











Efficacy of Proprioceptive Neuromuscular Facilitation on Jaw Function in Bruxism Among Post Stroke Survivor: A Case Study



Yamini Umasankar, Vignesh Srinivasan*, Prathap Suganthirababu and Poovarasana Murugaiyan

Saveetha College of Physiotherapy, Saveetha Institute of Medical and Technical Sciences (SIMATS) Chennai, Tamilnadu, India

E-mail/Orcid Id:

YU,  yaminiumasankar@gmail.com,  <https://orcid.org/0009-0000-9801-2197>; VS,  vigneshphysio1989@gmail.com,  <https://orcid.org/0000-0003-3378-4334>; PS,  emailprathap@gmail.com,  <https://orcid.org/0000-0002-1419-266X>; PM,  poovarasana892000@gmail.com,  <https://orcid.org/0000-0003-2834-596X>

Article History:

Received: 09th May, 2024

Accepted: 14th Aug., 2024

Published: 30th Aug., 2024

Keywords:

Bruxism, jaw opening, masticatory activity, proprioceptive neuromuscular facilitation, stroke, ultrasound therapy

How to cite this Article:

Yamini Umasankar, Vignesh Srinivasan, Prathap Suganthirababu and Poovarasana Murugaiyan (2024). Efficacy of Proprioceptive Neuromuscular Facilitation on Jaw Function in Bruxism Among Post Stroke Survivor: A Case Study. *International Journal of Experimental Research and Review*, 42, 292-297.

DOI:

<https://doi.org/10.52756/ijerr.2024.v42.025>

Abstract: A 49-year-old male who was a known case of Type 2 diabetes mellitus and hypertensive had a history of an acute infarct in the left ganglia capsular region and a chronic infarct in the left parieto-occipital lobe, which was conservatively managed and was referred for physiotherapy rehabilitation for strengthening the right upper and lower limb. During the physiotherapy intervention, abnormal teeth grinding was observed, and the patient was asked about parafunctional behaviour. Upon examination, there was a restriction in the jaw range of motion assessed by measuring the jaw range using the vernier caliper and tightness in the masticatory muscle, as evidenced by palpating the masseter muscle. Proprioceptive neuromuscular facilitation and ultrasound therapy were given for 1 session per week for 2 weeks to treat bruxism along with standardized stroke protocol. At the end of 2 weeks after the intervention, there was an increase in jaw opening and reduced masticatory muscle activity. Jaw opening was measured using a vernier caliper, and masticatory activity was measured using electromyography of the masseter and temporalis muscles. This study suggests the importance of treating bruxism to prevent complications related to it. It concludes that proprioceptive neuromuscular facilitation and ultrasound therapy were effective in improving mouth opening and reducing the masticatory activity in bruxism among stroke patients with ganglia capsular involvement.

Introduction

Bruxism involves a parafunctional behaviour that is characterized by the involuntary grinding of teeth. This activity involves nonfunctional gnashing or clenching of teeth that has the potential to result in occlusal trauma (Savla et al., 2021). Bruxism is of two types: occurs during sleep, which is referred to as sleep bruxism or while an individual is awake, which is referred to as wakeful bruxism (Lobbezoo et al., 2013).

Stroke, also called as cerebrovascular accident, is one of the main causes of both mortality and morbidity in India and it is a major global public health concern. Approximately 5.8 million people had a stroke in 2005 (Subramanian et al., 2024). Stroke is a sudden loss of cerebral function with an interruption of blood flow to the

brain. It can be due to ischemia or hemorrhage of the cerebral artery (Ranjani et al., 2023). Physiotherapy is a promising intervention that can help manage stroke symptoms (Vishnuramet al., 2024).

The prevalence of bruxism is higher in neurological disorders, out of which the prevalence of bruxism among stroke patients is 3.0% (Kwak et al., 2009). Stroke patients with basal ganglia infarction often have bruxism, but it remains unnoticed. The pathophysiology of bruxism among stroke patients is found to be the involvement of the central dopaminergic system, the direct and indirect pathway of basal ganglia, which is involved in the coordination of movement, is disturbed and leads to bruxism (Tan et al., 2004; Shetty et al., 2010).



