SPRING 2002

HeartWATCH

A NEWSLETTER PRODUCED BY THE TEXAS HEART INSTITUTE

TEXAS HEART® INSTITUTE
at St. Luke's Episcopal Hospital

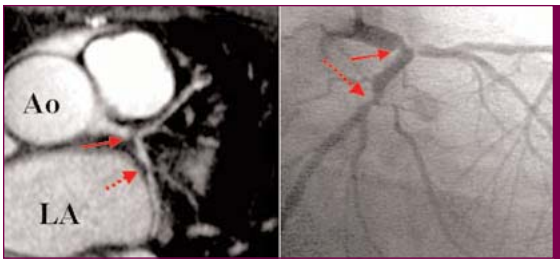
Noninvasive Coronary Magnetic Resonance Angiography Proves a Feasible Alternative to Standard Angiography

Abstract: In an international study, coronary magnetic resonance angiography had an accuracy of 72% in diagnosing coronary artery disease.

In an international study recently reported in the *New England Journal of Medicine* (December 27, 2001), researchers at the Texas Heart Institute (THI) at St. Luke's Episcopal Hospital (SLEH) helped establish noninvasive magnetic resonance angiography (MRA) as a feasible, accurate alternative to standard invasive coronary angiography for the diagnosis of coronary artery stenosis.

Invasive coronary angiography procedures are common. Over 1 million are done every year in the United States alone. However, because these procedures still carry a small risk of complications and can be expensive and inconvenient to patients, the search is on for noninvasive alternatives.

"This study was a real breakthrough in noninvasive imaging of the coronary arteries because it was the first time an international, multicenter format had been used and the results could be extrapolated to current practice," says Scott Flamm, M.D., director of Magnetic Resonance Imaging and Cardiovascular Magnetic Resonance Imaging Research at THI/SLEH and one of the study's investigators. "Though the results make clear that we're not ready yet to replace the traditional invasive coronary angiogram, we've gotten a very good start on making this a reality in the not-too-distant future."



Coronary MR angiogram (left) and corresponding conventional coronary angiogram (right) showing stenosis of the distal left main (solid arrow) and proximal left circumflex (dashed arrow) coronary arteries.
(Ao, aorta; LA, left atrium)

Imaging the coronary arteries noninvasively is very difficult because the vessels are relatively small (2–4 mm in diameter), follow a twisting course, and fluctuate constantly and rapidly in response to cardiac contractions and chest excursions during breathing. However, in the new study, MRA had an accuracy of 72% in diagnosing coronary artery disease, one of the highest rates reported so far for the technique. The procedure also reliably identified or ruled out left main coronary artery and 3-vessel disease, as evidenced by a sensitivity of 100%, specificity of 85%, and accuracy of 87%.

One hundred nine patients from 7 institutions in the United States and Europe took part in the study. THI, 1 of only 2 participating U.S. centers, provided the largest proportion of patients (25/109, or 23%).

"When the study began, THI was a newcomer to coronary MRA," says Dr. Flamm, "but we were included because we were a site with personnel who had strong experience in cardiac MRI and were an institution with a large cardiac patient population. Now, we also have experience in performing over 250 coronary MR angiograms."

Under the study protocol, each patient underwent coronary MRA followed by standard invasive x-ray angiography of the coronary arteries.

According to Dr. Flamm, "Coronary MRA takes more time than a simple or uncomplicated conventional angiogram but a little less time than a complicated angiogram, and the coronary MR angiogram costs dramatically less than a conventional angiogram."

The trial was the first to evaluate coronary MRA at several centers using standard hardware and software and a standard imaging protocol. Previous studies had been performed at single centers using disparate protocols, and it was not known whether their results could be repeated elsewhere.

