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Transcranial direct current stimulation in the treatment of anxiety and depression in patients with oral cancer during perioperative period

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Abstract

This study retrospectively investigated the efficacy of transcranial direct current stimulation (tDCS) in the treatment of anxiety and depression in patients with oral cancer (OC) during the perioperative period (PPP). This retrospective study reviewed the electronic medical records of patients who underwent OC surgery and experienced anxiety and depression during PPP. The patients were divided into the treatment (n = 36) and control (n = 36) groups. The patients in the treatment group received tDCS, whereas those in the control group did not receive tDCS. The primary outcomes included the Self-rating Anxiety Scale (SAS) and the Self-rating Depression Scale (SDS). Secondary outcomes included adverse events (AEs). We analyzed the outcome data before and after treatment. After treatment, patients in the treatment group achieved greater relief in SAS ($P < .01$) and SDS ($P < .01$) scores than those in the control group. Regarding safety, no electronic medical records reported any AEs in this study. The results of this study showed that tDCS may help relieve depression and anxiety in patients with OC during PPP. However, high-quality prospective randomized controlled trials are required to confirm these findings.

Abbreviations: OC = oral cancer, PPP = perioperative period, SAS = self-rating anxiety scale, SDS = self-rating depression scale, tDCS = transcranial direct current stimulation.

Keywords: anxiety, depression, efficacy, oral cancer, transcranial direct current stimulation

1. Introduction

Oral cancer (OC) is one of the most commonly diagnosed malignancy around the world.[1–4] It is also one of the leading causes of cancer-related mortality globally, with a 5-year survival rate of approximately 50% after treatment.[5,6] According to cancer statistics in China, about 48,100 patients are diagnosed with lip, oral cavity, and pharyngeal cancers.[7] Approximately 22,100 patients died in 2015.[7] Surgical resection is the first choice and gold standard treatment for curative purposes in patients with OC.[8–10] However, most patients who undergo surgery during the perioperative period (PPP) often experience psychological disorders, such as anxiety and depression.[11–14]

Transcranial direct current stimulation (tDCS) is a safe, noninvasive, and painless treatment technique.[15–18] It applies low-intensity direct current using scalp electrodes overlying targeted cerebral cortical areas through the scalp.[15–17] Although a variety of studies have reported tDCS for anxiety and depression relief,[19–25] there are still insufficient data to investigate the efficacy of tDCS in the treatment of anxiety and depression in patients with OC during PPP. Therefore, this retrospective study explored the efficacy of tDCS for anxiety and depression in patients with OC during PPP.

2. Methods

2.1. Ethical statement

Ethical approval was waived for this study because it only collected and analyzed data from completed patient records. Written informed consent was obtained from all patients.

2.2. Study design

This retrospective study was conducted at Yanan University Affiliated Hospital between May 2019 and April 2021. A total of 72 electronic medical records of patients with OC who underwent surgery were selected based on the inclusion and exclusion criteria. The patients were divided into treatment (n = 36) and a control (n = 36) groups. All patients were allocated according to the different treatments they received. The patients in the treatment group received tDCS, whereas those in the control

All authors declared no competing interest in this study.

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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group did not. All relevant data were collected by independent researchers who were blinded to the purpose of the study.

2.3. Inclusion and exclusion criteria

All included patients met the following criteria: OC confirmed by pathology; age from to 18–75 years; underwent surgery treatment course; presence of anxiety and depression; and fully understood the study process and signed the informed consent.

Patients were excluded if they met the following criteria: presence of mental problems or inability to communicate, presence of severe diseases, recurrence of the disease, and incomplete information in electronic medical records. In addition, we also excluded patients who had previously received the study medication within the month before the study.

2.4. Treatment schedule

All the patients in the treatment group underwent tDCS. This was achieved using a battery-powered microprocessor-controlled constant current device (Transcranial Ltd., London, United Kingdom). The patients were treated with 2-mA intensity for 30 minutes, once daily for a total of 4 weeks. None of the patients in the control group had receive tDCS.[26]

2.5. Outcome measurements

The primary outcomes were anxiety and depression. Anxiety was evaluated using the Self-rating Anxiety Scale (SAS).[27] Depression was measured using the Self-rating Depression Scale (SDS).[28] The secondary outcome was adverse events (AEs). Outcomes were analyzed before and after treatment.

2.6. Statistical analysis

SPSS software (SPSS 17.0, IBM Corp., Armonk, NY, USA) was used to analyze all data. For continuous data, Student *t*-test or Mann-Whitney *U* test was used to analyze normal or non-normal distribution. For discontinuous data, χ^2 test or Fisher exact test was used. A 2-side $P < .05$ was considered statistically significant for all tests.

3. Results

A total of 168 electronic medical records of patients with OC who underwent surgery during the study period were analyzed. After exclusion, 72 eligible patient records were included in the analysis, with 36 patients in the treatment group and 36 subjects in the control group (Fig. 1).

