Commentary: Conduction System in Tricuspid Atresia: Anatomic Insights Continue to Refine our Approach

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Central Message

Anatomic pathology is central to modern medicine and as technology advances we must continue to ask basic anatomic questions and seek answers in innovative ways.

Central picture legend: Elizabeth H. Stephens, MD, PhD and Joseph Maleszewski, MD
It can be easy to think of anatomy as a “dead” discipline. The fact that many begin their journey in medicine by studying it on cadaveric specimens has furthered this stereotype. We have amassed such an impressive understanding of anatomy, gleaned over millennia of studying the human form, that it is equally easy to think there is “nothing new under the sun.” Wada and colleagues\(^1\) have shown us quite vividly how technology is enhancing anatomic study, providing valuable insights on the conduction system in cases of tricuspid atresia. As single functional ventricle (e.g., tricuspid atresia) patients increasingly survive into adulthood, some require interventions on the aortic valve and/or root.\(^2\) In this setting, the surgeon must understand altered anatomy to avoid unintended consequences of intervention.

While conduction system anatomy in the setting of common congenital heart disease is basic fare for congenital heart surgeons; the anatomy in uncommon lesions (like tricuspid atresia) is more illusive owing to the paucity of systematic series. Baharati\(^3\) and others, for instance, have focused study of the conduction system in tricuspid atresia as it relates to the ventricular septal defect and early palliative procedures, but its relation to the aortic root has, hitherto, not been systematically studied.

In this current work, the authors employed synchroton radiation-based X-ray phase-contrast computed tomography of autopsy specimen of hearts with tricuspid atresia, allowing for non-destructive, high-resolution detailing of the conduction axis. This technique affords excellent spatial resolution that approximates what is seen on histologic sections, but is not limited by dissection technique or histologic processing. These factors have traditionally hampered the study of rare lesions. Image acquisition, with the ability to reconstruct and consider the anatomy from numerous perspectives is paradigm shifting, particularly at this resolution. The
provided schematics in this manuscript will serve as an important atlas for congenital surgeons facing aortic root operations in this population.

Anatomic Pathology is foundational to modern medicine. Dissection and visualization of human tissues has been critical to understanding disease and develop treatments. Imaging and 3-dimensional reconstructions represent the logical progression of this storied history. Insights provided by technological advances, such as those demonstrated by Wada and colleagues, make evident the continued importance of asking basic anatomic questions and seeking answers in innovative ways. Finding these answers will allow us to continue to advance our practice and best tend to the needs of our patients.
References


