

DR. SAMIN K. SHARMA FAMILY FOUNDATION

CARDIAC CATHETERIZATION LABORATORY



2017 CLINICAL OUTCOMES & INNOVATIONS REPORT





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A Message from Drs. Samin K. Sharma and Annapoorna S. Kini

Dear Colleague,

From the Cardiac Catheterization Laboratory at The Mount Sinai Hospital, we are proud to present our patient-centered 2017 Clinical Outcomes & Innovations Report, a comprehensive overview of the work being done at one of the nation's finest cardiac catheterization laboratories. Public reporting of quality outcomes and patient safety data is increasingly being mandated for transparency by various organizations and stakeholders. As we have done each year, in this issue, we also report our performance metrics and compare them to regional and national standards, with the goal of providing the highest level of care to our heart patients.

Our catheterization laboratory continues its relentless drive for procedural excellence, pursuing and developing the latest technical and technological advances in the field of percutaneous coronary intervention (PCI). Our procedural outcomes data over the last five years support the statement that we have *perfected* the art of PCI.

Despite the increasing complexity of PCI cases, we have observed an overall decline in complications of PCI because of our expertise, teamwork, and dedication in treating each patient as an individual. We are committed to the universal use of innovative and evidence-based standardized medical protocols, which have contributed to our extraordinary success. It is not unusual for patients who have been deemed "inoperable for advanced extensive cardiac disease" to come to us, be treated successfully, and go home with smiles on their faces.

In order to remain at the top, we will continue to employ cutting-edge technology and techniques that are now the hallmarks of our success. In this issue, we will provide details of several procedures that are routinely done at our center, as well as their volume and outcomes. Our constantly evolving, innovative approaches have contributed to our national and international recognition, and we highlight these innovations through the words of our grateful patients. Our goal for 2018 is to rise to eminence from excellence by innovation and well-organized comprehensive care and by adopting the Heart Team approach for management of complex cardiac patients.

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For more information, visit www.mountsinai.org/interventional-cardiology-cath-lab

Welcome from the President, The Mount Sinai Hospital



David L. Reich, MD

President and Chief Operating Officer,
The Mount Sinai Hospital

Over its relatively short history, the field of interventional cardiology has grown tremendously. More than a million catheterizations are performed each year in the United States, offering safe and effective treatment for patients with coronary artery disease. It seems that every year brings new innovations that can treat a greater variety of conditions, and increasingly complex cases. But this constant forward motion does not happen by accident. For many years, it has been the team at The Mount Sinai Hospital Cardiac Catheterization Laboratory, led by Samin K. Sharma, MD, and Annapoorna S. Kini, MD, that has helped to set the pace that's advancing interventional cardiology.

This remarkable group employs a team approach, consistently applying protocols and techniques that, when employed by skilled interventionalists, result in excellent quality and outcomes. While working to perfect percutaneous coronary intervention, they're also advancing the frontiers of cardiovascular medicine, pursuing clinical research and testing the next generation of devices that will provide hope to even more patients. I am proud to introduce this ninth edition of the Cardiac Catheterization Laboratory Clinical Outcomes & Innovations Report.

These pages detail the outcomes of the catheterization laboratory, advances in research and development, and perhaps most telling, the experiences of patients in their own words. The team's dedication to continuous quality improvement, extensive data analysis, and patient satisfaction exemplifies The Mount Sinai Hospital's commitment to its missions of clinical care, education, and research.

We hope you find this ninth edition of the Cardiac Catheterization Laboratory Clinical Outcomes & Innovations Report to be informative.



A Message from Valentin Fuster, MD, PhD, MACC



Valentin Fuster, MD, PhD, MACC

Physician-in-Chief,
The Mount Sinai Hospital

Director, Mount Sinai Heart

Director, Zena and Michael A. Wiener
Cardiovascular Institute and Marie-
Josée and Henry R. Kravis Center
for Cardiovascular Health

Richard Gorlin, MD, Heart Research
Foundation Professor of Cardiology

Mount Sinai Heart is celebrated internationally as a world leader in all facets of cardiology, and a large part of that reputation stems from the work that happens in our busy Cardiac Catheterization Laboratory seven days a week.

By attracting the most talented interventional cardiologists and providing them with an environment in which they can thrive, Samin Sharma, MD, and Annapoorna Kini, MD, are able to reassure patients with coronary artery disease that they're in the best hands.

By fostering a spirit of scientific curiosity and ingenuity, the team at The Mount Sinai Hospital Cardiac Catheterization Laboratory has become a leading force in research and innovation, advancing their locus from the coronary arteries to the valves and chambers of the heart, and beyond to the peripheral vascular system.

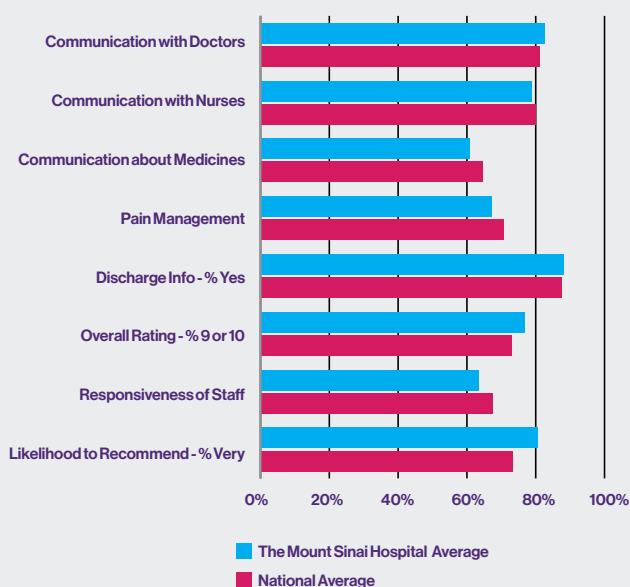
By taking the time to treat each patient as an individual, they have created an environment where patients not only feel compelled to ask questions and participate in their care, but inevitably find themselves enthusiastic advocates of the Cardiac Catheterization Laboratory.

Ultimately, the results speak for themselves. Few centers can compare with the record of safety that The Mount Sinai Hospital Cardiac Catheterization Laboratory has achieved. I am proud to have witnessed its growth to become the nation's busiest, and the advances you'll read about on these pages show promise for a bright future.



The Cardiac Catheterization Laboratory

Patient Satisfaction: 2017 HCAHPS Survey



An Overview of Services and Outcomes

“Perseverance is the hard work you do after you get tired of doing the hard work you already did.”

- Newt Gingrich
Former House Speaker

These powerful words, perseverance and hard work, sum up the principles of the successful operations at our Cardiac Catheterization Laboratory. The Cardiac Catheterization Laboratory at The Mount Sinai Hospital is among the highest-volume centers yet safest interventional catheterization laboratories in the United States. Consisting of six adult catheterization rooms (three equipped for endovascular procedures), the Cardiac Catheterization Laboratory is established as a tertiary center for complex coronary, valvular, and vascular interventions. Two of the rooms (hybrid catheterization laboratories) are equipped to perform transcatheter aortic valve replacement (TAVR). All catheterization rooms are equipped with intravascular ultrasound (IVUS) and fractional flow reserve (FFR) capabilities and optical coherence tomography (OCT). In addition, we have access to the hybrid OR suite to perform complex structural heart intervention cases.

Each member of the Cardiac Catheterization Laboratory staff has a strong work ethic and takes pride in his or her contribution to the principal goal: delivery of efficient and safe care to patients in need. As a result, the Cardiac Catheterization Laboratory consistently reports a very high level of patient satisfaction.

65 Percent

OF OUR ELECTIVE INTERVENTIONAL PATIENTS ARE DISCHARGED ON THE SAME DAY OF THE PROCEDURE

One very important aspect of patient satisfaction is making the in-hospital stay as short as possible. With this in mind, approximately 65 percent of our elective interventional patients are safely discharged on the day of the procedure (ambulatory PCI) following an established ambulatory discharge protocol. Others with more complex interventions, comorbid conditions and higher acuity are admitted for observation overnight with planned discharge home the next day.

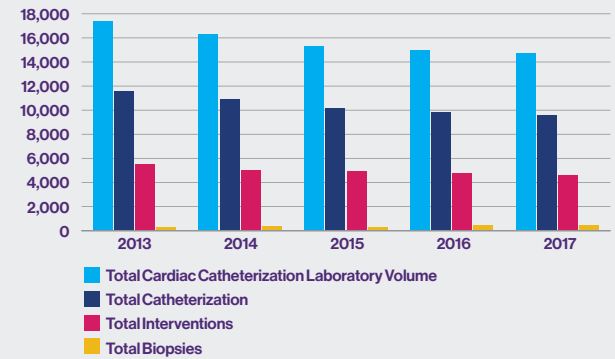
The system of established standard protocols, rigorous attention to detail, and a strong sense of teamwork have helped us to achieve the best interventional outcomes in the country. Overall angiographic success of non-CTO lesions remains over 99 percent in our Cardiac Catheterization Laboratory. We continue to improve our outcomes every year, with unprecedented low procedural complications in 2017; combined major complications of death, large MI, urgent CABG, and CVA cases were 0.72 percent. This remarkably low complication rate has been achieved despite high complexity and comorbid medical conditions of patients treated in the Cardiac Catheterization Laboratory.

99.67 Percent
OF PCI PATIENTS WERE DISCHARGED ALIVE

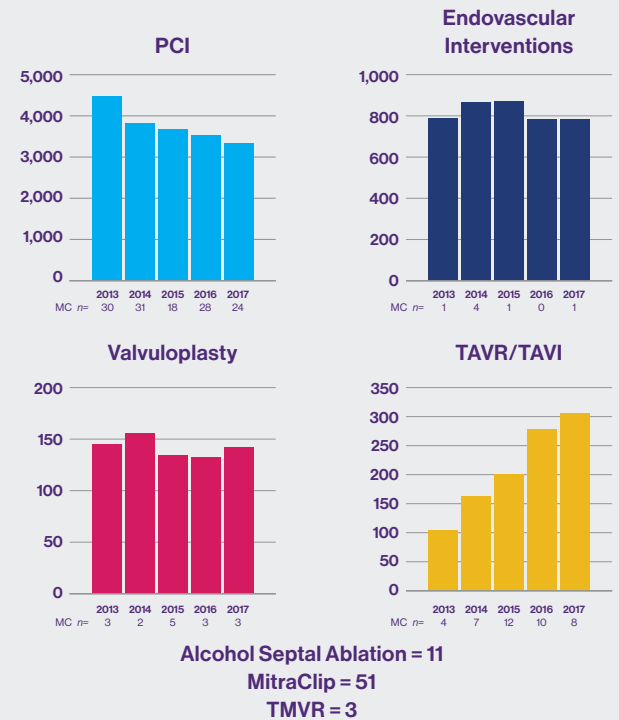
22% of 3,347
CASES HAD PLAQUE MODIFICATION
STRATEGY BEFORE STENT IMPLANTATION
DUE TO LESION COMPLEXITY



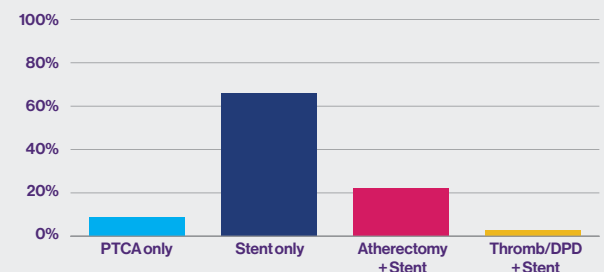
Growth and Trends in Cardiac Catheterization Laboratory Volume and Procedures



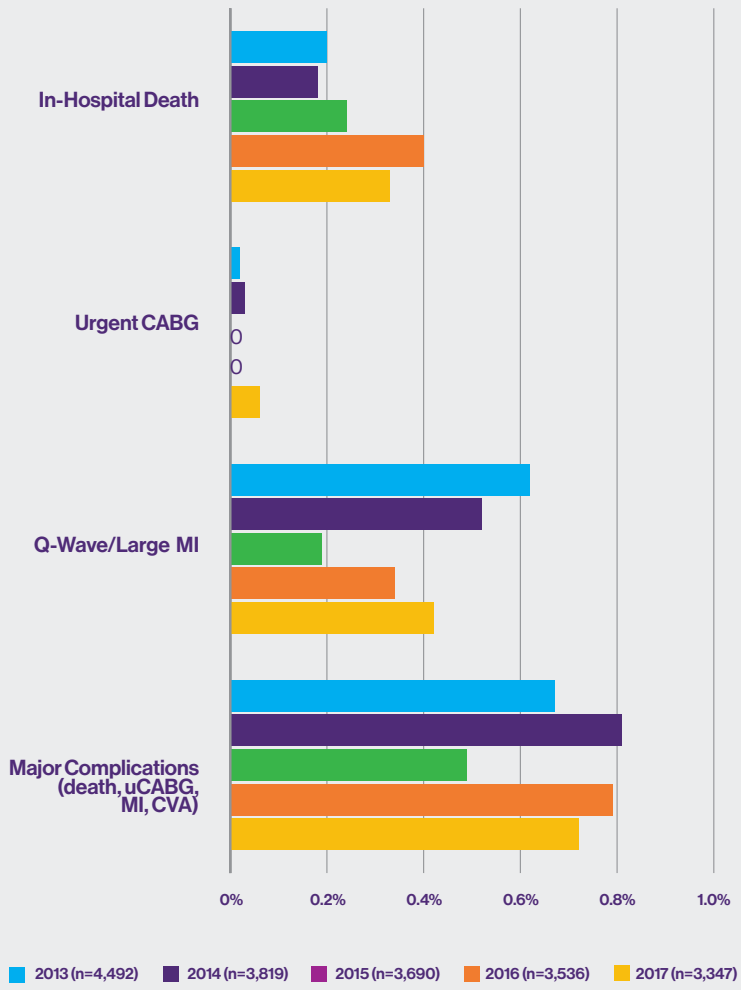
Interventional Volume and Major Complications (MC)



Type of Coronary Interventions in 2017 (n=3,347 PCIs)



Temporal Trends in Complications of PCI at The Mount Sinai Hospital



Comparison of Mount Sinai Hospital Interventional Outcomes with New York State Data for 2014

Our Cardiac Catheterization Laboratory continues to serve the full range of cases, from simple to the most complex cases with high clinical comorbidities and complex angiographic characteristics. Despite that added complexity, the majority of PCI complications at The Mount Sinai Hospital have been one-third to one-half of the New York State Department of Health results.

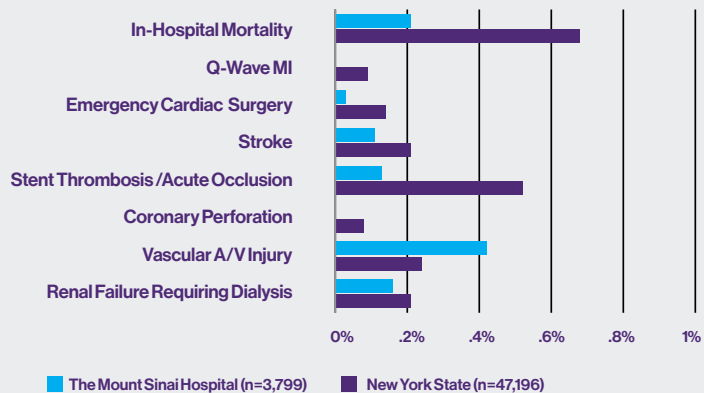
Reports of risk-adjusted PCI mortality over the last 19 years by the New York State Department of Health have consistently placed The Mount Sinai Hospital Cardiac Catheterization Laboratory among the lowest for in-hospital and 30-day risk-adjusted mortality, receiving the double star denoting statistically significantly lower RAMR than the statewide average consistently over the last 19 years of New York State Department of Health PCI reporting.

This lower 30-day risk-adjusted mortality can be attributed in large part to the experience and high procedural volume of the five senior full-time interventionalists, who together perform more than 3,000 cases per year. Our interventionalists frequently get double-star notations (**) for PCI safety among 600 interventionalists practicing in the state.

23 Percent
OF PCI'S WERE DONE VIA RADIAL ACCESS



NYS-Reported Major Complications of PCI 2014



19 Consecutive Years

MOUNT SINAI CATH LAB TOPS IN LOWER PCI MORTALITY IN NY STATE.



NYS-DOH Report of PCI 2012-2014 Data on the Top 10 Volume Centers in NY State 30-Day RAMR

PCI Statistics 2012-2014	# Cases	All Cases	Non-Emergency Cases	Emergency Cases
1. The Mount Sinai Hospital	13,029	0.75**	0.44**	2.82
2. Columbia Presbyterian Hospital	7,786	0.98	0.68	2.27
3. Saint Francis Hospital	7,125	0.89	0.55	2.98
4. Saint Joseph's Hospital	5,972	1.01	0.72	2.40
5. LIJ Medical Center	5,020	1.60*	1.09*	3.99
6. Lenox Hill Hospital	4,940	0.95	0.72	1.73
7. Rochester General Hospital	4,914	0.80**	0.56	1.88
8. Buffalo General Hospital	4,759	1.39	0.77	4.12
9. North Shore University Hospital	4,575	1.21	0.82	2.94
10. Beth Israel Medical Center	4,547	0.91	0.50	3.03
NYS Total	141,971	1.11	0.71	2.94

www.nyhealth.gov *Risk Adjusted Mortality Rate (RAMR) significantly higher than statewide rate
**Risk Adjusted Mortality Rate (RAMR) significantly lower than statewide rate

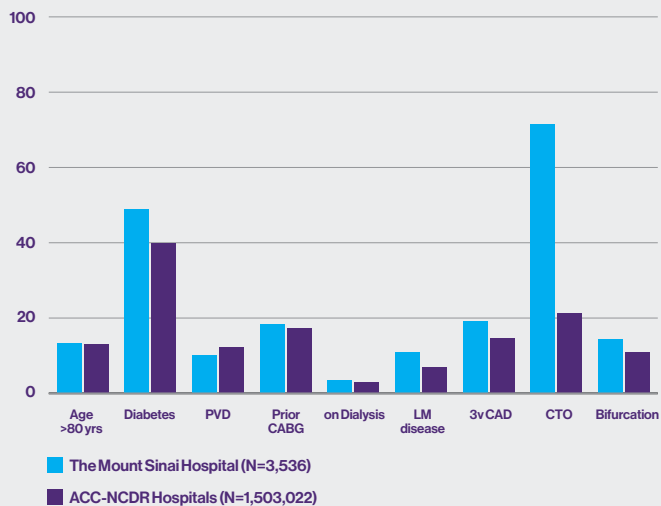
NYS-DOH 30-Day RAMR for PCI ** Interventionalist at MSH

Years/ # cases	All cases RAMR %	Non-Emergency cases RAMR %	**Interventionalist
2012-2014 /3,566 /2,714	0.62** 0.55**	0.36** 0.19**	Dr. Sharma Dr. Kini
2011-2013 /3,925 /2,883 /439	0.56** 0.60 0.29**	0.38** 0.31** 0.16	Dr. Sharma Dr. Kini Dr. Dangas
2010-2012 /4,052 /2,874	0.51** 0.29**	0.35** 0.21	Dr. Sharma Dr. Kini
2009-2011 /3,063	0.47**	0.33**	Dr. Kini
2008-2010 /1,447	0.29**	0.24	Dr. Moreno

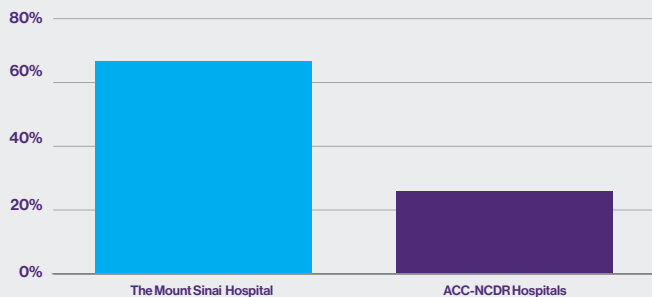
www.nyhealth.gov **Risk Adjusted Mortality Rate (RAMR) significantly lower than statewide rate



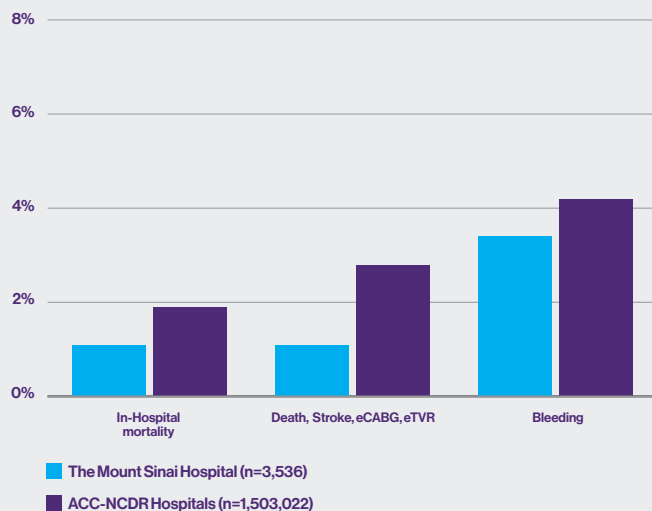
Important Baseline Clinical and Lesion Characteristics of PCI: ACC-NCDR Data for 2016



FFR Evaluation of Intermediate Stenosis Lesion (40-70%) Undergoing PCI: MSH vs ACC-NCDR Hospitals 2016



PCI Complications: MSH vs. ACC-NCDR Hospitals 2016



Comparison of The Mount Sinai Hospital Interventional Outcomes With Other U.S. Hospitals—2016 ACC-NCDR Report

The American College of Cardiology-National Cardiovascular Data Registry (ACC-NCDR) reports the characteristics and in-hospital outcomes after PCI of more than 1,400 hospitals in the United States, providing data of 1.5 million PCI patients.

