CORONARY SINUS REDUCER STENT

To the Editor:

I read with great interest the article by Guenter Weigel and colleagues.¹ I want to commend the authors for their great effort to understand the cascade of molecular events leading to neovascularization in coronary sinus interventions. However, I would like to add some comments.

The term "Beck procedure" alone is a nonspecific term inasmuch as Dr Claude Beck has described two types of coronary sinus interventions.²⁻⁴ The first one, the Beck I procedure, consisted of narrowing the coronary sinus to a diameter of 3 mm, abrading both the epicardium and inner pericardium, spilling of powdered asbestos and 5% aqueous trichloroacetic acid on the epicardium, and placement of mediastinal fat over the treated epicardium. The second, the Beck II procedure, consisted of a vascular graft between the descending aorta and the coronary sinus followed by operative constriction of the coronary sinus ostium a few weeks later. However, both of these procedures have very little in common with pressure-controlled intermittent coronary sinus occlusion (PICSO), which was studied by the authors.

PICSO has more in common with the coronary sinus reducer stent (CSRS) that was developed as an alternative treatment for patients with refractory angina pectoris.⁵ The CSRS

is a balloon-expandable stent that reduces the coronary sinus diameter to 3 mm. It is introduced into the coronary sinus via the venous system, using a percutaneous approach. Fifteen patients with severe angina pectoris have already been successfully treated by this technology.⁵

Personally, I had the opportunity to invent the Neovasc Reducer in the mid-1990s and to lead its initial development team until 2002. The primary idea was to increase a stenotic coronary artery perfusion pressure by limiting its outflow. In other words, if we cannot increase the coronary input, let's limit or decrease its output; instead of manipulating the coronary arteries, let's treat the coronary veins—the upside-down strategy. However, even our first study in nonischemic pigs revealed that 8 to 12 weeks of coronary sinus narrowing ended up with macroscopic epicardial new blood vessels—neovascularization. This was also seen intramyocardially. On those days, the cascade leading from coronary sinus narrowing to new macroscopic epicardial and intramyocardial blood vessels was not clear enough and some explanations other than neovascularization were suggested. The current study by Guenter Weigel and colleagues sheds some light on this subject by favoring the neoangiogenesis explanation that is triggered by some kind of increased coronary sinus pressure.

Werner Muhl, MD, PhD

Stefan Mina, BME

Dejan Milansinovic

Hirofumi Kasahara, MD, PhD

Paz Yoav, MD, MHA

Hadassah-Hebrew University
Medical Center, Department of

Cardiothoracic Surgery

Hadassah

Jerusalem, Israel

References

1. Weigel G, Kajgana I, Bergmeister H, Riedl G, Glogar HD, Gyöngyösi M, et al. Beck and back: a paradigm change in coronary sinus interventions—

pulsatile stretch on intact coronary venous endothelium. *J Thorac Cardiovasc Surg.* 2007;133:1581-7.

2. Edmunds LH. Cardiac surgery in the adults. New York: McGraw-Hill; 1997. p. 482.
3. Beck C. The coronary operation. *Am Heart J.* 1941; 22:539.
4. Beck C, Stanton E, Batinchok W, Leiter E. Revascularization of heart by graft of systemic artery. *JAMA.* 1948;137:436.
5. Banai S, Ben Muvhar S, Parikh KH, Medina A, Sievert H, Seth A, et al. Coronary sinus reducer stent for the treatment of chronic refractory angina pectoris: a prospective, open-label, multicenter, safety feasibility first-in-man study. *J Am Coll Cardiol.* 2007;49:1783-9.

doi:10.1016/j.jtcvs.2008.01.047

SINGLE-STAGE VERSUS 2-STAGE REPAIR OF COARCTATION OF THE AORTA WITH VENTRICULAR SEPTAL DEFECT

To the Editor:

We read with interest the article by Walters and colleagues¹ on single- versus 2-stage repair of coarctation (CoA) with ventricular septal defect (VSD) and congratulate the authors for excellent outcomes in patients undergoing single-stage repair of both lesions. However, we would be very cautious in adopting this strategy just because it has been shown to be technically feasible and equally effective in the authors' experience. As the authors have acknowledged themselves, the study population comprises patients spread over a long time frame. We may understand here that when the surgical protocols were developing at the authors' institution, the authors may have elected for a 2-stage approach over a 1-stage approach. As the protocols may have evolved, they were able to make this shift in strategy. However, what prompted them to perform only CoA repair combined with arch augmentation on cardiopulmonary bypass (CPB) and circulatory arrest leaving the VSD open in 3 of their patients is unclear.