The future of coronary MRA is bright, according to Dr. Flamm. "Right now we are very good at looking at anomalous coronary arteries that may cause chest pain or even sudden death, though only a small portion of patients have such arteries. For coronary artery disease, we should start evaluating patients with dilated cardiomyopathies to see whether we can differentiate patients without significant disease and thus save them from having a conventional angiogram. In the future, we hope that up to one fourth of patients, perhaps even more, who would otherwise have a conventional angiogram could instead get a coronary MR angiogram." ●

Contents

For more information:

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New Cooley Building Positions THI for Advances in Cardiovascular Medicine

Abstract: The new 10-story Denton A. Cooley Building includes state-of-the-art operating rooms, patient care units, laboratories, and telemedicine facilities.

With state-of-the-art facilities for surgery, patient care, telemedicine, and basic and clinical research, the new Texas Heart Institute (THI) at St. Luke's Episcopal Hospital—The Denton A. Cooley Building positions THI for major advances in the fight against cardiovascular disease.

"The opening of our new building comes at an encouraging time when physicians have, as never before, so many options available to treat cardiovascular disease and offer hope for future generations," says Denton A. Cooley, M.D., THI's president and surgeon-in-chief.

The new building, rising 10 stories above street level, encompasses 327,000 square feet. On the 2nd floor, eleven 650-square-foot operating rooms (ORs) have replaced the 9 much smaller (400-square-foot) ORs in the old building, which had been in use since the early 1970s. Floor space in the new ORs was gained by suspending electrical equipment and flat-screen monitors from ceiling booms. During surgery, the eye-level monitors can display the surgical field, vital patient information, and medical records such as x-rays, cardiac catheterization films, and magnetic resonance or computed tomographic images, allowing surgeons to easily see whatever information they need during the operation. A twelfth OR, still in the design phase and scheduled to become functional in mid 2003, will be used to perform advanced minimally invasive surgeries such as aortic stenting and hybrid procedures that may require bypassing some coronaries and stenting others.

Symposium to Celebrate Cooley Building Debut

Advances in Cardiovascular Medicine and Surgery
April 12–14, 2002
Chaired by Denton A. Cooley, M.D.,
O. H. Frazier, M.D., and James T. Willerson, M.D.

For more information, visit our Web site at texasheartinstitute.org or call 832.355.2157.

Three floors are committed to patient care. The 6th floor houses a 37-bed interventional cardiology unit, in close proximity to a catheterization laboratory and a coronary care unit; the 7th, a 12-bed cardiovascular intensive care unit and a 25-bed progressive care unit; and the 8th, a transplant intensive care unit and step-down unit. Patient rooms are designed for easy conversion into intensive care units as needed. Nurse substations are located between rooms to allow closer patient monitoring.

To bolster THI's mission to train future cardiologists and cardiovascular surgeons and educate physicians and scientists in other fields, the Cooley Building is equipped for telemedicine. Two of the operating suites include observation domes and are fitted for teleconferencing. The building's 500-seat auditorium, the largest in the Texas Medical Center, is designed to receive and broadcast videoconferences and to link the cardiac catheterization laboratories and cardiovascular operating rooms with other training and conference sites around the world.

Digital imaging technology extends to the patient care areas. According to Marie Clark, M.S.N., director of Cardiovascular and Transplant Nursing Services at St. Luke's Episcopal Hospital, "The patient care team on each patient floor will be able to pull up a patient's x-ray on a computer monitor instead of calling radiology and asking for it to be physically delivered."

To promote research efforts at THI, the 9th and 10th floors are dedicated to laboratory space for basic research into the causes, prevention, and treatment of cardiovascular diseases. Areas of investigation include gene therapy, molecular biology, heart failure, vulnerable plaque, immunology and inflammation, heart transplantation, valves, heart assist devices, and total artificial hearts. ●

