

Combined ultrasound-guided neurolysis of PECS planes I–II and interscalene block with phenol for the treatment of cancer pain in a palliative patient secondary to advanced metastatic breast cancer: case report

Abstract

Cancer pain associated with advanced breast cancer presents a complex therapeutic challenge due to the coexistence of somatic, neuropathic, and structural mechanisms resulting from tumor progression, surgical sequelae, and complications of systemic treatment. Although pectoral plane blocks (PECS I and PECS II) and interscalene nerve blocks are widely used in perioperative analgesia, published experience regarding their use as a route for chemical neurolysis in patients with refractory cancer pain remains limited.

Case presentation: We present the case of a 39-year-old woman diagnosed with triple-positive invasive ductal carcinoma of the left breast, with pulmonary, bone, and chest wall metastases. She had received neoadjuvant chemotherapy, left radical mastectomy, and adjuvant systemic therapy. During her follow-up, she developed extensive tumor infiltration of the chest wall and left axillary region, post-mastectomy pain syndrome, neuropathy secondary to vinorelbine, ipsilateral lymphedema, and bilateral pathological fractures of the humerus treated with intramedullary nail fixation. Despite multimodal pharmacological treatment, including oral morphine 30 mg every 6 hours, severe mixed pain persisted with an intensity of 10/10 on the Visual Analogue Scale (VAS), associated with significant functional impairment. Ultrasound-guided chemical neurolysis of PECS I and PECS II planes was performed using 3% phenol (5 mL in each plane), complemented by ultrasound-guided interscalene block using 0.375% ropivacaine and 1 mL of 3% phenol.

Results: The patient experienced an immediate reduction of over 80% in pain intensity, going from a VAS score of 10/10 to 1–2/10. During follow-up, she maintained complete analgesia at 7 and 15 days (VAS score of 0/10). At three months, clinically significant improvement persisted with a VAS score of 2/10, without complications attributable to the procedure.

Conclusion: Ultrasound-guided neurolysis of PECS planes I–II combined with interscalene block with phenol may represent a useful palliative alternative in patients with refractory cancer pain secondary to advanced metastatic breast cancer with chest wall infiltration and severe functional impairment.

Keywords: metastatic breast cancer, refractory cancer pain, chemical neurolysis, phenol, PECS, interscalene block, palliative care

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Introduction

Cancer pain remains a major cause of suffering in patients with advanced cancer and presents a particularly complex therapeutic challenge when multiple pathophysiological mechanisms converge simultaneously. In metastatic breast cancer, pain can originate from direct tumor infiltration of the chest wall, involvement of peripheral nerve structures, surgical sequelae from mastectomy, chemotherapy-induced neuropathy, and bone metastases complicated by pathological fractures.^{1,2} The coexistence of these mechanisms frequently produces mixed pain syndromes that can persist despite stepped pharmacological treatment based on opioids and adjuvants.^{3,4}

Bone metastases affect approximately 70% of patients with advanced breast cancer and are a major cause of pain, disability, and impaired quality of life. When metastatic lesions progress to pathological fractures, pain often intensifies significantly, leading

to severe functional limitations even after surgical stabilization.^{5,6} Furthermore, tumor infiltration of the chest wall and axillary region presents a particularly difficult condition to treat.⁷ Simultaneous involvement of the medial and lateral pectoral nerves, long thoracic nerve, thoracodorsal nerve, and lateral cutaneous branches of the intercostal nerves can generate persistent pain with neuropathic and somatic characteristics. Additionally, post-mastectomy pain syndrome is a frequent complication in patients undergoing radical breast surgery, contributing to chronic pain and functional disability.^{8,9}

In cases of refractory cancer pain, ultrasound-guided interventional techniques have acquired an increasingly important role within modern palliative care programs. Pectoral plane blocks PECS I and PECS II allow access to multiple sensory afferents responsible for pain originating in the anterior chest wall and axillary region.^{10,11} Similarly, the interscalene block provides access to the upper roots of the brachial plexus, allowing intervention on nociceptive pathways

involved in pain in the shoulder, proximal arm, and structures related to the humerus.^{12,13}

