

Peripheral Nerve Stimulation for Neurogenic Thoracic Outlet Syndrome with Re-implantation following Lead Migration: A Case Report



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Intro

- Thoracic Outlet Syndrome (TOS) encompasses a group of disorders caused by compression of neurovascular structures at the thoracic outlet, affecting the brachial plexus, subclavian artery, and/or subclavian vein.¹
- Neurogenic TOS (nTOS) is the most prevalent form, accounting for 82% of TOS cases in the USA, presenting with paresthesias, pain, and weakness in the upper limbs, neck, trapezius, and shoulder.^{1,2} While conservative treatments are effective in 60% of cases, refractory cases necessitate advanced interventions.^{2,3}
- Neuromodulation, including Peripheral Nerve Stimulation (PNS) and Spinal Cord Stimulation (SCS), is emerging as a novel treatment modality for refractory nTOS.^{4,5}

Methods

- A 25-year-old female with a significant history of Ehlers-Danlos Syndrome presented with right subscapular and midscapular pain radiating to her right upper extremity in a C5 dermatomal distribution, along with stabbing pain around her middle scalene. She experienced significant right arm weakness, and imaging confirmed a cervical rib, leading to a diagnosis of TOS.
- Multimodal pain management strategies were utilized; however the pain was refractory to conservative (physical therapy), pharmacological, interventional (scalene and pectoralis muscle trigger point injections and prolotherapy), and surgical therapies (right first rib resection).
- The patient subsequently received right suprascapular and axillary nerve blocks that provided 80 percent pain relief. We elected to proceed with a permanent, percutaneous peripheral nerve stimulator (PNS) system (Nalu, Nalu Medical; Carlsbad, CA) for the right axillary and suprascapular nerves .
- The trial lead placement resulted in 90 percent pain relief, and the patient subsequently elected for implantation of the permanent PNS system [Figure 1].

Results

- The patient reported 100% pain relief post the PNS system implantation. However, three months postoperatively, she was found to have lead migration at the surgical site second to increased physical activity with wound dehiscence and subsequent lead exposure requiring antibiotic treatment and urgent explantation.
- Given the notable efficacy with the initial PNS system, a decision was made to proceed with reimplantation of the PNS system with 40 cm leads and plan for tunneling of the PNS leads to the low back/flank to prevent lead migration. The patient underwent successful lead placement at both the axillary and suprascapular nerves under ultrasound and fluoroscopy guidance [Figure 2].
- Post-operatively, the patient reported no pain, weakness, or other complaints and no was able to taper off all oral pain medications. Over a two-year follow-up, she experienced a sustained 70-80% reduction in pain.

Discussion / Conclusion

This case highlights the potential of a novel neuromodulatory technique utilizing PNS for therapeutically managing refractory nTOS in patients unresponsive to conventional treatments. Current literature indicates that neuromodulation, specifically SCS, offers significant therapeutic advantages for patients with refractory nTOS, addressing neural compression and dysfunction more directly than traditional methods.^{4,5} However, there is paucity of literature that describes the use of PNS for refractory nTOS as an efficacious minimally invasive alternative.⁵ As shown in the case of this patient, permanent PNS may be a feasible treatment option for refractory nTOS and warrants further studies to prove long term efficacy of neuromodulation in nTOS.

