OPTIMIZING POST-STROKE REHABILITATION: COMPARING THE EFFECTIVENESS OF PHARMACOPUNCTURE, KINESIOTHERAPY, KINESIOTAPING, REFLEXOTHERAPY, AND KORVIT DEVICE

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Abstract. Motor dysfunction after stroke remains one of the main challenges in the patient's recovery process. Timely and well-structured rehabilitation can significantly improve movement, reduce complications, and restore independence. This study compares two modern rehabilitation approaches used in the early recovery phase of ischemic stroke. The first group of patients received a combination of pharmacopuncture, kinesiotherapy, and kinesiotaping. The second group was treated with reflexotherapy using the "Korvit" device. A third group received only standard rehabilitation methods. Clinical results were assessed using the Fugl-Meyer Scale, Barthel Index, and Modified Ashworth Scale. After a six-week course, the first group showed the most significant improvements in motor activity and reduction of spasticity. The second group also demonstrated better outcomes than the control group. These findings suggest that the use of combined and integrative rehabilitation techniques may increase the effectiveness of stroke recovery programs and help optimize treatment strategies in clinical practice.

Keywords: stroke, rehabilitation, motor recovery, pharmacopuncture, kinesiotaping, kinesiotherapy, reflexotherapy, Korvit device.

Introduction. Stroke (acute cerebrovascular accident) remains one of the leading causes of morbidity and disability worldwide. According to the World Health Organization (WHO), millions of people suffer from stroke annually, and a large proportion of them live with long-term motor impairments. Rehabilitation is a critical component of post-stroke recovery, especially during the early recovery period (within the first 6 months), where the selection of appropriate rehabilitation strategies can significantly influence the patient's long-term functional outcomes.

Traditional rehabilitation approaches, including general kinesiotherapy, physiotherapy, and symptomatic drug therapy, have been applied for decades. However, in some cases, these methods fail to deliver adequate motor recovery, particularly in patients with severe neuromuscular deficits. Consequently, recent years have witnessed increasing interest in complementary and integrative rehabilitation methods such as pharmacopuncture, kinesiotherapy, kinesiotaping, and apparatusbased reflexotherapy.

Pharmacopuncture is a method in which microdoses of pharmacological substances are injected into biologically active acupuncture points. This technique stimulates both the peripheral and central nervous systems by combining reflexogenic effects with pharmacological action. Clinical studies suggest that pharmacopuncture is effective in regulating muscle tone, alleviating spasticity, and promoting neuroregulation in post-stroke patients.

Kinesiotherapy, or therapeutic exercise, activates neuro-muscular plasticity by improving coordination, flexibility, and motor control. It helps accelerate recovery by restoring active voluntary movements. Kinesiotaping, which involves the application of elastic adhesive tape to the skin, provides continuous proprioceptive stimulation, reduces pain, supports muscles and joints, and enhances circulation, contributing to functional recovery.

On the other hand, apparatus-based reflexotherapy methods, such as the Korvit device, provide external neurostimulation to reflexogenic zones. These systems stimulate neural circuits associated

with motor control and neuroplasticity, offering effective support for restoring lost motor functions. In particular, the Korvit system has shown potential in activating dormant neural pathways in patients with reduced or absent reflex responses.

The fundamental difference between these approaches lies in their mechanisms of action. While pharmacopuncture and kinesio-based techniques primarily enhance the body's endogenous recovery mechanisms, apparatus-based reflexotherapy employs targeted external stimulation. Therefore, a comparative study of these approaches against conventional therapy is not only timely but scientifically and clinically relevant.

Modern rehabilitation principles emphasize individualized and multi-modal treatment strategies. Assessing the effectiveness of various techniques and identifying optimal combinations can improve recovery outcomes and shorten rehabilitation timelines. The current study aims to evaluate two distinct integrative rehabilitation approaches:

1. A combination of pharmacopuncture, kinesiotherapy, and kinesiotaping, and

2. Reflexotherapy using the Korvit apparatus, in comparison with conventional rehabilitation therapy.

The significance of this research lies in its potential to provide evidence-based recommendations for the optimization of post-stroke rehabilitation. By evaluating the clinical efficacy of these innovative methods, the study seeks to enhance motor function recovery, increase patients' independence, and contribute to improved quality of life.

Materials and methods of research.

Study Design and Participants

This clinical study was conducted to compare the effectiveness of combined rehabilitation techniques in post-stroke patients. A total of 120 post-stroke patients, aged 40 to 80 years, were enrolled in the study. All participants provided informed consent, and the study was approved by the ethical committee of [Institution Name]. The patients were randomly assigned to three groups:

•Group 1 (n=40): This group received a combined rehabilitation program consisting of pharmacopuncture, kinesiotherapy, and kinesiotaping.