The bruxism is conservatively managed through pharmacological, psychological counselling, physiotherapy and orthodontic intervention. The pharmacological intervention includes Botulinum toxin A which relieves pain and improves bite force in bruxism as a short-term intervention (up to 120 days) and occlusal splint are found to be effective in managing bruxism however, the long term effect is still unanswerable (da Silva Ramalho et al., 2023; Ainoosah et al., 2024). Psychological treatment to manage bruxism includes antistress counselling, lifestyle modification and behavioural therapy (Savla et al., 2021). There are various physiotherapy interventions available to manage bruxism. Previous studies have supported the use of modalities, massage therapy, K tape and dry needling to address bruxism.

PNF is one of the physiotherapy interventions to reduce pain, improve the range of motion, and improve the overall function of the patient with bruxism (Ergezen et al., 2022). Ultrasound therapy is used to treat soft tissue healing by reducing inflammation following a soft tissue injury (Papadopoulos et al., 2020). No research has investigated the effect of Proprioceptive Neuromuscular facilitation and ultrasound therapy on jaw range of motion and masticatory muscle activity in stroke patients with bruxism. Therefore, the study aims to determine the effect of Proprioceptive Neuromuscular Facilitation on jaw function in bruxism among post-stroke patients.

Case report

A 49-year-old male was apparently normal before April 16, 2024, after which he developed sudden

weakness over the right upper and lower limbs. The patient was provisionally diagnosed with acute CVA/hypertensive emergency/T2DM/SHTN and was shifted for radiological imaging. A CT brain scan was done on April 16, 2024 and showed fairly defined hypodensity noted in the right frontal region with no internal hyper-density, likely non hemorrhagic infarct, suggested MRI. MRI has done on April 17, 2024 and showed acute infarct in the left ganglio-capsular region, gliosis in the right fronto parieto occipital lobe causing of right lateral ventricle and chronic infarct in the left parieto occipital lobe The patient was medically managed with statins, antihypertensive measures, insulin therapy, and other supportive measures. Foley's catheterization was done. The patient was referred to physiotherapy rehabilitation to strengthen the right upper and lower limbs. During therapy, abnormal tooth grinding was observed, and the patient was asked about the parafunctional behaviour. Patient attendees reported the presence of bruxism in the patient after the stroke. On examination, restricted jaw range of motion is measured using a vernier caliper and tightness over the masseter muscle on both sides is assessed by palpation. The patient was educated about the importance of treating this unnoticed symptom and the complications associated with bruxism. After getting consent, the patient was treated for bruxism with proprioceptive neuromuscular facilitation and ultrasound therapy for 2 weeks, which was 4 days per week, along with standardized stroke protocol.

Investigations

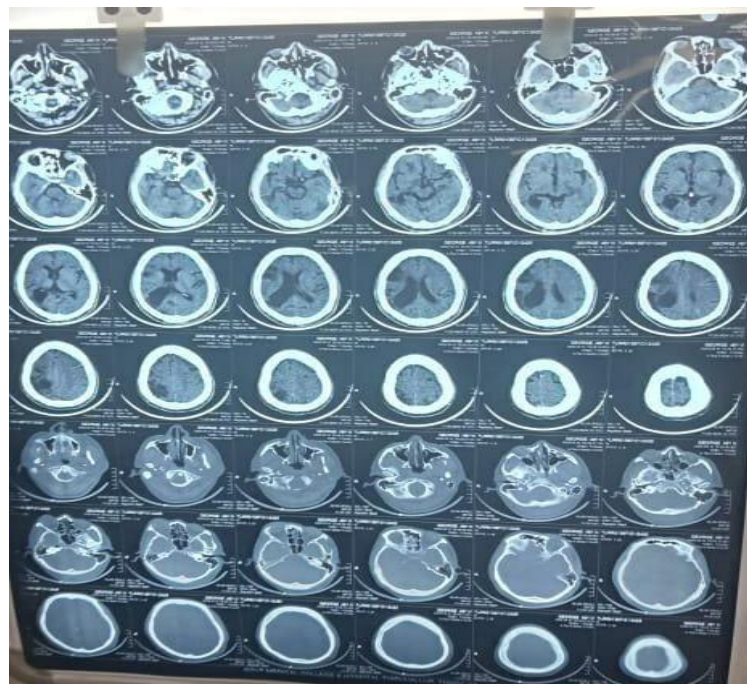


Figure 1. CT BRAIN Showing hypodensity noted in right frontal region likely non hemorrhagic infarct. (Date: 16/04/2024).

