

this series must take into account our institutional experience with MICS and may not be generalized to low-volume centers. The results of this study with regard to variables such as cross-clamp and cardiopulmonary bypass times do not highlight the potential effect of learning curves for this technique.

Conclusions and Implications

In this series, which is relatively large considering the low incidence of cardiac neoplasms, we demonstrate that an MI approach for the resection of cardiac masses is both safe and effective. In addition to the aforementioned limitations of this analysis, patients in the MI group were slightly younger and the majority of masses in this group were located in the left atrium. Despite the limitations of this analysis and potentially unmeasured confounders, there was no associated increase in operative times or compromise of tumor resection margins with an MI approach. Importantly, the MI approach is associated with a significant reduction in length of stay. Thus, given the potential for improvements in patient satisfaction and decreased resource utilization, the MI approach may be an effective approach for tumor resections when technically feasible.

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INVITED COMMENTARY

As the largest reported experience of cardiac tumor resection using minimally invasive techniques, this report [1] provides valuable insight into the advantages of minimally invasive surgery used in the appropriate patient and context. The sternotomy approach remains the standard of care, but the authors demonstrate that minimally invasive techniques in selected patients provide similar oncologic resection with reduced hospital length of stay.

When added to the other studies cited by the authors, these data help document a reproducible benefit of nonsternotomy approaches on patient recovery. This finding is important because all surgeons are under pressure to discharge patients early regardless of the techniques they prefer. Management decisions that affect length of stay (eg, when to extubate, discharge from the intensive care unit or the hospital) are susceptible to patient and pro-

vider biases. The authors should confirm this benefit in a follow-up study by measuring other surrogates of recovery time such as the Duke Activity Status Index or by documenting the time required to return to work.

Their suggestion that stroke rates may be improved by less invasive surgery is more problematic because of the poor power of the study and the presence of multiple confounders, measured and unmeasured. The minimally invasive cohort was younger and had smaller tumors isolated to the left atrium. Postoperative strokes in the sternotomy cohort occurred in those at high risk for stroke, such as complex atrial reconstructions with diffuse attachments of tumor or thrombus, chronic atrial fibrillation, and a history of stroke. Because both groups avoided the risk of complications associated with femoral and endoaortic approaches, the biologic rationale that implicates the choice of surgical incision on postoperative stroke is weak.

Success with surgical innovation starts by building a multidisciplinary team. Because learning comes from doing, it is unrealistic to expect to build a team around a rare operation like the atrial tumor resection. The authors of this study benefitted from extensive experience with minimally invasive mitral valve surgery that was readily transferrable to atrial tumor resection. Although not specifically outlined in this report, it is highly likely that the fundamentals of team training were still relevant

despite the benefit of the "halo effect." Successful adoption of change centers on regular team meetings to review the goals of the cardiac tumor program and provide regular feedback of outcomes after minimally invasive resection. Adverse trends are coupled with an action plan for improvement, and favorable outcomes are promoted to reinforce the extra efforts required of front-line staff. Their final step, a peer-reviewed publication, helps to establish an infrastructure in which all the elements needed for future innovations become integrated, creating an environment where seamless change becomes second nature.

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