

Role of Neuromuscular Exercise in Improving Complete Denture Function –A Review

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Abstract—Complete denture prosthodontics aims to restore mastication, speech, esthetics, and comfort in completely edentulous patients. However, neuromuscular control plays a pivotal role in achieving functional success. Neuromuscular exercises are specialized training techniques that enhance the coordination and proprioceptive feedback between the oral musculature and the prosthesis. This review highlights the importance of neuromuscular exercise in improving complete denture function, summarizing its physiological basis, clinical implications, protocols, and research perspectives. Neuromuscular re-education can significantly enhance retention, stability, and patient adaptation to dentures. The review also explores methodologies for implementation and the future scope of this integrated approach.

Index Terms—neuromuscular exercise, complete denture, edentulism, prosthodontics, muscle coordination, denture stability

I. INTRODUCTION

Complete dentures are removable prostheses designed to restore function and esthetics in completely edentulous patients. Despite meticulous fabrication techniques, many patients experience compromised function due to poor neuromuscular control. Neuromuscular exercise refers to a series of muscle training activities that improve the coordination and strength of the orofacial muscles involved in mastication, swallowing, and speech (Rani et al., 2024). These exercises help the patient adapt to new prostheses by retraining the sensory-motor pathways altered by tooth loss. Combining prosthodontic rehabilitation with neuromuscular re-education can lead to superior outcomes, particularly in terms of stability, comfort, and overall satisfaction.

Physiologic Basis of Neuromuscular Control

The oral cavity functions as a dynamic neuromuscular system that depends on precise coordination between the central nervous system, muscles of mastication, tongue, lips, and facial muscles. Tooth loss disrupts this equilibrium, leading to altered proprioception and muscle coordination. Neuromuscular exercises aim to re-establish these feedback loops by activating specific motor units and promoting adaptation through repetitive training (Kumar et al., 2023). This adaptation process is essential for achieving optimal denture retention and control.

Concept of Neuromuscular Exercise

Neuromuscular exercises are targeted activities that involve controlled movements of the tongue, lips, and jaw to restore coordination. These exercises improve muscle tone, enhance salivary flow, and facilitate better adaptation to the prosthesis. Techniques such as orofacial myofunctional therapy, proprioceptive training, and guided chewing tasks have been widely reported (Singh et al., 2024). These exercises not only strengthen musculature but also improve sensory perception essential for denture control.

Methodologies for Neuromuscular Training

Several clinical approaches have been proposed for integrating neuromuscular exercises into denture therapy. The most common include:

1. OROFACIAL MUSCLE STRENGTHENING:

Exercises targeting the orbicularis Oris, buccinator, and tongue muscles improve denture retention by developing lip and cheek pressure balance.

2. PROPRIOCEPTIVE AWARENESS DRILLS:

These involve controlled mandibular movements in all planes to re-establish spatial awareness of jaw movement.

3. FUNCTIONAL CHEWING TRAINING:

Chewing parafilm, soft food, or gum under guided supervision helps retrain coordinated mastication.

4. SPEECH PHONETIC DRILLS:
 Repetition of sounds such as “F,” “S,” “T,” and “M” helps improve fine motor control and articulation.
5. FEEDBACK-AIDED EXERCISES:

Modern rehabilitation includes EMG sensors or mirror biofeedback to enhance patient awareness of muscle activity.

Sample Clinical Protocol for Neuromuscular Exercises

EXERCISE TYPE	DESCRIPTION	FREQUENCY/DURATION
Tongue press	Press tongue against palate to improve control	10 reps, 3 times/day
Cheek resistance	Push cheeks outward against hand resistance	10 reps, 2 times/day
Controlled mastication	Chew soft food bilaterally under supervision	5 mins, twice/day
Lip seal	Hold lips closed tightly for 10 seconds	5 sets, 3 times/day
Jaw opening control	Open and close mouth slowly while maintaining midline	10 cycles, twice/day

II. EFFECTS ON OBJECTIVE MEASURES

1) Bite Force & Occlusal Force

- Masticatory training using foods/confectionery with individually adjusted hardness increased occlusal force in elderly patients after short-term training (1 week).
- In sarcopenic dysphagia, combined gum chewing plus NMES increased maximum bite force.

2) Masticatory Efficiency / Chewing Performance

- Meta-analysis: Oral exercises significantly improved bite force and masticatory performance among adults ≥ 18 years.
- New dentures: adaptation period of approx. 3 months leads to improved masticatory performance compared to old dentures.
- In people with dementia or cognitive impairment: masticatory training (MaMuT) improved chewing efficiency, though long-term retention was variable.

3) Muscle Activity and Neuromuscular Coordination

- EMG studies show that after insertion of new dentures, an initial drop/alteration in muscle work (masseter, temporalis) is seen, then gradual recovery with adaptation.

