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EXTERNAL WRAPPING OF ASCENDING AORTIC DISSECTION WITH INTRAMURAL

HEMATOMA

To the Editor:

We read with interest the recent article by Suematsu and colleagues¹ that reported wrapping as a good alternative to graft replacement for type A aortic dissection with intramural hematoma in high-risk patients. We would like to congratulate the authors for their important study and emphasize that we share the same enthusiasm. We would like to add several discussion points that we believe can increase the interest in this topic.

Although graft replacement for type A aortic dissection is now performed relatively safely, cardiac surgeons cannot ignore the hospital mortality and morbidity associated with this procedure in aging and sickly populations. Wrapping reduces cardiopulmonary bypass (CPB) time, the need for blood transfusion, and the incidence of complications. According to Laplace's law, this technique decreases stress on the aortic wall.

We have extensive experience with aortic wrapping at the Sanger Heart and Vascular Institute. My mentor and colleague, the late Dr Francis Robicsek, pioneered the technique.² Our experience over the last 50 years with more than 400 cases encompasses different aortic pathologies, including type A aortic dissection with intramural hematoma. Our technique is a bit different and has been described in many publications.³ We tend to not use CPB; however, we prepare for a potential femoral or axillary approach. When addressing the aortic root and ascending aorta, we recommend that the wrap start at the aortic annulus and extend all the way to the innominate artery and include its takeoff landing just proximal to the left common carotid

FIGURE 1. Robicsek's technique of external ascending aortic wrapping.

artery. We anchor the proximal and distal ends of the wrap to the adventitia (Figure 1). In our laboratory, we successfully restrained the growth of the ascending aorta in a growing swine model with aortic wrapping. Molecular studies of the aortic wall showed no necrosis in intima and media layers or "replacement" of the adventitia by the graft.

One of the main criticisms of wrapping is the possibility of inducing degeneration of the aortic wall.⁴ The reinforced aorta was thinner, with a sclerotic structure with no layers. Another concern is graft migration, causing supravalvular aortic obstruction with impingement on the coronary orifices and hematoma formation underneath the wrap.

Our experience with different synthetic vascular grafts has not been completely satisfactory, and we agree with the opinion, supported by the personalized external aortic root support technique, that a low- or zero-porosity prosthesis can promote the accumulation of fluids between the prosthesis and the aortic wall, making it difficult to achieve good adherence between the 2 structures.⁵ We believe that the synthetic materials used to reinforce the aorta are inelastic, and that the compliance mismatch leads to hemodynamic changes that promote intimal hyperplasia, wall stress, and chronic inflammation.⁶ As a consequence of these changes, the aorta would become a passive conduit. Tissue engineered elastic biological prostheses should be developed and targeted specifically for wrapping the aorta.

We believe that this is a reasonable option for (1) patients with a moderately dilated aorta who undergo other cardiac surgery procedures for whom a short aortic cross-clamp time is advantageous; (2) elderly patients with comorbidities who undergo aortic valve replacement with poststenotic dilatation or fusiform aneurysms; (3) patients with acute or chronic type A aortic dissection in whom the risk of conventional aortic replacement is too high; and (4) patients with Marfan syndrome or other connective tissue disorders with significant comorbidities.

In any case, the described technique gives sufficient evidence to suggest that when done properly, this procedure

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might be a satisfactory solution in selected patients with type A aortic dissection pathologies.

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REPLY: THE CONCEPT OF AORTIC WRAPPING—HOW DID IT ALL BEGIN?

Reply to the Editor:

The article by Suematsu and colleagues¹ presenting their version of stepwise aortic wrapping as a good alternative to aortic graft replacement in type A intramural hematoma stimulated a wide discussion, including Madjarov and colleagues,² about this alternative technique for high-risk patients. The dilemma is certainly the fact that experience is excellent in their center but randomized data or large compulsory registries to document long-term success are not available and will probably never be available in the future.³ Moreover, the principle concept is not new, although it never really reached a broad audience.⁴ One of the pioneers was certainly Francis Robicsek, who introduced, alongside with the concept of reduction aortoplasty (where an oval segment of the aortic aneurysm was excised of the maximal convexity of the ascending aorta), some

external support by additional wrapping as reinforcement using a customized Dacron vascular prosthesis placed around the reduced ascending aorta.⁵ This Dacron wrap is tailored snug but not constricting and closed by suturing from the annulus to the innominate artery. Francis Robicsek and his group concluded that external reinforcement as they called it might extend the scope of indications for aortoplasty of the ascending aorta regardless of aortic regurgitation to patients with primary structural aortic disease and Marfan syndrome.⁶ Nevertheless, they were aware that lifetime monitoring of the ascending aortic size was still essential even after successful surgery because of sporadic reports of under-the-wrap aortic wall atrophy, rupture, and other late events. Thus, the technique never really reached widespread popularity.

A Polish group around Tomas Plonek and colleagues⁷ have refined the wrapping technique to restore competence of the aortic valve in ascending aortic aneurysm and have provided supportive biomedical information of the technology and coded it a *corset* of the ascending aorta. Wrapping according to Plonek refers to the use of an off-the-shelf corrugated vascular graft, opened along its long axis and wrapped around the ascending aorta, essentially a refinement of the Robicsek approach. Radiologic follow-up studies, however, illustrated the shortcomings of using low porosity relatively rigid graft material to wrap around the aorta; such a graft does not conform well to the anatomy and allowed accumulation of fluid between the aorta and the corset support.⁸ Several variations of these initial wrapping techniques have been published but all miss some standardized and randomized scientific comparison or the scrutiny of prospective studies.⁹⁻¹¹

The personalized external aortic root support (PEARS) is the latest variation of the initial wrapping concept.¹² With PEARS a pliant porous mesh is wrapped around the ascending aorta in early stages of an aneurysmal evolution as a preventive measure, which becomes incorporated into the aortic wall. This avoids the risk of migration and impingement on other structures such as the coronaries. Moreover, no spaces are left between the porous mesh and the adventitia covering the aorta ideally from the annulus to the brachiocephalic artery. The operation itself is usually done on the beating heart as a pre-emptive measure to avoid further dilation and prevent dissection. Limitations to the PEARS procedure are certainly the fact that it is not suitable for unplanned use or an intraoperative change of plan. It requires a personalized imaging protocol, a computer-aided design, 3-dimensional printing, and the production of a customized sleeve suitable for a given anatomical structure.¹³ Although no randomized data exist to prove the benefit of PEARS, more than 400 patients have now been subjected to this protective or preventive surgical approach, in particular and for the most part, in patients with hereditary connective tissue disorder such as Marfan syndrome.