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PROPEL-ling Clear Aligner Treatment Time

by Ben Miraglia, DDS

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Andrew presented to my office specifically for an Invisalign consultation. He was interested in Invisalign and, like many other patients, wanted to know if it would work for him. My response to patients who ask, “Am I a candidate for Invisalign?” has become a source of enjoyment for my staff. I always respond, “Of course you are a candidate for Invisalign; now open your mouth so I can see your teeth!” Based on Andrew’s desire to fix his teeth and my confidence in the extraordinary ability of Invisalign to deliver excellent results, we recommended taking a set of records. Andrew happily agreed and a complete set of diagnostic records was taken. Andrew was then given a 1-hour consultation appointment. The purpose of the consultation was to discuss the diagnosis, treatment plan options, the Invisalign process, and our goals.

Diagnosis
- 26-year-old male
- Fair dental hygiene
- No decay
- Mild gingivitis
- Stable pocket depths
- Class I malocclusion
- Narrow arch width
- Transverse (McNamara) measurement of 32 mm
- Improper arch form
- Upper midline deviation—right

- Anterior crossbite
- Moderate crowding upper and lower
- Chief complaints: overlapped teeth, bad bite, poor smile (Figures 1-9)

The results of the diagnostic records confirmed that Andrew was an excellent candidate for Invisalign orthodontics. In fact, Invisalign would be of tremendous benefit to Andrew because it would correct his malocclusion as well as address his chief complaints. The entire Invisalign process was explained to Andrew, and he was excited to get started. He learned that the process might take 15-18 months, depending upon his compliance wearing the aligners. He was happy with the time frame, agreed to wear the aligners for 22 hours per day, and was ready to start. At that point I asked Andrew the following question: “If I had a technique that could offer a shorter treatment time, would that interest you?” Andrew’s response was “Yes, definitely.”

I then described the basics of tooth movement to Andrew. I explained that the rate at which teeth move depends on the rate of bone remodeling. Therefore, any technique that increases the rate of bone remodeling will increase the rate of tooth movement. The bone remodeling depends on how much cellular activity there is in the bone surrounding the teeth. Since orthodontics is essentially a controlled inflammatory response, the greater the level of cellular activity, the faster the...
Figure 2: Andrew has a normal profile.

Figure 3: Andrew has an upper midline deviation to his right. Tooth #9 is centered on the midline.

Figure 4: Moderate crowding with anterior crossbite of teeth #7 and #26, 27.

Figure 5: Tooth #7 is lingually trapped. The upper arch is narrow and has poor arch form.

Figure 6: The lower arch is narrow and has poor arch form.

Figure 7: Class I malocclusion. Note how tooth #7 is trapped lingually.

Figure 8: Class I malocclusion.

Figure 9: Before panorex shows good root length and quantity of bone.
bone remolds and the more quickly the teeth move. I then introduced Andrew to the PROPEL device and technique.

PROPEL Orthodontics is a company that produces innovative orthodontic instruments. The PROPEL device is a single-use, sterile, disposable, manual device that creates micro-osteoperforations (Figure 10). These micro-osteoperforations induce a very important cellular response which leads to an increase in cytokine levels in the bone. PROPEL has a 1.6 mm diameter and can be used up to a depth of 7 mm. PROPEL has a depth gauge which allows the dentist to set perforation depths at 3, 5, and 7 mm. The goal is to perforate the cortical bone. It is a comfortable technique, performed in minutes in the office, and the patient requires no additional treatments.

Previous techniques like Wilckodontics involve reflecting the gum tissue to expose the buccal cortical bone. Once exposed, the bone is cut to induce an inflammatory response which will increase cytokine levels. It is the increase in the cytokine levels that induces the bone to remodel at a faster rate. This technique does accelerate tooth movement; however, it is aggressive and invasive, and requires sutures, bone grafting, and an extended healing time. In comparison, the PROPEL technique is conservative, comfortable, and easy to perform, with no significant side effects.

Once Andrew understood the benefits of PROPEL, he was highly motivated to have us treat his case faster. Our goal was to have excellent tracking with a 9-day aligner-changing interval. We took the necessary PVS impressions for Invisalign that day.

Since Andrew’s crowding and malocclusion were caused by improper arch form and width, his case was developed using expansion. Developing proper arch form and width allowed me to develop his ClinCheck without any Interproximal Reduction (IPR). The resulting ClinCheck called for a 33-aligner course of treatment. Attachments were planned for teeth #5, 6, 8, 9, 10, 11, 12, 20, 21, 22, 27, and 28. Once again, no IPR was required in Andrew’s case.

When Andrew returned to start the Invisalign process, we placed all attachments and delivered the first set of aligners with instructions. Andrew made an appointment for two weeks later, in order to begin the first PROPEL treatment and then receive aligners #2, 3, and 4. At the PROPEL appointment Andrew rinsed with chlorhexidine for two 1-minute rinses, to decrease oral flora. The PROPEL sites had been identified by x-ray and clinical exam. Benzocaine 20% topical anesthetic gel was applied, and a drop of the local anesthetic carbocaine 3% was also used. The PROPEL device was used to place 18 micro-osteoperforations in the upper arch and 15 in the lower arch (Figures 11-13).