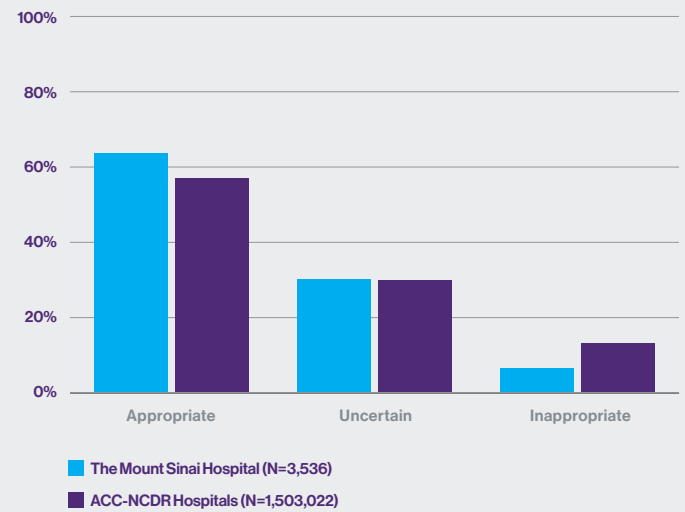
On these pages are the important baseline and procedure characteristics of The Mount Sinai Hospital (MSH) versus ACC-NCDR hospitals. These graphs show superior outcomes for PCI patients at The Mount Sinai Hospital in comparison to other U.S. hospitals in the ACC-NCDR report for 2016.



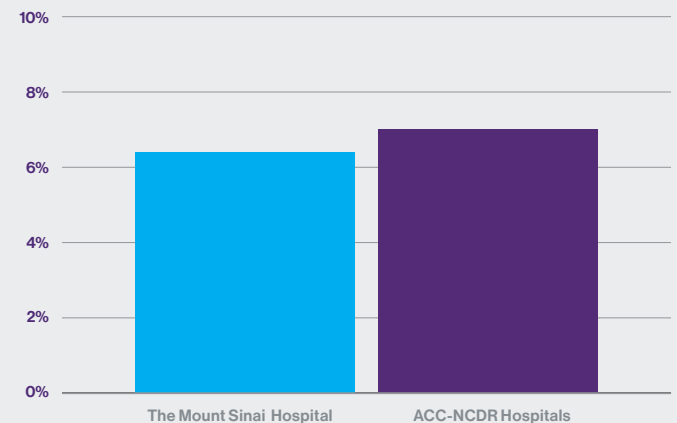
Appropriateness of PCI has recently come under strong scrutiny. Cases that are inappropriate based on the published guidelines are not only risky to the patient, since the intervention is not indicated, but also risk being denied reimbursement by federal agencies or insurance companies. At Mount Sinai Heart, we established evidence-based protocols for proper evaluation of CAD patients before scheduling catheterization and possible intervention and then rigorous application of the appropriate use criteria (AUC) of the American College of Cardiology; this has yielded one of the lowest rates of inappropriate PCI for stable CAD in the nation. Fractional flow reserve (FFR) has been increasingly adopted in our clinical practice, guiding the decision making for appropriate PCI.

Appropriateness of PCI Procedure

AUC Evaluation of PCI Procedures
MSH vs. ACC-NCDR Hospitals in 2016



STEMI PCI In-Hospital Mortality MSH vs. ACC-NCDR Hospitals 2016



Key Points

- We employ a Heart Team approach in complex coronary cases, where the patient consults with a cardiologist, cardiothoracic surgeon, and cardiac interventionalist to determine the best course of treatment.
- At The Mount Sinai Hospital, we have been recommending surgery for patients with complex CAD, and 60 percent of patients have complied with that recommendation.

Case 1:



Case 2:



To view two prerecorded cases featuring protected high-risk and bifurcation PCI, scan the QR codes above.

www.youtube.com/c/ccvvsymposium

Complex High-Risk Percutaneous Coronary Interventions (PCI)

Samin K. Sharma, MD **Annapoorna S. Kini, MD**

Data from several large, multicenter clinical trials continue to update our approach to clinical decision making for coronary revascularization. Two major trials of multivessel coronary artery disease (CAD), the SYNTAX (SYnergy Between Percutaneous Coronary Intervention with TAXus and Cardiac Surgery) and FREEDOM (Future Revascularization Evaluation in Patients with Diabetes Mellitus: Optimal Management of Multivessel Disease) trials, have established a definite role for coronary artery bypass surgery (CABG), especially in higher-angiographic-complexity cases, over percutaneous coronary intervention (PCI) with low long-

term mortality and myocardial infarction (MI) but higher stroke rates compared to PCI. The SYNTAX trial employed a novel grading tool, known as the SYNTAX Score, to assess the complexity of CAD based on several anatomical factors.

Based on data evidence, there is an increasing tendency at The Mount Sinai Hospital toward recommending surgery for patients with more complex CAD. Ultimately, the decision to have either surgery or PCI lies with the patient and his or her family, after consultation with the Heart Team, which includes a cardiologist, cardiothoracic surgeon, and cardiac interventionalist. Many patients (~ 40%) with complex CAD choose revascularization with PCI, due to lower short-term complications and relative ease of recovery compared with surgery.

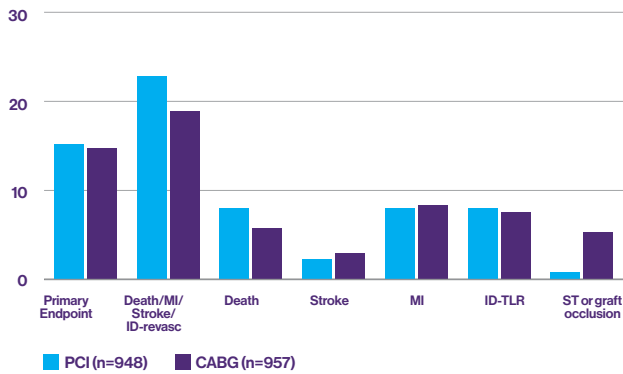
A recent trial comparing XIENCE DES with CABG in unprotected left main disease (EXCEL Trial) with SYNTAX Score <32 has shown equal results at three years follow-up after both modes of revascularization. Additional studies that take these design changes into account, combined with advanced imaging modalities before and during procedures, may tip the balance in favor of recommending PCI as first-line therapy for more patients with moderate to severe CAD.

In addition to expertise in treatment of CAD with PCI, our Catheterization Laboratory serves as a tertiary center for complex coronary intervention (bifurcation, calcified, left main, CTO, and/or vein graft lesions) and patients with low ejection fraction (LVEF <35 percent). We use a variety of adjunct interventional techniques in these complex coronary cases, such as atherectomy (for calcified lesions, 22 percent) and thrombectomy/distal protection devices (for thrombotic and vein graft lesions, in 3 percent).

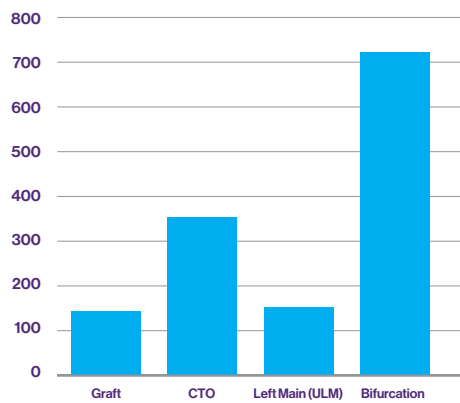
In a small number of complex lesion patients (~5 percent of PCI) with reduced ejection fraction (LVEF <35 percent) we use LV assist devices such as IABP, Impella, or ECMO to safely and dependably perform these high-risk PCIs (protected PCI).



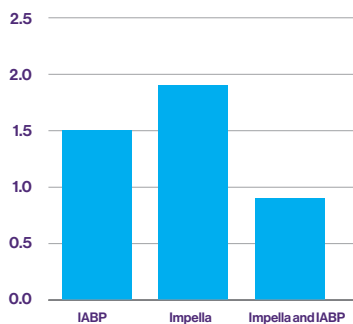
EXCEL Trial: Primary and Secondary Clinical Endpoints



Complex Coronary Intervention in 2017 at The Mount Sinai Hospital (N=3,347)



High-Risk PCI with LV Support in 2017 at The Mount Sinai Hospital (N=3,347)



354 of 3,347

PCI CASES WERE DONE FOR CHRONIC TOTAL OCCLUSION



PATIENT: Christopher Coroneos, 62

DIAGNOSIS: Three-vessel coronary artery disease

TREATMENT: PTCA, atherectomy and placement of seven drug-eluting stents

“I’ve been in the hospital a number of times with my spinal surgeries, and I have never experienced care like I have here.”

“I had been feeling constantly tired and fatigued – frankly I attributed it to age. I had an appointment with my cardiologist, and he didn’t like what he heard. I failed the stress test, and he recommended me for catheterization.

“My wife knows one of the nurses who works in the Cath Lab, and she suggested, ‘you have got to see Dr. Sharma. He’s the best.’ I did my homework on Mount Sinai and the Cath Lab, and determined this was the place to go. After the diagnostic catheterization, they took me into another room to meet the cardiac surgeon, because they were recommending open-heart surgery. I had already had several surgeries for unrelated conditions, so I didn’t want to do open-heart surgery.

“Dr. Sharma grabbed the bull by the horns, and they did the first procedure that day.

It was a complex case — I had a total of seven stents placed over two procedures about a month apart. Even after the first procedure, I felt a huge difference – it was night-and-day!

“I was lucky I didn’t have a heart attack – as Dr. Sharma said, when I came in, I was hanging by a thread of having a heart attack. Now, a month after the second procedure, I feel 20 years younger. I can go back to being active, to traveling. It’s amazing.

“I’ve been in the hospital a number of times with my spinal surgeries, and I have never experienced care like I have here.

“Dr. Sharma was amazing. I understand that no one can hold a candle to what he can do.”

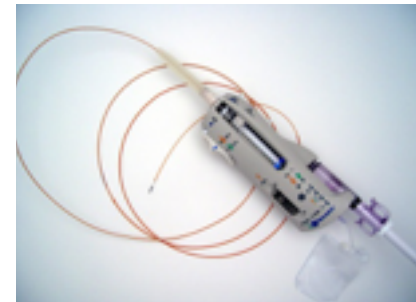
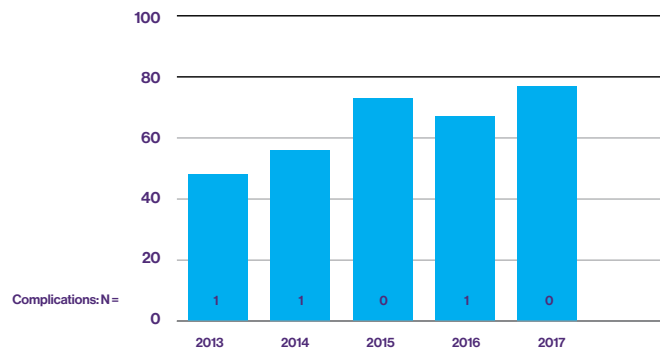
Intravascular Brachytherapy (IVBT) for Recurrent DES In-Stent Restenosis

Patients presented with recurrent in-stent restenosis (ISR) of DES with more than two layers of stents are appropriate cases for IVBT using the Beta-Cath™ System to reduce subsequent restenosis. Our IVBT data over the last five years have shown excellent acute outcomes with <1 percent major complications, no need for implantation of another stent, and long-term restenosis of 25 percent (compared to 55 percent in comparable recurrent DES ISR without IVBT).

References:

1. Coronary artery bypass graft surgery versus percutaneous coronary intervention in patients with three-vessel disease and left main coronary disease: 5-year follow-up of the randomized clinical SYNTAX trial, *Lancet* 2013;381:629.
2. Everolimus-eluting stents or bypass surgery for left main coronary artery disease (EXCEL trial), *N Engl J Med* 2016;375:2223.
3. Current Status of Rotational Atherectomy, *J Am Coll Cardiol Interv* 2104;7:345

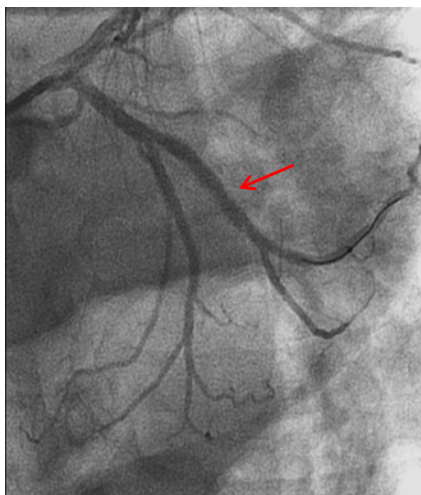
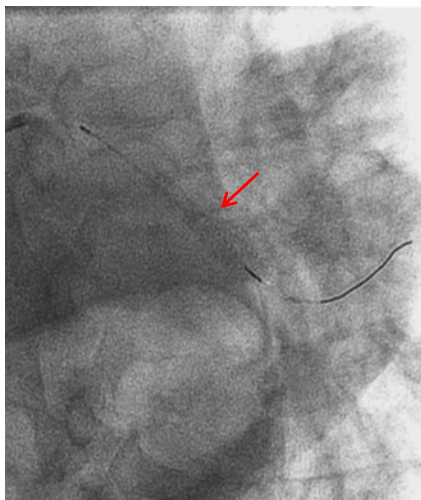
IVBT Volume at The Mount Sinai Hospital



Novoste™ Beta-Cath™ 3.5F System

77 Cases

OF IVBT WERE DONE IN 2017, WITHOUT ANY COMPLICATIONS



Intravascular Brachytherapy
Treatment



PATIENT: Violet Baksash, 100

DIAGNOSIS: Acute STEMI in LAD with ventricular fibrillation

TREATMENT: Thrombectomy, IABP, and placement of DES

“I want to take care of myself and live on my own, and I still am!”

“I was 99 years old last year when my own doctor recommended Dr. Sharma. I told my doctor for many years, if something happens and I need an operation, I’m not going to do it. I was determined.

“He agreed with me, but then came a time that there was nothing else that could be done. He said it was critical now because of the blockage. I thought it over and discussed with my children, and they said if I don’t do something now, it could get a lot worse. I live on my own and I always want to take care of myself, so I wouldn’t want that to happen.

“The procedure took two hours because I had leaky valves, so they had to put stents in, and they couldn’t do the TAVR procedure until later. They had to wait until my kidneys were ready to handle it too. I had a difficult recovery, but I had my children, aides, and nurses to help me through it.

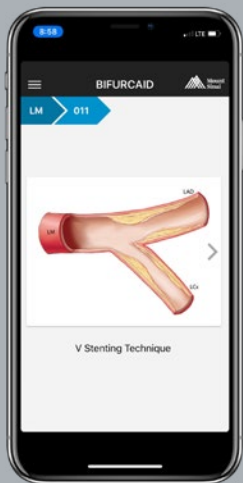
“Dr. Sharma has very good staff helping, like Vivian, the nurse practitioner. She followed everything very closely. We were all on top of it together, and after seeing Dr. Sharma, I’ve been doing so much better.

“Now, I’m back to normal and have my walker to help me get around the neighborhood and go to my synagogue. I want to take care of myself and live on my own, and I still am!”

Key Points

- Bifurcation lesions are among the most complicated cases seen in a cath lab.
- As a large, high-volume center, Mount Sinai has a wide experience of intervention for these lesions.
- The BIFURCAID app allows us to share this knowledge and experience with our colleagues at centers around the world.

To download, scan the following QR code:



Bifurcation Lesion Intervention: Bifurcaid App



Annapoorna S. Kini, MD

Samit Bhatheja, MD

Surbhi Chamaria, MD

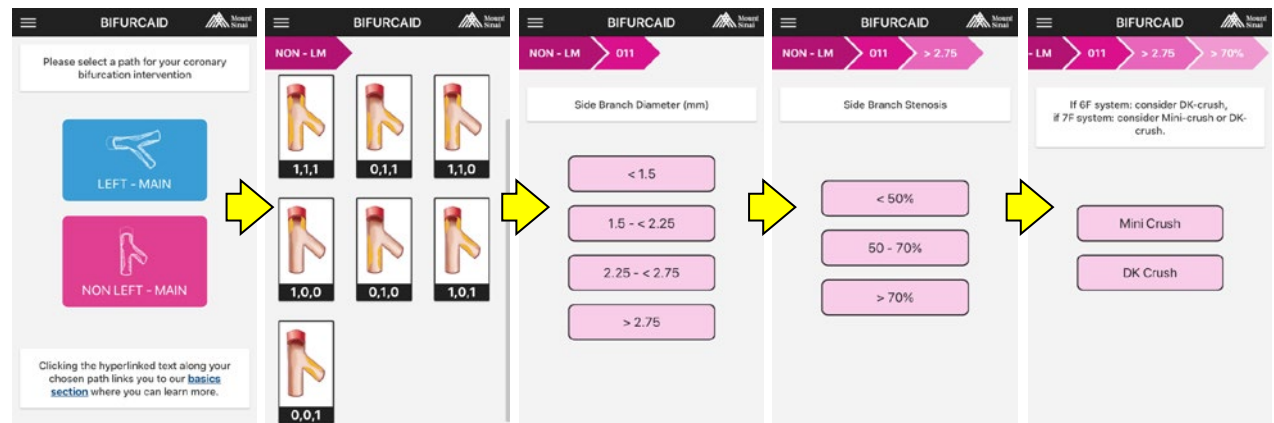
A blockage present in a coronary artery at or near the branching point is known as a coronary artery bifurcation lesion. Coronary artery bifurcation lesions can make the placement of a stent very challenging — that’s why stenting for these blockages is classified as a complex coronary artery intervention procedure. There are many techniques available to the interventional cardiologist; the most appropriate option is mostly determined by the location of the disease in the artery. In fact, there is such a wide variety of approaches that no single information source completely covers all of the possible scenarios.

The Mount Sinai Hospital Cardiac Catheterization Laboratory is a large, high-volume center that handles the most complex cases, including many of these coronary artery bifurcation lesions. Our center’s experience with treating such a wide range of bifurcation lesions means we are uniquely equipped

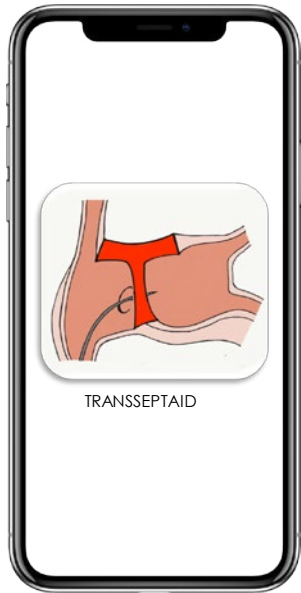
to fill the need for education about this technically challenging procedure. The educational tool we have developed is a new mobile application called BIFURCAID.

With live case webcasts and the annual CCVVC conference, the Cardiac Catheterization Laboratory has been a global leader in education in the field of interventional cardiology. This mobile application is the latest contribution to global cardiovascular education, and it has received an overwhelmingly positive response. Dr. Annapoorna S. Kini, MD, and her team of fellows in the Cardiac Catheterization Laboratory developed the application in collaboration with the Mount Sinai AppLab. It has been downloaded by more than 3,300 users in 20 countries.

This application is available to download free on both Apple App store and Google PlayStore.



**Upcoming Apps from the Cardiac
Catheterization Laboratory:**



PATIENT: Ula Lewis, 78

DIAGNOSIS: Mitral valve regurgitation

TREATMENT: Placement of three MitraClip devices

“The last time I was at the hospital I was leaving and I saw the bus — and would you believe I was running to catch it?”

“Every time I would go to the doctor, I would tell them I was short of breath. I would explain I’d have to sit down after walking a few blocks. They would give me this asthma medication, or put me on a water pill. The water pill had me losing a lot of weight, but wasn’t helping my breathing.

“My friend recommended Mount Sinai, so I went for a second opinion to a doctor there, and after running some tests, they decided to keep me overnight. They recommended open-heart surgery — I said, I’m too old to have open-heart surgery. I’m almost 80 and I have had a pacemaker since 2013. So, my heart is very weak.

“Once I decided to have the procedure with Dr. Kini, they didn’t waste any time. They

placed a clip on my mitral valve, and when that didn’t take, they placed a second, and a third. Dr. Kini is marvelous. She’s determined to solve the problem, and she did.

“The staff was very, very good — nice nurses, nice doctors, everyone was nice. A big thank-you to Mount Sinai. It’s nice to go out now and then — to a party, or to catch up with an old friend and just have a laugh. I do everything for myself, so it’s important that I feel healthy.

“The last time I was at the hospital I was leaving and I saw the bus — and would you believe I was running to catch it?”

INNOVATIONS

Expanding Indications of Transcatheter Aortic Valve Replacement (TAVR)

Key Points

- Mount Sinai Heart was an early pioneer in TAVR therapy for patients with severe aortic stenosis (AS).
- We are always evaluating new imaging techniques to ensure ideal placement and enhance the success rates of TAVR devices in our patients.
- Although TAVR is associated with faster recovery and fewer complications, appropriate discharge planning is vital to ensuring that success.

Case 1:



Case 2:



Case 3:



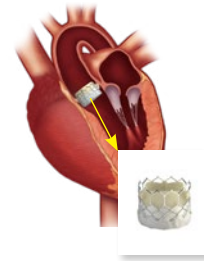
To view a prerecorded case featuring TAVR, scan any of the QR codes above.

Samin K. Sharma, MD **Annapoorna S. Kini, MD**

Multiple trials of transcatheter aortic valve replacement (TAVR) in various surgical risk (STS Score) patients have shown that it is an important therapeutic option for patients who have severe, symptomatic calcific aortic stenosis (AS) and who are an extreme, high, or intermediate risk for cardiac surgery due to serious comorbidities.

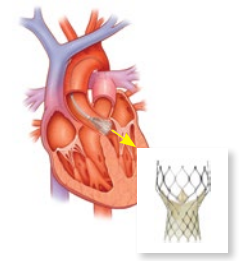
The Surgical Replacement and Transcatheter Aortic Valve Implantation (SURTAVI) Trial is a multicenter clinical trial comparing percutaneous implantation of a self-expanding prosthesis with surgical valve replacement in patients with severe aortic stenosis and intermediate risk for surgery. The results showed that TAVR in intermediate-surgical-risk patients with severe AS was a non-inferior alternative to surgery and had a lower stroke rate.

