Weston Hospital has moved toward offering highly specialized medical care to our community. In these past eight years, the surgical ICU has grown tremendously and the capacity of beds on the unit has expanded. During this same time, the surgical ICU staff has expanded to a team of BC/BE anesthesiology intensivists collaborating with a dedicated team of advanced practice providers, fellows, and residents. We now foresee further growth and are planning to expand to a total of 48 beds over the next year.

We have become a well-established referral center for cardiac care, and every day a wide array of cardiothoracic surgery and cardiology patients are admitted to our unit. Our physician-led multidisciplinary rounds have added value to the surgical operations of several subspecialty service lines at Weston Hospital. Our patients go back to our community in better health due to the focused collaboration of physicians, nurses, and allied healthcare providers.

Patients undergoing minimally invasive cardiac surgery receive nerve blocks as part of an aggressive analgesia plan. We are among the first hospital to implement routine parasternal blocks and pectoralis blocks (PEC1 or PEC2) for all cardiac cases, especially minimally invasive procedures in which we add serratus plane nerve blocks. We have also introduced the use of sub-anesthetic doses of ketamine and early multimodal analgesia as additional strategies to minimize sedation while providing intense analgesia. The combination of these analgesic modalities allows us to expedite liberation from mechanical ventilation in the SICU. Our average extubation time after cardiac procedures is 2.5 hours. Patients are, therefore, able to be out of bed within the first 6 hours of surgery and, thus, early mobilization and ambulation have become routine activities in our practice.

The combination of our physicians' expertise in individualized sedation and analgesic strategies, metabolic support, nutritional therapy,

hemodynamics management, and advanced ventilator management as well as our close collaboration with respiratory, physical, and occupational therapists have afforded us superior outcomes. Physical therapists find our patients out of bed and ready to engage in physical therapy within the first 12 hours after surgery. Our early ambulation protocols have been refined over time and, thus, the SICU/CVICU has the lowest rates of (catheter associated UTI (central line infections), and pressure ulcers, along with the highest rates of hand hygiene in our hospital. These ICU metrics are closely followed to adjust any of our protocols of care when necessary.

Our goal is to increase capacity in SICU/CVICU by 40% in 2023. With this expansion, The Heart, Vascular and Thoracic Institute in Florida will increase its capabilities to continue caring for the "sickest of the sick" in our community.

Dr. Noguera
noguere@ccf.org



#1 HOSPITAL IN SOUTH FLORIDA

5 YEARS IN A ROW

Cleveland Clinic Florida’s Weston Hospital has once again earned the top spot as the #1 hospital in the Miami-Fort Lauderdale metro area for 2022-2023, according to the newly released annual ranking of Best Hospitals by *U.S. News & World Report*. It is the fourth consecutive year Cleveland Clinic Weston Hospital has earned the top ranking, the only hospital to be ranked #1 for four straight years in South Florida.

HIGH PERFORMING IN CARDIOLOGY AND HEART SURGERY

Cleveland Clinic Florida’s regional hospitals were recognized as high performing for the following cardiac conditions and procedures:



Cleveland Clinic
Weston Hospital



Cleveland Clinic
Weston Hospital



Cleveland Clinic
Weston Hospital

Cleveland Clinic
Indian River
Hospital

Cleveland Clinic
Martin Health



Cleveland Clinic
Weston Hospital

Cleveland Clinic
Indian River
Hospital

Cleveland Clinic
Martin Health

New Staff

To refer a patient to one of our Heart, Vascular and Thoracic Institute specialists, please call 833.733.3710.

The Heart, Vascular and Thoracic Institute in Florida Welcomes the Following New Staff Members



Luis Marcelo Argote-Greene, MD, FCCP

*Regional Director, Thoracic and Esophageal Surgery
Cleveland Clinic Indian River Hospital*

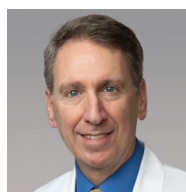
Specialty interests: Video-assisted minimally invasive thoracic surgery (VATS), robotically assisted minimally invasive surgery (RATS), pleural diseases benign and malignant, complex pleural spaces, giant hiatal hernias, mesothelioma, lung nodules, robotic esophagectomy, lung screening program



David A. Baran, MD, FACC, FSCAI, FHFSA

*Section Head, Advanced Heart Failure, Transplant and Mechanical Circulatory Support
Cleveland Clinic Weston Hospital*

Specialty interests: Heart failure, cardiogenic shock, mechanical circulatory support, heart transplantation, amyloidosis, hypertrophic cardiomyopathy



Ronald Cossman, MD

*Cardiothoracic Surgeon
Cleveland Clinic Martin Health*

Specialty interests: Coronary revascularization, valve repair and replacement, atrial fibrillation surgery, robotic thoracic surgery



Luis D. Velazco Davila, MD

*Cardiothoracic Surgeon
Cleveland Clinic Indian River Hospital*

Specialty interests: Coronary artery disease, aortic valve disease, aortic root aneurysm, transcatheter aortic valve replacement (TAVR), mitral valve disease, tricuspid valve disease, aortic aneurysm, aortic dissections, atrial fibrillation, pericardial disease



Jenny S. Placido Disla, MD

*Cardiologist
Cleveland Clinic Weston Hospital*

Specialty interests: Multimodality cardiac imaging including echocardiography, cardiac CT, cardiac MRI, nuclear medicine



Jerry D. Estep, MD

*Chairman of Cardiology
Staff, Section of Heart Failure, Mechanical Circulatory Support and Transplantation
Cleveland Clinic Weston Hospital*

