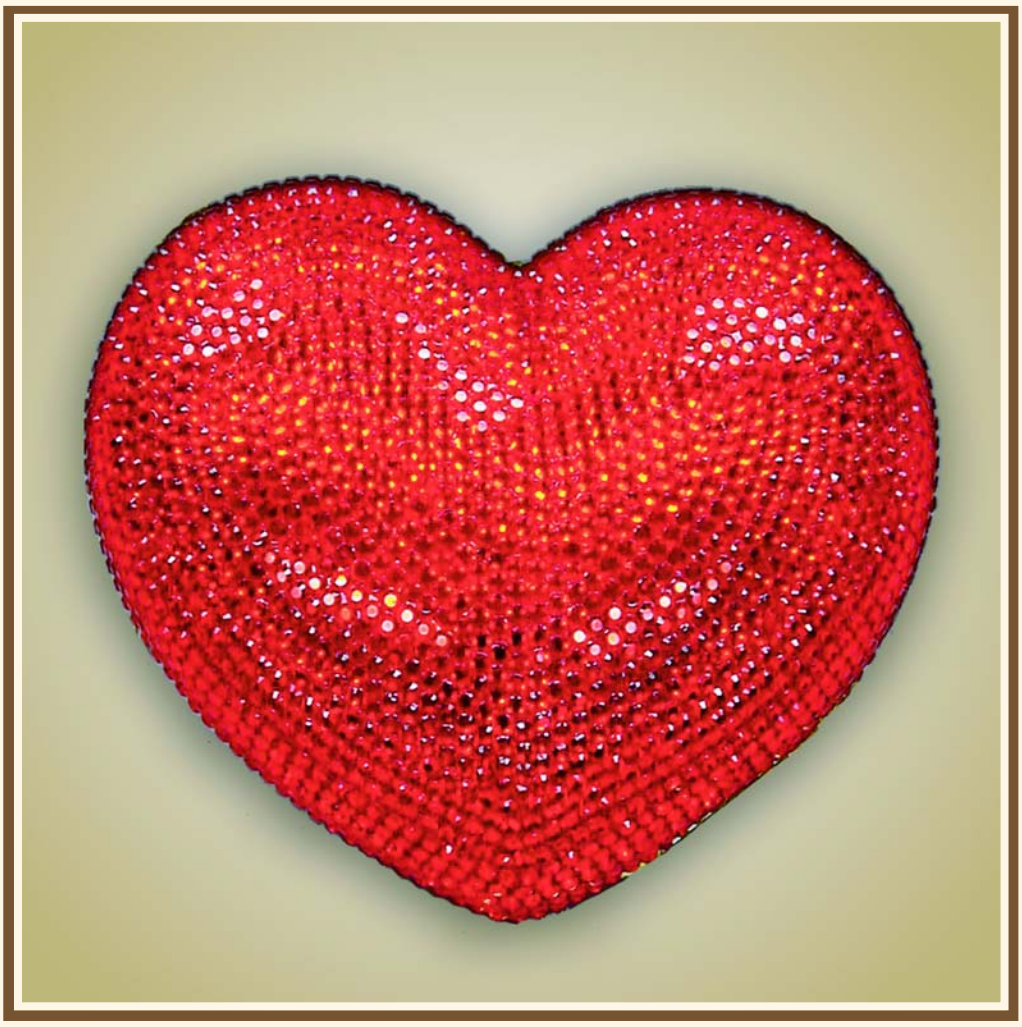
Heart WATCH

SPRING 2005

A Newsletter Produced by the Texas Heart Institute



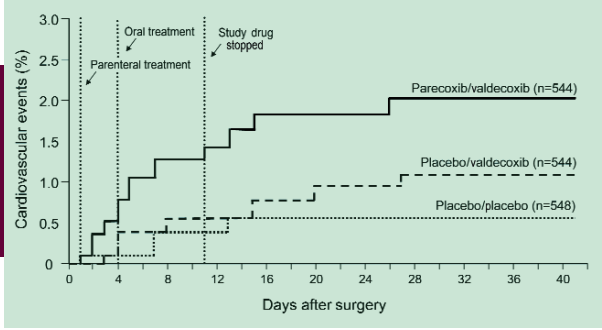
Texas Heart® Institute

at St. Luke's Episcopal Hospital

Studies Evaluate the Safety and Efficacy of COX-2 Inhibitors in Cardiac and Noncardiac Surgical Patients

Abstract: Recent studies suggest that the COX-2 inhibitors parecoxib and valdecoxib may pose particular risks for patients recovering from coronary artery bypass surgery.

