Let’s not forget that small emotions are the big captains of our lives, and we obey them often without realizing it
Vincent Van Gogh

Significance of coping strategies on the outcome of surgical treatment of patients with prosoplegia

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Abstract

Aim: to evaluate the impact of coping strategies on the outcomes of surgical treatment of patients with prosoplegia.

Material and methods: the analysis of the results of surgical treatment of 50 patients with prosoplegia that developed after removal of tumors of the posterior part of the skull, the lateral part of the skull base, and the parotid-masticatory region involved in reconstructive interventions on the facial nerve was performed. At the preoperative stage a clinical examination of patients was performed according to the House-Brackmann scale, Sunnybrook Facial Grading System (SFGS) scale, and a neurophysiological study was performed. A survey was carried out with the use of the Heim’s questionnaire, WCQ (version by Lazarus), CSI as an indicator of coping strategies before surgery and the Aaron Antonovsky’s Sense of Coherence Scale (SOC). Outcomes were evaluated according to the Johnny Chuieng-Yi Lu subjective scale “Satisfaction with surgical treatment”.

Results: all patients from 6 to 10 months after surgery showed signs of muscle recovery, which in the majority (88%, n=44) was accompanied by an improvement in their condition. In 12% of cases (n=6) there were no positive dynamics, which caused unsatisfactory results of treatment. Such painful conditions are often interrupted or recommendations for self-rehabilitation are not followed. The above-described predominance of maladaptive coping strategies in patients with unsatisfactory initial operations is reliable. Adaptive treatment strategies were better developed in patients with favorable treatment outcomes. A high direct correlation was established between the outcomes of treatment, assessed by the Johnny Chuieng-Yi Lu scales, SFGS and SOC coherence scale.

Conclusion: Systemic complex rehabilitation and self-rehabilitation have a significant impact on treatment outcomes. Prosoplegia leads to a violation of facial and emotional expression, causing social maladjustment and depressive disorders, minimizing the effects of reinervation in combination with negative coping strategies. As a result, full-fledged surgical treatment of the facial muscles is currently a very difficult and sometimes insurmountable task.

Keywords
Facial nerve, Prosoplegia, Surgical treatment, Coping strategies, Neuropsychological status

INTRODUCTION

Verbal and non-verbal communication of an individual with his/her human environment is an absolutely essential feature of modern society. From this point of view, the facial nerve is an important link connecting the brain with the facial muscles, contributing to the transformation of voluntary movements into speech production, and the involuntary ones into emotional facial expressions. Strong asymmetry of the face, difficulty with articulation and chewing, as well as disfiguring facial expressions are integral parts of prosoplegia. They produce the heavy burden of the disease for the patient and his/her relatives, reduce the quality of life, and they are the reason for the termination of employment, leading to shrinkage in the social communication circle. Ultimately, the inability to lead
a habitual way of life and adequately communicate in
the society results in an inevitable social disadaptation.

Over the past decades, many surgical techniques
have been proposed for such patients aimed at dynam-
ic reanimation of the face: restoration of the conduc-
tion function of the facial nerve or replacement of the
function of the facial muscles. Almost all of them are
aimed at the formation of a new system of innerva-
tion of the paralyzed mimic muscles from alternative
neuronal donors. Under these conditions, even a par-
tial reconstruction of the delicate connection between
the emotional sphere and the facial muscles is possible
only with long-term rehabilitation. The ultimate goal
of such complex measures is to restore the proper static
symmetry of the face with the physiological tone of the
target muscles, as well as natural symmetrical mimic movements of sufficient amplitude. However,
the outcomes of treatment of patients with prosople-
gia vary from excellent to unsatisfactory. This is due,
among other things, to the impact on the outcome of
treatment made by the patient's personal characteris-
tics, his/her cognitive, psychological status and behav-
ioral strategies in difficult life situations. The vector of
postoperative rehabilitation is aimed at neuromuscu-
lar retraining and consolidation of a new stereotype
of mimic movements based on the formation of new
connectome systems rested on synaptic neuroplastici-
ty, which undoubtedly requires an active participation
of the patient to be treated. It is quite obvious that the
desired result will be obviously unattainable with a de-
crease in such a basic resource for learning as a cogni-
tive reserve, integrated into the continuum of adaptive
coping strategies.

