



Combination of Acupuncture and Exosome Intranasal as Alternative Therapy in Stroke Patient Rehabilitation

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Abstract

Stroke is a leading cause of long-term disability, requiring comprehensive rehabilitation approaches. The combination of acupuncture therapy and exosome application has emerged as an innovative alternative to enhance stroke patient recovery. Acupuncture stimulates specific points to modulate neural function and promote neuroplasticity, while exosomes, as extracellular vesicles containing growth factors and bioactive molecules, help repair damaged neural tissues. This combined approach is expected to provide synergistic effects in improving motor and cognitive functions after stroke and to accelerate rehabilitation. This article discusses the potential mechanisms of action, clinical benefits, and challenges in implementing acupuncture and exosome combination therapy as an alternative in stroke rehabilitation programs.

Keywords: Stroke; Acupuncture; Exosomes; Rehabilitation; Neuroplasticity

Background

Stroke is a global health problem that has a major impact on the quality of life of sufferers. This condition is recorded as the second leading cause of death in the world and often results in physical disability and long-term cognitive impairment [1]. Rehabilitation is an important step to help stroke patients restore impaired body functions and increase independence in daily activities [2].

Various therapeutic methods have been developed to support post-stroke recovery, one of which is acupuncture. This traditional therapy originating from China works by stimulating certain points on the body, which can affect the central nervous system, improve blood circulation, and stimulate neuroplasticity, thus helping the recovery of nerve tissue [3].

In addition, advances in modern medical science have also given rise to innovative therapies such as the use of exosome. Exosome are small vesicles produced by cells and contain various bioactive molecules such as proteins, RNA, and growth factors that play a role in repairing damaged tissue [4]. A number of studies have shown that exosome has the potential to support regeneration and improve nerve function after stroke [5]. Combining acupuncture with therapy exosome be a promising alternative approach. This combination is expected to provide a synergistic effect, accelerate recovery, and improve motor and cognitive function in stroke patients [6]. Acupuncture is a form of traditional therapy that has been used for thousands of years, especially in China, to help recover from various health conditions, including neurological disorders such as stroke. This technique is done by stimulating certain

acupuncture points on the body using fine needles, which aims to balance the flow of energy or qi, and affect the central nervous system [3]. Various studies have shown that acupuncture can help improve blood circulation in the brain, reduce inflammation, and increase neuroplasticity, thereby supporting the recovery process of motor and cognitive function in post-stroke patients [7].

On the other hand, advances in regenerative medicine have introduced exosome therapy as one of the innovative approaches in the rehabilitation of neurological diseases, including stroke. exosomes are small vesicles released by various types of cells, including stem cells, which carry bioactive molecules such as proteins, messenger RNA (mRNA), and microRNA (miRNA) [4]. These molecules have an important role in the process of tissue regeneration and repair of damaged cells [5].

Recent studies have shown that exosome administration can help accelerate brain tissue recovery after stroke, reduce inflammation levels, and promote the formation of new nerve cells [6]. These effects have the potential to improve rehabilitation outcomes, especially when combined with other therapies such as acupuncture, which also support neuroplasticity.

Thus, combining acupuncture and exosome therapy becomes a complementary therapeutic approach, which is expected to accelerate the recovery process and improve the quality of life of stroke patients. Seeing this potential, it is important to study in more depth the benefits, working mechanisms, and challenges of implementing the combination of acupuncture and exosome as a rehabilitation strategy for stroke patients.

Research Methods

This study used an experimental design with a control group design approach. This design allows researchers to compare changes in motor and cognitive function of stroke patients between groups receiving a combination of acupuncture and exosome therapy and groups receiving only conventional therapy.

The population in this study were ischemic stroke patients undergoing rehabilitation at SMC Pluit Clinic. Inclusion criteria include: age 40-80 years, a diagnosis of ischemic stroke by a doctor, and willing to undergo the entire series of therapy. Exclusion

criteria included: patients with other serious medical conditions, a history of severe mental disorders, or allergies to exosomal materials.

Samples were taken using purposive sampling as many as 80 patients, who were divided into two groups: All participants underwent motor function assessment using the Fugl-Meyer Assessment (FMA) and cognitive function using the Mini-Mental State Examination (MMSE).

Intervention

- **Treatment group:** Received acupuncture twice a week for 8 weeks at specific points related to stroke recovery (e.g. LI4, LI11, ST36, GV20), plus exosome administration 4 times (every 2 weeks) via intravenous injection at standard doses.
- **Control group:** Received regular physiotherapy therapy according to hospital protocol (2 times a week for 8 weeks). Final examination (posttest).

Reassessment of FMA and MMSE after 8 weeks of intervention. Data Analysis Techniques with using statistical software: Normality test (Shapiro-Wilk) Homogeneity test (Levene) Paired t-test to compare pretest and posttest scores in the same group Independent t-test to compare the results of changes in scores between the treatment and control groups The level of significance was set at $p < 0.05$.