Texas Heart® Institute Milestones in Cardiovascular Care

- **1962** Texas Heart Institute (THI) founded by Denton A. Cooley, M.D.
- **1968** First successful heart transplantation in the United States
- **1969** First implantation in the world of an artificial heart in a human
- **1975** First NHLBI-funded study of an implantable left ventricular assist device (LVAD) for post-cardiotomy support
- **1978** First bridge to transplantation with an LVAD
- **1981** Second implantation in the world of an artificial heart in a human
- **1985** First laser coronary endarterectomy procedure performed in the United States
- **1986** First implantation of the HeartMate pneumatically powered LVAD as a bridge to transplantation
- **1988** First use of the Hemopump—a miniature, non-pulsatile heart assist device
- **1988** One of 3 centers to receive federal funding to develop a total artificial heart
- **1991** First patient in the world to leave the hospital with an electric, portable, battery-powered LVAD
- **1994** FDA approval to use the HeartMate pneumatic LVAD as a bridge to transplantation
- **1996** FDA approval to use the electric HeartMate as a bridge to transplantation
- **1998** One of 6 centers chosen for cardiac magnetic resonance imaging trials
- **1999** FDA approval of a stent-graft tested extensively at THI for repair of abdominal aortic aneurysms
- **2000** First site for clinical trials of the Jarvik 2000, a miniature, axial-flow LVAD
- **2001** 100,000th open heart operation performed
- **2001** Implantation of the AbioCor total artificial heart
- **2001** Completion of REMATCH study, which compared long-term implantation of the electric HeartMate with conventional medical therapy for heart failure
- **2002** Dedication of The Denton A. Cooley Building

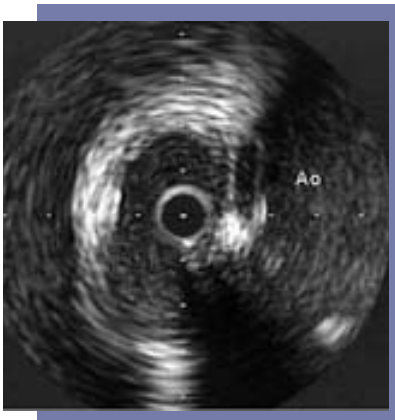
New Thinking on Coronary Artery Anomalies

Abstract: Cardiologists are seeking new ways of classifying coronary artery anomalies and identifying patients at risk.

Through new thinking and innovative work in the catheterization laboratory, a group of cardiologists led by Paolo Angelini, M.D., at the Texas Heart Institute (THI) at St. Luke's Episcopal Hospital (SLEH) is trying to better understand and treat congenital coronary artery anomalies.

Coronary anomalies occur in roughly 6% of Americans and cause 19% of sudden cardiac deaths in young athletes, but only a small minority of the 15,000,000 Americans with coronary anomalies will ever show clinical manifestations during their lifetimes. Besides causing sudden death, some coronary anomalies have been implicated in chest pain, cardiomyopathy, syncope, dyspnea, ventricular fibrillation, and myocardial infarction. These anomalies are usually treatable if recognized during life.

"We are trying to improve on the way the medical profession views and deals with a subject that is both confusing and fascinating," says Dr. Angelini. "Until now, the pathologist's viewpoint has predominated in trying to come to terms with coronary anomalies."



IVUS image showing lateral compression of the lumen in the intramural segment of an ectopic coronary artery. (Ao, aorta)

For example, according to Dr. Angelini, pathologists report a 35% mortality for a particular type of anomaly called ACAOS (anomalous origin of a coronary artery from the opposite sinus). As the most frequent and most lethal coronary anomaly in the general population, ACAOS has clearly been associated with sudden death at a young age and after extreme exercise but often goes unrecognized. In a recent study at the University of Padua, Italy, of young athletes who died suddenly during or immediately after exercise, investigators found that all had a congenital coronary anomaly identified at autopsy, but only 45% had shown any clinical signs or symptoms of the anomaly before the catastrophic final event.

"In our experience in the catheterization laboratory," says Dr. Angelini, "we have found a much higher frequency and a much more benign prognosis for ACAOS. One percent of our patients have this condition, which would extrapolate to some 3 million in the general population. This inconsistency with the pathologists' findings may well be due to a preselection bias for the population that undergoes autopsy. It also emphasizes the need to identify people at risk before sudden death becomes the first and only manifestation of their anomaly."

