

# Repeated botulinum toxin injections for neurogenic thoracic outlet syndrome: A case report

## Nörojenik torasik çıkış sendromunda tekrarlayan botulinum toksin enjeksiyonları: Olgu sunumu

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### ABSTRACT

Neurogenic thoracic outlet syndrome (nTOS) is a condition caused by compression of the brachial plexus in the thoracic outlet, often leading to pain and paresthesia. In this article, we report a 34-year-old female patient with chronic nTOS symptoms refractory to prior management. Ultrasound-guided diagnostic blocks of the anterior scalene and pectoralis minor muscles provided significant temporary relief. Subsequent ultrasound-guided onabotulinum toxin A (BTX-A) injections into the scalene muscles resulted in near-complete symptom resolution lasting approximately six months. Over an 18-month follow-up, repeated injections at six-month intervals produced consistent clinical improvement without adverse effects. In conclusion, repeated ultrasound-guided BTX-A injections may be a safe and effective option within a multimodal treatment approach for nTOS.

**Keywords:** Botulinum toxin A, thoracic outlet syndrome, ultrasound-guided injection.

Thoracic outlet syndrome (TOS) is a musculoskeletal condition characterized by the compression of neurovascular structures in the thoracic outlet, presenting challenges in etiology, diagnosis, and treatment.<sup>[1]</sup> Initial management typically involves conservative approaches, such as physical therapy and activity modification, as repetitive overhead motions can exacerbate TOS symptoms.<sup>[2]</sup> A scalene muscle block with a local anesthetic, typically performed under ultrasound (US) or fluoroscopy guidance, can assist in diagnosis and offer temporary relief.<sup>[3]</sup>

### ÖZ

Nörojenik torasik çıkış sendromu (nTOS), torasik çıkış bölgesinde brakial pleksusun kompresyonuna bağlı gelişen ve sıklıkla ağrı ile paresteziye yol açan bir durumdur. Bu yazıda önceki tedavilere dirençli kronik nTOS semptomları olan 34 yaşında bir kadın hasta sunuldu. Anterior skalen ve pektoral minor kaslarına uygulanan ultrason eşliğinde tanısıl bloklar anlamlı, ancak geçici semptom rahatlaması sağladı. Ardından skalen kaslara ultrason eşliğinde uygulanan onabotulinum toksin A (BTX-A) enjeksiyonları, yaklaşık altı ay süren belirgin semptom gerilemesi ile sonuçlandı. On sekiz aylık takip süresince, altı ay aralıklarla tekrarlanan enjeksiyonlar yan etki olmaksızın tutarlı klinik iyileşme sağladı. Sonuç olarak, tekrarlayan ultrason eşliğinde BTX-A enjeksiyonları nTOS için multimodal tedavi yaklaşımı içinde güvenli ve etkili bir seçenek olabilir.

**Anahtar sözcükler:** Botulinum toksin A, torasik çıkış sendromu, ultrason eşliğinde enjeksiyon.

Injection therapy or surgical release may be necessary for patients with persistent neurologic dysfunction or refractory pain.<sup>[4]</sup> Botulinum toxin (BTX) injection into the muscles surrounding the thoracic outlet can serve as a potential treatment option by inducing neuromuscular blockade and reducing tension on the brachial plexus.<sup>[5]</sup> However, there is a lack of high-quality evidence directly evaluating the effectiveness of BTX injections in the treatment of TOS, and it remains unclear whether BTX provides a durable solution or whether repeated injections are required.<sup>[6]</sup>

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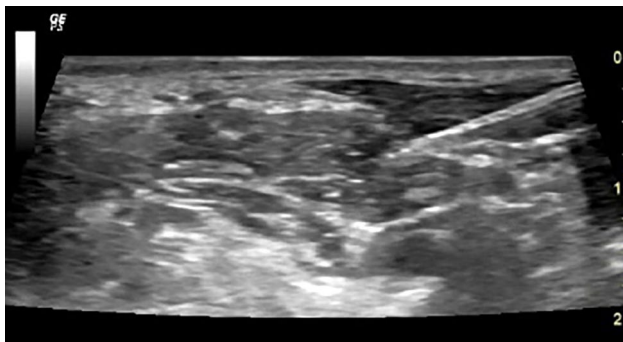
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In this article, we present a case of repeated BTX injections for the treatment of neurogenic TOS.

