Review

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Sociodemographic and Clinical-Psychological Factors of Postoperative Recovery of Patients With Spinal Canal Stenosis: a Review of Studies

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ABSTRACT The review is devoted to the role of psychological factors in the recovery of patients after spinal surgery (with spinal canal stenosis). The high epidemiological and economic significance of the back pain syndrome was noted. Research results of socio-demographic, clinical and psychological factors in assessing patient satisfaction with the result of the operation and quality of life after the surgery are given. The article presents studies of the effectiveness of psychological assistance methods in the preoperative period and their impact on recovery. The conclusion is made about a certain inconsistency of the existing data, the need for further research and the feasibility of psychological diagnosis before surgery to clarify the prognosis of recovery, identify targets for psychological assistance and conduct a course of psychological preparation to improve the results of surgical intervention.

Keywords: spinal stenosis, quality of life, surgery, sociodemographic factors, clinical factors, psychological factors, rehabilitation

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INTRODUCTION

Back pain is the leading economic burden of the disease according to the World Health Organization, as well as one of the main causes of disability and seeking help from neurosurgeons [1]. The common cause of pain is degenerative diseases of the spine. Multifactorial spinal stenosis is narrowing of the spinal canal, which is a common degenerative disease of the spine, leading to significant limitation in the active social life of patients. The frequency of detected lumbar stenosis is 5 cases per 1,000 examined patients [2] and increases with age: the prevalence of stenosis is 24% up to 40 years, and more than 60% at the age of 60–69 years [3].

The decision on surgical treatment of stenosis is made in order to reduce the severity of pain, increase activity and improve the quality of life of the patient, if conservative methods have been successful. And although most patients recover after surgery, in some cases a successful operation does not improve their condition.

In the practice of a neurosurgeon, the assessment of the effectiveness of the treatment by the patient and the doctor may not coincide. According to existing medical research, a realistic and satisfactory result after spinal surgery is a 30% reduction in pain sensation as assessed by the visual analogue scale [4]. Exaggerated expectations of the patient from the upcoming operation may cause disappointment and dissatisfaction with the treatment, and a good surgical result from the point of view of the surgeon may be negatively perceived by the patient [5].

Numerous observations have shown that a number of repeated operations performed to relieve pain are not always a solution to the problem of back and leg pain, each subsequent operation has less chance of a favorable outcome as improved function, and its result is comparable to the result of a conservative treatment or psychotherapy [6, 7]. This phenomenon is known as failed back surgery syndrome *(FBSS*).

The researchers note the need to search for psychological factors that determine the success of the operation, which could help conduct a psychological assessment before the operation and select the necessary targets for psychological assistance.

BIOPSYCHOSOCIAL MODEL OF BACK PAIN

The biopsychosocial model of back pain can be the basis for conceptualizing the influence of various factors on the success of the operation. Currently, it is the basis for the study of back pain and disability, and its use is also approved by the US National Institutes of Health as the standard of care for chronic pain [8, 9].

The biopsychosocial model is opposed to the biomedical model, which explains disease only as the result of biological processes. Followers of the biopsychosocial model propose to consider disability due to back pain as a dynamic process of interaction of biological, psychological and social factors, which is characterized by psychological stress and pain avoidance behavior that does not correspond to the physical condition of the patient. Patients who believe their condition is disabling have lower rates of postoperative recovery, regardless of objective medical evidence [10]. Thus, increased pain and disability can be understood as negative consequences of the operation, however, they cannot be explained only by physical pathology, as they can be observed in patients with good orthopedic and neurological results. Rather, they reflect the peculiarities of the patient's individual perception and interpretation of their condition and reactions to pain [11].

In studies investigating the outcome of spinal surgery in patients with stenosis, as an unsatisfactory outcome of the operation, the researchers considered the deterioration of the physical condition based on the patient's self-reported, for example, the persistence or increase in pain, disability, including the reduction and avoidance of various types of physical and social activity, such as a decrease in working capacity, limited social circle, decreased mood and deterioration in the quality of life [12–15]. Researchers emphasize the role of biological vulnerability, i.e., individual sensitivity to pain, which determines the severity of symptoms in degenerative spinal disease [16, 17].

SOCIODEMOGRAPHIC FACTORS

A study by *Peteler* (2021) showed that with the same severity of symptoms, women have more evident disability, depression and pain after surgery [18]. A study of gender aspects of reactions to pain revealed a relationship between gender and the severity of sensitivity to pain: women showed greater sensitivity to pain in spinal stenosis, which correlated with higher rates of disability and poor quality of life [16].