Outcome measures

The jaw opening range of motion was measured using a vernier caliper (Best et al., 2013) and the masticatory muscle activity using electromyography of the right and left masseter and temporalis muscles (Amorim et al., 2010) was measured before and after the physiotherapy intervention for 2 weeks.

association is due to dopaminergic dysfunction. Neuroimaging, such as computed tomography and magnetic resonance imaging, is a widely used noninvasive technique to detect any hemorrhage, infarct and tumors (Gautam et al., 2024; Himabindu et al., 2024). Bruxism following stroke remains an unnoticed complication and if it is not treated, it will end to tooth



Figure 2. MRI BRAIN showing Acute infarct in left gangliocapsular region, gliosis in right fronto parieto occipital lobe causing of right lateral ventricle and chronic infarct in left parieto occipital lobe. (Date:17/04/2024).

Table 1. Outcome measurement Assessment Pre & Post Physiotherapy Intervention.

Outcome measure	Pre physiotherapy Intervention	Post physiotherapy intervention
Jaw opening range (active)	37.4mm	57.8mm
EMG at mvc Right masseter	1.6mv	1.4mV
Left masseter	1.8mV	1.3mV
Right temporalis	1.5mV	1.3mV
Left temporalis	2.0mV	1.6mV

Discussion

Bruxism is an unusual grinding and clenching behaviour of teeth prevalent in all age groups. It is a repetitive activity of the masticatory muscles with no functional purposes, such as swallowing, mastication, or phonation. Bruxism occurs in a post-stroke patients, particularly with the basal ganglia infarct. This

wear, TMJ disorder, headache, and depression (Veiga et al., 2015; Tan et al., 2004). In bruxism, there is a restricted jaw movement because of excessive muscle tension and increased masticatory muscle activity. Jaw opening is measured with the help of the vernier caliper (Best et al., 2013). Masticatory muscle is measured with the help of electromyography where the right masseter,

right temporalis, left masseter and left temporalis are measured at maximal voluntary contraction (Amorim et al., 2010). This study uses ultrasound and Proprioceptive Neuromuscular Facilitation technique to treat bruxism. Ultrasound therapy helps in inducing blood circulation, tissue repair, regeneration and tissue healing (Shah et al., 2023).



Figure 3. Pre Treatment mouth opening range.



Figure 4. Post treatment mouth opening range.

Proprioceptive Neuromuscular Facilitation is a promising approach that offers educators and healthcare providers evidence-based choices for improving results. Proprioceptive Neuromuscular Facilitation helps treat various neurological illnesses, including stroke (Selvi et al., 2024). Proprioceptive Neuromuscular Facilitation can help in jaw opening by engaging the muscle responsible for the movement of the jaw (Ergezen et al., 2022).

Maximal mouth opening was measured before and after therapy, pre-intervention, and the mouth opening range was about 37.4mm, and post-intervention, the mouth opening range was about 57.8mm, which shows there is a significant improvement in jaw opening. Maximal voluntary contraction of the right masseter, left

masseter, right temporalis and left temporalis was measured and the values show there is a significant decrease in muscle activity. Therefore, the Proprioceptive Neuromuscular Facilitation and ultrasound therapy can be used to treat patients with bruxism.

Limitation of the study is that jaw muscle fatigue and jaw bite force were not evaluated. Future studies can include well-designed RCT with large sample sizes for a better representation of the population and should evaluate jaw bite force and jaw muscle fatigue in bruxism.

Treatment

Proprioceptive Neuromuscular Facilitation and ultrasound therapy were given to the patient for 2 weeks (4days/week).

Proprioceptive Neuromuscular Facilitation- Rhythmic stabilization given to the patient which involves applying gentle resistance to the patient while the patient performs the jaw movement opening, protrusion and lateral excursion. It is one technique that improves the jaw's range of motion and addresses the masticatory muscle activity. Rhythmic stabilization is given for 10 repetitions per set with manual resistance applied by the therapist for 10 seconds (Calisgan et al., 2018; Ergezen et al.,2022).