The micro-osteoperforations were distributed throughout each arch. Most of them were located in the canine to molar areas, with a few in the anterior. The depths of the perforations ranged from 3 mm to 4 mm, and all of the perforations were done between the roots of the teeth. Bleeding was minimal and lasted less than 1 minute. Two 500 mg tablets of Tylenol were given to Andrew at the appointment, and he was instructed to take Tylenol as needed for the rest of the day. During the postoperative phone call 24 hours later, Andrew informed me that he only took one 500 mg Tylenol tablet in the afternoon and one at bedtime the day of the procedure. Patients are advised to use only Tylenol, as anti-inflammatory pain medications counteract the effects of the PROPEL treatment.

Andrew was instructed to change aligners #2, 3, and 4 at 11-day intervals. After 33 days, he returned and was asked how the aligners felt at 11-day changes. Andrew reported slight pressure during the first day of aligner wear but said that by day 2 he was comfortable. (Patients wearing aligners for 14-day intervals usually describe the tightness as lasting 1 to 3 days.) We delivered aligners #5, 6, and 7, also to be worn for 11-day intervals.

Andrew returned 33 days later for a planned second treatment with PROPEL. This was about 9 weeks after the first PROPEL technique was performed. Photos were taken at aligner #7 for tracking purposes (Figures 14-15). The same preparations were performed as for the first procedure: chlorhexidine rinse, topical anesthetic, and a few drops of carbocaine 3%. The second PROPEL treatment was done on 17 upper sites and 12 lower sites (Figure 16). Following this appointment, Andrew wore aligners #8, 9, and 10 for 11-day intervals and then wore aligners #11, 12, and 13 for 10-day intervals. Andrew’s description of the comfort level at the 10-day interval was comparable to that at the 11-day intervals. Based on
Figure 12: the initial PROPEL treatment of the anterior teeth.

Figure 13: the initial PROPEL treatment of Andrew’s left side.

Figure 14: aligner #7 is in place and shows excellent fit and tracking. Note the position of tooth #9 in relation to the midpalatal suture.

Figure 15: aligner #7 in place showing excellent fit and tracking.

Figure 16: this is the second PROPEL treatment, performed with upper and lower aligner #8 in place. Note that the tracking is good.

Figure 17: aligner #14 in place. The third PROPEL treatment was done at #14. Note excellent fit and tracking with a 9-day interval for aligner wear time.

Figure 18: aligner #14 in place. The third PROPEL treatment was done at #14. Note excellent fit and tracking with a 9-day interval for aligner wear time.

Figure 19: anterior view of aligner #14 in place. Note the excellent fit so far with 9-day aligner changes.
Andrew’s comfort level, I instructed him to wear aligner #14 for 9 days.

Ten weeks after the second procedure was performed, Andrew returned for his third PROPEL treatment. Photos were taken at aligner #14 for tracking purposes (Figures 17-19). The PROPEL technique was repeated with 8 upper sites and 8 lower sites; once again, all the micro-osteoperforations were made to depths of 3 to 4 mm. Andrew was instructed to wear aligners #15, 16, and 17 for 9-day intervals. Photos were taken at aligner #17 for tracking purposes (Figures 20-22), and Andrew received 4 new aligners to be worn at 9-day intervals.

This pattern of returning to my office every 36 days to receive 4 new aligners was repeated through aligner #33. Andrew’s case tracked well through all 33 aligners. The photos of the final aligners in place demonstrate this (Figures 23-25). The 9-day interval proved to be comfortable, with only some mild tightness on the first day.

The final case photos show a full correction of Andrew’s malocclusion (Figures 26-33). PROPEL caused an increase in the cytokine levels, which in turn led to an increase in the rate of bone remodeling, allowing the teeth to move faster. The result of this was comfortable, healthy accelerated tooth movement. Andrew was able to save 139 days of aligner wear time. That is almost 5 months of treatment time. In the end, Andrew was extremely happy with the results of his Invisalign treatment. Andrew, like all of the patients I have treated with PROPEL, was thrilled to have had the benefit of a significantly shorter treatment time.
Figure 26: upper arch final photo showing proper arch form and proper arch width. Compare to Figure 5.

Figure 30: final right side photo showing Class I occlusion. Compare to Figure 7.

Figure 27: lower arch final photo showing proper arch form and proper arch width. Compare to Figure 6.

Figure 31: final face photo with Andrew fighting off a smile. The grin says it all.

Figure 28: final anterior photo showing proper overbite, proper overjet, and corrected midline and crossbite. Compare to Figure 4.

Figure 32: final smile photo showing a very happy patient. Compare to Figure 3.

Figure 29: final left side photo showing Class I occlusion. Compare to Figure 8.

Figure 33: panorex taken after treatment was completed. Note parallel roots.