AN INTERVIEW WITH...

Mayra Guerrero, MD

Dr. Guerrero offers insight on the effects of COVID-19 at her cath lab, an update on the status of the MITRAL trial, her role promoting greater female representation among interventional cardiologists, and more.

How has the global outbreak of COVID-19 affected your daily practice, and what do you think the future of interventional cardiology looks like post-COVID-19?

The COVID-19 pandemic has affected everybody in the world. I am very fortunate to work at an institution with great leadership that protects all personnel and carefully managed its limited resources to provide all necessary personal protective equipment (PPE) for its health care workers. It has been impressive to see the meticulous coordination of efforts to keep us safe, particularly in the cath lab. Due to all these efforts, including implementing a policy of "masks for all" long before it was widely recommended by the Centers for Disease Control and Protection, we have fortunately been able to flatten the curve in this area, and most of us have remained safe.

Many strategies were involved in this process: converting routine outpatient clinic visits into "non–face-to-face" encounters by phone or video conference (as has been done at most institutions), postponing all elective procedures, and pausing enrollment in clinical trials involving structural heart interventions. At one point, we were only performing urgent or emergency procedures; the rest of the work was done remotely from home, including telemedicine.

Our cath lab leadership implemented a lean process during procedures, which minimized the number of people involved to preserve equipment, particularly PPE. In the outpatient setting, workflows have changed to minimize the number of visits needed prior to a structural intervention procedure, helping to streamline the flow more. I believe this process of using resources wisely will be needed for a while, even after the COVID-19 pandemic ends, because we will need to work on recovering a weakened economy.

The future of interventional cardiology is already changing due to COVID-19. Because we were forced to embrace technology to offer more telemedicine, this new era may continue after COVID-19 to help us expedite the patient evaluation process, reducing the number of visits needed before interventional procedures. By reducing unnecessary face-to-face encounters, we can reduce costs and the risk of spreading COVID-19, either now or during a future spike. This is evolution, and we must adapt.

What is the current status of the MITRAL trial, and were there any areas that could benefit from further research in a potential MITRAL II trial?

The MITRAL trial is a physician-initiated, FDA-approved, multicenter, early feasibility study (EFS) evaluating the safety and feasibility of transcatheter mitral valve replacement (TMVR) using the Sapien 3 valve (Edwards Lifesciences) to treat patients with symptomatic severe calcific mitral valve disease with severe mitral annular calcification (MAC) and patients with failing mitral surgical rings or bioprostheses who are not candidates for mitral valve surgery.

We enrolled 91 patients: 31 in the valve-in-MAC arm (ViMAC), 30 in the mitral valve-in-valve (MViV) arm, and 30 in the mitral valve-in-ring arm (MViR).[1] One-year outcomes manuscripts are in process. We learned that with careful patient selection and procedural planning (1) transseptal MViV was associated with a very low complication rate and a very low (3.3%) mortality rate at 1 year, (2) transseptal MViR was associated with a 1-year mortality rate of 23.3% (similar to MitraClip [Abbott] in the TVT registry), and (3) mitral ViMAC is feasible but associated with a higher complication rate and higher mortality than MViV and MViR. We also found that the mortality of patients treated with transseptal access was lower than in patients treated with an open transatrial approach (6.7% vs 20% at 30 days and 26.7% vs 35.7% at 1 year), although this is not statistically significant given the small numbers in this EFS.

We knew from the TMVR in MAC Global registry that left ventricular outflow tract (LVOT) obstruction is the Achilles heel of ViMAC and is associated with

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high mortality. We learned in the MITRAL trial that emergency alcohol septal ablation can acutely reduce TMVR-induced LVOT obstruction and be lifesaving and that preemptive alcohol septal ablation performed 3 to 4 weeks before TMVR can prevent LVOT obstruction in patients at high risk. We plan to apply what we learned in the EFS as we move forward with the MITRAL II pivotal trial. This trial will have two arms: one with 100 patients treated with transseptal ViMAC and one with a registry of patients who are not candidates for any intervention and are treated medically. We hope to start enrollment in 2020. It will be important to support enrollment in this and other MAC trials. ViMAC remains an off-label procedure. I encourage colleagues to consider referring patients with MAC to any of the ongoing trials to help us generate the data needed to better understand the best treatment option for these complex patients.

