*Original Research*

# EVALUATION OF THE EFFECTIVENESS OF MOTOR FUNCTION REHABILITATION AFTER STROKE USING PHYSIOTHERAPY COMBINED WITH ELECTROACUPUNCTURE AT THONG NHAT HOSPITAL, 2025

**Nguyen Thi Hoang Yen**[1, *], **Tran Thi Kim Tuyet**[1], **Le Quang Phu**[1]

1. Thong Nhat Hospital, Ho Chi Minh City, Vietnam
* Corresponding author: Nguyen Thi Hoang Yen ✉ dr.hoangyen2511@gmail.com

**ABSTRACT:** Stroke is the leading cause of severe disability among adults worldwide. In Vietnam, the burden is rising rapidly. The increasing incidence drives higher healthcare costs, reduced work capacity, and greater social pressures. Accordingly, post-stroke motor rehabilitation is a priority to reduce mortality and complications and limit disability. At Thống Nhất Hospital, physiotherapy combined with electroacupuncture has been used for years under the guidance of the Ministry of Health, with observed functional benefits. Still, its effectiveness has not been formally evaluated. This study aimed to generate evidence to guide regimen selection and optimise patient outcomes. Materials and Methods: A clinical interventional study without a control group was conducted, employing a pre- and post-treatment comparison. Eighty-six patients newly diagnosed with stroke within the preceding three months, receiving inpatient or outpatient care at the Departments of Rehabilitation, Emergency Interventional Cardiology, Neurology, and Traditional Medicine at Thống Nhất Hospital from January to October 2025, were included. Motor function recovery was assessed through manual muscle testing and the Barthel Index after 30 days of treatment. Results: The proportion with muscle strength grades 0–2 fell from 53.49% to 17.44%, whereas grades 4–5 rose from 29.07% to 59.30%. The mean Barthel Index increased from 44.24 ± 18.16 to 69.07 ± 17.90. Post-intervention classifications were completely independent, 12.79%; partially dependent, 76.74%; entirely dependent, 10.47%. Conclusion: Physiotherapy plus electroacupuncture appears safe and effective for post-stroke rehabilitation, improving muscle strength and independence in activities of daily living. Benefits extend beyond statistical significance to practical gains in quality of life and community reintegration.

**Keywords:** Stroke; physiotherapy; electroacupuncture.

# 1. INTRODUCTION

Stroke is a leading cause of mortality and disability worldwide. In Vietnam, it accounts for 21.7% of deaths (WHO, 2015), with an estimated 150,000 stroke-related deaths annually (HealthGrove, 2013). Globally, stroke is also the most common cause of severe disability in adults; only 15–30% of survivors regain complete functional independence, and approximately 40–50% achieve partial independence (European Stroke Initiative Committee, 2003). The burden in Vietnam is rising rapidly: by 2030, incidence is projected to be 1.85 times higher than in 2010, posing significant challenges for the health system. [1] Increasing incidence drives higher healthcare costs, reduced work capacity, and mounting social pressures. Consequently, post-stroke motor rehabilitation is an urgent priority to reduce mortality and complications, limit long-term disability, improve quality of life, and facilitate community reintegration. At Thống Nhất Hospital, physiotherapy combined with electroacupuncture has been implemented for many years under the guidance of the Ministry of Health, with observed functional benefits; however, its effectiveness has not been evaluated explicitly at this institution. The present study, conducted at Thống Nhất Hospital in 2025, assessed the efficacy of motor rehabilitation after stroke using physiotherapy combined with electroacupuncture and aimed to generate scientific evidence on this combined treatment model to support clinicians in selecting appropriate regimens and optimising patient outcomes.

# 2. MATERIALS AND METHODS

## 2.1. Study Participants

**Participants**: Patients with a confirmed diagnosis of stroke within the preceding 3 months, established by clinical assessment and neuroimaging (CT or MRI).

**Inclusion criteria:** Alert, cooperative patients who provided voluntary consent, met admission criteria, and agreed to complete 30 days of treatment, with no exclusion criteria.

**Exclusion criteria:** Critical/emergency condition; contraindications to electroacupuncture or physiotherapy; lack of cooperation or withdrawal from the study.

## 2.2. Study Methods

$$n = \frac{Z^2{}_{1-\alpha/2}\, p(1-p)}{d^2}$$

Where:

- $n$ = Study sample size

- $\alpha$ = Type I error probability, with $\alpha$ = 0.05

- $Z$ = Value from the normal distribution; at 95% confidence, Z(1-α/2) =1,96

- $d$ = Allowable error, with d=0.08
  $p$ = estimated proportion, taken as 0.8281 based on the study by Tran Ngoc Xuan (2019) [2]

We calculated the minimum sample size to be 85.

Sampling method: Convenience sampling.

### Interventions

Physiotherapy: Individualised exercise therapy comprising passive range-of-motion exercises and the use of assistive devices for stroke patients. Duration: 20 minutes per session, once daily for 30 days.

Electroacupuncture acupuncture points protocol for hemiplegia (per Ministry of Health guidelines). Duration: 20 minutes per session, once daily for 30 days.