The nonsteroidal anti-inflammatory drugs (NSAIDs) known as selective cyclooxygenase-2 (COX-2) inhibitors can relieve many types of pain without causing the gastrointestinal side effects seen with nonselective NSAIDs. However, the selective COX-2 inhibitor rofecoxib (Vioxx) has been associated with an increased risk of cardiovascular thromboembolic events (*N Engl J Med* 2004;351:1701–11; *JAMA* 2001;286:954–9; *Circulation* 2001;104:2280–8; *Lancet* 2002;360:1071–3) and congestive heart failure (*Lancet* 2004;363:1751–6). This finding has brought other selective COX-2 inhibitors under scrutiny by clinicians, the US Food and Drug Administration, and the public.



Rates of cardiovascular thromboembolic events in patients treated with parecoxib/valdecoxib, placebo/valdecoxib, or placebo after undergoing CABG surgery. (Adapted from *N Engl J Med* 2005; 352:1081–91, with permission.)

For this reason, Nancy A. Nussmeier, MD, director of Cardiovascular Anesthesiology Research at the Texas Heart Institute at St. Luke's Episcopal Hospital (THI/SLEH), was asked by Pfizer, Inc., to examine the results of 2 multiinstitutional, randomized, placebo-controlled trials of the selective COX-2 inhibitor valdecoxib (Bextra) and its intravenous (IV) prodrug, parecoxib (Dynastat), in patients recovering from major surgery. One study involved 1,671 patients undergoing coronary artery bypass grafting (CABG); the other involved 1,062 patients undergoing various major orthopedic, abdominal, gynecologic, and noncardiac thoracic procedures requiring general or regional anesthesia. More than 100 centers around the world participated, including THI/SLEH.

"Patients in each study received both the study medication and standard-of-care pain control with opioids for 10 days after surgery," says Dr. Nussmeier. "All patients received IV study medication for the first 3 days, then were switched to oral medication as soon as it could be tolerated."

In the CABG study, patients were randomized to 3 groups. The parecoxib/valdecoxib group received parecoxib during the IV medication period and oral valdecoxib thereafter; the placebo/valdecoxib group received an IV placebo followed by oral valdecoxib; and the placebo group received placebos during both the IV and the oral periods. Patients in the noncardiac surgery study were assigned only to the parecoxib/valdecoxib or placebo group.

"We tabulated the number of patients in each group who had an adverse event in the 30 days after surgery," says Dr. Nussmeier, "including cardiovascular thromboembolic events, renal failure or severe renal dysfunction, gastroduodenal ulcers, and wound healing complications. Each adverse event was evaluated by an independent group blinded to the treatment assignment. We also assessed drug efficacy by examining the patients' use of any supplemental opioid medications."

Once collected, these data were given to Dr. Nussmeier, who agreed to provide impartial analysis and interpretation with the help of colleagues at THI/SLEH and other institutions. The findings of the CABG study appeared in the March 17, 2005, issue of *The New England Journal of Medicine* (2005;352:1081–91).

The analyses showed that the placebo groups in both studies consumed more opioid medications than the treated groups, suggesting that parecoxib and valdecoxib reduced the need for additional analgesia. However, in the CABG patients, postoperative adverse events were significantly more common in the parecoxib/valdecoxib group (7.4%) and the placebo/valdecoxib group (7.4%) than in the placebo group (4.0%) (P=0.02). Much of this disparity was attributable to cardiovascular thromboembolic events, which occurred more often in parecoxib/valdecoxib patients (2.0%) than in placebo patients (0.5%) (P= 0.03). In the noncardiac study, on the other hand, adverse events were not significantly different between the parecoxib/valdecoxib (2.7%) and placebo groups (3.2%). Particularly important were the similar rates of cardiovascular thromboembolic events (1.0%) in each group.

