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Fluoroscopy-Guided Posterior Atlanto-Axial Cervical Sympathetic Neurolysis for Refractory Cancer-Related Cervicofacial Pain: A Case Report

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Background: Bulky metastatic cervical lymphadenopathy and prior radiotherapy can distort anterior neck anatomy and make conventional access to the cervical sympathetic chain unsafe, limiting interventional options in severe refractory malignant pain.

Case Report: A 76-year-old man with metastatic lung cancer (diagnosed July 2023; prior chemotherapy and radiotherapy) presented with 3 weeks of severe right-sided cervical pain radiating to the preauricular region and right shoulder (numeric rating scale [NRS] score of 8–10/10) with spontaneous breakthrough pain, despite oral morphine (240 mg/day) complicated by severe constipation and somnolence, plus gabapentin, acetaminophen, and amitriptyline. Computed tomography showed extensive nodal metastatic disease involving the sternocleidomastoid region, hyoid area, and deep prevertebral musculature (longus colli), precluding a conventional technique. In October 2024, fluoroscopy-guided chemical neurolysis targeting the cervical sympathetic plexus was performed via a posterior atlanto-axial transarticular approach using 10% phenol mixed with contrast (total injectate, 7 mL). At 72 hours, pain resolved (NRS 0/10) without reported complications; benefit persisted to 12 weeks (NRS 3/10) with opioid reduction.

Conclusions: This approach may be considered in highly selected cases when conventional access is not feasible. The report does not establish its safety or effectiveness for routine use.

Key words: Cancer pain, cervical sympathetic chain, stellate ganglion, sympathetic plexus, neurolysis, phenol, fluoroscopy, atlanto-axial approach

BACKGROUND

Cancer-related cervicofacial and shoulder pain due to metastatic cervical lymphadenopathy may be severe, function limiting, and refractory to pharmacologic therapy. Opioid escalation can be limited by dose-dependent adverse effects such as constipation and sedation. In selected patients, interventional techniques targeting the cervical sympathetic chain or plexus (including stellate region interventions) may provide diagnostic and therapeutic value for sympathetically mediated pain syndromes affecting the head, neck, and upper extremity (1,2).

Conventional access to the cervical sympathetic chain is typically achieved through anterior or anterolateral cervical corridors. However, bulky tumor burden and prior radiotherapy may distort tissue planes and increase the risk associated with standard trajectories. Upper cervical procedures near C1–C2 require heightened caution because of the proximity of vertebral and neurovascular structures, and serious complications have been reported following atlantoaxial interventions (3,4). To our knowledge, this posterior transarticular approach for chemical neurolysis of the cervical sym-

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pathetic plexus has not been previously described in the published literature. Atlantoaxial joint injection techniques provided an anatomical and procedural reference for the approach used in this case. In highly selected patients for whom conventional approaches are not feasible, such an alternative access corridor may be considered with meticulous imaging guidance and strict risk mitigation.

We report a case of fluoroscopy-guided chemical neurolysis of the cervical sympathetic plexus using 10% phenol via a posterior atlanto-axial transarticular approach, performed as a compassionate, non-routine intervention for severe refractory malignant pain.

CASE PRESENTATION

Patient Information

A 76-year-old man with widely metastatic lung cancer diagnosed in July 2023, the patient received four cycles of chemotherapy, initiated in July 2023 at four-week intervals and completed in November 2023. Subsequently, the patient underwent 30 radiotherapy sessions between January and March 2024.

He presented with 3 weeks of uncontrolled pain (numeric rating scale [NRS] score, 8–10/10) involving the right cervical region with radiation to the preauricular area and right shoulder, accompanied by spontaneous breakthrough pain episodes. The neck and shoulder pain was clinically attributed to possible involvement of the superficial cervical plexus by the cancer.

Prior Analgesic Therapy

Despite multimodal analgesia, pain control remained inadequate. The regimen included:

- Oral morphine 240 mg/day, complicated by severe constipation and somnolence
- Gabapentin 1,200 mg/day
- Acetaminophen 1 g every 8 hours
- Amitriptyline 25 mg daily

Given refractory pain and opioid-limiting adverse effects, an interventional approach was considered with palliative intent and an opioid-sparing goal.

