

INTERVENTIONAL MANAGEMENT OF CHRONIC NEUROPATHIC CERVICAL PAIN FOLLOWING NERVE SHEATH TUMOR RESECTION AND RADIATION: A CASE REPORT

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- Background:** Chronic neuropathic pain after head and neck cancer is common and difficult to treat, especially when compounded by surgical and radiation-related neural injury. This case illustrates persistent superficial cervical plexopathy after tumor resection and adjuvant radiation with limited response to standard therapy.
- Case Report:** A man in his 30s developed constant, allodynic left anterolateral neck pain after resection of a carotid triangle nerve sheath sarcoma and postoperative radiation. Conservative measures (physical therapy, topical agents, gabapentin) provided minimal relief. An ultrasound-guided superficial cervical plexus block resulted in only transient pain relief, with symptoms recurring within hours. A trial of 2 cycles of botulinum toxin type A injections resulted in minimal and nonsustained improvement.
- Conclusion:** Post-treatment cervical neuropathic pain can be refractory despite standard care. A multidisciplinary, individualized approach that integrates diagnostic blocks, targeted interventions, and cancer rehabilitation may improve function and quality of life in selected patients.
- Key words:** Neuropathic pain; cervical plexopathy; nerve sheath tumor; head and neck cancer; radiation fibrosis; peripheral nerve block; case report

BACKGROUND

Chronic neuropathic pain is a well-recognized complication following head and neck tumor resection and radiation, particularly in the context of peripheral nerve involvement. The causes of this pain may include direct nerve injury during surgical dissection, nerve entrapment due to radiation-induced fibrosis, and maladaptive changes from nerve regeneration and sensitization (1-3). The superficial cervical plexus and associated branches are especially vulnerable to procedures involving the carotid triangle or lateral neck; subsequent radiation may exacerbate neural injury through progressive fibrosis and microvascular compromise (4).

Patients with post-treatment neuropathic pain may

report symptoms such as burning, tingling, allodynia, and sleep disturbances, which can persist for years and are often not recognized in survivorship care. These cases may be refractory to first-line pharmacologic interventions such as anticonvulsants and antidepressants, and may also be unresponsive to standard interventional techniques such as nerve blocks. This can lead to significant impairment in quality of life, including sleep, work, and daily activities. The diagnostic process is further complicated by the need to exclude tumor recurrence and the difficulty in distinguishing between neuropathic, nociceptive, and myofascial pain (4,5).

This report describes a young adult with persistent neuropathic cervical pain following resection and

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adjuvant radiation for a nerve sheath tumor. This case highlights the diagnostic complexity, limitations of conventional therapies, and the importance of a multidisciplinary, individualized approach to pain management.

CASE PRESENTATION

A man in his 30s with a medical history significant only for attention-deficit/hyperactivity disorder presented with chronic left-sided neck pain following treatment for a malignant peripheral nerve sheath tumor. In the early 2020s, he underwent surgical resection of a left carotid triangle (C4 level) nerve sheath tumor, histologically confirmed as sarcoma, followed by adjuvant external beam radiation therapy to the left neck.

Pain in his left neck developed shortly after surgery and worsened following radiation. He described the pain as constant, burning, and throbbing, localized to the left anterolateral neck and centered over the surgical scar, with radiation to the anterior superior pectoralis region. The pain was accompanied by marked allodynia, with pronounced sensitivity to light touch, clothing, and neck movement. Symptoms were exacerbated by wearing collared shirts, neck rotation, and sleeping on either side. He also reported occasional paresthesias in the ipsilateral 4th and 5th digits but denied persistent numbness or weakness.

The patient's pain intensity ranged from 3/10 at rest to 8/10 with movement. He remained physically active and employed but experienced significant sleep disturbance and impaired quality of life. Examination revealed a well-healed surgical scar anterior to the left sternocleidomastoid muscle with tenderness over the left cervical paraspinal region, sternocleidomastoid, and scar. Radiation-induced fibrosis was palpable, and cervical range of motion was limited; this was most notable in right side bending, while other planes of movement were relatively preserved. Neurological examination demonstrated full strength and symmetric reflexes in the upper extremities, negative Spurling and Hoffmann signs, and decreased sensation in the affected dermatome (C4). Gait and coordination were normal.

Diagnostic workup initially included magnetic resonance imaging (MRI) of the cervical spine and computed tomography of the neck, both of which demonstrated stable postoperative and post-radiation changes without evidence of tumor recurrence, significant nerve impingement, or other structural abnormalities. A small, stable submandibular lymph node was noted. No other acute findings were present.

