In this issue of the Journal, Coyan and colleagues report on a series of patients who underwent robotic mitral valve repair or replacement (RMVR). These patients were compared with a contemporary group of patients who had their mitral valves repaired or replaced through a sternotomy (surgical mitral valve repair or replacement). Experienced mitral valve surgeons performed all 328 consecutive procedures, 118 of which were performed with the robot. More than 80% of the patients had a repair. Coyan and colleagues were able to propensity match 182 patients.

Coyan and colleagues observed similar overall hospital costs between the patients undergoing RMVR and those undergoing surgical mitral valve repair or replacement. Interestingly, activity-based cost accounting was applied to include direct, semidirect, and indirect costs. The total cost also included depreciation of the robot.

The overall outcomes were excellent and similar in each group with respect to mortality and freedom from recurrent mitral regurgitation. The patients undergoing RMVR were more likely to be extubated in the operating room (74.7% vs 18.7%; \( P < .001 \)), to spend less initial time in the intensive care unit (ICU; 27 hours vs 31 hours; \( P = .004 \)), to have less total ICU time (27.5 hours vs 34.0 hours; \( P = .003 \)), and to have a shorter postoperative length of stay (5 days vs 7 days; \( P < .001 \)). There were also trends toward less blood use and toward fewer rehospitalizations in the RMVR group.

Although the overall hospital costs were similar, the significantly shorter ICU and hospital lengths of stay have an unaccounted-for impact on health care costs. There are several factors to be considered. One is the ability to receive transfers of new patients to the ICU or step-down unit in beds freed up by this decreased use in the RMVR group. Another is the potential for an improved work environment for the ICU staff because of the lower intensity level of the patients undergoing RMVR.

At my institution, the cardiothoracic ICU has many very high-acuity level patients. We have patients receiving extracorporeal membrane oxygenation and Impella (Abiomed, Inc, Danvers, Mass) support. We have a robust aortic surgery program that includes patients who have had hypothermic circulatory arrest. Performing valve surgery in a way that allows a lower acuity level course improves the overall work environment.

According to Society of Thoracic Surgeons data, only 14.5% of mitral valve operations are being performed with minimally invasive or robotic techniques, and 11% of mitral valve repairs are performed with the robot. There is as of now a single commercially available device for nonsurgical repair of the mitral valve, the MitraClip (Abbott Vascular, Santa Rosa, Calif). In data from the STS/ACC TVT Registry, 2952 patients were examined for the acute outcome; of these, 92.8% had postprocedural mitral regurgitation of 2 or less. In-hospital mortality was 2.7%, and most patients were discharged home (85.9%) after a median 2-day hospitalization. The median age of the patients was 82 years, 56% were men, 85% had New York Heart Association class III or IV heart failure, and 93% had grade III or IV mitral regurgitation. In our experience these patients recover in the cardiac catheterization laboratory and have no ICU stay.

There are other transcatheter and transapical mitral therapies in or near pivotal clinical trials. These include CardioBand (Valtech Cardio, OrYehuda, Israel), Pascal (Edwards Lifesciences, Irvine, Calif), Harpoon (Edwards Lifesciences), and NeoChord (NeoChord, Inc, St Louis Park, Minn).
Minn). Intrepid (Medtronic, Minneapolis, Minn), CardiAQ (Edwards Lifesciences), and Tendyne (Abbott Vascular) are transcatheter mitral valve replacements that are in or near pivotal trials.

Surgical treatment of mitral valve repair remains the criterion standard, as demonstrated by the excellent outcomes by the Coyan and colleagues. Nonsurgical approaches for the treatment of mitral valve disease, however, will create pressure on us as surgeons to provide a less-invasive surgical treatment for the mitral valve.

There may never be a randomized, controlled trial of minimally invasive mitral valve surgery versus a sternotomy approach. The propensity matching in this study does shed some light on the differences, however, and in my interpretation, it clearly favors the minimally invasive and RMVR options.

Why have less-invasive surgeries for mitral valve disease not been more widely adopted? It has been more than 20 years since minimally invasive and robotic valve surgery were introduced. There are specific pitfalls related to minimally invasive surgery and RMVR; however, as demonstrated by Coyan and colleagues and clearly described by surgeons with significant experience, these can be avoided. Is it because these procedures are perceived to be more complicated?

What is complicated about minimally invasive and robotic surgery? These procedures do require a team that is familiar with the equipment and techniques that are unique to them. But is not having such a team helpful in all cardiac operations? In my experience, these operations are a series of steps that can be learned and applied. This is not much different from sternotomy mitral valve repair or replacement, albeit some steps are different.

Application of these “complicated” minimally invasive and robotic procedures to patients with mitral valve disease avoids “complicated” ICU and hospital care, and it avoids a “complicated” recovery from surgery. This will become increasingly important as surgery competes with less effective transcatheter mitral valve therapies. In their report, Coyan and colleagues demonstrate that a minimally invasive mitral valve program, including the use of the robot, is highly beneficial to patients at no financial burden to the hospital.

References
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