Female patients had a higher level of anxiety about spinal surgery, and older patients had a higher level of anxiety about general anesthesia [19]. Female patients are also more prone to avoidance behavior due to fear of pain [20].

The postoperative outcome is influenced by the professional status of patients: the presence or absence of work at the time of surgery, the characteristics of professional activity, and the attitude of the employer [10]. Factors associated with a higher risk of disability and incapacity for work after surgery include lack of work at the time of surgery, the manual nature of work, high indices of pain and disability questionnaires (Oswestry Disability Index, ODI) before surgery, female gender and concomitan*t* chronic diseases (for example, diabetes mellitus) [21].

CLINICAL AND PSYCHOLOGICAL FACTORS (SYMPTOMS OF DEPRESSION AND ANXIETY)

Mental health indicators collected before surgery are associated with satisfaction with the outcome of the operation: patients with high rates of anxiety and depression symptoms in the preoperative period did not return to work [22]. There is evidence of a relationship between chronic degenerative disease and depressive disorder, as

well as that the severity of anxiety before surgery affects the satisfaction with the outcome of the operation [23, 24]. Symptoms of depression and anxiety, catastrophic thinking, high levels of distress, somatization, and reduced self-efficacy are among the most common psychological factors associated with adverse and poor postoperative outcomes [25].

A large number of studies have been devoted to studying the relationship between symptoms of depression and anxiety and quality of life, possible complications, and rate of recovery after surgery. There is an association between depressive symptoms and poor postoperative outcome [26–31].

Researchers confirm the relationship between the severity of symptoms of depression in the preoperative period and the degree of satisfaction with life for several years after surgery [29, 30]. Higher preoperative depression rates are associated with all postoperative outcome variables one year postoperatively: greater disability, pain, and symptom severity, and less ambulation [29]. Patients with depressive symptoms have an increased risk of postoperative pain and disability within 5 and 10 years after surgery [32].

Patients with high distress score (*Distress Risk Assessment Method, DRAM*) are less satisfied with the outcome of the operation, although they note a decrease in the severity of pain and disability index [33]. In their study, *Kim et al*. (2017) divided patients who underwent surgical treatment for degenerative disease of the lumbar spine into groups with and without signs of a depressive disorder (the Zung Depression Scale was used) [34]. Primary screening results showed that more depressed patients had higher *ODI* scores and more pain. The study showed that depression before surgery is associated with an increase in the disability index 12 months after surgery.

Suppression of the immune system in depressive disorders may lead to higher incidence of postoperative infections [35]. Depression may be associated with cognitive impairments such as episodic memory, attention, and information processing dysfunctions, which may be exacerbated after surgery.

The severity of postoperative depression in patients after elective surgery for degenerative diseases of the spine is a predictor of an (unsatisfactory) functional outcome of the operation and patient dissatisfaction. A number of studies also show the existence of an association between depression before surgery and failed surgery syndrome after the operation [37–39].

Löbner (2012) identified several factors that increase the risk of developing depression after surgery, such as older age, female gender, and a low level of education [37].

The presence of symptoms of anxiety disorders in a patient and the tendency to optimistic or pessimistic assessment were associated with the degree of subjective life satisfaction (subjective assessment of quality of life) in the postoperative period [19]. Preoperative anxiety is associated with more difficult recovery after anesthesia [40]. Increased preoperative anxiety correlates with increased postoperative pain, increased need for postoperative analgesia, and longer recovery and hospital stay, according to a survey of patients undergoing lumbar spine surgery, including patients with lumbar canal stenosis.

FACTORS OF PATIENT INVOLVEMENT IN THE POSTOPERATIVE REHABILITATION PROCESS: BELIEFS AND BEHAVIORAL STRATEGIES

The researches *by Archer* (2013, 2014) showed that the presence of postoperative fear of movement (kinesiophobia) and a strategy to avoid this fear (*fear-avoidance model*) in patients with degenerative spine disease correlated with increased pain, disability and deterioration in physical condition within six months after surgery, which influenced the patient's satisfaction with the result of the operation [41, 42]. These deteriorations were not related to the clinical success of the operation. The choice of non-adaptive behavioral strategies aimed at overcoming the consequences of the operation is associated with dissatisfaction with the outcome of the operation [43]. *Alodaibi et al*. (2018) studied the predictive value of fear avoidance model variables. It turned out that patients who use this strategy before surgery and maintain it after surgery experience greater pain intensity, they are characterized by self-limitation of physical activity, and in general they assess themselves as more disabled [44].

