



# Multimodal Intervention for Oncological Pain Through Transcranial Direct Current Stimulation & Virtual Reality: A Case Report

Buloz-Osorio, Edgar <sup>1-6</sup> Delgado-Gallén, Selma <sup>1-3</sup> Vallejos Valdivieso, Maryoly <sup>1-3</sup> Romero-Marín, Rubén <sup>1-3</sup> Roca-Ventura, Alba <sup>1-3</sup> Pelayo-Vergara, Raúl <sup>1-3</sup> Soler-Fernández, Dolores <sup>1-3</sup>

<sup>1</sup> Institut Guttmann, Institut Universitari de Neurorehabilitació adscrit a la UAB, Badalona, Barcelona, Spain <sup>2</sup> Universitat Autònoma de Barcelona, Bellaterra (Cerdanyola del Vallès), Spain <sup>3</sup> Fundació Institut d'Investigació en Ciències de la Salut Germans Trias i Pujol, Badalona, Barcelona, Spain <sup>4</sup> Universitat Autònoma de Barcelona, Departament de Ciències Morfològiques (Unitat de Anatomia y Embriología Humana), Facultat de Medicina, Cerdanyola del Vallès, España. <sup>5</sup> Grupo de Trabajo de Fibromialgia y Dolor Centralizado. Sociedad Española del Dolor <sup>6</sup> Societat Catalana de Salut Mediambiental. Fundació Acadèmia Ciències Mèdiques de Catalunya i de Balears. Barcelona, España

Oncological pain is a prevalent and complex challenge in patients with advanced malignancies, often resulting in significant functional impairment and reduced quality of life. This case report evaluates the efficacy of combining transcranial Direct Current Stimulation (tDCS) and Virtual Reality (VR), paired with rehabilitation therapy, as a part of a multimodal, non-pharmacological intervention for managing refractory oncological pain.

## CASE PRESENTATION

### MOTIVE FOR CONSULTATION

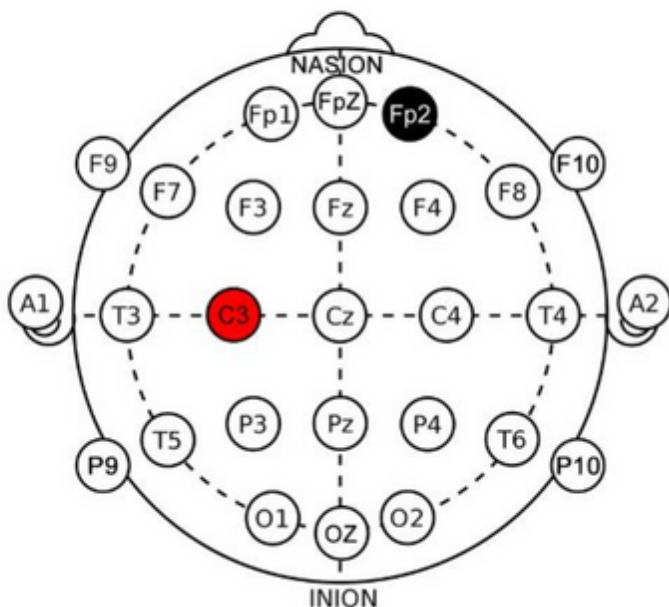
Chronic pain in the right upper limb of uncertain origin in the context of an oncological process.

### MEDICAL HISTORY

A **62-year-old female** with a history of **endometrial cancer** diagnosed in 2021 underwent para-aortic and pelvic lymphadenectomy, followed by chemotherapy. She then had a **surgical resection of the rectum and sigmoid colon** (2022). A PET-CT revealed a **paravertebral lesion at T1**, which required surgery (2023). A recent PET-CT (2024) suggested **diaphragmatic and right lung apex metastases**, although electromyography (2024) was unremarkable, disregarding chemotherapy-induced polyneuropathy.

