This was followed by establishing distal pulsatile flow (ie, completing the distal anastomosis) and then increasing DAP pressure. Recovery of MEPs was attributed to increased DAP pressure only 14% of the time. From this study of 105 patients, immediate paraplegia occurred in only 1 (1%) patient, with delayed paraplegia occurring in 3 (3%) patients, supporting our previous work showing that delayed was more frequent than immediate paraplegia.

As we reported in 2003, delayed paraplegia occurred more frequently than immediate paraplegia. We determined that the combination of adjuncts, DAP and cerebrospinal fluid drainage, was independently associated with delayed paraplegia. We hypothesized that this was related to the fact that patients who previously would have awoken paraplegic were now neurologically intact but still vulnerable to ischemia and injury. If a second unfavorable event occurred, such as hypotension or cerebrospinal fluid drain catheter malfunction, delayed paraplegia could ensue. Unlike immediate paraplegia, however, delayed paraplegia can be reversed.

In summary, we do agree with the authors that DAP is important and that optimizing perfusion to the collateral network of the spinal cord might be crucial. Collateral network preservation not only involves optimization of DAP but also cerebrospinal fluid drainage, moderate hypothermia, and intercostal artery reimplantation. In essence, spinal cord protection requires a standardized team approach incorporating a combination of adjuncts that should be available to most surgeons.

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References

1. Estrera AL, Miller CC III, Huynh TT, Azizzadeh A, Porat EE, Vinnerkvist A, et al. Preoperative and operative predictors of delayed neurologic deficit following repair of thoracoabdominal aortic aneurysm. *J Thorac Cardiovasc Surg.* 2003;126:1288-94.
2. Griep RB, Griep EB. Spinal cord perfusion and protection during descending thoracic and thoracoabdominal aortic surgery: the collateral network concept. *Ann Thorac Surg.* 2007;83(suppl):S865-9.

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IN SITU RIGHT INTERNAL THORACIC ARTERY IS USUALLY LONG ENOUGH FOR GRAFTING THE CIRCUMFLEX ARTERY THROUGH THE TRANSVERSE SINUS

To the Editor:

We read with great interest the article by Hayward and colleagues¹ about comparable patencies of the radial artery and free right internal thoracic artery (RITA) or saphenous vein at a mean of 5 to 6 years' follow-up after coronary artery bypass grafting (CABG) surgery. We congratulate the authors for their excellent results. Nonetheless, their article raises some concerns, and the conclusions should be debated.

The CABG procedure with bilateral internal thoracic artery (ITA) is associated with a better long-term survival, a lower incidence of cardiac events, and lower necessity of reoperation when compared with those seen in patients who receive a single ITA.

In situ ITA grafts are considered the gold standard for arterial conduits, and better long-term results are achieved when ITAs are primarily grafted to the left-sided coronary arteries, thus leaving the right coronary arteries to be grafted with other conduits. The common technique is to use the in situ left ITA to bypass the left anterior descending coronary artery and the in situ RITA to bypass the obtuse marginal branches of the circumflex artery through the transverse sinus.² How-

ever, the number and length of ITAs can limit their use. Many methods of increasing ITA length, mostly for the RITA, have been suggested.³

Although previous anatomic studies have shown that any coronary arteries can be reached with an in situ ITA,⁴ the Melbourne group reported that pedicled RITA conduits were not often able to reach the more distal circumflex marginal arteries, advocating use of a free RITA to overcome the anatomic limitations of the in situ RITA.⁵ Now the patencies of the radial artery and free RITA are similar at a mean of 5 to 6 years' follow-up.¹

These conclusions need to be taken with some caution because in their study it was mandatory that the RITA had to be proximally interrupted for comparison with other grafts. In our opinion ITAs should always be used as in situ grafts because ITAs are already perfectly connected to the arterial circulation and we have to perform only the distal anastomoses, avoiding proximal connection on the aorta. Free RITA proximal anastomosis on the ascending aorta is often difficult for the narrow diameter of the artery and for the diseased aortic wall.

Moreover, the in situ RITA is long enough for grafting the first or second branch of the circumflex artery through the transverse sinus. Literature articles reported the best results with bilateral in situ ITAs versus a single ITA,^{2,3} leaving free RITA use only in selected cases (third branch of the circumflex artery, sequential bypass, and injured ITA during harvesting). In the study by Hayward and colleagues,¹ all grafts have been performed with single distal anastomoses, and we do not know which marginal branch has been grafted.

In conclusion, in situ bilateral ITAs have to be considered in CABG procedures for their better results, leaving free RITA use only in some cases or selected trials.

