REVIEW REPORT

Title: Effect of an integrated exercise programme and use of electromyography to track chronic functional recovery after hemorrhagic stroke: A case report

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Round 1

Reviewer A: **Mohammad Tariqul Islam**, **ORCID:** **0000-0002-5272-6693**, **COI:** **None**, **AI disclosure:** **None**

1. Comment Overall manuscript writing is good, however study period is not clear and place of study should be included.

Response: In March 2025, she began regular physiotherapy sessions at a rehabilitation center, Bhubaneswar, Odisha, India. A 15-week rehabilitation program was implemented, consisting of six sessions per week, each lasting 1hour and 15 mins (Line no. 96, 97).

2. Comment Some abbreviations are used which should be elaborated (like MRP, ER pattern; line 198)

Response: MRP- Motor Relearning Programme, ER Pattern- External Rotation Pattern (Lines 178 and 179).

Reviewer B: **Anonymous**, **COI:** **None**, **AI disclosure:** **ChatGPT used to improve language**

3. Comment The manuscript addresses an important topic and presents a clinically interesting case suggesting functional improvement in the chronic phase of haemorrhagic stroke following an intensive physiotherapy programme. However, several issues need to be addressed before the manuscript can be considered for publication.

Response: I have considered and changed according to reviewers' comment.

4. Comment The most significant limitation relates to the EMG component. Although EMG is presented as a key methodological element used to assess muscle activation and motor unit recruitment, the manuscript does not provide sufficient methodological detail. Information regarding the type of EMG used, muscles assessed, recording protocol, and quantitative EMG results is lacking. Without these details, the findings cannot be reproduced or adequately evaluated.

Response: Device name- Clarity Octopus EMG Neuromuscular activation was assessed using a surface EMG system. Bipolar electrodes were placed on the Biceps Brachii and Rectus Femoris following SENIAM guidelines. Data were sampled at 1000 Hz, and the Root Mean Square (RMS) amplitude was calculated during Maximal Voluntary Isometric Contractions (MVIC) to quantify motor unit recruitment (Lines 108 to 111).

5. Comment The case description is also limited. While the patient is identified as a 56-year-old woman with left-sided haemiplegia following haemorrhagic stroke and craniotomy, the clinical characterisation is incomplete. Important details such as lesion location, imaging findings, cognitive and sensory status, gait level, and speech or swallowing function should be provided to allow a clearer understanding of the patient's baseline condition.

Response: Hemorrhagic stroke following a right-sided Basal Ganglia hemorrhage involving Internal Capsule as reveled by the MRI on December 9, 2015. At the baseline assessment, the Cognitive/Sensory assessment shows the patient was oriented with an MMSE score of 27/30. Sensation was intact, though proprioception in the left lower limb was diminished. In Motor Function Left-sided hemiplegia with a Modified Ashworth Scale (MAS) score of 3 (Upper Limb) and 2 (Lower Limb). Oromotor shows Mild facial asymmetry and Grade 1 Dysphagia (occasional coughing with thin liquids). Functional Status assessment revealed Required significant assistance for activities of daily living (Baseline FIM; 32). (Lines 81 to 92)

6. Comment The study design should be presented more consistently. The manuscript refers to the work both as a "case report" and a "single-case study." A single design classification should be used throughout, and the manuscript should follow established case-report reporting guidelines.

Response: It has been changed to "Case Report" and the manuscript has followed the Case report guidelines.

7. Comment The intervention programme is interesting but insufficiently detailed. The manuscript reports a 15-week rehabilitation programme delivered six days per week, including task-specific training, strengthening, gait and balance exercises, spasticity management, and facial oromotor stimulation. However, the progression, intensity, and rationale for these interventions are not clearly described, which limits reproducibility.

Response: Oromotor and Facial assessment was not added because the case report was focused more on Motor Evaluation. But House Brackman scale and swallowing was assessed. I have added the facial and oromotor segment in the case description (Lines 87 to 92).

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8. Comment Some treatment components also require better justification. For example, facial stimulation and oromotor exercises are included in the intervention table, but the manuscript does not clearly explain whether facial paralysis or swallowing dysfunction were key deficits assessed in the outcomes.

Response: Clinical examination at baseline revealed significant residual left-sided facial palsy (House-Brackmann Grade III), characterized by noticeable but not disfiguring asymmetry at rest and secondary weakness in lip closure. The patient also reported mild oropharyngeal dysphagia, specifically difficulty with bolus formation and occasional coughing when consuming thin liquids. These deficits necessitated the inclusion of muscle stimulation and the Motor Relearning Programme (MRP) for oromotor control to improve both aesthetic symmetry and functional (Lines 87 to 92).

9. Comment Outcome reporting should also be strengthened. The manuscript reports FIM score improved from 32 to 55, upper-limb MAS from 3 to 2, and lower-limb MAS from 2 to 1, which are useful findings, but the results are not presented in a clear structured table and EMG findings are reported descriptively rather than quantitatively. Providing item-level or subscale outcome data would improve interpretation.

Response: The integrated exercise programme led to a 107% increase in the primary agonist's neural drive at the final assessment (Week 15), with the TA reaching a peak RMS of 88.2 +/- 4.3 microvolt. Importantly, the GA activation declined to 72.1 +/- 6.1, thus decreasing the Co-contraction Index to 0.35 (Lines 135-138).

10. Comment The discussion section tends to overinterpret the findings. Statements suggesting that chronic deficits can be significantly improved or that EMG provides essential objective evidence of neuroplasticity are stronger than what can be supported by a single case report. The discussion should adopt more cautious language.

