procedures increased by 84.4% annually from 2013 to 2016. Despite comorbidities increased throughout the study for all groups, in-hospital mortality decreased from 8.5% to 3.7% for all interventions, with MitraClip having the most substantial decrease from 3.6% to 1.5%. The results depict how mitral valve interventions were associated with improved outcomes despite being applied to an increasingly sicker population. However, the main limitation of the current nonrandomized study was the lack of patient selection among treatments and collection of data from hospital discharge databases that are missing International Classification of Diseases diagnosis code (necessary to distinguish between primary and secondary mitral regurgitation), supply utilization (necessary to identify mini-thoracotomy or robotic surgery), and other clinical information such as regurgitation percentage and left ventricle dilation. Nevertheless, the possibility to treat patients in Heart Valve Centers of Excellence where successful outcomes are obtained across the spectrum of mitral valve pathologies with valve repair, replacement, or using catheter-based interventions mitigates these relevant drawbacks.⁴

The good news is that mitral valve interventions are effectively mostly reparative, are associated with improved outcomes despite being applied to an increasingly sicker population, and the possibility of a percutaneous intervention is a reality. The bad is that MitraClip device use is still limited on patient selection and robust midterm results are still lacking. The ugly is that MitraClip represents the only Food and Drug Administration-approved percutaneous mitral valve repair device and none of the actual devices provide the same treatment as conventional surgery.

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See Article page 551.

Commentary: What is now proved was once only imagined

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Mitral valve (MV) surgery has been a constantly evolving field since the beginning. From the first surgical series to these days, innovations¹⁻³ have been introduced in a continuous effort to improve the results and therefore enhance not only the life expectancy, but also the quality

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CENTRAL MESSAGE

Mitral valve surgery is a constantly evolving field and new technologies are helping us in improving outcomes.

of life of the patients. Multiple methods of treatment have been introduced over the years and different techniques and surgical approaches have been studied in numerous retrospective and prospective studies. Nowadays, we are

at the dawn of an innovative and exciting era: The MitraClip (Abbott Laboratories, Abbott Park, Ill) era. Although surgeons are incessantly optimizing their practice to provide better and longer-lasting results, there is no doubt that percutaneous approaches are becoming more and more important even in the treatment of MV diseases.

In this time of epochal changes, it is important to look back to realize what has been done until now and perhaps understand where the future is going to lead us. The study from Zhou and colleagues⁴ provides important information and an overview of the most recent trends in MV management. Through a very large retrospective analysis, involving more than 650,000 patients over a 16-year period, the authors provide clear insight into the different aspects of the treatments of MV disease. And the results are unquestionably encouraging, not only because the operative mortality has decreased over time, but also because this has happened despite the worsening preoperative risk profile of patients. These astonishing results have to be linked to the immense improvements in knowledge and treatment that the cardiovascular community has been able to achieve over the years. As the authors wrote in their Discussion, “this is likely due to advancements in surgical technique allowing for operations to be performed on older patients with more severe disease.”⁴ Not surprisingly, the study clearly shows an important trend in favor of MV repair over replacement and certainly this has been among the most beneficial aspects for patients.

As demonstrated by the authors, MV repair has shown constantly better performance than MV replacement in terms of mortality rate and length of stay.⁴ They consequently derive that MV repair cannot anymore be considered a specialized type of surgery, but rather should be in the armamentarium of every modern mitral surgeon. At the same time, the influence that the new technologies are having in curing MV disease should be recognized and this is clearly shown in the article. In fact, among the most significant data that the study provides are the phenomenal increases in the rate of MitraClip use over time: From the time of Food and Drug Administration approval in 2013, this procedure has increased an average of 84.4% annually. If we consider that the overall prevalence of MV disease has not changed over time, and

probably will not change in the near future, we can appreciate that the MitraClip will have a relevant place in curing MV regurgitation. Not surprisingly, the latest European Society of Cardiology/European Association for Cardio-Thoracic Surgery guidelines suggest that percutaneous edge-to-edge repair may be considered in patients at high surgical risk and as we can see from the current study, this procedure works well with good in-hospital outcomes and a shorter length of stay than surgery.

Perhaps a limitation of the study is the lack of information on the surgical approaches and it would have been nice to know how the trend of minimally invasive and robotic surgeries are evolving over time. These approaches are also rapidly expanding, promising an effective surgery with a quicker recovery. Due to the nature of the National Inpatient Sample database, on which the current study was based, these data were unavailable, and this is probably the most significant limitation of the study. Previous analysis on a different database⁵ has already shown the importance of thoracotomy in MV surgery by reporting very good results and we can expect an increasing number of less-invasive procedures in the near future with possibly even better outcomes.

We can certainly affirm that the field of MV surgery is in good health and constantly improving for the benefit of patients and the health care system. These days we can operate on more patients and more effectively, offering them a larger spectrum of treatments and the future appears even brighter.

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