"These findings led us to recommend that parecoxib and valdecoxib not be given to patients after CABG or any other cardiovascular operation," says Dr. Nussmeier. "As for noncardiac operations, we didn't find any significant differences in adverse events, and parecoxib appears to be an effective alternative to narcotics for postoperative pain control in younger, healthier patients. However, we can't say that parecoxib and valdecoxib are safe for patients with cardiac risk factors. That question will require additional study." ●

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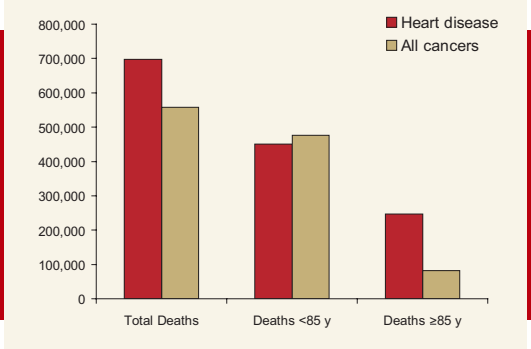
Heart Disease Remains the Top Killer of Americans

Abstract: When the entire US population is included regardless of age, heart disease still claims more lives than cancer does.

In mid-January 2005, major US newspapers ran a series of startling headlines: "Cancer Now the Leading Killer of Americans" (ABC News); "Cancer Now Kills More Than Heart Disease" (CNN News); "Cancer Passes Heart Disease as Top Killer" (*New York Times*). The stories that accompanied these headlines were based on *Cancer Facts and Figures 2005*, a statistical report newly released by the American Cancer Society (ACS) (www.cancer.org).



US mortality of heart disease versus cancer, 2002. (*Source:* American Heart Association and American Cancer Society.)

"Most of these stories were confusing, and some of them were inaccurate, possibly implying that the public can let down its guard about heart disease," says Denton A. Cooley, MD, founder and surgeon-in-chief of the Texas Heart Institute at St. Luke's Episcopal Hospital (THI/SLEH).

In actuality, the ACS report stated that since 1999 cancer has surpassed heart disease as the leading killer of Americans *under age 85*.

"This does not mean that cancer is the leading killer of Americans or that heart disease has become less of a threat than cancer," says Dr. Cooley. "When the entire US population, regardless of age, is included, heart disease still claims the most lives."

Nevertheless, on January 20, 2005, Fox News reported that cancer has surpassed heart disease to become the leading cause of death in the United States without mentioning any age-related statistics.

To clarify this issue, the American Heart Association (AHA) responded that the ACS report includes only coronary artery disease, hypertensive cardiac disease, heart failure, and other forms of heart disease. It does not include stroke (the 3rd leading cause of American deaths) or other cardiovascular problems associated with heart disease.

"In reality," Dr. Cooley points out, "more people, even under age 85, die of cardiovascular disease than of the next 5 leading causes of death combined: cancer, chronic lower respiratory disease, accidents, diabetes mellitus, and influenza and pneumonia."

Cancer claims more than 1,500 lives per day, accounting for 25% of all deaths in the United States, but cardiovascular disease claims 2,600 lives per day, accounting for 38% of all deaths (www.americanheart.org).

"Cardiovascular disease mainly affects men aged 40 to 59 and both men and women aged 75 to 84. However, many people think of heart disease as a less immediate threat than cancer," says Dr. Cooley. "In particular, women tend to underestimate their risk of heart disease and are more worried about breast cancer. But in 2002, almost a third of the cardiovascular-related deaths in the United States occurred in persons younger than 75."

"Of course, no health advocacy group wants its disease to be the most lethal," he adds. "Both the ACS and the AHA can be proud of the recent inroads that have been made against cancer and heart disease. Both conditions share many risk factors and respond to similar preventive measures."

In fact, the ACS and AHA recently joined with the American Diabetes Association to establish "Everyday Choices for a Healthier Life" (www.everydaychoices.org). This 3-year initiative is designed to educate health care professionals, health policy makers, and the general public about the importance of 4 simple, daily lifestyle choices that can protect against heart disease, stroke, cancer, and diabetes mellitus: eating healthfully, exercising, not smoking, and having regular medical checkups. In a joint statement intended to clarify any confusion about the recent statistics regarding cancer and heart disease, the ACS and AHA emphasized their shared mission and the necessity of raising public awareness of all the top lethal diseases.

