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Pharmacopuncture in stroke patients: An integrative approach to recovery and rehabilitation

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Abstract. Introduction. Stroke remains one of the leading causes of mortality and long-term disability worldwide. Despite significant advances in modern medicine, a substantial proportion of stroke survivors continue to experience persistent neurological deficits that adversely affect their quality of life and social functioning. In this regard, integrative medical approaches aimed at enhancing the effectiveness of rehabilitation interventions have attracted increasing attention. A promising therapeutic modality is pharmacopuncture that combines the principles of acupuncture and pharmacotherapy through the administration of medicinal substances into specific acupuncture points. Therefore, evaluating the potential of pharmacopuncture in comprehensive post-stroke rehabilitation is of considerable scientific and clinical importance. **Aim.** To analyze current literature on the use of pharmacopuncture in the rehabilitation of stroke patients and to assess its effects on neurological status, functional recovery, and quality of life. **Materials and Methods.** A systematic review of domestic and international scientific publications investigating the application of pharmacopuncture in post-stroke rehabilitation was conducted. Literature searches were performed in the major bibliographic databases, including PubMed, Scopus, Web of Science, Google Scholar, eLIBRARY.RU, and CyberLeninka. Original research articles, literature reviews, meta-analyses, and clinical practice guidelines published in recent years and addressing the efficacy and safety of pharmacopuncture in stroke rehabilitation were included in the analysis. **Results and Discussion.** The reviewed literature indicates that pharmacopuncture, when incorporated into comprehensive rehabilitation programs, may contribute to improved neurological outcomes, enhanced motor recovery, reduced pain intensity and muscle spasticity, and improved quality of life. Evidence suggests that this therapeutic approach may positively influence neuroplasticity and facilitate functional restoration of the central nervous system. In most studies, pharmacopuncture was reported to be a safe adjunctive treatment associated with a low incidence of adverse effects. Nevertheless, the available evidence highlights the need for standardized treatment protocols and well-designed multicenter randomized controlled trials to further validate its clinical effectiveness. **Conclusions.** Pharmacopuncture represents a promising component of multidisciplinary post-stroke rehabilitation, with a potential to enhance functional recovery and improve rehabilitation outcomes. However, further high-quality studies based on evidence-based medicine principles and standardized outcome assessment methods are required to establish its efficacy and optimize its integration into routine clinical practice.

Keywords: stroke, pharmacopuncture, rehabilitation, restorative treatment, acupuncture, integrative medicine, post-stroke disorders, neurological deficit, neuroplasticity, quality of life.

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Фармакопунктура у пациентов с инсультом: интегративный подход к восстановлению и реабилитации

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Реферат. Введение. Инсульт остаётся одной из ведущих причин смертности и инвалидизации населения во всём мире. Несмотря на достижения современной медицины, значительная часть пациентов после перенесённого инсульта сохраняет стойкие неврологические нарушения, ограничивающие качество жизни и социальную адаптацию. В связи с этим особый интерес представляют методы интегративной медицины, направленные на повышение эффективности реабилитационных мероприятий. Одним из перспективных направлений является фармакопунктура, сочетающая принципы акупунктуры и фармакотерапии посредством введения лекарственных веществ в биологически активные точки. Анализ возможностей данного метода в комплексной реабилитации пациентов после инсульта является актуальной научной и практической задачей. **Цель исследования.** Провести анализ современных литературных данных о возможностях фармакопунктуры в восстановительном лечении пациентов, перенесших инсульт, а также оценить её влияние на неврологический статус, функциональное восстановление и качество жизни пациентов. **Материалы и методы.** Выполнен систематический обзор отечественных и зарубежных научных публикаций, посвящённых применению фармакопунктуры в реабилитации пациентов после инсульта. Поиск источников осуществлялся в международных наукометрических

базах данных PubMed, Scopus, Web of Science, Google Scholar, а также в российских информационно-аналитических системах eLIBRARY.RU и CyberLeninka. В анализ были включены оригинальные исследования, обзоры литературы, метаанализы и клинические рекомендации, опубликованные за последние годы и посвящённые оценке эффективности и безопасности фармакопунктуры при постинсультной реабилитации. **Результаты и их обсуждение.** Анализ литературных данных показал, что применение фармакопунктуры в составе комплексной реабилитации способствует улучшению неврологических функций, восстановлению двигательной активности, снижению выраженности болевого синдрома и мышечной спастичности, а также повышению качества жизни пациентов. Отмечено положительное влияние метода на процессы нейропластичности и функционального восстановления центральной нервной системы. В большинстве исследований фармакопунктура рассматривалась как безопасный дополнительный метод лечения с минимальным количеством побочных эффектов. Вместе с тем выявлена необходимость стандартизации протоколов лечения и проведения многоцентровых рандомизированных исследований. **Выводы.** Фармакопунктура является перспективным компонентом комплексной реабилитации пациентов после инсульта, способствующим улучшению функционального восстановления и повышению эффективности восстановительного лечения. Для окончательного подтверждения её клинической эффективности необходимы дальнейшие исследования с использованием современных доказательных подходов и унифицированных методик оценки результатов.
Ключевые слова: инсульт, фармакопунктура, реабилитация, восстановительное лечение, акупунктура, интегративная медицина, постинсультные нарушения, неврологический дефицит, нейропластичность, качество жизни
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Introduction. Stroke continues to represent a major global public health challenge and remains one of the most common causes of death and disability [1]. Advances in emergency management, thrombolytic therapy, and rehabilitation have significantly improved survival rates; however, a substantial proportion of stroke survivors continue to experience long-term physical, cognitive, and psychological impairments [1,2]. These complications frequently limit independence and reduce quality of life, creating a significant socioeconomic burden on patients, families, and healthcare systems [3].