Coping strategies are actions, various types of ac-
tivity undertaken by an individual to overcome stress,
its negative impact or cognitive, emotional and behav-
ioral responses by a person in a difficult life situation,
aimed at overcoming, transforming and resolving it in
his/her everyday life.

For the first time in psychology, this term was in-
troduced by L. Murphy in 1962, when he studied how
children overcome developmental crises [1]. Further
in 1966, Richard Lazarus described coping as a con-
scious act of coping with stress and other anxiety-gen-
erating events [2].

In the process of health recovery, while coping with
a disease, the patient implements some individual be-
havioral stereotypes. These latter can have both pos-
itive and negative impact on the final outcome. Pre-
viously, the importance of the influence of adaptive
coping mechanisms of the behavior on the outcome of
complex therapy in patients with cancer and their abil-
ity to reduce stress and resolve the situation had been
evidenced [3]. However, some coping strategies are
essentially disadaptive and do not contribute to over-
coming the current stressful situation, leading in the
long term to a decline in the psychological and phys-
ical well-being of the individual [4]. According to the
data of various authors, more than 400 of the strategies
have been identified, and several attempts have been
made to classify them, but there is still no generally
accepted specification thereof available [5, 6].

Taking into account all of the above, it is clear that,
when deciding on a surgical technology in the last de-
cade, more and more attention is paid to the psycho-
social characteristics of the patient, as one of the fac-
tors affecting the results of surgical interventions and
the patient’s ultimate satisfaction with medical care.

For patients with prosoplegia, who have under-
gone surgical reconstruction of the facial nerve or
facial muscles, the effect of coping strategies on the
outcomes of facial rehabilitation has not been studied.
Therefore, a prospective cohort study that clarifies this
relationship seems to be relevant to us.

AIM

To evaluate the impact of coping strategies on the
outcomes of surgical treatment of patients with pro-
soplegia.

MATERIALS AND METHODS

The study analyzed the results of a comprehensive
examination and surgical treatment of 50 patients with
prosoplegia which developed after removal of tumors
of the posterior part of the skull, the lateral part of the
skull base, the parotid-masticatory region, who under-
went reconstructive interventions at the facial nerve
(see Table 1 herein), which corresponded to the codes
of diagnoses G51, G51.8, G51.9 according to ICD10.

The age of the studied patients ranged from 23 to
72 years, and the median age was 52.4 (55.6; 46.7). The
distribution by their genders was as follows: in the
study group, women prevailed: the group included 32
females (64%) and 18 males (36%).

In all cases, there was a severe degree of dysfunc-
tion of the facial nerve (grade VI on the House-Brack-
mann scale, 0-20 scoring on the SFGS scale). Proso-
plegia was subacute in all patients.
According to stimulation ENMG, in all cases there was no M-response by the mimic muscles of the paralyzed half of the face. According to the results of needle ENMG, all patients showed spontaneous activity in the form of fibrillation potentials of varying expression degree as a manifestation of subacute denervation.

The conducted research work was approved by the local Ethics Committee and completed in accordance with the statements and regulations stipulated by the Declaration of Helsinki. All patients were informed about the essence and procedure of the study with the signing by them of the appropriate written consent thereto. The patients underwent surgery by Neurosurgical Department No. 5 at the Almazov National Medical Research Centre from June 2015 to June 2022. The study excluded some patient cohorts as listed below: patients with absolute contraindications to surgical treatment; those with chronic diseases at the stage of decompensation; patients who refused to participate in the study. Incomplete or partially completed patients’ questionnaire forms were excluded from the study due to the impossibility of their correct analysis.

