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CASE REPORT

Motor cortex transcranial magnetic stimulation to reduce intractable postherpetic neuralgia with poor response to other threapies: Report of two cases

Huan Wang, Yu-Zhong Hu, Xian-Wei Che, Liang Yu

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Abstract

BACKGROUND

Postherpetic neuralgia (PHN) is a typical neuropathic pain condition that appears in the lesioned skin regions following the healing of shingles. The pain condition tends to persist, which is often accompanied by negative emotions (*e.g.*, anxiety and depression) and substantially reduces the quality of life. In addition to analgesia (*e.g.*, pregabalin and gabapentin), nerve radiofrequency technology is an effective treatment for intractable PHN. However, there is still a significant portion of patients who do not benefit from this treatment. As a non-invasive form of brain stimulation, repetitive transcranial magnetic stimulation (rTMS) targeting the motor cortex is able to reduce neuropathic pain with grade A evidence.

CASE SUMMARY

Here we report two cases in which motor cortex rTMS was used to treat intractable PHN that did not respond to initial drug and radiofrequency therapies. Moreover, we specifically investigated rTMS efficacy at 3 mo following treatment.

CONCLUSION

Motor cortex rTMS can treat intractable PHN that did not respond to initial drug and radiofrequency therapies.

Key Words: Post herpetic neuralgia; Repetitive transcranial magnetic stimulation; Radiofrequency; Case report

Core Tip: Postherpetic neuralgia (PHN) is a kind of refractory neuropathic pain, which seriously affects the quality of life. Repetitive transcranial magnetic stimulation can be used as an effective complement to the treatment of patients with refractory PHN.

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INTRODUCTION

Postherpetic neuralgia (PHN) is a typical neuropathic pain condition that appears in the lesioned skin regions following the healing of shingles[1]. The pain condition tends to persist, which is often accompanied by negative emotions (*e.g.*, anxiety and depression) and substantially reduces the quality of life[1]. In addition to analgesia (*e.g.*, pregabalin and gabapentin), nerve radiofrequency technology is a effective treatment for intractable PHN[2,3]. However, there is still a significant portion of patients who do not benefit from this treatment.

As a non-invasive form of brain stimulation, repetitive transcranial magnetic stimulation (rTMS) targeting the motor cortex (M1) is able to reduce neuropathic pain with grade A evidence[4]. Here we report two cases in which motor cortex rTMS was used to treat intractable PHN that did not respond to initial drug and radiofrequency therapies. Moreover, we specifically investigated rTMS efficacy at 3 mo following treatment[4].

CASE PRESENTATION

Chief complaints

Case 1: A 65-year-old woman was admitted with persistent pain in the left chest and back (T5/T6) for 6 mo after herpes zoster.

Case 2: A 75-year-old woman was admitted with left lower back pain (T11/12) for 4 mo after herpes zoster.

History of present illness

Case 1: The patient's pain was characterized by persistent tingling and burning sensations, with a visual analog scale (VAS) score of 8. She was prescribed pregabalin 150 mg bid, but she did not want to continue increasing the dose of the drug because of the side effect of dizziness, and received a spinal nerve radiofrequency surgery. However, there was no clear analgesia following these treatments.

Case 2: The patient was prescribed gabapentin 0.6 g tid. However, she had renal insufficiency so the drug dose was not increased further, as well as a spinal nerve radiofrequency surgery. The patient reported slight pain relief after treatment but still with a VAS score of 6.

History of past illness

Case 1: The patient claimed no history of past illness.

Case 2: The patient had a history of renal insufficiency for 5 years and was on drugs regularly.

Personal and family history

Neither patient had any relevant personal or family history.

Physical examination
Physical examination of both patients revealed no abnormalities.

Laboratory examinations
Laboratory examination of both patients revealed no abnormalities.

Imaging examinations
Imaging examination of both patients revealed no abnormalities.

FINAL DIAGNOSIS

Cases 1 and 2
PHN.

TREATMENT

Both patients provided written informed consent for rTMS treatment. rTMS was delivered to the contralateral motor cortex once daily for 10 consecutive days using an RT-50 stimulation system connected to a figure-of-eight coil (Sichuan Junjian Wanfeng Medical Equipment Co.). Each rTMS session delivered 3000 pulses at 10 Hz with 5-sec trains and 25-sec intervals at 100% resting motor threshold. Patients were assessed at baseline, the fifth treatment, the end of treatment, and 2 wk, 1 mo, and 3 mo after treatment. Clinical assessment included VAS, McGill Pain Questionnaire (McGill), Pittsburgh Sleep Quality Index (PSQI), Hamilton Depression Scale (24 items), Hamilton Anxiety Scale (17 items), Mini-mental State Examination (MMSE), and Perceived Deficits Questionnaire-Depression (PDQ-D). Drug dose remained the same as that before this treatment.

OUTCOME AND FOLLOW-UP

Both patients demonstrated a promising analgesia effect, with pain experience changing from severe to mild-to-moderate level (Figure 1). There was also a protect effect on negative emotions, especially in the first case with an initial mild depressive symptom. We also observed a significant improvement in sleep quality in both cases. More importantly, the protective effects of motor cortex rTMS lasted for 3 mo following treatment (Figure 2).

