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Advances in the Treatment of Atrial Fibrillation
At VCU Medical Center

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Advances in the Treatment of Atrial Fibrillation
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The Atrial Fibrillation Treatment Program at Virginia Commonwealth University (VCU) Medical Center is a nationally recognized program for the treatment of heart rhythm disturbances. The program’s focus is on meeting the individual needs of each patient.

The comprehensive program, part of the Pauley Heart Center, is a collaboration of cardiac specialists and cardiothoracic surgeons. The Atrial Fibrillation program is led by Kenneth Ellenbogen, MD, Kontos Professor of Medicine and director of cardiac electrophysiology and Vigneshwar Kasirajan, MD, chairman of the division of cardiothoracic surgery.

Patients who are evaluated and treated for atrial fibrillation at VCU Medical Center benefit from experienced clinicians and leading-edge equipment, technologies and procedures. Physicians perform a wide range of diagnostic and treatment procedures at one of three outpatient clinics. One site is the Heart Station, where patients’ heart functions are evaluated through electrocardiograms (ECGs), stress tests, echocardiograms and ambulatory monitoring devices.

In addition, the program performs a variety of arrhythmia studies and coronary angiography on an outpatient basis in the electrophysiology and catheterization labs. An 18-bed specialized preprocedure and recovery unit directly adjacent to the labs allows patients to be admitted, monitored and discharged all within the same area.

VCU Medical Center also features three cardiac surgery operating rooms and a dedicated cardiac surgery intensive care unit. Heart patients are also cared for in the coronary care unit, a state-of-the-art facility that features intensive care rooms with centralized, round-the-clock telemetry for patient monitoring. For visual contact and instant response, the unit is set up in pods around nursing station hubs. A step-down unit is also available for patients as they progress through recovery.
Atrial Fibrillation

Atrial fibrillation (AF) is a common heart condition where the upper part of the heart (the atria) beats irregularly and much too fast because it receives rapid, abnormal electrical signals. These signals cause the heart to quiver (fibrillate) and affect the heart’s ability to efficiently pump blood to the rest of the body. As a result, the brain and other organs may receive too little blood to operate at their best.

AF may occur occasionally, or it may be a persistent condition. It is rarely painful, though it can produce an uncomfortable sensation in the chest. The decreased pumping power of the heart can cause dizziness, lightheadedness, shortness of breath, weakness and fatigue. Some patients, however, have no sensation that their heart is fibrillating.

AF is a dangerous medical condition that becomes more difficult to treat over time and can lead to irreversible heart damage. AF can also lead to the formation of blood clots inside the heart, which can in turn cause a stroke. In fact, patients with atrial fibrillation are twice as likely to die and five times more likely to suffer a stroke. Medications can alleviate symptoms caused by AF, but they do not cure the underlying problem.

An estimated three million people in the United States have atrial fibrillation and about 160,000 new cases are diagnosed each year. AF is uncommon among young people, although it can occur at any age. The likelihood of developing the condition increases as we get older. After age 65, between 3 and 5 percent of the population have atrial fibrillation. Approximately 9 percent of people age 80 and older have the condition.

While for many people there is no apparent cause for AF, it can be related to underlying conditions or risk factors that include the following:

- Previous heart attack, congestive heart failure, leaky valves, coronary artery disease or inflammation near the heart
- High blood pressure or diabetes
- Thyroid, lung or other illnesses
- High levels of caffeine or alcohol use
- Sleep-disordered breathing

Atrial fibrillation may occur from time to time (paroxysmal) or be constant (chronic or persistent). If treated appropriately, atrial fibrillation and atrial flutter seldom cause serious or life-threatening problems.

To diagnose atrial fibrillation, the doctor combines a pulse reading and an ECG recording. If the pulse is irregular, AF is suspected. The diagnosis is then confirmed with the ECG – a simple, painless test that records the electrical activity of the heart.

Some patients may be asked to wear a small portable device with electronic memory that records a series of ECGs over time. These devices include Holter monitors, event recorders and loop recorders. A Holter monitor runs continuously and usually is worn for 24 to 48 hours. An event recorder is switched on by the patient to record an ECG whenever the patient senses an irregular heartbeat. A loop recorder can be automatically triggered by an abnormal heart rhythm or a heartbeat that is too fast or too slow.
**Nonsurgical Treatments for AF**

No single treatment strategy has been shown to be effective for all patients with AF. The choice of treatment depends upon the severity of the symptoms, the likelihood that the patient will respond to a particular treatment and consideration of the risks versus benefits of treatment. Doctors will discuss specific issues with individual patients.

Historically, treatment of AF has taken one of four forms:

- Medication to restore a normal heart rhythm, including a blood thinner to prevent stroke
- Cardioversion to shock the heart back into normal rhythm
- Pacemaker to prevent slow heart beating that’s either caused directly by AF or by drugs used to treat AF
- Catheter-based ablation to knock out the areas of the heart that are causing the fibrillation

**Treatment options tend to focus on three goals:**

- Reduce the risk of stroke
- Manage or control atrial fibrillation
- Try to cure atrial fibrillation

**Medications**

Anticoagulants (blood thinners) are prescribed to most AF patients to prevent blood clots that could lead to a stroke. Warfarin (Coumadin™) is the most commonly prescribed drug and has been shown to reduce the risk of stroke by 68 percent.

