Letter by Giardini et al Regarding Article, “Maladaptive Aortic Properties in Children After Palliation of Hypoplastic Left Heart Syndrome Assessed by Cardiovascular Magnetic Resonance Imaging”

To the Editor:

We read with interest the article by Voges et al,1 who analyzed aortic elastic properties in children who had received a Norwood operation for hypoplastic left heart syndrome. The authors confirmed previous findings by Cardis et al2 that the reconstructed ascending aorta in patients with hypoplastic left heart syndrome has reduced distensibility. Using magnetic resonance imaging, Voges demonstrated that abnormal elastic properties in the ascending aorta are associated with reduced right ventricular ejection fraction. However, in our opinion, several additional issues should be considered when interpreting the results.

Distensibility of the aortic wall at any given location is determined by the change in cross-sectional area and the pulse pressure at that specific location of interest. Thus, accurate calculation of the descending aortic distensibility requires precise knowledge of geometric and pressure conditions within the descending aorta. In healthy individuals, without aortic coarctation, the pulse pressure is identical throughout the arterial tree. However, in patients after the Norwood operation, the aortic reconstruction typically leaves geometric size mismatch between the reconstructed aortic arch and descending aorta, leading to pressure drop. Moreover, up to 23% of patients after the Norwood operation can have varying degrees of clinically significant aortic isthmus narrowing that require reinter-vention.3 The article does not state whether Norwood patients in the present study have aortic coarctation or isthmus narrowing,1 but careful inspection of study data would suggest that important narrowing exists in the Norwood group, with an average isthmus/descending aorta diameter ratio of 0.79 (149/188 mm²). As a result, we suggest that adoption of right arm blood pressure to calculate descending aortic distensibility can lead to inaccurate distensibility calculations. Therefore, in our opinion, further research is needed to confirm that descending aortic elastic properties are normal in Norwood patients.

A second point that we think should be considered while interpreting the study results is the use of healthy subjects as the control group. Because aortic wall elasticity is governed by the dimensional and pressure changes throughout a cardiac cycle, distensibility value depends on the stroke volume that is passed through the aorta. For a given aortic wall, larger stroke volumes can result in more pronounced cross-sectional area change and higher distensibility than smaller stroke volumes. Because healthy subjects with normal biventricular circulation have larger resting stroke volumes than Norwood patients with systemic right ventricle, we think that patients with single-ventricle physiology without history of aortic arch reconstruction might represent a more comparable control group.

Despite the above-mentioned limitations, we think that the authors have successfully unveiled the important relationship between aortic properties and ventricular mechanics in this population, and the results of their study will undoubtedly trigger further research in the field.

Sources of Funding

Drs Giardini, Biglino, and Hsia are funded by the Fondation Leducq Transatlantic Networks of Excellence program.

Disclosures

None.

Alessandro Giardini, MD, PhD
Giovanni Biglino, PhD
Tain-Yen Hsia, MD
Cardiorespiratory Unit
Great Ormond Street Hospital for Children
London, UK

References

Letter by Giardini et al Regarding Article, "Maladaptive Aortic Properties in Children After Palliation of Hypoplastic Left Heart Syndrome Assessed by Cardiovascular Magnetic Resonance Imaging"
Alessandro Giardini, Giovanni Biglino and Tain-Yen Hsia

_Circulation_. 2011;123:e594
doi: 10.1161/CIRCULATIONAHA.110.002949
_Circulation_ is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2011 American Heart Association, Inc. All rights reserved.
Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://circ.ahajournals.org/content/123/19/e594

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in _Circulation_ can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to _Circulation_ is online at:
http://circ.ahajournals.org/subscriptions/