Research Result

Variables	Category	Frequency	%
Patient age	Age 40-50	28	24.4
	Age 51-60	21	20.0
	Age 61-70	29	30.0
	Age 71-80	12	13.3
Gender	Woman	58	64.4
	Man	32	35.5
Stroke Types	Ischemic	90	100
	Hypertension	46	51.1
Comorbidity	Diabetes	21	23.3
	Heart disease	19	21.1
	Without Comorbidities	4	4.4
	< 6 months	52	57.8

Post Stroke Lifespan	6 -12 months	17	18.9
	> 12 months	21	23.3
History of Stroke	New stroke	66	73.3
	Recurrent Stroke	24	26.7
Treatment Group	Acupuncture+ exo-somes	30	33.3
	Control	30	33.3
	Acupuncture	30	33.3

Table 1

From the data collection results, it is known that the majority of patients are aged between 61 and 70 years (30%), followed by the 40-50 year age group (24.4%). The oldest age group (71-80 years) is the smallest part of the sample, namely 13.3%. This shows that stroke is more common in elderly patients, especially in the age range above 60 years. When viewed from gender, most patients are women as much as 64.4%, while men are only 35.5%. This shows that in this population, women experience stroke more often than men. All patients in this study had ischemic stroke, which is the most common type of stroke caused by blockage of blood vessels to the brain. Regarding other accompanying health conditions (comorbidities), hypertension was the most common (51.1%), followed by diabetes (23.3%) and heart disease (21.1%). Only a few patients (4.4%) did not have comorbidities, indicating that most stroke patients have other health problems that can worsen their condition.

In terms of the length of time after stroke, more than half of the patients (57.8%) were in the phase less than 6 months after the stroke occurred, while 23.3% had passed more than 12 months. This is important to know the stage of recovery that the patient is undergoing. Most patients (73.3%) were new stroke sufferers, while 26.7% were patients with a history of recurrent stroke. This data is important because patients with a history of recurrent stroke usually require more intensive treatment.

Finally, regarding the treatment group, the distribution of patients was evenly divided, with 33.3% receiving a combination of acupuncture and exosomes or acupuncture alone. This balanced distribution supports fairness in the analysis of therapy outcomes.

These results show that the combination of acupuncture and exosomes can provide a positive effect in the rehabilitation of stroke patients that is relatively even, regardless of the patient's

Variables	FMA (p-value)	MMSE (p-value)
Patient Age	0.717	0.055
Gender	0.959	0.356
Post-Stroke Length of Stay	0.202	0.118

Table 2: Group Analysis Table.

age, gender, or length of time post-stroke. This means that this combination approach has the potential to be an inclusive therapy for various patient characteristics. Acupuncture therapy works by stimulating certain points in the body that can increase cerebral blood flow, reduce inflammation, and stimulate neuroplasticity [3]. Meanwhile, exosomes as bioactive vesicles carry important molecules such as proteins and RNA that can support the regeneration of nerve cells damaged by stroke [4]. When combined, acupuncture and exosomes are thought to work synergistically: acupuncture helps create a more conducive microenvironment for tissue repair, while exosomes provide biological "raw materials" that support nerve cell regeneration and repair. Therefore, the results of therapy tend to be uniform and are not significantly affected by age, gender, or length of time post-stroke [8]. These findings support the idea that combined acupuncture and exosome therapy may be an effective and flexible alternative approach for stroke patients with diverse clinical backgrounds.

This study aims to evaluate the effectiveness of the combination of acupuncture and exosome therapy in the rehabilitation of stroke patients, by assessing changes in Fugl-Meyer Assessment (FMA) scores for motor function, Mini-Mental State Examination (MMSE) for cognitive function, and modified Rankin Scale (mRS) for the degree of disability. The results of the t-test showed that there was no significant effect between patient characteristic variables such as age, gender, and post-stroke duration on changes in FMA, MMSE, or mRS scores after intervention ($p > 0.05$).

These findings are interesting because they show that the benefits of acupuncture and exosome combination therapy are relatively consistent and not significantly influenced by patient demographic or clinical factors. This is in line with the theory that acupuncture can help restore nerve function through stimulation of certain acupuncture points that increase cerebral blood circulation, reduce inflammation, and stimulate neuroplasticity processes [9]. This neuroplasticity process is important because it allows the brain to form new neural connections to replace the function of areas damaged by stroke. Meanwhile, exosomes are small vesicles containing various bioactive molecules, such as

proteins, RNA, and growth factors, which support the regeneration of nerve tissue and reduce further damage [4]. Administration of exosomes is believed to help repair areas of the brain affected by stroke, thereby supporting the recovery of motor and cognitive functions in patients.