"In comparing major diseases with regard to mortality and morbidity," Dr. Cooley concludes, "the results depend on who is interpreting the statistics and how. Instead of becoming sidetracked by such comparisons, the important thing is that we be relentless in our efforts to overcome these killers. In the fight against cardiovascular disease, THI/SLEH will continue to devote all of its resources to achieving this goal." ●

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Contents

Artificial Aortic Valve Replacements Continue to Evolve

Abstract: Aortic valve replacements continue to evolve through incremental change and innovation.

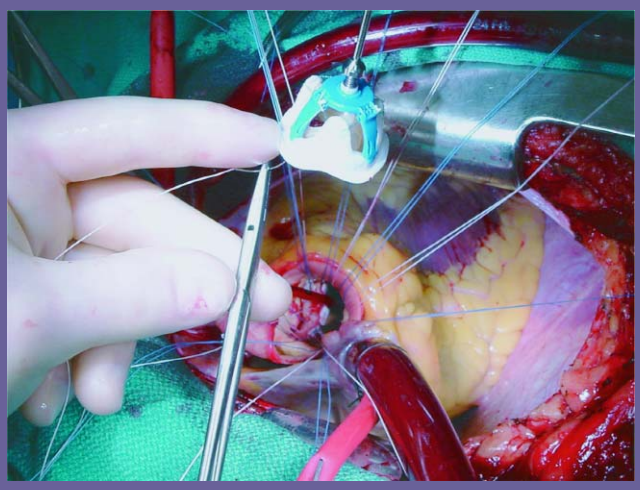
When an aortic valve becomes too stenotic or insufficient to allow adequate repair, an established therapeutic option is aortic valve replacement. Current mechanical and bioprosthetic (tissue) replacements for the aortic valve are relatively safe and effective. However, mechanical valves continue to be hampered by thrombogenicity and the need for continuous anticoagulation, while tissue valves have shorter useful lives and are vulnerable to calcification. Thus, the quest for better artificial aortic valve substitutes continues here at the Texas Heart Institute at St. Luke's Episcopal Hospital (THI/SLEH) and elsewhere.

In some cases, the steps taken are incremental. Recently, David A. Ott, MD, a cardiovascular surgeon at THI/SLEH, contributed to the redesign of a porcine bioprosthetic aortic valve called the Mosaic Ultra, which was developed by Medtronic, Inc. Dr. Ott also became the first surgeon in the world to implant the redesigned valve in a patient.

"Being the first to implant a new valve is not a major event, but in this case it's an excellent example of how doctors working with companies can make incremental, yet important, improvements in the products used to treat patients with heart disease," said Dr. Ott. "After implanting a previous version of the valve in several patients, I gave the company some suggestions on how to improve it."

One suggestion was to significantly reduce the size of the cuff used to attach the valve to the heart. The redesign allows some patients to receive a larger version of the valve, resulting in better hemodynamics and decreasing the pressure gradient. It also allows the valve to be easily implanted in a narrow aortic root, a condition often seen in elderly patients.

In other instances, the evolutionary steps being taken are larger. Cardiologists R. David Fish, MD, and David Paniagua, MD, have been continuing their development of a low-profile aortic valve fashioned from porcine pericardium. The valve has a novel, strutless design that allows folding and percutaneous implantation via a catheter (see *Heart Watch* Spring 2004). Already being tested in a sheep model, the valve is about to undergo 6 months of durability testing over an estimated 250 million cycles in a sealed hydraulic chamber.



Mosaic Ultra valve being maneuvered into position in a patient undergoing aortic valve replacement.

"Other percutaneous valve designs have been tested in Europe and the United States," says Dr. Paniagua," but they have had problems associated with the relatively large catheters needed to deliver them and with aortic insufficiency after implantation. Although these technical obstacles won't be easy to overcome, we believe that our flexible, low-profile design should eventually be deliverable via much smaller catheters and should be more easily scalable to fit individual patients."

