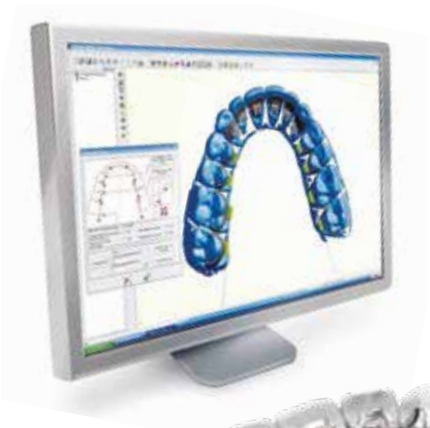
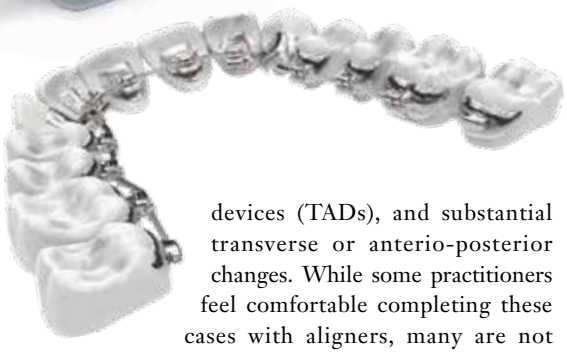
When Lingual Treatment Is the Best Option

Despite advances in aligner treatment, lingual appliances still offer advantages

BY SHAWN L. MILLER, DMD, MMSC



HARMONY Lingual System from American Orthodontics



How do orthodontists distinguish themselves from primary care dentists who offer aligner-based orthodontic treatment? How do orthodontists distinguish themselves from their orthodontist colleagues? By offering lingual treatment.

In today's competitive orthodontic marketplace, the legion of aligner therapy providers seems to be incessantly expanding. And with the tremendous advancement in efficacy of aligner-based orthodontic treatment, the apparent role of lingual braces in a modern orthodontic practice is sometimes questioned. However, despite significant advances in treatment mechanics with aligners, there are still a number of situations where lingual appliances may represent the best option.

In our practice, it is not uncommon for new patients to specifically request lingual braces. There are a number of reasons for this explicit request. We have seen patients who have already attempted or completed aligner therapy, and have not been satisfied with the results or were not able to tolerate the aligners due to the strict compliance requirements. These patients have no interest in trying aligners again, nor will they be satisfied with labial ceramic brackets. More rarely, we have seen a few patients with allergic hypersensitivity to certain aligners that precludes them from using removable trays. But sometimes the issue is more nebulous—a friend, co-worker, or family member had aligner therapy and by voicing their complaints and concerns, they have affected the decision of the interested patient. Whatever the reason, the demand is real. While the public awareness for aligner therapy is much higher, and requests greater, there is still a place in our practice for lingual braces.

From the orthodontists' standpoint, depending on their comfort and skill with aligners, there still may be certain cases that are beyond the scope of that appliance type. While lingual braces do have a learning curve and require practice, education, and patience, they are still familiar appliances mechanically. Dealing with wires, chains, brackets, elastics—albeit in a slightly different fashion—involves more typical mechanics that orthodontists are accustomed to. The esoteric adage "think like plastic" definitely doesn't apply.

In our practice, typical lingual appliance cases often fall into more complex case categories, including, but not limited to, cases involving orthognathic surgery, Accelerated Osteogenic Orthodontics (Wilckodontics©), posterior extractions, temporary anchorage devices (TADs), and substantial transverse or anterio-posterior changes. While some practitioners feel comfortable completing these cases with aligners, many are not quite ready to jump into those cases with seemingly less control over the mechanics throughout treatment. Not being able to quickly react to occlusal changes occurring at every stage of treatment is one of the vexing aspects of aligner therapy.

Although we currently use lingual appliances on challenging cases, it is important to at least begin with a few straightforward and simpler cases in order for the doctor and staff to gain experience and become acquainted with the appliance. Using a "hybrid system" in which there are lingual braces on the upper arch and labial braces on the less-visible lower arch is also a fabulous way to work up to more difficult cases.