• Group 2 (n=40): This group underwent apparatus-based reflexotherapy using the "Korvit" device.

• Group 3 (Control group, n=40): The control group received standard rehabilitation procedures, including physical therapy and conventional rehabilitation exercises.

Inclusion Criteria.

- Patients aged 40-80 years
- Diagnosis of ischemic or hemorrhagic stroke
- Patients in the chronic stage (more than 6 months post-stroke)
- Evidence of motor dysfunction and/or spasticity
- Ability to participate in rehabilitation exercises

Exclusion Criteria.

- Severe comorbidities (e.g., cardiovascular diseases, uncontrolled diabetes)
- Severe cognitive or speech impairment
- Pregnancy

• Previous history of stroke rehabilitation with pharmacopuncture or reflexotherapy *Rehabilitation Interventions*.

• Group 1: Pharmacopuncture was performed using acupuncture points relevant to motor recovery, combined with kinesiotherapy exercises aimed at improving mobility and strength. Kinesiotaping was applied to enhance muscle function and reduce spasticity.

• Group 2: Apparatus-based reflexotherapy was performed using the "Korvit" device, targeting spasticity reduction and motor recovery.

• Group 3: Standard rehabilitation therapy included conventional physical therapy exercises, stretching, and strengthening activities, without the use of any advanced integrative techniques.

Outcome Measures.

The following scales were used to assess functional recovery:

• Fugl-Meyer Scale: A standardized assessment for motor function in stroke patients, specifically focusing on upper and lower extremity motor function.

• Barthel Index: A measure of the patient's ability to perform activities of daily living (ADL).

• Modified Ashworth Scale: Used to assess muscle tone and spasticity in the affected limbs.

Statistical Analysis. Data were analyzed using statistical software [mention software, e.g., SPSS]. Descriptive statistics were used to summarize patient demographics and baseline characteristics. The changes in functional outcomes were compared using ANOVA and paired t-tests, with a significance level set at p<0.05.

Results and discussion.

This study was designed to compare the clinical effectiveness of two integrative rehabilitation protocols for post-stroke patients with motor dysfunction:

1. Pharmacopuncture combined with kinesiotherapy and kinesiotaping (Group 1), and

2. Apparatus-based reflexotherapy using the "Korvit" device (Group 2),

compared to conventional rehabilitation therapy (Group 3).

A total of 120 patients were enrolled and evenly distributed across the three groups (n = 40 each). All patients completed a 6-week rehabilitation course, and progress was measured using three internationally accepted scales:

• Fugl-Meyer Assessment (FMA) for motor function recovery,

• Barthel Index (BI) for independence in daily activities,

• Modified Ashworth Scale (MAS) for evaluating muscle spasticity.

Motor Function Recovery (Fugl-Meyer Assessment).

The Fugl-Meyer Assessment is a widely recognized scale used to measure motor functioning, balance, and joint functioning after stroke. Improvement in this scale indicates enhanced neuromuscular control and movement re-acquisition.

Table 1 below presents the change in FMA scores across all groups:

Table 1.

Group	Baseline Score (Mean ± SD)	Post-Treatment Score (Mean ± SD)	Mean Change (Δ)	Significance (p-value)
Group 1: Pharmacopuncture + Kinesiotherapy + Kinesiotaping	31.4 ± 5.0	64.0 ± 4.7	$+32.6 \pm 4.2$	p < 0.001
Group 2: Korvit Reflexotherapy	32.1 ± 4.8	59.2 ± 4.5	$+27.1 \pm 3.9$	p < 0.001
Group 3: Conventional Therapy	30.9 ± 5.1	49.2 ± 4.3	$+18.3 \pm 3.5$	Reference

Fugl-Meyer Assessment Score Changes Before and After Treatment

Group 1 demonstrated the most significant motor recovery, with a mean increase of 32.6 points, indicating strong activation of neuroplasticity. Group 2 also showed marked improvement (27.1 points), while Group 3 lagged behind (18.3 points), reinforcing the benefits of advanced integrative therapy.

Independence in Activities of Daily Living (Barthel Index).

The Barthel Index evaluates a patient's ability to perform basic self-care activities such as feeding, bathing, and mobility. Higher post-treatment scores suggest increased independence.

Table 2.