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References

1. Hayward PA, Gordon IR, Hare DA, Matalanis G, Horrigan ML, Rosalion A, et al. Comparable patencies of the radial artery and right internal thoracic artery or saphenous vein beyond 5 years: results from the Radial Artery Patency and Clinical Outcomes trial. *J Thorac Cardiovasc Surg.* 2010;139:60-7.
2. Ura M, Sakata R, Nakayama Y, Arai Y, Oshima S, Noda K, et al. Technical aspects and outcome of in situ right internal thoracic artery grafting to the major branches of the circumflex artery via the transverse sinus. *Ann Thorac Surg.* 2001;71:1485-90.
3. Raja SG, Dreyfus GD. Internal thoracic artery: to skeletonize or not to skeletonize? *Ann Thorac Surg.* 2005;79:1805-11.
4. Vander Salm TJ, Chowdhary S, Okike ON, Pezzella AT, Pasque MK. Internal mammary artery grafts: the shortest route to the coronary arteries. *Ann Thorac Surg.* 1989;47:421-7.
5. Tatoulis J, Buxton BF, Fuller JA. Results of 1,454 free right internal thoracic artery-to-coronary artery grafts. *Ann Thorac Surg.* 1997;64:1263-8.

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STROKE PREVENTION BY MEANS OF LEFT ATRIAL APPENDAGE STRANGULATION?

To the Editor:

With great interest we read the article by McCarthy and colleagues¹ about occlusion of canine atrial appendages with an expandable silicone band. Performing a thoracoscopy, they occluded the right atrial appendage (RAA) and left atrial appendage (LAA) with silicone bands in 15 healthy dogs. The dogs were killed 1, 2, and 12 weeks after the procedure and investigated pathoanatomically. The appendages were 100% occluded, and there was no migration of any bands. There was no bleeding, rupture, or systemic emboli. After occlusion, the appendages became necrotic and were replaced by scar tissue. It is concluded that band occlusion of the LAA could improve outcomes in patients with high risk of atrial thrombus formation. We have the following questions and concerns.

First, it is only described how completeness of RAA occlusion was assessed. In the Results section, however, completeness of LAA and RAA occlusion proved by dye injection is reported. When and by which method was LAA occlusion confirmed during the procedure?

Second, the pathoanatomic description and figures are confined to the 12-week findings. What were the findings in the dogs 1 and 2 weeks after LAA occlusion? Were thrombi detected at the occlusion site?

Finally, scars at the occlusion site might become arrhythmogenic foci. Were the dogs investigated for arrhythmias after appendage occlusion?

The LAA is known as a site of natriuretic peptide release and is known to play a hemodynamic role in pressure and volume overload.² Thus it would be of interest to know whether hemodynamic studies have been carried out and whether levels of natriuretic peptides were measured before and after LAA occlusion. The LAA contributes considerably to left atrial function, and left atrial function is impeded after LAA occlusion.³ Scar formation and necrotic tissue of the occluded LAA might additionally deteriorate left atrial function. Thus it would be interesting to know whether changes in left atrial size, morphology, and function had been measured and whether signs of heart failure were detected after LAA occlusion.

It is unknown how rapidly the hemodynamic consequences of LAA occlusion will occur. Thus it would be wise to follow the animals for a longer period than only 12 weeks. Furthermore, concerns about the biocompatibility of silicone, which is known to induce localized and systemic complications, justify a longer observation period.⁴

A disadvantage of thorascopic LAA closure could be that thrombi present within the cavum of the LAA in a pathogenic condition might be pressed out when strangulating the LAA, resulting in systemic embolism. In particular,

thrombi within or near the LAA orifice could be mobilized by the procedure.

Because the LAA is not the only site of intracardiac thrombus formation, particularly in atrial fibrillation, occlusion of the LAA might not prevent thromboembolic events. Thrombi might also develop within the left atrium and possibly also within the left ventricle.

In conclusion, early thrombus formation, assessment of complete LAA occlusion, potential arrhythmogenicity, short- and long-term hemodynamic consequences, tolerability of silicone, and biocompatibility of the described procedure have to be studied more thoroughly before applying the silicone band for LAA occlusion in human subjects. It should be considered also that LAA occlusion does not prevent cardioembolism in atrial fibrillation or other conditions.

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References

1. McCarthy PM, Lee R, Foley JL, Phillips L, Kanayinkal T, Francischelli DE. Occlusion of canine atrial appendage using an expandable silicone band. *J Thorac Cardiovasc Surg.* 26 March 2010 [Epub ahead of print].
2. Stöllberger C, Schneider B, Finsterer J. Elimination of the left atrial appendage to prevent stroke or embolism? Anatomic, physiologic, and pathophysiologic considerations. *Chest.* 2003;124:2356-62.
3. Yamanaka K, Sekine Y, Nonaka M, Iwakura A, Yoshitani K, Nakagawa Y, et al. Left atrial appendage contributes to left atrial booster function after the maze procedure: quantitative assessment with multidetector computed tomography. *Eur J Cardiothorac Surg.* 2010 [Epub ahead of print].
4. Wolfram D, Rainer C, Niederegger H, Piza H, Wick G. Cellular and molecular composition of fibrous capsules formed around silicone breast implants with special focus on local immune reactions. *J Autoimmun.* 2004;23:81-91.

doi:10.1016/j.jtcvs.2010.04.033