

# *Dental Follicle*

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## Scientific Editorial - Pre-Restorative Orthodontics – An approach to maximize aesthetics and function

Dr.Syed Nabeel | Editor in Chief Dental Follicle - The E Journal of Dentistry | Founder and CEO DentistryUnited.com | Director: Smile Maker Clinics Pvt. Ltd INDIA

### Abstract

The availability of many different choices for treatment and the advantages associated with the multidisciplinary approach towards oral rehabilitation has made the dental practice more challenging and competitive. Patient expectations when they enter a private practice can be

summarized as- “perfect smile in shortest time “. Keeping the patient apprehensions and desires, and applying the multidisciplinary approach – Orthodontics and Restorative Dentistry, optimal result was achieved in the case report presented here.

**Mesh Keywords:** Orthodontics, Aesthetics Dental , Crowns

### Case Report

A 25 year old female patient reported with forward placement of upper teeth and multiple spacing between front teeth. After discussing the options with the patient a multidisciplinary approach was chosen to give her the desired smile. Orthodontic treatment was done with MBT™ appliance.



Fig 1: Added to spacing , tooth number 8 also had a discolored composite restoration.



Fig 2: The Spacing between the maxillary incisors and prognathism .



Fig 3 and Fig 4: After Orthodontic treatment and bleaching with OpalBoost™ (Ultradent), tooth number 7, 8,9,10 were given Impress E-Max crowns.

## Discussion

Pre-restorative orthodontics is one of the most common approaches to achieve desirable results. This also permits dentists to place restorations that often require less natural tooth reduction<sup>1</sup> and additionally it reduces the chances of intentional Root Canal Treatment (which is done by some clinicians in severely prognathic anteriors). Orthodontics preliminary minor tooth movement helps in better results was

reported as early as 1978<sup>2</sup>, yet more and more dentists are yet to get acquainted with this approach. The Indications for pre restorative orthodontics include preservation of integrity of the dental arch, biomechanical factors, limitations in design of prostheses, esthetic appearance, periodontal considerations, prevention of malocclusion, and better retention of position of teeth.<sup>3</sup>

## Result:



Fig 6: Smile before Treatment



Fig 7: Smile after Treatment

The result achieved by the multidisciplinary approach for the smile makeover was appreciable and met the patient expectations from the treatment.

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## New resin materials for optimizing core buildups and post/core restorations

Dr. Gregori M. Kurtzman | DDS |MAGD |DICOI

### Abstract

Core buildups and post/core restorations can be a challenge when adhesives are utilized to lute the base due to inadequate light contact to polymerize the resins. This becomes increasingly problematic when deeper preparations in the posterior are being restored where an unpolymerized

adhesive may contribute to marginal leakage leading bond failure over time and subsequent marginal decay. Recent advances in resin technology will discuss a matched adhesive and core resin designed to initiate polymerization of the adhesive upon contact between the two materials.

**Mesh Keywords:**core buildup, post and core, fiber posts, resin restoration, dual-cure resin, Clearfil S3 Bond Plus, Clearfil DC Core Plus

### Introduction

Core buildups and post/core restorations can be a challenge when adhesives are utilized to lute the base due to inadequate light contact to polymerize the resins. This issue becomes increasingly problematic when deeper preparations in the posterior are being restored where an unpolymerized adhesive may contribute to marginal leakage leading bond failure over time and subsequent marginal decay. This has been addressed by the manufacturers with the development of self-cure promoters that can be added to light-curable adhesives. Yet these can lead to adhesive pooling in the apical of post preparations hampering insertion of the post to the desired depth within the tooth.

Researching these problems has addressed these clinical issues with an advanced and improved single component self-etch adhesive, Clearfil S3 Bond Plus and mated their new Clearfil DC Core Plus dual-cure resin to this improved adhesive marrying

the two materials for a total core system. (Figure 1) As an alternative to using a self-cure promoter, they added new catalysts to the adhesive and core resin that initiates the Clearfil S3 Bond Plus to set when Clearfil DC Core Plus contacts the adhesive without direct light contact to the resin adhesive. Additionally, working time was improved for the adhesive without compromising the bond strength to dentin.



Figure 1: Clearfil DC Core Plus an improved dual core resin material and the advanced Clearfil S3 Bond Plus self-etch adhesive from Kuraray America.

