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# Effect of Early Mobilization on Recovery in Acute Stroke Patients Using the Stroke Impact Scale and Trunk Impairment Scale

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## ABSTRACT

**Background:** Stroke can cause weakness and impaired mobility, which limit activities of daily living and reduce participation. Early mobilization may lessen the consequences of immobility and support functional recovery. Objective: To compare the effects of a very early mobilization (VEM) program with those of conventional exercises on the Stroke Impact Scale (SIS) and Trunk Impairment Scale (TIS) in patients with acute middle cerebral artery (MCA) stroke.

**Methods:** Forty-four patients aged 45–55 years with MCA stroke were recruited by convenience sampling and divided into two groups of 22. Group A received VEM and Group B received conventional exercises, each for 30 minutes, four times a week for four weeks. SIS and TIS were assessed at baseline, two weeks, and four weeks.

**Results:** In Group A, physical problems, mood and emotion, activities of daily living, mobility at home and in the community, participation, and stroke recovery improved significantly, whereas memory and thinking and communication did not. In Group B, physical problems, activities of daily living, mobility, hand use, participation, and stroke recovery improved significantly. TIS scores improved significantly in both groups, with greater gains in Group A.

**Conclusion:** Both programs were associated with improvement, but VEM produced greater gains than conventional exercises in several functional SIS domains and in trunk control.

***Keywords:*** acute stroke; early mobilization; middle cerebral artery stroke; Stroke Impact Scale; Trunk Impairment Scale; neurorehabilitation

## INTRODUCTION

Stroke is a major cause of morbidity, mortality, and long-term disability. Population-based studies from India report wide variation in stroke incidence and case fatality, which underlines the need for effective rehabilitation.[1] Survivors may have motor, sensory, cognitive, communication, emotional, and functional limitations that reduce independence and quality of life. [2,3]

The middle cerebral artery is frequently involved in acute stroke and can cause motor weakness, sensory loss, language disturbance, and cognitive impairment.[4] Weakness, abnormal muscle tone, reduced mobility, and inactivity add to the functional burden, and stroke-related muscle changes together with prolonged immobilization can further impair muscle structure and performance. [5,6]

Trunk control underpins the base of support, weight transfer, postural adjustment, sitting, standing, and walking. Poor trunk control is linked to limited mobility and reduced independence in activities of daily living, which makes it an important target for rehabilitation. [7,8] The Stroke Impact Scale (SIS) is a stroke-specific, multidimensional outcome measure that covers strength, hand function, activities of daily living (ADL) and instrumental ADL, mobility, communication, emotion, memory and thinking, and participation. [9] The Trunk Impairment Scale (TIS) assesses static and dynamic sitting balance and the coordination of trunk movement. [10]

Early mobilization means getting patients out of bed and engaging them in physical activity as soon as possible after a stroke. Depending on the patient's clinical status, it may include progressive sitting, standing, walking, range-of-motion exercises, and task-specific movements. Early movement is thought to stimulate the brain's capacity to reorganize and adapt, which is central to recovery.[6] Very early mobilization (VEM) is usually defined as out-of-bed activity started within 24 to 48 hours of stroke onset. [11]

Recent evidence supports the VEM concept. A 2026 meta-analysis of randomized trials and cohort studies concluded that VEM is safe and is associated with better functional recovery, fewer complications, and shorter hospital stay, [12] and a recent cohort study in older adults reported similar benefits. [13] Earlier reviews and trials also indicate that VEM is feasible and may improve functional outcomes. [14–16] Nevertheless, VEM is not consistently practiced. Findings across systematic reviews are inconsistent, [11,12,18] and the optimal timing, intensity, and dose remain uncertain. In the large AVERT trial, frequent, higher-dose mobilization starting within 24 hours of stroke was associated with lower odds of a favourabl outcome at three months, [17] which has made many clinicians cautious. In routine care, mobilization is also delayed or withheld because of hemodynamic instability, scheduled procedures, limited staffing, and the lack of standardized local protocols.[13] Evidence on VEM in Indian rehabilitation settings, particularly with trunk control and patient-reported outcomes, is limited.

The present study therefore compared a VEM program with conventional exercises in patients with acute MCA stroke, using the SIS and TIS as outcome measures.

## MATERIALS & METHODS

Study design and setting. This experimental comparative study was conducted in a hospital setting over one year. The study population comprised patients with MCA stroke.

Participants and sample size. Forty-four participants were enrolled by convenience sampling and allocated to two groups of 22. Group A received very early mobilization (VEM) and Group B received conventional exercises. The sample size was calculated with WINPEPI version 11.65, using pilot-study pre- and post-intervention standard deviations of 1.38 and 1.58, a 95% confidence interval, and 80% power.