Edwards SAPIEN[®] Valve



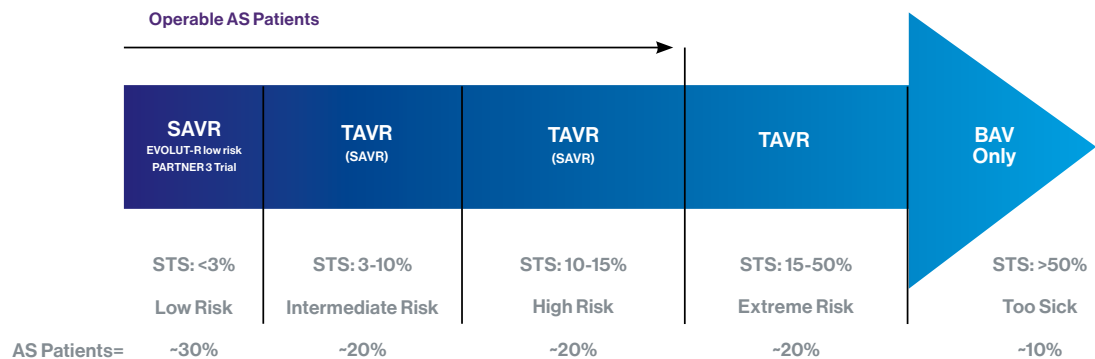
Balloon-Expandable, Bovine Valve

Medtronic CoreValve[®]



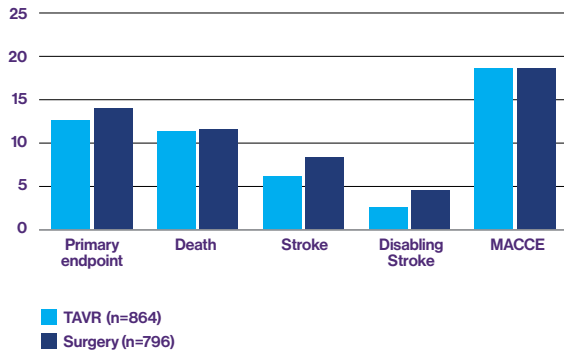
Self-Expanding, Porcine Valve

TAVR Recommendations Based on Surgical Risk (STS): More Patients Are Appropriate for TAVR Procedures as Shown Below



SURTAVI Trial: Clinical Outcomes

24 Months



PATIENT: June Heinz, 83, with son-in-law John Schlageter

DIAGNOSIS: Three-vessel coronary artery disease and left main artery disease

TREATMENT: PTCA, atherectomy, placement of two drug-eluting stents, placement of Impella device

“I’m brand new, all brand new. I surprise myself at times. At my age — still no gray hairs!”

“June had a bad heart attack, and it was just dumb luck that my wife — her daughter — decided to check in on her that morning. She was in her bed, in cardiac arrest. The ambulance brought her to our local hospital, and she recovered from that.

“They brought her to a cath lab in New Jersey, but they said she was too blocked for them to place any stents. They’d have to do open-heart surgery. She was in the hospital for a number of days while they brought in doctor after doctor to explain the procedure, and how it would be hard for someone in her 80s to go through something like this.

“June said, ‘Well, you know, I’ve had a good life, so I don’t want to go through that.’” We thought that was it. Then I remembered that I had done video shoots of televised symposiums at Mount Sinai with the best cardiac cath guy in the world, Dr. Sharma.

“I had a DVD of the scan when they tried to unblock June’s heart at the New Jersey cath lab, so I sent that to Dr. Sharma along with a letter and my picture so he might remember me.

“I couldn’t believe it — I almost cried when I got the call from him and he said, ‘Of course I remember you and of course we can help your mother-in-law. We’re going to fix this.’

“How can one hospital say there’s no hope and another guy say we can do it? That’s Dr. Sharma.

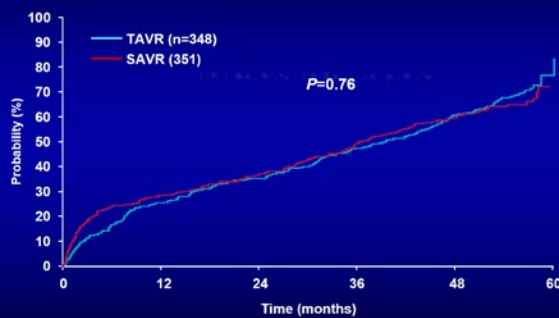
“We brought June in, and he was able to open up two of her arteries without taking dangerous risks. He used this cool tool called the Rotablator.

“Before the procedure, she couldn’t walk across the room without being out of breath. It’s a miracle rebirth after what Dr. Sharma did for her. He’s the best. He’s the guy. You can’t believe the things he does. And all the other doctors say, ‘I wouldn’t try that,’ and he says, ‘I’m going to do it.’ He’s so professional and calm and collected. He really works hard for his patients and doesn’t give up. We’re very thankful for him. As June says, ‘I’m brand new, all brand new. I surprise myself at times. At my age — still no gray hairs!’”

- John Schlageter.

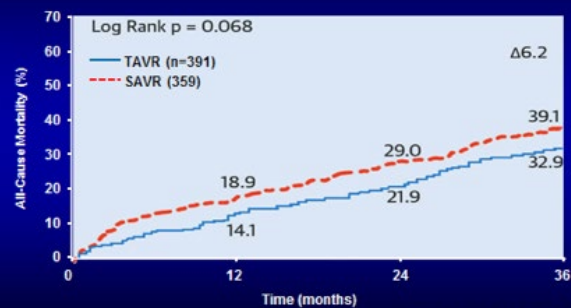
PARTNER 1 Trial: 5-Year Clinical Outcomes

All-Cause Death



Mack et al., Lancet 2015;385:2477

CoreValve Pivotal Trial: 3-Year Clinical Outcomes



Deeb et al., J am Coll Cardiol 2016;67:2565

The EVOLUT-R study evaluates transcatheter aortic valve (TAV) bioprosthesis in AS patients not suitable for surgical aortic valve replacement. Early results (30-day outcome) show that the EVOLUT-R self-expanding aortic valve prosthesis is safe and effective to treat AS patients who are poor candidates for surgery.

The SENTINEL Trial, to assess the risk of stroke in patients who have TAVR with the Sentinel Cerebral Protection System (which is an embolic filter designed to trap calcified and thrombotic deposits that become dislodged during the TAVR procedure), showed that use of the Sentinel device is associated with lower risk of brain infarction (42 percent) with a trend toward stroke rates compared to a control group. The Sentinel Ulm Study showed lower stroke rate and mortality with the Sentinel device.


Cardiologists at The Mount Sinai Hospital routinely employ three-dimensional transesophageal echocardiography (3D TEEecho), and 4D computed tomography (CT) to better evaluate the TAVR procedure. Image quality and details are highly relevant to the success of TAVR, which relies on the appropriate evaluation and measurement of the aortic annulus to prevent complications, such as paravalvular leak, prosthesis migration, coronary artery occlusion, or annulus rupture.

The Mount Sinai Hospital was the first center in the United States to deploy the CoreValve®, in December 2010. Since then, our TAVR volume and outcomes have improved significantly. Our TAVR data is regularly submitted to the national TVT registry. In the near future, a number of new TAVR valves will be approved after going through the rigorous FDA-approved clinical trials.

References:

1. Surgical or transcatheter aortic-valve replacement in intermediate-risk patients (SURTAVI). *N Engl J Med* 2017;376:1321.
2. 5-year outcomes of transcatheter aortic valve replacement or surgical aortic valve replacement for high surgical risk patient with aortic stenosis (PARTNER 1). *Lancet* 2015;385:2477.
3. Cerebral embolic protection during transcatheter aortic valve replacement significantly reduces death and stroke compared with unprotected procedures. *J MA Coll Cardiol Intv* 2017;10:2297.

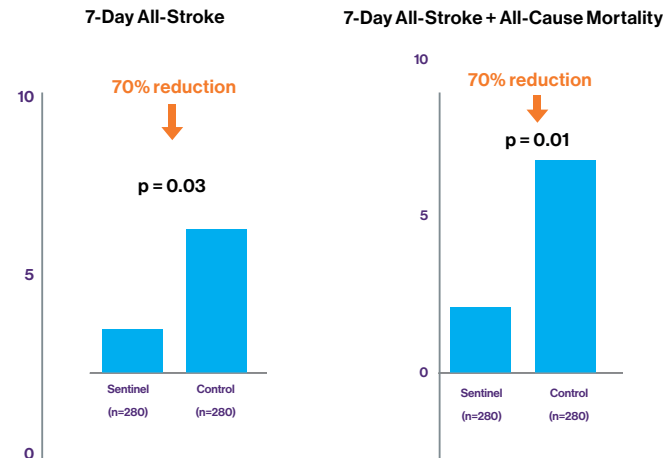
Claret Medical® Sentinel® Cerebral Protection System



- Dual independent filters for embolic debris capture and removal
- Right transradial 6F sheath access
- Deflectable sheath facilitates cannulation of LCC
- Low profile in aortic arch to minimize interaction with TAVR delivery catheter

Sentinel Ulm Study

70% Reduction in Stroke and Death in 560 Patients Prospective Study



Edwards Centera®



JenaValve™



Boston Scientific Lotus™

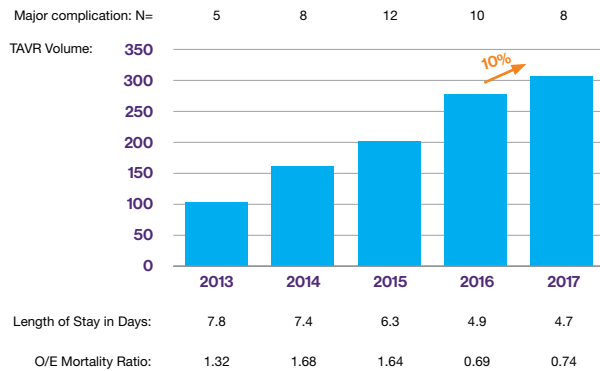


Abbott Portico™



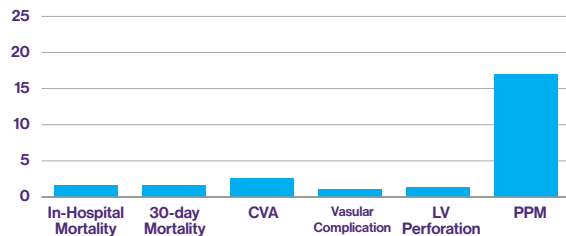
Boston Scientific ACURATE neo™

TAVR Volume and Outcomes Mount Sinai Experience



TAVR Outcomes at The Mount Sinai Hospital 2017

- 55% Evolut-R CoreValve, 45% SAPIEN-3
 - 78% Conscious Sedation; 22% GA
 - 82% Perc Femoral; 11% Cutdown Iliac;
 6% Subclavian; 1% Direct Aortic
 N=306



PATIENT: Brian Hughes, 67

DIAGNOSIS: Two-vessel CAD and occlusion/stenosis in existing bypass grafts

TREATMENT: Atherectomy in LAD Branch D1 and placement of drug-eluting stents

“Dr. Sharma changed my life and my whole family’s life.”

“In December of 1999, I collapsed in a park down here in Florida and was taken to the hospital where they did open-heart surgery and did a six-way bypass. Ever since, I have never really been well. I couldn’t walk very far or do anything physical, even though I had always taken good care of myself — eating healthy and going to the gym.

“I kept going back to the doctor and had 13 different cardiac catheterizations. Still, I couldn’t even walk from the front door to the car without stopping because of chest pain.

“We have a big yard and I’m always out there, working and hunting, but my quality of life was horrible. I was miserable. For three years, my doctor tried to get me to go to Dr. Sharma at Mount Sinai in New York. I didn’t want to go because I felt like there was nothing they could do. But they had me on the maximum dose of medications, and I was getting worse.

“My daughter planned a trip to New York on the pretense that we were all going up there for vacation. I didn’t know my wife had teamed up with my doctor to send all my records up to Dr. Sharma.

“Vivian, the nurse practitioner, was awesome. She arranged the appointment for a Wednesday and then everything was set up for my catheterization procedure that Friday.

“I liked Dr. Sharma as soon as I met him. He made me feel so comfortable. He took a lot of time with me and told us exactly what he would do. He was so hopeful that this would really work. His staff and the hospital took such good care of me — no matter where I was in the hospital, there was someone there to help me.

“The day after the procedure, I got out of the hospital bed and couldn’t believe the difference. I had absolutely no pain — and to this very day, I have had no pain. Now I have a total of eight stents, but I’m back to work around the house constantly. I can go for walks on the beach. I took a trip to Alaska with my wife and friends to celebrate my 50th wedding anniversary the September after my procedure — and I walked everywhere.

I used to think I wouldn’t live long enough to see my three grandkids grow up, but now my whole attitude is changed. Dr. Sharma changed my life and my whole family’s life. Now, they have to keep up with me!”

Key Points

- Mitral regurgitation or “leaky mitral valve” is a condition in which the two leaflets of this valve fail to seal effectively, resulting in some blood flowing back into the atrium every time the left ventricle squeezes.
- MitraClip received FDA approval in October 2013 for use in patients with degenerative MR, who are at prohibitive risk for conventional mitral valve surgery.
- The MitraClip procedure is performed through a small incision in the groin, unlike usual mitral valve surgery, which requires opening the chest and temporarily stopping the heart.
- In our experienced center, the procedure itself can take from 1 to 3 hours. Sometimes it can be longer, depending on the complexity of the case.



Increasing Acceptance of Transcatheter Mitral Valve Repair (MitraClip)

Annapoorna S. Kini, MD

Asaad Khan, MD

The mitral valve works like a one-way gate preventing the backward flow of blood from the left ventricle to the left atrium. Mitral regurgitation (MR) or “leaky mitral valve” is a condition in which the two leaflets of this valve fail to seal effectively, resulting in some blood flowing back into the atrium every time the left ventricle squeezes. Mitral regurgitation can originate from degenerative or structural defects of the mitral valve or it can be functional due to deterioration of the left ventricle, both diseases preventing the mitral valve from closing appropriately. In people with moderate to severe mitral regurgitation, the left ventricle works harder to keep up with the body’s demand for oxygenated blood.

Over time, this dysfunction can lead to enlargement of the left ventricle, weakening of the heart muscle and fluid buildup in the lungs.

Patients typically complain of shortness of breath, fainting, dizziness, tiredness, chest pain (angina), and atrial fibrillation.

First-line treatment for patients with significant mitral regurgitation consists of medical management with drugs such as beta-blockers, ACE inhibitors, diuretics and blood thinners such as Warfarin (if the patient has atrial fibrillation).

For patients with persistent symptoms, open-heart surgery and surgical repair or replacement of the defective heart valve is the recommended treatment.

MitraClip benefits many patients who have been denied surgery. It is successful at reducing mitral valve regurgitation and improving physical health. It requires a short recovery time compared to open-heart surgery. Quality of life is significantly improved in patients who

undergo the MitraClip procedure compared to those who did not and are living with mitral valve regurgitation.

The MitraClip procedure is performed through a small incision in the groin, unlike usual mitral valve surgery, which requires opening the chest and temporarily stopping the heart. A tube is then passed up through the leg vessels to the right side of the heart and then to the left side of the heart using a technique known as trans-septal puncture. The MitraClip is then passed up through this tube and subsequently deployed in the desired position. Not infrequently, a second clip may be needed to ensure adequate reduction in regurgitation. The MitraClip remains securely in position, tightly bound to the mitral valve leaflets. This whole procedure is performed under high-definition 3D echocardiography guidance.

Following the procedure, the patients are closely monitored for one to two days. By performing a comprehensive ultrasound of the heart within 24 hours of the procedure we assess and analyze any remaining mitral valve leakage and rule out any possible complications.

What to expect:

The whole process has three steps: the pre-procedure, the procedure, and post-procedure recovery.

Most patients will be reviewed in clinic to assess suitability for the MitraClip procedure.

At Mount Sinai Heart, we employ a variety of sophisticated imaging techniques to select patients who are most likely to benefit from a mitral clip procedure.

Patients arrive on the morning of the procedure. Some basic lab tests are done, and the patient will meet the anesthesiologist.

In the procedure room, the patient will be put to sleep for the procedure and a breathing tube will be inserted. This will usually be taken out as soon as the procedure is done.

In our experienced center, the procedure itself can take from 1 to 3 hours. Sometimes it can be longer if required, depending on the complexity of the case.

After the procedure, the patient will go to a recovery area and when he or she is felt to be stable enough, sent to a room in the hospital.

We usually send patients home the next day in the early afternoon.

Mount Sinai performs a high number of mitral clip procedures every year with excellent safety and long-term outcomes. We are currently ranked in the top 15 centers nationwide for performance of this procedure.

Catheter-Based Mitral Valve Repair



PATIENT: Shelly Klein, 43

DIAGNOSIS: One-vessel CAD and LV diastolic dysfunction

TREATMENT: PTCA and placement of drug-eluting stent

“I walked out of the hospital – walked out of the hospital after a heart attack.”

“I had been suffering bleeding and anemia and was on iron supplements to keep my blood iron up. I was walking in the neighborhood doing some holiday shopping, and I wanted to walk up another five blocks to another store I go to all the time. It was too difficult to walk even that short distance. I was able to get home, but as the evening came on, I started feeling short of breath, and had chest pain. It felt like the normal kind of chest pain you’d have with a bad cough.

“When I woke up, the chest pain and shortness of breath were worse. Everything seemed to make me feel tired — and we were supposed to be going on vacation. My husband suggested we go to the emergency room — even to call an ambulance. But I didn’t want to take an ambulance because I knew I wanted to go to Mount Sinai. By the time I got there, I could barely walk. They tested my blood, and I was not anemic — the EKG was normal. I was afraid they were going to send

me home. Waiting in the emergency room, the pain went from a five to a ten — they did another EKG and it was definitely a heart attack.

“I was terrified. But it seemed everyone who passed me said, ‘You’re in the best possible place for this treatment.’ We went straight to the cath lab, and everyone rushed right into action. Dr. Kini walked in in her bright red scrubs with a big smile and shook my hand. I was sedated, and when I woke up an hour later, I felt 100 times better — I mean zero pain. The catheter went through my wrist — so I had a major heart procedure and there was no lasting mark.

“They were a well-oiled machine. I saw Dr. Kini and said, ‘You saved my life.’ That’s not something that happens every day. These kinds of things are usually scheduled.

“I walked out of the hospital — walked out of the hospital after a heart attack.”

Transcatheter Valve Implantation in Patients with Calcific Mitral Stenosis and Failed Mitral Bioprosthesis or Ring (TMVR)

Key Points

- New treatments are being developed for high-risk patients with mitral stenosis.
- Transcatheter mitral valve implantation (TMVR) is providing new treatment options for these high-risk populations.
- This treatment has recently been approved for patients with a failed bioprosthesis.

George Dangas, MD

Annapoorna S. Kini, MD

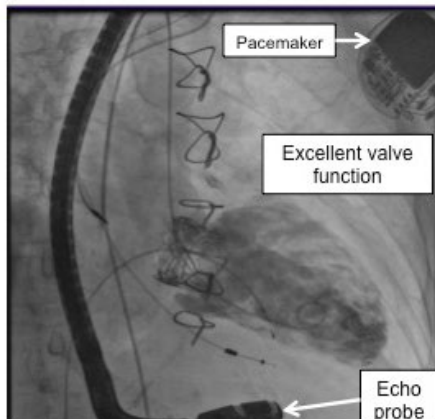
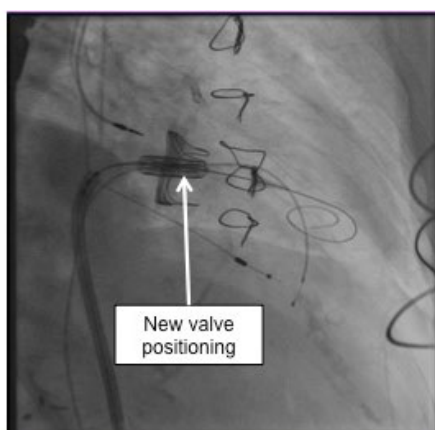
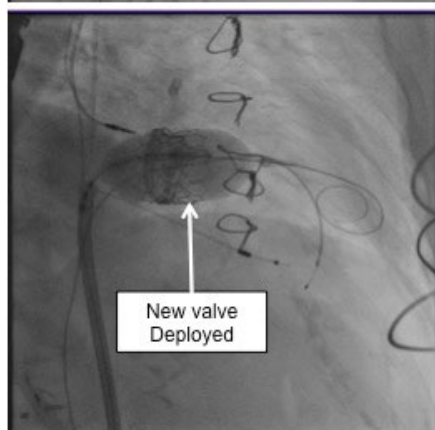
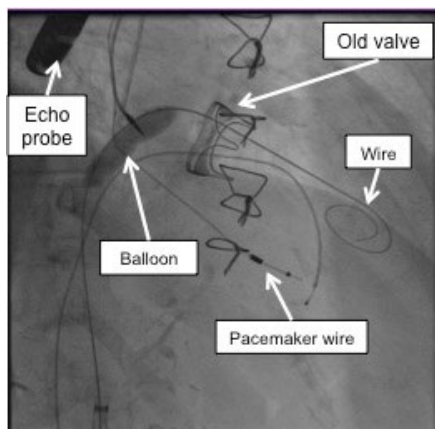
In patients with mitral stenosis (MS), heavy local calcification leads to decreased mobility of the valve leaflets with subsequent narrowing of the valve area and obstruction of blood flow. New treatment options are being developed for high-risk patients with mitral valve disease, especially for those patients with heavily calcified MS, and patients with failing bioprosthetic valves or annuloplasty rings, especially the elderly. These patients cannot benefit as much from percutaneous balloon valvotomy as patients with MS caused by rheumatic disease. Further, due to advanced age and frequent comorbidities in this patient population, surgery is often not feasible.

A new approach, transcatheter mitral valve implantation, involves placement of transcatheter aortic valve devices approved for patients with severe aortic stenosis. These artificial heart valves consist of a stent to hold the study device in its intended position and valve leaflets made from bovine tissue to direct the flow of blood in the heart. These devices can be delivered via catheter using a femoral approach or a transapical approach (through an incision in the left side of the chest directly accessing the tip of the heart). The approach selected depends on several factors, including history of prior heart surgery and the size of the heart chamber. This procedure is performed under general anesthesia, guided by fluoroscopy and ultrasound imaging, including placement of an echocardiography probe in the esophagus. A pacemaker often facilitates this procedure as well.