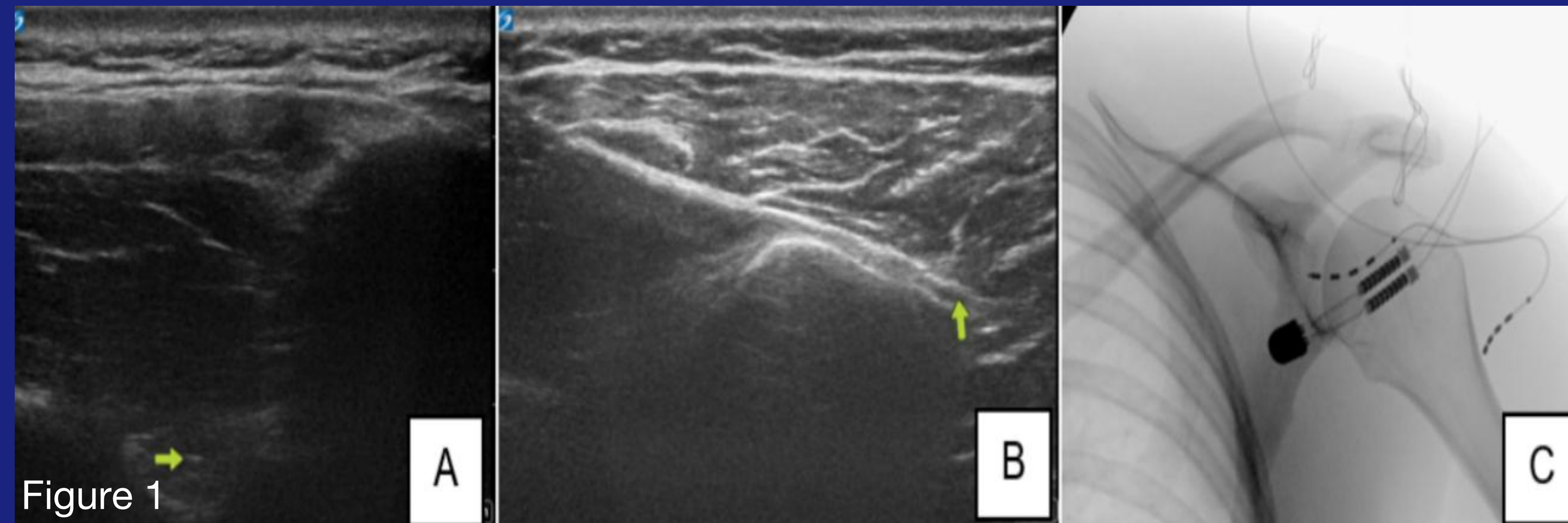


Figure 1. A) Ultrasound image of lead placement at suprascapular notch adjacent to the suprascapular nerve via out-of-plane approach. B) Ultrasound image of lead placement adjacent to the axillary nerve via in-plane approach. C) Fluoroscopy image of final PNS system placement.

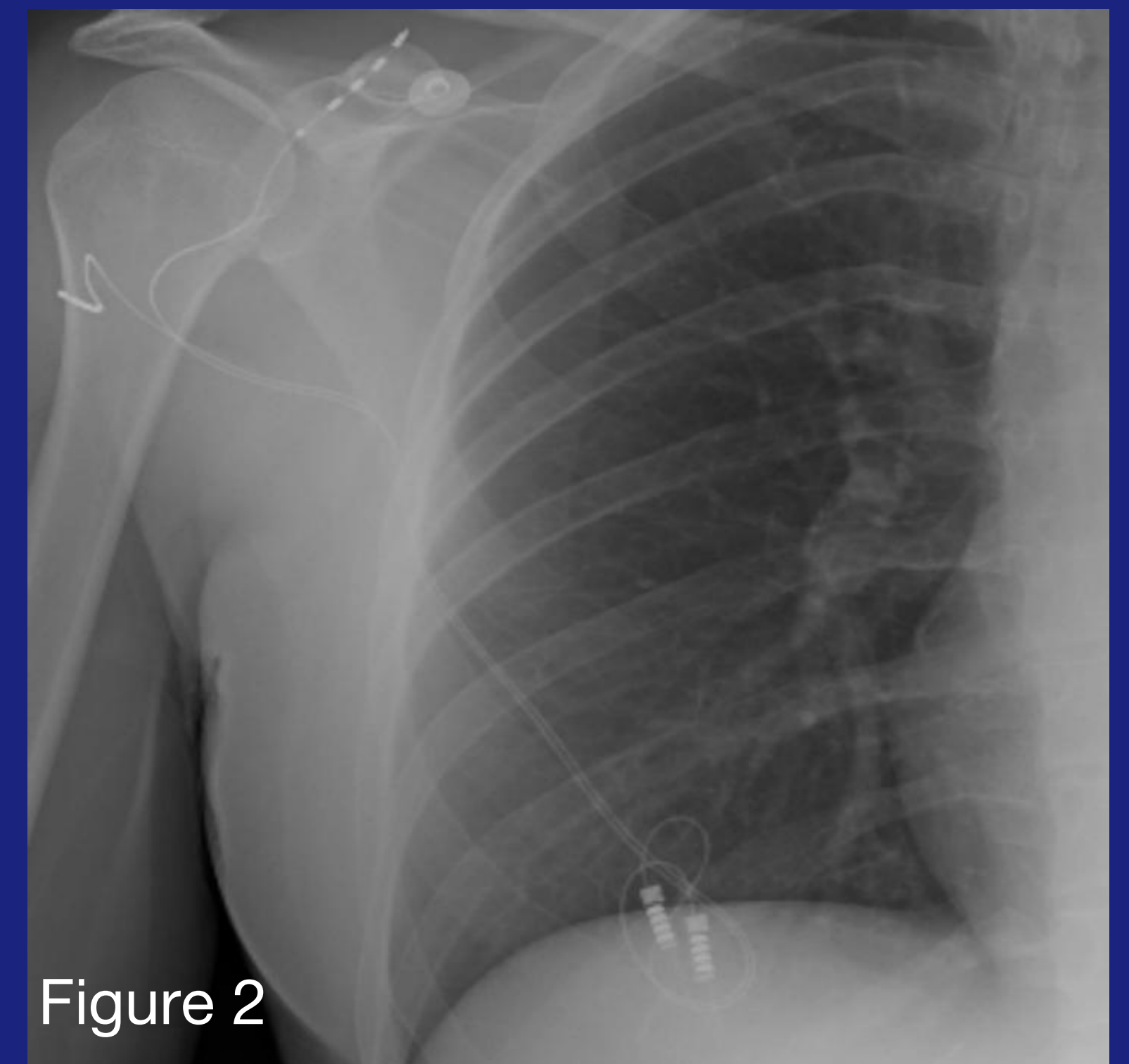
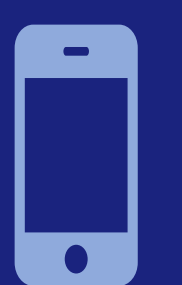


Figure 2. Fluoroscopy image of PNS re-implantation with leads targeting the axillary and suprascapular nerves and IPG placement at the left posterior flank.

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