To that end, intravascular ultrasonography (IVUS) is now being put to innovative use in studying and subclassifying anomalous coronary arteries that have been identified by angiography, echocardiography, or magnetic resonance imaging. At a recent symposium, *Coronary Artery Anomalies: Morphogenesis, Morphology, Pathophysiology, and Clinical Correlations,* held at THI from February 28 to March 1, 2002, Dr. Angelini presented the first 10 cases of ACAOS studied with IVUS. In 2 of the cases, patients were subsequently treated with coronary stents as part of a pilot trial at SLEH. One other patient was treated surgically by implanting a mammary artery.

"The challenge now," says Dr. Angelini, "is to devise a test that can be done in the catheterization lab that will mimic what happens when an athlete suddenly suffers the consequences of this anomaly on the playing field."

Dr. Angelini and colleagues have also been rethinking the way coronary anomalies are classified. Instead of the more traditional classification by clinical consequences, a more correct and meaningful system, says Dr. Angelini, might first classify the anomalies anatomically and then subclassify them by clinical (functional and prognostic) criteria.

The ultimate goal, says Dr. Angelini, who recently published a book on the subject (*Coronary Artery Anomalies: A Comprehensive Approach*, Philadelphia: Lippincott, Williams & Wilkins, 1999), is to promote a coordinated, multidisciplinary, multicenter program aimed at better understanding and treating this life-threatening, but potentially curable, group of congenital heart conditions. ●

For more information:

Dr. Paolo Angelini

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Expert FDA Panel Supports New Use of Thoratec HeartMate LVAD

On March 4, 2002, the FDA Circulatory System Devices Panel voted for approval of the HeartMate vented electric left ventricular assist device (Thoratec Corporation, Pleasanton, CA) as an alternative to medical therapy for patients with advanced congestive heart failure who are ineligible for a transplant. The Texas Heart Institute has been closely involved with development of the HeartMate for 30 years.

Changes in AbioCor™ Implantation Designed to Decrease Incidence of Stroke

Abstract: Thrombotic complications have caused surgeons to reevaluate how they implant the AbioCor™ total artificial heart.

Since July 2001, when the first clinical trial of the AbioCor™ Implantable Replacement Heart (ABIOMED, Inc., Danvers, MA) began, the device has been implanted in 5 patients at approved U.S. centers. Three patients have died (2 of thrombotic complications and 1 of multiorgan failure), while the 2 other patients remain well. In November 2001, the U.S. Food and Drug Administration approved enrollment of another 5 patients; in total, the initial trial population will consist of 15 patients.

"The success of this study will be decided not by the outcome of a single patient but by a positive outcome in the entire initial study group," says O. H. Frazier, M.D., chief of Cardiopulmonary Transplantation and director of the Cullen Cardiovascular Research Laboratories at the Texas Heart Institute (THI). Dr. Frazier has been involved in the development of the artificial heart for more than 30 years. For the last 10 years, he and other THI researchers have worked with ABIOMED on the final design of the AbioCor total artificial heart.

The AbioCor's thoracic unit is a titanium/polymer construct weighing approximately 2 pounds. An electrohydraulic actuator system shuttles blood between the left and right pumps, allowing for automatic balancing between the pumping chambers. An electronics package implanted in the patient's abdomen monitors and controls the pumping speed. The AbioCor is normally powered by an external console or by battery packs, which provide 4 hours of power. An internal battery powers the pump only when the external power supply is disconnected. A transcutaneous energy transmission (TET) system transmits power through the intact skin, thus avoiding skin penetration and minimizing the risk of infection associated with a percutaneous power line.

To avoid further thrombotic complications, surgeons are now reevaluating how they implant the device. Researchers believe that a design adjustment made during the early calf experiments may have contributed to the problem in the first human studies.

"The success of this study will be decided not by the outcome of a single patient but by a positive outcome in the entire initial study group."
– O. H. Frazier, M.D.