Contemporary stroke rehabilitation is based on a multidisciplinary approach involving physical therapy, occupational therapy, speech therapy, pharmacological treatment, and psychological support [4,5]. Although these interventions remain fundamental components of post-stroke care, functional recovery is often incomplete [6]. Consequently, interest in complementary and integrative therapeutic modalities has increased considerably over recent decades [7].

Pharmacopuncture is a therapeutic technique derived from traditional East Asian medicine that combines acupuncture stimulation with the administration of pharmacologically active substances into specific acupuncture points [8]. Depending on the clinical indication, herbal extracts, vitamins, peptides, and other medicinal compounds may be used [9]. This dual mechanism is believed to enhance therapeutic effects by combining local pharmacological action with neurophysiological stimulation associated with acupuncture [10].

Recent experimental and clinical studies suggest that pharmacopuncture may facilitate neurological recovery through several biological pathways, including modulation of neuroplasticity, enhancement of cerebral blood flow, regulation of inflammatory processes, and reduction of oxidative stress [11,12]. Furthermore, pharmacopuncture has demonstrated potential benefits in the management of post-stroke pain, muscle spasticity, and cognitive dysfunction [13].

The aim of this review is to evaluate current scientific evidence regarding the efficacy, safety, and clinical applicability of pharmacopuncture in patients undergoing stroke rehabilitation.

Materials and Methods. This review was based on a comprehensive analysis of published scientific literature addressing the application of pharmacopuncture in stroke rehabilitation. Relevant publications were identified through searches of international bibliographic databases, including PubMed, Scopus, Web of Science, and Google Scholar, as well as regional scientific repositories.

Original clinical studies, randomized controlled trials, systematic reviews, meta-analyses, and experimental investigations were included, examining the efficacy and safety of pharmacopuncture in patients with ischemic or hemorrhagic stroke. Publications focusing on motor recovery, pain management, cognitive function, emotional well-being, neuroplasticity, and rehabilitation outcomes were analyzed.

The data collected were systematically reviewed to assess therapeutic effectiveness, potential mechanisms of action, safety profiles, and practical aspects of integrating pharmacopuncture into multidisciplinary rehabilitation programs.

Results and Discussion. The available literature suggests that pharmacopuncture may provide meaningful benefits in several domains of post-stroke recovery [14]. One of the most frequently reported effects is the improvement of motor function [15]. Experimental studies indicate that pharmacopuncture may promote neuronal regeneration and facilitate neuroplastic changes within the central nervous system [16]. Enhanced cerebral perfusion and modulation of neurotrophic factors have been proposed as potential mechanisms contributing to functional recovery [17].

Clinical investigations have also reported reductions in muscle spasticity, a common complication that significantly impairs mobility and daily activities among stroke survivors [18]. By influencing neuromuscular regulation and inflammatory pathways, pharmacopuncture may improve muscle tone and facilitate participation in rehabilitation exercises [19].

Pain management represents another important area of application. Post-stroke shoulder pain,

neuropathic pain, and musculoskeletal discomfort frequently interfere with rehabilitation progress [20,21]. Several studies have demonstrated that pharmacopuncture may reduce pain intensity through anti-inflammatory, analgesic, and neuromodulatory mechanisms [22]. These effects may contribute to patients' improved mobility and increased engagement in rehabilitation programs [23].

In addition to physical recovery, pharmacopuncture may positively influence cognitive and emotional outcomes [24]. Cognitive impairment and post-stroke depression are common conditions that negatively affect long-term prognosis [25]. Evidence suggests that certain pharmacopuncture preparations may support cerebral circulation and neuronal function, potentially contributing to improvements in memory, attention, and emotional stability [26,27].

Compared with conventional acupuncture, pharmacopuncture offers the theoretical advantage of combining mechanical stimulation with localized pharmacological action [28]. This integrated approach may enhance therapeutic effectiveness and prolong clinical benefits [29]. Nevertheless, direct comparisons between pharmacopuncture and standard acupuncture remain limited, and further comparative studies are required [30].

