FIGURE 1. Repair of a dissected aortic root. A and B, The torn adventitia (A, arrow) was sutured with a 6-0 Prolene (Ethicon Inc, Somerville, NJ) suture (B, arrow) before application of BioGlue (CryoLife Inc, Kennesaw, Ga). C, After the dissected sinuses were reattached with BioGlue (arrow), the sinotubular junction was reinforced with 2 felt strips (arrowhead). D, The aortic graft was anastomosed to the reinforced sinotubular junction with telescopic suture technique (arrow).

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TO GLUE OR NOT TO GLUE IN TYPE A DISSECTION REPAIR?

Reply to the Editor:

In the current issue of the *Journal*, Drs Lee and Choi respond to the article published by Yang and colleagues¹ concerning the use of Prolene 50 suture (Ethicon, Inc, Somerville, NJ) without the use other anastomotic reinforcement technique in type A dissection repair. Drs Lee and Choi revive the vivid debate on the use of BioGlue in type A dissection repair. A summary of their experience seems to support good results with a high rate of root preservation with the use of BioGlue (CryoLife, Inc, Kennesaw, Ga). To address this controversial issue, one has to be reminded

of the main objectives that the surgeon wants to accomplish during a type A repair: (1) to resect the ascending aorta and if possible the primary intimal tear, (2) to restore and save if feasible the aortic valve competency, (3) to secure hemostasis, and (4) to ensure patient survival with minimal early and late complications. During the past 2 decades, many improvements in the field of cardiac surgery have contributed to improve our capacity to reach these goals, such as the development of novel cerebral protection techniques, use of moderate hypothermia to reduce overall cardiopulmonary bypass time, and establishment of multidisciplinary teams with expertise in the management of aortic dissection. Current graft technology and coagulation monitoring/transfusion protocols have also decreased bleeding issues. BioGlue was introduced in 2001 to improve hemostasis of suture lines and reinforce fragile tissue before reconstruction, such as in type A aortic dissection.

Experimentally, BioGlue has been reported to induce inflammatory changes and anastomotic stenosis in coronary artery anastomoses.² The mechanical properties of BioGlue show an increased stiffness compared to normal aortic tissue, which may promote pseudoaneurysm formation through augmented stress on the less compliant native aortic wall.³ The low viscosity of BioGlue has been reported to promote leakage through anastomoses or needle holes. Furthermore, neurotoxicity has also been described as a result of the glutaraldehyde component of BioGlue.⁴

Author has nothing to disclose with regard to commercial support.

BioGlue has been extensively used in the clinical setting of type A dissection, either to promote distal false-lumen thrombosis, to secure anastomotic hemostasis, or to reinforce a dissected root. Reports of systemic emboli, pseudoaneurysm formation, and tissue necrosis linked to the possible use of BioGlue, however, have hampered its use.^{3,5,6} Despite these concerns, with appropriate use, BioGlue has been reported as a safe and useful adjunct in type A repair as suggested by Lee and Choi. Currently, there is general consensus that BioGlue should not be applied in the distal false lumen to promote thrombosis because of the risk of embolization. The use of novel hybrid covered or uncovered stent grafts is emerging as a much more effective and secure therapy to promote distal false-lumen thrombosis. The risk of BioGlue leakage through anastomosis or needle holes contraindicates its use on anastomotic surfaces. New Hemo-Seal 1:1 needles (Johnson and Johnson, New Brunswick, NJ) and still newer and safer hemostatic agents are available to enhance anastomotic hemostasis in type A dissection. Root management in type A dissection is tailored according to the extent of root destruction and includes root replacement, isolated replacement of the noncoronary sinus, or full root preservation with or without BioGlue and Teflon (The Chemours Company, Wilmington, Del) felt reinforcement. Use of BioGlue at the root level necessitates technical precautions to maximize efficacy and minimize complications. Because blood interferes with the bonding of BioGlue to the native aortic tissue, all clots within the false lumen should be removed and the aortic tissue thoroughly dried before BioGlue application. A fine layer of 1 to 2 mm of BioGlue should be spread uniformly within the false lumen. After application, the dissected membrane should be aligned and held firmly to the outer aortic wall to ensure a uniform bonding. Protection of surrounding structures with humidified sponges is important to prevent spillage of BioGlue on structures such as the aortic leaflets. Caution is advised when applying BioGlue in presence of a circular coronary ostia dissection, because BioGlue, as a result of its stiffness, has been associated with strictures when applied circumferentially in pediatric vascular structures or coronary anastomosis.

In conclusion, to use or not to use BioGlue in type A dissection? During the past decade, thoracic aortic surgery has seen the development of important adjuncts in terms of operative techniques, devices, sutures, and hemostatic agents allowing to perform extensive and safe repairs in type A dissection. Although BioGlue remains part of the “toolbox,” its use should be restricted to reinforcing the

dissected aortic root tissues. Strict adherence to the principles of safe application and knowledge of the potential limitations and complications associated with BioGlue are important to minimize the morbidity reported with its misuse.

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DON'T THROW OUT THE BABY WITH THE BATHWATER!

Reply to the Editor:

The letter from Lee and Choi¹ and the article by Yang and colleagues² are part of a never-ending debate about trade-offs between functionality and biocompatibility of biological glues. Lee and Choi¹ describe the use of bovine serum albumin-glutaraldehyde to repair dissected aortic sinuses, and Yang and colleagues² report the (good) results of a technique that completely avoids the use of any glue or foreign material. There is no doubt that the introduction of biological glues into clinical practice improved the early results of surgery for acute aortic dissections. But, as stated by Downing,³ “there is no free lunch at this table.”

The most powerful adhesive⁴ is cyanoacrylate, which quickly polymerizes when applied. However, the possible complications (it can cause local cell death with subsequent necrosis of the arterial wall where applied³) limited its widespread clinical application.

Another tissue adhesive is represented by a mixture of gelatin-resorcinol cross-linked with formaldehyde was