At the preoperative stage, a clinical examination of the patients was carried out with an assessment of symmetry and mobility of the face according to the House-Brackmann scale of the functional activity of mimic muscles and Sunnybrook Facial Grading System (SFGS). The clinical data were recorded using photography and video. A neurophysiological study was performed (stimulation and needle ENMG) to determine the degree of dysfunction of the facial nerve and the contractility of facial muscles.

Also, before the reconstructive surgery, the patients were interviewed according to the scales validated in the Russian Federation: the Heim’s questionnaire, the methods of coping behavior (Lazarus version) and the indicator of coping strategies before surgery. When processing the Heim questionnaire data, the results were divided into ranks depending on their adaptability (0 – disadaptive strategies, 1 – relatively adaptive, 2 – adaptive). In addition, the Aaron Antonovsky’s Sense of Coherence Scale (SOC) was used at the presurgery level, where 0-20% is low; 21-40% – reduced rate; 41-60% average; 61-80% – increased rate; 81-100% is a high rate.

All studied patients had subacute prosoplegia and underwent surgery in the period within 1 to 18 months after injury. The treatment outcomes were assessed using the House-Brackmann (HB) and Sunnybrook Facial Grading System (SFGS) scales of functional activity of facial muscles 18 months after the surgery, with photo and video recording.

The treatment outcomes were evaluated according to the Johnny Chuieng–Yi Lu subjective scale Satisfaction with Surgical Treatment, according to which 1 point corresponds to the statement: “deploring the performed surgery”; two points – “not satisfied with the outcome, but no regret the surgery performed”, three – “satisfied with the outcome of the surgery, but needs significant correction”, four – “the outcome of the surgery is satisfactory, but minor correction is re-

<table>
<thead>
<tr>
<th>No.</th>
<th>Nosology</th>
<th>Females</th>
<th>Males</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>n=32</td>
<td>%</td>
<td>n=18</td>
</tr>
<tr>
<td>1</td>
<td>Vestibular schwannoma</td>
<td>16</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>Schwannoma of the facial nerve</td>
<td>2</td>
<td>6.25</td>
</tr>
<tr>
<td>3</td>
<td>Petroclival meningioma</td>
<td>2</td>
<td>6.25</td>
</tr>
<tr>
<td>4</td>
<td>Cholesteatoma</td>
<td>4</td>
<td>12.5</td>
</tr>
<tr>
<td>5</td>
<td>Paraganglioma</td>
<td>4</td>
<td>12.5</td>
</tr>
<tr>
<td>6</td>
<td>Ependymoma of the IV ventricle</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>Cavernoma of the Varolii bridge</td>
<td>1</td>
<td>3.13</td>
</tr>
<tr>
<td>7</td>
<td>Adenoid cystic cancer of the middle ear</td>
<td>1</td>
<td>3.13</td>
</tr>
<tr>
<td>8</td>
<td>Parotid gland carcinoma</td>
<td>1</td>
<td>3.13</td>
</tr>
<tr>
<td>9</td>
<td>Fracture of the pyramid of the temporal bone</td>
<td>1</td>
<td>3.13</td>
</tr>
</tbody>
</table>
quired” and, accordingly, five points: “fully satisfied with the surgery outcome”.

The satisfactory outcome was the restoration of facial symmetry and mobility according to the scales of functional activity of mimic muscles up to grade III on the House-Brackmann scale, 40-80 points on the SFGS scale and 4-5 points on the Johnny Chuieng-Yi Lu subjective scale of satisfaction with surgical treatment.

The materials of our research work were statistically processed using the methods of non-parametric analysis. The collection and systematization of the initial data and the visualization of the results were carried out with the Microsoft Office Excel 2016 software package. Statistical analysis was performed using the STATISTICA 12 software (StatSoft).

