Nociceptive Trigeminal Inhibition Device in the Management of Temporomandibular Disorder Secondary to Parafunctional habit: A Case Report

*Mariam **Alayo**, *Oluchi **Okolie**, **Ifeoluwa B **Falokun**, ***Bolanle **Akinboboye**

*[Department of Conservative and Prosthodontics, *Lagos University Teaching Hospital & ***College of Medicine, University of Lagos. ** Department of Preventive Dentistry, Lagos University Teaching Hospital]*

Correspondence
Prof. Bolanle Oyeyemi Akinboboye
Department of Conservative and Prosthodontics,
College of Medicine
University of Lagos.
Email: bakinboboye@unilag.edu.ng

ABSTRACT

Temporomandibular disorder (TMD) is a prevalent condition often associated with pain, functional limitations, and a significant impact on quality of life. Para functional habit is recognized as a contributing factor in the etiology and perpetuation of TMD symptoms. This case report presents the successful management of a patient with TMD resulting from para-functional habit using a nociceptive trigeminal inhibition (NTI) device. The patient, presenting with chronic jaw pain, muscle tenderness, and restricted mandibular movement, showed marked improvement following the introduction of the NTI device as part of a comprehensive treatment plan. Within weeks, there was a notable reduction in pain intensity and muscle hyperactivity, as well as improved mandibular function. This case highlights the clinical utility of the NTI device in alleviating TMD symptoms linked to para-functional habit, underscoring its potential role in non-invasive, conservative management strategies for TMD patients. Further studies are recommended to elucidate long-term outcomes and optimal patient selection criteria.

Keywords: Trigeminal inhibition device, temporomandibular disorder, parafunction habit.

Mariam Alayo
https://orcid.org/0009-0004-7096-0733
Ifeoluwa B Falokun
https://orcid.org/0009-0007-6850-567x
Bolanle Akinboboye
https://orcid.org/0000-0001-5779-4567

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INTRODUCTION

Temporomandibular disorders (TMDs) are a group of conditions affecting the temporomandibular joints, masticatory muscles, and related structures.[1] The etiology of temporomandibular disorders (TMD) is clearly multifactorial, encompassing a range of anatomical, traumatic, systemic, behavioral, and psychosocial influences.[2-4] Notably, research highlights systemic factors, such as vitamin D deficiency, which can significantly impact musculoskeletal function and inflammatory regulation.[5] In particular, parafunctional behaviors are critically important, as they exert substantial mechanical loads on the masticatory system, warranting further attention and study.

The result of para-functional habit is TMD symptoms, such as masticatory muscle and TMJ

pain, deviation of the mandible on opening or closing, joint clicking, crepitus, locking, limitations on jaw motion, disc displacement (DD), ear symptoms and headaches. [6]

There are wide variety of TMD interventions, including occlusal splints- stabilization splints and repositioning splints. The repositioning splint is common, reversible, and conservative, but the Nociceptive Trigeminal Inhibition Tension Suppression System (NTI-TSS) is recognized due to its proposed mechanism.[7]

NTI-TSS is a small, splint usually worn over two to four maxillary / mandibular teeth anterior teeth. It reduces muscle hyperactivity from para functional habits such as clenching and grinding. It reduces nocturnal tooth contact especially on posterior teeth (canines and molars). This subsequently reduces nociceptive stimulation of trigeminal nerve and reduces muscle hyperactivity that causes headaches and TMD symptoms. The hypothesis is that reducing nociceptive input from bruxism decreases trigeminal hyperexcitability, and subsequently reducing muscle tension and pain. This concept of intervention aligns with broader neurophysiological models of TMD that highlights nociceptive and central sensitization mechanisms. [8,9]

Although NTI-TSS is focused at reducing nociceptive trigeminal stimulation via reduction of nocturnal bruxism, its function in the management of TMD as a result of occlusal disharmony is not well documented.[9] Rigorous clinical studies—particularly case-based evaluations—are limited, and broader systematic evidence does not provide conclusive support for its use over conventional splints.[10]

The objective of this report was to demonstrate the use of NTI-TSS device in the effective management of TMD symptoms in a patient whose condition is attributable to parafunctional habit. By documenting the clinical course, response to the NTI-TSS intervention, and follow-up outcomes, this report shows the empirical basis for integrating neurological intervention strategies with parafunctional habit in TMD.