Combination anticoagulant therapy, including aspirin, may be prescribed for a certain time period after the procedure. Most recently, the FDA has approved this technique in patients with failed surgical bioprosthesis based on a clinical trial conducted across select centers in the United States, including The Mount Sinai Hospital. Transcatheter valve implantation in patients with calcific mitral stenosis is exclusively performed in an investigational setting, and indicated for patients who cannot have surgery. It is also available as a hybrid procedure for operable, high-risk patients.

Reference:

1. Everolimus-Eluting Bioresorbable Scaffolds Versus Everolimus-Eluting Metallic Stents. *J Am Coll Cardiol*. 2017 Jun 27;69(25):3055-3066
2. Bioresorbable Vascular Scaffolds in Women. *JACC Cardiovasc Interv*. 2017 Sep 25;10(18):1891-1893
3. Thrombo-embolic prevention after transcatheter aortic valve implantation. *Eur Heart J*. 2017 Dec 1;38(45):3341-3350



PATIENT: Frayda Pitkowsky, 82

DIAGNOSIS: Aortic valve stenosis

TREATMENT: Placement of TAVR device utilizing SENTINEL cerebral protection device

“Dr. Dangas gets right on the phone and answers my questions. I really appreciate his approach and his attitude.”

“I’m not your typical TAVR patient. I wasn’t really having symptoms but had a cardiac catheterization that my cardiologist wanted me to do, which is when they noticed that things were not the way they should be with the valve. My cardiologist wanted me to have the procedure before it became worse, and I was in terrible shape, and Dr. Dangas agreed.

“I love Dr. Dangas. He’s attentive to his patients and takes time to talk with you — you don’t feel like he’s going to give you 20 seconds and rush out. He’s really very charming, which was a comfort. It’s funny because I kept referring to this as minor surgery, but it really isn’t! They just make it feel that way because it’s so much less trauma than open-heart surgery.

“It’s remarkable that they can go through an incision in the groin to repair your heart — that in itself is amazing to me. The incision took time to heal, but that’s nothing compared to the recovery you go through with open-

heart surgery. Whenever I call the office there, they’re so responsive. Usually when you call a doctor’s office, you’ll only talk to the nurses, but Dr. Dangas gets right on the phone and answers my questions. I really appreciate his approach and his attitude.

“I was also very impressed with the nursing staff. In the CCU and out of the CCU, they were consistently attentive and comforting — really treating me like a person and not just a patient. I wouldn’t recommend dancing into the hospital to get this procedure done if you don’t need it, but if you do, I would recommend doing it at Mount Sinai. My experience was a positive one.”

Key Points

- Coronary artery bifurcation lesions represent between 15 and 20 percent of PCI procedures.
- The provisional approach is a common technique used to treat these occlusions, but in some cases, this approach can result in less than optimal outcomes.
- The ORBID study sought to characterize the underlying plaque morphology of bifurcation lesions using OCT and identify the predictors of side branch ostial stenosis (SBOS) developed after MV stenting.

Invasive Imaging in the Catheterization Laboratory: Expanding OCT

Annapoorna S. Kini, MD

Yuliya Vengrenyuk, PhD

ORBID (Three-Dimensional Optical Coherence Tomography Guided Assessment of Side Branch Vessel after Provisional Main Vessel Stenting in Coronary Artery Disease) study.

Coronary artery bifurcation lesions are a commonly encountered lesion subset observed in up to 15 to 20 percent percutaneous coronary intervention (PCI) procedures. Despite major advancements in bifurcation stenting approaches, treatment of bifurcation lesions remains a challenging area in interventional cardiology. Currently, provisional stenting, when the main vessel is treated first and the side branch (SB) is treated only if necessary, remains the main approach to treatment of the majority of bifurcation lesions. However, it may result in compromise of the SB ostium and in some cases may even lead to total occlusion of the SB, a complication associated with peri-procedural myocardial infarction and poorer long-term outcomes, making it important for interventional cardiologists to be able to identify at-risk patients before they undergo PCI.

Several intravascular ultrasound (IVUS) studies of bifurcation lesions established main vessel plaque or carina shift into the SB lumen as two main mechanisms of SB occlusion; however, they were not able to identify specific morphologic predictors of SB complication. Optical coherence tomography (OCT) is an emerging high-resolution intravascular imaging modality which allows visualization of the coronary pathophysiology in vivo with unprecedented detail and clarity comparable to histology. The aim of the ORBID study was to characterize the underlying plaque morphology of bifurcation lesions using OCT and identify the predictors of side branch ostial stenosis (SBOS) developed after main vessel stenting.

The prospective single-center study included 30 patients who did not have initial blockage in the SB ostium. After stenting, significant angiographic SBOS, defined as a stenosis of 50 percent or more, was observed in 30 percent of the patients. OCT image analysis showed that lesions from the affected patients were characterized by a higher prevalence of spotty calcifications and lipid-rich plaques with greater lipid arcs and higher lipid volume index compared to patients without SB stenosis. Multivariate logistic regression analysis identified maximal lipid arc and the presence of lipid plaque contralateral to SB ostium before stenting as independent predictors of significant SBOS after PCI.

The ORBID study demonstrated that OCT imaging of the main vessel before stenting can help identify bifurcation lesions, which might develop significant SBOS after provisional stenting. Predicting the risk of SB occlusion could improve clinical outcomes. Several techniques, including kissing balloon angioplasty, T-stenting, and cutting balloon angioplasty, can be used to protect the SB; however, they require more time and have more risks. A specialized procedure can be performed, when the risk of SB occlusion is high. The study results suggest that SB protection can be considered, when OCT imaging detects a large lipid plaque or spotty calcification in the main vessel lesion before PCI, even in cases without significant SB stenosis.

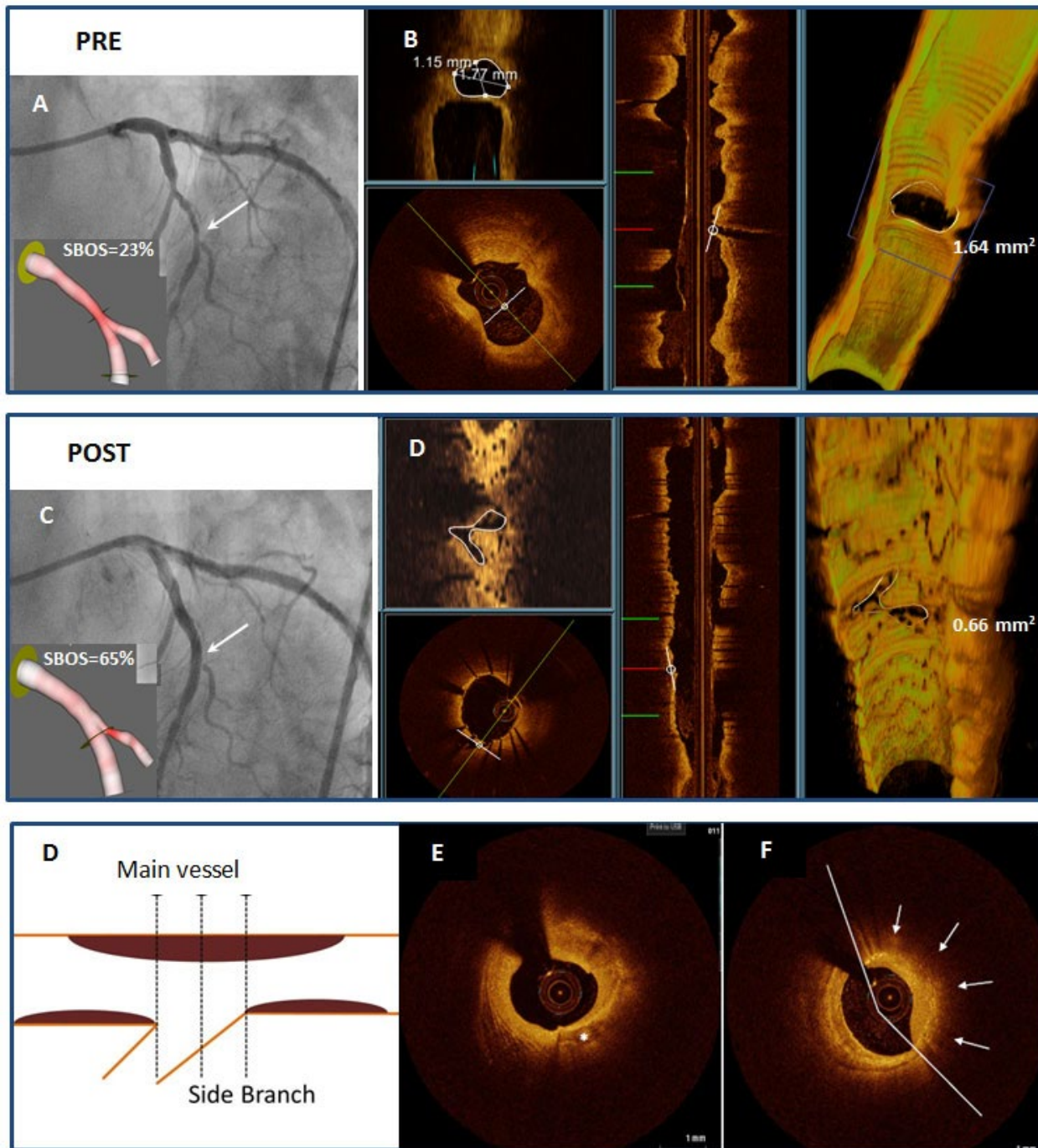


Figure. A representative ORBID case with side branch complication after main vessel stenting. A mid-LAD bifurcation lesion without significant side branch ostial stenosis (SBOS) is shown in a coronary angiogram (A, arrow) before stenting (PRE). After main vessel stenting (POST), a significant ostial stenosis of 65% developed in the SB ostium (C). According to 3D-OCT analysis, the SB ostium area was 1.64 and 0.66 mm² before (B, circled) and after provisional stenting (D, circled) respectively. OCT pullback of the main vessel (D) detected a spotty calcification (E, asterisk) and a large lipid-rich plaque contralateral to the SB ostium (F, arrows) before PCI.

Reference:

1. Kini AS, Vengrenyuk Y, Pena J, Yoshimura T, Panwar SR, Motoyama S, Kezbor S, Hasan CM, Palkhiwala S, Kovacic JC, Moreno P, Baber U, Mehran R, Narula J, Sharma SK. Plaque morphology predictors of side branch occlusion after provisional stenting in coronary bifurcation lesion: Results of optical coherence tomography bifurcation study (ORBID). *Catheter Cardiovasc Interv* 2017;89:259-268

Innovations for the Endovascular Treatment of Calcified Peripheral Arterial Disease

Key Points

- The incidence of PAD is rising in the U.S.
- Endovascular interventions have become increasingly common for treating arterial disease.
- New therapies offer greater options for patients with calcified lesions.

Prakash Krishnan, MD

The incidence and prevalence of peripheral arterial disease are rising in the United States. This is likely attributed to an increase in risk factors such as diabetes mellitus, hypertension, obesity, chronic kidney disease and an aging population. The last decade has seen exponential growth in the field of endovascular intervention for the management of peripheral arterial disease. An endovascular approach is preferred even for the most difficult lesion subsets (TASC C & D), a consensus that is supported among experts (Trans-Atlantic Society).

While the success rate of procedures has been enhanced by advancements in techniques and equipment, their durability remains a challenge. Durability is affected by many factors — one of which is calcium. Calcium in vessel walls, either intimal or medial, is a major negative predictor of procedural success, and until recently it was not uncommon to exclude patients with calcified lesions from major trials addressing therapies for peripheral arterial disease. Three novel therapies that the FDA approved in the last five years have brought forth a paradigm shift in the management of calcified arterial lesions.

The unique interwoven design of the Supera stent provides excellent radial force addressing the issue of recoil associated with calcified lesions. In addition, its kink- and fracture-resistant design makes it ideal for complex lesions when stenting is needed. The excellent results from the SUPERB Trial were shown in participants' freedom from clinically-driven target lesion revascularization (CD TLR) — 89% at 12 months, 84% at 24 months, and 82% at 36 months — making the Supera stent an essential tool for the treatment of complex calcified lesions.

The drug-coated balloon (DCB) that has shown promise in calcified lesions is the Stellarex DCB. The ILLUMENATE Pivotal Study, for which Dr. Krishnan was the Co-National Principal Investigator, demonstrated primary patency at day 365 of 82.3% for DCB vs. 70.9% for PTA ($p=0.002$). The rate of CD-TLR was significantly lower in the DCB cohort (7.9% vs. 16.8%, $p=0.023$). Improvements in ankle

brachial index, Rutherford class, and quality of life were comparable, but the PTA cohort required twice as many revascularizations. Of clinical importance, there was a high percentage of women (DCB: 44.0% vs. PTA: 36.0%, $p=0.185$), patients with diabetes (DCB: 49.5% vs. PTA: 52.0%, $p=0.683$), obesity (DCB: 39.5% vs. PTA: 30.0%, $p=0.107$) and a high degree of severe calcification (DCB: 43.9% vs. PTA: 43.0%, $p=0.877$). This makes the Stellarex DCB the only DCB to show safety and efficacy in a heavily calcific and complex lesion cohort.

Another innovative therapy is intravascular lithotripsy using the FDA-approved Shockwave balloon. Localized lithotripsy technology is grounded in the same fundamental principles as traditional lithotripsy, a trusted technology used to break up kidney stones. It utilizes semi-compliant balloon catheters with multiple lithotripsy emitters along the length of the balloon that create diffusive pulsatile mechanical energy to disrupt calcified lesions. The intermittent pulsatile pressure waves produced are inherently tissue-selective, passing through balloon walls and soft vessel tissue, preferentially interacting with calcified plaque. When the waves come in contact with calcium, they create a series of micro-fractures in the plaque, disrupting it, after which the vessel can be effectively dilated using low pressures. By breaking the calcium, the vessel wall becomes malleable and avoids dissection recoil, which may increase drug uptake and potentially minimize the need for stenting. This technology is currently being studied at Mount Sinai in the DISRUPT PAD III trial, a multi-center, single-arm study using the Shockwave Medical IVL System in combination with drug-coated balloon (DCB) therapy. The trial assesses short- and long-term outcomes compared to outcomes achievable using traditional balloon angioplasty (PTA) prior to DCB in a calcified patient population.

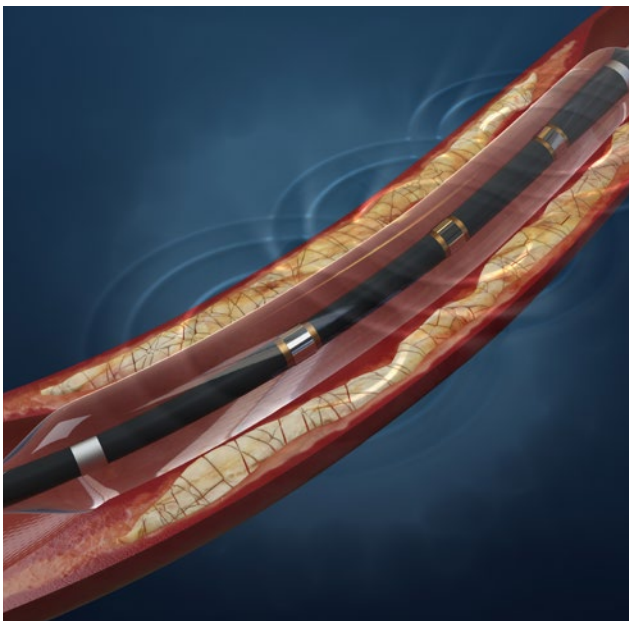
The field of endovascular intervention is making great strides in patient care with the continuing evolution of cutting-edge technology.



Supera Stent



Stellarex DCB



Shockwave Balloon



PATIENT: Robert Royal, 89

DIAGNOSIS: Critical limb ischemia, severe calcific occlusion of superficial femoral artery and infrapopliteal vessels.

TREATMENT: Successful endovascular intervention of the superficial femoral and popliteal arteries utilizing Stellarex drug-coated balloon and Supera stent

“My feeling is that, well, the procedure saved my life. It allowed me to be more energized. I’m so grateful.”

“I have a long history with a number of procedures for my heart and have undergone a below-knee amputation without being offered any alternatives. Last year, when I began having pain and ulcers in my legs, I went to my primary doctor. He explained I was having problems with circulation in my legs, so he recommended that I see a vascular specialist. The first specialist said that there were no options except amputation because my arteries were severely calcified. When I saw Dr. Krishnan, he said I had to have a stent placed in my leg in order to let the flow of blood come from my heart to my legs.

“Dr. Krishnan was so much more than helpful. He took the time to go step-by-step to tell me what the procedure was all about and what to anticipate. He was very clear and concise.

“Now I’m feeling fine! I go at least once a month to see Dr. Krishnan as a follow-up to make sure everything is okay.

“I’m back to my regular activities and feeling great. “My feeling is that, well, the procedure saved my life. It allowed me to be more energized. I’m so grateful.”

Evaluation and Treatment of Cardiac Allograft Vasculopathy in the Cardiac Catheterization Lab

Joseph Sweeny, MD

Key Points

- Cardiac allograft vasculopathy (CAV) is a leading cause of death beyond one year for heart transplant recipients.
- We are investigating better ways to detect and treat this narrowing of the arteries.

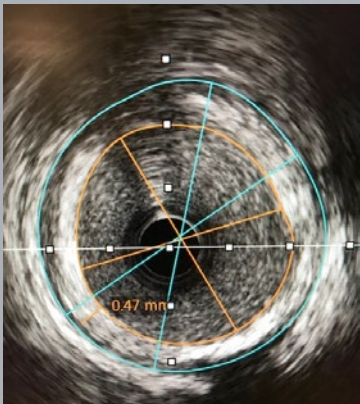


Figure 1. IVUS of the proximal LAD eight years after heart transplant showing concentric intimal thickening with maximal intimal thickness of 0.47mm.

Cardiac allograft vasculopathy (CAV) is a progressive fibroproliferative arteriopathy characterized by diffuse and concentric coronary intimal hyperplasia; it is one of the leading causes of death beyond one year in open-heart transplant (OHT) recipients. The incidence of CAV is approximately 8 percent at one year, 30 percent at five years and 50 percent at ten years. While the precise pathophysiology of CAV is not well understood, it is hypothesized to involve immune- as well as non-immune-mediated factors.

In 2010, the International Society for Heart & Lung Transplantation (ISHLT) developed a new classification system to standardize the diagnosis and treatment of this disease (Table 1). Invasive coronary angiography (ICA) remains the main screening tool used to detect CAV. Unfortunately, as ICA only assesses the coronary lumen and not the arterial wall remodeling that is characteristic of CAV, ICA alone has a limited sensitivity for detecting CAV in its early stages. With a resolution of 100 microns, intravascular ultrasound (IVUS) has provided important advances in this field, by detecting changes in the thickness of the inner lining of the coronary artery (intima) at an early stage, which translates into excellent prognostic information. Due to its higher sensitivity, combining coronary angiography with

intravascular ultrasound (IVUS) is now widely used for the diagnosis of CAV, as well as a prognostic tool, and has been shown to be one of the best surrogate markers for predicting outcomes from CAV (Figure 1). Published IVUS parameters of CAV include 1) intimal thickness, 2) intimal index, 3) change in maximal intimal thickness as a reference point, 4) total atheroma volume and 5) percentage of atheroma volume. An increase in maximal intimal thickness (MIT) of >0.5mm at a specific site in the coronary tree during the first year of transplant is considered rapidly progressive CAV and make it a poor prognostic indicator where an intimal thickness >0.6mm is associated with 10x risk of cardiac events.

Treatment of CAV has been a challenge for patients with OHT and largely revolves around immunosuppressive modification and rarely percutaneous coronary intervention (PCI) for selected patients. While PCI has a high immediate success rate, it is considered palliative in nature as PCI does not influence the progressive nature of CAV and is hampered by high rates of restenosis. Optimal candidates for PCI are those patients with focal stenosis of a proximal segment of a major primary vessel.

Table 1. ISHLT-Recommended Cardiac Allograft Vasculopathy Nomenclature

Classification	Severity	Definition
ISHLT CAV0	Not significant	No detectable angiographic lesions
ISHLT CAV1	Mild	Angiographic LM<50%, or primary vessel with maximum lesion of <70%, or any branch stenosis of <70%
ISHLT CAV2	Moderate	Angiographic LM≥50%; a single primary vessel ≥70%, or isolated branch stenosis of ≥70% in branches of 2 systems
ISHLT CAV3	Severe	Angiographic LM≥50%; or 2 or more primary vessels ≥70% stenosis, or isolated branch stenosis of ≥70% in all 3 systems; or ISHLT CAV1 or CAV2 with allograft dysfunction

Resources:

1. Mehra MR, Crespo-Leiro MG, Dipchand A, et al. International Society for Heart and Lung Transplantation working formulation of a standardized nomenclature for cardiac allograft vasculopathy – 2010. *J Heart Lung Transplant* 2010;29:717-27
2. Pollack A, Nazif T, Mancini D, et al. Detection and Imaging of Cardiac Allograft Vasculopathy. *J Am Coll Cardiol Img* 2013;6:613-623



PATIENT: David Hage, 60

DIAGNOSIS: Two-vessel coronary artery disease

TREATMENT: Placement of stent in right coronary artery

“If a doctor and patient can get along and just explain things to one another, what’s better than that?”

“Mount Sinai has been taking care of my family for many years, and I have all my faith and trust in them. When I went to see them, I was feeling uncomfortable with what I thought was heartburn.

“I know you get that from eating badly, and I knew I wasn’t doing that, so I decided to get it checked out since something wasn’t adding up. They told me that feeling I was having was a heart attack — and it’s a feeling not everyone goes to get checked out right away. Dr. Sweeny is a phenomenal doctor and really took great care of me. He explained that I had a 99 percent blockage and that he’d have to go in to clear the artery and put a stent in. And he’s concerned and caring. A lot of doctors, they come in, they’re not open with you, they don’t really talk with you. But Dr. Sweeny — he explained everything thoroughly to me

— everything before and after the procedure, what happened to me, what I had to do to change my lifestyle — and that’s what you want to hear when your life’s on the line. After the procedure, my breathing was better and I felt more comfortable, and catching it early is 100 percent why I’ve had such a good recovery. It’s good to be back to normal and just feeling better. I’ve gone back in for check-ups, and the nurses there are the best — they were a really important part of my care. The entire Cath Lab staff was excellent. I keep Dr. Sweeny’s instructions in mind and follow them: ‘Dave, you can’t imagine how important walking is and, if you’re able to get to the ocean or pool, swimming is an unbelievable exercise for your body and your heart.’ If a doctor and patient can get along and just explain things to one another, what’s better than that?”

