



A Clear Method

*Satisfying aesthetically astute patients
using modern aligner therapy,
digital workflows and predictable
composite attachments*

Introduction

Historically, orthodontic treatment of alignment issues involved metal or ceramic brackets for the vast majority of patients—especially adolescents—to realize the necessary corrections. This orthodontic patient base consisted mostly of children between the ages of 6 and 18.

Since clear aligners were introduced, however, they have increasingly gained in popularity because they can address the full gamut of orthodontic needs. Unfortunately, that wasn't always the case; the first clear aligners treated only mild malocclusions, such as crowding and spaces between teeth.¹ As a result, if a patient needed more complex corrections, they were required to get ceramic or metal braces.

Adult patients, however, didn't view these options as an attractive alternative, so they opted against orthodontics altogether.²

The only other option for patients who wanted a less noticeable, more aesthetic alternative for straightening their teeth, was "clear" ceramic braces. Few teens, but many adults, chose this option.

Today, adolescents and adults are enjoying the benefits of clear aligners for straightening their teeth and addressing a multitude of orthodontic issues. The technology has improved greatly in the past decade, and now, virtually all orthodontic issues that previously could be achieved only with ceramic or metal appliances can be corrected with clear aligners.

In particular, the use of stronger plastics enables the aligners to withstand tooth pressure and generate the forces necessary for more extensive and precise movement.³

Many times, a combination of elastics or limited fixed appliances is needed to facilitate aligner treatment. The software used to plan the patient's tooth movement (e.g., Invisalign ClinCheck) determines if composite attachments, bonded buttons or temporary anchorage devices are needed on specific teeth, and where, to achieve the necessary movement for proper alignment.⁴

Success with clear aligners is predicated on proper case selection (particularly for adolescents) and education, and adolescents are actually fairly compliant. In my practice, more than 400 aligner cases have been initiated, and only two teenage patients were switched to traditional braces. In fact, selection of braces versus clear aligners is approximately 70 percent to 30 percent.

Alternatively, adult patients—who are typically financially responsible for their treatment—opt for clear aligners. This decision is almost exclusively based on aesthetics and a desire to straighten their teeth in a less noticeable manner. After reviewing the benefits and potential disadvantages of clear aligners compared with traditional orthodontics, 95 percent of adults chose clear aligner treatment. However, there is *not* a good correlation between who is paying for treatment and compliance with wearing the appliance. (Many people pay for a gym membership but still don't go.)

Clear aligners' benefits over traditional braces include greater patient comfort, easier oral hygiene and enhanced aesthetics during treatment.⁵ Research has shown that patients undergoing clear aligner orthodontics experienced less pain compared with patients wearing fixed orthodontic appliances.^{6,7}

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Fig. 1: The teeth were isolated using a soft, flexible and latex-free lip and cheek retractor.



Fig. 2: Bonding agent was applied to the teeth where attachments would be placed according to the manufacturer's instructions.

Case presentation

A 46-year-old patient presented for a secondary consultation after receiving a quote for clear aligners from a general dentist, and she wanted another opinion. Ten years earlier, she was informed during a consultation that she was not a candidate for clear aligners, so she chose not to undergo orthodontics altogether. A professional in the dental industry, the patient said her primary concerns were spacing and overlapped teeth, and she specifically stated that she wanted a straighter smile without undergoing fixed prosthodontics.

During the consultation, it was determined that the patient had a mild overjet and mild overbite. There were spaces between the maxillary teeth and mild crowding in the mandibular arch. Both maxillary and

mandibular teeth shifted to the right. The patient had a Bolton tooth size discrepancy, where the maxillary incisors were narrow and the lower incisors were wide. The patient also had worn incisal edges on teeth #24 and #25. Oral hygiene was excellent, the skeletal profile was convex and there was no evidence of temporomandibular joint dysfunction.

Treatment planning

CAD/CAM dental technologies were used to perform a diagnostic examination, outline a digital treatment plan for progressive tooth movements and visualize the anticipated treatment outcome. With clear aligners, the basis for treatment is a virtual model; therefore, the patient's maxillary and mandibular teeth and arches were scanned using an iTero Element intraoral scanner to capture digital impressions of the patient's pretreatment condition.

Digital impressions and the software used to plan the patient's tooth movement, along with the doctor's experience, determine if composite is more accurate for treatment

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Fig. 3: The clear aligner, with the attachments in place, was seated and light-cured using an LED curing light.



Fig. 4: The attachment template was carefully removed, leaving only the attachments bonded to the tooth structure.

planning than using traditional impression materials and stone models.⁸ Once the scans were taken, they were reviewed on screen, after which the aligner software manipulated the scans to demonstrate how the patient's teeth would move during the course of treatment.