Appliance System

Currently, we are using the HARMONY Lingual System (American Orthodontics). After working for a number of years with another popular lingual braces system, we have been very pleased with the results and practice integration with HARMONY. With the ability to now scan patients (the iTero® Element™ scanner, from Align Technology Inc, has been validated and others are accepted) to submit the digital records online, the process has been streamlined from polyvinyl siloxane impression submission and thus requires fewer steps during fabrication. The digital files are directly imported into the manufacturing software, which allows the brackets and wires (SS, TMA, NiTi) to be designed virtually, potentially eliminating errors that are introduced with plaster models

SHAWN L. MILLER, DMD, MMSC, is in private practice in Orange and Aliso Viejo, Calif. He completed his dental degree at the University of Pennsylvania School of Dental Medicine and his Masters of Medical Sciences degree and orthodontic residency at Harvard University School of Dental Medicine. He lectures on accelerated orthodontic treatment, lingual braces, and interdisciplinary orthodontic treatment.

Figure 1A (i-iii): Palatal alveolar indirect anchorage with 18 x 25 SS wires bonded to mesial of premolars.

Figure 1B (i-iii): Palatal para-median indirect anchorage with 21 x 25 SS wire bonded to mesial of first molars.

and light scanning. Once lab technicians complete the setup, the orthodontist is able to direct any desired changes to the occlusion, teeth positions, interproximal reduction, and arch forms using a virtual 3D setup. Any extra torque can also be prescribed and built into any bracket, as well as auxiliary tubes and sheaths.

Probably the two most important aspects of the HARMONY System, which were critical in our decision to switch, were the self-ligation brackets and the edgewise brackets. The self-ligating brackets are very simple to master, easy to delegate, and familiar to orthodontic assistants. Lingual elastomeric ties, steel ties, and other complex ties (lasso ties, double overties, co-ligation, etc) were time-consuming and difficult for the staff to master clinically. It was also complicated for the staff to fully understand when and why certain ties were being used, therefore requiring constant doctor input. The HARMONY System's self-ligating brackets require very little special supervision, because there are no complex "tie-in" protocols. The other substantial advantage was the edgewise slot, in comparison to the vertical (ribbon-wise) slot in other systems. I find that the edgewise slot offers superior transverse control, anterior tip control, and posterior rotation control. There are very few modern labial orthodontic systems that use a vertical slot, which is a testament to the

Figure 1C: Palatal indirect anchorage with ligature tie to first molar bracket.

advantages of the edgewise slot.

Cases

In the clinical photos shown here, I wanted to explore some advanced auxiliaries and mechanics used in lingual cases in order to achieve optimal results. This should appeal to the more proficient lingual clinician, but will also show any novice lingual provider what the system is capable of.

Using Temporary Anchorage Devices (TADs) Palatal

In the maxilla, the consensus area of choice for TADs is in the palate. It offers superior retention in a low-risk area, with extreme ease of placement. There are a variety of applications and possible utilizations from this position. For extraction cases needing absolute or enhanced anchorage, the TADs can be placed in a number of positions for either indirect (Figure 1) or direct (Figure 2, page 28) anchorage. The TADs can be attached indirectly using composite or steel ties, and can be placed in a midline or para-median position, or into the palatal alveolar ridge. Alternatively, the TADs directly can retract individual teeth by attaching elastic chains to bracket hooks or they can retract the entire anterior segment utilizing crimpable archwire hooks. A very common secondary application of palatal miniscrews is for posterior intrusion (Figure 3, page 28). With or without a transpalatal support bar (attached with sheaths custom built into the lingual bracket), the TADs can directly be attached to individual teeth or the archwire with elastic chain or nitinol coils. The forces can be directed slightly anterior or posterior as needed, and can also differ on each side. Controlling torque and tip on the molars can be accomplished either with archwire adjustments chairside, prescribing the custom wires/brackets with additional torque compensation, or adding buccal TADs to counteract palatal tipping.

Using Temporary Anchorage Devices (TADs) Buccal

Of course, TADs can be placed for anchorage as well in the buccal regions of the maxilla and mandible (Figure 4, page 28). Although the patient may object to the "visibility" of the TAD, this initial objection

Figure 2. Palatal alveolar direct anchorage with elastomeric chains directly to cuspid hooks for retraction. Once the anteriors were aligned, crimpable hooks were placed distal to the canines on the archwire and en masse retraction (with a slight intrusive vector) was started.

Figure 3: Palatal direct intrusion with elastomeric chains to the 17 x 25 SS archwire and bracket. Two chains on the left for increased intrusive force. A TPA bar is used for stabilization, which is inserted into custom sheaths on the molar bands.

Figure 4A: Mandibular indirect buccal anchorage for molar protraction using composite buttons. A lingual chain is also being used simultaneously with the lingual appliance system to prevent arch bowing and unwanted tooth rotations.

Figure 4B: Maxillary indirect buccal anchorage using a 18 x 25 SS wire bonded to facial of second premolar. Elastomeric chains are being used both on the buccal and lingual for balancing of forces.

