The modern biologic model of orthodontic treatment has revealed soft-tissue elements as the primary drivers of therapeutic outcomes. The periodontium, neuromusculature, airway, temporomandibular joint, and facial contours, as well as their evolution over the life of the patient, all dictate how we must approach treatment as orthodontists.1-7 Therefore, it is essential that we not only cultivate greater understanding of soft-tissue function and esthetics, but that we also equip ourselves with tools that enhance our command over soft-tissue elements. Otherwise, we fall far short of what we can deliver for our patients.

Neuromodulators and soft-tissue fillers provide orthodontists with a minimally invasive means of addressing soft-tissue obstacles to orthodontic goals, and thus have an important role to play in patient care. These tools will continue to expand the envelope of orthodontic changes that are possible without surgery, and will make significant cosmetic and functional enhancements more accessible to a greater number of patients.

In this article, we will briefly review the action of injectable neuromodulators and soft-tissue fillers, discuss their clinical value, and present cases to illustrate how their use enhances orthodontic care. This article should serve as a proof of concept, with contemporary references, and I urge the reader to monitor and contribute to progress on this front in orthodontics.

Traditionally, disharmonies of the soft-tissue envelope beyond the scope of simple tooth movement have been left to surgical correction, or have to be accepted as less than ideal. However, soft-tissue fillers now provide us a means to bridge the gap between surgical intervention and orthodontic therapy. They also empower the clinician to engage in soft-tissue finishing—whereby, dentoskeletal anomalies are confronted by addressing their soft-tissue manifestations. Let us briefly consider a few examples.
Case: Soft-tissue Le Fort

Patient presented with mild maxillary retrusion and reduced upper vermilion projection. As an alternative to maxillary surgery, the skeletal deficiency was addressed and soft-tissue relationships were corrected using Juvederm XC (Allergan), a hyaluronic acid filler. Before and after profile photos, as well as a cephalometric superimposition showing normalization of lip projection is shown.

Case: Cosmetic camouflage

Patient presented with reduced dental support resulting in esthetic decline of the facial soft tissues. Significant retrusion and retroclination of the incisors relative to upper facial structures could be seen upon evaluation of her profile while smiling. Although her case of dental retrusion was due to the extraction of four bicuspid combined with orthodontic retraction of the dentition, this can also present as congenital in some patients.

Ideally, dental support would have been restored orthodontically, but the patient declined comprehensive orthodontic treatment and instead elected for a cosmetic camouflage of the underlying hard-tissue deficiencies with soft-tissue fillers. A combination of Radiesse, a calcium hydroxylapatite filler in a gel carrier, and Juvederm XC were used to restore balance to the lower third of the face by lifting the oral commissures while advancing the lips and perioral soft tissues. Esthetic changes to the lower third of the face can be seen in the oblique and profile views.
**Case: Black triangles**

The application of soft-tissue finishing principles is not limited to macroesthetic concerns alone. Tissue engineering using hyaluronic acid fillers to correct black triangles is another quite effective, though largely unknown, indication for their use in orthodontics. We see here the restoration of papillary volume after treatment with hyaluronic acid.

Whether we prescribe orthognathic surgery, adjunctive esthetic surgeries and treatments, simple orthodontic tooth movement, or a combination of the above for our patients, the responsibility to design optimal esthetic outcomes lies with the prescriber, the orthodontist. Thus, as the prime mover in esthetic treatments, it is incumbent upon us to present and—more importantly—execute appropriate treatment options, including the use of injectable soft-tissue fillers.

**Neuromodulator-enhanced orthodontics**

Although often mistaken for soft-tissue fillers, neuromodulators do not increase soft-tissue volume; instead they act upon neural transmission in a highly precise fashion. The most widely recognized brand of neuromodulator, BOTOX, has become synonymous with cosmetic therapies of all kinds. However, the conventional wisdom that products like BOTOX treat wrinkles is a gross misapprehension about the nature of these drugs.

BOTOX and other purified botulinum toxins are simply injectable medications originally designed to therapeutically reduce the strength of targeted muscles by suppressing the release of acetylcholine from motor neurons. Their use for cosmetic purposes is a relatively recent phenomenon, and their impact on wrinkles is more appropriately classified as a side effect of their clinical action, one that must be managed by the practitioner as with any other medication. In this sense, they have one of the most favorable safety profiles of any class of drug, since wrinkle reduction is the primary side effect of the medication and there is no systemic effect or distant spread observed at the clinical doses used in orthodontics.

This ability to target and control the neuromusculature liberates the orthodontist from many potential myogenic obstacles to orthodontic care and enhances treatment. It has already been established that neuromodulators are effective in treating hyperactive and asymmetric smile curtains, but there are many other valuable applications in orthodontics that have largely been unexplored.

Perhaps the most relevant indication for neuromodulator-enhanced orthodontics is for adult patients exhibiting brachyfacial skeletal patterns. This phenotype of the patient presents a significant treatment challenge. Having concluded active pubertal growth, the resting length and functional capacity of the massteric sling in these patients has become established and very resistant to stable vertical development.

