

# ELECTROMYOGRAPHY APPLIED TO CHEWING MUSCLES

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## SUMMARY

The electromyography has if shown an effective method in the aid of diagnoses and treatments of muscular disorders. In dentistry your main application it is in Dysfunction Temporomandibular treatment. The dentistry professionals don't use this technique for they ignore their benefits or even they have not knowledge on the subject.

One of the main objectives of the treatment using electromyography is to show to the patient the current state of the analyzed muscle and your evolution during the treatment, until arriving to a satisfactory function.

**Keywords:** Electromyography; Temporomandibular joint dysfunction syndrome; Temporomandibular joint.

## INTRODUCTION

Electromyography has been broadly used in clinical diagnosis for over 40 years. It has first been used in neurophysiology, then the term "electromyography" was used as a reference to methods employed to record potential actions of muscle fibers in healthy and ill patients <sup>(1)</sup>.

The monitoring of muscles activity by means of electromyography (EMG) is an irreplaceable way to check physiological conditions of the stomatognathic system <sup>(1)</sup>.

Surface electromyography is today a part of the evaluation quantifying chewing muscles function in dental patients. Obviously, an approach to real values for a muscle under analysis could be valuable for the diagnosis of stomatognathic system changes and for assessing therapeutic effects <sup>(2,3,4)</sup>. It can be used to get a deeper understanding of various pathologies, such as, for example, temporomandibular disorders <sup>(3)</sup>.

It is a safe, easy, and non-invasive method that enables the objective measurement of studied muscle energy <sup>(5)</sup>.

Electromyography has been considered as of great importance for in vivo muscle physiology knowledge, for differential diagnosis, and monitoring of potential disorders <sup>(4)</sup>.

By knowing what is normal, we can make a differential diagnosis of abnormal conditions <sup>(4)</sup>.

We aimed to check which activity areas of electromyography in odontology were, whether its use would be restricted only to Temporomandibular dysfunctions or it might be used in areas such as Buccomaxillofacial Surgery and Traumatology.

neuromuscular disease or trauma scope, and as a kinesiological instrument for muscular function studies. As an evaluation procedure, clinical electromyography involves detecting and recording electric potentials of musculoskeletal fibers <sup>(6)</sup>.

Electromyography (EMG) is the electric record of a muscle activity <sup>(5,7,8)</sup>. It monitors through sensors applied to the skin on appropriate muscles, where they are monitored and reproduced on a PC screen.

It is basically used in the Occlusion field for evaluating the activity pattern of a working chewing muscle, as well as the resting postural position of the mandible <sup>(7)</sup>. It can be an additional and useful method for assessing chewing movements in temporomandibular disorders <sup>(9)</sup>.

The clinical electrophysical consists of the observation, analysis and interpretation of bioelectric activity and the functional integrity of neuromuscular system when responding to electric activation or stimulation. For a better understanding of these procedures, some electrophysiological basic concepts involved in neuromuscular system are presented here <sup>(10)</sup>.

Muscular contraction and strength production are fostered by a relative change of several molecules or filaments within muscles. Filament slipping is caused by an electric phenomenon known as action potential <sup>(8)</sup>.

Action potential is the muscle depolarization that occurs when an axon drives an impulse to all its muscle fibers. That action potential is graphically registered by the electromyogram <sup>(6,8,10)</sup>.

Thus, an action potential transmitted through a nervous fiber is called nervous impulse, while detectable through electrodes applied to the skin or by needle electrodes inserted into the muscle, which, in both cases, the recorded electric disorder is the sum

## LITERATURE REVIEW

Currently, electromyography is employed in the evaluation of

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of potentials produced by all activated muscle fibers <sup>(10)</sup>.

In electromyography, action potentials occurring as a result of voluntary activation of the muscle or through its response upon an electric stimulus can be recorded <sup>(10)</sup>.

Electromyography does not translate a force measurement, since it is known that electromyography and force dissociate when the muscle is fatigued or in non-isometric contractions <sup>(10)</sup>.

Electrodes capturing electrical potentials of muscles in contraction can be of two types:

**Surface electrodes:** these are small metal discs, commonly made of silver – silver chloride, which are applied on the skin. They are much more convenient for clinicians, more acceptable for patients and produce less movement; this is a non-invasive and user-friendly method. It is used for superficial muscles. Skin preparation is required with cleaning or friction with alcohol for removing dead epithelial cells. Some electrode gel is applied to enable an easy transport of electrical potentials. The electrode must be firmly attached to the skin, with adhesive tape, to avoid bias due to movements <sup>(6,7,8,10,11)</sup>.

**Deep electrodes:** the electrodes are inserted within the muscle by using two thin coated wire filaments, which are introduced by means of a hypodermal needle. Its use is limited for being an invasive method <sup>(6,8,10,12)</sup>.

Electrodes can also be categorized as:

**Monopolar:** An electrode is placed on a muscle bundle of interest and another electrode is placed at a point non-affected by the activity of that muscular bundle; then, the difference in potential is measured between those two points <sup>(8)</sup>.

**Bipolar:** two electrodes on the region of study and a third electrode – called grounding electrode – is placed somewhere not affected by the activity of the region of interest. Then, the difference of electric potential is measured between both electrodes on the region of interest, taking the grounding electrode as reference <sup>(3,7,8)</sup>.

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## DISCUSSION

The authors report that electromyography has a major application on temporomandibular dysfunctions, where its action on chewing muscles analysis is verified.

We confirmed that the use of surface electrodes is unanimous because of its user-friendly characteristic, as well as for being non-invasive, causing no discomfort to patients. All authors stated the potential use of electromyography in other dental areas, however, they discuss its use only for temporomandibular disorders.

Electromyography could be used in areas such as orthodontics as a way to diagnose a potential muscle change early to the beginning of treatment and to find a potential post-treatment muscular reorganization, checking if that muscle could again perform its normal physiological activities.

It could also be used in Buccomaxillofacial Surgery and Traumatology, also checking muscle functions, which were changed before surgery, observing its postoperative adjustments and reorganization until reaching a satisfactory function.

By electromyography, we can also see muscular changes in patients requiring prosthetic rehabilitation, therefore we can state that rehabilitation need interferes on muscle harmony, thus interfering in Temporomandibular Joint function.

## CONCLUSIONS

The electromyography test was shown to be of great effectiveness on ancillary and preventive diagnosis of disorders involving stomatognathic system muscles.

Electrodiagnostic resources are still far from a concrete professional reality due to the lack of knowledge about the technique along with high-cost equipment.

With results achieved through electromyography, one can accurately prove – and show to patients that orthodontic treatments, surgery and rehabilitation are not only indicated because of their aesthetic end result but because of the functional outcome it presents to occlusion, joint positioning and muscular function, which is proven by electromyography.

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