To the Editor:

We read with great interest the article by Yang and colleagues assessing the early outcomes of the Y-incision technique to enlarge the aortic annulus by 3 to 4 valve sizes. The outcomes have been further validated by a recent article by the same team reporting outcomes from 119 patients undergoing Y-incision aortic annular enlargement. Given the significance of the provided evidence, we would like to further stress another important point we believe contributes to the success of the Y-incision technique.

Across the universe, all natural structures tend to follow the golden ratio, a mathematical pattern defined by the equation $a + b/a = a/b = 1.618$. The golden ratio was first described by Euclid and Fibonacci and is present across all entities in nature, ranging from sunflowers to stars and galaxies. In this context, the human body and the cardiovascular system would not represent an exception to the rule. In fact, there is growing evidence demonstrating that the anatomy of both the coronary arteries and the normal native aortic valve follows this perfect geometrical pattern, approximating the ratio of 1.618, a phenomenon known as phyllotaxis.

In the case of the normal aortic valve specifically, the ratio of sinus height:annular radius tends to match the golden ratio (Figure 1). This is where the Y-incision technique comes into play. As Yang and colleagues demonstrate in their Table E1, the annular enlargement with the Y-incision technique enables the upsized valve to have an inner diameter where the opening of the cusps matches or is larger than the diameter of the patient’s basal ring, thus restoring the normal size of the aortic annulus for the patients. Our hypothesis dictates that the restored annular radius contributes to a ratio of sinus height:annular radius approximating that of the golden ratio.

The surgical restoration of the aortic root should strive to replicate the natural proportions as accurately as feasible. In this regard, we suggest that preserving the golden ratio might be crucial for optimal vortex formation and blood flow through the aortic root when Y-incision technique is employed. If the answer to the question “what valve upsizing is the ideal?” is upsizing with moderation, then moderation is a different word for the golden ratio, as should be approximated by the sinus height/annular radius ratio. Overall, we believe that the golden ratio offers a promising perspective and mathematical framework for approaching aortic valve replacement and annular enlargement with the Y-incision technique and should be further investigated.

The Journal of Thoracic and Cardiovascular Surgery • Volume ■, Number ■ • e1
Letter to the Editor


https://doi.org/10.1016/j.jtcvs.2024.01.012