Initially introduced in 2005, Clearfil S3 Bond (Tri-S Bond in Japan) is a single component

self-etch adhesive. Most single component self-etch adhesives unlike Clearfil S3 Bond undergo phase separation of the hydrophilic and hydrophobic components. But the use of a unique proprietary technology creates a homogeneous bond layer preventing phase separation in the bottle between uses. Phase separation between the hydrophilic and hydrophobic components in an adhesive leads to blisters (microbubbles) within the adhesive layer decreasing the bond strength with the dentin. Therefore, a lack of phase separation in an adhesive provides improved bond strength and marginal integrity compared to similar products available where phase separation may occur.<sup>1,2</sup>

As part of continued product development, Kuraray improved the adhesive (Clearfil S3 Bond Plus) by modification of the catalysts improving the curing properties, with a subsequent increase in bond strength<sup>3-9</sup> (figure 2) with a decrease in time needed to self-etch the tooth surface and light-cure the adhesive. With the addition of fluoride release to the adhesive this provides a long term durable bond to dentin with less technique sensitivity than with other single

component self-etch adhesives. (Table 1) Post-operative sensitivity has been a challenge with resin bonding. But elimination of this post operative sensitivity has been well documented in the literature with the use of self-etch adhesives compared to total-etch adhesives. Clearfil S3 Bond Plus, a universal self-etch adhesive may be used for bonding anterior and posterior direct restorative materials and is also well suited when utilized with Clearfil DC Core Plus for core buildups and post/core restorations.

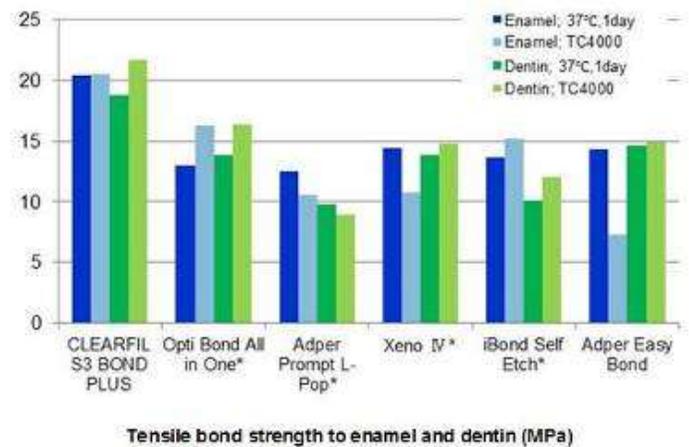


Figure 2: Comparison of bond strength to enamel and dentin of both 1 day and aged samples of various self-etch adhesives. (Data: Kuraray America)

	Clearfil S3 Bond	Clearfil S3 Bond Plus	Clearfil DC Core Automix	Clearfil DC Core Plus
Self-etch time for bond	20 sec	10 sec	20 sec (DC Bond)	10 sec (S3 Bond Plus)
Light-cure time for bond	10 sec	10 sec	20 sec (DC Bond)	10 sec (S3 Bond Plus)
Light-cure time for Core	_____	_____	20 sec (1.5mm) 40 sec (2.0mm)	10 sec (1.5mm) 20 sec (2.0mm)
Self-cure time for Core	_____	_____	6 min	6 min
Working time for Core	_____	_____	3 min	3 min
Bond strength Immediate Dentin	17.7 MPa <sup>1)</sup>	18.8MPa <sup>2)</sup>	17.6 MPa <sup>3)</sup> 7.5 MPa <sup>4)</sup>	18.5 MPa <sup>5)</sup> 12.4 MPa <sup>6)</sup>
Immediate Enamel	20.2 MPa <sup>1)</sup>	20.4 MPa <sup>2)</sup>	_____	_____
TC 4000 Dentin	20.7 MPa <sup>1)</sup>	21.7 MPa <sup>2)</sup>	_____	_____
TC 4000 Enamel	20.8 MPa <sup>1)</sup>	20.5 MPa <sup>2)</sup>	_____	_____
Flexural strength	_____	_____	144 MPa	148 MPa
Fluoride release	No	Yes	No	Yes
Catalyst Light-cure	Yes	Yes	Yes	Yes
Self-cure	No	Yes (with DC Core Plus)	Yes	Yes

<sup>1)</sup> Clearfil S3 Bond and Clearfil AP-X (light-cure)

<sup>2)</sup> Clearfil S3 Bond Plus and Clearfil AP-X (light-cure)

<sup>3)</sup> Clearfil DC Bond and Clearfil DC Core Automix (light-cure)

<sup>4)</sup> Clearfil DC Bond and Clearfil DC Core Automix (self-cure)

<sup>5)</sup> Clearfil S3 Bond Plus and Clearfil DC Core Plus(light-cure)

<sup>6)</sup> Clearfil S3 Bond Plus and Clearfil DC Core Plus(self-cure)

Table 1: Comparison chart of the older Clearfil S3 Bond and Clearfil DC Core with the advanced and improved Clearfil S3 Bond Plus and Clearfil DC Core Plus.