RESULTS

The patients underwent surgery using 2 main surgical technologies for reinnervation of the anastomosis of the facial nerve with masticatory or accessory nerves.

All patients in their postoperative period were prescribed a course of rehabilitation, including training led by a physical therapy methodologist, physiotherapy, and support medication. At the time of their discharge from the hospital, all patients received brief guidelines for self-rehabilitation.

All patients in the period from 6 to 10 months after the surgery showed signs of restoration of movements in the paralyzed muscles, which proved the correctness and effectiveness of the surgical treatment that in the vast majority of the patients (88%, n=44) was accompanied by clinical improvement, manifested in the restoration of the face symmetry at rest and with mimic movements of the III degree on the HB scale and 45-80 points on the SFGS scale. The outcome of the surgery was found to be completely satisfactory or that required minor correction according to the subjective assessment by the patient (on the Johnny Chuieng-Yi Lu scale).

In 12% of the cases (n=6) there was no pronounced positive dynamics either on the HB (grade IV) or SFGS (20-40 points) scales, or according to the Johnny Chuieng-Yi Lu surgical treatment subjective scale that corresponded to the unsatisfactory treatment outcomes. It was noted that such patients significantly more often interrupted their rehabilitation courses, did not complete them at all, or did not adhere to the recommendations for self-rehabilitation.

In the course of the research work, it has become obvious that the outcome of the surgery is influenced not only by the neurological status of the patient, the decision on the surgical strategy, the timing of the operation after the development of prosoplegia, and the technical correctness of the intervention (the patients in the group did not show differences in those indicators), but also by the characterological features of the patient.

Upon statistical processing of the obtained results, the prevalence of disadaptive coping strategies calculated according to the questionnaires WCQ (distracting, escaping/avoidance, confrontation), COPE (behavioral avoidance of the problem, denial), CSI (avoidance/escaping) turned out to be significantly higher in the patients with unsatisfactory outcomes of the surgery (see Table 2 given herein).

The adaptive coping strategies were significantly better developed in the patients with a favorable treatment outcome (see Table 3 given herein).

Table 2
Disadaptive coping strategies which influenced the outcomes of surgical treatment in patients with prosoplegia. WCQ- The Ways of Coping Questionnaire by Lazarus, COPE – Coping Orientation to Problems Experienced Inventory, CSI – The Coping Strategy Indicator (by D. Amirkhan).

<table>
<thead>
<tr>
<th>Scale</th>
<th>Satisfactory (Me; Q1, Q3) n=44</th>
<th>Unsatisfactory (Me; Q1, Q3) n=6</th>
<th>p-criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>WCQ: Distancing</td>
<td>37.14(33.33;44.44)</td>
<td>68.75(50;69,87)</td>
<td>0.010</td>
</tr>
<tr>
<td>WCQ: Escaping, avoidance</td>
<td>37.66 (29.12;44.88)</td>
<td>53.41(46.75;63.5)</td>
<td>0.018</td>
</tr>
<tr>
<td>WCQ: Confrontation</td>
<td>44.44(33.33;50)</td>
<td>51(37.76;56.75)</td>
<td>0.043</td>
</tr>
<tr>
<td>COPE: Behavioral escaping, avoidance</td>
<td>7(7;8)</td>
<td>9(8,5;9,5)</td>
<td>0.03</td>
</tr>
<tr>
<td>COPE: Denial</td>
<td>8(7;8)</td>
<td>8.5(7.5;10.5)</td>
<td>0.017</td>
</tr>
<tr>
<td>CSI: Avoidance</td>
<td>16(15;17)</td>
<td>18(16.5;20)</td>
<td>0.032</td>
</tr>
</tbody>
</table>
When analyzing the outcomes of treatment, assessed by the Johnny Chuieng–Yi Lu scales, SGFS and the SOC index, a strong direct correlation was established between them. The higher the test scores, the higher the scores on the coherence scale.

