# Successful Treatment Outcomes Using 3M<sup>™</sup> Clarity<sup>™</sup> Ultra Self-Ligating Brackets Bonded with a Digital Flash-Free Bonding Technique



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## Introduction

Accurate bracket placement is fundamental to achieve a beautiful result in a short time. Research has shown 3D printed bonding trays to accurately reproduce virtual bracket positioning done on digital models<sup>1</sup>. This method provides confidence that brackets will be positioned on the patient's teeth as intended to achieve treatment goals<sup>1</sup>. It also helps ensure that finishing procedures are simpler and faster. In this case, Digital Flash-Free Bonding was performed by positioning brackets on digital models using Ortho Analyzer<sup>™</sup> (3Shape) software and then by 3D-printing a bonding transfer tray with bracket wells.

3M<sup>™</sup> APC<sup>™</sup> Flash-Free Adhesive Coated Brackets were loaded into the tray on the day of bonding and kept in a light-proof box until the bonding appointment time. 3M<sup>™</sup> Clarity<sup>™</sup> Ultra Self-Ligating Brackets with 3M<sup>™</sup> Unitek<sup>™</sup> Lateral Development Archwires permitted first phase application of light forces in order to orthodontically develop both the upper arch and, to a lesser extent, the lower arch (uprighting movement).

Nevertheless, in the second phase of treatment, with Beta-Titanium and Stainless Steel archwires it was possible to perfectly control of the final tooth position. Aesthetics has become very important nowadays and with Clarity Ultra Brackets it was possible to satisfy the patient's aesthetic request without renouncing the advantages of a self-ligating appliance.

## **Diagnostic Description of the Case**

A 14-year-old male patient with Class II skeletal bases (ANB 6°) on an average angle pattern (SN-mandibular plane angle 26°) and with Class II molar and canine relationship. There was an upper midline shift of 2 mm to the left and a deep overbite (6 mm) with lower incisors at -1 mm to the APog line but with an increased inclination relative to the mandibular plane (100°). Canine and premolar torques were too negative in botharches creating dark buccal corridors. The upper right canine was more extruded than the contralateral canine (pupillary line as reference) introducing risk of canting of the upper arch after leveling and aligning procedures with a conventional straight-wire appliance.









Fig. 1D



Fig. 1G



Fig. 1J



Fig. 1M



Fig. 1B



Fig. 1E



Fig. 1H



Fig. 1K



Fig. 1N



Fig. 1C



Fig. 1F



Fig. 1I



Fig. 1L



Fig. 10





Fig. 1P



Fig. 1S



Fig. 1Q







Fig. 1R



Fig. 1U



Fig. 2



Fig. 1A-O, Facial photos at start of treatment.

Fig 1, P-U, Additional intraoral photos at start of treatment.

Fig 2-3, Table 1, Initial panoramic and cephalometric x-ray analysis.



## **Treatment Plan**

The patient's chief concerns were smile aesthetics and alignment of the anterior frontal teeth. In order to improve the final result and accelerate treatment by reducing the duration of the finishing procedure, we decided to use a digital bonding technique. Using this technique, bracket positioning is more accurate and it is possible to previsualize the final result.<sup>1</sup> The software provides the orthodontist with much information about the final occlusion obtainable and the aesthetic outcome. It is possible to introduce all of the overcorrections needed to obtain the best result for each patient by evaluating both Bolton discrepancies and anatomical variations in tooth morphology.<sup>2</sup>

It is also possible to carefully plan the movement of each single tooth from its initial position to its final planned position. We decided to use Clarity Ultra Brackets in both arches to satisfy the patient's aesthetic request while maintaining the high versatility of a fixed self-ligating appliance system.

Fig. 4-5, Software views of teeth, brackets, and positioning.



