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Commentary: First rib resection in the age of robotic surgery

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Thoracic outlet syndrome (TOS) may have various root causes, namely, neurogenic, venous, and arterial TOS. The vast majority of TOS cases, approximately 95%, are neurogenic. Venous (3%) and arterial (1%-2%) causes combine to make up the remaining 5%.^{1,2}

Resection of the first rib allows for thoracic outlet decompression, providing a wider berth through which the neurovascular structures may pass without impingement or encroachment. This may not only require first rib resection but may also include resection of a cervical rib, venolysis, scalenectomy, and division of anomalous bands or musculotendinous insertions.

The approach to first rib resection is quite varied, with no single approach regarded as the criterion standard. Several methods have been described, including supraclavicular, infraclavicular, transaxillary, high posterior thoracoplasty, video-assisted thoracoscopic, and robotic approaches. The approach generally depends on the anatomic abnormality requiring correction, clinical presentation, and surgeon preference.³⁻⁸ This is exemplified by the treatment of Paget-Schroetter syndrome, in which some advocate patch angioplasty of the vein in addition to thoracic outlet decompression. This approach usually necessitates an infraclavicular incision, which allows adequate control of the subclavian vein to sew in a patch.⁹

Treatment of TOS risks injuring the neurovascular structures that surround the first rib. Surgeons who use the supraclavicular approach site perform a thorough venolysis or neurolysis that those who use the VATS approach may struggle to achieve. In this article, however, Burt and colleagues¹⁰ describe their surgical approach to first rib resection with the da Vinci Xi Robot (Intuitive,

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CENTRAL MESSAGE

As experience with robotic surgery grows, surgeons are applying the improved visualization and dexterity of instrumentation to allow safe surgery in expanded indications, such as first rib resection.

Sunnyvale, Calif). They demonstrate the controlled and delicate dissection of the neurovascular structures, confirming that thorough and safe venolysis or neurolysis is possible with the robotic approach. In addition, they perform a complete or nearly complete resection of the rib, especially the posterior aspect, which Mingoli and colleagues¹¹ have cited as the strongest determinant of long-term results.

The learning curve of any procedure is an important variable to keep in mind when considering how reproducible the results and techniques of a described approach are. Knowing the learning curve of the procedure for Burt and colleagues¹⁰ would help better elucidate the reproducibility of this technique for surgeons familiar with video-assisted thoracoscopic surgery as well as robotic surgery, in addition to those surgeons not experienced with minimally invasive approaches.

As technology and instrumentation continue to advance in thoracic surgery, so will the boundaries of the surgeon's comfort with adoption of new and emerging techniques and radical approaches to current problems. For example, in TOS requiring venous patch angioplasty, the surgeon may choose to complete the operation robotically. Rather than use an infraclavicular approach, the advanced robotic surgeon may attempt to gain proximal and distal control robotically and sew the patch in with the robot as well, thus pushing the boundaries, as has been demonstrated with robotic vascular sleeve

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resections. As with most disease states, there is more than one way to approach decompression of the thoracic outlet and first rib resection. The most important determinant remains surgeon ability to perform the selected approach safely and efficaciously.

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