Meanwhile, researchers in THI/SLEH's Cardiovascular Research Laboratories have been helping to develop and test preclinically a unique tricuspid mechanical valve called the Triflo (Triflo Medical, Inc.) The valve consists of 3 pyrolytic carbon leaflets hinged on a titanium ring. Computer-aided design and computational fluid dynamics studies have helped determine the valve's current form. In vivo studies, performed in the relatively harsh and demanding environment of the bovine heart, have demonstrated that the valve can function well, with little or no thrombosis, for up to 502 days.

"The Triflo's leaflets are aerodynamically designed to minimize blood turbulence, shear stress, and stagnation as blood crosses the valve annulus and to close gently without damaging blood cells," says Kamuran A. Kadipasaoglu, PhD, assistant director of Cardiovascular Surgical Research at THI/SLEH and a member of the team evaluating the valve. "The leaflets also open in a way that mimics the centric opening of the native aortic valve. Thus, even though the valve has been successfully tested preclinically in both the mitral and aortic positions, its design may make it especially appropriate for the aortic position." ●

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Texas Heart Institute Establishes Center to Coordinate Stem Cell Research

Abstract: The Texas Heart Institute at St. Luke's Episcopal Hospital has established a center to coordinate its laboratory and clinical research involving stem cell therapy.

Congestive heart failure is the foremost cardiovascular problem in the world, relentlessly defying all medical and surgical attempts at a cure. Stem cell therapy, which is based on the revolutionary notion that the myocardium can regenerate itself, has emerged as a promising new treatment option. In theory, stem cell therapy is simple to apply, and it does not require immunosuppressive agents. Over the last several years, researchers at the Texas Heart Institute at St. Luke's Episcopal Hospital (THI/SLEH) have been studying stem cell therapy in patients with coronary artery disease and congestive heart failure. THI/SLEH physicians have also been conducting laboratory studies with collaborators at The University of Texas M. D. Anderson Cancer Center in Houston to identify the best stem cell types for use in these patients.

The amount and scope of this research has grown quickly over the last 5 years, and THI/SLEH recently established a center to coordinate its stem cell research efforts. The center is funded in part by an anonymous $2.5 million donation, and more funds are being sought from the National Institutes of Health.

The center is directed by James T. Willerson, MD, medical director and director of Cardiology Research, and Emerson C. Perin, MD, PhD, director of New Interventional Cardiovascular Technology. It will occupy more than 5,000 square feet on the 10th floor of THI/SLEH's Denton A. Cooley Building. Approximately 4,000 of those square feet will house a heart failure laboratory; laboratories for biochemistry and molecular biology, cardiac electrophysiology, and cardiac physiology research; and stem cell storage facilities. The rest will serve as offices for support staff. The center's staff will also have access to THI's existing cardiovascular surgical and pathology research laboratories.

"The main goal of our combined research is to demonstrate that stem cells can save the lives of patients with heart failure by regenerating and restoring damaged cardiac cells and tissue," says Dr.Willerson. "Coordinating our research through the new stem cell center should help us move this therapy more quickly to the patient's bedside."

> *"The stem cell center will allow us to build quickly and effectively upon our previous efforts to apply stem cells therapeutically...."*
>
> *–James T. Willerson, MD*
> *Director*
> *Cardiology Research*

Several projects under the center's auspices are already underway. Last year, THI/SLEH began the only FDA-approved trial in the United States involving direct endocardial injection of autologous bone marrow–derived mononuclear cells for the treatment of patients with severe CHF. The protocol is essentially the same as one Dr. Willerson and Dr. Perin used successfully in 14 Brazilian patients in collaboration with Brazilian colleagues. Fourteen patients have been enrolled in the THI/SLEH trial so far.

The basic research collaboration with M. D. Anderson Cancer Center, including the cancer center's chief of Cardiology, Edward T.H. Yeh, MD, has revealed that circulating human CD 34+ cells injected intravenously into the tail veins of immunodeficient mice differentiate into vascular and smooth muscle cells and fuse with existing and damaged cardiomyocytes. After an experimentally induced heart attack, they may even become new myocytes.

"In the laboratory, we will compare the stem cells we use now with other types of stem cells derived from placenta, cord blood, mesenchyma, and adipose tissue, and we will identify the optimal dosage," says Dr. Perin. "We'll also develop imaging procedures for tracking the movement, engraftment, and differentiation of injected stem cells over the long term."

