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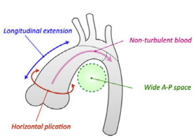

GRADUAL CALIBER TRANSITION OF THE NEOAORTIC ARCH AFTER THE NORWOOD PROCEDURE CAN PREVENT NEOAORTIC DILATION AND RIGHT VENTRICULAR DETERIORATION

To the Editor:

We read the article of Schäfer and colleagues,[1] titled "High-Degree Norwood Neoaortic Tapering Is Associated With Abnormal Flow Conduction and Elevated Flow-Mediated Energy Loss," with great interest. The authors concluded that high-degree Norwood neoaortic tapering developed flow-mediated energy loss and a high energy-loss condition in the neoaorta correlated with future occurrence of neoaortic dilatation.[1] In addition, the authors also emphasized that oversizing the Norwood neoaortic reconstruction should be avoided.

The viscous energy loss that they proposed is correlated with the standard deviation of neoaortic tapering. Therefore, a larger neoaortic sinus must have a greater standard deviation, and modification of Norwood aortic arch reconstruction might be needed for this spectrum. This concept coincides with what we have believed, which is the basis of our development of the chimney technique.[2] This chimney reconstruction can provide gradual caliber tapering of the neoaorta and can avoid oversizing the neoaortic reconstruction. We have demonstrated its hemodynamic advantages using computational fluid dynamic analyses with 3-dimensional computed tomographic angiography in our series,[3] and our computational fluid dynamic results were compatible with the authors' magnetic resonance imaging results. Our previous study based on numerical simulation using 3-dimensional computed tomographic angiography showed that the chimney reconstruction enabled us to reconstruct a hemodynamically excellent neoaortic arch and emphasized the importance of the neoaortic arch design with gradual caliber tapering. Schäfer and colleagues[1] insisted on the rheological advantages of a reconstructed neoaorta with a low-degree tapering design using patch supplementation based on 4-dimensional flow magnetic resonance imaging measurements. In contrast, the authors did not refer to the relationship between viscous energy loss and the amount of curvature of the reconstructed arch, but this is essential, and the neoaortic arch should be refashioned less acutely.

In the Norwood neoaortic reconstruction, the avoidance of recoarctation has been overemphasized as a top priority. As a result, sufficient patch supplementation with a large anastomosis has been recommended. Flow analysis started with the remarkable study by Itatani and colleagues,[4] and the ideal configuration of the neoaortic arch after the Norwood operation has become apparent. They concluded that creation of a large anastomotic space and a smooth aortic arch angle reduced wall shear stress and energy loss and should improve long-term cardiac performance after the Norwood procedure.[4] Subsequently, Plummer and colleagues[5] demonstrated that Gothic neoaortic arch geometry is the least beneficial and produced the greatest propensity for ascending aortic dilation and reduced distensibility. While patch reconstruction including the interdigitating technique is now a universally applied technique, excess tailoring of the patch used to avoid recoarctation can develop into a Gothic arch. Although our chimney technique without patch supplementation can be technically demanding, the longitudinal extension and horizontal plication of the neoaortic trunk can provide a Romanesque-shaped and large-curvature neoaortic arch and can avoid oversizing the neoaortic reconstruction.

We believe that the study results of Schäfer and colleagues[1] clarify the ideal design of the neoaortic arch, as well as provide us surgeons the opportunity to reconsider the application of patch supplementation in Norwood neoaortic reconstruction.

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