The incorporation of neurolytic agents such as phenol allows the duration of analgesic benefit to be extended beyond the transient effect of local anesthetics. Although the use of phenol in neuroablative procedures is part of the therapeutic arsenal of interventional palliative medicine, published experience on ultrasound-guided chemical neurolysis of the PECS planes and brachial plexus in patients with metastatic breast cancer remains limited.^{14,15} We present the case of a 39-year-old patient with triple-positive infiltrating ductal carcinoma, pulmonary, bone, and chest wall metastases, post-mastectomy pain syndrome, chemotherapy-induced neuropathy, and bilateral pathological humeral fractures treated with intramedullary nail osteosynthesis. She presented with refractory cancer pain despite the use of strong opioids and was treated with a combined strategy of ultrasound-guided neurolysis of PECS planes I–II and interscalene block with phenol, achieving a reduction of over 80% in pain intensity and maintenance of analgesic benefit during three months of follow-up.^{16–18}

Case presentation

A 39-year-old female patient diagnosed with triple-positive invasive ductal carcinoma of the left breast in June 2024. Initially, she received neoadjuvant chemotherapy followed by left radical mastectomy and subsequently systemic treatment with capecitabine, vinorelbine, and denosumab. During the course of the disease, it progressed with the development of pulmonary, bone, and chest wall metastases. Extensive tumor infiltration of the left anterior chest wall and axillary region was documented, associated with multiple cutaneous and subcutaneous nodular lesions consistent with locoregional progression.

Additionally, she developed peripheral neuropathy secondary to vinorelbine, cervical and left upper limb lymphedema, as well as progressive functional limitation of the ipsilateral upper limb.

In March 2026, she presented with a pathological fracture of the left humerus secondary to metastatic bone disease, undergoing surgery by the Orthopedics and Traumatology Service with intramedullary nailing. Two months later, she developed a pathological fracture of the right humerus, also treated with intramedullary nailing. Despite adequate orthopedic treatment, the patient continued to experience severe and debilitating pain. At the time of evaluation by the Palliative Care and Pain Unit, she was receiving 15 mg of oral morphine every 6 hours, without achieving satisfactory symptom control. She reported mixed pain, predominantly on the left side, located in the anterior chest wall, axillary region, shoulder, arm, and elbow, with an intensity of 10/10 on the VAS scale. The pain caused significant sleep disturbance, partial dependence for basic activities of daily living, and a significant decline in her quality of life. The physical examination showed extensive tumor infiltration of the left thoracic wall, cervical and left upper limb lymphedema, decreased superficial sensitivity in the ipsilateral axillary and thoracic territory, as well as significant muscle weakness of the left upper limb with a strength of 2/5 on the MRC scale. Functional assessment revealed ECOG 3, Karnofsky index estimated between 40 and 50 points, and DASH score estimated between 85 and 95 points. Due to the persistence of pain despite higher opioids, the anatomical complexity of the clinical picture, and the need for a long-acting palliative strategy, it was decided to perform an ultrasound-guided analgesic intervention (Figure 1).



Figure 1 Multiple erythematous-violaceous cutaneous nodules with areas of superficial ulceration overlying the surgical scar and left chest wall, consistent with cutaneous tumor infiltration.

Procedure

After obtaining written informed consent, the patient was transferred to the procedure area of the Palliative Care and Pain Unit. Continuous monitoring was performed using electrocardiography, non-invasive blood pressure monitoring, and pulse oximetry. The patient was placed in a supine position with slight elevation of the left hemithorax and contralateral rotation of the head to optimize exposure of the left cervical and pectoral region.

After asepsis and antisepsis with alcoholic chlorhexidine solution and placement of sterile fields, ultrasonographic exploration was initiated using a high-frequency linear transducer protected with a sterile cover.

During the initial ultrasound evaluation, significant alteration of the usual anatomy was documented secondary to extensive tumor infiltration of the left anterior chest wall and axillary region. Multiple heterogeneous masses consistent with neoplastic infiltration were observed, distorting the fascial planes, causing partial loss of conventional anatomical landmarks, and displacing superficial muscle structures. To identify the PECS I plane, the probe was initially positioned in an oblique parasagittal orientation over the left infraclavicular region. Due to tumor infiltration and increased tissue thickness, the plane between the pectoralis major and pectoralis minor muscles was identified at an approximate depth of 7 cm from the skin surface, significantly greater than that typically observed in patients without tumor infiltration.

