



Letter to the Editor

The Effects of Vibration Treatment in Rhinoplasty

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I would like to thank Drs Carlson and Marcus for their interest, comments, and congratulations about the study. Here, I will clarify the points they raise,¹ and expand the scope of my article, “The Effects of Vibration and Pressure Treatments in Early Postoperative Period of Rhinoplasty,”² with further discussion and comments.

First of all, my complete perioperative regimen for management of edema and ecchymosis, in addition to vibration and pressure treatment, was stated in the Methods section of the study: “None of the patients had received herbal supplements, such as arnica, steroid treatments, and cool application intraoperatively and postoperatively to exactly measure the effect of the pressure and vibration. All patients underwent closed rhinoplasty under general anesthesia. Hypotensive anesthesia was applied to achieve an average arterial blood pressure of approximately 60 mm Hg. Lidocaine with 1:100,000 adrenaline was administered close to the incision sites before start to the operation.”² Head-of-bed elevation is routine in my practice. Because all of the patients in the study received the same perioperative regimen, except for vibration and pressure treatment, it is straightforward to contextualize the results as a true decrease in edema and ecchymosis attributable to pressure and vibration.

Second, before making any comparisons between this innovative vibration-based approach and conventional and “evidence-based methods,” such as steroids or head-of-bed elevation, it should be noted that the actual mechanism of the “evidence-based methods” is not in fact known. For instance, the literature on the effects of steroids on edema is highly controversial; some studies

report that steroids offer no benefit.³⁻⁶ Although not clearly proven, the anti-inflammatory characteristics of glucocorticoids should theoretically result in a decrease in vascular permeability, thereby reducing exudates and edema.⁷ However, whether a decrease in vascular permeability following steroid treatment is desirable in rhinoplasty, or whether this decrease would affect edema, ecchymosis, and wound healing, is unknown. Although steroids are associated with some complications, side effects, and mood changes (including depression or euphoria), they are commonly administered as part of rhinoplasty treatment.⁸ In addition, because the presented study is a Level 1 clinical study, it provides a good demonstration of evidence-based medicine.

On the other hand, as stated in the article: “Recent studies concluded that low-magnitude, high-frequency vibration (LMHFV) therapy induces the mesenchymal stem cells to rebuild the soft tissue, activates osteoblasts, and decreases the osteoclastic activity to increase the bone healing,” and “Moreover, recent studies about the effect of LMHFV therapy were very exciting. It was demonstrated that vibration therapy induced an anabolic effect on the mesenchymal stem cell and osteoblast activity and decelerated the catabolic effects with osteoclastic activity, thus decreasing bone resorption and increasing bone formation

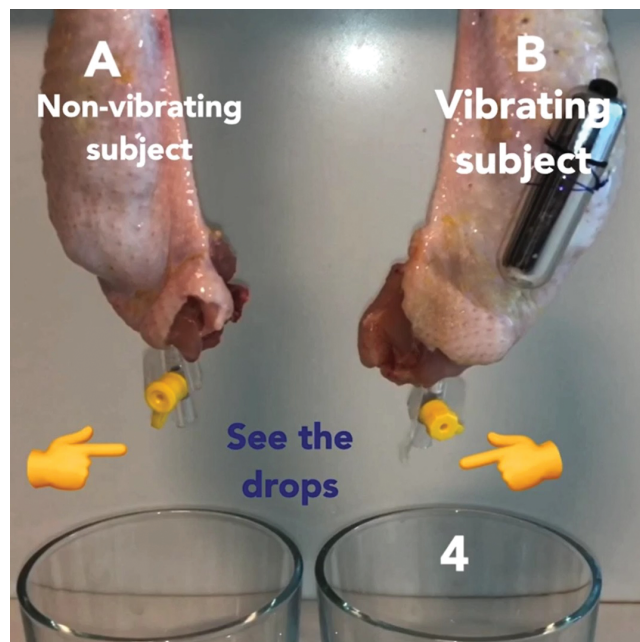
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and therefore bone strength. It also stimulates collagen synthesis and increases the tendon and muscle strength by differentiation of the mesenchymal stem cells. Because of these effects, vibration therapy is employed even in the treatment of sarcopenia. Because the nasal bones are small and heal very slowly, utilizing vibration treatment may be helpful in providing more stable nasal bones; however, this requires further study.² Most cells are created from a lineage of progenitor cells. These progenitor cells are known as mesenchymal stem cells and are multipotent stromal cells capable of differentiation along myogenic, osteogenic, chondrogenic, and adipogenic lineages, and are also known to be immunomodulatory, reducing strong inflammatory responses within tissues, promoting wound healing, angiogenesis, and migration to the injury site. There is a specific field of medicine, known as regenerative medicine, investigating how these multipotent stem cells augment healing. Regenerative medicine involves tissue engineering and repair procedures in vitro, in which stem cells are induced to differentiate towards a required lineage and then implanted back into the patient to effect healing or regeneration. To stimulate differentiation, steroids, growth factors, or chemical agents are used in vitro; however, these approaches have some side effects in vivo, as well as cost implications. Therefore, the idea of LMHFV inducing stem cell repair is very exciting.⁹ The stimulation of mesenchymal stem cells, which modulate the immune system, alleviate the inflammatory response, and induce angiogenesis, is probably one of the mechanisms via which vibration acts on edema and ecchymosis.

