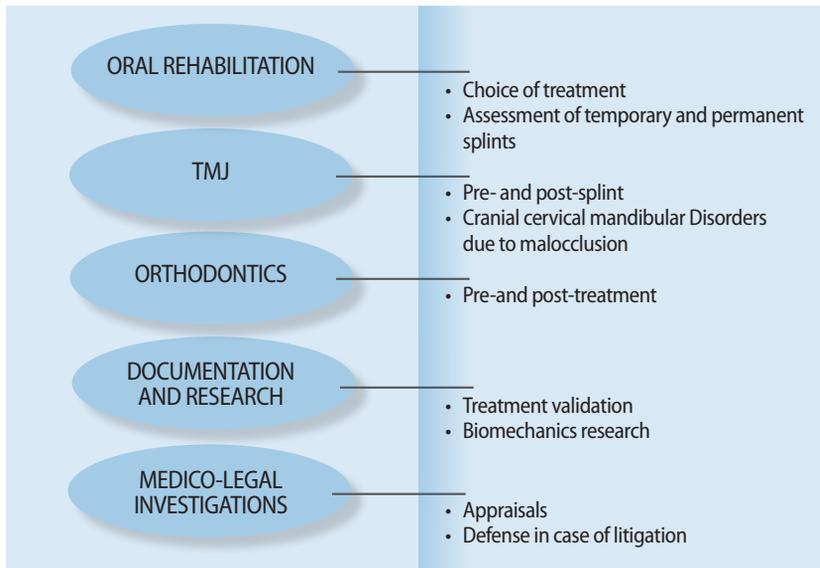


# TMJOINT: The pursuit of neuromuscular stability



BTS TMJOINT applications

Key of the method is the standardization of the EMG potentials by comparison between two clenching trials one with the interposition between the arches of salivary rollers, and one allowing the contact of the teeth.

Overlapping the areas subtended to the EMG waves of the two trials, using mathematical algorithms, it is possible to determine how the occlusion affects the muscle balance.

The result of this analysis presents high repeatability and reliability: the normalization erases the variability typical of EMG acquisitions that are non-repeatable for extrinsic factors, such as the position of the electrode with respect to the motor unit and to the muscle fibers, and intrinsic, such as the possibility to have in the same patient different situation of muscle trophism; physiological, anatomical and biochemical characteristics of the skin including the thickness, hydration and cleaning.

**In clinic, the parameters calculated by BTS TMJOINT are indispensable tools to highlight in a functional manner the altered occlusal conditions and in particular those situations where an apparent good morphological condition does not reflect a good neuromuscular balance.**

*All treatments involving the occlusal surfaces, almost inevitably, interfere with occlusal stability and consequently influence the activity of the levator muscles.*

*Through the application of the proposed indices, orthodontic treatment, prosthetic reconstructions and morphologically correct conservative restorations could also be evaluated from a functional point of view. The resulting standardized EMG potentials depend only on the muscle contraction in relation to the occlusal surfaces.*

*(Ferrario et al., 2000).*

**Orthodontics:** after correction of tooth misalignment, the achievement of the neuromuscular balance, verified by means of BTS TMJOINT, will be safe from relapse.

**Diagnosis and care of the dysfunctional patient:** TMJOINT is a simple but highly predictive method for identifying the dysfunctional patient, and apply, as a result, suitable odonto-periodontal treatment plans, or otherwise to exclude the occlusal problems and to address the patient to other therapeutic options.