Benefits of Radial Interventions

Key Points

- The radial artery as an access site for PCI results in fewer complications, faster ambulation and earlier discharge.
- Increasing amounts of data support the benefits of radial PCI in terms of improved survival in patients with ACS.
- While radial PCI in the U.S. is increasing, those most likely to benefit remain the least likely to receive this treatment (risk/treatment paradox).
- The Mount Sinai Hospital remains a local and national leader in transradial procedures and offers education to physicians nationwide in complex radial coronary procedures.

Nitin Barman, MD

Percutaneous coronary intervention (PCI) with stenting, in addition to medications, has remained the preferred treatment for symptomatic obstructive coronary artery disease (CAD) for decades. Originally performed through larger arteries including the femoral artery in the groin and the brachial artery in the upper arm, pioneers in the field of interventional cardiology demonstrated through the early 2000's the feasibility of conducting the procedure through the radial artery, a smaller artery in the wrist.

Utilizing the radial artery for coronary procedures results in less procedure-related bleeding and fewer vascular complications. Additionally, radial access for PCI has been shown to be strongly preferred by patients as it allows for earlier ambulation and discharge from the hospital, as well as return to normal function. One important trial was the MATRIX (Minimizing Adverse Hemorrhagic Events by Transradial Access Site and Systemic Implementation of Angiomax) study, which compared radial versus femoral access in patients with ACS (acute coronary syndrome) including STEMI (ST elevation myocardial infarction) heart attacks. This pivotal trial demonstrated a significant reduction in major cardiovascular events and bleeding in the radial group. More recent analysis of more than 6,000 patients in the VALIDATE-SWEDEHEART trial supported these findings. Similarly, in a large meta-analysis of all randomized trials addressing this issue, which included nearly 20,000 patients, ACS patients receiving radial access enjoyed a 28 percent reduction in all-cause mortality^(1,2). These powerful data led the European Society of Cardiology to adopt a Class 1A recommendation (strongest possible) for radial access for acute coronary syndrome, and the expectation is that the American College of Cardiology and American Heart Association will follow with a similar recommendation at the time of their next update⁽³⁾.

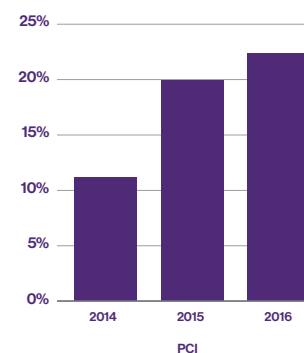
Despite these significant findings, the majority of patients in the United States undergoing PCI continue to receive their procedure through the groin. While there has been a consistent increase in utilization of

the radial artery for PCI, in general, patients who are the most likely to benefit from radial access (i.e. sicker patients) remain the least likely to receive radial PCI (the so-called risk/treatment paradox). This paradox occurs largely because of reduced operator experience, particular in these sicker patients. To surmount the risk/treatment paradox, and thus provide proven benefits to more patients, operators must achieve a higher proficiency in complex radial PCI. To this end, Mount Sinai has initiated a training course in complex radial PCI, available to providers throughout the nation, to teach the skills necessary to perform these complex radial procedures safely and successfully. Mount Sinai remains committed to providing the best possible care to all patients while educating other physicians in the process. Adhering to the mandates of patient care and education supports Mount Sinai's position as a local and national leader in the area of transradial procedures.

Resources:

1. Valgimigli M, et al. *Lancet*. 2015;385:2465-76
2. *European Heart Journal* (2016) 37, 267-315
3. Wimmer NJ, et al. *J Am Heart Assoc*. 2013 24;2(3):e000174

Growth of Radial Procedures at MSH



Prognostic Importance of Bleeding Post-DES

Roxana Mehran, MD

Dual-antiplatelet therapy (DAPT) is prescribed for patients undergoing percutaneous coronary intervention (PCI) with drug-eluting stent (DES) placement to reduce the risk of thrombotic events, such as stent thrombosis and myocardial infarction. However, DAPT increases the risk of major bleeding. But what is the prognostic importance of bleeding post-DES?

The association of BARC type 2 or 3 bleeding following PCI was the focus of a subgroup analysis of the PARIS (Patterns of Non-Adherence to Dual Antiplatelet Therapy in Stented Patients) registry. This prospective registry included 4,190 patients who were treated with DES in at least one native coronary artery. Bleeding occurred in 8.1% of patients. A risk model has been developed from the PARIS registry to predict risk of bleeding (Figure 1).

The ADAPT-DES study enrolled 8,582 all-comers PCI patients who were successfully treated with 1 or more DES, with a recommended duration of clopidogrel for one year and lifelong aspirin. In a recent analysis the incidence of post-discharge bleeding (PDB) was assessed, and the effect of PDB on mortality at 2 years of follow-up was assessed. In 6.6% of patients bleeding occurred within 2 years of follow-up. In 4.7% of patients bleeding did not require a transfusion; in 2.1% of patients the bleed required a transfusion. Most bleeds were gastrointestinal (61.7%), followed by peripheral bleeds (12.2%) and genitourinary bleed (8.6%). All-cause mortality and cardiac mortality at 2 years were higher in patients with PDB (as shown in Figure 2).

The TWILIGHT study is a large, prospective, double-blind, randomized clinical trial initiated and led by The Mount Sinai Hospital to evaluate the safety and efficacy of a potent P2Y12 receptor antagonist (ticagrelor) alone 3 months after PCI against ticagrelor and aspirin in high-risk patients treated with DES. This study will gain insight into whether bleeding can be reduced without increasing ischemic events by antiplatelet monotherapy.

References:

1. Coronary Thrombosis and Major Bleeding After PCI With Drug-Eluting Stents: Risk Scores From PARIS. *J Am Coll Cardiol*. 2016 May 17;67(19):2224-34. doi:10.1016/j.jacc.2016.02.064.
2. Incidence, Predictors, and Impact of Post-Discharge Bleeding After Percutaneous Coronary Intervention. *J Am Coll Cardiol*. 2015 Sep 1;66(9):1036-45. doi:10.1016/j.jacc.2015.06.1323.

Parameter	Score
Age, yrs	
<50	0
50-59	+1
60-69	+2
70-79	+3
≥80	+4
BMI, kg/m ²	
<25	+2
25-34.9	0
≥35	+2
Current smoking	
Yes	+2
No	0
Anemia	
Present	+3
Absent	0
CrCl <60 ml/min	
Present	+2
Absent	0
Triple therapy on discharge	
Yes	+2
No	0

Figure 1

Integer risk score for major bleeding.

Risk is categorized as low (0 to 3), intermediate (4 to 7) and high (≥ 8) risk of bleeding.

All-cause and cardiac mortality according to post-discharge bleeding.

Solid line presents all-cause mortality, and dotted line is cardiac mortality.

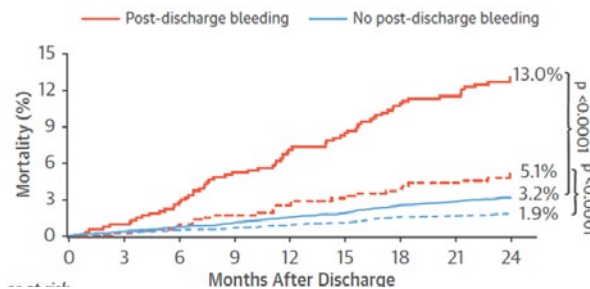


Figure 2

Key Points

- Dual-antiplatelet therapy is recommended for all patients receiving drug-eluting stents to prevent thrombotic events post-PCI. However, this dual-antiplatelet regimen increases the risk of bleeding.
- Post-discharge bleeding is associated with an increased risk of cardiac and all-cause mortality.
- Mount Sinai is conducting a large, prospective trial to evaluate the safety and efficacy of antiplatelet monotherapy with ticagrelor after 3 months in high-risk PCI patients.

Spontaneous Coronary Artery Dissection – Advances in Recognition, Cause and Treatment

Jason Kovacic, MD, PhD

An unusual cardiovascular condition, which we are increasingly recognizing to be of critical importance, is spontaneous coronary artery dissection (SCAD).

Although SCAD can present in different ways, it can most easily be thought of as a spontaneous “tearing” of a coronary artery. These different presentations of SCAD are shown in Figure 1, which in addition to an obvious tear (dissection — shown in A), can also include intramural hematoma or smooth narrowing, which involves bleeding into the wall of the artery — (seen in B and C), and the associated feature of severe tortuosity (an excessive and unusual number of curves in the artery — seen in D). A clinical example of a patient who presented with SCAD and was successfully treated at Mount Sinai is shown.

SCAD predominantly affects women (92–98 percent of cases) who are relatively young (45–52 years of age) and with a low burden of cardiovascular risk factors such as high cholesterol or smoking. Tragically, SCAD can be a fatal disease, as it can be the cause of acute myocardial infarction (AMI) in some patients. However, this is uncommon, and the vast majority of cases recover fully. Although SCAD has historically been considered rare, it is now appreciated to cause 2–4 percent of all cases of acute coronary syndrome and as much as 24 percent of myocardial infarction in women aged older than 50.

As far as what causes SCAD at the genetic level, at present almost nothing is known. However, SCAD is closely related to another disease called fibromuscular dysplasia (FMD) and up to 80 percent of SCAD patients have FMD. We have been working for more than five years to understand the cause of these diseases with a clinical study called DEFINE-FMD.

We shall soon have a greatly increased knowledge of the cause of SCAD, and how to best manage these patients.

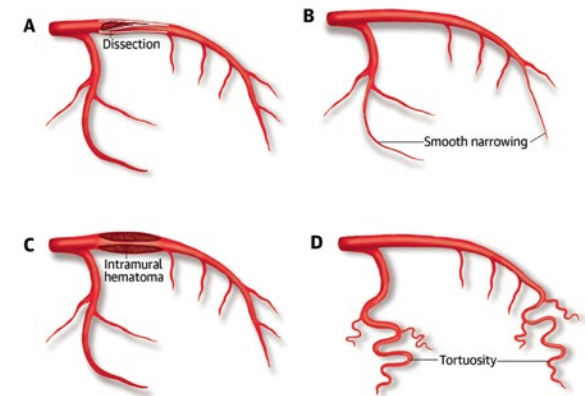


Figure 1: Possible ways SCAD may appear. (A) dissection, (B) smooth narrowing, (C) intramural hematoma and (D) tortuosity.

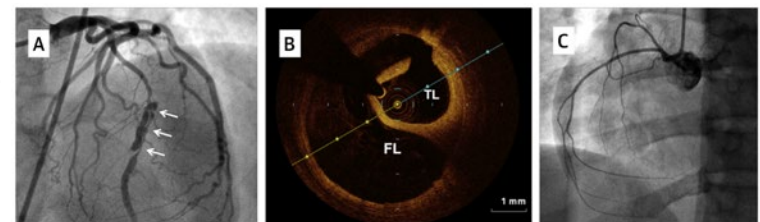


Figure 2: SCAD affecting the left anterior coronary artery successfully treated by stents. (A) Angiographic appearance of SCAD (arrows). (B) The same area of SCAD imaged by OCT with TL = true lumen and FL = false lumen (a false passage in the vessel.) (C) Normal right coronary artery of the same patient.

References:

1. Yip, A. & Saw, J. Spontaneous coronary artery dissection-A review. *Cardiovasc Diagn Ther* 5, 37-48 (2015).
2. Roleder, T., Sharma, R., Kini, A.S., Moreno, P. & Sharma, S.K. Imaging of postpartum coronary artery's spontaneous dissection treated with stents implantation. *European heart journal cardiovascular Imaging* 2013; 14, 503.
3. Michelis, K.C., Olin, J.W., Kadian-Dodov, D., d'Escamard, V. & Kovacic, J.C. Coronary artery manifestations of fibromuscular dysplasia. *J Am Coll Cardiol* 2014; 64, 1033-1046.

Key Points

- Spontaneous coronary artery dissection is drawing greater attention from interventional cardiologists.
- This “tearing” of a coronary artery primarily impacts women ages 45-52.
- We are investigating the causes of SCAD and its relationship to fibromuscular dysplasia.

Venous Ablation for Varicose Veins

Vishal Kapur, MD

Veins contain tiny valves that open and close as needed to ensure that blood flows in a one-way direction toward the heart. Varicose, or enlarged, veins occur when these valves become weakened or damaged, allowing blood to flow backward and pool in the veins. The condition may develop as the veins lose elasticity due to aging or smoking. It is also caused by increased pressure on the veins due to pregnancy, obesity, and standing or sitting for long periods of time.

Symptoms of varicose veins may include swelling in the lower leg or ankle, pain or achiness, and skin problems such as itching, discoloration, and, in severe cases, ulceration. While varicose veins are not life-threatening, they can lead to significant discomfort and disability, particularly for those who have jobs or activities that require them to stand for long periods of time. Since many varicose veins are not visible, they are frequently underdiagnosed and undertreated. Varicose veins are 2 times more prevalent than coronary heart disease (CHD) and 5 times more prevalent than peripheral arterial disease (PAD) — with 30 million affected patients. However, only 1.9 million patients each year seek treatment and fewer—only 447,000 patients—are treated each year.

Patients with varicose veins might be surprised to learn they can be easily diagnosed with a simple ultrasound. If treatment is needed, most cases are easy to treat on an outpatient basis with minimally invasive methods that require little or no recovery time.

Physicians at Mount Sinai Heart are experienced in using thermal endovenous ablation to treat varicose veins. In thermal ablation, laser energy or high frequency radiowaves are delivered to the vein via a catheter. The energy superheats the affected vein and closes it off, redirecting blood flow to healthy veins. We use Doppler ultrasound to locate the vein and guide placement of the catheter, which is inserted using

only local anesthesia. Endovenous thermal ablation is performed on a completely outpatient basis and is completed in 15-20 minutes. The patient is able to walk home immediately after the procedure. Surveillance venous ultrasound is performed at defined intervals as part of follow-up.

Laser and radiofrequency thermal ablation methods are proven to be equally effective, with trials showing similar one-year results in vein closure and reflux free period. At the end of 30 days, there is no difference in the pain and swelling between the two procedures. They are both considered standard of care in the treatment of varicose veins.

Venaseal® is a newer treatment option for patients with varicose veins. This method uses a specialized glue, which is introduced in the vein via a small catheter. The procedure is safe and equally effective as other methods of closing varicose veins and has the advantage of avoiding multiple needle sticks and nerve injury potential. However, the procedure is not always covered by insurance.



BEFORE



AFTER

Key Points

- Varicose veins are very common, affecting 30 million patients.
- Only a small percentage of patients seek and receive treatment for varicose veins.
- Diagnosis and treatment are easy and can be performed in an outpatient setting.
- Mount Sinai Heart employs the latest imaging and treatment modalities to ensure safe and effective treatment for varicose veins.

INNOVATIONS

Cardiac Urgent Care Centers

Key Points

- To ensure access to care for our patients and avoid unnecessary ED visits, we have created the Rapid Cardiac Evaluation Program.
- Patients who have been evaluated by their providers and deemed not “high risk” can be referred for same-day evaluation and diagnostic testing at Mount Sinai West (MSW).
- The program operates Monday through Friday, 8 am to 6 pm, and is staffed by a designated cardiologist.

Jeffrey Bander, MD

Walk-in cardiology evaluation for patients with new-onset cardiac symptoms.

Patients with chest pain and other cardiac symptoms account for approximately 10 percent of all emergency department (ED) consultations.¹ Many of the low-risk patients who present with cardiac symptoms can avoid the ER if they can be seen immediately and if appropriate testing can be performed. These patients can appropriately be identified by primary care physicians (PCPs) and urgent care providers; however, because same-day cardiac testing is difficult to obtain and arrange, patients are often sent to the ED.

Given the need of the Mount Sinai Health System and our partners to ensure access to care for our patients and avoid unnecessary ED visits, we have created the Rapid Cardiac Evaluation Program. Mount Sinai Heart at Mount Sinai West (MSW), centrally located in Manhattan across the street from the MSW ED, serves as a central hub. Patients who have been evaluated by their providers and deemed not “high risk”^{**} can be referred for same-day evaluation and diagnostic testing.

With the tremendous growth of urgent care centers, patients are accustomed to having medical services available on demand and don't want to wait for appointments, especially when dangerous cardiac symptoms arise.

The program operates Monday through Friday, 8 am to 6 pm, and is staffed by a designated cardiologist. Exercise treadmill testing, echocardiograms and stress echocardiograms can be performed on-demand. Same-day nuclear stress and CCTA are available as well.

1. Mozaffarian D. et al. *Circulation* 2015; 131, e29-322.

Where:

MSH Rapid Evaluation Center

Mount Sinai West

425 W 59th St #9c,

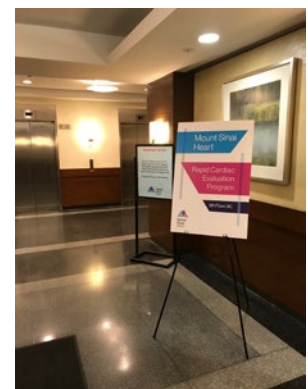
New York, NY 10019

Tel: 212-752-2700

Fax: 855-281-8629

Guggenheim Pavilion 6th Floor Non-Invasive Suite

Referrals can be sent via ReferWell or Par8o. Please call 347-642-8970 for verbal handoff. If a study will require prior authorization, please allow up to two hours. If admission is warranted, a call will be made to the referring physician. If appropriate, patients will be directly admitted and will not need to go to the ER and will be taken care of by our team.



DAPT Interruption for Non-Cardiac Surgery

Usman Baber, MD

Each year, thousands of patients with coronary artery disease (CAD) undergo percutaneous coronary intervention (PCI) with stent implantation. Among these, a significant number will also require non-cardiac surgery after PCI. In the Patterns of Non-Adherence to Anti-Platelet Regimens in Stented patients (PARIS) registry, we found that approximately 10 percent of patients will require a surgical procedure over the two years following PCI. Major surgeries usually include abdominal, cardiothoracic or orthopedic operations, while endoscopies constitute most of the minor procedures.

The clinical management of patients with coronary stents who require surgery is challenging for several reasons. First, stent implantation mandates antiplatelet medications to prevent clotting (thrombosis) of the stents. In general, patients are treated with two medications (aspirin and clopidogrel). These medications are usually interrupted for surgery, which can increase the risk of stent thrombosis. Secondly, bleeding is a major complication of surgery, and risk increases in patients who are taking blood-thinning medications. As a result, clinicians must take into account the simultaneous consideration of stopping antiplatelet medication, bleeding risks and the impact of delaying surgery.

In 2016 the American College of Cardiology and the American Heart Associations (ACC/AHA) released an updated guideline statement that includes recommendations to inform clinical decisions in this very complex clinical scenario.² First, elective surgery should be delayed at least one month after implantation of a bare metal stent or six months after a drug-eluting stent (DES). Surgery may be performed three months after DES implants if it is deemed that the risk of delaying surgery is too great. Secondly, interruption of antiplatelet medications should be

brief, and one medication should be continued during the perioperative period. In the PARIS registry, interruptions lasted no longer than 14 days and among those with interruption only 1.0 percent experienced a thrombotic event during this time interval. In addition, most interruptions involved clopidogrel alone, with most patients undergoing surgical procedures while taking aspirin. Hence, brief interruptions of clopidogrel alone appear to be safe and are currently endorsed in contemporary guidelines.

Notwithstanding the evidence for elective surgery, there are other instances when need for surgery after PCI is not anticipated. In these cases, decision-making is even more problematic. One option is the use of a short-acting intravenous medication that inhibits platelets (cangrelor).

DAPT interruption for surgery after PCI remains a challenging clinical arena that continues to evolve. At present, decision-making centers on balancing risks of thrombosis and bleeding and requires an approach that includes the treating surgeon, cardiologist and patient.

References:

1. Schoos M et al., Causes, Timing, and Impact of Dual Antiplatelet Therapy Interruption for Surgery (from the Patterns of Non-Adherence to Anti-Platelet Regimens In Stented Patients Registry). *Am J Cardiol* 2017; 120:904–910.
2. Levine GN et al., 2016 ACC/AHA Guideline Focused Update on Duration of Dual Antiplatelet Therapy in Patients with Coronary Artery Disease. *JACC* 2016; 68.

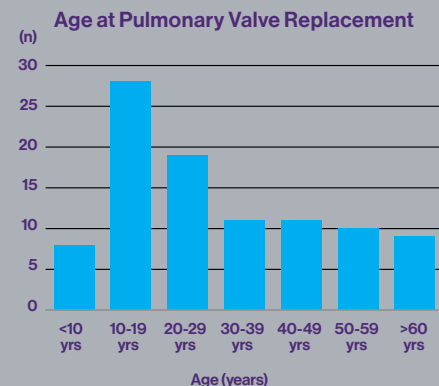
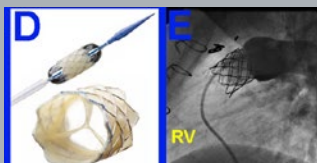
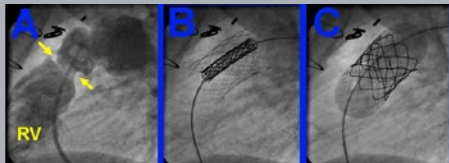
Key Points

- Approximately 10 percent of patients will require a surgical procedure over the two years following PCI.
- Antiplatelet therapy, typically prescribed after stent implantation, is interrupted for surgery. This can increase the chance of bleeding events.
- The patient and their medical team must balance risks of thrombosis and bleeding when making decisions about interruption of antiplatelet therapy.

Transcatheter Pulmonic Valve Replacement (TPVR)

Key Points

- Congenital heart disease is often treated with surgically placed conduits between the right ventricle and pulmonary artery.
- These conduits often need to be surgically replaced throughout the patient's life, with an increased risk with each reoperation.
- New transcatheter options for pulmonary valve placements eliminate the need for open surgery and are associated with a low risk of complications.



