Endoscopic Treatment for Neurogenic Thoracic Outlet Syndrome: Predictors of Success and Long-Term Outcomes

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INTRODUCTION: Neurogenic Thoracic Outlet Syndrome (nTOS) is a complex condition caused by compression of the brachial plexus, leading to pain, weakness, and functional impairment of the affected side. While open surgical techniques remain the standard for severe vascular cases, endoscopic approaches have emerged as minimally invasive alternatives for less severe cases. This study evaluates the safety, efficacy, and predictive factors for success of an endoscopic technique for nTOS.

METHODS: A retrospective case series was conducted including 34 patients with clinically and radiographically confirmed nTOS who had failed conservative treatment for at least six months. All patients underwent brachial plexus endoscopy with targeted soft tissue release. Pre- and postoperative outcomes were assessed using the Visual Analogue Scale for Pain (VAS) and the Quick Disabilities of the Arm, Shoulder, and Hand (QDASH) score. The minimum follow-up was 24 months, with a mean follow-up of 33.2 months. Logistic regression analysis was performed to identify predictors of surgical success.

RESULTS: The mean preoperative VAS score was 6.09 ± 2.17, which significantly decreased to 1.44 ± 1.06 postoperatively ($p < 0.001$). The mean QDASH score improved from 42.07 ± 11.86 to 6.85 ± 6.87 ($p < 0.001$). Logistic regression analysis identified key predictors of surgical success:

VAS Pre-Operative Score ($\beta = -0.74$, OR = 0.48, $p = 0.022$): Higher preoperative pain was associated with a lower probability of good results.
QDASH Pre-Operative Score ($\beta = -0.55$, OR = 0.58, $p = 0.035$): Greater functional impairment preoperatively also reduced the likelihood for good results.

Vascular Compromise ($\beta = -2.91$, OR = 0.05, $p < 0.001$): Patients with vascular involvement were 20 times less likely to experience a successful outcome.

This procedure also demonstrated low morbidity, with no neurological injuries or major complications. However, one patient with severe vascular compromise required a secondary open first rib resection.

High statistical power (>99%) and large effect sizes (VAS $r = 0.84$, QDASH $r = 0.81$) reinforce the reliability of these findings.

DISCUSSION AND CONCLUSION: Endoscopic decompression for nTOS is a safe and effective treatment, significantly reducing pain and improving function. Vascular compromise is the strongest negative predictor of success, indicating that open surgical techniques remain preferable for these cases. Conversely, patients without vascular involvement exhibit high success rates, supporting the use of this minimally invasive technique in appropriately selected candidates. The mean follow-up of 33.2 months confirms the durability of these results, reinforcing endoscopic decompression as a viable long-term treatment option for nTOS.