Figure 4C (i-ii): Maxillary direct buccal anchorage using elastic forces to close the posterior open bite (note the hybrid system, with labial lower braces and lingual upper braces).

tends to wane after explaining the reasoning and efficiency gained by using skeletal anchorage. As stated above, in the maxilla, the palatal is the principal location, but if the palatal is not feasible, the buccal can be used for direct or indirect anchorage. In the mandible, lingual placement is difficult, uncomfortable for the patient, and very unstable. Therefore, buccal placement is the most typical location, including the buccal shelf. The mandibular retromolar sites are also common. Similar to applications with palatal TADs, mechanically the miniscrews can be used for intrusion, enhanced anchorage, or to help with elastic forces when used either directly or indirectly.

Surgical Cases

With orthognathic surgery, lingual braces are an excellent choice, as with any custom appliance. The postsurgical occlusal result can be visualized in the 3D virtual simulation, which allows for precise planning for optimal outcomes. The presurgical setup becomes very efficient, and postsurgical finishing can commence without delay (compared to ordering new aligners for finishing). The main dilemma becomes how the surgeon

Figure 5A: Postsurgical stabilization with composite labial buttons and elastic forces. Lingual braces are on both arches. This was a single jaw, single piece maxillary LeFort advancement.

Figure 5B: Postsurgical stabilization with partial labial braces and elastic forces. Again, lingual braces are on both arches. Labial wires were planned, but ultimately not needed.

Figure 5C: Postsurgical finishing with partial maxillary braces and a 16 x 22 SS archwire. This is a hybrid setup (lingual maxillary appliance and labial mandibular appliances). The labial wire was used to help establish arch form and stabilize the arch after a multipiece maxillary LeFort 1 procedure.

Figure 6: Rapid Alveolar Expansion (RAE) with an expansion screw fabricated to fit custom lingual sheaths attached to first molar bands. This adult patient had Wilckodontics to facilitate expansion.

handles not having the typical labial braces to ligate the surgical stent and/or fixate the jaws together with steel wire or traction elastics. There are a number of possibilities to work around these obstacles, depending on the preferences of the oral surgeon involved with the case (Figure 5, page 28). In a routine jaw surgery with an excellent presurgical setup, perhaps only a few aesthetic composite labial buttons are all that is required. In that situation, the lingual wires are left in place for the surgery. If the surgeon requests a labial wire, partial ceramic or metal braces can be used, and a passive wire (usually 16 x 22 SS) can be inserted prior to the surgical date. This often is requested in a multipiece LeFort case, so that the arch form can be stabilized and shaped soon after surgery. It is important to note in multipiece maxillary surgeries, that the presurgical planning needs to be specially fashioned. In a standard lingual case, the archwires will be designed for the *final* postsurgical result, therefore it is important to work with sectional lingual wires prior to surgery, custom wires (to keep the arch narrow), or light wires that will not aggressively orthodontically expand to the final postsurgical arch width size. In these instances, the lingual wire is removed or sectioned prior to surgery. In general, in any lingual surgical case, labial wires and/or labial braces are on for about 1 to 2 weeks prior to surgery, and are kept on 4 to 6 weeks post-surgery. Depending again on the oral surgeon, TADs can also be used in lieu of labial braces for fixation to the stent, intraoral elastics, or inter-arch ligature wire fixation.

Expansion

Maxillary expansion can be done with a custom RPE screw attached to lingual sheaths (Figure 6, page 28). These expanders can be used in conjunction with Accelerated Osteogenic Orthodontics (Wilckodontics) surgery to allow for greater alveolar expansion, with potentially increased bone support via bone grafting. This allows for controlled expansion and no time delay converting to aligners in a two-step approach. When doing accelerated treatment, any time lost in order to get additional aligners is disadvantageous. Wilckodontics utilizes the regional acceleratory phenomenon (RAP), which only lasts 4 to 6 months in humans, so time is of the essence. For the HARMONY Lingual System, the RPE is fabricated on a stone model from a pickup impression in alginate, using an analog of the lingual sheath. The expander can be easily inserted and removed as necessary from the sheath.

Summary

Lingual braces remain an important tool in a modern orthodontist's repertoire. While aligner therapy is growing rapidly and is being increasingly used in more complex cases, there is still often no greater feeling than having full control of challenging movements in dynamic cases. Providing lingual treatment definitely distinguishes progressive orthodontic specialists from primary care dentists, who seldom use lingual braces due to clinical skill and orthodontic knowledge required. **OP**