CLINICAL FINDINGS

A comparative clinical assessment of the affected and contralateral extremities revealed significant differences. The Budapest criteria were also applied, and the findings were consistent with probable complex regional pain syndrome, including erythema, increased temperature, pain, allodynia, and hyperalgesia. Tumor-related entrapment or invasion of the brachial plexus was considered a potential underlying mechanism.

DIAGNOSTIC ASSESSMENT

Computed tomography (Figs. 1 and 2) demonstrated extensive metastatic cervical lymphadenopathy with significant distortion of expected anterior cervical corridors, including involvement of the sternocleidomastoid region, hyoid area, and deep prevertebral musculature, including the longus colli. Tumor burden and prior radiotherapy contributed to unfavorable anatomy, rendering a conventional technique unsafe or technically unfeasible.

Therapeutic Intervention

In October 2024, fluoroscopy-guided chemical neurolysis targeting the cervical sympathetic plexus was performed.

- Approach: Posterior cervical approach using an atlanto-axial (C1–C2) transarticular trajectory
- Needle: 22-gauge Quincke spinal needle
- Sedation and analgesia: midazolam 4.5 mg and fentanyl 100 mcg
- Local anesthetic: none
- Diagnostic block: none
- The procedure was performed on the right side. The needle was advanced under fluoroscopic tunnel-view guidance, approximately 90° to the skin, through the lateral third of the C1–C2 interdiscal space, approximately 1 cm medial to the lateral border of the vertebral body. After advancing 3 cm, lateral fluoroscopy was used to assess needle depth. The needle was advanced to the anterior vertebral body margin, with a final depth of approximately 6 cm from the skin. Anteroposterior and lateral fluoroscopic images documenting the needle trajectory and final position are provided in (Fig. 2)
- Contrast distribution was assessed in real time under fluoroscopic guidance, with no flow patterns suggestive of intravascular injection or abnormal spread observed. Anteroposterior and lateral views were reviewed to confirm contrast localization. The contrast agent used was the nonionic iodinated contrast medium (Lopamiro® 370, Braccco), Standard monitoring was maintained throughout the procedure, in-

cluding blood pressure, peripheral oxygen saturation (SpO_2), electrocardiography (ECG), and heart rate
- Neurolytic agent: 10% phenol mixed with contrast, injected incrementally under continuous fluoroscopic monitoring
- A 15% phenol formulation was used. A volume of 4.6 mL was mixed with 2.4 mL of contrast medium, yielding a total volume of 7 mL. The resulting final phenol concentration was approximately 10%.
- Immediate complications: none observed

This procedure was undertaken as an exceptional, compassionate intervention for refractory cancer-related pain, given the inadequate response to escalating opioid therapy, associated adverse effects, and the lack of a feasible conventional approach due to extensive tumor infiltration and anatomical distortion. The potential risks, complications, and available alternatives were discussed with the patient, who provided informed consent. No ethics committee review or specific institutional authorization was obtained.

Outcomes and Follow-Up

At 72 hours, pain had resolved completely (NRS 0/10). During the 72-hour hospital observation period, neurological and vascular assessments, including evaluation of motor function and sensation, revealed no abnormalities. Morphine requirements decreased to 90 mg/day for one week and subsequently to 60 mg/day. Follow-up assessments were performed in person at 1 week, 1 month, and 12 weeks, with telephone monitoring during the intervening days. At 12 weeks, pain remained improved (NRS 3/10), with no reported Horner syn-