The choice of unproductive behavioral strategies during the postoperative recovery period is influenced by catastrophizing, which is characterized by an unrealistic expectation that the current situation (e.g., activity) will lead to the resumption of pain. Patients with chronic pain who do not experience catastrophizing feel better than those who do. Catastrophization leads to the avoidance of activities aimed at rehabilitation and recovery after surgery, which is a necessary condition for achieving an improvement in physical condition [45, 46].

Maladaptive beliefs aimed at avoiding physical activity are associated with a negative outcome of the operation [47]. Adult subjects who in the experimental situation have formed beliefs in the importance of fear avoidance perform physical exercises less actively and do not experience a real risk of pain intensification [48]. Maintaining

sustained pain avoidance at 6 and 12 months postoperatively is significantly associated with treatment dissatisfaction [49].

The fear of movement is an important marker of reduced activity in social interactions and a higher risk of psychological distress after surgery than morphological changes. The severity of fear of movement may indicate a limitation in the ability to adapt and cope with the disease and its consequences [50].

Despite the proven benefits of physical rehabilitation for many health conditions, including recovery from surgery, patient involvement in rehabilitation is often less than 35%. [51]. Factors such as self-efficacy, expected outcome, risk assessment, maladaptive beliefs and others are recognized as personality factors in the World Health Organization Classification of Functioning, Disability and Health (ICF, International Classification of Functioning, Disabilities and Health) [52].

Self-efficacy in pain, i.e. belief in one's ability to cope with pain, was associated with improved outcomes reported by patients 12 months after spinal surgery [53].

Self-efficacy has been characterized in a number of studies as a factor associated with functional improvement in adults with chronic pain, and changes in self-efficacy beliefs have been a strong predictor of response to medical therapy [54]. In turn, a decrease in the level of self-efficacy is invariably associated with a higher clinical severity of pain in various conditions, a greater risk of disability and disability [54].

A weak sense of connectedness or a belief in low controllability and meaningfulness of ongoing events is correlated with poorer long-term outcomes after surgery [55]. In the studies of factors that contribute or do not contribute to improved recovery after surgery, *Block* (2012) identified a category of "demoralization" of the patient, a condition different from depression, but also associated with poorer pain coping, less functional improvement and low satisfaction with surgery. Demoralization is characterized by feelings of dysphoria, low self-efficacy with low self-esteem, and high levels of negativism and distress. Unlike patients with depression, "demoralized" patients may experience positive emotions, do not have autonomic sleep and appetite disorders, but suffer from feelings of hopelessness, helplessness, and meaninglessness. These data support studies of the cognitive attitudes of such patients [56].

The opposite of "demoralization" is the concept of "activation" of the patient, which describes a high degree of activity and involvement of the patient in medical care, which is associated not only with improved surgical results, but also with improvements in a wide range of medical conditions [56]. Patients' beliefs about their health influence self-efficacy beliefs and treatment-related decisions, such as the choice to accept surgery or continue conservative treatment. Patients who insisted on surgery perceived PFS as a more threatening condition than patients who decided to continue conservative treatment. Patients in the conservative treatment group also had lower self-efficacy scores in terms of being able to manage their symptoms. Although patients in this group saw benefit in conservative treatment due to its lower risk and the need to develop self-discipline and self-control, many of them had a low level of education and reported unsuccessful experience with conservative treatment [57].

Also, such a psychological factor as perceived social support affects the outcome of treatment in people with degenerative spinal disease and, in the case of low values for this parameter, along with indicators of distress, predicts a negative outcome of the operation better than morphological changes [10].

The presence of perceived social support is associated with a shorter hospital stay and greater satisfaction with the outcome of the operation [58]. The more social support and less life stress patients with degenerative spine disease experience in their lives, the more satisfied they are with the results of treatment and overall quality of life after spinal decompression surgery [10].

RELATIONSHIP WITH THE PHYSICIAN, PSYCHOEDUCATION AND PSYCHOTHERAPY

Regardless of the cause, the presence of an identified disease, deterioration in the quality of life, lack of progress from conservative treatment, the prospect of surgery and rehabilitation after it, can increase the patient's anxiety and depression in anticipation of surgery. The patient's satisfaction depends on how the relationship with the doctor is built, how realistic the patient's expectations for the upcoming treatment are, how informed he is, how the choice of treatment method is oriented to the needs of the patient, and how the continuity of the treatment process (surgery, subsequent rehabilitation, observation) is maintained. An established diagnosis and a known cause of pain are important for the patient to understand and accept the symptoms and limitations caused by the disease. On the contrary, delegitimization (the patient's feeling that he is not trusted or denied) is associated with dissatisfaction with the treatment [59].