### Techniques, tools, and data collection procedures

**Data collection.** All eligible stroke patients were interviewed and underwent a standardised clinical examination using the study case-record form. Motor recovery was assessed directly in patients by manual muscle testing and the Barthel Index.

**Muscle strength assessment.** Muscle strength was graded on the six-point Medical Research Council (MRC) scale: Grade 5 (*normal*)–full range of motion against gravity with maximal resistance; Grade 4 (*good*)–full range of motion against gravity with moderate resistance;

Grade 3 (*fair*)–full range of motion against gravity; Grade 2 (*poor*)–full range of motion without gravity; Grade 1 (*trace*)–palpable contraction without joint movement; Grade 0-no detectable contraction. [3]

**Barthel Index assessment.** Functional independence in activities of daily living was measured using the Barthel Index across 10 domains (feeding, bathing, grooming, dressing, bowel control, bladder control, toilet use, transfers from bed to chair, walking on level ground, and stair climbing). Scores range from 0–100 and were categorised as complete dependence (0–45), partial dependence (50–85), and independence (90–100).

**Timing of evaluations.** All outcomes were recorded at two time points: baseline (pre-treatment) and after 30 days of treatment. Clinical findings and rehabilitation assessment forms were completed for each participant at both assessments.

## 2.3. Data Analysis

### Data processing and analysis

Data were analysed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Categorical variables were summarised as frequencies and percentages; continuous variables were summarised as means and standard deviations. Between-group comparisons for categorical variables were conducted with the chi-square test. Mean differences in continuous variables between groups were assessed using the independent *t*-test.

## 2.4. Ethical Considerations

The study protocol was reviewed and approved by the Scientific Research Committee of Thống Nhất Hospital, ensuring scientific validity and feasibility. All participants provided voluntary informed consent. Patient information was kept confidential and used solely for research purposes.

## 3. RESULTS

**Table 1.** Baseline characteristics of the study population (n = 86)

| Characteristic | n | % |
|---|---|---|
| Age | | |
| <60 years | 32 | 37.21 |
| ≥60 years | 54 | 62.79 |
| Mean ± SD (years) | 62.99 ± 12.01 | |
| Sex | | |
| Male | 55 | 63.95 |
| Female | 31 | 36.05 |
| Time since stroke | | |
| <1 week | 68 | 79.07 |
| 1–4 weeks | 12 | 13.95 |
| >4 weeks | 6 | 6.98 |
| Type of stroke | | |
| Hemorrhagic | 20 | 23.26 |
| Ischemic | 66 | 76.74 |
| Comorbidities | | |
| Hypertension | 75 | 87.21 |
| Diabetes mellitus | 24 | 27.91 |
| Dyslipidemia | 51 | 59.30 |
| Lifestyle factors | | |
| Alcohol (beer) | 49 | 56.98 |
| Smoking | 49 | 56.98 |

*Notes: The mean age was 62.99 ± 12.01 years; 62.79% were ≥60 years. Males accounted for 63.95% (male-to-female ratio 1.78:1). Most patients were assessed within <1 week (79.07%) of stroke onset. Ischemic stroke was more common (76.74%) than hemorrhagic (23.26%). The most frequent comorbidity was hypertension (87.21%), followed by dyslipidemia (59.30%) and diabetes mellitus (27.91%); 56.98% reported alcohol (beer) use, and 56.98% reported smoking.*

**Table 2.** Muscle strength before and after treatment

| MRC grade | Before treatment, n (%) | After treatment, n (%) | *p*-value |
|-----------|-------------------------|------------------------|-----------|
| 0 | 9 (10.47) | 2 (2.33) | *p* < 0.001 |
| 1 | 14 (16.28) | 5 (5.81) | |
| 2 | 23 (26.74) | 8 (9.30) | |
| 3 | 15 (17.44) | 20 (23.26) | |
| 4 | 23 (26.74) | 37 (43.02) | |
| 5 | 2 (2.33) | 14 (16.28) | |

*Notes: The proportion of patients with MRC grades 0–2 decreased from 53.49% before treatment to 17.44% after treatment. The proportion with MRC grades 3–5 increased from 46.51% to 82.56%. Changes were statistically significant (p < 0.001).*

**Table 3.** Change in the Barthel Index before and after treatment

| Measure | Before treatment (Mean ± SD) | After treatment (Mean ± SD) | p-value |
|---------|------------------------------|------------------------------|---------|
| Barthel Index | 44.24 ± 18.16 | 69.07 ± 17.90 | *p* < 0.001 |

*Notes: The mean Barthel Index increased from 44.24 ± 18.16 before treatment to 69.07 ± 17.90 after treatment (increase 24.83 points), with statistical significance (p < 0.001).*

**Table 4.** Shift in dependency levels (Barthel Index categories) before and after treatment

| Level of independence | Before treatment, n (%) | After treatment, n (%) | *p*-value |
|-----------------------|-------------------------|------------------------|-----------|
| Independent (90–100) | 0 (0.00) | 11 (12.79) | *p* < 0.001 |
| Partially dependent (50–85) | 39 (45.35) | 66 (76.74) | |
| Entirely dependent (0–45) | 47 (54.65) | 9 (10.47) | |
| Total | 86 (100) | 86 (100) | |