Barry Love, MD

Surgically placed conduits between the right ventricle and the pulmonary artery are used to palliate several forms of congenital heart disease. No matter the choice of conduit, they invariably become dysfunctional over time with stenosis, regurgitation or both. Patients with right-ventricle-to-pulmonary-artery conduits as well as those with prosthetic pulmonary valves are subject to a lifetime need for conduit/valve replacements. Previously, the only option for conduit revision was surgery. Surgical conduit replacement has a significant risk of serious complications, and the risk increases with each subsequent reoperation. Prolonging the life of the conduit, which decreases the need for repeat surgeries, is clearly advantageous for this patient population.

The first transcatheter valve to receive FDA approval for any indication was the Melody valve in 2010. This valve was approved to treat stenotic and regurgitant pulmonary conduits. The valve received full FDA approval in 2015 and in 2017 was approved to treat valve-in-valve pulmonary indications. The Melody valve is expandable to 22mm (range 18-22mm).

The Edwards Sapien XT was granted FDA approval for use in the pulmonary position in 2016. The Mount Sinai team was the first to implant this valve in the pulmonary position after FDA approval. Though somewhat more difficult to deliver, the valve offers the advantage of larger sizes (23mm, 26mm and 29mm) for larger-sized conduits. Mount Sinai continues to participate in investigation in this area as a part of the Edwards Compassion XT study of long-term follow-up of these valves in the pulmonary position.

Unlike transcatheter aortic valves, owing to the compliance of right-sided structures, both valves require pre-stenting of the conduit prior to implantation of the valve.

Mount Sinai has wide experience implanting these valves in children as well as adults. Owing to the large number of patients who have undergone the Ross procedure at Mount Sinai, we have a larger proportion of our patients who have received TPVRs for this indication than most other centers.

The incidence of major complications with transcatheter pulmonary valve placement is low. There is a small (~1%) risk

of conduit rupture with aggressive expansion of stenotic conduits that can usually be managed with covered stents. Coronary artery compression can potentially occur if the conduit courses adjacent to a coronary artery — most often in patients who have undergone the Ross procedure. Late follow-up has shown good valve function over time.

Transcatheter pulmonary valve replacement is now the procedure of choice for children and adults with right-ventricle-to-pulmonary-artery-conduits who have significant stenosis or regurgitation.

Case example:

A 20-year-old woman with a history of pulmonary stenosis as an infant had undergone surgical valvotomy at age 3 months and then surgical pulmonary valve replacement with a xenograft valve 1 year prior. This valve rapidly became dysfunctional with stenosis and regurgitation.

The patient was brought to the catheterization laboratory where hemodynamics showed a 45 mmHg peak-to-peak gradient across the prosthetic pulmonary valve with severe pulmonic insufficiency (Fig A). A Palmaz 3110 stent was first expanded to 22 mm in the outflow tract to provide a more rigid scaffold for the valve, and then the Melody valve (Fig D) was then delivered on a 22mm delivery system and expanded within the Palmaz stent (Fig B,C). After valve placement, the stenosis and regurgitation were completely eliminated (Fig E). The patient was discharged the following day and back to school the next week.

Figure legend:

A: Pulmonary artery angiogram in the lateral projection showing stenosis at the level of the pulmonary xenograft valve (arrows). Severe regurgitation is seen with contrast refluxing into the right ventricle (RV).

B: After stenting across the stenotic area, the Melody valve is positioned with the delivery system. The platinum-iridium stent is more radio-opaque than the stainless steel stent already in position.

C: Balloon expansion of the Melody valve.

D: Photograph of the Melody valve, and the Melody valve on the balloon of the Ensemble delivery system.

E: Pulmonary artery angiogram after Melody valve placement showing a competent valve.

Transcatheter Tricuspid Valve Repair (TTVR)

Gilbert Tang, MD

Moderate or greater tricuspid regurgitation (TR) affects more than 1.6 million patients — but currently only 0.4 percent undergo surgical treatment. Many patients who have had prior mitral valve surgery, intervention or pacemaker/AICD implantation have significant TR. They often suffer from shortness of breath, fatigue, bloated abdomen, liver congestion, leg edema, and right heart failure, and if left untreated some symptoms can result in death. Tricuspid valve surgery can be high-risk, and there have been no minimally invasive treatment options for these patients, until now.

Built upon the excellent outcomes in surgical tricuspid valve repair, The Mount Sinai Hospital is proud to be one of the four hospitals in the U.S. to offer the transcatheter Tricuspid Clip (TriClip) repair in patients who have symptomatic moderate or greater TR and who are considered high-risk for open-heart surgery. As part of the TRILUMINATE trial, The Mount Sinai Hospital is the only site in the eastern U.S. to offer this innovative therapy. The Tricuspid Clip offers the same features and excellent safety profile as the MitraClip device; more than 600 transcatheter tricuspid valve repairs with the MitraClip system have been performed worldwide. Enrollment for the TRILUMINATE study has already begun, and we look forward to treating patients with symptomatic tricuspid disease without open-heart surgery.

References:

1. Tang GH. Tricuspid clip: step-by-step and clinical data. *Interv Cardiol Clin* 2018;7:37-45.
2. Tang GH, Kaple R, Cohen M, Dutta T, Undemir C, Ahmad H, Poniros A, Bennett J, Feng C, Lansman SL. First percutaneous Micra leadless pacemaker implantation and tricuspid valve repair with MitraClip NT for lead-associated severe tricuspid regurgitation. *Eurointervention* 2017;12:e1845-8.



Key Points

- Tricuspid regurgitation impacts more than 1.6 million patients, but only a small percentage receive surgical treatment.
- Symptoms include shortness of breath, fatigue, bloated abdomen and liver congestion.
- The Mount Sinai Hospital is the only site in the eastern U.S. to offer the transcatheter Tricuspid Clip (TriClip).

Top Ten Major Publications of 2017



1. Intracoronary Imaging, Cholesterol Efflux, and Transcriptomics after Intensive Statin Treatment in Diabetes

Surbhi Chamaria, Kipp W. Johnson, Yuliya Vengrenyuk, Usman Baber, Khader Shameer, Aparna A. Divaraniya, Benjamin S. Glicksberg, Li Li, Samit Bhatheja, Pedro Moreno, Akiko Maehara, Roxana Mehran, Joel T. Dudley, Jagat Narula, Samin K. Sharma & Annapoorna S. Kini

Sci Rep. 2017; 7: 7001. 2017 Aug 1. doi: 10.1038/s41598-017-07029-7

Clinical Implication: Bayesian network analysis revealed key driver genes within these modules. These transcriptomic findings might provide potential mechanisms responsible for the higher cardiovascular risk in DM patients.



2. Increased Lipid Length, Macrophage Infiltration, and Neovascularization in Coronary Atheroma From Patients With Chronic Kidney Disease

Jacobo Pena, Yuliya Vengrenyuk, Safwan Kezbor, Takahiro Yoshimura, Jason C. Kovacic, Samin K. Sharma, Usman Baber, Annapoorna S. Kini, Jagat Narula and Pedro R. Moreno

JACC: Cardiovascular Imaging Apr 2017, 2220; DOI: 10.1016/j.jcmg.2017.01.019

Clinical Implication: The study demonstrated higher lipids macrophage and neovascularization as the pathogenetic mechanism of CAD in patients with CKD.



3. Stellarex Drug-Coated Balloon for Treatment of Femoropopliteal Disease: Twelve-Month Outcomes From the Randomized ILLUMENATE Pivotal and Pharmacokinetic Studies

Prakash Krishnan, Peter Faries, Khusrow Niazi, Ash Jain, Ravish Sachar, William B. Bachinsky, Joseph Cardenas, Martin Werner, Marianne Brodmann, J. A. Mustapha, Carlos Mena-Hurtado, Michael R. Jaff, Andrew H. Holden, Sean P. Lyden

Circulation. 2017 Sep 19;136(12):1102-1113. doi:10.1161/CIRCULATIONAHA.117.028893. Epub 2017 Jul 20

Clinical Implication: The data demonstrate superior safety and effectiveness of the Stellarex DCB in comparison with PTA, and plasma levels of paclitaxel fall to low levels within 1 hour.



4. An Algorithm for the Use of Embolic Protection During Atherectomy for Femoral Popliteal Lesions

Prakash Krishnan, Arthur Tarricone, K. Raman Purushothaman, Meerarani Purushothaman, Miguel Vasquez, Jason Kovacic, Usman Baber, Vishal Kapur, Karthik Gujja, Annapoorna Kini and Samin Sharma

JACC: Cardiovascular Interventions Feb 2017, 10 (4) 403-410; DOI: 10.1016/j.jcin.2016.12.014

Clinical Implication: Chronic total occlusion, in-stent restenosis, thrombotic, calcific lesions >40 mm, and atherosclerotic lesions >140 mm identified by peripheral angiography necessitate concomitant filter use during atherectomy to prevent embolic complications.



5. Clinical and Angiographic Predictors of Haemodynamically Significant Angiographic Lesions: Development and Validation of A Risk Score to Predict Positive Fractional Flow Reserve

Nishtha Sareen, Usman Baber, Safwan Kezbor, S Sayseng, Melissa Aquino, Roxana Mehran, Joseph Sweeny, Nitin Barman, Annapoorna Kini, Samin Sharma

EuroIntervention. 2017 Apr 7;12(18):e2228-e2235. doi: 10.4244/EIJ-D-16-00749

Clinical Implication: We identified several clinical and angiographic characteristics and formulated a scoring system to guide the approach to intermediate lesions. This may translate into cost savings. Larger studies with prospective validation are required to confirm our results.



6. 2017 ACC Expert Consensus Decision Pathway on Management of Bleeding in Patients on Oral Anticoagulants. A Report of the American College of Cardiology Task Force on Expert Consensus Decision Pathways

Gordon F. Tomaselli, Kenneth W. Mahaffey, Adam Cuker, Paul P. Dobesh, John U. Doherty, John W. Eikelboom, Roberta Florido, William Hucker, Roxana Mehran, Steven R. Messé, Charles V. Pollack Jr., Fatima Rodriguez, Ravindra Sarode, Deborah Siegal and Barbara S. Wiggins

Journal of the American College of Cardiology Dec 2017, 24302; DOI: 10.1016/j.jacc.2017.09.1085

Clinical Implication: The primary objective of this decision pathway is to provide a clinically applicable, easily referenced conceptual framework to support clinician decision making while caring for patients with bleeding complications during OAC therapy. The writing committee considered patients taking anticoagulant therapy for any indication to broaden the potential clinical use and impact of the decision pathway.



7. Associations Between Chronic Kidney Disease and Outcomes With Use of Prasugrel Versus Clopidogrel in Patients With Acute Coronary Syndrome Undergoing Percutaneous Coronary Intervention: A Report From the PROMETHEUS Study

Usman Baber, Jaya Chandrasekhar, Samantha Sartori, Melissa Aquino, Annapoorna S.Kini, Samir Kapadia, William Weintraub, Joseph B. Muhlestein, Birgit Vogel, Michela Faggioni, Serdar Farhan, Sandra Weiss, Craig Strauss, Catalin Toma, Anthony DeFranco, Brian A. Baker, Stuart Keller, Mark B. Efron, Roxana Mehran

JACC Cardiovasc Interv. 2017 Oct 23;10(20):2017-2025. doi: 10.1016/j.jcin.2017.02.047. Epub 2017 Aug 2

Clinical Implication: Although risks for 1-year MACE were significantly higher in ACS PCI patients with versus without CKD, prasugrel use was 50% lower in patients with renal impairment. Irrespective of CKD status, outcomes associated with prasugrel use were not significant after propensity adjustment. These data highlight the need for randomized studies evaluating the optimal antiplatelet therapy in CKD patients with ACS.



8. Everolimus-Eluting Bioresorbable Scaffolds Versus Everolimus-Eluting Metallic Stents

Sabato Sorrentino, Gennaro Giustino, Roxana Mehran, Annapoorna S. Kini, Samin K. Sharma, Michela Faggioni, Serdar Farhan, Birgit Vogel, Ciro Indolfi and George D. Dangas

Journal of the American College of Cardiology Jun 2017, 69 (25) 3055-3066; DOI: 10.1016/j.jacc.2017.04.011

Clinical Implication: Compared with metallic EES, the BVS appears to be associated with both lower efficacy and higher thrombotic risk over time. (Bioresorbable vascular scaffold compare to everolimus stents in long-term follow-up.)



9. Impact of Diabetes Mellitus on the Pharmacodynamic Effects of Ticagrelor Versus Clopidogrel in Troponin-Negative Acute Coronary Syndrome Patients Undergoing Ad Hoc PCI

Joseph M. Sweeny, Dominick J. Angiolillo, Francesco Franchi, Fabiana Rollini, Ron Waksman, Ganesh Raveendran, George Dangas, Naeem Khan, Glenn F. Carlson, Yonggang Zhao, Renli Teng, Roxana Mehran

J Am Heart Assoc. 2017 Mar 29;6(4). pii: e005650. doi: 10.1161/JAHA.117.005650

Clinical Implication: Compared with clopidogrel, ticagrelor achieved faster, enhanced platelet inhibition and reduced high on-treatment platelet reactivity rates, in DM and non-DM patients.



10. Unraveling the Complex Genetics of Coronary Artery Disease

Jason C. Kovacic, MD, PhD

J Am Coll Cardiol. 2017 Feb 21;69(7):837-840. doi: 10.1016/j.jacc.2016.12.007

Clinical Implication: In the current study in the Journal, the consortium leveraged the data set to look for novel common variants associated with CAD; the consortium identified and validated 6 new variants associated with CAD at genome-wide significance, the genes KCN13-GIGYF2, C2, MRVI1-CTR9, LRP1, SCARB1, and CETP.

Research and Clinical Trials

- There are more than 60 research trials going on in the Cardiac Catheterization Laboratory at The Mount Sinai Hospital.

- Our Catheterization Laboratory is among the top enrollers for many of the research trials in the United States.

- These trials have resulted in advancement of the field of interventional cardiology and FDA approval of many new devices.

Study Title	Study Details	Sponsor	Principal Investigator(s)	Target Enrollment and Study Sites	Current Status/ Enrollment at MSH
COAPT Trial	The purpose of the Cardiovascular Outcomes Assessment of the MitraClip® Percutaneous Therapy for Heart Failure Patients with Functional Mitral Regurgitation (COAPT) Trial is to confirm the safety and effectiveness of the MitraClip System for the treatment of moderate-to-severe or severe functional mitral regurgitation (FMR) in Symptomatic Heart Failure Subjects.	Abbott Vascular	S. Sharma	612 (USA) 52 Centers	Completed/ 5 subjects enrolled
EVOLUT-R Low Risk TAVR Trial	Transcatheter Aortic Valve Replacement (TAVR) in patients with severe, symptomatic Aortic Stenosis (AS) at low surgical risk by randomizing patients to either Surgical Aortic Valve Replacement (SAVR) or TAVR with the Medtronic CoreValve® System.	Medtronic Inc.	S. Sharma	1,200 (USA) 75 Centers	Ongoing/ 6 subjects enrolled
HYBRID Trial	Randomized Trial of Hybrid Coronary Revascularization Versus Percutaneous Coronary Intervention in Multi-vessel Coronary Artery Disease.	NHLBI	S. Sharma J. Puskas	2,250 (Global) 60 Centers	Ongoing/ 1 subject enrolled
GALILEO Trial	Global multi-center, open-label, randomized, event-driven, active-controlled study comparing rivaroxaban-based antithrombotic strategy to an antiplatelet-based strategy after transcatheter aortic valve replacement (TAVR) to optimize clinical outcomes.	Bayer Pharma AG	A. Kini	1,520 (Global) 65 Centers	Ongoing/ 42 subjects enrolled
Renal Guard Trial	A study to evaluate RenalGuard System Safety & Efficiency When Compared With Standard Care in the Prevention of Contrast Induced Nephropathy (CIN) in the setting of a Catheterization Laboratory.	PLC Medical Systems	G. Dangas	326 (USA) 20 Centers	Ongoing/ 52 subjects enrolled

Study Title	Study Details	Sponsor	Principal Investigator(s)	Target Enrollment and Study Sites	Current Status/ Enrollment at MSH
ORBID-FFR Trial	Optical Coherence Tomography Predictors of Functionally Significant Side Branch Compromise after Provisional Main Vessel Studying in Coronary Artery Disease Assessed by Fractional Flow Reserve.	Boston Scientific Corp.	A. Kini	150 (USA) 1 Center	Ongoing/ 23 subjects enrolled
ENVISAGE TAVI-AF Trial	Edoxaban versus standard of care and their effects on clinical outcomes in patients having undergone Transcatheter Aortic Valve Implantation – in Atrial Fibrillation .	Daichi-Sankyo	G. Dangas	120 sites in Europe, N. America, Japan and S. Korea	Ongoing/ 25 subjects enrolled
XIENCE SHORT-DAPT Study	Comparing three-month DAPT duration after Xience DES in patients with high risk bleeding.	Abbott/ Cardiovascular Systems Inc.	U. Baber	400 (USA) 40 Centers	Ongoing/ 5 subjects enrolled
SPYRAL HTN ON/OFF Study	Global Clinical Study of Renal Denervation with the Symplicity Spryal™ multi-electrode renal denervation system in Patients with Uncontrolled Hypertension in the Absence of Antihypertensive Medications.	Medtronic Inc.	G. Dangas	220 (USA) 15 Centers	Ongoing/ 31 subjects enrolled
TWILIGHT Study	Ticagrelor with Aspirin or Ticagrelor Alone in High-Risk Patients After Coronary Intervention.	AstraZeneca	S. Sharma	9,000 (Global) 120 Centers	Ongoing/ 124 subjects enrolled

Full-Time Senior Attendings



Samín K. Sharma, MD, FACC, FSCAI

Director, Clinical and Interventional Cardiology
President, Mount Sinai Heart Network
Dean of International Clinical Affiliations
Anandi Lal Sharma Professor of Medicine in Cardiology

Education and Training

- MBBS: SMS Medical College Jaipur, India
- Residency, Internal Medicine: NY Infirmary; Beekman Downtown Hospital, NY
- Fellowship, Cardiology: City Hospital Center at Elmhurst, NY
- Fellowship, Interventional Cardiology: The Mount Sinai Hospital, NY

Samín K. Sharma, MD, is an interventional cardiology expert, well known for performing high-risk complex coronary interventions with an extremely high success rate (>99 percent) while achieving an extremely low complication rate (<0.5 percent major complication). He has received the prestigious two-star designation (significantly lower than expected mortality) numerous times by the New York State Department of Health and the Governor's Award of Excellence in Medicine in 1996. He served on New York State's Cardiac Advisory Board from 2004 to 2016. Under Dr. Sharma's leadership, The Mount Sinai Hospital Cardiac Catheterization Laboratory has become one of the safest and busiest centers in New York, providing state-of-the-art cardiac and interventional care for all types of simple and complex heart patients. In addition to coronary interventions, Dr. Sharma specializes in the non-surgical treatment of mitral and aortic valve disease including Transcatheter Aortic Valve Replacement (TAVR) and MitraClip procedures (TMVR). Dr. Sharma is the founder of www.ccllivecases.org, an excellent resource for teaching complex coronary, endovascular and structural intervention to >10,000 people per month globally. Over the years, Dr. Sharma has received numerous awards for his teaching to residents, fellows and interventional fellows, including the coveted Simon Dach Best Teacher Award in 1998.

He has been dubbed "master of the Rotablator" and is regularly featured on national and local TV and in newspapers and magazines including *Newsday*, *Newsweek*, *The New York Times*, *The New York Post*, *Forbes*, *The Wall Street Journal*, *The New York Daily News*, *The Washington Post*, *New York Magazine*, *India Abroad*, and *India Today*. He has received numerous awards: 2015 Honorary Master of Science PhD degree by Rajasthan University Jaipur India, 2014 Distinguished Physician Scientist by AAPI-QLI for excellence in Medicine, 2011 Ellis Island Medal of Honor, 2011 American Heart Association Achievement in Cardiovascular Science & Medicine Award, 2011 American Association of Physicians of Indian Origin (AAPI) Physician of the Year, 2010 Association of Indians in America (AIA) for excellence in Medicine, 2003-2007 and 2010-2017 Best Doctors by *New York Magazine*, 2008-2017 Super Doctors, 2007 Jacobi Medallion Award by The Mount Sinai Hospital, and 2007 Physician of the Year by The Mount Sinai Hospital. He has authored more than 250 papers and 15 book chapters in the field of coronary interventions, structural heart disease and safety of percutaneous interventions. He is also a philanthropist, and The Mount Sinai Hospital Cardiac Catheterization Laboratory is now named the Dr. Samín K. Sharma Family Foundation Cardiac Catheterization Laboratory. Dr. Sharma has built a 250-bed heart hospital (EHCC) in his native Jaipur, India, to provide the best care to all patients irrespective of their financial and social status.

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Clinical Interests:

Coronary Artery Disease
Interventional Cardiology
Valvular Intervention

Annapoorna S. Kini, MD, MRCP, FACC

Director, Cardiac Catheterization Laboratory
Interventional Director, Structural Heart Program
Director, Interventional Cardiology Fellowship Program
Zena and Michael A. Wiener Professor of Medicine, Cardiology

Education and Training

- MBBS: Kasturba Medical College Mangalore, India
- Residency, Medicine/Cardiology: University of Wales Cardiology, UK
- Fellowship, Cardiology: The Mount Sinai Hospital, NY
- Fellowship, Interventional Cardiology: The Mount Sinai Hospital, NY

Annapoorna Kini, MD, performs more than 1,000 coronary interventions annually (the highest number by a female interventionalist in the United States) with an extremely low complication rate of <0.3 percent. According to the New York State Department of Health Report for 2004-2006, 2005-2007, 2009-2011, 2011-2013, and 2012-2014, Dr. Kini received the two-star status for percutaneous coronary intervention (PCI) safety among >500 other interventionalists. She is highly regarded for performing complex coronary interventions, especially in chronic total occlusions for patients with advanced heart disease, with the utmost safety and excellent long-term results. She is also a national expert in various intracoronary imaging modalities such as optical coherence tomography and near-infrared spectroscopy. Dr. Kini also specializes in the non-coronary interventions of mitral and aortic balloon valvuloplasty, alcohol septal ablation for obstructive hypertrophic cardiomyopathy, catheter-based aortic valve implantations (TAVR), and mitral valve therapies. As director, she has taken a leadership role in enhancing the research programs of The Mount Sinai Hospital Cardiac Catheterization Laboratory. Several projects in coronary imaging are currently under way, including the YELLOW Trial and various YELLOW substudies. The most recent YELLOW II study was an ambitious translational combination of multi-modality imaging with clinically relevant cellular biology and comprehensive transcriptomics.