Ultrasound therapy was given for soft tissue healing with an intensity of 0.4 w/ cm² frequency of 3Mhz in a 1: 4 ratio pulse for 5 minutes over the right and left masseter muscles (Handa et al., 2018 ; shah et al., 2023).

After 2 weeks of physiotherapy intervention, there is an improvement in jaw opening and reduced masticatory muscle activity.

Conclusion

The study concluded that Proprioceptive Neuromuscular Facilitation and Ultrasound therapy were more effective in improving jaw opening and reducing masticatory muscle activity in stroke patients with bruxism.

Acknowledgement

It's a pleasure to acknowledge the department, and I owe it to many people who have influenced us to develop our foundation in this study work.

Conflict of interest

No conflict of interest

References

- Ainoosah, S., Farghal, A. E., Alzemei, M. S., Saini, R. S., Gurumurthy, V., Quadri, S. A., ... & Heboyan, A. (2024). Comparative analysis of different types of

- occlusal splints for the management of sleep bruxism: a systematic review. *BMC Oral Health*, 24(1), 29. <https://doi.org/10.1186/s12903-023-03782-6>
- Amorim, C. F., Giannasi, L. C., Ferreira, L. M. A., Magini, M., Oliveira, C. S., de Oliveira, L. V. F., ... & Politti, F. (2010). Behavior analysis of electromyographic activity of the masseter muscle in sleep bruxers. *Journal of Bodywork and Movement Therapies*, 14(3), 234-238. <https://doi.org/10.1016/j.jbmt.2008.12.002>
- Best, N., Best, S., Loudovici-Krug, D., & Smolenski, U. C. (2013). Measurement of mandible movements using a vernier caliper—an evaluation of the intrasession-, intersession-and interobserver reliability. *CRANIO®*, 31(3), 176-180. <https://doi.org/10.1179/crn.2013.028>
- Calisgan, E., Talu, B., Altun, O., Dedeoglu, N., & Duman, B. (2018). The effects of proprioceptive neuromuscular facilitation, myofascial releasing maneuvers and home exercises on pain and jaw function in patients with bruxism. *Medicine*, 7(3), 617-21. <https://doi.org/10.5455/medscience.2018.07.8852>
- da Silva Ramalho, J. A., Palma, L. F., Ramalho, K. M., Tedesco, T. K., & Morimoto, S. (2023). Effect of botulinum toxin A on pain, bite force, and satisfaction of patients with bruxism: A randomized single-blind clinical trial comparing two protocols. *The Saudi Dental Journal*, 35(1), 53-60 <https://doi.org/10.1016/j.sdentj.2022.12.008>
- Ergezen, G., Atilgan, E., & Kilicaslan, A. (2022). Immediate effect of proprioceptive neuromuscular facilitation on pain and maximal mouth opening in temporomandibular dysfunction: A pilot study. *Rawal Medical Journal*, 47(1), 125-125
- Gautam, S., Ahlawat, S., & Mittal, P. (2022). Binary and Multi-class Classification of Brain Tumors using MRI Images. *Int. J. Exp. Res. Rev.*, 29, 1-9. <https://doi.org/10.52756/ijerr.2022.v29.001>
- Handa, R., Sunil, M. K., Gupta, C., Raina, A., Khan, T., & Gulzar, A. (2018). Efficacy of ultrasound massage therapy as an adjuvant pain control modality in TMDs: A clinical study. *Journal of Indian Academy of Oral Medicine and Radiology*, 30(2), 107-109. https://doi.org/10.4103/jiaomr.jiaomr_5_18
- Himabindu, D. D., Pranalini, B., Kumar, M., Neethika, A., Sree N, B., C, M., B, H., & S, K. (2024). Deep CNN-based Classification of Brain MRI Images for Alzheimer's Disease Diagnosis. *International Journal of Experimental Research and Review*, 41(Spl Vol), 43-54. <https://doi.org/10.52756/ijerr.2024.v41spl.004>
- Kwak, Y. T., Han, I. W., Lee, P. H., Yoon, J. K., & Suk, S. H. (2009). Associated conditions and clinical significance of awake bruxism. *Geriatrics & Gerontology International*, 9(4), 382–390. <https://doi.org/10.1111/j.1447-0594.2009.00538.x>
- Lobbezoo, F., Ahlberg, J., Glaros, A. G., Kato, T., Koyano, K., Lavigne, G. J., de Leeuw, R., Manfredini, D., Svensson, P., & Winocur, E. (2013). Bruxism defined and graded: an international consensus. *Journal of Oral Rehabilitation*, 40(1), 2–4. <https://doi.org/10.1111/joor.12011>
- Papadopoulos, E. S., & Mani, R. (2020). The role of ultrasound therapy in the management of musculoskeletal soft tissue pain. *The International Journal of Lower Extremity Wounds*, 19(4), 350-358 <https://doi.org/10.1177/1534734620948343>
- R., P., Subramanian, S. sundaram, Ramanathan, K., & Alhalaiqa, F. (2024). Assessing the Impact of Real-Time Visual Feedback during Treadmill Training on Walking Improvement in Stroke Patients. *International Journal of Experimental Research and Review*, 39(Spl Volume), 180-189. <https://doi.org/10.52756/ijerr.2024.v39spl.014>
- Ranjani, J. S., SenthilKumar, S., Suganthirababu, P., Srinivasan, V., Kumaresan, A., & Alagesan, J. (2023). Effectiveness of vestibular exercises on balance impairment in patients affected with stroke-A systematic review. *Biomedicine*, 43(02), 567-571. <https://doi.org/10.51248/v43i02.633>
- Savla, K., Vardhan, V., & Aage, D. (2021). Physiotherapy in bruxism: a Scoping review. *Children*, 11, 12. <https://doi.org/10.52403/ijhsr.20210616>
- S., Selvi, A., Kumar P.G., M., Subramanyan P.V., H. H., Subramanian, S. Sundaram, Altam, T. A., Alkhob, S., & Gaowgzeh, R. A. (2024). Comparison between Task-Oriented Training and Proprioceptive Neuromuscular Facilitation Exercise on Upper Extremity Function in Spastic Cerebral Palsy. *International Journal of Experimental Research and Review*, 39(Spl Volume), 109-117. <https://doi.org/10.52756/ijerr.2024.v39spl.008>
- Shah, R. B. (2023). Effectiveness of ultrasound therapy to reduce pain and help in mouth opening in TM Joint dysfunction-A review. *Journal of Survey in*