**DISCUSSION**

At the present stage of the development of medicine, the nosocentric understanding of the problem of human health and disease has been replaced by an adaptive approach, the need for a comprehensive assessment of each individual patient, his/her biological, psychological and social properties [7].

Considering a number of the factors that have a significant impact on the final outcomes of the surgical treatment in patients with various pathologies, more and more researchers are interested in coping strategies of the patient as ways of responding to the appeared life difficulties in order to overcome them, solve the set tasks and adapt to new conditions of the existence.

In a situation of an oncological disease, a person faces complex psychological problems that place increased demands for his adaptive potential [8]. Emotions directly related to the diagnosis and treatment of neoplasms can lead to socio-psychological disadaptation and, as a result, to a decrease in the effectiveness of treatment. This is especially important in neuro-oncological patients undergoing complex surgical interventions accompanied by the loss of the facial nerve. The diagnosis of a brain tumor by itself, and the developed facial paralysis with facial disfigurement become a severe psychological impact for the patient. Despite the development and improvement of modern and comprehensive diagnostic methods, the development and use of new surgical technologies, the impeccability of the technically performed operations, their just-in-time realization and the outcomes of surgical treatment of prosoplegia do not always satisfy both the surgeons and the patients. The need for long-term rehabilitation dictates the importance of the predominance of adaptive and problem-oriented coping mechanisms for coping with the current stressful situation.

So, for example, according to the researchers, who studied stressful events, coping strategies, health status and quality of life in a cohort of postmenopausal women with newly diagnosed or recurrent breast cancer, the relationship between their psychological parameters and the outcomes of treatment of their oncological diseases was revealed, and identified was

<table>
<thead>
<tr>
<th>Scale</th>
<th>Indicator</th>
<th>Satisfactory (Me; Q1, Q3) n=44</th>
<th>Unsatisfactory (Me; Q1, Q3) n=6</th>
<th>p-criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>WCQ: self-control</td>
<td></td>
<td>66.67(46.41;75.38)</td>
<td>37.25(27.52;43.81)</td>
<td>0.003</td>
</tr>
<tr>
<td>WCQ: Seeking social support</td>
<td></td>
<td>66.67(51;77.25)</td>
<td>44.44(36.12;51)</td>
<td>0.008</td>
</tr>
<tr>
<td>WCQ: Undertaking responsibility</td>
<td></td>
<td>56.23(50;75)</td>
<td>40.15(34.23;50)</td>
<td>0.009</td>
</tr>
<tr>
<td>WCQ: Planning for problem solving</td>
<td></td>
<td>71.11(54;68;82;31)</td>
<td>37.56(36.15;44;44)</td>
<td>0.007</td>
</tr>
<tr>
<td>WCQ: Positive re-assessment/re-interpretation</td>
<td></td>
<td>51.53(41;46;67;45)</td>
<td>34.2(32.25;38;14)</td>
<td>0.034</td>
</tr>
<tr>
<td>COPE: Positive reframing and personal growth</td>
<td></td>
<td>9(8;12)</td>
<td>7(6;7.5)</td>
<td>0.002</td>
</tr>
<tr>
<td>COPE: Instrumental and social support</td>
<td></td>
<td>9(8;12)</td>
<td>7(6;5.8)</td>
<td>0.002</td>
</tr>
<tr>
<td>COPE: Active coping</td>
<td></td>
<td>11(10;13)</td>
<td>7(7;8.5)</td>
<td>0.0015</td>
</tr>
<tr>
<td>COPE: Humor</td>
<td></td>
<td>5(5;7)</td>
<td>4.5(4;5)</td>
<td>0.02</td>
</tr>
<tr>
<td>COPE: Planning</td>
<td></td>
<td>11(9;14)</td>
<td>7(6;5.8)</td>
<td>0.0002</td>
</tr>
<tr>
<td>COPE: Acceptance</td>
<td></td>
<td>10(7;11)</td>
<td>7(6;8)</td>
<td>0.04</td>
</tr>
<tr>
<td>COPE: Suppressing competing activities</td>
<td></td>
<td>11(8;12)</td>
<td>8(7;8)</td>
<td>0.008</td>
</tr>
<tr>
<td>CSI: Problem solving</td>
<td></td>
<td>28(25;29)</td>
<td>22(20;23)</td>
<td>0.003</td>
</tr>
</tbody>
</table>
the importance of assessing coping strategies of the patients as one of the factors that have a tangible impact on the treatment process, the general condition and quality of life in a cancer patient. Active adaptive behavioral strategies against the background of the absence of emotional and affective disorders in patients, combined with a high level of social support, have determined the favorable treatment outcomes [9]. Similar data were obtained after studying the influence of coping mechanisms in patients with lung cancer on the outcomes of their treatment: a reduced quality of life was associated with a destructive style of behavior and disadaptive coping strategies in difficult life situations: avoiding the problem, escaping, confrontation [10]. Correction of the patient’s disadaptive coping strategies, depression and anxiety at all stages of treatment can, in general, lead to an improvement in the quality of patient care [11].

