



## The Use of Shock Wave Therapy at the Early Stage of Rehabilitation in Patients with Cervical Radiculopathy

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**Abstract:** The medical literature on neck pain was analyzed. The classification and etiopathogenetic mechanisms of radiculopathies are given. A comparative analysis of the results of the shock wave therapy method and other therapeutic regimens for treating various pain syndromes in the neck was carried out.

**Keywords:** radiculopathy, cervicalgia, osteochondrosis, shock wave therapy.

The vast majority of people experience an episode of neck pain (cervicalgia) at least once in their lives. In half of cases, cervical pain has a recurrent course [2]. Population studies demonstrate that the annual prevalence of cervicalgia is 10.4-21.3% [1]. It is higher in females, in higher income countries and among urban residents. Neck pain accounts for 15% of all musculoskeletal syndromes encountered in general medical practice [3]. Neck pain is the fourth leading cause of maladaptation among chronic non-communicable diseases [1]. The majority of patients have a recurrent course of pain syndrome.

Factors associated with the development and persistence of neck pain largely overlap with risk factors for the formation of other musculoskeletal diseases. These factors include primarily hereditary determinism, emotional-affective disorders (depression, anxiety, somatization), sleep disorders, smoking, and sedentary lifestyle [4].

It is assumed that among them, high body mass index is of considerable importance as a surrogate marker of higher representation of structural changes in the cervical region, increased exposure to mechanical factors, higher level of kinesiophobia and psychosocial maladaptation. In some cases, cervical spine trauma, primarily whiplash, and sports types of trauma (wrestling, hockey, soccer) have a specific impact. It is noteworthy that some studies have shown a high frequency of neck pain complaints among certain professions such as office workers, physical laborers, and health care workers, in whom low job satisfaction was the main factor associated with these disorders [4].

Although the main forms of cervicalgia are characterized by a benign course, some patients require a detailed examination to rule out potentially dangerous causes of neck pain. Clinical history and physical examination of the patient can provide important information indicating the nature of the pain (whether the pain is neuropathic or nociceptive), potentially dangerous causes of pain, and serious pathology if “red flags” are present.

The frequent use of neuroimaging methods in clinical practice leads to a high frequency of detecting morphological changes of different nature in patients with neck pain. However, it is often impossible to determine a clear causal relationship between the changes detected by magnetic resonance imaging (MRI) and the clinical manifestations of cervicalgia, which significantly complicates the diagnostic search.

The treatment of patients with neck pain in routine clinical practice involves the use of several strategies, including pharmacologic, nonpharmacologic treatments, and various interventional therapies and surgical treatments. Despite this, there are very few specific randomized controlled trials (RCTs) on cervical pain, making it difficult to prioritize treatment in each individual patient[5].

Neck pain can also be categorized based on the leading mechanism of its development into nociceptive (musculoskeletal), neuropathic, and secondary pain associated with specific causes. Musculoskeletal pain is mainly related to mechanical factors arising from pathology in the spine or its supporting structures such as ligaments and muscles. This type of pain includes, for example, pain resulting from facet joint pathology (arthritis, etc.), discogenic pain, and myofascial pain. Neuropathic pain occurs when the peripheral nervous system is affected or injured and is usually associated with mechanical or chemical irritation of nerve roots.

The most common examples of peripheral neuropathic pain are radicular symptoms due to disc herniation, osteophytes, and spinal stenosis. Myelopathy is a form of central neuropathic pain. Mixed neuropathic-nociceptive pain syndromes include, for example, postlaminectomy syndrome (after unsuccessful neck surgery) and degenerative disc disease, which leads to a combination of mechanical pain due to the destruction of the fibrous ring and radicular syndrome caused by herniated nucleus pulposus [6].

A study conducted by D.R. Gore et al. [7] in patients with chronic and recurrent neck pain showed that individuals with more severe pain syndrome due to trauma and patients who had manifestations of cranial radiculopathy more often suffered from pain of a constant nature. At the same time, no correlation between the severity of radiologic degenerative changes and the results of treatment was revealed. Meanwhile, a large retrospective epidemiologic study conducted in patients with radicular pain at the Mayo Clinic showed that although recurrence of pain was frequent (31.7%), with a mean follow-up period of 5.9 years, 90.5% of patients no longer had pain or had mild pain [8]. These patterns of a higher level of chronification with maximum subjective assessment of pain and the presence of signs of radiculopathy are also characteristic of patients with low back pain and indicate the role of both objective and subjective factors in the prognosis of the disease.

Clinical observations show that the majority of patients with radiculopathy have relief of symptoms on the background of treatment or the pain syndrome regresses spontaneously. This is consistent with small studies that show significant regression of cervical disc herniations in 40-76% of cases, similar to similar observations in low back pain [9].

Based on observations of patients with neck pain syndromes, an integrated approach [10] combining physical, pharmacologic, and physiotherapeutic treatments is advantageous. In contrast to the problem of low back pain, there are very few RCTs on the efficacy of different treatment methods for cervicgia [11].

Recently, shock wave therapy (SWT) has been successfully applied in the treatment complex. Prospectivity and high efficiency of this method are noted by many authors [12-19,21-25,26, 21-28, 31, 32, 34, 35, 36, 37].

