

# Electromyography Biofeedback for Management of Post Stroke Spasticity, Gait Disorders After 10 Years of Stroke

Dr. Deepak Arjundas, Neurologist, Department of Neurology, Mercury Institute of Neuroscience, Chennai, Tamil Nadu, India

KB Darshan Rao, Neuro Physiotherapist, JOGO Health, Chennai, Tamil Nadu, India

Dr. Ruchi Shah, Senior Medical Advisor, JOGO Health, Chennai, Tamil Nadu, India

## BACKGROUND

Stroke is India's 4<sup>th</sup> leading cause of death and the 5<sup>th</sup> leading cause of disability.<sup>1</sup>

Complete functional recovery with conventional physiotherapy is less likely in stroke patients.<sup>2</sup>

## AIM

A case study of combining Electromyography (EMG) biofeedback therapy with neuro-physiotherapy to assess the improvement in movements and functional recovery.

## CASE PRESENTATION

A 19-year-old female patient presented with difficulty in using her right hand for daily activities. Her examination revealed flexed finger, grasping difficulties, referred pain to shoulder, and grade 2 muscle tone. Her past medical history indicated encephalitis followed by left middle cerebral artery stroke at the age of 9 years. She was on Botulinum toxin intramuscular injections at regular intervals for more than 9 years to reduce spasticity, which in turn caused severe pain in her right upper extremity.

## BIOFEEDBACK THERAPY

Surface electromyographic biofeedback (EMG-BF) is an advanced treatment that uses sensory inputs to enable neuromuscular retraining. The EMG-BF sensors capture muscular activity which is transmitted via Bluetooth to a Tablet. EMG-BF helps patients to 'visualize' the muscle activity, and the real-time feedback. This helps the person to become aware of the muscle activity and later to relax a spastic muscle or to activate its antagonist.<sup>3,4</sup>

## METHODS

The rehabilitation regimen encompassed various exercises and activities targeting hand and foot coordination, balance, posture, and muscle strength, along with biofeedback. For functional improvement, JOGO Digital Therapy (DTx) EMG biofeedback was used for 7 sessions. Ability to open the hand was trained with visual cues. JOGO DTx was also used for Gait training

*\*FIM components:- Motor items - Self-care; Sphincter control; Transfers; Locomotion, and cognitive items- Communication and Social cognition.*

*\*\* Barthel Components: Bowel, Bladder, Feeding, Transfers, Mobility, Stairs, Eating, Grooming, Bathing, Dressing, Toileting*

## RESULTS

DTx demonstrated significant improvements in spasticity reduction, grasp function, gait, and activities of daily living (ADL). Resting potential reduced from 54 to 27mVs. The patient transitioned from moderate assistance to modified independence in ADL tasks, as evidenced by FIM scores and Barthel Index score improvement from 65 to 80. Moreover, dynamic gait index scores improved from 14 to 19. Patient also discontinued Botulinum toxin injections.

## IMPROVEMENT IN ACTIVITIES OF DAILY LIVING

Functional Independence Measure (FIM)\*

(Out of 7)

Session 1 Session 7

3

7

Barthel Index\*\*

(Out of 100)

Session 1 Session 7

65

80

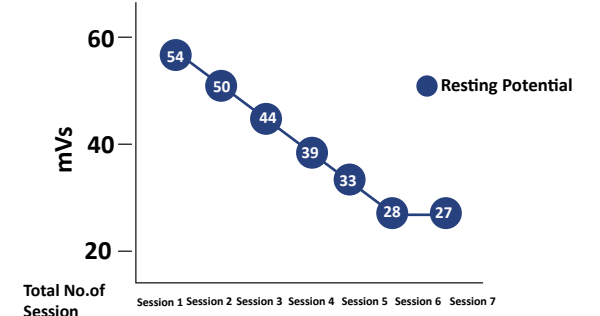
Greater score indicates Greater independence in living

## CONCLUSION

JOGO DTx helped in reducing spasticity, enhancing gait and ADL, and improving voluntary muscle control in the affected upper extremity. Notably, the patient reported ability to do tasks such as self-braiding and hairdressing for the first time, which indicates substantial functional gain and improved quality of life.

## REDUCTION IN SPASTICITY OF RIGHT HAND

Biofeedback Relaxation for wrist flexors



1. Jones SP, Baqai K, Clegg A, et al. Stroke in India: A systematic review of the incidence, prevalence, and case fatality. *International Journal of Stroke*. 2022;17(2):132-140.

2. Ernst E. A review of stroke rehabilitation and physiotherapy. *Stroke*. 1990;21(7):1081-1085.

3. Giggins OM, Persson UM, Caulfield B. Biofeedback in rehabilitation. *J Neuroeng Rehabil*. 2013;10:60. Published 2013 Jun 18. doi:10.1186/1743-0003-10-60

4. Kondo K, Noonan KM, Freeman M, Ayers C, Morasco BJ, Kansagara D. Efficacy of Biofeedback for Medical Conditions: an Evidence Map. *J Gen Intern Med*. 2019;34(12):2883-2893