How would you describe your ideal screening process for determining TMVR eligibility?

Cardiac CT has become the main screening imaging modality for determining TMVR eligibility. It allows operators to define mitral valve anatomy, including specific mitral annulus dimensions, which is essential for understanding which TMVR device best fits the anatomy. CT is also crucial to evaluate the risk of TMVR-induced LVOT obstruction—the most important complication of TMVR. When high risk of LVOT obstruction is detected, risk reduction strategies can be implemented to decrease such risk to improve outcomes.

What is your algorithm for treating severe mitral disease and MAC?

Patients with symptomatic severe mitral valve dysfunction in the setting of severe MAC usually are at high surgical risk due to multiple comorbidities and/or technical challenges related to severe MAC. Once the multidisciplinary team has determined that the patient has high surgical risk and the patient has expressed interest in considering TMVR, we obtain a cardiac CT scan to perform a detailed evaluation of the mitral annulus. We have developed a MAC score that has helped us identify patients at high risk of valve embolization while using a Sapien 3 valve for ViMAC. In an analysis from the TMVR in MAC Global registry, we found that patients with a MAC score ≤ 6 have a very high risk of valve embolization if treated with a transseptal ViMAC (Figures 1 and 2 show a description of this MAC score[2]). If the MAC score is ≥ 7, we can consider transseptal ViMAC with Sapien 3. We then evaluate the risk of LVOT obstruction. If it is high, we may consider alcohol septal ablation, percutaneous anterior leaflet laceration, or radiofrequency septal ablation according to the patient's anatomy. Participation in a clinical trial using dedicated mitral transcatheter valves may also be an option for patients with a MAC score ≥ 7. If the MAC score is ≤ 6, indicating moderate MAC that is not enough to provide adequate anchoring of a Sapien 3 valve, the best option may be participation in a clinical trial evaluating a transcatheter heart valve designed for the mitral valve with an anchoring mechanism. Figure 3 summarizes my personal algorithm while evaluating these patients. This is not an official recommendation from a society or institution; it is just my opinion using what I have learned after seeing hundreds of these patients.

CT-Based MAC score to categorize severity

CT Findings	Points
Calcium thickness:	
< 5 mm	1
5-9.99 mm	2
> 10 mm	3
Calcium Distribution:	
<180 °	1
180-270 °	2
> 270 °	3
Trigone involvement:	
None	0
Anterolateral	1
Posteromedial	1
Leaflet involvement:	
None	0
Anterior	1
Posterior	1
Total points	10

Mild= 0-3
Moderate= 4-6
Severe= 7-10

Figure 1. Cardiac CT-based score to categorize MAC severity. Reprinted with permission from Guerrero M, Wang D, Pursnani D, et al. A cardiac computed tomography–based score to categorize mitral annular calcification severity and predict valve embolization. JACC Cardiovasc Imaging. Published online May 13, 2020.

As Co-Chair of Mayo Clinic's Department of Diversity and Inclusion, what steps are you taking to increase diversity in medicine, particularly in cardiology?

Our institution has supported diversity and inclusion efforts at multiple levels for a long time. As a result, we are privileged to have one of the most diverse cardiology departments in the country. The proportion of female cardiologists in the United States has historically been in the range of 15%. Currently, 32.5% of physicians

in our department are nonwhite and 18.5% are women. The percentage of women fellows in our fellowship programs is above the national average, with 25% women in our general cardiology fellowship program and an even higher proportion in our interventional programs (2 out of 3 [66.7%] interventional fellows and 1 out of 3 [33.3%] structural heart disease interventional fellows are women).