"The negative pressure that the pump generated to allow left-sided filling caused the anatomically normal but small left atrium of the calf to move into the drainage pathway of the left superior and inferior pulmonary veins," says Dr. Frazier. "This impeded filling and also injured the left lung."

To avoid this problem, a cage was placed in the inflow to the pump, which prevented further complications in the calf model.

In humans, however, the left atrial cuff was sewn to the rim of the left ventricle at the level of the mitral annulus—instead of being sewn to the atrium just above the drainage site of the left pulmonary vein (as in a standard human heart transplant). In this position, little of the Teflon cuff remained, causing the cage to protrude from the mitral annulus into the completely retained left atrium, which is enlarged in patients with chronic heart failure. During filling, the pump generates negative pressures, which created high shear stress around the post of the cage and sucked the lateral wall of the atrium against the base of the cage.

"On echocardiography, the first patient [in Louisville] was found to have a thrombus in this area," explains Dr. Frazier. "After a minor stroke, our patient was also found to have a mobile thrombus in the same area. Despite anticoagulation, this thrombus broke off and caused a severe stroke, after 4 months of continuous improvement in the clinical status of the patient as well as perfect performance by the pump." Thrombotic material was also found around the post of the cage in the patient who received the device at UCLA, who died of multiorgan failure after 59 days.

The next patients will receive an AbioCor with a remodeled form of the cuff, without the cage.

"Because this pump has no inherent areas of stasis, a low level of anticoagulation should be sufficient for most patients," says Dr. Frazier. "We hope that removing the cage and using the cuff wall to replace the lateral wall of the enlarged left atrium will avoid the stasis and high shear involved in clot formation and prevent impairment of left-lung venous drainage associated with collapse of the patient's left atrium." ●

For more information:

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Sirolimus-Coated Stents Appear to Reduce Restenosis

Abstract: Sirolimus-coated stents appear to reduce the occurrence of restenosis in stented coronary arteries.

Building on the Texas Heart Institute's pioneering initiative in the testing of interventional devices, Texas Heart Institute (THI) at St. Luke's Episcopal Hospital physicians were the first in Texas to take part in the SIRIUS clinical trials to evaluate the efficacy of a sirolimus-eluting stent to reduce the occurrence of restenosis.

Stents are designed to support plaque-obstructed arterial walls after a blockage has been opened, usually with balloon angioplasty. Depending on where the stent is placed, between 15% and 40% of patients develop restenosis, usually as a result of a build-up of scar tissue inside the stent.

"The development of the stent itself was a significant milestone in the treatment of blocked coronary arteries, but the problem of restenosis has continued to be an issue," says Emerson C. Perin, M.D., director of New Cardiovascular Interventional Technology at THI/SLEH and a principal investigator in this study. "If this new procedure proves successful, it could revolutionize interventional cardiology."

> *"The recently completed SIRIUS trial has produced very encouraging results, including minimal restenosis; these stents will likely be commercially available by early 2003."*
>
> — *James J. Ferguson III, M.D.*
> *Associate Director*
> *Clinical Cardiology Research*

Sirolimus (rapamycin) is a potent immunosuppressive medication approved by the U.S. Food and Drug Administration for preventing organ rejection after renal transplantation. By coating a stent with sirolimus and a non-eroding polymer, it allows for direct drug application at a site where restenosis occurs. The reduced incidence of restenosis in patients treated with the sirolimus-eluting stent may be attributed to the potent cytostatic effect of sirolimus, which appears to prevent local cell replication and deter scar tissue from forming within or on the edge of the stent.

Clinical trials conducted in Brazil and The Netherlands tested a fast-release (FR) and slow-release (SR) sirolimus-eluting stent. With the FR formulation, the drug was almost completely eluted by 15 days. With the SR formulation, another layer of drug-free polymer was applied on top of the drug-polymer mixture to introduce a diffusion barrier and prolong drug release to 4–6 weeks. All stents in this study, regardless of the coating composition, were loaded with a fixed amount of sirolimus per unit of metal surface area (140 µg sirolimus/cm²).