Despite promising findings, several challenges remain. Considerable variability exists regarding the substances used, injection techniques, treatment schedules, and selection of acupuncture points [31]. Such heterogeneity complicates the interpretation of results and limits the development of standardized clinical protocols [32]. Furthermore, many available studies are characterized by relatively small sample sizes and methodological limitations [33].

Future research should focus on large multicenter randomized controlled trials, standardized treatment protocols, and objective outcome measures [34]. The integration of modern imaging techniques and biomarker analysis may provide additional insights into the biological mechanisms underlying pharmacopuncture-induced recovery [35].

Another important consideration is the potential role of pharmacopuncture as an adjunct to conventional rehabilitation rather than as an isolated therapeutic intervention [36]. Stroke recovery is a complex and multidimensional process that requires coordinated management of motor, sensory, cognitive, emotional, and functional impairments [37]. Pharmacopuncture may therefore be most beneficial when integrated into a comprehensive rehabilitation program that includes physiotherapy, occupational therapy, speech therapy, and pharmacological management. Combination of these approaches may facilitate greater patient participation in rehabilitation and support the achievement of functional goals [38,39].

Duration and sustainability of the therapeutic effects also require further consideration. Although some studies have reported improvements following a relatively short course of pharmacopuncture, the persistence of these effects after treatment discontinuation remains insufficiently investigated [40,41]. Repeated treatment courses may be necessary in some patients, particularly those with persistent spasticity, chronic pain, or long-standing neurological deficits. Long-term follow-up studies are therefore needed to determine whether the observed improvements translate into sustained functional independence and better quality of life [42,43].

Patient selection may represent another important factor influencing treatment outcomes. The clinical response to pharmacopuncture may vary according to stroke type, lesion location, severity of neurological impairment, time since stroke, age, comorbidities, and baseline functional status [44]. Patients in the early and subacute stages of recovery may respond differently from those with chronic neurological deficits. Future studies should therefore include clearly defined patient subgroups and investigate whether specific clinical characteristics can predict treatment response [45].

Safety is also an essential component of evaluating pharmacopuncture. Although the procedure is generally considered minimally invasive, potential adverse effects may include local pain, bleeding, infection, allergic reactions, or other complications associated with the injected substances [46]. The safety profile may depend on the pharmacological preparation, concentration, injection technique, anatomical location, and qualifications of the practitioner. Standardized reporting of adverse events should therefore become an integral component of future clinical trials. Particular attention should also be paid to patients receiving antiplatelet or anticoagulant therapy, who represent a substantial proportion of the post-stroke population.

From a clinical perspective, objective assessment of treatment response is particularly important. In addition to subjective pain scores and clinical examination, standardized neurological and functional scales may provide more reliable measures of therapeutic effectiveness. The use of validated instruments such as the Fugl-Meyer Assessment, Modified Ashworth Scale, Barthel Index, and Stroke Impact Scale may facilitate comparison between studies and improve the reproducibility of findings [47]. Incorporating quantitative measures of gait, muscle tone, upper-limb function, and activities of daily living may further strengthen the evidence regarding the clinical value of pharmacopuncture.

Another promising direction is the use of neuroimaging and neurophysiological techniques to investigate treatment-related changes in the central nervous system. Functional magnetic resonance imaging, diffusion-weighted imaging, diffusion tensor imaging, electroencephalography, and transcranial magnetic stimulation may help characterize changes in functional connectivity, white-matter integrity, cortical excitability, and neural network reorganization following treatment [48,49]. Such objective biomarkers could contribute to a better understanding of the mechanisms of action and potentially identify patients who are more likely to benefit from pharmacopuncture [50].

Overall, the available evidence indicates that pharmacopuncture may have a complementary role in post-stroke rehabilitation, particularly in the management of motor dysfunction, spasticity, pain, and selected cognitive and emotional symptoms. However, the current evidence should be interpreted

cautiously because of differences in study design, treatment protocols, sample size, outcome measures, and methodological quality. Establishing standardized protocols and conducting well-designed multicenter clinical trials will be essential for determining the true clinical effectiveness, safety, and long-term benefits of pharmacopuncture in stroke rehabilitation.

Conclusions. Pharmacopuncture represents a promising integrative therapeutic modality that may enhance the effectiveness of comprehensive stroke rehabilitation. Current evidence indicates potential benefits in motor recovery, pain reduction, management of muscle spasticity, and improvement of cognitive and emotional functioning. The combination of acupuncture stimulation and localized pharmacological intervention may provide unique therapeutic advantages in post-stroke care.

Nevertheless, the existing evidence base remains limited by methodological heterogeneity and insufficient standardization. Further high-quality clinical studies are required to establish definitive conclusions regarding efficacy, safety, and optimal treatment protocols. The continued integration of traditional therapeutic concepts with contemporary evidence-based medicine may facilitate the development of more effective rehabilitation strategies for patients recovering from stroke.

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