Additionally, their latent growth pattern poses an ongoing problem to retaining any vertical enhancement provided orthodontically. These problems are further compounded by increased occlusal loading and bone density, due to stronger masticatory muscles, that significantly retard the rate of orthodontic tooth movement.

**BOTOX and other purified botulinum toxins are simply injectable medications originally designed to therapeutically reduce the strength of targeted muscles by suppressing the release of acetylcholine from motor neurons.**

By addressing the neuromusculature with a medication like BOTOX, we deal with the root cause of these obstacles and unlock skeletal deep bite patients to achieve more effective vertical development. Periodic treatments, no more than once yearly, may be administered to act as an active chemical retainer to stabilize the vertical changes that are produced. Additionally, dosing can be tailored to reduce the size of the masster muscles and provide the esthetic benefit of increased facial taper, which is often deficient in these individuals. Let us explore the advantages of this treatment approach with focus on the macroesthetic changes that occur.

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Case: Neuromodulator-enhanced orthodontics

Patient presented for examination with an anterior crossbite, deep overbite, asymmetric mandible, and Class III malocclusion. No functional shift was present. Orthognathic surgery was discussed to address the mandibular asymmetry, but the patient declined. Neuromodulators were used in conjunction with Invisalign to correct the bite and provide the vertical development necessary to achieve acceptable functional and esthetic outcomes. The improvement in the patient’s smile and bite after 13 months (at end of the initial series of active aligners) can be viewed from the frontal and oblique views. Additionally, the progression of the patient’s facial taper in response to the neuromodulators can be observed from baseline to five months and 13 months into treatment.

Aside from enhancing our biomechanics, neuromodulators are useful in a wide range of dental therapeutic indications, from simple bruxism to recapturing displaced discs. They also possess additional therapeutic actions, such as the suppression of neuropathic pain, making them a robust tool for the treatment of TMD, neuralgias, migraines, and various forms of orofacial pain. In fact, BOTOX is the only FDA-approved medication for the treatment of chronic migraines, and is twice as effective as traditional treatments.

In the past, acrylic and occlusion were the only answers orthodontists had for migraines and orofacial pain, so it is understandable why many have been frustrated with their efforts treating these patients. Now clinicians can deliver more effective treatment of these conditions by combining, or in many cases replacing, traditional therapies with neuromodulators. This is illustrated by the following case example.
Case: Therapeutic neuromodulators

Patient presented for evaluation with a history of episodic migraines. Occlusal findings were not significant. The patient’s headaches were characterized by pressure and pain originating on the forehead, over the right eye, that progressed to the right side of the head.

Neuromodulators were administered to the forehead and peri-orbital musculature for the prophylactic treatment of cephalgia, and a significant reduction in headache frequency and severity was achieved. As a consequence of treatment, there was a reduction in forehead and peri-orbital wrinkles. The overall esthetic improvement of the upper face can be seen in the initial and four week post-procedure photos of the upper face in repose. Before and after photos of the patient attempting to frown demonstrate the reduction in muscular hyperfunction produced by the neuromodulators.

Many without adequate knowledge of the action of medications like BOTOX make the mistake of considering “cosmetic” and “therapeutic” treatments as distinct, when in fact the two are one in the same. Managing esthetic side effects is an integral part of proper orofacial pain management with neuromodulators. The muscles injected for the prophylactic treatment of migraines and cephalgia are the same muscles responsible for fine lines and brow deformities. In the same sense that detailing the shade and shape of teeth is important to restorative dentistry, being mindful of the esthetic implications of therapeutic treatment is essential to the clinical application of neuromodulators.

Managing esthetic side effects is an integral part of proper orofacial pain management with neuromodulators.

Facial taper progression at Initial (left), five months (center), and 13 months (right)
Closing remarks

It is understandable that some orthodontists may be reticent to embrace soft-tissue orthodontic treatments, and to date there has been considerable confusion regarding their standing within the scope of practice. However, if we are to take even the most basic definition of orthodontics as outlined by the ADA, orthodontists are tasked with the treatment of “neuromuscular and skeletal abnormalities in developing and mature orofacial structures.” The application of both soft-tissue fillers and neuromodulators, as I have outlined them, certainly fall squarely within our purview as orthodontists, and they are as simple and safe to administer as procedures we already perform.

As the orthodontic profession continues to evolve, it is time that we had a long hard look in the mirror and considered what our role as orthodontists will be in the future. To continue to deliver excellent care and stay relevant as a profession, we must be willing to recognize the full needs and demands of our patients, and develop the right skill set to meet the challenges that we face.

Our recognition of the soft-tissue paradigm enjoins us to increase our understanding of the soft tissues and adopt new tools to advance the level of orthodontic care. In the same way that temporary anchorage devices have impacted the practice of orthodontics, neuromodulators and soft-tissue fillers will further extend the envelope of changes that are possible with treatment and will help fuel a paradigm shift that has already been set in motion.

References

What is your experience with soft-tissue orthodontics? Comment on this article at Orthotown.com/Magazine.aspx.

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