"Clinically," he adds, "we plan to eventually extend treatment to patients who have had acute myocardial infarctions not amenable to revascularization procedures, as well as to transplant candidates with ischemic or nonischemic cardiomyopathies, including those being supported with left ventricular assist devices."

"The stem cell center will allow us to build quickly and effectively upon our previous efforts to apply stem cells therapeutically in humans with severe heart disease," says Dr. Willerson. ●

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Clinical Trials Update

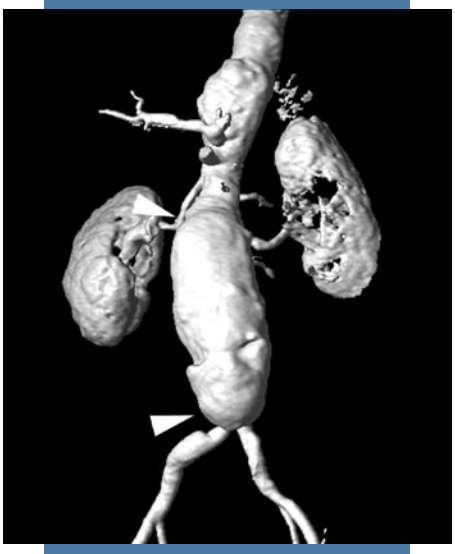
In a recent multicenter, randomized, controlled trial, an implantable cardiac monitor improved the care of patients with moderate to severe heart failure. Investigators for the COMPASS-HF (Chronicle Offers Management to Patients with Advanced Signs and Symptoms of Heart Failure) trial found that the device, which continuously recorded intracardiac pressures and transmitted the data once a week to physicians, helped to head off heart failure–related events, reduce hospitalizations, and prevent the worsening of heart failure. These findings were based on 6-month follow-up of 134 patients who received the device and 140 patients who did not. THI/SLEH was 1 of 28 US centers participating in the trial.

New Recommendations Urge Screening for Abdominal Aortic Aneurysms in Older Men Who Have Smoked

Abstract: According to an independent panel of medical experts, all men aged 65 to 75 who have ever smoked should undergo ultrasound screening for abdominal aortic aneurysms.

The US Preventive Services Task Force (USPSTF) is recommending one-time ultrasonographic screening for abdominal aortic aneurysms (AAAs) in all men aged 65 to 75 years who have ever smoked. The USPSTF is an independent panel of medical experts that reviews published research and advises the federal Agency for Healthcare Research and Quality. Many of the Task Force's recommendations are used to set government policy, and the recommendations are generally followed by primary care physicians.

The current recommendation is based on the results of 4 population-based, randomized, controlled trials wherein ultrasonographic screening in men 65 or older was associated with a significant reduction in AAA-related mortality rates (*Ann Intern Med* 2005;142: 198–202; *Ann Intern Med* 2005;142:203–11).



A magnetic resonance image of the abdomen showing a large abdominal aortic aneurysm that begins at the level of the renal arteries (upper arrowhead) and extends to the pelvic arteries (lower arrowhead).

AAAs occur when the portion of the aorta below the renal arteries expands to a maximal diameter of ≥3 cm. Ruptured AAAs cause an estimated 9,000 deaths each year, and up to 9% of people older than 65 may have asymptomatic AAAs. The condition affects 4% to 8% of older men and 0.5% to 1.5% of older women. Increasing age, a history of smoking, male sex, and family history are all risk factors for AAAs. However, the USPSTF's guidelines specifically target the 9.8 million older American men who are current or former smokers because this group is at greatest risk.

"Screening for AAAs is very accurate, with a sensitivity of 95% and a specificity of nearly 100% in ultrasound laboratories with good quality control," says Scott D. Flamm, MD, director of Magnetic Resonance Imaging and Cardiovascular Magnetic Resonance Imaging Research at the Texas Heart Institute at St. Luke's Episcopal Hospital (THI/SLEH). "The recent USPSTF report makes it clear that in men between the ages of 65 and 75 who have ever smoked, screening can reduce mortality by more than 40%. This makes ultrasonic screening especially appealing, particularly because ultrasonic examination of the aorta carries no significant risks."

