Transcatheter Aortic Valve Replacement in patients with severe aortic stenosis who cannot undergo surgery

Your patients deserve exceptional care for their cardiac valve conditions. At the USC CardioVascular Thoracic Institute (CVTI) at Keck Medicine of USC, physicians treat patients who have the most complicated conditions, using one of the most advanced skill sets in the nation.

The CVTI physicians use a full spectrum of devices and techniques to treat diseased cardiac valves. CVTI physicians are specialists in the Ross procedure, in which a pulmonary autograft replaces a diseased aortic valve. The Bentall procedure is commonly used to repair an ascending aortic or aortic root aneurysm that occurs in combination with aortic valve disease. A composite aortic valve graft replaces the proximal ascending aorta and aortic valve. When possible, aortic root aneurysms can be treated surgically with a valve-sparing aortic root replacement, which will preserve the hemodynamics and function of a healthy native aortic valve.

Several options exist to repair mitral valves instead of replacing them. Depending on the nature of the mitral valve condition (e.g., regurgitant or stenotic), the surgical treatment will be tailored to the patient (see page 5 for details).

Within the last three years, transcatheter aortic valve implantation was approved in the United States to treat patients with severe native aortic stenosis who are deemed high risk or extreme risk to undergo surgical aortic valve replacement. In that time, physicians at CVTI have trained to become specialists in
transcatheter aortic valve implantation (TAVI). (Transcatheter aortic valve implantation is synonymous with transcatheter aortic valve replacement and percutaneous aortic valve replacement). TAVI devices combine an expandable metal mesh and tissue valve leaflets (see Table 1).

The Centers for Medicare and Medicaid Services (CMS) mandate that two cardiac surgeons determine that a patient with severe aortic stenosis has a high or extreme risk of mortality by treatment with a traditional surgical procedure and that TAVI is the best treatment option. The high-risk analysis includes the Society of Thoracic Surgeons Predicted Risk of Mortality (STS-PROM) estimate. Long before Medicare mandated it, CVTI surgeons and interventional cardiologists had established comprehensive collaboration in patient care. As a result, CVTI has seamlessly complied with the CMS guidelines.

The outcomes from randomized, controlled clinical trials show a statistically significant reduction in the rate of death at one year for patients treated with TAVI. In the PARTNER trial, the rate of death from any cause was 30.7 percent with TAVI, compared with 50.7 percent with standard surgical therapy (hazard ratio with TAVI, 0.55; 95 percent confidence interval, 0.40 to 0.74; P<0.001).1 In the CoreValve® High-Risk population, the rate of death in the as-treated group from any cause at one year was 14.2 percent in the TAVI group vs. 19.1 percent in the surgical group, for an absolute reduction in risk of 4.9 percentage points (upper boundary of the 95 percent confidence interval, −0.4; P<0.001 for noninferiority; P=0.04 for superiority).2 CVTI participated in the clinical trial that resulted in this publication and the CoreValve® Extreme-Risk publication.3 Preliminary results from the PORTICO European trial show the rate of death from any cause was 7.8 percent in the TAVI group (n=102).4 The earliest TAVI patients have had the bioprostheses in place for four to six years, and all valves are functioning as expected with few complications.
Transcatheter Aortic Valve Replacement (continued from page 3)

In the near future, transcatheter valves will be used to treat a wider array of patients and conditions. Clinical trials are underway to examine TAVI in expanded patient populations, specifically patients with moderate aortic stenosis and patients at intermediate surgical risk (see Clinical Trials for more details).

Instead of repeating cardiac surgery for a failed bioprosthetic valve, transcatheter valves are beginning to be used for a “valve-in-valve” procedure to replace the degraded bioprosthesi. TAVI is also being explored to treat patients with bicuspid aortic valve disease, traditionally considered an exclusion for TAVI.

Ray V. Matthews, MD, professor of medicine, Keck School of Medicine of USC, and director of interventional cardiology, believes that valve repair and replacement will be “the area of greatest change and advancement in all of cardiovascular medicine in the next decade.” He sees new transcatheter and surgical techniques for other cardiac valves, not just the aortic valve, on the horizon. “We’re absolutely committed to be at the forefront of all those techniques.”

At CVTI, a team of physicians, nurse practitioners and supporting staff collaborate to evaluate each patient thoroughly. Clinical trials are underway for TAVI. Interventional cardiologists, such as Dr. Matthews and cardiovascular surgeons, such as Mark J. Cunningham, MD, associate professor of cardiothoracic surgery, Keck School of Medicine of USC, and director of interventional cardiology, Ray V. Matthews, MD, professor of medicine, Keck School of Medicine of USC, meet with the patient concurrently to review all of the clinical data and discuss the best treatment option with the patient and family. CVTI employs a highly personal approach where the patient is the focus.

