Improving collaboration and clinical outcomes

Arlen J. Hurt, CDT, explores some clear aligner options and tips for making the right choice

Clear aligners are becoming a popular alternative to traditional braces as patients seek esthetic treatment choices. As consumers become more educated with regard to their orthodontic options, “anterior-only” therapy may be the treatment of choice for cases such as anterior relapse or minor tooth movement. At the same time, the total length of treatment is an issue, especially with busy time-conscious adults. For these cases, anterior aligners can offer a viable solution with improvements in as little as 4 to 6 months.

Now, nearly every orthodontic laboratory in the world offers some form of aligner service. The orthodontist’s choices regarding which service to use and what types of results can realistically be obtained have almost become overwhelming. There are hard- and soft-tray systems as well as claims to move teeth .025 to .50 mm per tray. Which system works the best? Regardless of the specific system used, three main areas should be considered to achieve success. These include: proper patient selection and case diagnosis; patient cooperation and motivation; and technical execution both in the clinic and laboratory. These factors are further enhanced by excellent communication between the clinician, patient, and laboratory.

Success with aligner treatment

By definition, treatment with Clear Image® Aligners (Specialty Appliances Orthodontic Laboratory) addresses just the anterior teeth, including selective repositioning of the cuspids as needed. Therefore, treatment expectations for the clinician and patient must be realistic in terms of the types and amount of tooth movement. Cases that respond well to these aligners include minor rotations, labial/lingual movement, and mild space closure. With each reset in the aligner sequence, rotations are usually in the 2-3-degree range, and teeth may be moved .5 mm in the lingual/labial orientation (Figures 1 and 2). Anterior crowding is typically addressed with interproximal reduction (IPR) as posterior expansion and/or anterior posterior movement is beyond the scope of this treatment modality. Also, when treating both arches with aligners, changes in the anterior occlusion must be carefully monitored to avoid undesirable interferences. Again, patient selection is critical, and case diagnosis must take into account the tooth movement limitations with anterior aligner systems.

In addition to the obvious esthetic advantages with aligners, another “selling point” for adult patients is the reduced treatment time when addressing just the anterior teeth. With each aligner in the sequence worn for 3 weeks, significant corrections can take place in 4 to 6 months. Despite these advantages, patients must still be carefully informed of and understand the limitations of the anterior aligner. One example is the difficulty in predictably changing vertical dimension, such as leveling incisal edges with anterior aligners.

Patients are expected to wear their aligners up to 22 hours per day, removing them for eating and cleaning only. They may experience slight discomfort when moving from one aligner to the next due to the changes introduced into each subsequent appliance. This new “pressure” usually decreases within 24 to 48 hours as the teeth adapt to each aligner. Informing patients about this effect is important so they know what to expect.

Communication between the orthodontist and the laboratory is one of the most important elements of successful aligner treatment. This begins with the orthodontist’s diagnosis and treatment plan, including what amount of IPR is required and where. After the IPR needs have been established, the laboratory technicians will incorporate this into the sequence of aligners as the teeth are repositioned. When the aligners are returned to the orthodontist, the IPR is summarized (amounts and locations) so the orthodontist can duplicate this clinically. Without complete coordination of the

Figure 1: This is a typical lower arch correction with a series of four aligners. Slight IPR (.2 mm per contact) was done on the right central and lateral. Total treatment time was just 12 weeks. A fixed lingual retainer is often used immediately after the aligner phase.

Arlen J. Hurt, CDT, graduated from Indiana University in 1984 with a Dental Laboratory Technology Degree. He started working for Specialty Appliances in 1984 and is currently the Vice President of the company. Arlen has traveled to numerous orthodontic meetings as an exhibitor and presenter. He also assisted in Hands-On Herbst™ training for 9 years with Dr. Terry Dischinger. Arlen has invented the RES™ Expansion screw, Herbst AppleCore Screw, Mini-Palex™ Expansion screw, Herbst MiniScope mechanism, and various orthodontic appliances over the last 27 years. He is the 2008 winner of the National Association of Dental Laboratories (NADL) Harry Hagman inventor of the year award.
IPR between the orthodontist and laboratory, the aligner treatment may become compromised.

The aligner manufacturing process
As with all laboratory manufactured appliances, aligners require excellent impressions and models. We recommend using a 100-hour impression material such as Algimax® (JBC and Company), Kromopan® (Lascod SpA), or Silginat (Kettenbach). These materials are highly stable and produce highly detailed models when poured with orthodontic stone. The stone is critical to the laboratory manufacturing process and should be used exactly according to the manufacturer's instructions.

In the laboratory, a great amount of experience and skill is required to produce accurate set-ups capable of moving the teeth in a consistent manner. At Specialty Appliances, we have an extensive background in resetting teeth for spring retainers, lingual class services, and tooth positioners. It is critical to understand the limitations of tooth movements in all dimensions, and at the same time progress the case through each stage toward completion as efficiently as possible.

The typical anterior aligner case involves three to four appliances per arch, with each aligner worn for 3 weeks. Both arches can be treated together, or a single arch can be fabricated. Either way, the opposing model is highly recommended to make sure all occlusal relationships are taken into consideration when repositioning the teeth. Cases with moderate amounts of tooth movement may need additional aligners beyond the initial series of four. Our process is to receive a new model (reflecting the IPR done clinically to this point) where we can continue repositioning the teeth to the next stage toward completion. Our experience suggests that a sequence of four to five aligners fabricated from an initial model can produce significant tooth movement, yet remain quite predictable in the outcomes. Attempting to fabricate a larger number of appliances with optimum clinical "tracking" can be very difficult with a manual resetting system.

As the teeth are repositioned in the laboratory using the orthodontist's prescription instructions governing movement and IPR, the changes are monitored using vision-referencing equipment (Figure 3). While quite simple in application, this system can track movements as small as .25 mm and rotations of 2 degrees. By comparing each new set of changes to the previous stage, the teeth are repositioned throughout the aligner sequence until the final results are achieved. This reset process is an entirely manual process compared to the sophisticated software used to digitally reposition teeth by companies including Align Technology for their Invisalign® system, Ormco for their Insignia™ Custom Brackets (Sybron Dental Specialties Inc.), and OraMetrix® Inc. for their robotic wire bending products.

We also have the ability to incorporate certain targeted digital applications with our aligners. Using a 3-D scanner from 3Shape Corporation combined with their OrthoAnalyzer™ software, we are able to assist the clinician in determining the amount and locations of IPR required for an aligner case and relay this information to the orthodontist as part of the diagnostic information (Figure 4). Orthodontists can also download this software in a “viewer version” to better examine the results from the Ortho Analyzer™ software. Practices are also purchasing these types of tabletop 3-D scanners to do their own in-office electronic study models and eliminate the need for an outside service. Once a model is digitized in the practice, it can be sent to our laboratory where it is converted into a physical model using an Objet 3-D digital printer (Objet Geometries Ltd). These 3-D “printed” models can be used for aligners or any other type of appliances such as a Herbst or for indirect bonding.

As Specialty Appliances continues forward in the aligner market, our commitment to researching the best materials and methods, as well as cultivating the orthodontist/lab relationship remains our focal point. We look forward to bringing new developments to the aligner market as well.