## CASE REPORT

A 34-year-old female patient presented with burning pain and tingling in her right arm, which worsened following overhead activities. Her symptoms began two years ago following a fall onto her outstretched arm. Over the past year, there had been a progressive worsening of pain and tingling in her arm, along with fatigue in the intrinsic muscles of her hand. Her medical history revealed surgery for cubital tunnel release due to suspected ulnar nerve compression at the cubital tunnel, despite a normal ulnar nerve conduction study result. Persistent symptoms following the surgery prompted a referral to our clinic. Physical examination revealed no restrictions in the cervical spine and upper extremity range of motion. There was no significant muscle weakness in the right upper extremity. Her sensory system was intact, except for slight hypoesthesia in the T1 dermatome, and deep tendon reflexes were normal. The Tinel's test at the wrist and elbow did not evoke a prominent tingling sensation in the fingers. Applying pressure on the scalene and pectoralis minor muscles elicited radiating numbness and burning pain in the ring finger, rated 7 and 5 on the Numeric Rating Scale (NRS), respectively. The Wright's test, Adson's test, and Roos's test were all positive on the right side, with no swelling or discoloration observed in the hand.

Cervical spine radiographs showed no evidence of a cervical accessory rib. Arterial and venous Doppler US of the upper extremities during the hyperabduction maneuver showed normal findings. Nerve conduction studies were normal, except for the right medial antebrachial cutaneous nerve, which exhibited a decreased sensory amplitude of 7.8 microV compared to 11.2 microV on the left.



**Figure 1.** Ultrasound-guided botulinum toxin A injection into the anterior scalene muscle.

Diagnostic US-guided lidocaine injections were administered to assess the contribution of the pectoralis minor and anterior scalene muscles to the patient's symptoms. A total of 4 mL of lidocaine was injected into the pectoralis minor, resulting in a 40% reduction in symptoms. Subsequently, 2 mL of lidocaine was administered to the anterior scalene, leading to a 70% improvement. Based on these findings, nTOS was considered prominent at the level of the scalene muscles. However, the diagnostic block provided symptom relief for more than one week, after which the symptoms gradually recurred. The initial onabotulinum toxin A (BTX-A) injection was performed, targeting the anterior and middle scalene muscles, three months after the diagnostic blocks. A total of 70 IU of BTX-A was injected into the anterior scalene muscle (Figure 1), and 30 IU into the middle scalene muscle. After one month, the patient reported almost complete relief of her symptoms, which lasted for six months. Subsequently, two additional sessions of BTX-A injections, using the same doses, were performed with approximately six months between each session. The patient reported significant symptom relief after each session, with no side effects observed. A written informed consent was obtained from the patient for publication of this case report.

## DISCUSSION

Botulinum toxin type A is a neurotoxin that has traditionally been used to treat pain caused by excessive muscle contraction. A recently published article by Woodworth et al.<sup>[6]</sup> provided a comprehensive review of the role of BTX injections in managing neurogenic TOS (nTOS). However, they also highlighted several uncertainties, including variability in injection protocols and the lack of clear evidence favoring US over fluoroscopy guidance. Additionally, whether BTX injections provide a permanent solution or require repeated sessions remains unclear. Our case demonstrated that BTX is not a permanent solution, and repeated injections are necessary to manage symptoms. While the expected duration of action of BTX is typically around three months, our 18-month follow-up showed that a six-month interval between injections is both effective and acceptable. This extended follow-up period allowed us to evaluate the safety and efficacy of repeated injections, confirming that they remain effective and well-tolerated over time.

Jordan et al.<sup>[7]</sup> found that US was not clearly superior to fluoroscopic guidance for BTX injections.