"Follow-up assessment of patients in these trials showed remarkable results," says Dr. Perin. "Twelve-month follow-up of the initial 30 Brazilian patients revealed no evidence of in-stent or edge restenosis. The initial group of 15 patients in The Netherlands showed similar results after 6 months."

These results are further supported by RAVEL, a larger clinical trial involving 238 patients, conducted in Europe and Latin America. That study found that restenosis at 6 months was reduced from 26% in patients who received placebo to 0% in those who received the sirolimus-eluting stents.

Sirolimus therapy to date has been associated with a generally low incidence of side effects and toxicity. The cumulative effect of sirolimus in the body is much lower than that of other medications previously tested for coated stents.

"There is a wide therapeutic range with these stents," says Dr. Perin. "Because the dose is actually much lower than would be given for renal transplant patients, a patient can have multiple sirolimus-coated stents without any toxic effects."

THI is 1 of 55 centers across the country that participated in the SIRIUS trial, sponsored by Cordis, a Johnson & Johnson Company.

"If our results are similar to those found in the European and Latin American studies, it should lead to approval of the stent for use in the United States," says Dr. Perin. ●

For more information:

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Clinical Trials Update

Coated Stents THI is currently recruiting patients for the TAXUS trial of stents coated with paclitaxel (a diterpenoid drug that alters microtubular dynamics and interferes with cellular mitosis).

Percutaneous Carotid Interventions The recent application of distal protection devices in the cerebral circulation to prevent cerebrovascular events has reawakened interest in percutaneous carotid revascularization. Trials of 3 different distal protection devices are underway: SAPPHIRE (randomization to either surgical endarterectomy or stenting with the AngioGuard protection device), BEACH (a nonrandomized trial of carotid stenting with the FilterWire protection system), and CARESS (a nonrandomized trial of carotid stenting with the PercuSurge® protection system).

Robotic Closed-Chest Coronary Artery Bypass Trial Opens

Abstract: An FDA-sponsored clinical trial will determine whether minimally invasive totally endoscopic coronary artery bypass surgery will be a successful alternative to standard bypass surgery.

Cardiac surgeons at the Texas Heart Institute (THI) and several other major medical centers in the United States are participating in a U.S. Food and Drug Administration (FDA)-sponsored clinical trial of robotically assisted totally endoscopic coronary artery bypass (TECAB) surgery.

Coronary artery bypass grafting is the most commonly performed heart operation in the United States. About 375,000 such procedures are performed each year.

"One thrust of this study," according to O. H. Frazier, M.D., chief of Cardiopulmonary Transplantation, director of the Cullen Cardiovascular Research Laboratories at THI, and a principal investigator for the TECAB study, "is to gain, within the context of a trial designed to protect the patient, clinical insight into the use of minimally invasive robotic technology for many possible cardiac applications, beginning with coronary artery bypass."

The first successful TECAB procedure in the United States was performed earlier this year at a participating center in New York. The procedure involves mobilizing a left internal mammary artery graft with the robotic da Vinci surgical system (Intuitive Surgical, Inc., Mountain View, CA) and then anastomosing the graft to the appropriate coronary artery (usually the left anterior descending). The da Vinci system has been used in other FDA-sponsored trials to repair mitral valves and atrial septal defects. It has been used in Europe to perform more than 200 TECAB surgeries. In the United States, the system has already been approved by the FDA for use in a number of laparoscopic, thoracoscopic, obstetric-gynecologic, and radical prostatectomy procedures.

Robotic da Vinci surgical system.

The da Vinci system consists of a control console and a patient-side cart with 3 robotic arms. A wraparound video-monitor station at the control console provides a magnified, 3-dimensional view of the surgical field. One of the robotic arms carries an endoscope; the other 2 carry surgical instruments. Under the surgeon's control, the 3 arms are inserted into the patient's body through 3 pencil-sized incisions or "ports," each about 10 mm wide. In comparison, conventional coronary artery bypass surgery requires an 8- to 10-inch incision through the chest wall.