According to Dr. Flamm, once an AAA is found on an ultrasonic examination, patients must undergo a definitive imaging study, such as computed tomography (CT) or magnetic resonance imaging (MRI), to assess the size and extent of the aneurysm and its relationship with the arteries that supply blood to the abdominal organs and the legs. Both CT and MRI can provide high-resolution images of the AAA and the associated vessels—essentially a road map for interventional or surgical treatments. CT is frequently preferred when extensive calcification is present, whereas MRI is preferred for patients who have renal insufficiency or who wish to avoid the radiation necessary for CT scans.

With increased screening comes a greater need for elective AAA repair. Open surgical repair is well established as the standard of care for AAAs, but the endovascular approach is fast gaining popularity. Physicians at THI/SLEH have experience with both approaches.

"Patients who come to us are fortunate to have the full range of options for AAA repair," says Dr. Flamm. "Our interventional cardiologists have performed hundreds of endovascular procedures with excellent success rates. Patients not eligible for endovascular repair can undergo open surgical repair. So far, the endovascular approach has had lower short-term complication rates, but we are awaiting data regarding long-term benefits."

"Because people are living longer, we are seeing more of the complications of older age, including AAAs, so screening is ever more important," continues Dr. Flamm. "The new USPSTF recommendations, when applied in good quality screening and treatment centers around the country, will help improve and extend the lives of more patients." ●

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The following are now available:

- **Current Issues in Cardiology** (From Orlando, March 5, 2005)
- **6th Symposium on Cardiac Arrhythmias** (From Houston, February 19, 2005)

To visit, go to www.texasheart.org/cmeonline.html

Patent Foramen Ovale: To Treat or Not to Treat?

Abstract: Patent foramen ovale, which has been linked to both cryptogenic stroke and migraine headache, can now be treated with a transcatheter closure device.

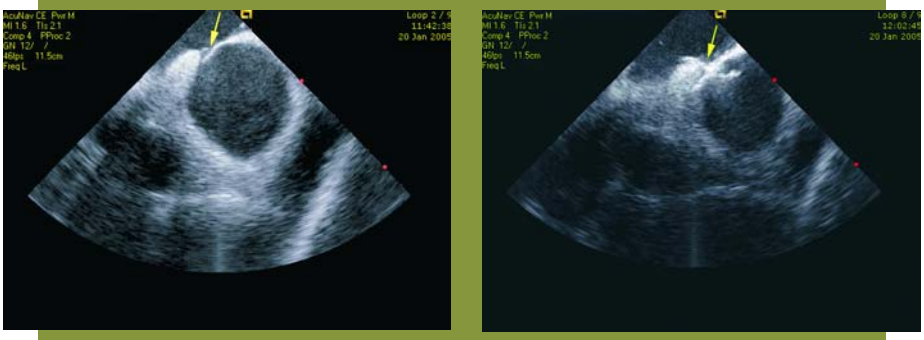
The foramen ovale, which forms at the overlap of the septum secundum and the superior apical remnant of the septum primum, allows oxygenated blood from the inferior vena cava to reach the systemic fetal circulation. Normally, the foramen ovale closes functionally after birth, when neonatal left atrial pressure exceeds right atrial pressure, and fuses within a year. However, in up to 25% of the population, fusion does not occur, and the foramen ovale remains patent, providing an opportunity for a clot to reach the arterial circulation.

In recent years, more evidence has surfaced linking patent foramen ovale (PFO) both to cryptogenic stroke (ie, stroke of unknown cause) and to migraine headache. In patients age 55 or younger, about half of strokes are cryptogenic.

PFO is best identified by transesophageal echocardiography (TEE)—usually after injection of agitated saline solution. TEE can also be used to identify atrial septal defects, or interatrial communications, which are often a cause of hemodynamically important shunts.

Historically, PFO has been treated with long-term oral anticoagulants or antiplatelet agents. In the past decade, however, percutaneous transcatheter devices have emerged as feasible, low-risk alternatives to medical therapy, but optimal management remains controversial.

