Title: Invited commentary for coarctation and hypoplastic distal aortic arch; a keystone shift away from the archway?

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Kozyrev et al. report their results in a modified technique for coarctation of aorta with hypoplastic distal aortic arch (1). This paper represents a quality initiative as much as a technical manuscript. The authors included 32 patients during a three year time period from 2016 until 2019. The study group had specific criteria, yet lacked a control group as a comparison. The patients studied were neonatal patients (median 3.5 kilograms, with a range of 3.1 to 4.0 Kg) with 12 of 32 (37.5%) having bicuspid aortic valve pathology and excluded patients with other associated anomalies. Included in the study were atrial septal (n=3) and ventricular septal (n=5) defects. In this report the authors performed a pre-operative computer tomography (CT) scan to precisely define the distal arch size, arch geometry (height/width ratio), and Z-score and performed post–operative CT scan and 6 month follow up CT scan as well. The authors specifically included a median Z-score of the distal part of the arch -2.5 (-3.1;2.3). Surgical approach is described as a left chest, third intercostal space with extensive mobilization. The authors noted the first anastomosis was between the left carotid artery (LCA) and the left subclavian artery (LSA) with a cross-clamp time of 25 minutes (range 23-28 minutes). The second anastomosis included (PDA ligation and division, resection of coarctation tissue) incision of leftward side of the aortic isthmus to the end of the descending aorta with a second cross-clamp time of 19 minutes (range 17; 23 minutes). The authors concluded that this technique provides favorable geometry of the aorta with a low risk of morbidity. At 18 months follow up no mortality, recoarctation, or bronchial compression was noted. What prompted the authors to examine this group? Why did the authors utilize CT scan, not echocardiography? Is the radiation exposure less obtaining 2-3 CT scans compared to one interventional procedure in the instance of recoarctation? Will this approach foster better definition of concomitant arch and coarctation disease?

Kozyrev et al. present an intention to diagnose and to treat distal aortic hypoplasia separate from coarctation (Figure #1). This is manifested in the diagnostic use of CT scan, not echocardiography, and the modified approach they describe and illustrate well. The author's first anastomosis may augment the distal aortic arch laterally displacing the keystone, while the second anastomosis corrects the coarctation and upward shifts the archway (Figure #2 and #3). The results in this specific group show good results and illustrate the goal of obtaining a romanesque arch "way", as opposed to gothic or crenel arch "way" (2,3). Magnetic resonance imaging and 4D flow or computational fluid dynamics may serve as the next phase of study for the authors obviating the need for post-operative radiation exposure. Will this new surgical approach resolve high blood pressure associated with left heart pathology and end the need for post-operative balloon intervention by pediatric cardiologists? Avoiding the cost of stenting for aortic coarctation and life-long antihypertensive medications would be ideal (4). Surgical quality initiatives are evident in the Getting It Right First Time (GIRFT) Toolkit approaches to cardiac surgery (5). Perhaps CT scan is superior for pre-operative surgical planning compared to

echocardiography in distal arch pathology. The authors are to be commended for a novel modified geometric approach to coarctation repair with hypoplastic distal aortic arch.

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