An important factor to be considered in developing countries is the morbidity and the costs of the procedure the patients undergo.² Group 1 patients had a prolonged course in

The Editor welcomes submissions for possible publication in the Letters to the Editor section that consist of commentary on an article published in the Journal or other relevant issues. Authors should: • Include no more than 500 words of text, three authors, and five references. • Type with double-spacing. • See <http://jtcvs.ctsnetjournals.org/misc/fora.shtml> for detailed submission instructions. • Submit the letter electronically via jtcvs.editorialmanager.com. Letters commenting on an article published in the JTCVS will be considered if they are received within 6 weeks of the time the article was published. Authors of the article being commented on will be given an opportunity to offer a timely response (2 weeks) to the letter. Authors of letters will be notified that the letter has been received. Unpublished letters cannot be returned.

the intensive care unit with a high incidence of delayed sternal closure. Open sternums do translate into a high risk of infection in tropical countries² and may adversely affect the outcome. Also with a single-stage strategy, extracorporeal membrane oxygenation support may not always be available if there is difficulty weaning these patients from CPB, particularly after an extensive 2-stage procedure in a neonate. Under these circumstances, if the anatomy of the CoA is suitable for repair and there is no need for arch repair, a 2-stage approach can often be justified, particularly in the neonatal age group in whom the risk of CPB and total circulatory arrest related complications is higher. These patients can have the VSD closure in a safe manner at a later stage, which is also technically simpler in an older patient.

In patients beyond the neonatal period with uncomplicated CoA, we prefer the single-stage approach described by Kanter and colleagues,³ in which the CoA is first repaired via a posterolateral thoracotomy, the patient is turned supine, and the VSD is closed using standard CPB. The advantages of this approach are its simplicity, better CoA management (debatable), less CPB times, and avoidance of circulatory arrest. However, this strategy is not applicable to patients with arch hypoplasia and has the disadvantage of 2 incisions.

In most of the public hospitals in India and other developing countries, an initial repair of the CoA costs approximately \$500 and a subsequent second stage can be accomplished at less than \$1500, but if we were to adopt a 1-stage approach, we may incur a substantial increase in costs because of a higher morbidity and longer intensive care unit stay. Despite the claimed advantages of a single-stage approach, we continue to advocate the 2-stage approach in developing countries, particularly in those centers where "proficiency" has not been achieved in managing these critically ill small neo-

nates. The authors are to be congratulated on successfully achieving this.

Sachin Talwar, MCh
Shiv Kumar Choudhary, MCh
Balram Airan, MCh
Cardiothoracic Center
All India Institute of Medical Sciences
New Delhi, India

References

1. Walters HL, Ionan CE, Thomas RL, Delius RE. Single-stage versus 2-stage repair of coarctation of the aorta with ventricular septal defect. *J Thorac Cardiovasc Surg.* 2008;135:754-6.
2. Talwar S, Kumar Choudhary S, Airan B, Juneja R, Sunder Kothari S, Saxena A, Kumar AS. Reducing the costs of surgery for congenitally malformed hearts in developing countries. *Cardiol Young.* 2008;18:363-71.
3. Kanter KR, Mahle WT, Kogon BE, Kirshbom PM. What is the optimal management of infants with coarctation and ventricular septal defect? *Ann Thorac Surg.* 2007;84:612-8.

doi:10.1016/j.jtcvs.2008.06.039

Reply to the Editor:

As Talwar and colleagues state in their Letter to the Editor, we acknowledged the obvious and unavoidable era bias in our article. The 3 patients who underwent repair of coarctation (CoA) of the aorta *alone*, using a median sternotomy incision with cardiopulmonary bypass, had significant proximal aortic arch hypoplasia that precluded satisfactory repair through a left posterolateral thoracotomy incision. In the era during which those patients presented, we were not performing single-stage repair of CoA with ventricular septal defect (VSD).

We agree that the socioeconomic context in which the patient with CoA-VSD presents should be considered when choosing the surgical strategy, namely, single- versus 2-stage repair. Similarly, institutional resources and surgeon-specific variables should also be factored into this decision. We have documented, in our own institutional experience, that the increased need for delayed sternal closure has now been neutralized¹ and that the risk of mediastinitis with delayed sternal closure,

when used, is minimal,² but the same may not be true in other centers.

Nonetheless, the advantages of single-stage repair that we have clearly documented, such as earlier age at complete repair, as well as the hypothetical advantages that we have postulated, such as better neurodevelopmental outcomes related to earlier complete repair, may, in the end, transcend the economic advantages of 2-stage repair. Therefore, the single-stage repair of CoA-VSD could, in the future, become a goal worth pursuing in all centers regardless of socioeconomic barriers. With further research on neurodevelopmental outcomes, the advantages of this technique may become important enough to serve as a stimulus for the development of resources to accommodate its successful and improved implementation.

Henry L. Walters, III, MD
Department of Cardiovascular Surgery
Children's Hospital of Michigan
Detroit Medical Center
Wayne State University School of
Medicine
Detroit, Mich

References

1. Walters HL, Ionan CE, Thomas RL, Delius RE. single-stage versus 2-stage repair of coarctation of the aorta with ventricular septal defect. *J Thorac Cardiovasc Surg.* 2008;135:754-61.
2. Hakimi M, Walters HL, Pinsky WW, Gallagher MJ, Lyons JM. Delayed sternal closure after neonatal cardiac operations. *J Thorac Cardiovasc Surg.* 1994;107:925-33.

doi:10.1016/j.jtcvs.2008.06.040

SOLID AND GASEOUS CEREBRAL MICROEMBOLIZATION AFTER BIOLOGIC AND MECHANICAL AORTIC VALVE REPLACEMENT: INVESTIGATION WITH MULTIRANGE AND MULTIFREQUENCY TRANSCRANIAL DOPPLER ULTRASOUND

To the Editor:

We read with interest the recent article by Guerrieri Wolf and colleagues¹