Reply to the Editor:

Appreciation is extended to Magouliotis and colleagues for their intellectual engagement with the research presented in their article. Their letter emphasizes the intertwining of mathematical elegance and surgical precision, fostering a forward-thinking perspective on aortic valve surgery.

Building on our initial study, further investigation into the integration of the golden ratio into aortic valve replacement (AVR) with Y-incision aortic annular enlargement (Y-incipision AAE) is warranted. The intriguing hypothesis that aligning the sinus height and annular radius ratio with the golden ratio could optimize treatment outcomes suggests a novel avenue for surgical design. This concept proposes a potential paradigm shift where biologically inherent mathematical patterns are incorporated into surgery for optimized results, supported by studies demonstrating a close alignment of aortic root dimensions with the golden ratio ($R = 1.618$).

Prompted by Magouliotis and colleagues, we examined our data on the preoperative and postoperative computed tomography aortograms of 51 patients undergoing AVR with Y-incipision AAE for severe aortic stenosis (abstract presented at Society of Thoracic Surgeons [STS] 60th Annual Meeting, January 27th-29th, 2024, San Antonio, TX). Preoperatively, the ratio of sinus height to aortic annular radius was 1.47; postoperatively, the ratio was 1.54, closely approaching the golden ratio (1.618) (Figure 1). Unlike traditional aortic annular enlargement techniques that frequently upsize prosthesis by 1 to 2 valve sizes, Y-incipision AAE increases the prosthesis size by 3 to 4 valves. This yields improved hemodynamics, resulting in a lower incidence of moderate and severe patient-prosthesis mismatch compared with traditional AAE techniques. In patients treated with AVR without AAE or limited AAE, the smaller implanted prosthesis, often with a smaller radius (5-7 mm), leads to a smaller postoperative ratio of sinus height and prosthesis radius further deviating from the golden ratio. As noted by Magouliotis and colleagues, our focus has predominantly been on acute postoperative complications and the short-term efficacy of Y-incipision AAE. Inclusion of long-term patient follow-ups to assess the endurance of these anatomical ratios and their influence on survival and quality of life metrics is crucial.

The prospect of tailoring valve size and annular enlargement to the unique anatomical dimensions of each patient, particularly through the application of the golden ratio, presents a compelling advancement. This approach holds potential for addressing patient-prosthesis mismatch, a significant concern in aortic valve replacement. Although the integration of the golden ratio in aortic annular enlargement is theoretically sound, its practical application necessitates rigorous scientific inquiry and empirical validation. Insights linking cardiac dimensions to innate ratios provide a captivating foundation for further investigation. The emergence of harmonious interventions may be on the horizon as surgical procedures align with the body’s native forms in phi’s proportions.

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Conflict of Interest Statement
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References


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