

An EMG study to evaluate Chewing Efficiency and Maximum voluntary clenching (MVC) for different malocclusion groups before and during Orthodontic Treatment

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Research Question

Do orthodontic treatments affect chewing efficiency and Maximum Voluntary Clenching (MVC) for different malocclusion groups?

Background

- Robert E. Moyers was the first to apply electromyography to dentistry
- Two ways to get EMG: non-invasive (surface EMG) and invasive (intramuscular EMG).
- Premature contacts and muscle activity can worsen malocclusion.
- Compensatory activities are seen in Class II and Class III malocclusion. Understanding the impact of abnormal muscle function on the teeth can help solve malocclusion problems.

Introduction

- **Study goal:**
 - Assess EMG activity of temporalis and masseter before and during orthodontic therapy to explore mastication efficiency and Maximum voluntary clenching (MVC) for different malocclusion groups.
- **Hypothesis:**
 - There is no significant difference in the chewing efficiency and MVC of temporalis and masseter muscles in different examined groups.
- **Rationale:**
 - The muscles of mastication are crucial to our body's functional anatomy.
 - The mandibular elevators (masseter, temporalis, and medial pterygoid muscles) and the mandibular depressor (lateral pterygoid muscle) are important muscles in orthodontics.
 - These muscles are continuously remodeled to meet functional demands.
 - The chewing cycle is a complete mandibular movement during a single masticatory stroke.
 - Electromyography (EMG) records muscular activity using an electromyogram and is useful in physical therapy.

Experimental Design

A malocclusion sample of 33 subjects (54% female and 46% male), ranging from 12 to 25 years of age, participated in the study. The subjects were separated into three sets based on Angles classification.



EMG recordings

- This study used an EMG machine with disposable electrodes.
- The EMG machine was connected to a voltmeter which provided the Root Mean Square value of the activities of the muscles during rest position, chewing, and maximum voluntary clenching (MVC).
- The EMG recordings were taken before orthodontic treatment (T0), after 6 months of active treatment (T1), and after 1 year of active treatment (T2)



Rest Position

The subjects sat upright on a chair with the Frankfort plane parallel to the floor.

MVC

The patient was asked to clench their teeth at maximum intercuspal relation for 4 seconds

Chewing

The subjects were instructed to bite on wax between the maxillary and mandibular right and left 1st molars and premolars.

Results

- Class III malocclusion had the highest muscle activity, while Class II had the least among the three groups.
- During chewing, Class III had higher temporal muscle activity, while Class I had higher masseter muscle activity at T1.
- After one year, temporal muscle activity increased for all groups, and masseter muscle activity decreased only for Class I.

Summary

- After one year of active orthodontic treatment, the masticatory function is found to be altered. However, the muscle activity for maximum voluntary contraction (MVC) and chewing for the three groups was almost similar at the start of treatment (T0). Further studies can be carried out to check the stability of muscle activity after orthodontic treatment and after six months of retention.

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