To: Editor, *The Angle Orthodontist*


This recently published article is very interesting. Various approaches have been attempted to increase the rate of orthodontic tooth movement (OTM), including surgery, pharmaceutical and physical stimulation, among which vibration has drawn increasing attention in recent years due to its non-invasiveness and the capacity to affect all of the teeth at the same time. However, the effectiveness of vibration on OTM acceleration is still under debate.

The study showed that vibration generated by a household electric toothbrush can accelerate OTM, and has attributed this effect to IL-1β. The findings are very promising since electric toothbrushes are common and easy to obtain. However, I have two questions for the authors.

The first question is regarding the force-loading technique used. The authors used labial and palatal chains adjusted to generate an approximately equal net force of 60 g, as determined using a force gauge. It might be very hard to provide force of an exact value using power chain, since only one ring can be added or reduced at a time. Also, with tooth movement, the length of the chain decreases and the closing force decays rapidly, the rate of which is related to the initial length of the chain. Therefore, with the same distance of tooth movement, the force on the one side might attenuate more rapidly compared to the other side. Could the model be improved by 1) adjusting the spaces on both sides to be equal before initiating vibration and measurement of OTM; 2) using a NiTi coil closing spring instead of elastic chain for more consistent force application?

The second question is about the mechanism for vibration to enhance OTM (disregarding the so-called “stick-slip phenomenon” that reduces frictional resistance to sliding between bracket and arch wire). Biologically, the rate limiting step in OTM is bone resorption, while vibration, as a cyclic mechanical stimulation, is generally believed to be a promoter, but not inhibitor, of bone formation. If vibration really accelerates OTM biologically, it should speed up the bone remodeling cycle, including formation and resorption. On the other hand, IL-1β is an inflammatory cytokine, which plays an important role in inflammation induced bone resorption like periodontitis. Generally, IL-1β is destructive but not constructive for bone. Therefore, is it be possible that the increase of IL-1β in the gingival crevicular fluid was caused by gingival irritation due to use of the electric toothbrush?

Thank you again for publishing this paper which raises such interesting points of discussion.

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