The endoscope magnifies and visualizes the surgical field on the surgeon's video monitor. Assisted by a computer, the robotic system translates the surgeon's natural hand and wrist motions at the control console into corresponding movements of the surgical tools, each of which has a wrist-like joint that allows exact and intricate motions. The system also filters out any movements generated by tremors in the surgeon's hands.

"This ability to filter out tremors is especially important when operating on small vessels like the coronary arteries," says Igor Gregoric, M.D., associate chief of Cardiopulmonary Transplantation at THI and a study co-investigator.

Dr. Gregoric says that, by combining the advantages of minimally invasive surgery with the range of motion available to the surgeon in open heart operations, the robotic system should benefit patients by reducing trauma, scarring, and pain and allowing a quicker recovery than with traditional open heart operations. This may allow patients to return to work in less than a week, as reported in a recent study.

The first THI patient in the TECAB trial will be enrolled later this year. ●

For more information:

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Basic Science Report

THI researchers are continuing efforts to identify the genes and abnormal proteins they encode that cause heart and vascular diseases. S. Ward Casscells, M.D., Morteza Naghavi, M.D., and James T. Willerson, M.D., have built upon their original discovery of temperature heterogeneity in vulnerable atherosclerotic plaques in humans and are now pursuing noninvasive imaging and catheter-based techniques for identifying unstable atherosclerotic plaques. Pierre Zoldhelyi, M.D., and Dr. Willerson are studying the use of gene therapy to restore prostacyclin and to inhibit tissue factor, a technique that has shown promise in preventing thrombosis and neointimal proliferation in experimental animal models of native atherosclerosis. Researchers led by Heinrich Taegtmeyer, M.D., are looking for molecular mechanisms responsible for heart failure. Y. J. Geng, M.D., Emerson Perin, M.D., and Dr. Willerson continue to explore stem cell therapy for healing the injured heart and promoting angiogenesis. Recent progress and findings indicate that some of these therapies should be available for use in humans in the not-too-distant future.

HeartWATCH

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Cover: Statue donated by entertainers Lisa Hartman Black and Clint Black 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 2002

Advances in Cardiovascular Medicine and Surgery
April 12–14, 2002
Texas Heart Institute at St. Luke's Episcopal Hospital—The Denton A. Cooley Building
Program Directors: Denton A. Cooley, M.D.; O. H. Frazier, M.D.; and James T. Willerson, M.D.

20th Annual Auscultation Session
April 17–19, 2002
Texas Heart Institute at St. Luke's Episcopal Hospital—The Denton A. Cooley Building
Program Director: Robert J. Hall, M.D.

3rd Symposium on Congestive Heart Failure
October 3–4, 2002
Texas Heart Institute at St. Luke's Episcopal Hospital—The Denton A. Cooley Building
Program Director: Sayed Feghali, M.D.

American Heart Association Satellite Symposium
November 16, 2002
Chicago, Illinois
Program Directors: James J. Ferguson III, M.D.; R. David Fish, M.D.; and James T. Willerson, M.D.

For information about any of the CME activities listed above, please contact cme@heart.thi.tmc.edu or call 832.355.2157.

Selected Upcoming National Meetings

International Society for Heart and Lung Transplantation
22nd Annual Meeting and Scientific Sessions
April 10–13, 2002
Washington, D.C.

American Heart Association
Scientific Sessions 2002
November 17–20, 2002
Chicago, Illinois
Abstract deadline: May 17, 2002

Society of Thoracic Surgeons
39th Annual Meeting
January 31–February 2, 2003
San Diego, California
Abstract deadline: August 5, 2002

American College of Cardiology
52nd Annual Scientific Session
March 30–April 2, 2003
Chicago, Illinois
Abstract deadline: September 10, 2002

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