CASE REPORT

A 30-year-old, female presented to the prosthodontics clinic, Lagos University Teaching Hospital on account of involuntary movement of the left jaw of 7 months duration, aggravated by talking. There was associated dysphagia and severe, constant pain which radiates to her head and neck on that side. Pain was temporarily relieved with the use of analgesics. There was frequent clicking sounds and positive history of clenching of teeth. There was no history of trauma to the jaws.

She had been referred from oral medicine clinic requesting for the provision of occlusal splint on account of a provisional diagnosis of myofascial pain and temporomandibular joint dysfunction syndrome. She was being managed with pregabalin, Norflex and Olfen gel.

She had been to the neurology clinic and physiotherapist. The pregabalin was prescribed by the neurologist and no significant finding noted. She was also diagnosed of gastritis and hiatal hernia 6 months prior to presentation and had since been managed by a gastroenterologist.

On extra-oral examination, twitching of the tragus of the left ear and muscle tension was observed. Mouth opening was inadequate(18mm). There was deviation of the temporomandibular joint to the right on closing and tenderness on the left side. There was no clicking sound or crepitus. Submandibular lymph nodes were bilaterally palpable, freely mobile and non-tender.

On intra-oral examination, missing teeth (28 and 38) were noted as a result of extraction. All present teeth were examined to rule out any source of odontogenic pain. Questions based on the DC/TMD Axis I symptom was instituted to confirm symptoms such as headache, pain, jaw joint sounds, closed locking of the jaw, and open locking of the jaw. [11]

Investigations carried out include Full blood count (FBC), Estimated sedimentation rate (ESR), Retroviral disease (RVD), Antinuclear antibody (ANA) test, TMJ views (open and close), Brain computed tomography (CT) scan and Brain Magnetic resonance imaging (MRI). FBC revealed lymphocytosis and ESR was within normal range. RVD and ANA tests were negative. TMJ views revealed no abnormal findings, brain CT scan reported maxillary sinus polyp while the brain MRI reported a normal finding.

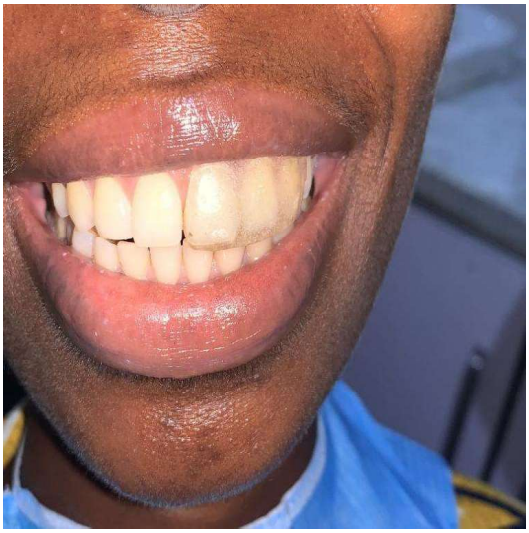
Based on clinical features of pain, restricted mouth opening, deviation on closing, parafunctional habits (clenching), and exclusion of neurological pathology, a diagnosis of temporomandibular joint dysfunction syndrome secondary to parafunctional habit was made.

The treatment plan included fabrication of an occlusal appliance which was a nociceptive trigeminal inhibition tension suppression system device.

Diagnostic impressions were made and casts were poured with dental stone to initiate the treatment plan. A nociceptive transient inhibition device was fabricated and fitted successfully. Clinical photographs were taken. Patient was advised to wear it at daytime and night for the first week.

One-week post usage of the appliance review was done and there was significant improvement of the condition as the pain, intermediate clicking and involuntary movement of the jaw had reduced. Mouth opening also improved to 33mm. She claimed her psychosocial well-being had significantly improved. She was subsequently reviewed at two weeks interval with continual improvement and advised to wear the appliance at night only subsequently. The appliance was discontinued at 8 weeks and patient reviewed intermittently.