A number of studies show the importance of preoperative patient education and its relationship to clinical-psychological (symptoms of anxiety, depression, beliefs that support fear avoidance behavior), clinical (pain, functioning, disability) and economic (life expectancy, medical costs, direct and indirect costs) results of surgical intervention [60]. Other benefits of preoperative education include improved patient knowledge of their condition, feeling better prepared for surgery and rehabilitation, reduced negative thinking, and increased levels of physical activity after the intervention. Providing information can help reduce preoperative anxiety and increase feelings of control [61].

Psychoeducation is associated with a reduction in anxiety before surgery and a better outcome of surgery [62, 60]. A review by *Strom* (2018) identified five categories of interacting factors that influenced symptoms of anxiety and depression both before and after surgery: pain, lack of information, disability, return to work, and mental health. Thus, informing has a regulatory effect, contributing to the reduction of symptoms of anxiety and depression [61].

Researchers note the effectiveness of psychotherapeutic methods in the preoperative and postoperative periods for patients with spinal stenosis, while the cognitive-behavioral approach was mainly investigated. Thus, *Rolving* (2015) showed that patients with stenosis who underwent group psychotherapy before surgery recovered faster, more often noted an increase in the quality of life during the first three months after surgery compared with the control group [63].

The effectiveness and availability of cognitive-behavioral techniques for rehabilitation specialists in the process of physiotherapy and physiotherapy exercises was shown. As described above, catastrophization and avoidance of physical activity are factors that increase the patient's disability and dissatisfaction with the results of the operation. Cognitive behavioral techniques, including problem solving training, cognitive restructuring and relaxation strategies, contributed to overcoming unproductive behavioral strategies, including avoidance [64]. Support groups organized via the Internet have also shown their effectiveness [65].

A group of researchers developed a detailed psychotherapeutic protocol for dealing with catastrophization in patients with spinal canal stenosis, including a series of psychotherapeutic meetings before and after surgery [66]. A meta-analysis *by Parrish* (2021) showed that the use of cognitive-behavioral psychotherapy in the perioperative period is associated with improved quality of life, psychological well-being, reduced disability and pain in the postoperative period, which increases satisfaction with the operation [67].

There are studies that do not confirm the relationship between symptoms of anxiety and depression before surgery and a negative outcome after [47]. For example, a study by *Kim* (2015) found no differences in the criterion of satisfaction with the outcome of the operation between groups of patients with a high and low level of catastrophization [68]. An outcome study of 63 patients undergoing spinal surgery by *Knafo et al.* (2021), showed that after 8.5 months between patients with high and low rates of avoidance and the severity of beliefs about anxiety intolerance (fear of fear), no differences were found in other parameters, that is, there was no statistically significant relationship between these indicators and functional the outcome of the operation [20].

CONCLUSION

Despite the numerous data cited above on the important role of psychological and socio-demographic factors, the question of the contribution of psychosocial factors to the success of recovery after spinal surgery is still controversial.

It should be noted that there are no unambiguous data that allow to refuse surgery for a patient on the basis of psychological screening, as a stage in the treatment of multifactorial spinal canal stenosis, however, there is an opinion that in the case of a prognostic expectation of a negative assessment of the surgery outcome by the patient (such as deterioration in the emotional state, avoidance, low involvement in the rehabilitation process), the continuation of conservative treatment or psychotherapy is recommended [69].

It is important to include methods of psychological assessment of the patient's mood and expectations in the daily practice of a neurosurgeon.

The contribution of psychosocial factors to satisfaction with the outcome of the operation, shown in existing studies, does not imply a denial of the somatic aspects and the reality of pain experience. The role of psychological education in the preoperative period in reducing anxiety before surgery has been proven, and studies are underway on the effectiveness of psychotherapeutic protocols before and after surgery, including the use of certain - techniques by rehabilitation specialists.

1. In some cases, a successful operation for multifactorial stenosis of the spinal canal does not satisfy the patient. Research confirms the role of psychological factors in the successful outcome of surgery. As a model for conceptualizing the influence of these factors, the best is the biopsychosocial model.

2. Existing research confirms the role of anxiety and depression in the patient's assessment of the success of the operation. The presence of symptoms of anxiety and depression both before and after the operation correlates with the patient's dissatisfaction with the operation.

3. The main risk factors for dissatisfaction of patients with multifactorial spinal canal stenosis with surgery are: deligitimization, demoralization, the presence of an avoidance strategy, depression, high distress, low level of education and professional status of the patient; factors of favorable psychological outcome and high patient satisfaction with treatment: social support and self-efficacy.

4. The presence of emotional disadaptation in the patient, ineffective behavioral strategies, distorted beliefs that can reduce the patient's involvement in the rehabilitation process cannot be the reason for refusal to perform the operation, but requires psychological preparation for the operation.

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