Subsequently, the probe was moved laterally to locate the plane corresponding to the PECS II block. Ultrasound evaluation identified the pectoralis minor and serratus anterior muscles, again revealing anatomical distortion secondary to neoplastic infiltration. The target interfascial plane was located approximately 8 cm below

the skin surface. Using the in-plane technique and continuous visualization of the needle tip, an echogenic needle for regional block was advanced until reaching the PECS I plane. After negative aspiration for blood, 5 mL of 3% phenol was administered, observing adequate hydrodissection and distribution of the neurolytic within the interfascial compartment. The needle was then repositioned towards the PECS II plane, again confirming the correct ultrasound localization. After negative aspiration, an additional 5 mL of 3% phenol was administered, verifying homogeneous expansion of the interfascial plane between the identified muscle structures.

Due to the persistence of severe pain localized in the left shoulder, proximal arm, and elbow region, associated with a pathological humeral fracture, chemotherapy-induced neuropathy, and severe functional impairment of the upper extremity, it was decided to complement the treatment with an ultrasound-guided interscalene block.

For this procedure, the linear transducer was placed on the lateral region of the neck at the level of the interscalene sulcus. Despite regional tumor infiltration, the superior roots of the brachial plexus were adequately identified between the anterior and middle scalene muscles. The approximate depth of the neural target was 1 cm from the skin surface. Using an echogenic needle and in-plane technique, the needle was carefully advanced until the tip was positioned adjacent to the superior roots of the brachial plexus. After negative aspiration, a mixture of 0.375% ropivacaine and 1 mL of 3% phenol was administered, and adequate perineural dispersion was observed under direct ultrasound guidance.

Throughout the procedure, continuous visualization of the needle was maintained, avoiding vascular and pleuropulmonary structures. No immediate complications, vascular puncture, systemic toxicity from local anesthetics, pneumothorax, or acute neurological events were recorded. At the end of the intervention, the patient presented an immediate decrease in pain of more than 80%, with a reduction of ENVA from 10/10 to ENVA 1–2/10 and partial improvement of the functional mobility of the left upper extremity (Figure 2).

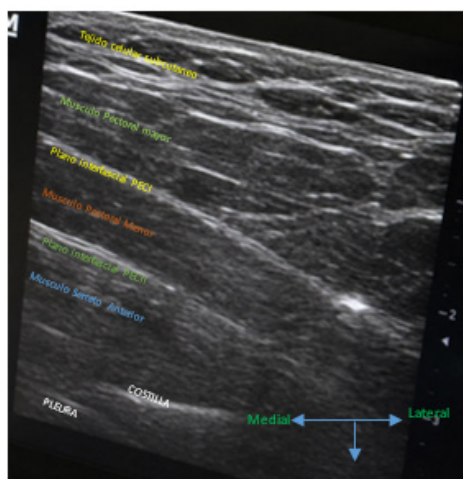


Figure 2 Ultrasound-guided PECS I–II block. The pectoralis major, pectoralis minor, and serratus anterior muscle planes are identified, with the needle positioned in the target interfascial space for the administration of 3% phenol.

Results

The patient experienced an immediate analgesic response with a reduction of more than 80% in pain intensity, going from ENVA

10/10 to ENVA 1–2/10. During follow-up, she maintained complete analgesia at seven and fifteen days after the procedure, reporting ENVA 0/10, improvement in nighttime rest and a significant decrease in pain-related suffering. At three months, clinically significant improvement persisted with ENVA 3/10, with no evidence of neurological, infectious, or vascular complications associated with the intervention. The patient continues to be followed by the Oncology and Palliative Medicine services. In the event of a recurrence of pain, thoracic neurolysis with 8% hypobaric alcohol was considered as a complementary palliative strategy.