The software also showed the anticipated treatment outcome, determined the number of aligners necessary to produce each specified movement, and showed where attachments and interproximal reduction would be needed. Individual aligners usually move teeth an average of 0.2mm inclination and/or 1 degree rotation.⁹

At this time the patient was inquisitive and asked what the difference would be between clear aligner treatment from an orthodontist and at-home aligner solutions via an online aligner company that lets patients take traditional impressions at home and send them to the company to receive less-expensive aligners. She was informed that the thorough examination and diagnostic plan determined that her specific alignment issues required the use of attachments and

interproximal reduction to create space for proper tooth alignment, optimal function, stability and aesthetics. It was also explained that the basis of the orthodontic practice was discussing and providing information about all alternatives for patients to make the best treatment decisions and achieve the best possible results.

Three treatment options were presented and discussed:

1. Clear aligners with interproximal reduction to improve alignment, normalize Bolton discrepancy and eliminate the need for further dental work (i.e., veneers).
2. Preprosthetic alignment with clear aligner therapy, in combination with aesthetic maxillary anterior bonding.
3. Prosthodontic treatment to enhance smile aesthetics with no orthodontic treatment.

The patient selected Option 1.

Aligner fabrication

Based on the consultation, the computerized treatment plan was finalized, and



Fig. 5: Excess flash on the attachments was removed using finishing stones.



Fig. 6: The patient examines the appearance of the 14 attachments.

the case sent to the clear aligner company.¹⁰ By using the 3D software, proper tooth alignment was achieved, attachments were chosen to facilitate the tooth movements with the clear aligners, interproximal reduction was prescribed in specific areas on the lower arch to assist in maxillary space closure, and the proper staging of tooth movement was assigned.

For the first batch of aligners, treatment was staged with weekly aligner changes over 54 aligner stages. All attachments—14 in total—were placed during Stage 1 on teeth #4–7, #10–13, #20–22 and #27–29. Interproximal reduction was prescribed at Stage 7, at the contacts between teeth #22–27.

Attachment placement and aligner delivery

An appointment was scheduled to place the attachments and begin the 54 weeks of orthodontic treatments. During this appointment, the teeth were isolated using a flexible latex-free OptraGate lip and cheek retractor from Ivoclar Vivadent (Fig. 1, p. 30), which reduces salivary contamination of the attachment teeth. The prefabricated

attachment template was then tried into the patient's mouth to ensure a proper fit, after which it was removed, and the first aligner tried in to confirm an ideal fit.

The shape and location on the teeth for the composite attachments had already been determined. Clear aligner attachments may be ellipsoid, rectangular or beveled,¹¹ depending upon the type of movement required to achieve the desired outcome. For example, certain rotations require ellipsoid attachments, while others are best achieved with vertical rectangular attachments.¹²

The enamel was etched and rinsed in the areas and on those teeth in the predetermined shape and location for the attachments. Transbond Plus Self Etching Primer bonding agent from 3M Unitek was applied to the teeth where attachments would be placed, then light-cured (Fig. 2, p. 30).

Because patients who choose clear aligners are usually very self-conscious about their appearance and aesthetically aware, it is imperative that attachments appear as seamless and invisible as possible. Therefore, the composite material selected for creating the attachments was a translucent



Fig. 7: The patient was fitted with the clear aligners and provided with detailed instructions for insertion, removal, daily wear time and care.

universal nanohybrid composite with natural shade blending, Tetric EvoCeram from Ivoclar Vivadent in shade T.¹³ Additionally, the selected composite demonstrates exceptional wear resistance and tends to last for the entire treatment process.

The composite was loaded into the wells of the maxillary attachment template, after which the template was placed in the patient's mouth and light-cured using a Bluephase Style 20i LED curing light from Ivoclar Vivadent (Fig. 3, p. 31). This process was repeated on the lower arch. The attachment template was carefully removed, leaving only the attachments bonded to the tooth structure (Fig. 4, p. 31). Excess flash was removed using Dura-Green FL2 Finishing Stones from Shofu (Fig. 5). The patient examined the appearance of the 14 attachments and was pleased with how well they blended into her natural dentition (Fig. 6).

Once the patient was comfortable with her new clear aligners (Fig. 7), the next appointment was scheduled for six weeks later (Fig. 8, p. 34). At that time, interproximal reduction would be performed as planned, and the patient would receive the next six sets of clear aligners.

Conclusion

As dental professionals and orthodontic specialists, it is our responsibility to provide patients with information about all possible treatment options to help them achieve their aesthetic goals and maintain optimum oral health.

Given the many options available for perfecting their smiles, some

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Fig. 8: View of the patient during her first six-week recall appointment.

patients may choose fixed prosthodontics, others may choose orthodontics, and some may choose a combination of both.

What is right for one patient may not be for another, but our discussions with patients enable them to make the best decision based on their current situations and the options we provide to maximize their results and expectations. Therefore, our goal during these conversations is to be as upfront and honest with our patients as possible, since that is the only way our patients can benefit from our professional experience.

Our experience can provide patients with life-changing results and increased confidence. Making a patient's dream a reality is something not many other professionals can claim, and there is nothing more fulfilling than removing the orthodontics at the last visit and seeing that brand new smile on the patient's face. ■

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