Dr. Kini is an excellent teacher, and is dedicated to the teaching of both cardiology and interventional fellows. She is the Director of the largest Interventional Cardiology Fellowship Program. In fact, the 2012 batch of Mount Sinai interventional fellows created a teaching award in her name, The Annapoorna S. Kini Fellows' Choice Award for excellence in teaching. She was the recipient of this award for several years. Dr. Kini is the Director of the Annual Live Symposium of Complex Coronary & Vascular Cases at The Mount Sinai Hospital, one of the most attended and respected meetings in the field of interventional cardiology in the country. She is the director of monthly live web casts and plays a key role in educating interventionalists globally in the technical aspects of complex coronary interventions via monthly webcasts on www.ccclivecases.org and www.structuralheartlivecases.org with a worldwide audience of several thousand physicians in more than 132 countries.

She is the recipient of 2011 Dean's Award for Excellence in Clinical Medicine at The Mount Sinai Hospital for unprecedented clinical skills. She was listed as a *New York Times Magazine* "Super Doctor" every year since 2009, "Best Doctor" from *New York Magazine* in 2017 and was awarded "The Physician of the Year" in 2014 by the nurses association of The Mount Sinai Hospital. She received the Excellence in Medicine Award from the National Association of Physicians of India (AAPI) in July 2016 and the Ellis Island Medal of Honor in 2017.



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Clinical Interests:
Intravascular Imaging
Interventional Cardiology: CTO
Hypertrophic Obstructive Cardiomyopathy



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Clinical Interests:

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Peripheral Artery Disease
Endovascular Intervention



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Clinical Interests:

Interventional Cardiology
Valvular Heart Disease
Endovascular Intervention

Prakash Krishnan, MD, FACC

Director of Endovascular Services, The Mount Sinai Health System
Associate Professor of Medicine (Cardiology)

Education and Training

- MBBS: Rajah Muthiah Medical College, Chidambaram, Tamil Nadu, India
- Residency, Internal Medicine: St. Vincent's Medical Center of Richmond, New York, NY
- Fellowship, Cardiology: Ochsner Clinic Foundation, New Orleans, LA
- Fellowship, Interventional Cardiology: The Mount Sinai Hospital, NY
- Fellowship, Endovascular Intervention: North Central Heart Institute, Sioux Falls, SD

Prakash Krishnan, MD, is a world-renowned expert in peripheral vascular disease and is internationally recognized as a leader in the catheter-based treatment of peripheral arterial disease. Dr. Krishnan's expertise includes nonsurgical treatment of coronary and peripheral vascular diseases including coronary stents, peripheral vascular angioplasty and stents, atherectomy, carotid stents, renal stents, renal denervation, and complex venous disease intervention. Dr. Krishnan is a patient advocate and an educator. He has built a robust community-based outreach program that serves a vast population of patients with complex coronary and peripheral arterial diseases at offices in all five boroughs. He is the director of the Endovascular Intervention Fellowship in the Cardiac Catheterization Laboratory and has been educating interventionalists globally via live satellite transmissions within national and international meetings and with the monthly webcast showcased at www.peripheralinterventions.org. He is the current co-national primary investigator in the ILLUMENATE Trial, a multicenter randomized control study evaluating the safety and efficacy of the Stellarex drug-coated balloon in femoro-popliteal lesions. He has received numerous awards and honors, most recently the Reverend Dr. Martin Luther King Legacy Award for Physician Services from Clergy with a Purpose in 2016. He has authored numerous peer-reviewed articles and book chapters on peripheral arterial disease and is the co-director of the annual Live Symposium of Complex Coronary and Vascular Cases, an Icahn School of Medicine at Mount Sinai and Cardiovascular Institute-supported program, and director of Mount Sinai's Peripheral Interventions Live webcast.

George D. Dangas, MD, PhD, FACC, MSCAI

Director, Cardiovascular Innovation
Professor of Medicine (Cardiology)
Professor of Surgery (Vascular)

Education and Training

- MD, PhD: National Kapodistrian University of Athens, Greece
- DHM: Naval School of Hyperbaric Medicine, Hellenic Navy, Athens
- Residency, Internal Medicine: Miriam Hospital, Brown University, Providence, RI
- Fellowship, Cardiology: The Mount Sinai Hospital, NY
- Fellowship, Interventional Cardiology: The Mount Sinai Hospital, NY

George Dangas, MD, performs a wide spectrum of complex cardiovascular interventional procedures to treat coronary and valvular heart disease, aortic, carotid and peripheral arterial disease, and resistant hypertension. Dr. Dangas is a leading authority in the performance of nonsurgical cardiac and vascular interventions and in the development of innovative approaches to treat complex problems across many specialties. He is currently a trustee of the American College of Cardiology and editor-in-chief of *CardioSource WorldNews Interventions*, and has been chair of the Interventional Scientific Council and a trustee of the Society for Cardiovascular Angiography & Interventions. He is co-director of the annual conferences "Transcatheter Cardiovascular Therapeutics" and "Interventional Fellows' Courses" in the United States and Europe, and a key faculty and program committee member for multiple international conferences, including the ACCi2 Summit, ACCIS, AHA, and SCAI for many years. Dr. Dangas is the Director of Academic Affairs at the Cardiovascular Research Foundation.

Joseph M. Sweeny, MD, FACC

Medical Director, Ambulatory Cardiology Center
Assistant Professor of Medicine (Cardiology)

Education and Training

- MD: Georgetown University School of Medicine, Washington, DC
- Residency: Hospital of the University of Pennsylvania, Philadelphia, PA
- Fellowship, Cardiology: The Mount Sinai Hospital, NY
- Fellowship, Interventional Cardiology: The Mount Sinai Hospital, NY

Joseph Sweeny, MD, performs both diagnostic cardiac catheterization and coronary interventions. He is the principal investigator of multiple national clinical trials and is actively involved in the interventional cardiology fellowship training program as the associate program director. In 2014, he became the medical director of the Lauder Ambulatory Cardiology Center, which provides comprehensive ambulatory clinical care and all kinds of non-invasive cardiac testing in one central location. His research has focused mainly on antiplatelet therapy in the treatment of acute coronary syndrome. He is the site principal investigator of an ongoing NIH-sponsored ischemia trial.



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Clinical Interests:

Acute Myocardial Infarction
Fellows Education
Coronary Intervention

Roxana Mehran, MD, FACC, FACP, FESC, MSCAI

Director, Interventional Cardiovascular Research and Clinical Trials
Professor of Medicine in Cardiology; Professor of Population Health Science and Policy

Education and Training

- MD: St. George's University School of Medicine, Grenada, WI
- Residency, Internal Medicine: University of Connecticut
- Fellowship, Cardiovascular Disease: The Mount Sinai Hospital, NY
- Fellowship, Interventional Cardiology: The Mount Sinai Hospital, NY

Roxana Mehran, MD, is internationally recognized for her work as a clinical trial specialist with complex data analyses. Her research interests expand from mechanisms of restenosis to treatment and prevention of acute kidney injury in cardiac patients, outcomes research, and advancing pharmacologic and interventional treatments for acute coronary syndromes and acute myocardial infarction. In addition to founding a highly regarded academic research organization at the Cardiovascular Research Foundation, she is a widely published author and is among the most sought-out speakers at national and international scientific conferences. She has served as course co-director of the annual Transcatheter Cardiovascular Therapeutics (TCT) conference for the last 22 years. Dr. Mehran is a member of the editorial board of multiple peer-reviewed journals and has served on the Board of Trustees of SCAI, the program committee of the AHA Scientific Sessions, and the writing committee of the ACC/AHA PCI guidelines. She is a member of the Board of Directors for Harboring Hearts, co-founder and program chair for the Society of Cardiac Angiography and Interventions Women in Innovations (SCAI- WIN) Initiative, program chair of ACC 2018 Scientific Sessions, and chair of ACC's Interventional Section Leadership Council. In recognition of her work, Dr. Mehran has been the recipient of numerous prestigious awards and special acknowledgements, most recently, the Bernadine Healy Leadership in Women's CV Disease Award (2017). Dr. Mehran is a practicing interventional cardiologist and is active in the teaching program of cardiology at the Icahn School of Medicine at Mount Sinai.



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Clinical Interests:

Restenosis Prevention
Contrast-Induced Acute
Kidney Injury (AKI)
Cardiovascular Disease in Women

FULL-TIME ATTENDINGS (LISTED ALPHABETICALLY)



Farah E. Atallah-Lajam, MD

Associate Clinical Professor of Medicine (Cardiology)

Education and Training

- MD: Universidad Autonoma De Santo Domingo, Santo Domingo
- Residency, Internal Medicine: Elmhurst Hospital
- Fellowship, Cardiology: Brooklyn Hospital Center
- Fellowship, Cardiac Catheterization, Nuclear Cardiology: Lenox Hill Hospital, NY

Clinical Interests: Clinical Cardiology, Cardiac Catheterization, Nuclear Cardiology

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Usman Baber, MD, MS

Assistant Professor of Medicine (Cardiology)

Education and Training

- MD: University of Texas Southwestern Medical Center, Dallas, TX
- MS: Columbia University, NY
- Residency, Internal Medicine: Parkland Memorial Hospital, Dallas, TX
- Fellowship, Cardiology: The Mount Sinai Hospital, NY
- Fellowship, Interventional Cardiology: The Mount Sinai Hospital, NY

Clinical Interests: Coronary Interventions, High-Risk Cardiac Populations, Cardiorenal Physiology

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Jeffrey Bander, MD, FACC

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Director of Operations, Cardiology, Mount Sinai Hospital West

Assistant Professor of Medicine (Cardiology)

Education and Training

- MD: Harvard Medical School
- Residency: Columbia Presbyterian Medical Center, NY
- Fellowship, Cardiology: The Mount Sinai Hospital, NY
- Fellowship, Interventional Cardiology: The Mount Sinai Hospital, NY

Clinical Interests: Clinical Cardiology, Cardiac Catheterization, Coronary Interventions

Phone: 212-381-0918 Email: jeffrey.bander@mountsinai.org

Nitin Barman, MD

Director, ADS Telemetry

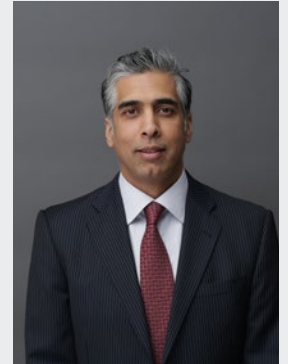
Associate Professor of Medicine (Cardiology)

Education and Training

- MD: University of Chicago
- Residency, Internal Medicine: University of California, San Francisco
- Fellowship, Cardiology: Cleveland Clinic Foundation
- Fellowship, Interventional Cardiology: The Mount Sinai Hospital, NY

Clinical Interests: Clinical Cardiology, Transradial Intervention, AMI Intervention

Phone: 212-241-1825 **Email:** nitin.barman@mountsinai.org



Srinivas Duvvuri, MD

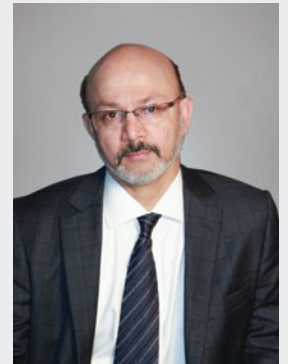
Associate Professor of Medicine (Cardiology)

Education and Training

- MD: University of the West Indies Faculty of Medical Sciences
- Residency, Internal Medicine: Howard University
- Fellowship, Cardiovascular Disease: UMDNJ-New Jersey Medical School
- Fellowship, Cardiovascular Disease: Mount Sinai School of Medicine

Clinical Interests: General Cardiology, Cardiac Catheterization, Interventional Cardiology

Phone: 718-981-2684 **Email:** sd.heart1@gmail.com



Lynne Glasser, MD

Director, Interventional Inpatient Service

Assistant Professor of Medicine (Cardiology)

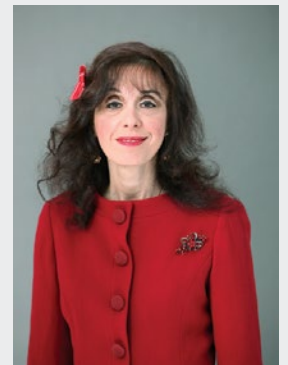
Education and Training

- MD: SUNY Downstate Medical Center, NY
- Residency, Internal Medicine: New York University Medical Center
- Fellowship, Cardiology: Manhattan Veterans Administration Medical Center

Clinical Interests: Clinical Cardiology, Preventive Cardiology, Inpatient Cardiology

Since joining The Mount Sinai Hospital in November 2008, Dr. Glasser has been playing an important role in the treatment and management of interventional patients, before and after the procedure.

Phone: 212-241-4521 **Email:** lynne.glasser@mountsinai.org





Vishal Kapur, MD, FACC, FSCAI, RPVI

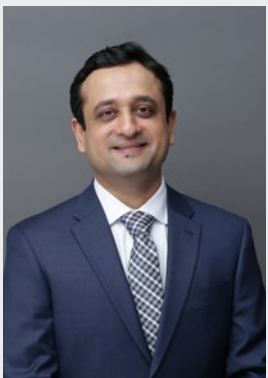
**Director of Endovascular Services, Mount Sinai St. Luke's
Assistant Director, Endovascular Services, The Mount Sinai Hospital
Assistant Professor of Medicine (Cardiology)**

Education and Training

- MD: University College of Medical Sciences, University of Delhi, India
- Residency: University of Texas Medical Branch
- Fellowship, Cardiology: Methodist DeBakey Heart & Vascular Center/UTMB, TX
- Fellowship, Interventional Cardiology: Columbia University Medical Center, NY
- Fellowship, Endovascular Medicine: Columbia University Medical Center, NY

Clinical Interests: Coronary Interventions, Peripheral Interventions, Non-Invasive Vascular Medicine

Phone: 212-241-0898 Email: vishal.kapur@mountsinai.org



Asaad Khan, MD, MRCP

**Assistant Director, Interventional Structural Heart Disease Program, The Mount Sinai Hospital
Assistant Professor of Medicine (Cardiology)**

Education and Training

- MD: King Edward Medical College, Lahore, Pakistan
- Residency: University College Hospital Galway, National University of Ireland
- Fellowship, Cardiology: Royal College of Physicians of Ireland (CSCST)
- Fellowship, Advanced Clinical and Research Fellowship in Echocardiography: Massachusetts General Hospital, MA
- Fellowship, Interventional Cardiology: Mount Sinai Medical Center, NY
- Fellowship, Interventional Structural Heart Disease: Mount Sinai Medical Center, NY

Clinical Interests: Coronary Interventions, Structural Heart Disease Interventions

Phone: 212-241-0898 Email: asaad.khan@mountsinai.org



Jason Kovacic, MD, PhD

Associate Professor of Medicine (Cardiology)

Education and Training

- MD: University of Melbourne, Australia
- Residency, Internal Medicine: Prince of Wales Hospital, Sydney, Australia
- Fellowship, Cardiology: St. Vincent's Hospital, Sydney, Australia
- Fellowship, Vascular Biology: National Heart Lung and Blood Institute, National Institutes of Health
- Fellowship, Interventional Cardiology: The Mount Sinai Hospital, NY

Clinical Interests: Atherosclerosis, Vascular Biology, Coronary Interventions

Phone: 212-241-4059 Email: jason.kovacic@mountsinai.org

Atul Kukar, DO, FACC, FSCAI, RPVI

Chief, Division of Cardiology – Mount Sinai Queens

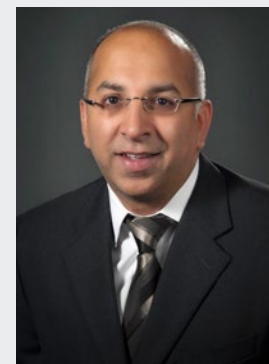
Assistant Professor of Medicine

Education and Training

- Residency: St. Luke's-Roosevelt Hospital Center
- Fellowship, Cardiology: St. Luke's-Roosevelt Hospital Center
- Fellowship, Interventional Cardiology: Lenox Hill Hospital
- Fellowship, Endovascular Intervention: Lenox Hill Hospital

Clinical Interests: Coronary Interventions, Peripheral Interventions, General Cardiology

Phone: 212-241-6422 **Email:** atul.kukar@mountsinai.org



Barry A. Love, MD, FSCAI

Director, Congenital Cardiac Catheterization Laboratory

Assistant Professor of Pediatrics and Medicine

Education and Training

- MD: University of Western Ontario
- Residency, Pediatrics: McGill University Medical Center
- Fellowship: Children's Hospital Boston

Clinical Interests: Pediatric Catheterization and Intervention, Adult Congenital Heart Disease

Phone: 212-241-9516 **Email:** barry.love@mssm.edu



Sumeet Singh Mitter, MD, MSc

Advanced Heart Failure, Mechanical Circulatory Support and Transplant Cardiology

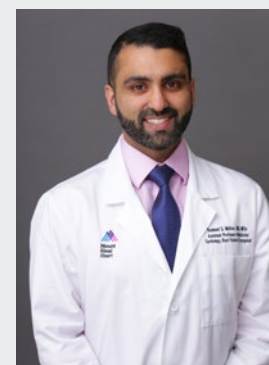
Assistant Professor of Medicine (Cardiology)

Education and Training

- MD: David Geffen School of Medicine at UCLA, CA
- Residency: Internal Medicine, Mount Sinai Medical Center, NY
- Fellowship: Cardiology, Northwestern Memorial Hospital, IL
- Fellowship: Advanced Heart Failure and Transplant Cardiology, Northwestern Memorial Hospital, IL

Clinical Interests: Infiltrative Cardiomyopathies, Endomyocardial Biopsy, IVAD Care

Phone: 212-241-7300 **Email:** Sumeet.Mitter@mountsinai.org





Noah Moss, MD

Medical Director, Mechanical Circulatory Support Program

Assistant Professor of Medicine

Education and Training

- MD: Albert Einstein College of Medicine of Yeshiva University, Bronx, NY
- Residency, Internal Medicine: Montefiore Medical Center, Bronx, NY
- Fellowship, Cardiology: The Mount Sinai Hospital, NY
- Fellowship, Advanced Heart Failure and Transplant Cardiology: The Mount Sinai Hospital

Clinical Interests: Mechanical Circulatory Support, Cardiac Transplantation, CardioMEMS HF System

Phone: 212-241-7300

Email: noah.moss@mountsinai.org



Pedro R. Moreno, MD, FACC

Director, Cardiac Catheterization Laboratory, Mount Sinai St. Luke's

Professor of Medicine (Cardiology)

Education and Training

- MBBS: Universidad Javeriana, Bogota
- Residency, Internal Medicine: Brigham and Women's Hospital
- Fellowship, Cardiology: Massachusetts General Hospital
- Fellowship, Interventional Cardiology: Massachusetts General Hospital

Clinical Interests: Coronary Artery Disease, Interventional Cardiology, Plaque Imaging

Phone: 212-241-3497

Email: pedro.moreno@mountsinai.org



Jagat Narula, MD, PhD, MACC

Chief of Cardiology, Mount Sinai St. Luke's

Philip J. and Harriet L. Goodhart Chair in Cardiology

Professor of Medicine & Radiology

Education and Training

- MD: SMS Medical School, India
- Fellowship, Cardiology, Heart Failure & Transplantation, Nuclear Cardiology: Massachusetts General Hospital and Harvard Medical School

Clinical Interests: Noninvasive and Invasive Cardiovascular Imaging

Phone: 212-241-4122

Email: jagat.narula@mountsinai.org

Sean P. Pinney, MD, FACC

Director, Advanced Heart Failure and Cardiac Transplant Program
Professor of Medicine (Cardiology)

Education and Training

- MD: Georgetown University School of Medicine
- Residency, Internal Medicine: Beth Israel Deaconess Medical Center, Boston
- Fellowship, Cardiology: Columbia-Presbyterian Medical Center

Clinical Interests: Cardiac Catheterization, Cardiac Transplantation, Heart Failure

Phone: 212-241-7300 **Email:** sean.pinney@mountsinai.org



Gila Perk, MD, FASE, FACC

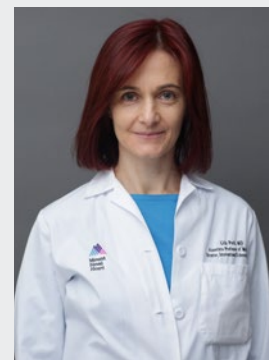
Director, Interventional Echocardiography
Associate Professor of Medicine, Cardiology

Education and Training

- MD: Hadassah School of Medicine, Hebrew University, Jerusalem, Israel
- Residency: Internal Medicine, Hadassah Mount Scopus, Jerusalem, Israel
- Residency: Internal Medicine, NYU Medical Center
- Fellowship, Cardiology, NYU Medical Center

Clinical Interests: Interventional Echocardiography, Structural and Valvular Heart Disease

Phone: 646-889-4815 **Email:** gila.perk@mountsinai.org



William J. Schwartz, MD

Assistant Clinical Professor of Medicine (Cardiology)

Education and Training

- MD: Albert Einstein College of Medicine, NY
- Residency, Internal Medicine: Bronx Municipal Hospital Center
- Fellowship, Cardiology: Bronx Municipal Hospital Center
- Fellowship, Cardiac Catheterization: New York University Medical Center

Clinical Interests: Clinical Cardiology, Noninvasive Cardiology, Cardiac Catheterization

Phone: 718-721-1500 **Email:** wjsheartmd@aol.com





Joshua Shatzkes, MD

Assistant Professor of Medicine (Cardiology)

Education and Training

- MD: SUNY Downstate Medical Center
- Residency, Internal Medicine: Yale-New Haven Hospital
- Fellowship, Cardiology: The Mount Sinai Hospital, Elmhurst, NY

Clinical Interests: Noninvasive Cardiology Imaging, Peripheral Arterial Disease, Hyperlipidemia