- Fisheries Sciences*, 10(4S), 2989-3000
<https://doi.org/10.17762/sfs.v10i4S.1753>
- Shetty, S., Pitti, V., Satish Babu, C. L., Surendra Kumar, G. P., & Deepthi, B. C. (2010). Bruxism: a literature review. *Journal of Indian Prosthodontic Society*, 10(3), 141–148.
<https://doi.org/10.1007/s13191-011-0041-5>
- Tan, E. K., Chan, L. L., & Chang, H. M. (2004). Severe bruxism following basal ganglia infarcts: insights into pathophysiology. *Journal of the Neurological Sciences*, 217(2), 229–232.
<https://doi.org/10.1016/j.jns.2003.10.003>
- Veiga, N., Angelo, T., Ribeiro, O., & Baptista, A. (2015). Bruxism—literature review. *International Journal of Dentistry and Oral Health*, 15(5).
<https://doi.org/10.16966/2378-7090.134>
- Vishnuram, S., Suganthirababu, P., Ramalingam, V., Srinivasan, V., & Alagesan, J. (2024). Effect of Peripheral Nerve Mobilization and VR-Based Gait Training on Gait Parameters Among Patients with Chronic ACA Stroke—A Pilot Study. *Physical & Occupational Therapy In Geriatrics*, pp. 1-11.
<https://doi.org/10.1080/02703181.2024.233225>

How to cite this Article:

Yamini Umasankar, Vignesh Srinivasan, Prathap Suganthirababu and Poovarasana Murugaiyan (2024). Efficacy of Proprioceptive Neuromuscular Facilitation on Jaw Function in Bruxism Among Post Stroke Survivor: A Case Study. *International Journal of Experimental Research and Review*, 42, 292-297.

DOI : <https://doi.org/10.52756/ijerr.2024.v42.025>



This work is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License.