To achieve this level of protection, however, it is important to maintain the correct level of warfarin in the blood. Too little and clots can form; too much and a patient can develop severe bleeding problems. Since many other drugs, as well as dietary supplements and foods, can affect warfarin levels, it is important for patients to follow their doctor’s instructions closely and have their blood levels checked regularly.

Rate-control drugs manage heart rate during AF and rhythm-control drugs (anti-arrhythmics) try to bring the heart back into normal rhythm. These drugs can offer a degree of success, but some people have problems tolerating their side effects or cannot use them because of interactions with other drugs they are taking.

**Cardioversion**

For most individuals with chronic atrial fibrillation, whose symptoms do not improve with medications, a normal heart rhythm can be restored by applying a controlled electric shock to the heart. This procedure, which breaks the pattern of abnormal electrical signals, is performed under careful medical supervision. Short-acting sedatives are used so patients do not feel pain or discomfort.

It is also possible to restore the heart’s normal rhythm using medications, but attempts at drug cardioversion are limited by the potential for serious side effects.
Ablation of the Atrioventricular Node and Pacemaker

A pacemaker is a small device implanted under the skin near the collarbone, which monitors the heart's rhythms and sends a controlled electrical pulse to the heart muscle if it identifies a slow rate. A permanent pacemaker is only considered for patients who are unresponsive to medical therapy (i.e. drugs and cardioversion) and have significant symptoms. Placement of a pacemaker usually occurs in the electrophysiology lab.

In some instances the therapy of choice is to sever the atrioventricular (AV) nodal impulses going from the atrium to the ventricle. This routine ablation procedure immediately slows the heart’s rhythm; once the AV nodal impulses to the ventricle are cut, the heart rate drops to about 40 beats per minute. Consequently, a pacemaker is implanted to establish a reliable, vigorous beat.

The whole procedure can be performed in an hour or two, and patients are usually symptom free as a result. Patients are required to see their caregiver regularly for a pacemaker check. Because of the special characteristics of the procedure, most patients are not eligible for ablation of the AV node and pacemaker.

It's also important to note that even though the heartbeat is now regular, the upper chambers of the heart continue to fibrillate and the risk of stroke persists.

Catheter Ablation

Another mode of treatment for atrial fibrillation is radiofrequency catheter ablation. During this procedure, one or more flexible catheters are inserted via X-ray into a blood vessel and directed to the heart muscle. Electrodes at the end of the catheter assist the doctor in detecting the faulty electrical sites that are causing the heart to beat irregularly and too fast.

A burst of heat in the form of radiofrequency energy destroys the tissues that create the abnormal electrical signals responsible for the irregular heartbeat. Sometimes the doctor may need to repeat the procedure. Catheter ablation can take four to six hours but on average only requires a one- or two-night hospital stay. When successful, catheter ablation ends the patient’s need to take heart rhythm medications.

VCU Medical Center specialists have performed over 500 radiofrequency catheter ablation procedures.

Cryoablation

Cryoablation is a new and safer method of treating and often eliminating the most common arrhythmias in both children and adults. With less chance of complications, this technique uses a freezing method, rather than heat, to disable arrhythmias permanently.

This freezing technique used by cardiologists at VCU Medical Center is also called cryotherapy. It involves threading a small catheter into the heart and freezing the tissue that’s causing the heart to beat irregularly. Cryoablation does not cause patients pain.

Unlike current methods for treating arrhythmias, cryoablation allows cardiologists the advantage of testing the site for accuracy before carrying out the actual procedure. By threading a catheter through veins from the groin into the heart, cardiologists can map the heart’s electrical impulses and freeze tissue that’s suspected of creating a disturbance.

Physicians test potential ablation sites by temporarily chilling tissue in the target area. Cells that prove to be nontargets are returned to normal temperature and function before the physician repositions the catheter. Once the target site is pinpointed, the catheter tip is cooled to −75 degrees Celsius to freeze the affected tissue.
Cryoballoon Ablation

A promising new line of clinical research at VCU Medical Center is cryoballoon ablation therapy. When the pulmonary veins are thought to be the source of the electrical disturbance causing atrial fibrillation, cryogenic (cold) energy is applied to stop the transmission of the abnormal electrical signals. This technique is experimental.

WATCHMAN®

A new area of treatment at VCU’s Pauley Heart Center involves use of the WATCHMAN. This device is designed to keep harmful blood clots that form in the left atrial appendage from entering the bloodstream and potentially causing a stroke. The WATCHMAN is designed to be permanently placed at the opening of the left atrial appendage.