Figure 1: The Nociceptive Trigeminal Inhibition Tension Suppression System (NTI-TSS) device



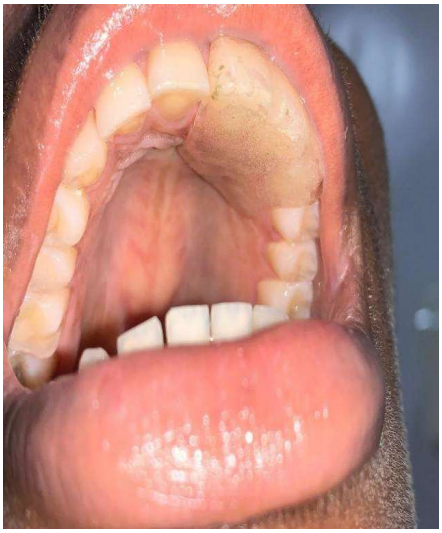


Figure 2: NTI-TSS device in the maxillary arch

DISCUSSION

This case highlights the successful management of a 30-year-old female with temporomandibular disorder (TMD) symptoms associated with para functional habit, treated with the NTI-TSS device. Epidemiological data indicates that TMDs affect up to 10% of the general population and females are more likely to be affected by TMD than males, in a ratio of about 2:1 for unknown reasons with peak incidence between ages 20-40 years. [1,12,13] In this case, the patient seen had similar demographics as previous demographic findings. Another previous study confirmed the multifactorial character of TMD, such as occlusal factors, combined with parafunctional habits and systemic factors, aging and gender predisposition.[2] The reported prevalence of TMD from the highest to the lowest is South America (47%), Asia (33%), Europe (29%), and North America (26%). [14]

The patient in our report presented with severe unilateral pain, involuntary jaw movements, reduced mouth opening, and history of clenching, which are consistent with the spectrum of TMD manifestations (pain, joint noises, restricted movement, and muscle tenderness). Evidence from randomize clinical trial have shown that the NTI-TSS device can be used successfully for management of TMDs associated with para-functional habits, but proper follow up appointment must be ensured to prevent unwanted adverse effects such as alteration of the position of teeth in the arch.[9] The insertion of the

NTI-TSS device results in a significant reduction in electromyography (EMG) activity of the jaw-closing muscles during clenching or grinding.[9] Early studies[15] reported that maximal-effort incisal-edge clenching resulted in a significant decline in EMG activity compared with intercuspation clenching. In this patient, parafunctional habits likely generated nociceptive sensitization input, leading to sensitization of the trigeminal system and ongoing muscle hyperactivity. The NTI device helped disrupt this cycle by reducing mechanical strain and promoting neuromuscular down regulation.

Temporomandibular joint (TMJ) clicking is a common clinical indicator of disc displacement with reduction, representing one of the most prevalent forms of TMJ internal derangement.[16] In this report, radiographic investigations revealed no abnormal findings related to the TMJ.

Figure 2: Sagittal view of Brain MRI

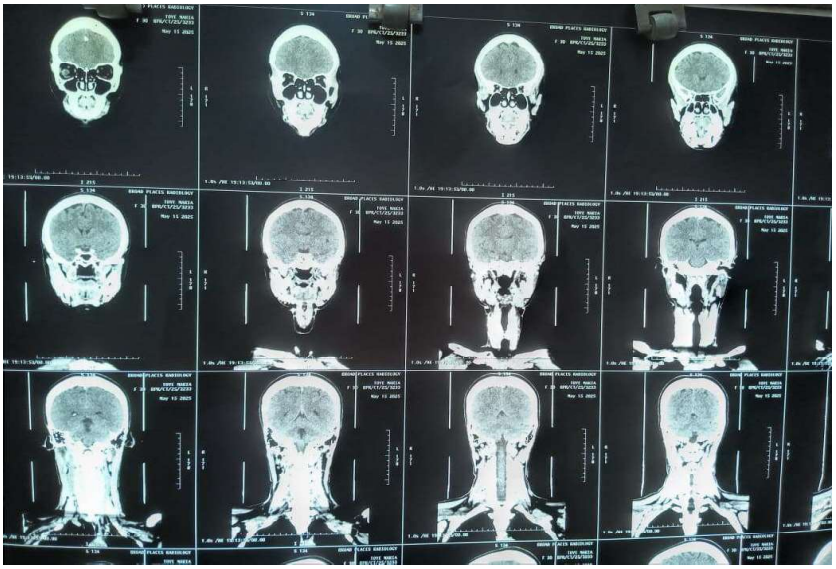


Figure 3: Sagittal view of Craniofacial CT scan

The association between tooth loss and temporomandibular disorders remains controversial, as multiple factors may contribute to these conditions. A previous study reported a statistically significant increase in the number of missing teeth among patients with disc displacement with reduction.[16] In this case, the extraction of teeth 28 and 38 occurred during the course of management and did not contribute to the para-functional habit.

