To reattach or not to reattach, that is *not* the question

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Central Message

Reattachment of the intercostal arteries during open thoracic aortic aneurysm repair is important; how it is done likely matters less.

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In 1986, Crawford and colleagues¹ noted that intercostal artery (ICA) reattachment was associated with an increased incidence of paraplegia after thoracoabdominal aortic aneurysm replacement. Subsequently, Safi and associates² noted that during the Crawford group's "clamp and sew" era, the crossclamp time was a greater determinant of paraplegia than was ICA reattachment, as the added suturing became detrimental. With use of the adjuncts distal aortic perfusion and cerebrospinal fluid drainage, Safi and associates² observed a reduction in immediate paraplegia with the reattachment of ICAs, specifically: T8 to T12. In contrast, Griep's experimental and clinical work on the "collateral network" minimized the importance of ICA reattachment by promoting the collateralization of spinal cord perfusion.³ Moreover, development of this network likely occurred within 1 week, reducing any need for a long-term conduit patency. These competing models led to continued controversy, especially as the endovascular revolution began.

As outcomes improved with open thoracoabdominal aortic aneurysm repair and adjuncts reduced the risks of immediate paraplegia, delayed paraplegia became more significant. Recent work from my group demonstrated the importance of adequate, stable *systolic* arterial blood pressure, as opposed to *mean* arterial blood pressure, as well as the importance of the reattachment of patent ICAs for the prevention of delayed paraplegia.^{4,5} Although still subject to debate, whether to reattach is *not* the question—as we believe this has been answered. The questions that remain are *how* do we reattach, *what* conduit do we use, and does all this really matter?

In their study reported in this issue of the *Journal*, Sultan and colleagues⁶ performed endoscopic harvest of the greater saphenous vein as the conduit for reattachment of selected ICAs for the prevention of paraplegia. Their series included 22 cases of thoracoabdominal aortic aneurysm repair (of which 12 cases were extent II), with individual bypasses of as many as 3 patent ICAs per patient. The technique appears cumbersome and tedious, because the greater

saphenous vein has to be harvested and prepared before the aortic repair—and individual bypasses to each *selected* patent ICA have to be performed as many as 3 times after completion of the aortic replacement. The results are commendable, as there were no deaths or cases of permanent paraplegia. Although completeness of follow-up was not mentioned, 72% of the saphenous vein graft ICA bypasses were patent. Sultan and colleagues⁶ reported interrogation of ICA saphenous vein grafts with transit-time flowmetry, but they did not report whether this changed their intraoperative management or if reduced flow predicted early or late thrombosis. They also did not note why only 2 ICA bypasses per patient were performed.

Sultan and colleagues⁶ are to be commended for reporting a relatively novel approach to ICA reattachment in human patients (although Lansman and Spielvogel reported using SVG for ICA in pig models) and demonstrating persistent patency. Unfortunately, definitive conclusions cannot be derived from this report because of the limited cohort size; inherent biases, such as, to name a few, which ICA to reattach (upper or lower, left or right); when to reattach in relation to the neural monitoring; and the hemodynamic parameters. Long-term follow-up of this series is encouraged, because previous ICA reattachment techniques, such as the traditional island patch (which was subject to aneurysmal degeneration) and the direct Dacron polyester fabric graft bypass (which was subject to late thrombosis) had limitations.

In the end, spinal cord protection is achieved by providing perfusion directly with reattachment of ICAs and indirectly by increasing hemodynamics (systolic

arterial blood pressure) to promote *early* collateralization of the spinal cord blood supply. Whether to reattach has likely been answered. How to do it and what conduit to use, likely does not matter.

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