With the improvement in the Clearfil S3 Bond Plus adhesive, Kuraray also improved their dual-cure core resin Clearfil DC Core Plus with the incorporation of a new accelerator (catalyst) to the core resin. This allows when mated with the Clearfil S3 Bond Plus, self-curing of the adhesive within the tooth upon contact of the core resin. Additionally, the new Clearfil DC Core Plus has added fluoride release improving the resin tooth interface and decreasing the potential for recurrent decay at this interface. Improvement also was made in the flow and body of the uncured resin core material allowing placement without

slumping prior to light-curing allowing the practitioner to forgo use of a matrix in some clinical applications. This also prevents the slump of uncured material typically observed after placement in a maxillary preparation due to gravities effect on the material following placement. Improved flow also permits its usage in combination with Clearfil S3 Bond Plus for cementation of posts allowing the practitioner to eliminate a separate post luting material when placing a post/core restoration and eliminate any interfaces between a luting material and the core material.

### **Clinical usage:Post/Core Restorations:**

The flow of Clearfil DC Core Plus allows for a its use as a luting resin for fiber or metal posts thereby eliminating the need for a separate post luting cement. But, needs to be utilized with a dentin adhesive to ensure bonding to the dentin walls of the post preparation. When combined with Clearfil S3 Bond Plus concerns with light penetration to adequately cure the adhesive at the apical extent of the post preparation are eliminated. Additionally, as the adhesive is not light-cured but cured after contact with the Clearfil DC Core Plus resin the potential for pooling of the cured adhesive thereby preventing full seating of the post is avoided.

Following post preparation, Clearfil S3 Bond Plus is applied to the apical depth of the post preparation with a micro-applicator scrubbing the self-etch adhesive into the post preparation and any exposed dentin. This is not light-cured at this time. The post to be placed is also lightly coated with

additional adhesive, which may be light-cured or not depending on the practitioner's preference. Utilizing the thin tip on the Clearfil DC Core Plus automix syringe the tip is placed at the apical extent of the post preparation and resin is expressed from the automix syringe backfilling the post preparation to the canal orifice and coating all dentin surfaces. The pre-fitted post is inserted to depth in the post preparation. A Light-curing tip is placed on the top of the post and activated for 20 seconds and is then followed by bulk-filling the remainder of the preparation with additional core resin and light-curing is accomplished from buccal and then the lingual to ensure full polymerization of the core resin. Modification of the accelerators in the core resin, decrease light-cure times compared to the prior version of this material (Clearfil DC Core) with an increase in bond strength as well as flexural strength has been reported. (Table 1)

### Case example:

An 84 year old female presented with complaint of loss of a crown from the maxillary right first molar. (Figure 3) This patient was in treatment with our office for an implant placed at the 2<sup>nd</sup> premolar site several months previously by a periodontist. She indicated the crown on the molar was approximately 20 years old and a radiograph demonstrated prior endodontic treatment had been performed but no post and core was present. Examination noted sufficient tooth structure present to place a ferrule for a new crown and the prior practitioner having placed composite into the pulp chamber as part of the restoration. (Figure 4)



Figure 3: Patient presented with existing crown off the maxillary right 1<sup>st</sup> molar that had prior endodontic treatment.



Figure 4: Occlusal view demonstrating an absence of a post and core and tooth had been restored by placing composite into the pulp chamber after endodontic treatment.

The old composite was removed with a carbide bur in a highspeed handpiece and orifices for three canals were identified each obturated with gutta percha. (Figure 5) Post preparations were created in each of the three canals to allow placement of a fiber post into each thereby locking the new core to the remaining tooth structure. Clearfil S3 Bond Plus was applied into the post spaces and all exposed dentin with a microbrush, scrubbing it into the dentin. (Figure 6) Next, injection of Clearfil DC Core Plus into the post spaces was performed to act as a luting material for the fiber posts. The fiber posts after having a coating of Clearfil S3 Bond Plus applied and light-cured were inserted to depth and light-cured for 40 seconds touching the light to the top of the posts to transmit light down the posts and accelerate setting of the dual-cure resin. (figure 7) Additional Clearfil DC Core Plus resin was placed to form a core which was then light-cured for 40 seconds then allowed to complete self-curing for 4 minutes. Crown preparation was completed ensuring a ferrule was placed onto natural tooth structure circumferentially. (Figure 8, 9) An impression was then made using a VPS impression material and a provisional restoration placed. The case was sent to the lab for fabrication.

