

Empowering End-of-Life Comfort: The Promise of rTMS in Cancer Pain Management

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Abstract

People in the advanced stages of cancer frequently grapple with persistent discomfort that proves difficult to mitigate. The administration of elevated doses of pain medication often falls short in providing relief, and can sometimes lead to unwelcome side effects such as excessive drowsiness. This study introduces a groundbreaking case wherein a patient's pelvic discomfort was markedly alleviated through a course of five repetitive transcranial magnetic stimulation (rTMS) sessions targeting the motor cortex. This intervention not only resulted in an enhanced quality of the patient's final moments but also facilitated a reduction in the necessary medical interventions.

Keywords: Palliative care; Cancer pain; Repetitive transcranial magnetic stimulation; Pain management; Quality of life; End-of-life care

Introduction

A considerable majority of individuals diagnosed with cancer grapple with persistent pain [1]. This pain often falls into the nociceptive category, necessitating the use of opioid analgesics for effective treatment [2]. Alternatively, neuropathic pain may require the administration of anticonvulsant or antidepressant medications [3,4]. Complicating matters further, many patients experience a combination of both nociceptive and neuropathic pain, presenting a challenge in pain management during the terminal phase of cancer that often requires the use of high-dose medication combinations [5]. Unfortunately, the utilization of these medications can result in undesirable side effects such as sleepiness, thereby diminishing the overall quality of life for patients in their final stages [6]. This study delves into a unique case where a patient's pelvic discomfort was successfully addressed through a series of five sessions of repetitive transcranial magnetic stimulation. Notably, this intervention led to a significant reduction in the need for analgesic medications, as evidenced by the Medication Quantification Scale (MQS) score. Moreover, the treatment allowed the patient to regain a normal level of awareness, enabling her to fulfill a poignant wish getting married in a dignified setting before peacefully passing away. This case highlights the potential of alternative approaches in providing effective pain relief while preserving the patient's overall well-being and personal aspirations.

Case Study

In August 2020, a 23-year-old patient encountered multiple episodes of haematochezia, leading to a diagnosis of rectal adenocarcinoma. Following radiation and abdominopelvic excision in February 2021, chemotherapy was administered. Unfortunately, local disease progression persisted, and by October 2022, peritoneal carcinomatosis with liver and lung metastases emerged. As the patient's health deteriorated, escalating abdominal and pelvic discomfort, partly attributed to nociceptive pain from tumor compression, became increasingly evident. Initially, oral morphine was prescribed at a dosage of 40 mg per day, later increased to 200 mg after four months. Concurrently, the patient grappled with neuropathic pain stemming from surgery and radiation, scoring 7/11 on the DN4 scale. Despite receiving oral morphine for nociceptive pain, along with pregabalin and intravenous amitriptyline for neuropathic pain, the patient's Numerical Rating Scale (NRS) scores remained high (8-10), coupled

with cognitive sluggishness and fatigue. Various therapies, including antidepressants, anxiolytics, and psychological interventions, were incorporated. The patient's wish for a traditional wedding seemed unattainable unless medication dosages and side effects could be mitigated. Attempts with ketamine and intrathecal morphine proved unsuccessful, and a 10-day surgery had to be halted [7]. The Medication Quantification Scale (MQS) score indicated therapeutic dosages at 126 when the patient was admitted to the Palliative Care Unit in December 2022. Given the success of motor cortex stimulation by repetitive transcranial magnetic stimulation (rTMS) in managing refractory pelvic and perineal pain, this approach was recommended for the patient. The right motor cortex area corresponding to the perineal region underwent stimulation for 20 minutes with specific settings: 80% of the resting motor threshold, 20 trains of 10 seconds each at 10 Hz, with a 50-second inter-train interval (2000 stimuli). Remarkably, the patient experienced a significant reduction in discomfort following the initial rTMS session. Medication was subsequently halved, reflected in a MQS score drop to 96 and later to 56 [8]. The patient regained nearly normal levels of alertness, clarity, and even resumed walking. Anxiety and depressive symptoms also diminished. To sustain this improvement, four additional rTMS sessions were conducted, enabling the patient to realize her envisioned wedding. Tragically, her death, occurring six weeks later due to intestinal blockage, was a direct consequence of the disease's progression.

Discussion

Addressing persistent or end-of-life cancer-related pain presents a formidable challenge in effective management. Often, the necessity for high doses of analgesics and co-analgesics arises to control both neuropathic and nociceptive facets of the pain [9]. Opioids at WHO step 3 are frequently employed for managing nociceptive pain, offering

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oral, parenteral, or intrathecal administration as viable options. Despite these treatments, some patients endure nociceptive pain resistant to morphine, while others grapple with side effects despite ongoing treatment. Similarly, managing certain types of neuropathic pain may demand substantial doses of anticonvulsants and antidepressants, leading to pronounced sleepiness and further compromising the patient's overall quality of life. For terminally ill patients contending with mixed pain, the amalgamation of various treatment classes often results in significant sleepiness and a discernible decline in their quality of life [10]. Consequently, pursuing personal or family projects under such circumstances becomes exceedingly challenging, if not impossible. Noninvasive brain stimulation via repetitive transcranial magnetic stimulation (rTMS) emerges as a novel approach to pain management. Our previous study demonstrated the positive impact of motor cortex stimulation through rTMS on non-cancer pelvic pain. Integrating rTMS as adjuvant therapy within a multidisciplinary treatment framework offered by palliative care units holds promise as a potentially beneficial strategy with a favorable benefit-to-risk balance. Research indicates that rTMS is effective in addressing depression and chronic pain, particularly of neuropathic origin. The focus of treatment for chronic pain is the precentral motor cortex rather than somatosensory cortical regions. Despite initial skepticism, numerous studies have underscored the efficacy and mechanisms of action of both invasive and noninvasive motor cortex stimulation, emphasizing the significance of this target. Typically, side effects of rTMS are mild and infrequent. Furthermore, it has been observed that unilateral stimulation can effectively alleviate bilateral or midline pain, as exemplified in the current case. The dorsolateral prefrontal cortex stands as a common target for rTMS treatment of depression. A previous study on chronic pain patients undergoing motor cortex stimulation reported simultaneous improvements in pain and depression, addressing the emotional component of pain. This dual effect holds potential benefits for patients at the end of life. In the described case, a series of five rTMS treatments administered over a week enabled the patient to regain a sufficient level of alertness, clarity, and motivation. This transformation empowered her to accomplish a formidable task at the end of her life-organizing her wedding.

Conclusion

In the palliative care of terminally ill cancer patients, noninvasive brain stimulation through repetitive transcranial magnetic stimulation

(rTMS) emerges as a valuable supplementary treatment. This therapeutic approach holds promise in enhancing multiple aspects of pain, including the emotional dimension such as depression. Moreover, by diminishing the reliance on high doses of pain medications, rTMS has the potential to alleviate the severity of associated side effects, ultimately contributing to an enhanced quality of life for the patient.

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Conflict of Interest

Author declares no conflict of interest.

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