

# You Got Some Nerve



David Spielvogel, MD

In this issue of *Seminars in Thoracic and Cardiovascular Surgery*, Imasaka et al describe the fate of the pectoralis major and minor muscles following axillary cannulation for aortic arch surgery. Their technique for axillary artery exposure included splitting the pectoralis major in the direction of the muscle fibers and incising the clavipectoral fascia. The pectoralis minor was retracted laterally, but in some cases divided. The surgeons used sharp dissection to mobilize the axillary artery, avoiding injury to the medial and lateral brachial plexus.

This investigation measured the depth of 3 zones related to axillary artery dissection and cannulation. With the use of CT scans, the authors demonstrated atrophy of both the pectoralis major and minor muscles. CT scans were obtained preoperatively, at 6 months postoperatively and, for certain patients, every 6 months to 1 year thereafter. Overall, the study demonstrates diffuse atrophy in all zones, including right and left sides following bilateral axillary artery cannulation. Three patients had graft stump infections and an additional patient required ligation and resection of an extra-anatomic bypass to the left axillary artery.

The medial pectoral nerve arises from the medial cord of the brachial plexus and may pierce the pectoralis minor as a single branch or multiple branches or may course laterally, innervating the pectoralis minor and lower part of the pectoralis major. The lateral pectoral nerve arises as a branch of the lateral cord or the anterior division of the upper and middle trunk of the brachial plexus and runs along the upper border or medial to the pectoralis minor before coursing along the undersurface of the pectoralis major, innervating the superior portion.<sup>1</sup> When dissecting the axillary artery, injury to the medial pectoral nerve may not lead to pectoralis major muscle atrophy, but if both nerves are damaged, the pectoralis major and minor will undergo marked atrophy and possible fibrosis. Rather than divide the pectoralis minor muscle to exposure the axillary artery, which essentially guarantees injury to the medial pectoral nerve, it is best to gently retract it inferolaterally. Similarly, the lateral pectoral nerve should be carefully preserved, as it is often sacrificed in attempting to expose a sufficient length of the axillary artery to permit Dacron graft attachment or direct cannulation. However, despite



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## Central Message

Imasaka et al describe the fate of the pectoralis major and minor muscles following axillary cannulation for aortic arch surgery.

Cardiothoracic Surgery, Westchester Medical Center, New York Medical College, Valhalla, New York

Conflicts of Interest: None.

Address reprint requests to David Spielvogel, MD, Cardiothoracic Surgery, Westchester Medical Center, New York Medical College, Macy Pavilion 114W, Valhalla, NY 10595. E-mail: [spielvogelD@wcmc.com](mailto:spielvogelD@wcmc.com)  
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one's best efforts, obtaining safe axillary arterial inflow for selective cerebral perfusion may incur injury to these nerves. In young patients, consideration should be given to alternative cannulation sites, such as the innominate artery, carotid artery, or distal aortic arch, to avoid pectoralis muscle atrophy and the resultant chest wall deformity.

Since the publication by Sabik et al,<sup>2</sup> attachment of a Dacron graft (8 or 10 mm) has become the standard methodology for axillary perfusion in most centers due to a perceived reduction in arm ischemia, axillary artery injury, aortic dissection, and brachial plexus injury. We believe that the residual Dacron graft stump, remaining at the end of the procedure, exposes patients to the risk of graft infection and pseudoaneurysm formation. We published a large experience with direct axillary artery cannulation, demonstrating excellent results,<sup>3</sup> and we have used this technique for over 20 years with minimal morbidity. With cannula removal, the axillary artery is repaired directly, and, since no prosthetic graft is left behind, we have not experienced a single surgical site infection.

This detailed study by Imasaka et al demonstrates nicely a seldom-discussed consequence of the use of the axillary artery for arterial inflow for aortic surgery, which is often preferable for a hostile ascending aorta or ECMO. Attempts should be made to preserve at least 1 pectoral nerve and to inform patients of the possible consequences of the planned operative strategy.

### REFERENCES

1. Hoffman G, Elliott L, et al: The anatomy of the pectoral nerves and its significance to the general and plastic surgeon. *Ann Surg* 20:75–81, 1987
2. Sabik J, Neme H, Lytle B, et al: Cannulation of the axillary artery with a side graft reduces morbidity. *Ann Thorac Surg* 77:1315–1320, 2004
3. Strauch J, Spielvogel D, Lauten A, et al: Axillary artery cannulation; routine use in ascending and aortic arch replacement. *Ann Thorac Surg* 78:103–108, 2004