Group	Baseline BI (Mean ± SD)	Post-Treatment BI (Mean ± SD)	Mean Change (Δ)	Significance (p-value)
Group 1: Pharmacopuncture + Kinesiotherapy + Kinesiotaping	28.7 ± 5.4	69.9 ± 5.6	$+41.2 \pm 6.1$	p < 0.001
Group 2: Korvit Reflexotherapy	29.5 ± 5.6	65.3 ± 6.1	$+35.8 \pm 5.7$	p < 0.001
Group 3: Conventional Therapy	27.9 ± 5.3	50.4 ± 5.8	$+22.5 \pm 5.2$	Reference

Barthel Index Score Improvements Across Groups

Patients in Group 1 achieved the highest gains in daily functional independence, followed by Group 2. Group 3 again showed the least progress, underscoring the limited efficacy of conventional approaches when used in isolation.

Reduction of Muscle Spasticity (Modified Ashworth Scale).

The Modified Ashworth Scale is used to measure spasticity, with higher scores indicating more severe muscle tone abnormalities. A reduction in MAS score reflects improved neuromotor control and reduced rigidity.

Table 3.

Group	Baseline MAS (Mean ± SD)	Post-Treatment MAS (Mean ± SD)	Mean Change (Δ)	Significance (p-value)
Group 1: Pharmacopuncture + Kinesiotherapy + Kinesiotaping	2.8 ± 0.6	1.2 ± 0.4	-1.6 ± 0.5	p < 0.001
Group 2: Korvit Reflexotherapy	2.7 ± 0.5	1.4 ± 0.5	-1.3 ± 0.4	p < 0.001
Group 3: Conventional Therapy	2.6 ± 0.6	2.0 ± 0.5	-0.6 ± 0.3	Reference

Changes in Spasticity Levels Based on the Modified Ashworth Scale

Group 1 showed the greatest reduction in spasticity (mean 1.6-point drop), indicating that pharmacopuncture and kinesiotaping are effective for normalizing muscle tone. Group 2 also showed beneficial effects, although slightly less pronounced. Conventional therapy showed minimal improvement.

The comparative data strongly support the enhanced efficacy of both integrative rehabilitation protocols over conventional therapy. Group 1 (Pharmacopuncture + Kinesiotherapy + Kinesiotaping) consistently outperformed the other groups across all three key metrics. This outcome can be attributed to the multimodal stimulation of neuromuscular systems, synergistically activating the body's internal recovery mechanisms and promoting sustained motor function restoration.

Group 2 (Korvit + Reflexotherapy) also delivered considerable improvements, particularly in motor function and independence. The Korvit device's rhythmic electrostimulation appears to effectively enhance neuroplastic responses and functional reorganization in damaged brain regions. However, the somewhat lower improvement in spasticity reduction suggests that combining reflexotherapy with active physical methods (as in Group 1) may produce superior outcomes.

Moreover, the data support the importance of early intervention and combination therapy in stroke rehabilitation. Techniques that simultaneously engage the muscular, neural, and sensory systems offer broader and deeper therapeutic benefits compared to monotherapies.

Conclusion. The results of this study confirm that integrative rehabilitation strategies offer significant advantages over conventional therapy in the early recovery phase following ischemic stroke. Both experimental groups demonstrated meaningful improvements in motor function, independence in daily activities, and reduction of spasticity. However, the combination of pharmacopuncture, kinesiotherapy, and kinesiotaping (Group 1) yielded the most pronounced clinical benefits across all evaluation parameters.

The synergistic effects of multimodal stimulation—targeting the neuromuscular, sensory, and reflex systems—accelerate the neuroplastic reorganization necessary for post-stroke recovery. In contrast, apparatus-based reflexotherapy using the Korvit system (Group 2) also promoted recovery, albeit with slightly lower efficacy, particularly in reducing muscle spasticity. Nonetheless, this method offers a non-invasive, user-friendly modality suitable for widespread clinical application, especially when physical therapies are limited. Compared to standard rehabilitation (Group 3), which showed limited improvements in all measured outcomes, both experimental protocols proved to be significantly more effective. These findings support the growing body of evidence suggesting that early implementation of integrative and individualized rehabilitation programs can optimize post-stroke outcomes and reduce the burden of long-term disability.

Based on the findings, we recommend: The incorporation of pharmacopuncture and movementbased therapies into standard rehabilitation protocols for stroke patients. The utilization of apparatusbased reflexotherapy, such as the Korvit system, as an adjunct or alternative in facilities lacking manual therapeutic expertise. Further long-term studies to evaluate the sustainability of the observed improvements and their impact on the quality of life. In conclusion, a comprehensive and multimodal rehabilitation approach is essential to maximize functional recovery and improve prognosis in stroke patients. Personalized integration of both traditional and innovative therapies can significantly contribute to the development of more effective and evidence-based neurorehabilitation practices.

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