One of the most robust findings in the study is a reduction in patients' postoperative pain, which is associated with less inflammation and possibly less postoperative swelling and bruising. Another mechanism to reduce edema and ecchymosis is the increased level of lymphatic and blood flow, as stated in the article.² Increased lymphatic and blood flow will eliminate the stasis that occurs due to inflammation and causes swelling. I suggest that this mechanism can essentially be explained in terms of the motion energy created by the vibration. Vibration accelerates blood flow and drainage, and this helps to resolve the edema. To demonstrate the efficiency of the vibration, I designed an in vitro experiment (Video 1, available online at www.aestheticsurgeryjournal.com). I took 2 fresh chicken wings and inserted a yellow cannula into the main vein located in the medial and proximal side, to observe the reuptake (Figure 1). After stabilizing the cannulas with sutures, I injected 30 mL isotonic saline solution into the middle part of the wings (Figure 2). Then I hung the wings up and applied vibration to one (specimen B) and nothing to the other (specimen A). I collected the isotonic saline solution from each specimen in a glass, and observed and recorded the drainage. The volume flowing from specimen



Video 1. Watch now at <http://academic.oup.com/asj/article-lookup/doi/10.1093/asj/sjaa049>.

B was almost 1.5 times greater than that from specimen A (Figure 3). Therefore, this basic experiment indicates that vibration significantly enhances the movement of liquids. This observation correlates with the findings of the reported clinical study, which was a Level 1 study demonstrating the in vivo effects of vibration treatment. I do not recommend vibration treatment in first 3 days after surgery, because vibration may increase bleeding via the same mechanism.

Furthermore, instead of postoperative massage, I apply a vibratory splint to my patients which works according to the same logic. In a further study, I will report these results, but in summary this splint is more effective than postoperative massage.

The main value of this study is as the first report of vibration treatment for edema and ecchymosis. Previously, vibration treatment has been used for its analgesic effect in chronic musculoskeletal pain, venipuncture, diabetic peripheral neuropathy, injection-associated pain during dental and cosmetic surgery, and for inducing mesenchymal stem cells in fracture healing, osteoporosis, osteogenesis imperfecta, and tendon and muscle healing. All we try to do as surgeons is to advance science and increase the quality of the treatment modalities. All these advances and studies will help us achieve that purpose.

Disclosures

The author declares that he has no conflicts of interest, commercial associations, or intent of financial gain regarding this research. The vibrating nasal cast (a thermoplastic cast with

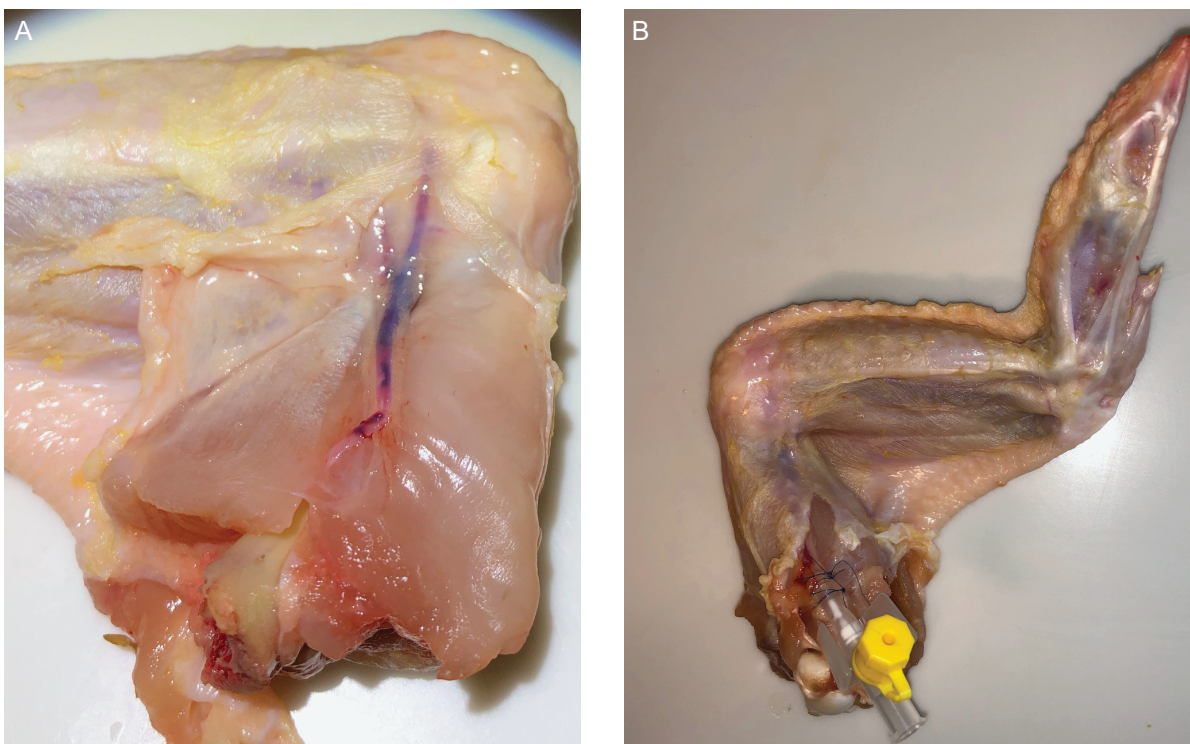


Figure 1. (A) The main vein in the medial and proximal parts of the chicken wing. (B) After cannulation and stabilization of the cannula with sutures.