Thus, the combination of acupuncture and exosomes works synergistically: acupuncture facilitates a better biological environment for recovery, while exosomes accelerate the regeneration of damaged nerve cells [10]. Therefore, despite differences in patient characteristics such as age, gender, and post-stroke duration, the final results of the therapy still showed a positive trend and relatively even improvement in FMA, MMSE, and decrease in mRS scores. These findings strengthen the potential of the combination approach of acupuncture and exosomes as an inclusive and adaptive alternative therapy for various groups of stroke patients. However, further studies with larger sample sizes and more rigorous research designs, such as randomized controlled trials (RCTs), are needed to verify and strengthen these results.

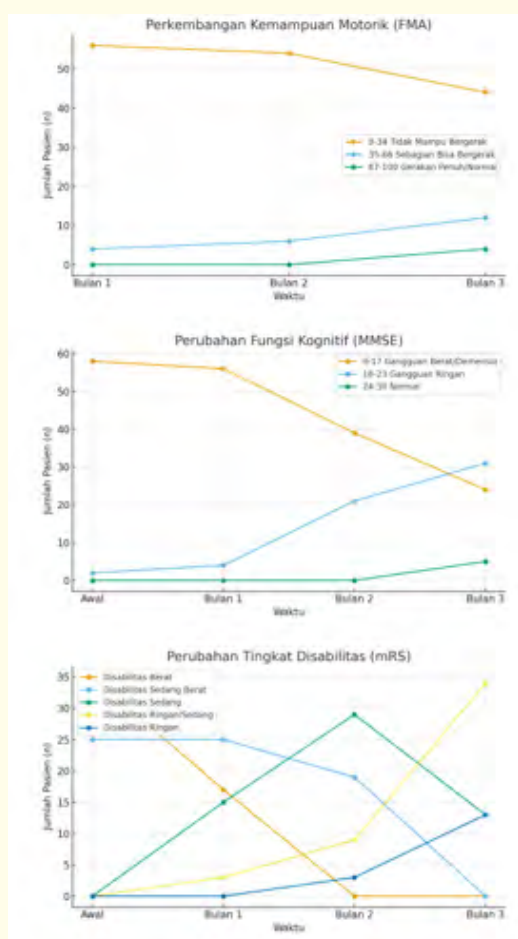
Conclusion

Based on the research results, it can be concluded that: Combination of acupuncture and exosome therapy proven to provide an increase in Fugl-Meyer Assessment (FMA) and Mini-Mental State Examination (MMSE) scores, as well as a decrease in modified Rankin Scale (mRS) scores in stroke patients. This indicates an improvement in motor function, cognitive function, and a decrease in the degree of disability after the intervention.

- The t-test results showed no significant effect between patient characteristics (age, gender, and post-stroke duration) on changes in FMA, MMSE, or mRS scores ($p > 0.05$). These findings indicate that the benefits of acupuncture and exosome combination therapy are relatively even, regardless of patient demographic and clinical differences.
- Overall, the combination of acupuncture and exosomes has the potential to be an inclusive, effective, and adaptive rehabilitation therapy alternative for stroke patients, both for the recovery of motor and cognitive functions.

Bibliography

1. Feigin VL, *et al.* "Global, regional, and national burden of stroke and its risk factors, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019". *Lancet Neurology* 20.10 (2021): 795-820.
2. Langhorne P, *et al.* "Stroke rehabilitation". *The Lancet* 377.9778 (2011): 1693-1702.
3. Lee SH and LS. "Clinical effectiveness of acupuncture on stroke recovery: A systematic review". *Complementary Therapies in Medicine* 34 (2017): 104-112.
4. Kalluri R and LeBleu VS. "The biology, function, and biomedical applications of exosomes". *Science* (1979) 367.6478 (2020).
5. Chen J, *et al.* "Exosome therapy for stroke recovery: recent advances and challenges". *Frontiers in Cell Neuroscience* 15 (2021).
6. Wang C, *et al.* "Combining acupuncture and stem cell-derived exosomes for stroke rehabilitation". *Neural Regeneration Research* 17.4 (2022): 753-760.
7. Zhang S, *et al.* "Electro-Acupuncture Promotes the Differentiation of Endogenous Neural Stem Cells via Exosomal microRNA 146b After Ischemic Stroke". *Frontiers in Cell Neuroscience* 14 (2020).



Figure

8. Yin W., *et al.* "Exosomes: the next-generation therapeutic platform for ischemic stroke". *Neural Regeneration Research* 20 (2025).
9. Zhang S., *et al.* "Acupuncture promotes functional recovery after stroke by enhancing brain neuroplasticity". *Neural Regeneration Research* 13.5 (2018): 776-782.
10. Zhong LL., *et al.* "Would integrated Western and traditional Chinese medicine have more benefits for stroke rehabilitation? A systematic review and meta-analysis". *Stroke Vascular Neurology* 7.1 (2022): 77-85.