*Notes: Before treatment, no patients were independent (0%); 54.65% were entirely dependent, and 45.35% were partially dependent. After treatment, 12.79% were independent, 76.74% were partially dependent, and 10.47% were entirely dependent. Overall changes were statistically significant (p < 0.001).*

# 4. DISCUSSION

## 4.1. Summary of key findings

This study observed clinically meaningful improvements in motor function and functional independence after 30 days of electroacupuncture combined with physiotherapy. The proportion of patients with low muscle strength (MRC grades 0–2) decreased from 53.49% before treatment to 17.44% after treatment, while those with higher strength (MRC grades 4–5) increased from 29.07% to 59.30%. The mean Barthel Index improved from 44.24 ± 18.16 to 69.07 ± 17.90, with a corresponding shift in dependency levels (independence increasing from 0% to 12.79%).

a.General characteristics of the study population

Among 86 included stroke cases, the mean age was 62.99 ± 12.01 years, with most participants aged ≥60 years (62.79%). This age distribution reflects the epidemiology of stroke, which predominantly affects older adults due to cumulative vascular changes and clustering of risk factors, and is consistent with domestic reports (Nguyễn Hữu Phước: 64.5 ± 10.25; Lê Minh Hoàng: 61.48 ± 10.48). [4, 5]

The male-to-female ratio was 1.78:1 (males 63.95%), higher than that reported by Lê Minh Hoàng (1.2:1) and comparable to that reported by Nguyễn Hữu Phước (1.4:1), and aligns with international data (Li Pei: males 61.2%). [4-6] The observed sex disparity may relate to higher

prevalences of hypertension, dyslipidemia, smoking, and alcohol use among men, patterns mirrored in our cohort, of which hypertension is implicated in 70–80% of stroke cases. [7]

Notably, 79.07% of patients were admitted within one week of symptom onset and received electroacupuncture following confirmation of stroke. Early presentation and initiation of intervention may favour motor recovery; this will be explored further in subsequent sections.

b.Treatment results and interpretation

After 30 days, the proportion of patients with low muscle strength (MRC grades 0–2) declined from 53.49% at baseline to 17.44%, whereas those with higher strength (grades 4–5) increased from 29.07% to 59.30%, indicating substantial motor recovery. Specifically, 9.30% and 23.26% of patients were at grades 2 and 3, respectively (total 32.56%), while 43.02% and 16.28% were at grades 4 and 5, respectively (total 59.30%).

Compared with Bùi Vinh Sơn, where 72% of patients reached grades 2–3 after 40 days, our cohort exhibited lower proportions in grades 2–3 but markedly higher proportions in grades 4–5, suggesting greater recovery in absolute muscle strength despite the shorter treatment duration (30 vs. 40 days). This may relate to earlier diagnosis, intervention, and initiation of therapy in our sample, consistent with reports by Lê Minh Hoàng and Bùi Vinh Sơn, which emphasised the benefits of early intervention for optimising functional recovery. [4, 8]

The mean Barthel Index improved from 44.24 ± 18.16 pre-treatment to 69.07 ± 17.90 at day 30, a gain of 24.83 points, comparable to the 29.61-point increase reported by Lâm Quang Vinh. [2] These findings indicate meaningful enhancement in self-care capacity with the combined intervention, contributing substantially to post-stroke motor rehabilitation.

Dependency categories based on the Barthel Index shifted favourably: complete dependence decreased from 54.65% to 10.47%, partial dependence rose from 45.35% to 76.74%, and independence increased from 0% to 12.79%. These changes were statistically significant (p < 0.001) and underscore the intervention's positive impact on functional independence. The results align with Nguyễn Hữu Phước and the broader literature, indicating that multimodal rehabilitation achieves the most pronounced gains when initiated early, particularly within the first 3–6 months post-stroke. [5]

Overall, the observed improvements are consistent with the clinical expectation that combining a structured physiotherapy program with electroacupuncture may support motor relearning and functional recovery when initiated early, particularly during the subacute period when recovery potential is typically most significant.

c.Generalizability and implications

These findings are most directly applicable to post-stroke patients similar to those included in this study and treated in a tertiary hospital rehabilitation context, using the same combined protocol over 30 days. Clinically, the shifts in MRC grades and Barthel Index categories support the continued integration of electroacupuncture alongside physiotherapy in routine rehabilitation services, while reinforcing the practical importance of early admission and early initiation of rehabilitation.

d.Limitations

This study used an uncontrolled pre–post interventional design without a control group and employed convenience sampling at a single centre, which limits causal inference and broader generalizability. Outcomes were assessed over 30 days at two time points, so longer-term durability of improvements was not evaluated. Future studies with controlled designs and longer follow-up would strengthen the evidence base for this combined regimen.

## 5. CONCLUSION

Physiotherapy combined with electroacupuncture is a safe and effective intervention for post-stroke rehabilitation. It produced significant gains in muscle strength and independence in activities of daily living. These benefits extend beyond statistical significance to meaningful improvements in quality of life and community reintegration for stroke survivors.

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