The patient's pain was refractory to multiple pharmacologic and nonpharmacologic interventions. Trials of acetaminophen, topical compounded agents (amitriptyline 2%, gabapentin 3%, ketoprofen 10%, lidocaine 2%), and oral gabapentin 300 mg 3 times daily (900 mg total daily dose) provided no meaningful benefit. A short course of oxycodone produced significant but transient relief and was discontinued. The patient was hesitant to pursue further oral medications due to prior adverse experiences. He participated in physical therapy focused on scar mobilization, desensitization, stretching, and postural correction, which provided only temporary improvement.

Given the patient's focal neuropathic pain, an ultrasound-guided superficial cervical plexus block was performed (Fig. 1). Using sterile technique and a high-frequency linear probe, a 22-gauge, 80-mm echogenic needle was advanced in-plane from posterior to anterior to the posterior border of the left sternocleidomastoid at mid-neck. After negative aspiration, 8 mL of injectate (10 mg dexamethasone, 3 mL of 1% lidocaine, and 4 mL of 0.5% ropivacaine) was administered with confirmed spread under direct visualization; images were archived. The block resulted in immediate and complete pain relief, though symptoms returned within hours. This response supported a neuropathic etiology, most consistent with superficial cervical plexopathy due to iatrogenic injury and radiation-induced fibrosis. Given the clinical context and distribution of symptoms, an MRI of the left brachial plexus was obtained. Imaging revealed no evidence of pseudomeningocele or nerve root avulsion. The left brachial plexus appeared intact, with normal caliber and signal throughout the roots, trunks, divisions, cords, and terminal branches. No abnormalities were identified in the adjacent paraspinal structures. The multidisciplinary team discussed additional interventional and rehabilitative strategies, including advanced physical therapy modalities and the potential use of botulinum toxin, with plans for continued follow-up in a cancer rehabilitation clinic. Expected outcome: sustained relief over hours to days to help guide treatment. Actual outcome: complete but short-lived relief, highlighting limited durability of a single injection.

The patient received an initial series of onabotulinumtoxinA (BoNT-A) injections in early fall. Ultrasound was used to identify and target the muscles, with the toxin prepared at a concentration of 50 units/mL. The first treatment consisted of 20 units to the left sternoclei-

domastoid, 15 units to the left anterior scalene, and 10 units to the left middle scalene, for a cumulative dose of 45 units. Approximately three months later, a second treatment session was completed using the same concentration, ultrasound-guided approach, and injection sites. The dose was increased by 5 units at each muscle, resulting in 25 units to the left sternocleidomastoid, 20 units to the left anterior scalene, and 15 units to the left middle scalene, for a total of 60 units. He reported mild and transient improvement after the initial injections but no meaningful or sustained benefit. After the 2nd cycle, he noted no improvement in pain intensity, allodynia, or functional limitations. Although he was counseled that some patients may require up to 3 treatment cycles to determine full responsiveness, he elected to cancel the planned 3rd cycle and requested earlier follow-up to discuss alternative management strategies. Because no additional benefit was observed following the 2 treatment sessions, further BoNT-A injections were deferred until the patient could be reassessed.

DISCUSSION

Neuropathic pain after cervical oncologic resection and radiation is often complex and persistent. In this case, the presentation was most consistent with superficial cervical plexopathy from combined iatrogenic injury during tumor resection and subsequent radiation-induced fibrosis. Likely mechanisms include direct nerve trauma, progressive fibrotic change, microvascular compromise, and chronic nerve entrapment, leading to the persistent pain, allodynia, and functional impairment observed in this patient (1-4).

Comprehensive imaging with MRI of the cervical spine and computed tomography of the neck was essential to exclude structural causes of pain and tumor recurrence. The absence of recurrent disease, combined with the focal symptom distribution and transient relief following a diagnostic nerve block, localized the pain generator to the superficial cervical plexus. This case underscores the value of integrating clinical findings with imaging when evaluating post-treatment pain syndromes in head and neck cancer survivors.

