Commentary

Minimally invasive first rib resection: a technique that is here to stay

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Thoracic outlet syndrome (TOS) effects approximately 8% of the population and although conservative management consisting of physiotherapy and avoidance of maneuvers that exacerbate the symptoms is usually successful, 5% of patients diagnosed with the disease will have persistent symptoms and need to undergo an operation to cure their disease. Several approaches to resect the first rib and cervical ribs have been described including the supraclavicular, infraclavicular, transaxillary, high posterior thoracoplasty incision and more recently minimally invasive video assisted techniques.

This manuscript by George *et al*. is a case series of 10 patients who underwent resection of the first rib to treat TOS. They present good results with resolution of symptoms in 9 of the 10 patients after 6 months of follow-up and demonstrate that in this small series the procedure can be performed safely with only 1 patient having brachial plexus complications of mild functional and sensation loss in the ipsilateral upper extremity, which improved with physiotherapy after 8 months. Their approach utilized 3 incisions, with no rib spreading in accordance with the definition of true video assisted thoracic surgery (VATS) (1). Their median operative time of 85 minutes (range, 65 to 90 minutes) is reasonable. Included in the manuscript are also helpful photos which demonstrate several important steps of the procedure.

It would be interesting to hear about the learning curve of the procedure for the group of surgeons to better understand how reproducible this technique is when added to the armamentarium of surgeons unfamiliar with VATS. As the boundaries are being pushed as to the utility of minimally invasive techniques for surgical diseases it is always important to consider how reproducible the results and techniques are when applied to a large cohort of surgeons. As more instruments are developed specifically for minimally invasive approaches the reproduction of good results and dispersion of the approach will likely follow. Specialized instruments also help to address specific technical issues unique to the approach such as the rib cutter, which the authors describe as having a protective edge to help minimize the risk of injuring the neurovascular structures that surround the first rib. Those of us who were performing VATS operations prior to the production of specialized instruments can attest to the difficulty of using traditional open instruments in a minimally invasive approach.

The authors discuss several approaches including the supraclavicular approach (2), transaxillary approach (3), and a modified minimally invasive approach that utilizes a transaxillary incision (4,5). These different approaches all serve to achieve the same goal, decompression of the various structures that can become compressed by the first rib, each with different strengths and weaknesses.

It is important to appreciate that not all TOS is equal and that in the case of this disease the symptomatology can dictate approach and technique. The best example of this fact is when treating a patient with Paget-Schroetter syndrome. Paget-Schroetter syndrome, characterized by the thrombosis of the ipsilateral subclavian vein with exertion of the arm presents with symptoms associated with venous outflow obstruction of the arm and is due to

compression of the subclavian vein between the subclavius muscle and the anterior scalene muscle leading to intimal injury and chronic scarring of the vein. The sequelae of the chronic intimal injury and healing in Paget-Schroetter syndrome dictate that, in addition to decompressing the thoracic outlet, the vein must also be addressed in the form of a patch angioplasty (6). This is best approached from an infra clavicular incision which allows for division of the bony attachments of the subclavius and the anterior scalene muscle as well as adequate control of the subclavian vein to sew in a patch.

More recently thoracoscopic techniques have been described. There are several advantages to the VATS approach as stated in the manuscript. The visualization is superior in the VATS approach to the transaxillary or infraclavicular approach. This improved visualization is especially evident when resecting the posterior part of the rib at its attachment to the thoracic vertebra. The importance of resection of the posterior extent of the rib is supported by the work of Mingoli as stated in the manuscript as the strongest determinant of long term results (7).

Avoidance of the phrenic nerve also seems to be easier with a thoracoscopic approach as it can be traced back from its location on the pericardium and does not have to be identified in its course over the anterior scalene muscle. The supraclavicular approach involves a visible scar and also has the disadvantage of having to work through and retract the brachial plexus. As stated by the authors of the manuscript the transaxillary approach can place the intercostobrachial cutaneous nerve as risk of being injured, a complication that is avoided when the transaxillary approach is not utilized.

As can be gathered from this discussion there are several important and reproducible approaches to TOS. The syndrome has several differing presentations, which are dependent on the specific structures that are compressed and can range from neurologic to arterial and venous compressive symptoms. Each approach including the minimally invasive approaches all have their strengths and weaknesses for achieving the goal of decompression of the thoracic outlet and what is most important is that thoracic surgeons maintain the skills and knowledge to perform each operation safely to the benefit of our patients.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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