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have found it a useful adjunct facilitating aortic repair in dissection patients. Recently, we had a chance to use Bio-glue as part of a clinical trial. Though the experience is limited, we have seen pseudoaneurysm formation in 2 out of our 5 patients receiving this glue. Last year, Bavaria and colleagues presented the results of a prospective randomized study with Bio-glue at the 81st Annual Meeting of the American Association for Thoracic Surgery [1]. In this study, there were 4 patients out of 17 in the Bio-glue group who required late reoperation, and two of these reoperations were due to pseudoaneurysm formation.

The reason behind pseudoaneurysm formation is not clear but a degree of tissue necrosis and perhaps technical flaws in application of glue may be involved. In our article, we emphasized the importance of proper use of glue to obtain the desired effect [2]. Ensuring that the area where glue is to be applied is dry and bloodless is an important precaution. Similarly, care should be taken to prevent spilling the glue. Bio-glue being more liquid in consistency than the GRF glue has a greater chance to exude out of the false lumen when a clamp is applied to ensure firm apposition between the intima and adventitial walls. However, it appears that despite all these precautions, pseudoaneurysms develop. This implies that we still do not have a perfect glue. While the search for better glues should continue, we should not lose sight of the fact that biological glues have greatly facilitated aortic repair in dissection patients. Dr Bavaria showed that use of Bio-glue significantly reduced pump time, aortic repair time, and total operation time.

Dr Bachet, while discussing Dr Bavaria's article, mentioned that with the use of glues, mortality in acute type A dissection patients has steadily fallen over the years and stabilized at around 18%. Therefore, I agree with Dr Downing when he says that there is no free lunch in this world. For the greater benefit of improving survival in critically ill acute type A aortic dissection patients, we may have to pay this small price of occasional pseudoaneurysm formation, at least for the time being. Given the limited experience with Bio-glue, it is probably too early to make any definitive conclusions regarding potential detrimental effects.

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Alternate Technique of Routing the In Situ Right Internal Mammary Artery to Graft the Left Anterior Descending Artery and Its Branches

To the Editor:

I have read with interest the article by Al-Ruzzeh and colleagues [1]. I would like to congratulate them on their excellent results. I concur with their findings and recommendations for the use of the pedicled (in situ) right internal mammary artery (RIMA) for grafting the left anterior descending artery. However, many cardiac surgeons have not adopted this technique because of the need for the RIMA to course across the midline and over the aorta, as stated in the discussion of Al-Ruzzeh and colleagues. To supplement their findings, I would like to outline an additional maneuver that has not been previously described. The new technique alters the course of the in situ RIMA so as to provide additional length as well as protect it from injury during reentry or cannulation during a future reoperation. The technique consists of the following steps:

1. The RIMA is harvested completely, close to its origin from the subclavian artery.
2. The patient is then heparinized and the RIMA is divided distally.
3. The superior vena cava (SVC) is easily dissected away from its thin surrounding tissue at the level of the proximal RIMA.
4. By passing an angled clamp under the SVC from medial to lateral and grasping the end of the RIMA (with minimal to no pedicle), it is passed posterior to
5. the SVC and redirected from its original lateral position to one medial to the SVC.
6. The innominate vein is easily freed from its surrounded tissue and off the aortic arch in a similar fashion.
7. The RIMA is then passed posterior to the innominate vein (alternatively, the IMA can be passed under both the innominate vein and the aortic arch if additional length is needed) to emerge through the mediastinal fat directly over the main pulmonary artery and right ventricular outflow tract: a very favorable position to graft the left anterior descending artery; diagonal and occasionally ramus intermedius artery (Fig 1).