"At the Texas Heart Institute at St. Luke's Episcopal Hospital (THI/SLEH), we recommend closure in younger patients with cryptogenic stroke and in patients with PFO and documented, recurrent cerebral infarction who are receiving antithrombotic therapy," says R. David Fish, MD, director of Interventional Cardiology Research and Education. "We may also recommend closure for patients with large PFOs, significant shunting or shunting at rest, or an associated atrial septal aneurysm (a critical risk factor for stroke); or for deep sea divers with PFOs. (Divers are at increased risk because of the potential for gas embolism during decompression.) A PFO may also be dangerous during cardiovascular surgical procedures, when air may embolize into the venous system."



Patent foramen ovale before (left) and after (right) deployment of a closure device. Both images were obtained via an intracardiac echocardiographic catheter that allows the operator to navigate the cardiac structures.

In addition, recent studies have linked PFO to migraine headaches, especially in patients who experience auras. (This may result when poorly oxygenated blood or vasoactive substances reach the brain through the systemic circulation and trigger migraines.) In the above-mentioned studies, patients with migraines were twice as likely as the general population to have a PFO; in many cases, migraine symptoms disappeared or improved significantly after transcatheter PFO closure.

"These studies were retrospective, however," says Dr. Fish, "and they were done only in stroke patients, so a prospective, randomized study in otherwise healthy migraine patients is needed."

"Although several transcatheter devices are available for PFO closure," he continues, "the one we most often use is the CardioSEAL (NMT Medical, Inc.). However, we typically use the Amplatzer Septal Occluder (AGA Medical Corporation) for atrial septal defects."

"Complications are minimal, and we take great care to avoid known hazards," he adds. "For instance, to avoid misplacement or device embolization, we continuously monitor the heart echocardiographically, usually with a special intracardiac echocardiographic catheter that makes navigating the cardiac structures easier. The device is deployed but not finally released until its position is confirmed by intracardiac echo and by fluoroscopy. Persistent shunts are very unusual, but if a shunt does occur, it can be treated with an additional device."

Each year in the United States, approximately 300,000 people have cryptogenic strokes, which cost more than $25 billion for evaluation and treatment. THI/SLEH has been a leader in using percutaneous devices to close cardiac defects, including PFOs. Physicians at THI/SLEH will soon be enrolling patients in new multicenter trials designed to better define the role of closure devices. These trials should help determine the best treatment for patients with PFO and, possibly, for patients with migraines. ●

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Cover: Detail of evening bag donated by columnist Frenchy Falik for the Celebration of Hearts display in the Wallace D. Wilson Museum of the Texas Heart Institute at St. Luke's Episcopal Hospital—The Denton A. Cooley Building.

Calendar of Events

Texas Heart Institute Continuing Medical Education Symposia

Texas Heart Institute Advances in the Treatment of Cardiovascular Disease
April 22–23, 2005 • South Padre Island, Texas
Program Director: Reynolds M. Delgado III, MD

The Society for Cardiovascular Angiography and Intervention 28th Annual Scientific Sessions Satellite Symposium Stem Cell Therapy for the Treatment of Heart Disease
May 7, 2005 • Ponte Vedra, Florida
Program Directors: Emerson C. Perin, MD, PhD; Guilherme V. Silva, MD

Texas Heart Institute Sixth Annual Texas Update on Cardiovascular Disease
Program Director: James T. Willerson, MD
September 24–25, 2005 • Houston, Texas

American Heart Association Satellite Symposium Current Issues in Cardiology
Program Directors: James J. Ferguson III, MD; James T. Willerson, MD; R. David Fish, MD
November 12, 2005 • Dallas, Texas

Selected Upcoming National and International Meetings

International Society for Heart and Lung Transplantation 25th Annual Meeting and Scientific Sessions
April 6–9, 2005 • Philadelphia, Pennsylvania

American Heart Association Scientific Sessions 2005
November 13–16, 2005 • Dallas, Texas
Abstract submission ends: May 27, 2005

Society of Thoracic Surgeons 42nd Annual Meeting
January 30–February 1, 2006 • New Orleans, Louisiana

American College of Cardiology 55th Annual Scientific Session
March 12–15, 2006 • Atlanta, Georgia

For information about the CME activities listed above, please e-mail cme@heart.thi.tmc.edu or call 832.355.2157. To view selected CME presentations and other physician resources online, please visit www.texasheartinstitute.org/doctors1.html.

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