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Electromyography of the Masticatory Muscles – A Quick Glance

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Abstract

The knowledge of masticatory function and its relationship with craniofacial morphology is essential to the field of orthodontics. Electromyography has been used to assess the muscle function of the masticatory muscles both qualitatively and quantitatively in orthodontics.

This article shows the importance of electromyography of masticatory muscles in orthodontics.

Introduction

In assessment of muscle function one of the most common recording techniques is electromyography (EMG). The record obtained from the electromyography is electromyogram. This technique assesses the magnitude and duration of muscle activity by recording the intrinsic electrical potential arising from the active motor units.[1]

EMG as an aid in treatment assessment in orthodontics is used in determining maxillo–mandibular relationships brought about by tooth movements and in assessing muscle function and balance before, during and after fixed and functional orthodontic therapy and orthognathic surgery. It has been used to evaluate muscle function both quantitatively and qualitatively.[1]

Types of Electromyography

There are two main types of EMG which are as follows:

- Intramuscular Electromyography.
- Surface Electromyography.

Intra muscular electromyography

In intramuscular electromyography needles or fine wire electrodes are inserted through the skin into the muscle. These electrodes can record single motor unit action potentials.

Surface Electromyography

In surface electromyography surface electrodes over the skin are used to detect the motor unit action potentials from the muscles.

What All Can Be Recorded By Performing The Electromyography Test on Jaw Muscles?

The electrical activity of the masticatory muscles can be recorded and assessed during static tests (rest, maximal, or sub-maximal voluntary clenching) or during active tests (opening or closing the mouth, protrusion, retrusion, or lateral deviation of the mandible, mastication, swallowing, or speaking).[2]

The Masticatory Muscles

There are four muscles of mastication which are as follows:[3]

- Temporalis muscle – Consisting of the Anterior, Middle and Posterior segments.
- Masseter muscle – Consisting the Superficial and Deep segments.
- Medial Pterygoid muscle.
- Lateral Pterygoid muscle.

All the four muscles of mastication are supplied by the mandibular branch of the Trigeminal Nerve. They are responsible for the complex jaw movements.[3]

The Structure of Masticatory Muscles

Jaw muscles are capable of powerful contractions by virtue of regular organization of their contractile proteins. The cellular units of a skeletal muscle are the muscle fibers which are long cylindrical cells that contain multiple nuclei. Each muscle fiber contains many myofibrils that run parallel along its length. The myofibrils are composed of sarcomeres that are arranged end to end. Sarcomeres are the contractile units of a skeletal muscle fiber. Sarcomeres consist of two types of myofilaments that are organized into regular arrays with a partially overlapping structure.[4]

The thin filaments contain mainly actin and the thick filaments contain mainly myosin. Myosin consists of two heavy peptide chains which are intertwined and four light peptide chains. The myosin heavy chain is mainly responsible for the contraction velocity of the muscle fiber.[4]

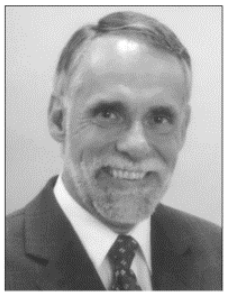
A distinguishing feature between jaw muscles and other skeletal muscles lies in their internal organization. In the limb muscles, the fibers of a motor unit intermingle with large parts whereas in the jaw muscles they are restricted to specific areas. This type of organization permits the differential control of separate muscle portions.[4] Thus, the jaw muscles are capable of performing a larger variety of motor tasks than the average limb or trunk muscles because of their complex architecture and heterogenous fiber–type composition.[4]

Electromyography Studies Of Jaw Muscles

Sr. No.	Name of Researcher(s)	Year of Study
1.	Robert Edison Moyers[5]	1949
2.	Robert Edison Moyers[6]	1950
3.	Ralph E. Karau[7]	1956
4.	A. Latif[8]	1957
5.	Johan Ahlgren[9]	1960
6.	Johan Ahlgren[10]	1973
7.	Hans Pancherz and M. Anehus[11]	1978
8.	Bengt Ingervall and Inger Egermark-Eriksson[12]	1979
9.	Hans Pancherz[13]	1980
10.	Johan Ahlgren[14]	1985
11.	Carine Carels and D. van Steenberghe[15]	1986
12.	Bengt Ingervall and Elias Bitsanis[16]	1986
13.	Johan Ahlgren[17]	1986
14.	Rodolfo Miralles[18]	1988
15.	Stephen W. H. Yuen[19]	1990

DR ROBERT E MOYERS

HANS PANCHERZ



Conclusion

The application of electromyography in orthodontics has been a boon in the study of masticatory muscles. Orthodontists can evaluate the efficacy of their treatment (for example functional therapy) by conducting static and/or active tests on the masticatory muscles.

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