**The selective grinding of occlusal surfaces, both natural and artificial (fillings, dentures) can be implemented not only using the conventional method with occlusion foil, but also guided by EMG (Ciusa et al., 2000). In this case the control by EMG can better highlight the existence of an alteration in the neuromuscular system (Ferrario et al., 1998a; Tartaglia et al., 2001).**

**In implanto-prosthetic field, the EMG signal can be used in the evaluation of the impact that a full dental prosthesis on implants exerts against the muscle coordination during the performance of standardized activities such as, for example, chewing. The statistical parameters based on EMG data have evidenced that a full dental prosthesis on implants can restore chewing symmetrical pattern even in edentulous patients (Ferrario et al., 1998b).**

**The method suggested for standardizing the EMG potentials allows to exclude the problem of an occlusion altered by other pathologies such as craniomandibular disorders or muscle diseases.**

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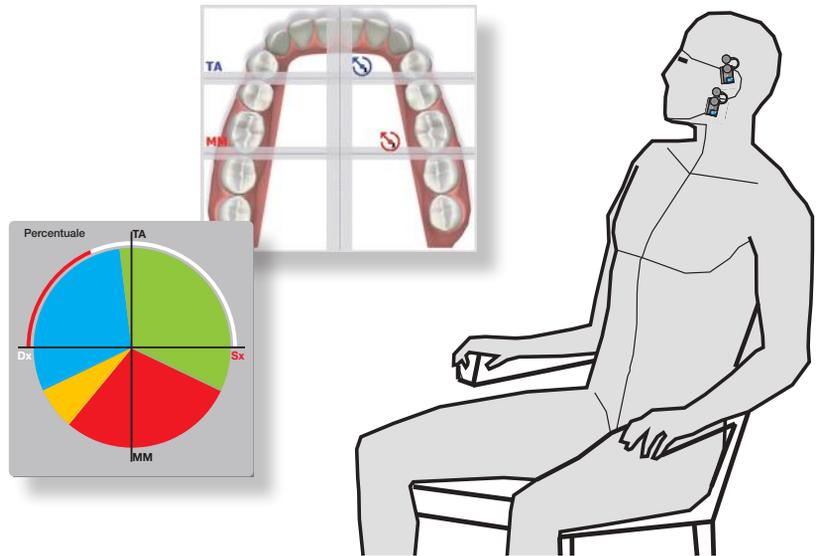
BTS TMJOINT is a modular and scalable solution, structured on various levels of analysis.

The first level, called POC4, through the analysis of the activities of the masseter and anterior temporal muscles, right and left, during a quick 5 second clenching test, provides indexes which makes it possible to establish the role of occlusion on muscular balance:

- The POC (percentage overlapping coefficient) that is an index of the symmetric distribution of the muscular activity determined by the occlusion.
- The TORS (torque coefficient) to estimate the possible presence of mandibular torque.
- The IMPACT index, that allows evaluating the muscular work, providing information about the occlusal vertical dimension.

The second level, called POC6, adds to the previous the calculation of the indices related to the sternocleidomastoid muscle, right and left, allowing evaluating the effects of the teeth touching, on the neck muscles.

The third level, called MASTICATION, analyses the neuromuscular coordination during mastication. The masticatory frequency, the Lissajous curve, and indices of muscle symmetry are calculated.



The method of analysis implemented in BTS TMJOINT focuses on the muscular component of the apparatus stomatognathic and on its relationship with the occlusal state.

10 years of scientific research have shown that it is now crucial to move from the research of the mechanical stability, and therefore from a purely morphological evaluation criterion, to the research of the neuromuscular stability: the dysfunctional patient should then be evaluated more than in terms of altered mechanics, in terms of to recover neuromuscular physiology.

**The surface electromyography is an excellent tool to evaluate the alterations induced by occlusal interferences on muscle symmetry.**

*“The occlusal interferences are quite common in the natural dentition and may be associated with craniomandibular disorders (CMD). Presumably, the malocclusion alters the proprioceptive and periodontal stimuli sent to the central nervous system, that, in response, change sequences of muscle activation, their duration and intensity, by acting on the number of motor units active in an attempt to avoid contact between the interference and the antagonistic element. Studies conducted by inserting an occlusal interference of height equal to those encountered in the prosthetics field, have shown an asymmetric contractile activity in the elevator muscles and a potential displacement of the jaw in a lateral position.*

Ferrario et al., 1999a.

**These results highlight the need of both functional (through the sEMG) and morphological accurate controls.**