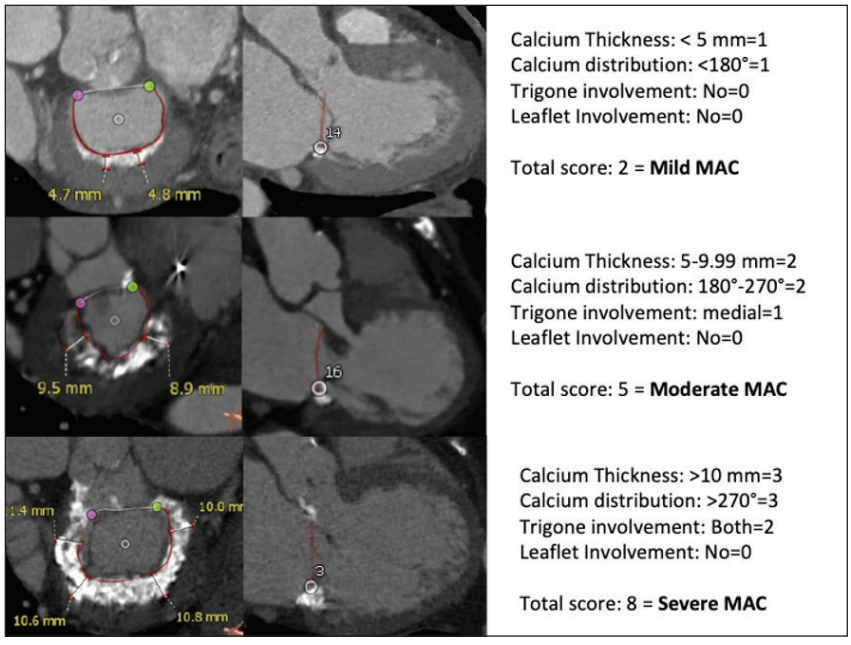

Figure 2. Examples of MAC cases and their severity grade according to CT-based MAC score. Reprinted with permission from Guerrero M, Wang D, Pursnani D, et al. A cardiac computed tomography–based score to categorize mitral annular calcification severity and predict valve embolization. JACC Cardiovasc Imaging. Published online May 13, 2020.

Regarding strategies to increase diversity, I don't think there is a simple solution or magic formula. The lack of female representation in cardiology is a complex problem at a national level and around the globe. The reasons are multiple: a culture of a male-dominated field, lack of mentors and opportunities, discrimination, and, perhaps, concerns about the risk of radiation exposure and work-life balance, among many other factors that cannot all be covered in this brief communication. To solve this problem, we need a change in culture, with efforts aimed to make this field more equitable to attract more women. An environment that embraces the importance of diversity in the main shields of medicine (clinical practice, research, and education) is needed. This requires involvement from leadership at each institution and