Standard pharmacologic therapies were ineffective, and physical therapy interventions such as scar mobilization and desensitization yielded only transient benefit. The superficial cervical plexus block was diagnostically valuable in confirming the neuropathic origin and nerve distribution, but provided only temporary analgesia. This case illustrates the refractory nature of postsurgical

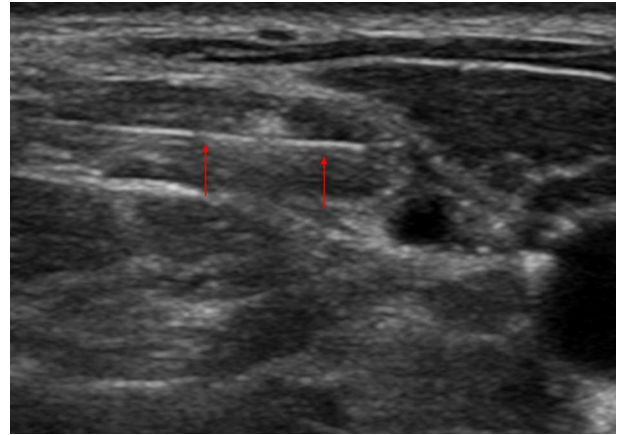


Fig. 1. Ultrasound-guided superficial cervical plexus block at the left C4 level. An in-plane posterior-to-anterior approach is shown; the echogenic needle (red arrow) courses toward the fascial plane at the posterior border of the sternocleidomastoid muscle.

and postradiation neuropathic pain, particularly when compounded by radiation-induced fibrosis, which can perpetuate nerve entrapment, limit the effectiveness of conservative measures, and complicate both diagnosis and management (4).

In select head and neck cancer survivors with radiation-associated neuropathic and myofascial pain, botulinum toxin type A (BoNT-A) has been described as an adjunctive treatment option (5). Survivorship guidance supports consideration of botulinum toxin injections for pain, muscle spasm, and radiation fibrosis-associated contracture in patients following neck dissection and radiation therapy (5). Although high-quality randomized trials are limited, observational studies suggest potential benefit in selected patients. In a retrospective series evaluating patients with radiation fibrosis syndrome, 87% reported subjective improvement following BoNT-A injections, including individuals treated for cervical dystonia, neuralgia, and radiation-associated neck pain (6). In these cases, injections were typically directed toward symptomatic muscles within the irradiated field rather than into neural structures. Common targets include the sternocleidomastoid, anterior and middle scalenes, upper trapezius, and levator scapulae, depending on pain distribution and examination findings.

A standardized dosing regimen for botulinum toxin in radiation-associated cervical pain has not been established. Reported dosing strategies are primarily extrapolated from cervical dystonia and other neuro-

muscular conditions. Dosing is typically individualized based on muscle size, symptom severity, and response to prior treatment. Ultrasound guidance may improve anatomic accuracy when targeting muscles of the anterior and lateral neck. Clinical effects develop gradually after injection and are temporary. Repeat treatment cycles may therefore be necessary to assess sustained clinical response.

In this patient, 2 injection cycles resulted in minimal and nonsustained improvement. The lack of progressive benefit across two treatment cycles, even with increased dosing, suggests that fixed radiation-related fibrosis or ongoing neuropathic entrapment may have contributed more substantially to the patient's pain than reversible muscle hyperactivity alone. This case highlights both the potential role and the limitations of BoNT-A in managing radiation-associated cervical neuropathic pain and underscores the importance of careful patient selection and counseling regarding variable response rates.

Limitations

This report describes the course of a single patient, which limits the generalizability of the findings to broader populations. The combination of surgical history, radiation effects, and individual patient factors in this case may not reflect all presentations of post-treatment neuropathic pain in the head and neck. While this patient underwent 2 cycles of botulinum toxin injection, longer-term follow-up data regarding durability

of response and optimal treatment duration remain limited. Furthermore, while dosing was increased during the second cycle, the overall amounts administered remained modest. Therefore, an insufficient dose response cannot be completely ruled out as a factor in the limited clinical benefit. The lack of objective functional measures and standardized patient-reported quality-of-life data also makes it harder to fully assess the impact of the multidisciplinary approach. Larger studies with consistent outcome measures are needed to better guide management for this challenging condition.

CONCLUSIONS

Persistent neuropathic pain following cervical nerve sheath tumor resection and adjuvant radiation can be severe, functionally limiting, and refractory to standard pharmacologic and rehabilitative therapies. This case highlights the importance of a multidisciplinary, multimodal approach incorporating careful diagnostic evaluation, targeted interventional procedures, and specialized rehabilitation. Botulinum toxin injection may provide benefit in selected patients with radiation-associated cervical pain; however, response can be variable, particularly in the setting of established radiation fibrosis. Early recognition, individualized treatment planning, and realistic counseling regarding expected outcomes are essential to optimizing function and quality of life in this complex survivorship population.

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