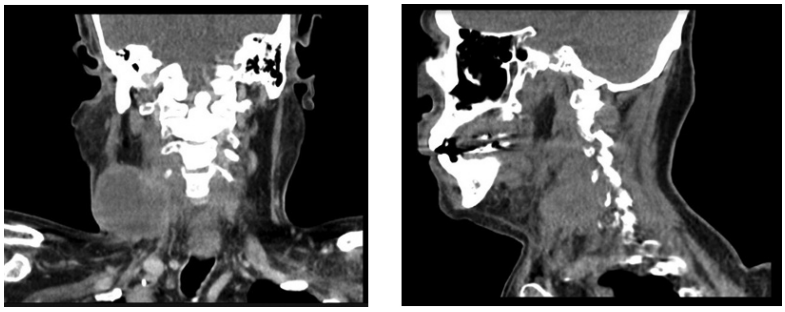


Fig. 1. Computed tomography demonstrating bulky right cervical metastatic lymphadenopathy with distortion of anterior cervical corridors and involvement of sternocleidomastoid region, hyoid area, and deep prevertebral musculature (including longus colli).

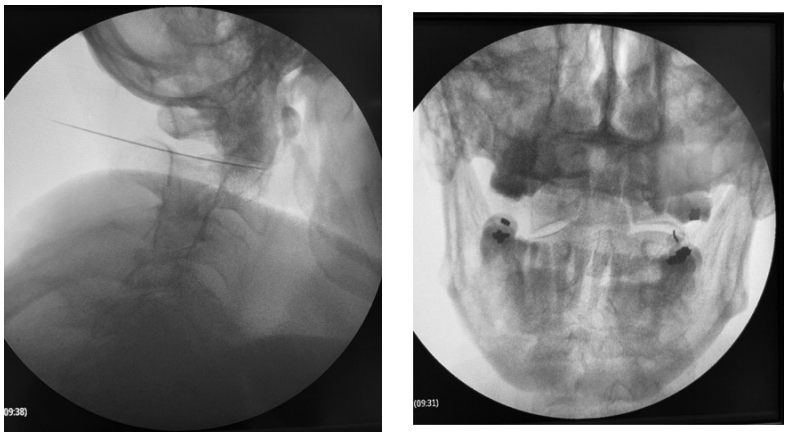


Fig. 2. Lateral and anteroposterior fluoroscopic views showing the final needle tip position anterior to the vertebral body at C1–C2 via a posterior atlanto-axial transarticular trajectory.

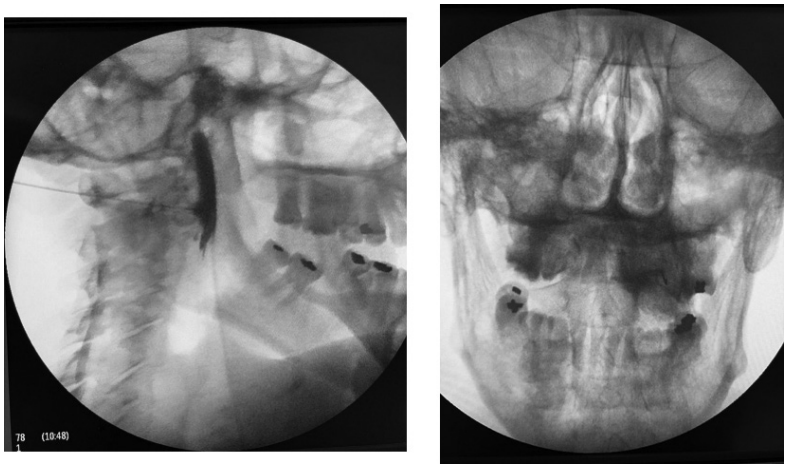


Fig. 3. Fluoroscopic contrast dispersion before incremental injection of phenol mixed with contrast (combined injectate volume, 7 mL).

drome, neurological deficits, or vascular complications during the documented follow-up period.

DISCUSSION

This case describes fluoroscopy-guided chemical neurolysis of the cervical sympathetic plexus via a posterior atlanto-axial transarticular approach in a patient with extensive metastatic cervical lymphadenopathy and prior radiotherapy that precluded conventional access. The patient experienced complete pain relief at 72 hours, meaningful opioid reduction, and sustained benefit through 12 weeks.