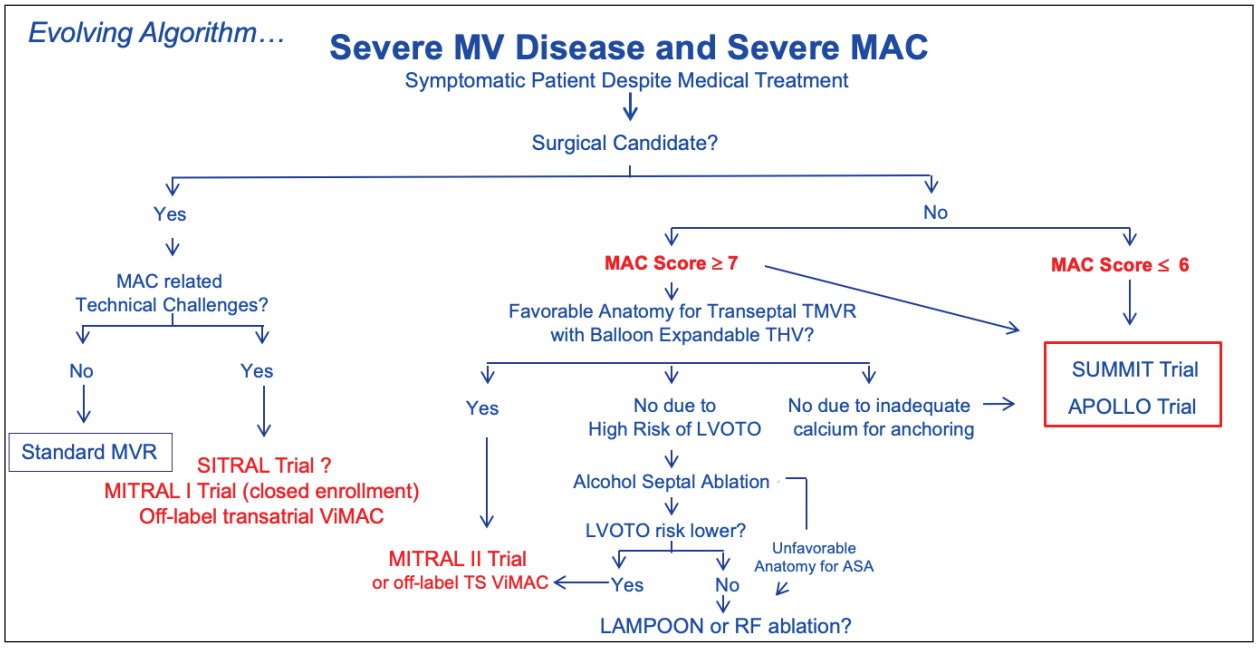

Figure 3. Evolving algorithm of treatment options for patients with severe MAC. ASA, alcohol septal ablation; MV, mitral valve; RF, radiofrequency; LVOTO, left ventricular outflow tract obstruction; THV, transcatheter heart valve; TS, transseptal.

Figure 4. Team performing a TAVR procedure on a female patient.Left to right: Juliet Henderson, RCIS; Crystal Biksen, cath lab invasive technician; Mayra Guerrero, MD, interventional cardiologist; Kimberly A. Holst, MD, cardiothoracic surgery resident; Colleen E. Connolly Lane, MD, interventional cardiology fellow; Stephanie El Hajj, MD, structural interventional cardiology fellow.

societies such as the American College of Cardiology, via the Women in Cardiology section, which has great ongoing efforts to support and mentor women.

Although there is so much work that still needs to be done, I am optimistic that we are making progress. In one lifetime, I have seen so much change already. I was the only female cardiology fellow in my program many years ago. Now, it is not rare to be surrounded by an all-female team while performing a percutaneous coronary intervention or even transcatheter aortic valve replacement (TAVR). For instance, on December 11, 2019, I arrived to our cath reading conference where one cath lab attending meets with the fellows working in the cath lab that day to review cath films before cases, and they all were women! The photo in Figure 4 is one of my favorite pictures of 2020: a female structural interventional fellow, a female interventional fellow, a female cardiothoracic surgery resident, female cath lab technicians, and a female interventional cardiologist performing TAVR in a female patient! The only male in the room was our cardiac surgeon. I used to be the only woman in the procedure room years ago, and that is rarely the case now.

I am grateful to work at an institution that embraces and promotes diversity. Our department of cardiology supports ongoing evening events for the WIC (Women in Cardiology) group, where female cardiologists, female cardiology fellows, and female residents are invited to spend the evening together. We network while enjoying either dinner, a nice workout at a fitness center, or some other fun activity. The goal is to promote networking and bonding, share our experiences, and strengthen our community to lift us and lift others together. Sometimes, just being there and knowing we are there for each other is all we need. I would totally recommend this type of activity to other institutions. ■

1. Guerrero M. One-year outcomes of transcatheter mitral valve-in-valve, valve-in-ring and valve-in-mitral annular calcification: results from the MITRAL trial. Presented at: EuroPCR 2019; May 21–24, 2019; Paris, France.
2. Guerrero M, Wang D, Pursnani D, et al. A cardiac computed tomography–based score to categorize mitral annular calcification severity and predict valve embolization. JACC Cardiovasc Imaging. Published online May 13, 2020. doi: 10.1016/j.jcmg.2020.03.013

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