DISCUSSION

Here we report two cases in which motor cortex rTMS was able to significantly reduce intractable PHN that did respond to first-line drug and radiofrequency therapies. Drugs and radiofrequency therapies are first-line treatments in clinical settings for PHN[5]. Our results indicated that motor cortex rTMS could be considered when the pain become intractable and/or the patient does not seem to benefit from regular drug and radiofrequency therapies. Some studies have shown that rTMS treatment is safe for patients with PHN and has better efficacy at 10 Hz[6], which is the frequency that we chose for these two patients. More importantly, our results indicated a long-term analgesic effect for 3 mo. Most previous studies have shown that pain relief from neuroplasticity can last for several days, usually a week to a month, after transcranial magnetic stimulation treatment[4]. This long-term 3-mo effect was potentially associated with a relatively large dose of pulses in daily treatment[7]. Previous studies tended to deliver approximately 1500 daily pulses whereby the number of pulses was doubled in these two cases.

TMS is a non-invasive stimulation technique that produces analgesic effects similar to those of invasive techniques by targeting rTMS to M1[8]. High-frequency rTMS delivered to M1 areas obtains analgesic effects by modulating several distant brain regions involved in the processing or control of nociceptive information. This pain relief can last for several weeks beyond the duration of stimulation, especially during repetition, and may be related to the process of long-term synaptic plasticity[9]. rTMS is now mainly used for the treatment of neuropathic pain and requires a trained physician or nurse to perform this procedure, which is a technique that can be widely used. The most common side effects are dizziness and scalp discomfort, which are transient and disappear after the treatment.

The mechanism of rTMS analgesia remains an open question. There is evidence that motor cortex rTMS could drive top-down pain modulation[10]. In addition, motor cortex stimulation is also able to activate cortical and subcortical regions (*e.g.*, insular and cingulate cortex) involved in the processing of

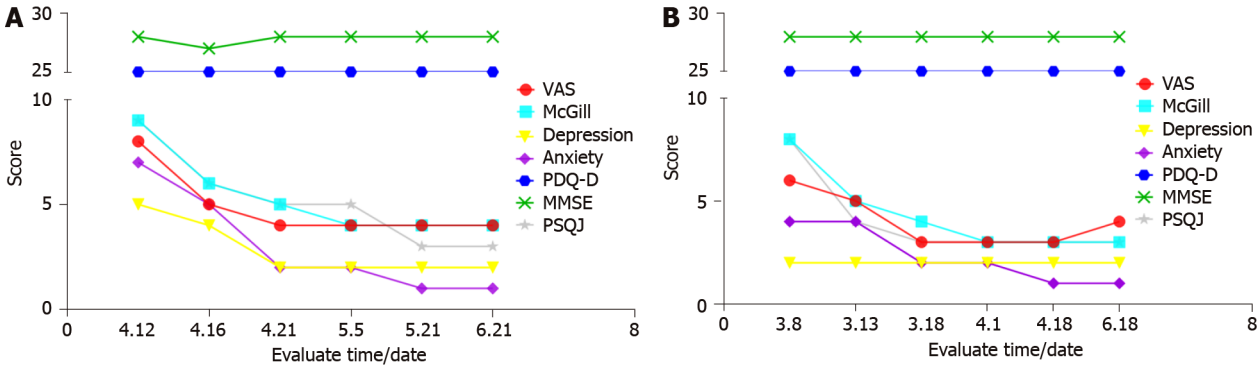

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Figure 1 Case results. A: Case 1; B: Case 2. Motor cortex rTMS is able to reduce pain conditions, negative emotions, as well as sleep quality in two cases with intractable postherpetic neuralgia when first-line drug and radiofrequency therapies had no clear benefits. VAS: Visual analogue scale; McGill: McGill Pain Questionnaire; Depression: Hamilton Depression Scale (24 items); Anxiety: Hamilton Anxiety Scale (17 items); PDQ-D: Perceived Deficits Questionnaire-Depression; MMSE: Mini-mental State Examination; PSQI: Pittsburgh Sleep Quality Index.

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Figure 2 A patient treated by repetitive transcranial magnetic stimulation.

affective-emotional aspects of pain[11]. In either case, cortical and/or subcortical responses to rTMS may help explain the poor response to radiofrequency therapies, in which spinal nerves may not be well damaged by the surgery or become recurrent following surgery.

We have also observed a promising effect on negative emotions in these two cases. This is in line with the finding of a study that rTMS treatment had a significant effect on the whole brain functional network in PHN patients with inhibited sensory-motor functions and improvements in mood, cognitive, emotional, and memory functions[12]. rTMS has been approved by the United States Food and Drug Administration to treat depression by targeting the dorsolateral prefrontal cortex. Recent studies have also tried to manage comorbid pain and depression with rTMS in one setting[13]. In addition, we provide an interesting finding that motor cortex rTMS is able to improve sleep quality in the two cases, which has been rarely investigated compared to evidence on depression and neuropathic pain[14,15].

CONCLUSION

To conclude, we provide two cases in which motor cortex rTMS is able to reduce pain sensations in intractable PHN when first-line drug and radiofrequency therapies had no clear benefits. These findings need to be further validated in large, randomized controlled trials.

FOOTNOTES

Author contributions: Wang H contributed to literature search, and manuscript drafting and writing; Che XW contributed to supervision and writing of the manuscript; Hu YZ and Yu L contributed to literature search; all authors made substantial contributions to conception and design and data acquisition, analysis, or interpretation; took part in drafting the article or revising it critically for important intellectual content; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

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