Rationale for Sympathetic Targeting

Interventions involving the cervical sympathetic chain or stellate region may provide benefit in sympathetically mediated pain syndromes affecting the head, neck, and upper extremity (1,2). For this patient, the pain distribution (right cervical, preauricular, and shoulder regions), severity, and accompanying mild autonomic changes (warmth and erythema) suggested a possible sympathetically mediated component. However, in the absence of a diagnostic block, a specific sympathetic mechanism could not be definitively established. The underlying pain driver was considered to be malignant infiltration and distorted regional anatomy.

Why Conventional Access Was Not Feasible

Bulky metastatic nodal disease involving the sternocleidomastoid region, the hyoid area, and deep prevertebral musculature (including longus colli), together with post-radiotherapy tissue changes, may significantly compromise anterior or anterolateral corridors. In such settings, an alternative approach may be the only feasible interventional option when rapid symptom relief is prioritized.

Phenol Neurolysis Considerations

Chemical neurolysis with phenol is an established modality in interventional pain practice and cancer pain scenarios, though careful consideration must be given to target selection, imaging confirmation, and risk mitigation (5,6). Using contrast to confirm dispersion prior to incremental delivery is especially important in anatomically complex or distorted regions, to assess possible unintended spread. The observed clinical response—complete analgesia at 72 hours and sustained improvement—is consistent with a possible procedure-related effect, particularly given the pre-procedure refractoriness and dose-limiting opioid toxicity.

Safety and the "Atypical/Compassionate" Nature of This Case

Upper cervical procedures at C1–C2 require heightened caution. Serious adverse events after atlanto-axial interventions have been described, and the safety profile of C1–C2 injections has been debated in the literature (3,4). Accordingly, we do not recommend this technique as a routine intervention. This was an atypical scenario, performed as a compassionate block in a patient with advanced malignancy, severe suffering, and absence of a safe conventional corridor. Fluoroscopic guidance, contrast confirmation, incremental injection, and close monitoring were used as risk-reduction measures.

Limitations

This report reflects a single case and cannot establish comparative effectiveness or safety versus standard techniques. No diagnostic block was performed, and no local anesthetic was used; therefore, mechanistic

Table 1. Timeline

Time	Clinical Course
July 2023	Metastatic lung cancer diagnosis; chemotherapy and radiotherapy initiated/completed
3 weeks pre–Oct 2024	Right cervicofacial/shoulder pain begins; NRS 8–10/10 with spontaneous breakthrough pain
Pre-procedure	Morphine 240 mg/day (severe constipation, somnolence) + gabapentin 1,200 mg/day + acetaminophen 1 g q8h + amitriptyline 25 mg daily
Oct 2024	Fluoroscopy-guided cervical sympathetic plexus neurolysis via posterior atlanto-axial transarticular approach; 22G Quincke; contrast confirmation; 10% phenol mixed with contrast; total injectate 7 mL; sedation midazolam 4.5 mg + fentanyl 100 mcg
+72 hours	NRS 0/10; no complications
Week 1	Morphine reduced to 90 mg/day
After Week 1	Morphine reduced to 60 mg/day
12 weeks	NRS 3/10

attribution is limited. Standardized quality-of-life or functional outcome measures were not recorded. No additional chemotherapy was administered during the 12-week follow-up; the main treatment change was a reduction in morphine dosage, from the preprocedural regimen to 90 mg/day during the first week and subsequently to 60 mg/day. The rapid and sustained analgesic response, accompanied by opioid dose reduction, suggests potential palliative value in this highly selected clinical circumstance.

CONCLUSIONS

A posterior atlanto-axial transarticular approach enabled fluoroscopy-guided chemical neurolysis of the cervical sympathetic plexus using 10% phenol in a patient with extensive metastatic cervical disease and prior radiotherapy that precluded conventional access. Complete pain relief was achieved at 72 hours without reported complications and remained improved at 12 weeks (NRS 3/10) with a reduction in opioid dose. This approach warrants further evaluation before it can be recommended beyond carefully selected cases in which conventional access is not feasible.

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