### CLINICAL PRESENTATION

The patient developed **persistent neck pain radiating to the right shoulder, arm, and wrist** following cervical surgery of paravertebral lesion (2023), and was characterized as pressure without burning or electric sensations, **did not follow a dermatomal pattern and significantly impaired daily activities**. Prior treatments: Anticonvulsants, antidepressants, opioids, stellate ganglion block, and rhizolysis, failed to provide relief. The patient was using **fentanyl patches and pregabalin**.



### INTERVENTION

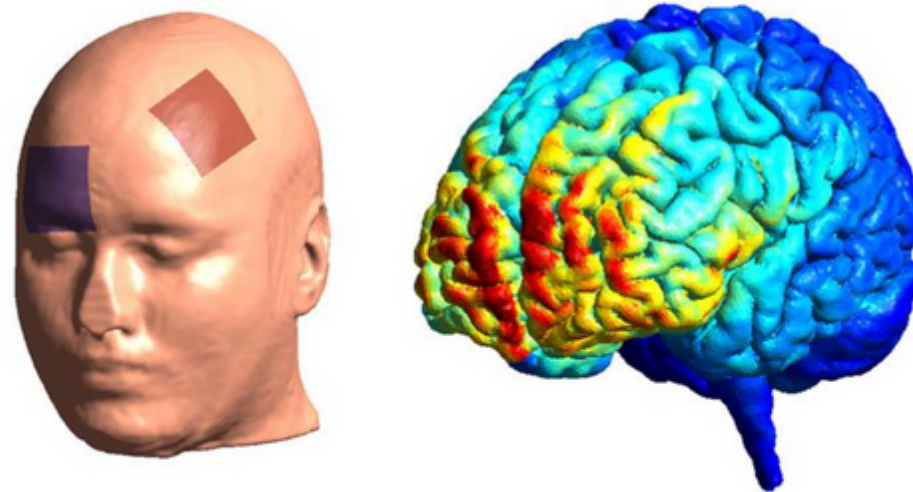
tDCS targeting the **left primary motor cortex (M1)** (daily 20 sessions, 2mA intensity), supplemented by VR-based visual imagery, in between chemotherapy cycles. **Occupational therapy and physiotherapy** (including neuroscience pain education): dual-task exercises for limb function and cognitive engagement, gradual mobility and endurance exercises, relaxation and breathing techniques. Treatment was well tolerated, and **no adverse effects were reported**.

### OUTCOMES

Significant pain relief was experienced within two to three weeks post-intervention, even resulting in a **reduction in fentanyl dosage**. Although anxiety and mild pain exacerbation occurred during ongoing chemotherapy, the fentanyl dosage remained stable during breakthrough cancer pain (BtCP) crisis.

Table 1. Pre-Post Intervention Scores and Interpretations

Scale	Pre	Post	Interpretation
BPI – Pain Severity	23	17	<u>Clinically significant reduction (≥2 points or ≥30%)</u>
BPI – Pain Interference	38	36	Small improvement; may not reach clinical significance
PainDETECT	27	27	No change; neuropathic pain likely persists
PCS – Pain Catastrophizing Scale	39	41	Slight increase; remains clinically elevated (≥30)
CSI – Central Sensitization Inventory	55	47	Notable improvement; still indicates central sensitization (≥40)
PVAQ – Pain Vigilance and Awareness Questionnaire	29	37	Increased vigilance; may reflect heightened pain focus post-treatment
TSK – Tampa Scale for Kinesiophobia	22	22	Stable; low kinesiophobia maintained (≤37)
GAD-7 – General Anxiety Disorder	14	12	<u>Mild improvement; remains in moderate anxiety range</u>
PHQ-9 – Patient Health Questionnaire (Depression)	16	12	<u>Moderate improvement; shift from moderately severe to moderate depression</u>



### Conclusions

This case report demonstrates the **potential of combining tDCS and VR as an innovative, safe and effective approach to managing oncological pain**, especially in cases involving central sensitization. The integration of non-invasive neuromodulation within a multidisciplinary treatment framework in rehabilitation may significantly enhance patient outcomes and quality of life.