In this regard, in recent years, interest in the application of UHT as a method of physiotherapy has significantly increased and most of the publications fall on the last 10-15 years. UHT is successfully applied in a wide range of diseases.

Extracorporeal shockwave therapy is a non-invasive treatment method, which is based on the conversion of electro magnetic vibrations into acoustic waves of infrasound range. Low-energy shock waves are generated electrohydraulically, electromagnetically, piezoelectrically or pneumatically, which determines the shape of the pulse.

When acting on biological tissues, extracorporeal shock waves have a mechanical effect proportional to the impedance at the boundary of different tissues of the body, causing subsequent

thermal and chemical effects [29]. The main clinical effects of shock waves are analgesic effect [16,21,24,25,34], activation of microcirculation and neoangiogenesis, stimulation of metabolic processes [14,20], reduction of the severity of fibrotic-sclerotic changes, anti-inflammatory effect [12,13,19,26].

To date, a large number of studies are devoted to the effectiveness of UHT in the pathology of the musculoskeletal system of traumatic and inflammatory genesis. Y. Marwan et al. described 2 cases of effective application of UHT in patients with coccygodynia. Evaluated by 10-point digital pain scale and visual analog scale (VAS), the intensity of pain syndrome after UHT in the first patient decreased from 6 and 5.1 points, respectively, to 0 points on both scales, in the second patient - from 7 and 6.9 points to 1 and 0.8 points, respectively. The achieved effect was maintained for one year [30].

The authors note that despite the proven efficacy of medium- and high-intensity UHT, further studies on the use of low-intensity shockwave therapy should be conducted to determine the minimum effective parameters of exposure [19].

M. Haake, I.H. Chow and other researchers also speak about the possibility to significantly increase the effectiveness of UWT and influence the outcome of the disease by varying the parameters of the procedure. Chow and other researchers. The results of application of EUVT in various pathologies vary from the absence of positive results of therapy to complete elimination of clinical symptoms. The applied equipment and the method of shock wave generation used in it can influence the effectiveness of shock wave therapy procedures [18]. Many authors have proved the safety of the UWT method with adequate selection of therapy parameters, which allows expanding the list of indications for UWT [15,16, 29].

Active research of the shockwave therapy method and its high efficiency in the treatment of pathology of various organs and systems have led to the interest in the comparative evaluation of the clinical effectiveness of UHT with other therapeutic methods. Thus, Y.S. Cho et al. noted that the complex of UWT and stabilization exercises is more effective in the treatment of cervicgia compared to the isolated use of each factor [17]. When comparing the effectiveness of radial UHT (3 weekly sessions) and a standard course of physical therapy (10 ultrasound and kinesiotherapy procedures) in the treatment of plantar fasciitis, J.M. Greve et al. and M.V. Grecco et al. noted that the clinical effect of UHT developed faster and persisted for a longer time [25]. A. Gur et al. compared the effectiveness of ultrasound and UHT in patients with cervical radiculopathy. As a result of a randomized controlled trial (66 people), it was found that low-intensity UHT (3 sessions) had a higher efficacy compared to ultrasound therapy, which was manifested by a decrease in the number of trigger points, a decrease in pain syndrome and improved quality of life ( $p < 0.05$ ) [26]. We found literature data reporting potentiation of the effect of UHT when the method is combined with other physiotherapeutic factors.

## **Conclusion.**

Thus, many researchers note the need for further study of the UHT method and techniques of its application, analyzing the long-term results of course therapy with acoustic waves of the infrasound range [31,37]. An active discussion on determining the range of indications and contraindications to the use of shockwave therapy in the spine region based on studies that allow us to assess the degree of its effectiveness continues, since the area of action is very close to the spinal cord and the mechanisms of the factor's action are not yet sufficiently studied. There are also no standardized rules for selecting therapy parameters (energy flow density, number of pulses per procedure, course duration).

All of the above confirms the need for further study of this relatively new, promising and highly effective method of treatment.

One of the largest RCTs studied the short-term and long-term effect of manual therapy, therapeutic physiotherapy against the background of standard pharmacotherapy [38]. After 7 weeks, a positive effect (subjective patient's report of complete or significant pain relief) was

achieved in 68.3% of patients on the background of manual therapy, in 50.8% of patients who used physical therapy and in 35.9% of standard pharmacotherapy.

There is a limited number of studies on other conservative methods of treatment. For example, the effects of acupuncture have been investigated in several studies that have shown short-term efficacy for chronic neck pain, with no long-term effects reported [39].

There are relatively few RCTs examining the efficacy of different treatments for patients with neck pain. Nevertheless, clinical experience shows the benefits of a multidisciplinary approach involving a wide range of physical, behavioral, and pharmacological treatments. Effective pain management remains the leading management strategy for these patients. Among all classes of pharmacologic agents, NSAIDs have universal properties, and their use allows effective pain control and prevention of disease recurrence [40]. Although complete elimination of the pain syndrome is not achieved in all cases, nevertheless, comprehensive treatment brings significant relief and ensures the return of functional activity in patients.

## Literature

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