Discussion

This case describes the interventional management of a young patient with advanced triple-positive infiltrating ductal carcinoma, with metastatic disease in the lungs, bones, and chest wall, who developed a complex and refractory cancer pain syndrome despite the use of strong opioids. The coexistence of extensive tumor infiltration of the chest wall, post-mastectomy pain syndrome, vinorelbine-induced neuropathy, and bilateral pathological humeral fractures created a particularly challenging clinical scenario for pain management.^{19,20}

The pathophysiology of pain in this patient was clearly multifactorial. Tumor infiltration of the anterior chest wall and axillary region led to persistent activation of nociceptive afferents from muscles, fascia, periosteum, and infiltrated subcutaneous tissue. Simultaneously, radical breast surgery favored the development of persistent neuropathic pain consistent with post-mastectomy syndrome. This was compounded by peripheral neuropathy secondary to vinorelbine and deep somatic pain resulting from bone metastases complicated by bilateral pathological fractures of the humerus.^{21,22}

This set of mechanisms explains the persistence of severe pain despite the administration of oral morphine 15 mg every 6 hours and other previously employed pharmacological strategies. Although opioids remain the cornerstone of advanced cancer pain treatment, their efficacy may be limited when neuropathic, infiltrative, or complex mechanical components predominate. In these scenarios, regional interventional techniques can play a relevant role as part of a multimodal approach.²³ The selection of PECS I and PECS II planes was based on the predominant anatomical distribution of pain. These interfascial compartments allow access to nerve structures responsible for much of the sensory innervation of the anterior thoracic wall and axillary region, including the medial and lateral pectoral nerves, long thoracic nerve, thoracodorsal nerve, and lateral cutaneous branches of the upper intercostal nerves. These structures were located within the area affected by the clinically observed and ultrasound-documented tumor progression.

A particularly relevant aspect was the significant anatomical distortion caused by neoplastic infiltration. During the ultrasound examination, loss of conventional anatomical landmarks, displacement of muscle planes, and a significant increase in the depth of the therapeutic targets were observed, reaching approximately 7 cm for PECS I and 8 cm for PECS II. These modifications increase the technical complexity of the procedure and highlight the usefulness of real-time ultrasound guidance to ensure adequate distribution of the neurolytic agent and minimize complications.^{24,25} The addition of an interscalene block was due to the presence of a second, clearly differentiated pain source. Unlike the pain originating in the chest wall, the patient presented with intense pain localized in the shoulder, arm, and elbow region, associated with pathological humeral fractures, prolonged immobilization, and peripheral neuropathy. From a pathophysiological perspective, this pain component was largely dependent on afferent signals from the upper brachial plexus, which

is why it was decided to complement the interfascial neurolysis with an interscalene approach.

The clinical response observed was remarkable. The immediate pain reduction of over 80%, followed by complete analgesia for the first two weeks and maintenance of a maximum pain intensity of 3/10 at three months, suggests a clinically significant benefit. Although it is not possible to establish a definitive causal relationship from a single case, the duration of the observed analgesic effect far exceeds that expected for the local anesthetics used during the procedure, supporting the hypothesis of a significant contribution from the neurolytic effect.

Another point of interest is the palliative care context in which the intervention took place. The patient did not have access to advanced therapies such as implantable intrathecal drug delivery systems or to certain more complex interventional procedures. In many healthcare systems, especially in resource-limited settings, this situation is a common reality. Consequently, low-cost, reproducible, and potentially outpatient ultrasound-guided techniques can acquire considerable value within interventional palliative medicine. This case study has several limitations. First, it is based on the experience of a single patient and therefore does not allow for generalizable conclusions. Second, the simultaneous performance of PECS neurolysis and interscalene block makes it impossible to determine the exact individual contribution of each procedure to the outcome. Furthermore, the natural progression of the cancer and the continuation of systemic treatments may have partially influenced the overall perception of pain.

However, the magnitude of the improvement achieved, the absence of complications, the anatomical complexity resulting from tumor infiltration, and the limited existing literature on chemical neurolysis of the PECS planes in patients with metastatic breast cancer make this case a relevant clinical experience. We believe that future prospective studies and case series could help to more precisely define the role of ultrasound-guided interfascial neurolysis within the therapeutic arsenal for the treatment of refractory cancer pain.

Conclusion

Ultrasound-guided neurolysis of PECS planes I–II combined with interscalene block using phenol provided rapid, profound, and sustained analgesia in a patient with advanced metastatic breast cancer, extensive chest wall infiltration, and pain refractory to strong opioids. This strategy could represent a useful palliative alternative in carefully selected patients, particularly when there are limitations in accessing other, more complex interventional modalities. Compassionate analgesia.

Informed consent

The patient gave written informed consent for the procedures and expressly authorized the use of her clinical information and images for academic and scientific purposes.

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