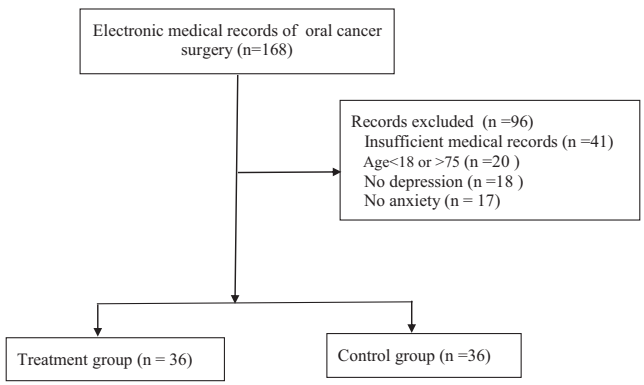

Figure 1. Procedure of study patient selection.

The general patient characteristics are summarized in Table 1. We collected and analyzed data on age, sex, race, cancer location, tumor size, risk factors, smoking status, and alcohol consumption status from the included case records. There were no significant differences in any of these general characteristics between the 2 groups (Table 1).

Before treatment, there were no significant differences in the SAS ($P = .75$; Table 2) and SDS ($P = .76$; Table 3) scores between the 2 groups. After treatment, the patients in the treatment

Table 1

General characteristics of all patients.

Characteristics	Treatment group (n = 36)	Control group (n = 36)	*P*
Age (years)	52.5 (8.6)	53.1 (8.2)	.76
Gender			
Male	29 (80.6)	31 (86.1)	.53
Female	7 (19.4)	5 (13.9)	–
Race (ethnicity)			
Han	35 (97.2)	33 (91.7)	.33
Mongolian	1 (2.8)	3 (8.3)	–
Cancer location			
Buccal	21 (58.3)	19 (52.8)	.64
Lower gum	3 (8.3)	4 (11.1)	.69
Lower lip	1 (2.8)	0 (0)	.49
Mouth floor	3 (8.3)	4 (11.1)	.69
Tough	8 (22.3)	9 (25.0)	.78
Tumor size (mm)			
<10	16 (44.4)	14 (38.9)	.63
≥10	20 (55.6)	22 (61.1)	–
Risk factors			
Smoking status			
Smoker	26 (72.2)	24 (66.7)	.61
Nonsmoker	10 (27.8)	12 (33.3)	–
Alcohol status			
Drinker	29 (80.6)	27 (75.0)	.57
Nondrinker	7 (19.4)	9 (25.0)	–

Data are present as mean ± standard deviation or number (%).

Table 2

Comparison of SAS before and after treatment between the 2 groups.

Outcome measurements	Treatment group (n = 36)	Control group (n = 36)	*P*
Before treatment	55.4 (7.7)	56.0 (8.1)	.75
After treatment	41.2 (4.4)	47.3 (5.0)	<.01
Change from treatment before	−14.2 (−16.9, −11.5)	−8.7 (−10.1, −7.0)	
Difference between 2 groups		−5.5 (−6.8, −4.2)	<.01

Data are present as mean ± standard deviation (range).
SAS = self-rating anxiety scale.

Table 3

Comparison of SDS before and after treatment between the 2 groups.

Outcome measurements	Treatment group (n = 36)	Control group (n = 36)	*P*
Before treatment	66.7 (8.1)	67.3 (8.4)	.76
After treatment	44.6 (5.9)	52.5 (6.3)	<.01
Change from treatment before	−22.1 (−26.3, −18.6)	−14.8 (−17.9, −10.2)	
Difference between 2 groups		−7.3 (−9.1, −5.7)	<.01

Data are present as mean ± standard deviation (range).
SDS = self-rating depression scale.

group achieved a greater reduction in SAS ($P < .01$; Table 2) and SDS ($P < .01$; Table 3) scores than those in the control group.

In terms of safety, no medical records reported tDCS-related AEs in this study.

4. Discussion

OC is one of the most frequently reported cancers in the world. Despite great improvements in OC diagnosis and treatment, morbidity and mortality rates remain high. Currently, surgery is the first choice for OC management. However, patients who undergo surgery also experience psychological disorders, such as anxiety and depression. Studies have reported that tDCS can relieve anxiety and depression with promising efficacy. However, there is limited data to support the efficacy of tDCS in the treatment of anxiety and depression in patients with OC during PPP.

This retrospective study analyzed the electronic medical records of patients with OC. We divided the 72 eligible medical records into treatment and control groups, with 36 participants in each group. All the patients in the treatment group underwent tDCS, and none of the patients in the control group underwent tDCS. The results of this study showed that patients in the treatment group experienced greater reductions in depression and anxiety than those in the control group. This finding indicated that tDCS may be effective in relieving anxiety and depression in patients with OC during PPP. Additionally, no AEs related to tDCS were reported in electronic medical records.

This retrospective study has several limitations. First, the present results may be affected by confounding factors and selection bias due to the retrospective nature of this study. Second, this study only assessed anxiety and depression using the SAS and SDS, respectively. No additional outcomes were assessed owing to insufficient information in the electronic medical records. Third, no randomization, blinding of patients, researchers, and data analysts, and allocation details were identified in the medical records, which may have increased the risk of selection bias. Finally, we collected all electronic medical records from Yanan University Affiliated Hospital, which may have affected its generalization to other hospitals.

5. Conclusion

The current study suggests that tDCS could provide clinical benefits in terms of anxiety and depression relief in patients with OC during PPP. Further clinical trials are required to confirm this finding.

Author contributions

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Methodology: Xia Xiao.
Supervision: Wei-jing Cao.
Validation: Xia Xiao.
Writing–original draft: Zhi-biao Gao.
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