

Editor's Letter. Malocclusion treatment tools evolution – mechanical vibration synergism. What is the current status of knowledge? Part II

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Received 29 October 2024; accepted 30 November 2024; published online 31 December 2024
DOI <https://doi.org/10.21595/jfocg.2024.24651>



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Returning to the subject of the last issue (4.1) editorial regarding use of waves as a synergic treatment protocol to Jaw Functional Orthopedics (JFO), Patil et al. [1] reported that noninvasive methods to enhance response to malocclusion treatment are preferable to invasive ones because they cause less discomfort and pain to the patient and are easier to be administered by the doctor and some of them may be self-applicable. The most common types of noninvasive treatment acceleration methods are the low-level laser therapy (LLLT) and mechanical vibration. Here we will address the effects of mechanical vibration in treatments with JFO. A critical review about the subject showed that mechanical vibration applied under determined conditions to all species studied stimulates osteogenesis with consequent gain in bone mass [2]. Based on the findings of this review the use of mechanical vibration is indicated only in cases where an increase in facial bones mass, in other words, growth of the structure(s) is needed. For instance, in Angle's Class III the treatment the use of mechanical vibration is not indicated when treating with JFO. In orthodontic treatment in adults where alveolar bone is stimulated, mechanical vibration can be used because there will be no orthopedic stimulation. Pascoal et al. [3] in a case report showed orthodontic improvement and no orthopedic side effect on the malocclusion treatment.

Based on the state of art of mechanical and electromagnetic stimulation for facial development both are not able to stimulate the development as the main treatment protocol. They will not promote the development of facial structures by themselves acting as a background activity (BGA) in some situations. The stimulation through waves (electromagnetic or mechanical) acts as a synergic treatment to JFO, in other words they will not replace conventional treatment with functional appliances even with mechanical orthopedic appliances, occlusal adjustments with griding of Planas Direct Tracks, exercises or physical therapy, they will enhance conventional treatment quality. It is very important to have in mind that we are talking about the knowledge of October 2024, tomorrow is another day bringing new knowledge, deepening established knowledge, overturning old paradigms and building new ones.

In my opinion the great disadvantage of mechanical vibration stimulation on the head, even not being a whole-body vibration, affects all soft and hard structures in the cranium. This is a major aspect to be observed when applying vibration to the cranium, the eyes and the ears will be submitted to the vibration, for such the protocol must be strictly observed to avoid vision, audition and balance commitment among other side effects [4]. Does it mean that mechanical vibration has an iatrogenic potential and electromagnetic vibration has none? Electromagnetic vibration must be as dangerous or more dangerous to the eyes when not applied within the correct protocol, mainly the red frequency that has the potential to blind. Both types of vibrations are supposed to be applied following strictly the protocol. In the last issue editorial, it has been seen that electromagnetic vibration has a synergistic effect on malocclusion treatment, but what about mechanical vibration?

With ILLLT electromagnetic vibration can be applied to a restricted region and will not affect the whole cranium. The consequence to this is in an Angle's class II treatment with retrognathism but an ideal maxillary growth you can apply LLLT only stimulating mandibular development and don't stimulating maxillary growth the same caution one is supposed to have with the use of

functional orthopedics appliances (FOAs) to treat this malocclusion. With mechanical vibration osteogenesis in mandible and maxilla will be stimulated. Does this mean that you cannot stimulate a patient undergoing a class II treatment if the maxilla has a correct development? The answer is, yes, you can use mechanical vibration to as a synergic stimulation, but some points have to be observed in FOA's planning (also called prescription), construction and clinical management.

An important aspect was raised by Alikhani et al. [5], mechanical vibration used to stimulate the stomatognathic system (SS) produces osteogenesis and osteolysis, in other words it promotes development not only increase in size but adjustments to keep proportion of the SS bones. For such, mechanical vibration can be used during malocclusion treatment (using a correct protocol) to treat maxillary and mandibular bone deformations because it will enhance osteolysis where osteolysis is stimulated and osteogenesis where osteogenesis is stimulated.

Further investigations are needed since there are some points, mainly regarding vibration application protocol, that are not very well established. Some investigations applied the vibration for 15 minutes, other for 20 and there are some that the daily period application used was 30 minutes. Frequency ranged from 20 to 110 Hz. Besides the fact that all of them reported good results, what is the ideal time and frequency of application? Are they malocclusion type dependent? Are they related to patient craniofacial biotype? Is there any difference between orthopedic and orthodontic treatment application protocol?

Much must be answered but the use of mechanical vibration within the parameters of application protocols (vibration displacement, frequency and acceleration) studied was proved to be safety to craniofacial structures and improve malocclusion treatment results. The vast majority of the studies are about tooth movement (orthodontic treatment) made with conventional fixed appliances or aligners. A vast and necessary field of investigation is open, which is the best mechanical vibration protocol to enhance FOA efficiency? Is it related of craniofacial and/or malocclusion type, age? Manuscripts about the subject are very welcome for publication.

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