Eligibility criteria. Participants were 45–55 years old, had right- or left-sided hemiplegia due to MCA stroke, scored at least 4 for eye opening and 5 for verbal response on the Glasgow Coma Scale, and had a normal pupillary reflex. Patients were excluded if they had musculoskeletal disorders affecting trunk or limb motor performance, transient ischemic attack, head trauma, a neurological disease affecting balance (such as Parkinson disease), or unstable physiological parameters. Parameters were considered unstable when systolic blood pressure was below 110 or above 220 mmHg, oxygen saturation was below 92%, or resting heart rate was below 60 or above 110 beats/min. Participants were withdrawn if they could not understand or comply with the program, or if they developed unstable vital parameters, pain, breathlessness, or other adverse effects.

Ethics and consent. Clearance was obtained from the institutional ethics committee (approval number: IEC/MPT/2022-23/0011). Written informed consent was

obtained in Marathi, Hindi, or English, according to the language best understood by each participant.

Intervention. Group A (VEM) was first mobilized within 24 hours of symptom onset and no later than 48 hours. Blood pressure, heart rate, oxygen saturation, and temperature were checked before each mobilization during the first three days. Patients progressed from head-end elevation to assisted sitting at the edge of the bed, five minutes of sitting with reassessment, five minutes of assisted standing with reassessment, and assisted walking when possible. Exercises progressed from passive to active-assisted movements and included pelvic bridging, upper and lower trunk rotation, weight shifting, trunk lateral flexion, forward and lateral reaching, functional scapular movements, reaching tasks, pelvic movements, foot-target activities, and hand-gripping and finger activities. Assistance and monitoring were provided throughout to reduce the risk of falls.

Group B received conventional exercises: positioning; passive movements progressing to active-assisted movements of the upper and lower limbs; trunk mobility in supine; rolling; and progression to active-assisted and active limb movements. Sitting and standing were added when permitted by the physician. Both groups received 30-minute sessions four times a week for four weeks.

Outcome measures. SIS version 3.0 has 59 items across eight domains: strength, hand function, ADL/instrumental ADL, mobility, communication, emotion, memory and thinking, and participation/role function. Scores range from 0 to 100, and higher scores indicate better recovery.[9] The TIS evaluates static sitting balance, dynamic sitting balance, and coordination of trunk movement, with a total score from 0 to 23.[10]

## Statistical Analysis

SIS and TIS were assessed at baseline, two weeks, and four weeks. Data were entered in Microsoft Excel and analyzed with WINPEPI version 11.65 and GraphPad InStat version 3.05. Continuous variables are expressed as mean and standard deviation. Normality was examined with the Shapiro–Wilk test. Repeated-measures ANOVA was used for within-group comparisons, and the unpaired t test or Mann–Whitney test was used for between-group comparisons. A p value below 0.05 was considered statistically significant.

## RESULT

Forty-four participants were included, 22 in each group. The mean age was 50.22±3.00 years in Group A and 49.86±3.12 years in Group B. Group A comprised 13 males and 9 females, and Group B comprised 14 males and 8 females (Table 1).

**Table 1: Baseline demographic characteristics**

| Characteristic | Group A: Very early mobilization (VEM) | Group B: Conventional exercise |
|---|---|---|
| Participants, n | 22 | 22 |
| Age, years, mean± SD | 50.22±3.00 | 49.86±3.12 |
| Male, n | 13 | 14 |
| Female, n | 9 | 8 |

Stroke Impact Scale. Within Group A, significant improvement was found in physical problems, mood and emotion, activities of daily living, mobility at home and in the community, participation in activities, and stroke recovery. Memory and thinking (p=0.956) and communication (p=0.9664) did not improve significantly. Within Group B, significant improvement was found in physical problems, activities of daily living, mobility, ability to use the hand, participation in activities, and stroke recovery, whereas memory and thinking (p=0.8168), mood and emotion (p=0.8892),

and communication (p=0.8154) did not change significantly (Table 2).

Between-group analysis showed greater improvement in Group A than in Group B for physical problems, mood and emotion, activities of daily living, mobility at home and in the community, participation, and stroke recovery. No significant between-group difference was found for memory and thinking, communication, or ability to use the hand.

**Table 2: Stroke Impact Scale domain scores at baseline and at four weeks**

| SIS domain | Group A baseline | Group A 4 weeks | Group B baseline | Group B 4 weeks |
|---|---|---|---|---|
| Physical problems | 16.750±3.773 | 51.545±9.303 | 17.205±3.351 | 32.455±4.512 |
| Memory and thinking | 37.455±7.627 | 38.045±7.606 | 38.045±5.464 | 39.091±5.502 |
| Mood and emotion | 27.455±6.717 | 47.364±6.485 | 34.182±7.872 | 35.318±7.852 |
| Communication | 36.045±6.890 | 36.682±7.028 | 37.000±5.255 | 38.000±5.201 |
| Activities of daily living | 40.295±7.799 | 58.773±6.070 | 41.386±7.260 | 52.636±5.412 |
| Mobility at home/community | 31.955±7.041 | 56.636±7.436 | 38.864±6.854 | 46.182±6.389 |
| Ability to use hand | 36.045±6.890 | 47.909±6.031 | 31.773±8.580 | 40.636±8.572 |
| Participation in activities | 34.955±8.726 | 57.227±6.645 | 37.864±8.866 | 45.909±9.314 |
| Stroke recovery | 25.045±8.957 | 57.727±9.351 | 24.364±9.132 | 40.455±8.716 |

Values are expressed as mean± SD.