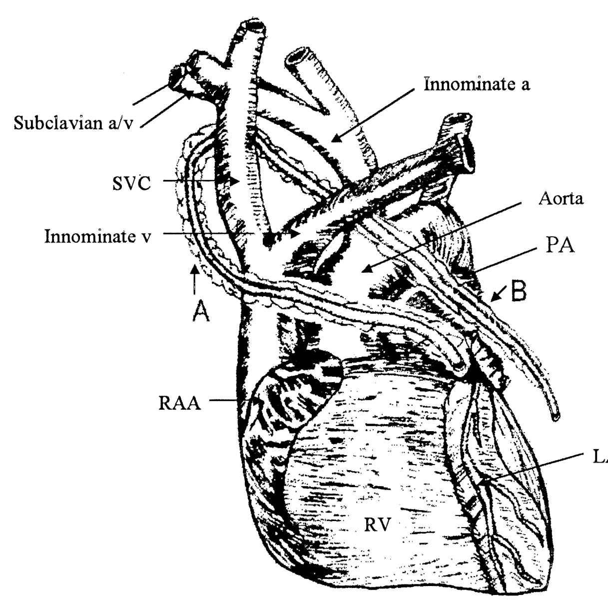

Fig 1. (A) Conventional route of the in situ RIMA to the LAD courses anterior to the SVC and ascending aorta. (B) A more direct and less exposed route to the LAD and its branches courses the RIMA under the SVC, innominate vein and alternatively, the aorta. (a = artery; a/v = artery/vein; LAD = left anterior descending; PA = pulmonary artery; RAA = right atrial appendage; RIMA = right internal mammary artery; RV = right ventricle; SVC = superior vena cava; v = vein.)

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Using this technique, the RIMA consistently has 1 to 3 additional centimeters of length (compared to the anterior technique), and avoids the concerns of stretching the RIMA over the ascending aorta. In many patients, the length of the RIMA is sufficient to perform a sequential graft to the left anterior descending artery and diagonal coronary arteries. Furthermore, the course of the RIMA posterior to the SVC, innominate vein ± aortic arch and fairly high on the aorta protects it from reentry and cannulation. However, when grafting the circumflex with an in situ RIMA, I believe the transverse sinus still provides the most direct path [2].

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Reply

To the Editor:

We thank Dr Vassiliades for his nice comments regarding the article on the right pedicled internal mammary artery to the left anterior descending artery. The technique he describes is very elegant and has at least two advantages. One is that it is somehow buried behind the actual superior vena cava and the innominate and therefore, it is not directly exposed for re-do operation. In addition it probably provides more length. As mentioned in our article we never encountered any need for extra length of the right internal mammary artery. Longitudinal without transverse fasciotomy of the pedicled right internal mammary artery has always been enough to reach the portion of the left anterior descending artery we needed to reach. As far as the issue of re-do is concerned we always make sure that the right internal mammary artery is covered with thymic, pleural, or even peicardial tissue.

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Which Is the Best Sternotomy Closure Technique?

To the Editor:

We read with interest the recent article by Cohen and Griffin on biomechanical comparison of sternotomy closure techniques [1]. The authors compared peristernal figure-eight wires, figure-eight cables, and PectoFix Dynamic Sternal Fixation (DSF) plates under constant tension. Cohen and Griffin's experimental model and results are similar to those shown at the Pectofix web site [2], indicating DSF's superiority in stiffness and yield load. The biomechanical basis of DSF's effectiveness is based on force distribution over a larger area, resulting in lower sternal stress [2]. This principle has been established in earlier sternotomy closure studies utilizing wires [3] and cables [4] threaded through sternal grommets, important biomechanical research articles not cited in the Cohen and Griffin article. Their experimental model included figure-eight peristernal closures and constantly increasing tension which might not approximate actual physiologic strain. Their article does not assess transsternal cerclage wire, among the most widely used closure methods [5], nor repetitive cycling loading, a realistic replication of the forces associated with breathing, coughing, and bodily movement which cause wire to cut through the bone [5]. The wiring system used by Cohen and Griffin might respond differently if tested under repetitive variable force cycling loads. Our ongoing sternotomy closure study uses fresh cadaveric sterna attached to a biomechanical testing device (TAHDi Texture Analyzer, Texture Technologies Corp, Scarsdale, NY). Various sternotomy repair techniques utilizing #5 cerclage wire (Ethicon Somerville, NJ), including transsternal, peristernal, and pericostal single and figure-eight closures, are tested at repetitive cyclic loads at both 400 and 800 Newtons and speeds of 0.04 mm/sec and 0.5 mm/sec. The preliminary results of sternotomy closure's failure testing (wire cutting through bone) shows striking differences in sternal displacement associated with particular closure methods and variable forces and speeds. Despite some questions about their biomechanical model's design and relationship to earlier sternotomy research studies, Cohen and Griffin's results suggest superiority of both the DSF system and cables over cerclage wires.

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