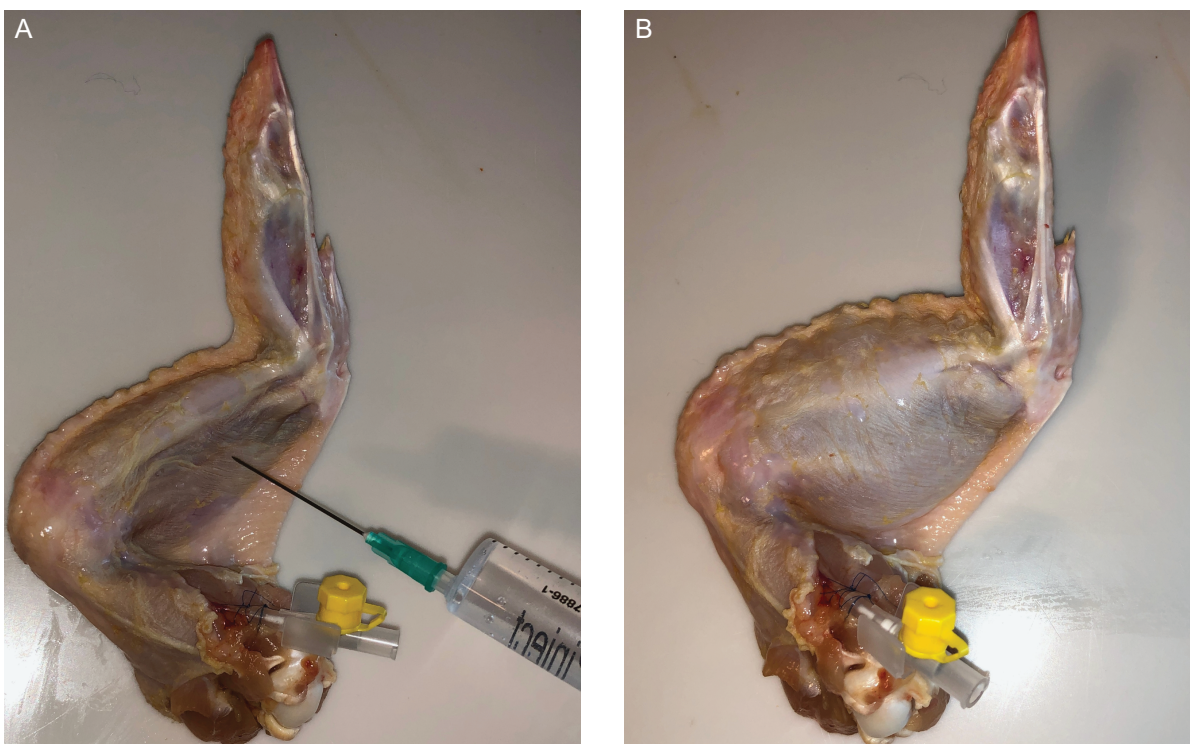


Figure 2. (A) Isotonic saline solution was injected into the middle third of the wing. (B) After a 30-mL injection, swelling of the wing is observed.

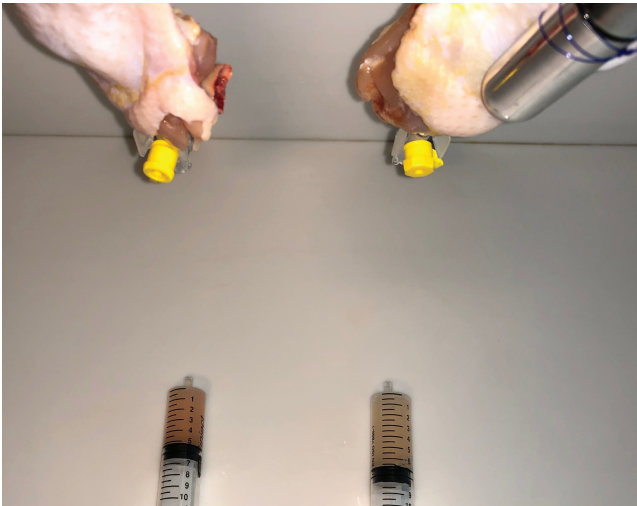


Figure 3. After 5 minutes of observation, the volume that had flowed from specimen B (right side of the figure, 7 mL) was almost 1.5 times higher than that from specimen A (left side of the figure, 5 mL).

an elastic bandage and vibrating motor) was designed by the author (S.T) and is patented by the Turkish Patent Institute (no TR 2016 14675 B). This invention is not commercially available.

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