annular dimension progression; however, the younger cohort saw a significant size increase in the sinuses of Valsalva.

It is important to recognize that of the 497 patients included in this analysis, a single surgeon performed more than 70% of the procedures and provided proctoring to the individual site surgeons for this complex aortic procedure. One must exercise caution when generalizing these outcomes across all centers and it is unclear whether the success demonstrated by the authors will be reproducible on a larger scale.

The transcatheter aortic valve replacement era has brought sweeping changes to the treatment paradigm of aortic valve disease and how the various surgical options are contemplated when considering a patient's long-term outlook. Recent trends favor the use of tissue valves performed with minimally invasive

techniques and are often driven by the lower risk and younger patient populations. Such choices may ultimately increase the need for potentially higher risk interventions later in life.

We commend the authors for seeking a durable procedure that is aimed at avoiding both the perils of anticoagulation therapy and the need for future reintervention. The question remains: How will patients respond to this option?

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Commentary: Expanding the utility of the Ross procedure—proceed with caution

Ramsey S. Elsayed, MD, MS, Craig J. Baker, MD, and Vaughn A. Starnes, MD

Clinical equipoise remains regarding the Ross procedure and its utility. The choice of conduit for aortic valve replacement in adults continues to represent a significant challenge for some clinicians and must be carefully tailored to each individual patient.¹ The ideal valve procedure should carry a low incidence of stroke and other valve-related complications and be durable, reliable, anticoagulation-free, and fairly reproducible by a wide array of young and experienced surgeons. Continued technical improvements to the Ross procedure have expanded its indications over the past 2 decades, making it a viable option in older patients.² Despite being offered to infants, children, adolescents, and

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CENTRAL MESSAGE

The Ross procedure provides excellent hemodynamics and mid-term survival in patients >50 and should be contemplated in older patients with high levels of physical activity and small aortic annuli.

young adults, the long-term safety of the Ross procedure in adults >50 years has not been well studied.³

In this issue of the *Journal*, Chauvette and colleagues⁴ provide a formidable multicenter report of early- and mid-term outcomes of nearly 500 carefully selected adult patients divided into cohorts of younger and older than 50 years of age who underwent the Ross procedure over a span of 9 years. Due to the retrospective nature of this study and lack of a randomized protocol, the authors rightfully compared cohort

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Disclosures: The authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

Received for publication Oct 13, 2020; revisions received Oct 13, 2020; accepted for publication Oct 15, 2020; available ahead of print Oct 22, 2020.

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J Thorac Cardiovasc Surg 2022;164:847-8

0022-5223/\$36.00

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<https://doi.org/10.1016/j.jtcvs.2020.10.058>

survival with that of the age- and sex-matched general population. The cutoff of 50 years was justified for statistical and clinical rationales, which aligns with the need to address an important topic of debate, outcomes in patient >50 years old undergoing the Ross procedure. As expected, patients <50 years had more previous interventions, unicuspid valves, and aortic regurgitation whereas those >50 years had more comorbidities, ie, hypertension, diabetes, dyslipidemia, and lung and coronary artery disease.

We agree with the authors that consideration of the Ross procedure in adults >60 years of age should be dictated by lifestyle and hemodynamic reasons in conjunction with a thorough preoperative evaluation and limited to physically fit patients with no comorbidities and small aortic annuli who were at risk of patient–prosthesis mismatch.

This study showed comparable perioperative complication and survival rates between groups. Similarly, the cumulative incidence of more than moderate aortic regurgitation (as a surrogate of autograft valve function) and the cumulative incidence of reintervention were not different between groups. These data support the notion of safely expanding the utility of the Ross procedure in carefully selected patients at centers of expertise.

The overall results of this study are promising, but the main limitation is the length of follow-up, with a median of only 2.4 years with only 6-year reintervention and survival data available. Unfortunately, the lack of at least

10-year rates of autograft failure and valve-related mortality precludes the widespread use of the Ross procedure in older patients. Furthermore, 74% of procedures were performed by a single surgeon, rendering the universal reproducibility of similar results questionable.

In summary, the study of Chauvette and colleagues should stimulate the emergence of further studies to potentially confirm equivalent long-term outcomes between younger and older patients undergoing the Ross procedure. Because of the lack of a sufficient number of surgeons performing this operation due to the preconceived notion of its difficulty and limited reproducibility, along with equipoise among clinicians, a formal randomized trial is unlikely. For these reasons, surgeons should take notice of this important novel indication to the Ross procedure and consider it during the patient–surgeon decision making process.

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Check for updates

Commentary: How old is too old for the Ross procedure?

Tirone E. David, MD

In this issue of the *Journal*, Chauvette and colleagues¹ have a study supporting the performance of the Ross procedure in patients older than 50 of age with expected lifespan greater

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CENTRAL MESSAGE

If a mechanical valve is to be avoided, the Ross procedure may be the best AVR for patients whose lifespan is greater than 15 years.

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Disclosures: The author reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

Received for publication Oct 6, 2020; revisions received Oct 6, 2020; accepted for publication Oct 8, 2020; available ahead of print Oct 17, 2020.

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J Thorac Cardiovasc Surg 2022;164:848-9

0022-5223/\$36.00

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<https://doi.org/10.1016/j.jtcvs.2020.10.033>