Phone: 212-241-9457 Email: joshua.shatzkes@mssm.edu



Michael Alan G. Sicat, MD

Assistant Professor of Medicine (Cardiology)

Education and Training

- MD: University of the East Ramon Magsaysay Memorial Med CTR, Quezon City, Philippines
- Residency: Staten Island University Hospital
- Fellowship: St. Vincent Catholic Medical Center of NY - Staten Island Track

Clinical Interests: Clinical Cardiology, Echocardiography, Cardiac Catheterization

Phone: 718-273-9080 Email: michael.sicat@mountsinai.org



Javed Suleman, MD

Associate Clinical Professor of Medicine (Cardiology)

Education and Training

- MBBS: Sindh Medical College, Pakistan
- Residency, Internal Medicine: Salem Hospital
- Fellowship, Cardiology: Saint Vincent Hospital, Worcester, MA
- Fellowship, Interventional Cardiology: The Mount Sinai Hospital, NY

Clinical Interests: Clinical Cardiology, Coronary Intervention, Primary PCI

Phone: 718-297-0440 Email: javed.suleman@mountsinai.org



Gilbert Tang, MD, MBA, FRCSC, FACC

Surgical Director, Structural Heart Program

Associate Professor of Cardiovascular Surgery

Education and Training

- MD: University of Toronto
- Residency, Cardiac Surgery, University of Toronto
- Fellowship, Mitral Valve Repair and TAVR, Mount Sinai Medical Center

Clinical Interests: Transcatheter Valve Therapy (TAVR, MitraClip, Transcatheter Mitral Valve Repair/Replacement, Transcatheter Tricuspid Repair)

Phone: 646-761-0391 Email: gilbert.tang@mountsinai.org

VOLUNTARY ATTENDINGS (LISTED ALPHABETICALLY)

Dimitrios Bliagos, MD

Assistant Professor of Medicine (Cardiology)

Education and Training

- MD: SUNY Stony Brook
- Residency: New York-Presbyterian/Columbia University Medical Center
- Fellowship, General Cardiology: Montefiore Medical Center
- Fellowship, Interventional Cardiology: New York-Presbyterian/Columbia University Medical Center
- Fellowship, Endovascular Intervention: New York-Presbyterian/Columbia University Medical Center

Clinical Interests: Clinical Cardiology, Coronary Intervention, Endovascular Intervention

Phone: 914-831-2943 **Email:** dimitrios.bliagos@mountsinai.org



Karthik Gujja, MD

Associate Director, Endovascular Interventions

Clinical Instructor Medicine (Cardiology)

Education and Training

- Internship, Internal Medicine: Long Island College Hospital
- MD: SUNY Downstate, LICH Program
- Fellowship, Cardiology: Beth Israel Medical Center
- Fellowship, Interventional Cardiology: Beth Israel Medical Center
- Fellowship, Endovascular Intervention/Peripheral: The Mount Sinai Hospital

Clinical Interests: Peripheral Artery Disease, Endovascular Intervention, Venous Interventions

Phone: 646-584-6460 **Email:** karthik.gujja@mountsinai.org



Choudhury M. Hasan, MD

Assistant Clinical Professor of Medicine (Cardiology)

Education and Training

- MBBS: Dhaka Medical College, Dhaka, Bangladesh
- Residency, Internal Medicine: Brooklyn Hospital Center
- Fellowship, Cardiology: Brooklyn Hospital Center
- Fellowship, Interventional Cardiology: Deborah Heart and Lung Center

Clinical Interests: Cardiac Catheterization, Coronary Interventions, Echocardiography

Phone: 718-657-8001 **Email:** cmmhasan03@gmail.com



Srinivas Kesanakurthy, MD

Director of Cardiac Cath Lab, The Brooklyn Hospital Center

Education and Training

- MBBS: Rangaraya Medical College, Kakinada, India
- Residency: Lenox Hill Hospital, NY
- Fellowship, Cardiology: Lenox Hill Hospital, NY
- Fellowship, Interventional Cardiology: Lenox Hill Hospital, NY

Clinical Interests: Clinical Cardiology, Cardiac Catheterization, Coronary Interventions

Phone: 718-250-8676 **Email:** kesana@yahoo.com





José Meller, MD

Clinical Professor of Medicine (Cardiology)

Education and Training

- MD: Catholic University of Chile, Santiago
- Residency, Internal Medicine: The Mount Sinai Hospital, NY
- Fellowship, Cardiology: The Mount Sinai Hospital, NY

Clinical Interests: Clinical Cardiology, Fellows Education, Cardiac Catheterization

Phone: 212-988-3772 Email: josemeller44@gmail.com



Niranjan K. Mittal, MD

Clinical Instructor of Medicine (Cardiology)

Education and Training

- MBBS: Government Medical College, Patiala, India
- Residency, Internal Medicine: Jamaica Hospital, NY
- Fellowship, Cardiology: Brooklyn Hospital Center
- Fellowship, Interventional Cardiology: The Mount Sinai Hospital, NY

Clinical Interests: Clinical Cardiology, Cardiac Imaging, Interventional Cardiology

Phone: 718-439-5111 Email: smarthealth1@gmail.com



Tien Nguyen, MD

Assistant Clinical Professor of Medicine (Cardiology)

Education and Training

- MD: New York Medical College
- Residency: St. Vincent's Medical Center, NY
- Fellowship, Cardiology: St. Vincent's Medical Center, NY
- Fellowship, Interventional Cardiology: St. Vincent's Medical Center, NY

Clinical Interests: Clinical Cardiology, Cardiac Catheterization, Coronary Interventions

Phone: 212-532-0888 Email: tien.nguyen@nyheart.net



Christopher Varughese, MD

Clinical Instructor of Medicine (Cardiology)

Education and Training

- MD: Howard University College of Medicine
- Residency, Internal Medicine: Montefiore Medical Center/Albert Einstein College of Medicine
- Fellowship, Cardiology: The Mount Sinai Hospital, Elmhurst, NY
- Fellowship, Interventional Cardiology: The Mount Sinai Hospital, NY

Clinical Interests: Cardiac Catheterization, Coronary Angioplasty, Peripheral Arterial and Venous Disease

Phone: 718-727-7546 Email: christopher.varughese@mountsinai.org

CARDIAC CATHETERIZATION LABORATORY ADMINISTRATIVE STAFF

Beth Oliver, DNP, RN

Senior Vice President of Cardiac Services, Mount Sinai Health System

Education and Training

- BS, Nursing: University of Massachusetts, Boston
- Nurse Practitioner Certification: Columbia University, NY
- DNP: Case Western University, Cleveland, OH

Beth Oliver is responsible for the executive leadership of clinical services within Mount Sinai Heart. She is a past recipient of the Ellen Fuller Award of Excellence in Nursing Leadership as well as the AHA Heart Hero Award. She is a member of Sigma Theta Tau, the National Nursing Honor Society; the American Organization of Nurse Executives (AONE) and the Board of Directors of the American Heart Association.

Phone: 212-241-0796 Email: beth.oliver@mountsinai.org

Haydee Garcia, MSN, ACNP-BC, CCRN-CMC

Nursing Director, Mount Sinai Heart

Education and Training

- BSN: Nursing: University of Santo Tomas (Manila, Philippines)
- MSN: University of Medicine and Dentistry of New Jersey (UMDNJ-Rutgers)

Haydee Garcia started as a nurse practitioner in the Mount Sinai Hospital Cardiac Cath Lab in 2006, serving as the lead NP from 2010-2014 before transitioning into her leadership role in 2014 as nursing director for Mount Sinai Heart. She directs, oversees and coordinates all administrative operations for the Cardiac Cath Lab, Post Intervention Units, Non-invasive Cardiology, Cardiovascular Ambulatory and Cardiac Nurse Practitioners.

Phone: 212-241-3058 Email: haydee.garcia@mountsinai.org

Jennifer Del Campo, MSN FNP-C, CCRN, CMC

Clinical Nurse Manager

Education and Training

- BSN: Nursing: Phillipines College of Health Sciences
- MSN: Lienhard School of Nursing, Pace University
- Doctor of Medicine: MCU-FDTMF, Manila, Philippines

Jennifer Del Campo joined the Mount Sinai Hospital Cardiac Cath Lab in 2005. She is a certified critical care nurse, an adult nurse practitioner, and is a member of the Sigma Theta Tau Nursing Honor Society. She became the lead NP for two years and in 2016 became Cath Lab manager. She effectively manages a unit with a diverse staff of more than 167 health professionals.

Phone: 347-504-5487 Email: jennifer.delcampo@mountsinai.org

Gregory Gojkovich

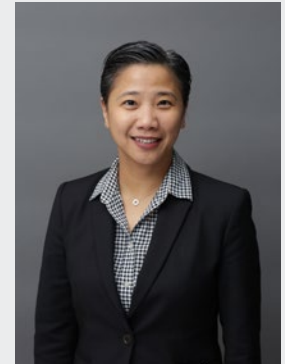
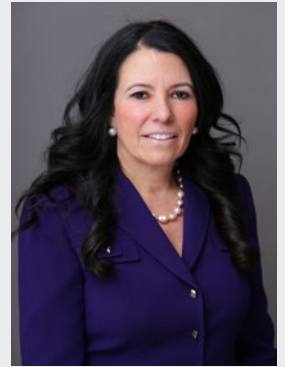
Operations Manager

Education and Training

- AA Degree, Moorpark College, California

Greg Gojkovich joined the Mount Sinai Hospital Cardiac Cath Lab in January 1987. In 1992, he accepted a cardiac catheterization laboratory operational manager position at Beth Israel Medical Center, New York, NY. He returned to Mount Sinai in 2001.

Phone: 212-241-1548 Email: gregory.gojkovich@mssm.edu

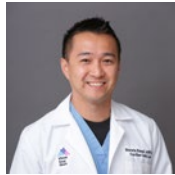


Nurse Practitioner Team

The Mount Sinai Hospital's dedicated staff of nurse practitioners work closely with the physicians in planning and implementing care from the time of intake to discharge, ensuring a quality experience at all points in the patient's visit.



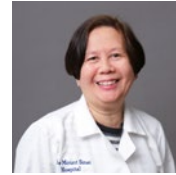
Chandra Bhim



Norwin Bunal



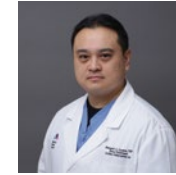
Tia Coleman



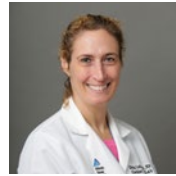
Leticia Jakasal



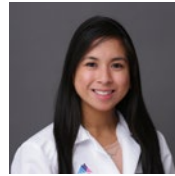
Vivian Lau



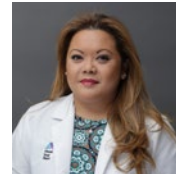
Rheoneil Lascano



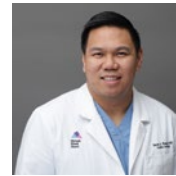
Dana Leichter



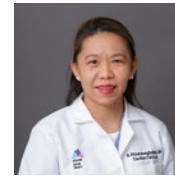
Jessica Lim



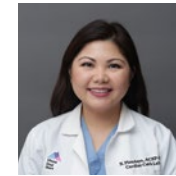
Gloria Manzanilla



Derek Pineda



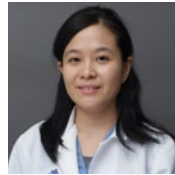
Supawadee
Pitakmongkolkul



Nerissa Plondaya



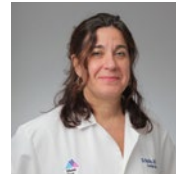
Sandie Romain



Roannie Santos



Aanal Shah



Dominique Sicile



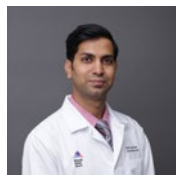
Richard Ternemille



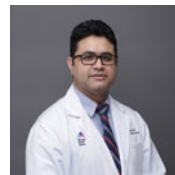
Kevin Williams

Interventional Cardiology Fellows

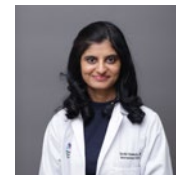
Mount Sinai Heart's Interventional Cardiology Fellowship Program is the largest in the country, educating the next generation of clinical cardiology and interventional cardiology specialists. This well-regarded program, which combines academic and hands-on experience, has graduated physicians who are serving as noted leaders in community and academic medical centers.



Sunil Agarwal, MD



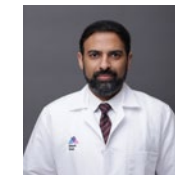
Samit Bhatheja, MD



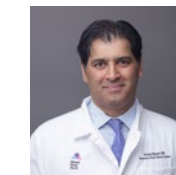
Surbhi Chamaria, MD



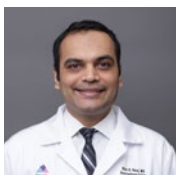
Asma Khaliq, MD



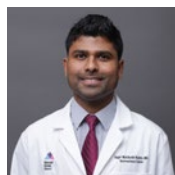
Muhammad Khan, MD



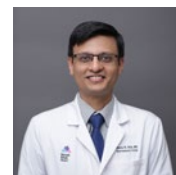
Farhan Majeed, MD



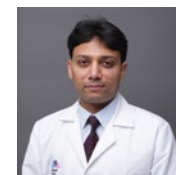
Nish Patel, MD



Sagar Reddy, MD



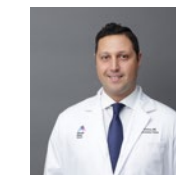
Neeraj Shah, MD



Sandeep Singla, MD



Matius Yudi, MD



Jossef Amirian, MD

Interventional Database Team

Samhita Bhattarai, Srushti Shah, Pooja Vitay,
Roja Thapi, Elena Ramos, Birju Narechania



Interventional Research Team

Naotaka Okamoto, Yuliya Vengrenyuk, Reyna Bhandari,
Madhav Sharma, Faride Godoy, Pedro Veras,
Nicole Saint Vrestil, Samuel Zucker, Santa Jimenez



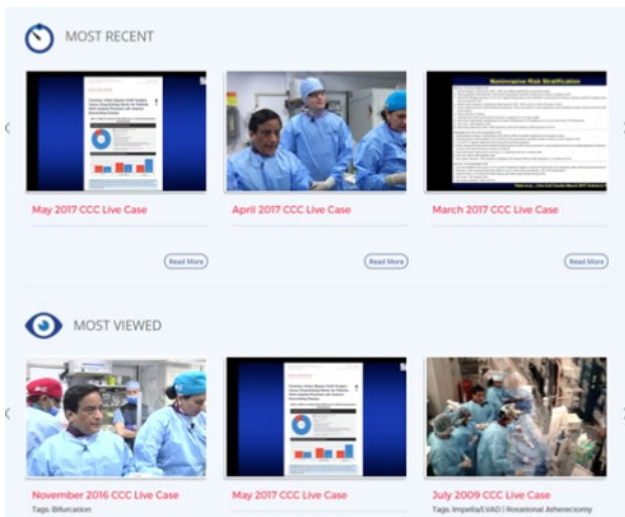
Supporting Staff

Michelle Brewster, Shante Hines, Debra Bradley,
Radha Gokul, Kimberley Kostiw, Maria Directo,
Pamela Fernandez, Juanita Gamboa, Pearl
Tongson, Shulandia Avila, Era Zuberko





Watch live interventions highlighting in-depth procedural techniques for managing complex cardiac cases, streamed in real time and archived. Viewers are encouraged to participate in our online didactic discussion.



COMPLEX CORONARY CASES

Every 3rd Tuesday at 8am

LIVE PERIPHERAL INTERVENTIONS

Every 4th Wednesday at 8am

STRUCTURAL HEART LIVE CASES

Every 2nd Tuesday of alternating months at 9am



Upcoming Topics:

Coronary:

- Bifurcation Lesions
- Chronic Total Occlusion
- Complex Diffuse CAD
- Radial Intervention

Peripheral:

- Carotid Artery Stenosis
- Renal Iliac
- SFA
- Below the Knee

Structural Heart:

- CoreValve TAVR
- SAPIEN-3 TAVR
- Mitral Valve Repair

Monday, June 11th

Endovascular Fellows Course

**Tuesday, June 12th &
Wednesday, June 13th**

LINC Mount Sinai
Endovascular Symposium



Thursday, June 14th

Coronary / Structural Heart Symposium

Friday, June 15th

Interventional Cardiology Board Review
Nurse / Technologist Symposium

**CORONARY / STRUCTURAL HEART
SYMPOSIUM DIRECTORS**

Samin K. Sharma, MD, FACC, FSCAI
Annapoorna S. Kini, MD, MRCP, FACC
Roxana Mehran, MD, FACC, FSCAI

CO-DIRECTORS

Usman Baber, MD, MS
Nitin Barman, MD, FACC
George Dangas, MD, PhD, FACC, MSCAI
Jason Kovacic, MD, PhD, FACC, FSCAI
Pedro R. Moreno, MD, FACC
Joseph M. Sweeney, MD, FACC
Gilbert Tang, MD, MSc, MBA, FRCSC, FACC

**ENDOVASCULAR
SYMPOSIUM DIRECTORS**

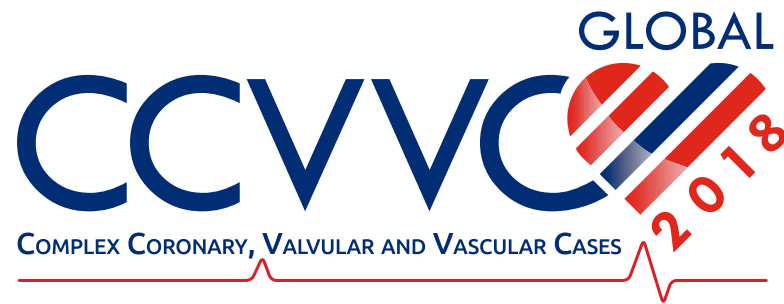
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Dierk Scheinert, MD

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Beth Oliver, DNP, RN



**Special Focus on Calcified, Bifurcation
& Total Occlusion Lesions**

JUNE 12-15, 2018
New York, New York



Hosted by the Dr. Samin K. Sharma
Family Foundation Cardiac Catheterization Laboratory



Celebrating
50
years
1968-2018



Icahn School
of Medicine at
Mount
Sinai

Innovation in Science and Medicine



2018 Cardiac Catheterization Laboratory Achievements

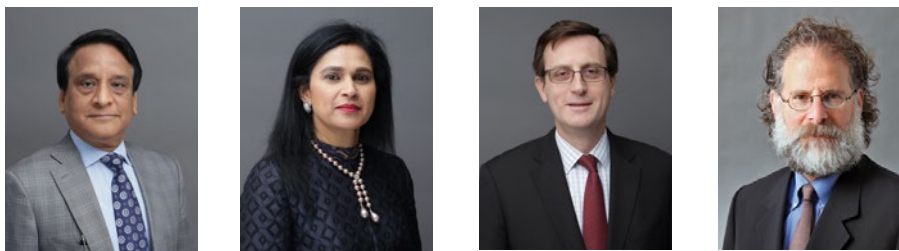
#1: New York Magazine

Dr. Samin Sharma (Total 10 times in 16 years), Dr. Annapoorna Kini (1st entry in this listing), Dr. Pedro Moreno (2nd year in a row) and Dr. George Dangas (4th year in a row).



#2: New York Times Magazine

Dr. Samin Sharma (9th year in a row), Dr. Annapoorna Kini (6th year in a row), Dr. William Schwartz (2nd year in a row) and Dr. George Dangas (1st entry in this issue).

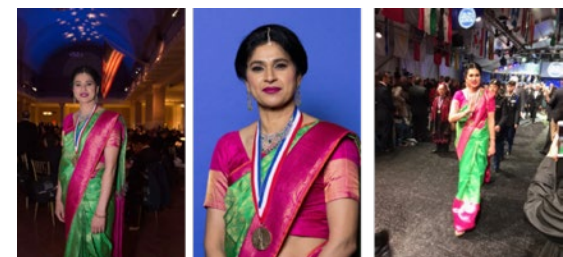


#3. Castle Connolly Top Doctors

Dr. Samin Sharma, Dr. Annapoorna Kini, Dr. Prakash Krishnan, Dr. George Dangas, Dr. Pedro Moreno, Dr. Roxana Mehran and Dr. William Schwartz.



#4: Dr. Annapoorna Kini received the Ellis Island Medal of Honor



#5. Dr. Roxana Mehran and Dr. George Dangas were Recognized by the ACC

Dr. Mehran received the Bernadine Healy Award from ACC, and Dr. Dangas received the ACC Distinguished Teacher Award.



Mount Sinai Heart Directory

Area	Telephone
MS Heart Director	212-241-7911
Cardiac Nursing	212-241-3483
Cardiac Rehab Program	212-241-8597
Cardiology Administration	212-241-4030
Cardiology Appointments	212-427-1540
Cardiology Privileges	212-241-4029
Cardiothoracic Surgery	212-659-6800
Cardiovascular MRI and CT Imaging	855-MSHEART
Catheterization Laboratories	212-241-5881
Cardiac Catheterization Laboratory Assistance (any issues)	212-241-0935
Catheterization Laboratory Events	212-241-0592
Catheterization Laboratory Office	212-241-4021
Catheterization Laboratory Research	212-241-0229
Catheterization Laboratory Scheduling	212-241-5136
Coronary Care Unit	212-241-7222
Electrophysiology/Pacemakers	212-241-7272
Genetic Disorders	212-241-3303
Heart Failure/Transplantation	212-241-7300
Lipid Management	212-241-7651
MS Heart Information Technology	212-241-4026
Noninvasive Cardiology	855-MSHEART
Pediatric Cardiology	212-241-8662
Pulmonary Hypertension	212-241-7300
To Transfer a Patient	212-241-6467
Vascular Laboratory	212-241-6773
Vascular Surgery	212-241-5315

Request an Appointment

Scan the following QR code to request an appointment:



Contact Info

To make an appointment:

Phone: 212-427-1540

To refer a patient:

Phone: 212-241-5136

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**The mission of the Cardiac Catheterization
Laboratory at Mount Sinai Heart is:**

**“To improve outcomes and safety of interventional
patients by delivering clinical innovations,
unrivaled research, and personalized
clinical care as a Team Concept.”**