In another study which analyzed predictors of stressful events, coping strategies, health status and quality of life of women diagnosed with breast cancer, the SOC scale was used to assess their adaptive potential. Patients with high SOC applied more positive coping strategies and reported their improved health and quality of life. The relationship between the SOC score, the health status and the quality of life was linear [12]. This suggests that the sense of coherence can significantly predict distress, the number and type of coping strategies in cancer patients. The SOC scale may be an alternative measure of the rehabilitation potential of this sort of patients and, thus, predetermine the success of surgical treatment in patients with prosoplegia. Our data bear witness to that the SOC scale may be a useful screening tool to identify individuals, who are vulnerable to stress and unable to adequately manage it.

It is interesting to note that when comparing groups of surgical patients who underwent emergency surgery with those upon elective surgery procedure, including that due to oncological diseases, it was found that the elective surgical and the oncological patients are characterized by similar behavior in critical situations according to the psychosomatic type, characterized by restraint of their emotions and over-control. In contrast thereto, the emergency patients in their psychological status had indicators similar to those found in healthy people [13]. This indicates the need for elective surgical patients to provide for psychological correction and psychotherapy during the period of preparation before surgery and after it, in accordance with their personality type and adaptive resources, mechanisms of coping with the disease.

Our studies devoted to the effectiveness of cognitive-behavioral training in people with facial disfigurement have shown positive results in terms of self-esteem, development of positive coping strategies, reduction of social anxiety and improvement of social skills [14, 15]. Our study also shows that coping strategies are an important integral part of the healing process, having a direct impact on the latter. Since coping strategies are a modifiable parameter, the patients with disadaptive strategies require extensive, lengthy preoperative preparation. To personalize the focus of such training, in our opinion, the COPE Questionnaire (Coping Orientation to Problems Experienced Inventory) and WCQ (the Ways of Coping Questionnaire) can be regarded as the most convenient and suitable to an application in the real clinical practice despite their complexity.

In our opinion, the treatment outcome is not affected by the immediate nature of the surgical intervention, but by the fact that subsequent recovery requires the patient to reconsider his/her persistent life stereotypes of functioning and lifestyle stereotypes, at least for the near future after surgery.

**CONCLUSION**

There is no doubt that systemic complex rehabilitation and, as its integral part, self-rehabilitation, have a significant impact on treatment outcomes. On the other hand, prosoplegia leads to impaired facial and emotional expression, causing social disadaptation and depressive disorders. These latter, in combination with negative coping strategies, minimize the effects of reinnervation. In this regard, full-fledged surgical reanimation of the facial muscles is currently a very difficult and sometimes insurmountable task.

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