Nurse practitioners navigate each patient through the pre-procedure testing and are in constant communication with the patient before, during, and after each procedure. CVTI physicians keep an open line of communication with referring physicians, reaching out after the patient’s initial office visit, after any procedure, and after the patient has been discharged from the hospital. The referring physician typically receives a phone call immediately following the procedure to be informed in real-time about the status of the patient.

PROCEDURE SHOWCASE AND OUTCOMES

Mitral valve repair instead of replacement

The CVTI physicians perform several types of mitral valve repair procedures to preserve valve function and restore the surface of coaptation. Surgeons perform a quadrangular resection of prolapsed posterior mitral valve leaflets to remove the prolapsed section. Mitral valve leaflets can be resuspended by inserting artificial chordae. An annuloplasty can correct annulus-to-leaflet mismatch in size and placement. The annuloplasty may be performed as a stand-alone procedure or following a quadrangular resection or artificial chordae insertion.

There are numerous benefits of mitral valve repair instead of replacement for the patient. The mortality rate is lower for repair when compared to replacement, with 1.5 percent vs. 5.5 percent, respectively, according to the STS database. There is no need for chronic anticoagulation therapy. In addition, patients undergoing mitral valve repair have lower rates of endocarditis and thromboembolism than patients undergoing valve replacement.

Mitral valve repair for severe, symptomatic mitral regurgitation

A 67-year-old female weighing 130 lbs and standing 5’8” tall, she presented with frequent premature ventricular contractions, shortness of breath, exercise intolerance and fatigue. She also had a history of multiple sclerosis.

A coronary angiogram ordered by Dr. Gates’ referring cardiologist was negative for coronary artery disease. An echocardiogram showed severe mitral regurgitation on a myxomatous mitral valve with prolapse of leaflet segments A2, P2 and P3. No atrial fibrillation was present.

After a clinical evaluation at CVTI, Dr. Starnes recommended that Dr. Gates undergo a minimally invasive mitral valve repair. By choosing a minimally invasive incision over a sternotomy, she could ambulate sooner, so there was no aggravation of her MS symptoms.

For the mitral valve repair, a small, anterolateral thoracotomy was made based on the anterior apical line. Dr. Starnes performed a quadrangular resection of a large segment of P3, a fisting valve prolapse of P2 to P3, insertion of chordae to A2 and A3, and placement of a 34-mm annuloplasty band. Following the procedure, the patient spent one day in the ICU and was discharged from the hospital on postoperative day 3. Her recovery was typical.

Dr. Gates, a practicing pediatrician, returned to work shortly after the procedure, and she also resumed master’s-level swimming.

“By three months [after the procedure], I was going up and down the stairs without any shortness of breath. People wouldn’t have to wait for me anymore. In swimming, I can keep up with my teammates now,” Dr. Gates exclaimed.

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“By three months [after the procedure], I was going up and down the stairs without any shortness of breath. People wouldn’t have to wait for me anymore. In swimming, I can keep up with my teammates now,” Dr. Gates exclaimed.
Dr. Matthews was recently selected as a proctor to train U.S. physicians to use the Medtronic CoreValve® system for TAVI. He travels to medical centers across the country to teach interventional cardiologists from his own experience with the device. This appointment recognizes Dr. Matthews as an expert in the implantation technique.

Data from a recent clinical trial of the Medtronic CoreValve® system were published in the New England Journal of Medicine. CVTI was a top recruiting center for this trial. The paper showed a significantly lower death rate in the TAVI group than in the surgical group (14.2 percent vs. 19.1 percent, respectively; P=0.001 for non-inferiority; P=0.04 for superiority). (Adams et al, N Engl J Med. 2014;370:1790-1798.)

Dr. Matthews was the lead author on a recent review paper that was published in Cardiology Clinics. The paper reviews the use of the Medtronic CoreValve® system to treat severe aortic stenosis. (Matthews and Shavelle, Cardiol Clin. 2013 Aug;31(3):351-61.)