Response: The language of the discussion has been changed and all the authors agree as this is a single case report the result cannot be generalized for a larger population (Lines 126-144).

11. Comment Most references appear generally relevant to stroke rehabilitation and electromyography; however, the reference list requires revision. At least one duplicate reference appears in the list (Li et al., 2024 appears twice). In addition, one citation related to facial exercise and ageing seems only weakly connected to the primary focus of stroke rehabilitation unless its relevance is better justified. The references should be carefully checked for duplication, and alignment with the manuscript's central topic.

Response: The duplicate references are removed and corrected.

12. Comment The overall structure of the manuscript is understandable; however, the paper requires language editing to improve clarity, readability, and grammar. Several sentences contain awkward phrasing, grammatical errors, and inconsistent capitalization. Minor typographical issues are also present.

Response: Paraphrasing done, and grammatical errors and unnecessary capitalization have been removed.

Responsible editor: **M Mostafa Zaman**, **ORCID:** **0000-0002-1736-1342**, **COI:** **None**

13. Comment Add an AI disclosure if it is not already done.

Response: It has been added.

Round 2

Reviewer B: **Anonymous**, **COI:** **None**, **AI disclosure:** **ChatGPT used to improve language**

1. Comment The authors have undertaken a substantial revision of the manuscript and have addressed several concerns raised in the initial review. Notable improvements include a more comprehensive clinical description of the case, clearer justification of intervention components, and improved overall manuscript structure.

Response: Thank you for appreciating the effort

2. Comment However, despite these improvements, several important methodological and reporting issues remain only partially addressed, particularly regarding the EMG component and quantitative outcome reporting. These shortcomings continue to affect the scientific rigor, interpretability, and reproducibility of the study.

Response: EMG Component has been explained in details.

3. Comment EMG Methodology – Partially resolved.

The authors have added details regarding the EMG device, muscles assessed, sampling rate, and reference to SENIAM guidelines. While this represents progress, critical methodological elements remain missing, including:

- Signal processing parameters (e.g., filtering),
- MVIC protocol details (number and duration of trials),
- Rest intervals between trials,
- Normalization procedures, and
- Quantitative EMG results.

Currently, EMG findings are reported only descriptively. As EMG is central to the study, these gaps significantly limit interpretability and reproducibility.

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Response: Data were sampled at 1000 Hz and-pass filtering (20- 450 Hz). Muscle activity was normalized to Maximum Voluntary Isometric Contraction (MVIC) determined as the average of three 5-second trials with 1-minute rest intervals to minimize fatigue (Lines 110- 112).

4. Comment Intervention Description – Partially resolved

The intervention is better structured, and progression and intensity indicators are now described. However, repetitions/sets are not consistently specified, progression criteria are unclear, and the decision-making process for modifying interventions is not described. Further clarification is required to ensure full reproducibility.

Response: Progression to the next exercise was based on the patient scoring a 'Correct Quality of Movement' score of 4/5 on an internal Likert scale and an RPE of < 13. In instances where the patient exhibited signs of excessive neural fatigue (defined as a 20% decrease in peak EMG amplitude across sets), the following session volume was reduced by one set to allow for recovery (Lines 117- 121).

5. Comment Outcome reporting – partially resolved.

FIM and MAS outcomes are reported clearly. However, results are not presented in a structured table, subscale outcomes are absent, and EMG data remain qualitative rather than quantitative. Structured and detailed reporting is necessary for proper interpretation.

Response: EMG analysis revealed a significant change in neuromuscular activationpatterns through the 15- week protocol. In the paretic Tibialis Anterior (TA) at baseline (Week 0), the mean peak Root Mean Square (RMS) amplitude was 42.5 +/- 5.1 microvolt, which was accompanied by excessive compensatory activation of the Gastrocnemius (GA) at 110.4 +/- 8.2 microvolt. The integrated exercise program to a 107% increase in the primary agonist's neural drive at the final assessment (Week 15), with the TA reaching a peak RMS of 88.2 +/- 4.3 microvolt. Importantly, the GA activation declined to 72.1 +/- 6.1, thus decreasing the Co- contraction Index to 0.35 (Lines 130- 138).

6. Comment Interpretation of Findings – Partially resolved

The discussion is more cautious than in the original version; nevertheless, some statements still imply stronger conclusions than are supported by a single case. Interpretations regarding recovery and EMG outcomes should remain strictly aligned with the observational nature of the study.

Response: EMG analysis revealed a significant change in neuromuscular activation patterns through the 15- week protocol. In the paretic Tibialis Anterior (TA) at baseline (Week 0), the mean peak Root Mean Square (RMS) amplitude was 42.5 +/- 5.1 microvolt, which was accompanied by excessive compensatory activation of the Gastrocnemius (GA) at 110.4 +/- 8.2 microvolt. The integrated exercise program led to a 107% increase in the primary agonist's neural drive at the final assessment (Week 15), with the TA reaching a peak RMS of 88.2 +/- 4.3 microvolt. Importantly, the GA activation declined to 72.1 +/- 6.1, thus decreasing the Co- contraction Index to 0.35 (Lines 130- 138).

7. Comment Limitations – Partially resolved

The limitations section has been expanded but should explicitly address EMG measurement limitations, the absence of a control or comparator, and the lack of long-term follow-up.

Response: Quantitative surface EMG results may have been affected by inherent technical limitations, including possible signal crosstalk from adjacent musculature and longitudinal changes in skin-electrode impedance over the 15-week study period. The limitation lack of follow up was already mentioned (Lines 162-164).

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