The temporomandibular joint (TMJ) components can become overloaded when posterior teeth are absent. The absence of posterior teeth has been both hypothesized and experimentally shown to

cause mandibular over-closure, which may shift the condyles from their normal centric position within the TMJ.[17] Loss of molar support can affect the articular eminence, especially in younger individuals, and may result in lesions developing on the load-bearing articular surfaces of the condyle.[18] There is evidence suggesting that missing posterior teeth contribute to the changes observed in the TMJ.[11] However, our case report differs from these findings, as the temporomandibular disorder (TMD) described was predominantly of muscular origin rather than being caused by missing posterior teeth.

The management of TMD is primarily focused on relieving symptoms and improving the patient's quality of life. Identifying, assessing, and eliminating precipitating and perpetuating factors are crucial components of TMD management. Correcting occlusal disharmony plays a significant role in the treatment of TMDs.[8] Patient education, reassurance, counseling, and behavioral modification are recommended as first-line therapies. Intraoral splints, either alone or in combination with these first-line therapies, are often used to alleviate pain and enhance function in TMD patients. Among the various types of occlusal splints, stabilization splints and nociceptive trigeminal inhibition splints are considered safer and more effective options.[8]

Nociceptive Trigeminal Inhibition Tension Suppression System (NTI-tss) splint is a pre-fabricated device of very small size that covers two to four maxillary or mandibular anterior teeth. The NTI-tss device functions by promoting optimal musculoskeletal stability in the condylar position. If a patient's condylar position is not ideal, the condyle may shift more posteriorly or superiorly as symptoms resolve.[8]

Following insertion of the NTI-TSS device, there was a marked reduction in pain, joint sounds, and involuntary movements within two weeks. The patient's rapid improvement indicates a predominantly muscular etiology, as the NTI-TSS primarily disrupts nociceptive signals mediated by periodontal mechanoreceptors in the anterior teeth. This disruption results in reflexive inhibition of masticatory muscle activity. A study by Baad-Hansen et al. involving sleep bruxism patients (aged 23–39) demonstrated that NTI use reduced nocturnal masseter electromyography (EMG) events by half, from 19.3 to 9.2 per hour ($p = 0.004$), whereas a conventional occlusal splint had no significant effect.[19]

In a 6-month study of TMD patients conducted by Boulad J et al.[20]the use of an NTI splint significantly reduced activity in both the masseter and temporalis muscles, with a corresponding decrease in discomfort ($p < 0.001$).These findings support the view that, particularly in cases of muscular TMD driven by parafunctional habit, the NTI splint can provide significant relief.

Despite its efficacy, the NTI device carries distinct occlusal risks. Prolonged avoidance of posterior tooth contact can result in open bites, supraeruption of posterior teeth, increased tooth mobility, and altered occlusal relationships. Systematic reviews recommend cautious, short-term use of the appliance with close monitoring.[8,9]

CONCLUSION

This case demonstrates that the NTI-TSS device provides significant short-term relief in patients with TMD associated with parafunctional habit. Although favorable results were achieved, long-term studies and larger clinical trials are necessary to confirm its effectiveness.

RECOMMENDATIONS

i. Longitudinal studies monitoring occlusal and skeletal changes after NTI use are needed.
ii. Comparative trials in TMD patients with para-functional habit could guide treatment algorithms.
iii. Neurological studies measuring central sensitization before and after NTI intervention would better illuminate mechanistic pathways.
iv. Exploring digital occlusal splint design (e.g., Computer-aided-designed-based positioning splints) may offer safer, highly individualized alternatives.

Source of Support
Nil.

Conflict of Interest
None declared

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