The close relationship of the scalenes with the neurovascular structures must be considered; therefore, we suggest US guidance for its precision and safety, as fluoroscopy cannot visualize lung tissue or neurovascular structures. A recent study by Murie-Fernández et al.<sup>[8]</sup> also showed that the amount of BTX-A administered per gram of muscle was 14.6 IU/g in the scalene muscles, with a mean real-life dose of 36.5 units. However, in our case, we preferred a significantly higher dose, administering 70 IU of BTX-A to the anterior scalene. The well-established dose-dependent effect of BTX supports our choice of a higher dose to achieve improved outcomes. Considering the risk of undesired effects, future studies could explore varying doses of BTX-A to determine the optimal dosage for maximizing efficacy while minimizing potential side effects.

In conclusion, this case suggests that repeated US-guided BTX-A injections may be a safe and potentially effective long-term component of a multimodal treatment approach for nTOS.

#### Author Contributions

D.P., R.T., K.A.: Contributed to the idea and concept of the study, provided control and supervision throughout the study, critically reviewed the manuscript; D.P., R.T.: Were responsible for the study design; E.A., B.U.C.: Contributed to data collection and/or processing, analysis and/or interpretation of the data, literature review, writing of the manuscript, and preparation of references and funding-related sections. All authors read and approved the final version of the manuscript.

#### Conflict of Interest

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

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#### Data Sharing Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

#### AI Disclosure

The authors declare that artificial intelligence (AI) tools were not used, or were used solely for language editing, and had no role in data analysis, interpretation, or the formulation of conclusions. All scientific content, data interpretation, and conclusions are the sole responsibility of the authors. The authors further confirm that AI tools were not used to generate, fabricate, or 'hallucinate' references, and that all references have been carefully verified for accuracy.

## REFERENCES

1. Nichols AW. Diagnosis and management of thoracic outlet syndrome. *Curr Sports Med Rep* 2009;8:240-9. doi: 10.1249/JSR.0b013e3181b8556d.
2. Li N, Dierks G, Vervaeke HE, Jumonville A, Kaye AD, Myrcik D, et al. Thoracic outlet syndrome: A narrative review. *J Clin Med* 2021;10:962. doi: 10.3390/jcm10050962.
3. Jordan SE, Machleder HI. Diagnosis of thoracic outlet syndrome using electrophysiologically guided anterior scalene blocks. *Ann Vasc Surg* 1998;12:260-4. doi: 10.1007/s100169900150.
4. Hooper TL, Denton J, McGalliard MK, Brismée JM, Sizer PS Jr. Thoracic outlet syndrome: A controversial clinical condition. Part 2: Non-surgical and surgical management. *J Man Manip Ther* 2010;18:132-8. doi: 10.1179/106698110X12640740712338.
5. Christo PJ, Christo DK, Carinci AJ, Freischlag JA. Single CT-guided chemodenervation of the anterior scalene muscle with botulinum toxin for neurogenic thoracic outlet syndrome. *Pain Med* 2010;11:504-11. doi: 10.1111/j.1526-4637.2010.00814.x.
6. Woodworth TT, Le A, Miller C, Conger A, Mahan MA, Cushman DM. Botulinum toxin injections for the treatment of neurogenic thoracic outlet syndrome: A systematic review. *Muscle Nerve* 2024;70:28-35. doi: 10.1002/mus.28080.
7. Jordan SE, Ahn SS, Gelabert HA. Combining ultrasonography and electromyography for botulinum chemodenervation treatment of thoracic outlet syndrome: Comparison with fluoroscopy and electromyography guidance. *Pain Physician* 2007;10:541-6.
8. Murie-Fernández M, Bahamonde C, Graffigna D, Hontanilla B. Botulinum toxin type A infiltration in spasticity and cervical dystonia. Muscle morphology: An overlooked factor. *Neurologia (Engl Ed)* 2024;39:523-9. doi: 10.1016/j.nrleng.2021.09.012.