Specialty interests: Cardiomyopathy, cardiac amyloidosis, congestive heart failure, diastolic dysfunction, cardiomyopathy valvular, cardiac transplantation, cardiogenic shock, mechanical circulatory support, left ventricular assist devices



Lubka Ilieva, DO

Cardiologist
Cleveland Clinic Indian River Hospital

Specialty Interests: Preventive cardiology, women’s health, advanced cardiac imaging



Mary Oberst, MD

Cardiologist
Cleveland Clinic Indian River Hospital

Specialty interests: Cardiac CT, cardiac MRI, structural imaging, preventive cardiology, cardiac plaque analysis and risk assessment, use of AVSCD scores with coronary calcium scores to modify patient medical management



Yasser Rodriguez, MD

Electrophysiologist
Cleveland Clinic Weston Hospital

Specialty interests: Fluoro-free (radiation-free) ablations for arrhythmias, atrial fibrillation and atrial flutter, supraventricular tachycardias (SVTs), ventricular tachycardia, implantation and management of pacemakers and ICDs



Morris Sasson, MD

Vascular Surgeon
Cleveland Clinic Weston Hospital

Specialty interests: Aortic dissection, aortic aneurysm open repair and endovascular repair, aortic iliac occlusive disease, bypass surgery, carotid artery disease, stents for peripheral vascular disease, transcarotid artery revascularization (TCAR), varicose veins, vena cava filter, venous insufficiency, visceral ischemic syndrome



Laura Sullivan, MD, FACC

Cardiologist
Cleveland Clinic Indian River Hospital

Specialty interests: Advanced cardiac imaging, women’s health, heart failure, preventive cardiology



Keith Swanson, MD

Vascular Surgeon
Cleveland Clinic Martin Health

Specialty interests: Venous thromboembolism, chronic vein disease, varicose veins, post thrombotic syndrome, thrombophilia states, arterial obstruction including embolism and de novo arterial thromboembolism, small digit vasospastic and vaso-occlusive disorders, extremity ulcers



Chase Trotter, MD

Cardiologist
Cleveland Clinic Indian River Hospital

Specialty interests: Interventional cardiology and cardiovascular diseases



Allan Welter-Frost, MD

Electrophysiologist
Cleveland Clinic Indian River Hospital

Specialty Interests: Abnormal heart rhythms, bradyarrhythmia, Brugada syndrome, cardiac device implant and management, heart palpitations, Long QT syndrome, sinus node dysfunction, sudden cardiac arrest, syncope, ventricular arrhythmias, Wolff-Parkinson-White syndrome

The Heart, Vascular and Thoracic Institute in Florida

Patients from across the United States, Latin America and the Caribbean turn to Cleveland Clinic Florida's Heart, Vascular and Thoracic Institute for life-saving treatment options. Physicians are subspecialty trained in a number of areas and provide compassionate heart care that is second to none.

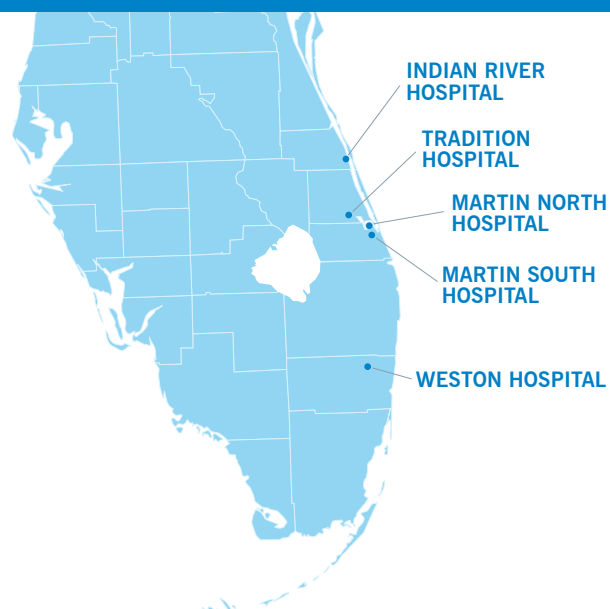
Departments & Centers

- Cardiology
- Cardiac Amyloidosis
- Cardiac and Thoracic Surgery
- Cardiac Electrophysiology and Pacing
- Cardiac Imaging
- Cardio-Oncology
- Heart Transplant and Mechanical Circulatory Support
- Hypertrophic Cardiomyopathy
- Structural and Interventional Cardiology
- Vascular Medicine
- Vascular Surgery

About Cleveland Clinic in Florida

Cleveland Clinic Florida is a nonprofit, multi-specialty healthcare provider that integrates clinical and hospital care with research and education. The Florida region now includes Cleveland Clinic Indian River Hospital, Cleveland Clinic Martin North Hospital, Cleveland Clinic Martin South Hospital, Cleveland Clinic Tradition Hospital, and Cleveland Clinic Weston Hospital, with five hospitals and numerous outpatient centers in Broward, Palm Beach, Martin, St. Lucie and Indian River counties. Cleveland Clinic Florida ranked #1 in the Miami-Fort Lauderdale metro area and is a top hospital in Florida, according to *U.S. News & World Report's* "2022-23 Best Hospitals" rankings. The Florida region is an integral part of Cleveland Clinic in Ohio, where providing outstanding patient care is based upon the principles of cooperation, compassion and innovation. Physicians at Cleveland Clinic are experts in the treatment of complex conditions that are difficult to diagnose.

For more information about Cleveland Clinic in Florida, visit clevelandclinicflorida.org.



For Patient Appointments

Cleveland Clinic Weston Hospital
877.463.2010

Cleveland Clinic Martin Health
844.630.4968

Cleveland Clinic Indian River Hospital
877.463.2010

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