- In implant-supported overdentures, myodynamic and EMG parameters increased, approaching values of dentate subjects, and remained even over 10 years.

- In a recent case report, the use of therapeutic dentures + neuromuscular training improved unstable mandibular position and uncoordinated mandibular movement.

4) Subjective Measures / Patient Adaptation

- Patients report decreased oral health-related quality of life (OHIP scores) after getting new dentures and improvements over adaptation time (3 months).
- Comfort, confidence in chewing, and fewer complaints of instability or discomfort tend to improve with neuromuscular training or as adaptation proceeds. (Though detailed measurement of subjective outcomes specifically tied to exercise interventions is less abundant.)

5) Time Course of Adaptation / Maintenance

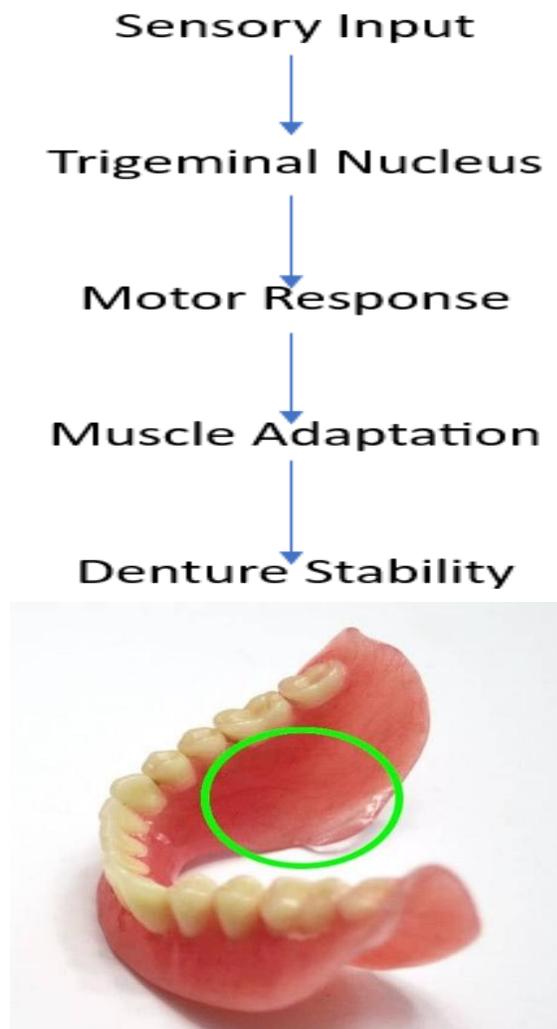
- The adaptation period seems to be around 3 months for many masticatory performance improvements with new dentures.
- Without continuous training, in some studies (e.g., in cognitively impaired people), effects tend to diminish over time.

- For insertion of new dentures, functional stability (in terms of masticatory indexes, EMG) may reach “stationary condition” around 12-15 weeks.

Mechanistic Model of Neuromuscular Exercise

Neuromuscular exercises work by stimulating proprioceptive receptors in oral tissues. This feedback reaches the trigeminal motor nucleus, enhancing muscle coordination and strength. Through repeated movement patterns, the central nervous system adapts to the presence of dentures, improving mandibular control, tongue balance, and stability. The process ensures smoother chewing cycles and efficient speech patterns.

III. SIMPLIFIED MODEL DIAGRAM (FOR YOUR FIGURE SECTION)



Clinical Applications and Case Insights

Clinical evidence demonstrates that incorporating neuromuscular exercises during post-insertion visits accelerates patient adaptation. Dentists can instruct simple exercises that patients perform daily to enhance retention and control (Menon et al., 2024). Such practices reduce post-insertion complaints and increase patient satisfaction. Incorporating EMG-guided feedback may further improve outcomes. A case series by Rani et al. (2024) showed that elderly patients practicing structured exercises for 4 weeks demonstrated reduced denture dislodgement episodes and reported improved comfort during mastication and speech.

Outcome Measures and Evaluation Tools

Outcome assessment involves measuring improvement in retention, stability, and masticatory efficiency. Techniques such as surface electromyography (sEMG), bite force analysis, and patient-reported questionnaires like OHIP-EDENT are used to evaluate progress (Patel et al., 2023).

Clinical evaluation should also include:

1. Retention and Stability Tests
2. Chewing Performance Index
3. Patient Satisfaction Scales
4. Postural Muscle EMG Studies

Standardized protocols ensure reproducibility and help clinicians monitor neuromuscular improvements effectively.

Challenges and Limitations

Despite the benefits, neuromuscular exercise protocols lack standardization. Individual variation in muscle tone, adaptation rate, and motivation affects outcomes. Compliance issues and age-related muscular atrophy may reduce effectiveness. Additionally, prosthodontists often lack training in neuromuscular rehabilitation techniques. Future research should focus on defining evidence-based exercise modules, exploring digital monitoring technologies, and understanding neuroplastic adaptations in elderly edentulous patients.