**References**


**For more information on any of the clinical trials or to inquire about enrolling a patient, please contact** Stephanie Mullin, RN, Research Coordinator, Supervisor, at (323) 442-6226 or stephanie.mullin@med.usc.edu

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**CLINICAL TRIALS (continued from page 1)**

St. Jude Medical is sponsoring three studies in which Keck Medicine of USC is participating: The PORTICO® trial is a prospective, randomized, controlled study designed to evaluate the safety and effectiveness of the Portico® TAVI system via transfemoral and transapical delivery (NCT01200015). Two post-approval studies are further evaluating the safety and efficacy of Biocor™ valves and Trifecta™ aortic valves (NCT00636987 and NCT01514162, respectively).

There are six clinical trials currently sponsored by Medtronic: The CoreValve® Pivotal trial is a prospective, randomized controlled study for safety and efficacy of the CoreValve® system to treat severe aortic stenosis in high-risk and extreme-risk patients (NCT01429092). The CoreValve® SURTAVI trial is a prospective, randomized trial to evaluate the safety and efficacy of TAVI in patients with severe aortic stenosis at intermediate surgical risk (NCT01594890). In addition to the Pivotal trial, two extension CoreValve® trials are underway. The CoreValve® Continued Access trial is analyzing a subset of patients designated as extreme risk (NCT01371790). The CoreValve® Expanded Use trial is evaluating the safety and effectiveness of the CoreValve® system in a subset of subjects who were excluded from Pivotal trial population due to co-morbidities (NCT01794540).

The EVOLUT R trial is a non-randomized trial to evaluate the CoreValve® EVOLUT R TAVI system, which offers the possibility of recapturing and repositioning the CoreValve® during deployment (NCT02027059). Finally, the PERIGON trial is a non-randomized trial to determine the safety and efficacy of an aortic valve bioprosthesis in patients with aortic valve disease (NCT00884854).

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**USC CardioVascular Thoracic Institute**

**Ray V. Matthews, MD**
Professor of Clinical Medicine
Department of Medicine
Keck School of Medicine of USC
Director, Interventional Cardiology
USC CardioVascular Thoracic Institute

**Ray V. Matthews, MD**
Professor of Clinical Medicine
Department of Medicine
Keck School of Medicine of USC
Director, Interventional Cardiology
USC CardioVascular Thoracic Institute

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**USC CardioVascular Thoracic Team**

**Cardiothoracic Surgery**

Vaughan A. Staros, MD
Hastings Distinguished Professor and Chair
Department of Surgery
Executive Director, USC CardioVascular Thoracic Institute

Craig J. Baker, MD
Associate Professor of Cardiothoracic Surgery

Mark L. Barr, MD
Associate Professor of Cardiothoracic Surgery
Co-director, Cardiothoracic Transplantation

Michael E. Bowles, MD
Assistant Professor of Cardiothoracic Surgery
Director, Mechanical Circulatory Support

Robb G. Cohen, MD
Associate Professor of Clinical Cardiothoracic Surgery

Mark J. Cunningham, MD
Associate Professor of Cardiothoracic Surgery
Surgical Director, Heart Transplant Program

Fernando Fleischman, MD
Assistant Professor of Clinical Cardiothoracic Surgery
Director, U.S. Comprehensive Aortic Center

Guangqiang Gao, MD
Assistant Professor of Clinical Cardiothoracic Surgery

Amy Hackmann, MD
Assistant Professor of Clinical Cardiothoracic Surgery

Ming Lu Huang, MD
Assistant Professor of Clinical Cardiothoracic Surgery

Sophia Lam, RN, MSN, CNS, ACNP-BC
Nurse Practitioner

**CardioVascular Medicine**

Ray V. Matthews, MD
Professor of Clinical Medicine
Director, Interventional Cardiology

Leonardo C. Clavijo, MD, PhD
Assistant Professor of Clinical Medicine
Director, Cardiovascular Medicine and Peripheral Interventions

Tracy D. Lawrence, MD
Assistant Professor of Clinical Medicine

Vivian Y. Mo, MD
Assistant Professor of Clinical Medicine
Director, Women’s CardioVascular Center

David H. Shavelle, MD
Associate Professor of Clinical Cardiothoracic Surgery

Jerold S. Shinbane, MD
Associate Professor of Clinical Cardiothoracic Surgery

Mary Schoenbaum, RN, ACNP
Nurse Practitioner, TAVI Program

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**Radiology**

Farhood Saremi, MD
Professor of Radiology

Alison G. Wilcox, MD
Assistant Professor of Radiology
Director, Cardiovascular Imaging

**Neurology**

Nerses Sanossian, MD
Assistant Professor of Neurology

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USC CardioVascular Thoracic Institute: (323) 442-5849 cvti.KeckMedicine.org