Trunk Impairment Scale. TIS scores improved significantly in both groups (Table 3). In Group A, the score rose from 8.27±2.68 at baseline to 12.82±2.63 at two weeks and 16.91±1.85 at four weeks (p<0.0001). In Group B, it rose from 8.55±2.70 to 11.50±2.63 at two weeks and 14.68±2.40 at four weeks (p<0.0001). Change scores favoured Group A: 4.55±1.30 versus 2.95±0.65 at two weeks (p<0.0001), 8.64±1.87 versus 6.14±1.25 at four weeks (p<0.0001), and 4.09±1.19 versus 3.18±0.91 between two and four weeks (p=0.007).

**Table 3: Trunk Impairment Scale scores and between-group comparison of change scores**

| TIS measure | Group A | Group B | p value |
|---|---|---|---|
| Baseline, mean± SD | 8.27±2.68 | 8.55±2.70 | — |
| 2 weeks, mean± SD | 12.82±2.63 | 11.50±2.63 | — |
| 4 weeks, mean± SD | 16.91±1.85 | 14.68±2.40 | — |
| Change: 2 weeks − baseline | 4.55±1.30 | 2.95±0.65 | <0.0001 |
| Change: 4 weeks − baseline | 8.64±1.87 | 6.14±1.25 | <0.0001 |
| Change: 4 weeks − 2 weeks | 4.09±1.19 | 3.18±0.91 | 0.007 |

## DISCUSSION

In this study, patients in both groups improved in several functional domains over four weeks of rehabilitation, but the VEM group showed greater improvement in several SIS domains and in trunk control. This agrees with the view that early activity limits the effects of prolonged immobility and gives patients repeated opportunities for functional movement and task practice. [11,14–16] It is also consistent with a recent meta-analysis reporting better functional recovery, fewer complications, and shorter hospital stay with VEM,[12] and with a

cohort study of older adults in which a structured early mobilization pathway was associated with better functional outcomes.[13]

The largest gains in the VEM group were in physical and functional domains: activities of daily living, mobility, participation, and overall stroke recovery. Studies of very early mobilization suggest that carefully delivered out-of-bed activity is feasible and may support recovery, but they also warn against excessive dose or intensity soon after stroke.[14–17] The AVERT trial, for example, tested frequent, higher-dose mobilization within 24 hours and found lower odds of a favorable outcome at three months.[17] The VEM program in the present study was of lower dose (30-minute sessions four times a week) and was applied with close physiological monitoring and assisted progression. This may be relevant to its tolerability, although the study was not designed to evaluate safety outcomes, and no conclusion about safety can be drawn from it.

Trunk control improved significantly in both groups, with greater improvement in the VEM group. This is clinically relevant because trunk control contributes to balance, postural transitions, sitting, standing, walking, and functional independence. Earlier research has identified trunk impairment as an important predictor of ADL and gait-related outcomes after acute stroke. [7,8,19]

Memory and thinking and communication did not improve significantly. This may reflect the mainly physical, task-oriented nature of both programs, as motor rehabilitation can improve physical and functional performance without directly targeting language or cognitive impairment.

Hand use improved within both groups, but the between-group difference was not significant. Fine hand function requires selective motor control and repeated task-specific practice, and four weeks may be too short to show a clear difference between programs.

Safety was built into the protocol through monitoring of blood pressure, heart rate, oxygen saturation, and temperature, and through assistance during sitting, standing, and walking. This matters because the acute phase of stroke calls for individualized decisions about timing, physiological stability, and mobilization dose. [14,15]

This study has several limitations. Fatigue was observed during exercise but was not formally documented. The programs focused mainly on physical domains, the sample was small, participants were recruited by convenience sampling, and follow-up lasted only four weeks, so the long-term retention of benefit is uncertain.

## CONCLUSION

Both the very early mobilization program and the conventional exercise program were associated with improvement in recovery after acute stroke. However, very early mobilization produced greater improvement in several Stroke Impact Scale domains and in trunk control measured by the Trunk Impairment Scale. Appropriately monitored VEM may be a useful component of acute stroke rehabilitation, while cognitive, communication, and other domain-specific impairments may need additional targeted interventions.

### *Declaration by Authors*

**Ethical Approval:** Approved by the institutional ethics committee of CMF's College of Physiotherapy, Pune (approval number: IEC/MPT/2022-23/0011).

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