Using techniques commonly performed in catheterization procedures, the physician guides the WATCHMAN into the heart through a catheter (flexible tube) inserted through a vein in the upper leg. Once the catheter is in position, the doctor photographs the heart in order to measure the left atrial appendage and determine which size WATCHMAN device to use. After the device is put into place, additional measurements and pictures are taken to make sure the device is in the correct position. Once the correct position is confirmed, the doctor releases the device to leave it permanently implanted in the heart.

With this procedure, patients stay in the hospital overnight and recovery takes about 24 hours. It is hoped that the device will eliminate the need for blood thinners. This technique is experimental.

Stereotaxis Remote Catheter Navigation

The Stereotaxis Magnetic Navigation System allows for remote-controlled navigation of magnetically enabled catheters and guide wires for clinical ablation and electrophysiology device placement.

Stereotaxis provides pinpoint accuracy in placing electrophysiology catheters. The system uses two permanent magnets located on opposite sides of the patient table. The magnetically manipulated catheter is able to move in small increments with great precision, allowing physicians to more precisely map the treatment area.

With this new method, VCU Medical Center physicians can access difficult areas of the heart chamber quickly, safely and easily. This also enables them to perform more complex, successful and time-efficient ablation procedures for atrial fibrillation in the cardiac catheterization laboratory.
Surgical Options

Successfully managing atrial fibrillation can be difficult. At some point, doctors will likely discuss with their patients options for trying to cure the condition. The term ablation will be used frequently and means destruction of abnormal tissue. Using ablation, abnormal electrical signals can be blocked.

These ablation procedures offer an excellent chance of curing atrial fibrillation. The success of each approach varies, and the type of AF that the patient has can play a role in the options that are available. Surgical procedures also carry risks that the doctors will discuss with each patient.

Surgical Treatments for AF

Surgical therapy for atrial fibrillation is usually reserved for a carefully selected group of patients who have failed medical therapy and are at risk for complications from medications or strokes. This decision is best made after evaluation by a team comprised of an electrophysiologist and a surgeon well versed in this field.

Open-Chest Surgical Ablation

Many patients are treated with an open-chest operation called a Maze procedure. It has been highly effective for a wide range of atrial fibrillation patients. It can be a cure, but it is highly invasive, requiring open-heart surgery and heart-lung bypass.

The surgeon uses instruments to identify the faulty electrical sites in the heart that are causing it to beat irregularly and too fast. Then an instrument with a source to heat or freeze tissue is used to create precise ablation lesions. This can return the heart to a normal rhythm.

Some patients with AF who need open-heart surgery for another reason, such as bypass surgery or valve replacement or repair, have their surgeons perform surgical ablation too. It only takes another 15 to 25 minutes to create the necessary scars that can block the abnormal electrical impulses. Many surgeons also remove or close off a small outpouching of the heart (the left atrial appendage) that is believed to be the main site where stroke-causing blood clots form during atrial fibrillation.

Minimally Invasive Surgical Ablation

Doctors have developed a minimally invasive approach often called the “mini-Maze.” It is similar to the open-chest ablation except the surgeon gains access to the heart through three small incisions on each side of the chest. This approach usually takes about four hours and, as in open-chest procedures, the surgeon uses an energy source to make precise scars on the heart to block the irregular electrical impulses that cause AF.
Again, many surgeons close off or remove the small flap on the heart that is believed to be the main site of stroke-causing blood clots. Because the chest does not have to be opened, recovery is much easier and the average hospital stay is around four days.

**Patient Follow-Up**

All patients receiving therapy for atrial fibrillation – whether catheter ablation or surgical therapy – require lifelong follow-up to monitor anticoagulation, heart rate and rhythm.

The ultimate goal is to maintain normal atrioventricular sinus rhythm using ablation procedures. Patients need a two- to four-week monitoring of their heart rhythm six months after the procedure to document the absence of atrial fibrillation. Patients who remain free from atrial fibrillation for a long period are carefully evaluated for possible cessation of the use of warfarin, the drug used to prevent strokes.

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**About VCU**

The VCU Medical Center is the only academic medical center in central Virginia and one of the leading centers nationwide. It includes the region’s only Level I Trauma Center, 780 inpatient beds, outpatient clinics and the VCU Health Sciences Schools of Allied Health Professions, Dentistry, Medicine, Pharmacy and Nursing. Its 600 physicians and faculty members offer state-of-the-art care in more than 200 specialty areas including comprehensive cardiac care, organ transplantation, head and spinal cord trauma, burn healing and cancer treatment.

The VCU Pauley Heart Center offers a comprehensive lineup of cardiovascular services for patients in Virginia and beyond.

Pauley Heart Center physicians and staff offer the most up-to-date diagnostic evaluations, a complete complement of nonsurgical and surgical interventions, and post-treatment rehabilitation therapies. Care of emergent heart problems includes close coordination with emergency room physicians at the VCU Medical Center and facilities throughout Virginia.

VCU faculty and staff are sensitive to patients’ needs and have a commitment to keeping referring physicians informed about the progress of their patients. The Pauley Heart Center community is also active in researching and refining the next generation of advances in heart care through pioneering investigation.