Fig. 4A



Fig. 4D



Fig. 4B



Fig. 4E



Fig. 4C



Fig. 5A



Fig. 5D



Fig. 5B



Fig. 5E



Fig. 5C



#### Fig. 6, A-E, Digital Flash-Free Bonding lower arch.



Fig. 6A



Fig. 6D



Fig.6B



Fig.6E



Fig. 6C

We planned to open the bite principally through lower incisor absolute intrusion, avoiding premolar and molar extrusion, in order not to rotate the mandible in a clock-wise direction. Reducing profile convexity and increasing chin projection were necessary to improve the facial appearance of this patient. For this reason, we chose a self-ligating appliance (light forces) and we planned to build occlusal build-ups only on posterior teeth. We decided, in agreement with the patient, to correct the dental Class II by using light Class II elastics. Taking into account the patient's favorable growth pattern, we planned to accurately control the vertical dimension by limiting posterior dental extrusion in order to allow a favorable sagittal growth response.<sup>3</sup>

Fig. 7-8, Initial bonding intraoral photos.



Fig. 7A



Fig. 8A



Fig. 7B



Fig. 8B



Fig. 7C



Fig. 8C



## **Treatment Progress**

• Archwire progression in the upper arch:

014 Nitinol Lateral Development - Arch Form Size R28 (1.5 months) 016 x .022 Nitinol Lateral Development - Arch Form Size R28 (1.5 months) 019 x .025 Nitinol Lateral Development - Arch Form Size R28 (3 months) 019 x .025 Stainless Steel Posted - Individualized Arch Form (4 months)

• Archwire progression in the lower arch:

014 Nitinol Lateral Development - Arch Form Size R28 (1.5 months)

- 018 Nitinol Lateral Development Arch Form Size R26 (1.5 months)
- 019 x .025 Nitinol Lateral Development Arch Form Size R26 (1.5 months)
- 019 x .025 Beta III Titanium Individualized Arch Form (4 months)
- Upper occlusal build-ups on molars and first premolars and lower occlusal build-ups on first premolars were built to control molar and premolar vertical position during the lower incisor intrusion phase and to promote Class II occlusal correction.<sup>4</sup>
- Class II elastics (Size 3/16 in. Force Rating Light 3.5 oz.) were used for 7 months, 14 hours per day, to center upper and lower midlines and to correct the Class II molar and canine relationship. The light force was necessary to limit posterior extrusion.

Fig. 9, A-E, Class II elastics and occlusal build-ups



Fig. 9A



Fig. 9D



Fig. 9B



Fig. 9E



Fig. 9C



• Intercuspation elastics (Size 1/8 in. - Force Rating Light 3 oz.) were used for 1 month, 14 hours per day, to improve occlusion in the left side and to parallelize upper and lower arches (in the lower arch we used a sectional from 3 to 3).

Fig. 10, A-C, Finishing.



Fig. 10A



Fig. 10B



Fig. 10C

Fig. 11, A-D, Intercuspation and sectional 3-3 in the lower arch.



Fig. 11A



Fig. 11B



Fig. 11C



Fig. 11D

## **Treatment Results**

Active treatment time was 10 months. No brackets were inadvertently debonded. Ideal occlusion <sup>5</sup>, <sup>6</sup> was achieved and the deep bite was corrected. ANB decreased by 2° improving lip fullness and profile appearance. Upper occlusal plane was parallel to the pupillary line. Negative buccal corridors were reduced.









Fig. 12D



Fig. 12G



Fig. 12J



Fig. 12M



Fig. 12B



Fig. 12E



Fig. 12H



Fig. 12K



Fig. 12N



Fig. 12C



Fig. 12F



Fig. 121



Fig. 12L



Fig. 120





Fig. 12P



Fig. 12S



Fig. 12Q



Fig. 12T



Fig. 12R



Fig. 13



Fig. 12, A-O, Facial photos at end of treatment.

Fig. 12, P-T, Intraoral photos at end of treatment.

Fig. 13-14, Table 2, Final panoramic and cephalometric x-ray analysis.











Fig. 15D

Fig. 15A

Fig. 15E

Fig. 15, A-E, Final digital models.

## Conclusions

The most significant results in this case were the improvement in smile aesthetics and the complete Class II correction in a short treatment time. Accurate orthodontic planning aided by the use of digital bonding software was of great help in obtaining the final result.

Precise control of the final tooth position was obtained with accurate positioning of Clarity Ultra Ceramic Brackets. This appliance also provided great torque and rotation control. Hi-tech Lateral Development archwires permitted application of light forces during the arch development phase and Beta III Titanium archwires were of great help in the final detailing. The patient was very satisfied with both the aesthetics of the orthodontic appliance used and the final result of treatment.

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