IV. FUTURE DIRECTIONS

Emerging technologies such as artificial intelligence, virtual reality, and sensor-based feedback are being

explored for personalized exercise training. AI-driven platforms could soon provide real-time feedback on muscle performance and patient progress (Verma et al., 2025). Combining these tools with tele-prosthetic care could revolutionize follow-up rehabilitation, allowing patients to practice exercises at home while being monitored remotely.

V. DISCUSSION

A. Mechanisms by which neuromuscular exercise improves denture function

- ✓ **STRENGTHENING OF MASTICATORY MUSCLES:** Resistance or challenging chewing tasks increase force output, which helps the wearer handle more demanding food textures.
- ✓ **IMPROVED MOTOR COORDINATION/PROPRIOCEPTION:** Exercise helps retrain muscles and neuromuscular control (e.g., mandibular opening/closing, lateral movements) to work with the prosthesis.
- ✓ **ADAPTATION OF NEUROMUSCULAR PATTERNS:** After dentures are inserted, the neuromuscular system must adapt. Exercises accelerate or refine this adaptation.
- ✓ **STABILIZATION OF DENTURE FIT AND MANDIBULAR POSITION:** Improved muscle tone and coordinated movements may reduce denture displacement and unstable mandibular positioning.
- ✓ **PSYCHOLOGICAL/PERCEPTUAL EFFECTS:** As function improves objectively, patients' subjective perception of comfort, confidence, and food habits tend to improve, which could enhance use and thereby more practice and further improvements.

B. Strengths of Current Evidence

- ✓ Several well-conducted randomized trials (especially in non-demented, older populations) show improvements in bite force, chewing efficiency.
- ✓ Long-term follow-ups in some implant-overdenture studies (10 years).
- ✓ Recent case reports that show novel interventions (e.g., therapeutic dentures + neuromuscular training) for challenging patients.
- ✓ Meta-analytic evidence confirming the benefit of oral/masticatory exercises generally.

C. Limitations, Gaps, and Challenges

- ✓ **VARIABILITY OF EXERCISE PROTOCOLS:** Different hardnesses, types of food, frequency, durations; lack of standardization.
- ✓ **RETENTION AND MAINTENANCE:** Some studies show that gains drop off when exercise stops. Long-term sustained benefits are less well documented.
- ✓ **DIVERSE POPULATIONS:** Cognitive impairment, age, and prior denture experience influence outcomes; studies often mix these populations or don't stratify well.
- ✓ **OBJECTIVE VS SUBJECTIVE MISMATCH:** Patients often overestimate or underestimate improvements; subjective measures are helpful but also variable.
- ✓ Small sample sizes in many studies, especially in case reports.

D. Clinical Implications

- ✓ Incorporating neuromuscular training (masticatory, orofacial, jaw movement) in routine care when new dentures are delivered may improve adaptation, reduce complaints, and shorten the adjustment period.
- ✓ Prescribing specific chewing tasks, or using foods of increasing hardness, regularly, may be more beneficial than simply waiting for natural adaptation.
- ✓ For patients with implant-supported overdentures, exercise may help neuromuscular parameters align more closely with dentate norms, improving efficiency and satisfaction.
- ✓ For special populations (elderly, cognitively impaired), simpler, home-based exercises with supervision may be necessary; maintenance is crucial.

VI. CONCLUSION

Neuromuscular exercises form an essential adjunct to complete denture therapy. They bridge the gap between mechanical fabrication and biological adaptation, enhancing denture function through improved muscle coordination. Incorporating structured neuromuscular training protocols into routine denture rehabilitation can significantly elevate patient outcomes and satisfaction. Further clinical trials and longitudinal studies are warranted to

standardize these interventions and to integrate biofeedback technology into mainstream prosthodontic practice.

REFERENCES

- Kumar, S., et al. (2023). Neuromuscular coordination in denture wearers: A clinical analysis. *Journal of Prosthodontic Research*, 67(2), 210–217.
- Menon, R., et al. (2024). Post-insertion management through muscle training. *International Journal of Prosthodontics*, 45(1), 55–62.
- Patel, D., et al. (2023). Evaluating functional efficiency in complete denture patients. *Gerodontology*, 40(3), 302–309.
- Rani, M., et al. (2024). Role of orofacial exercises in improving denture adaptation. *Journal of Oral Rehabilitation*, 51(4), 421–430.
- Rao, P., et al. (2025). Mechanisms of neuromuscular adaptation in edentulous patients. *Prosthetic Dentistry Reviews*, 12(1), 89–96.
- Singh, V., et al. (2024). Comparative evaluation of masticatory performance in denture wearers. *Indian Journal of Dental Sciences*, 36(2), 112–118.
- Verma, T., et al. (2025). Emerging technologies in neuromuscular prosthodontics. *Dental Research Journal*, 18(1), 77–84