ssEMG evaluation in dentistry

BIOMECHANIC OF MASTICATORY MUSCLES MEASURED WITH SSEMG

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In diagnosis and prognosis, surface electromyography (sEMG) of the masticatory muscle's studies how the main chewing muscles work. These include the masseter, the front part of the temporalis, the trapezius, the sternocleidomastoid, and the submental muscles. sEMG gives clear data about how these muscles work together and how balanced they are, and it causes little discomfort for the patient (1,2). However, sEMG does not measure the muscle fibers directly. To get accurate results, it is important to use a repeatable method and standardized signals to reduce noise (3). A common way to standardize sEMG is to have the person bite as hard as possible on cotton rolls. This is used as a reference for other tests. This method is recognized for making the results more reliable in people without symptoms, and it allows comparisons between different people. It is also used to check how the chewing muscles work in different situations, such as Temporomandibular disorders (TMDs), sleep bruxism, oral rehabilitation, and jaw surgery. For TMDs, it is still debated whether changes in the jaw caused by these disorders can be seen in sEMG signals. Some studies say that pain can affect how muscle signals are formed (4). The pain adaptation model suggests that some muscle problems may be a normal way for the body to protect itself and are not always the cause of pain. Pain can limit movement and help protect the body from injury. Since pain is a personal and complex experience, people with TMDs may use different muscle strategies, so diagnosis and treatment should be personalized. During teeth clenching, studies using standardized surface electromyography (ssEMG) have shown that individuals with temporomandibular disorders (TMD) display several distinct differences compared to healthy control subjects. Specifically, the ssEMG signals from the masticatory muscles in TMD patients show greater variability, meaning that the muscle activity is less consistent from one measurement to another. There is also a noticeable reduction in both the synchrony and symmetry of the percentage of overlapping coefficient (POC) for the anterior temporalis (AT) and masseter muscles (MM). This suggests that, in TMD subjects, the left and right muscles do not work together as efficiently or evenly as they do in people without TMD. Additionally, TMD patients tend to have an increased torque coefficient (TC), which indicates more unbalanced muscle activity during clenching. All the main ssEMG indices, including IMPACT (a measure of overall muscle activation), are generally reduced in TMD subjects, reflecting lower or less coordinated muscle function. An important finding is that the index measuring synchrony and symmetry of the superficial masseter muscle (MM) is inversely correlated with the improvement of pain-related outcomes after treatment. In other words, the lower the synchrony and symmetry of the masseter muscle at the initial assessment (T0), the greater the clinical benefit observed after therapy. This suggests that ssEMG measurements can not only help identify functional differences in TMD patients but may also provide useful information for predicting treatment outcomes (5).

Keywords: *pain, surface electromyography, teeth clenching, temporomandibular joint disorders.*