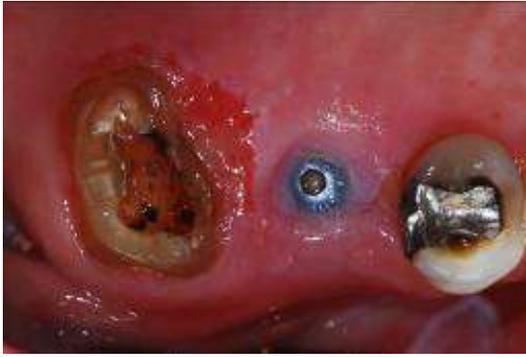


Figure 5: Old composite core has been removed demonstrating sufficient tooth to achieve ferrule with a new crown. Orifices for three canals are identified obturated with gutta percha.



Figure 6: Following post preparation into each of the three canals, Clearfil S3 Bond Plus is applied to the post spaces and exposed dentin with a microbrush.



Figure 7: Clearfil DC Core Plus has been injected into each post space and a fiber

post inserted to depth with convergence of the three posts to lock the core to the remaining tooth.



Figure 8: Additional Clearfil DC Core Plus was injected in the coronal aspect around the post heads to form a core and allowed to fully set, then the tooth was prepared for a new crown restoration. Note ferrule of natural tooth structure present to retain the new crown.



Figure 9: Occlusal view following crown preparation illustrating the coronal aspects of the three fiber posts locking the core to the remaining tooth structure.

## Core Buildups:

Although most practitioners would ideally like to be able to bulk fill preparations when a core is to be placed. An improvement in bond strength has been shown when the initial layer of the dual-cure core material is 1.5mm compared to bulk filling of the preparation. Following placement of the Clearfil S3 Bond Plus to the dentin and prepared enamel margins with a micro-

applicator a thin layer of Clearfil DC Core Plus is placed to just cover the preparation surface. Then light-curing of the adhesive and initial core material layer for 10 seconds, the remainder of the preparation is bulk filled with additional core resin and light-cured from the occlusal, buccal and lingual to ensure complete polymerization of the resin.

## Case presentation:

A 56 year old male presented with a defective amalgam restoration on the lower right 2<sup>nd</sup> molar. Treatment recommendation was a core buildup followed by a full coverage crown to restore function. The tooth was isolated and the old amalgam and decay removed with a highspeed handpiece demonstrating the need for a full coverage crown based on remaining tooth structure. (Figure 10). A Caulk Automatrix was placed to contain the core buildup during core fabrication. Clearfil S3 Bond Plus was applied to all dentin and enamel surfaces with a microbrush scrubbing it into the dentin then light-cured for 20 seconds. (Figure 11) Utilizing the intraoral tip on the automix syringe, a thin layer of Clearfil DC core Plus just covering the dentin was placed and followed by light-curing the tooth for 20 seconds. (Figure 12) Placement of a thin layer followed by light-curing has been shown to improve bond strength of the resin to the core compared to bulk filling the preparation as this ensures that the material in contact with the dentin surface has been cured with the light and not relying on a self-cure mode only. (figure 13). The preparation was then bulk filled

with additional Clearfil DC Core Plus which was followed by light-curing for 40 seconds from the occlusal. (figure 14) The restoration was allowed to self-cure for 4 minutes to ensure complete setting. Following setting of the core resin the matrix was removed and the core was then contoured and shaped. (Figure 15) The patient was dismissed and appointed for a crown preparation.



Figure 10: Following removal of the defective amalgam and decay a matrix was placed to contain the core buildup to be placed.



Figure 11: Clearfil S3 Bond Plus is applied to the exposed dentin and enamel with a microbrush then light-cured for 20 seconds.



Figure 12: A thin layer of Clearfil DC Core plus is applied using the intraoral tip on the automix syringe just covering the dentin then light-cured for 20 seconds.



Figure 13: To improve the bond of the core to the tooth it is recommended that the first layer be thin just covering the dentin

then light-cured before additional material is placed.



Figure 14: The core area is then filled with additional resin completely filling the preparation.



Figure 15: The matrix as been removed and the core shaped and is ready for crown preparation at the next appointment.

## Conclusion:

Material selection is as important as the techniques and preparations we provide during treatment. What may work well in one clinical situation such as a direct Class II resin restoration may not work in other clinical situations. With improvements in dental material chemistry today we have adhesives that are better mated to the resins placed with them when fabricating core buildups and post core restorations.

## Author Information:

Dr. Kurtzman is in private general practice in Silver Spring, Maryland and a former Assistant Clinical Professor at University of Maryland. He has lectured internationally on the topics of Restorative dentistry, Endodontics and Implant surgery and prosthetics, removable and fixed prosthetics, Periodontics and has over 320 published articles. He has earned Fellowship in the AGD, AAIP, ACD, ICOI,

Clearfil S3 Bond Plus dentin adhesive has been designed to have an optimal self-cure mode when combined with Clearfil DC Bond Plus dual-cure resin. Thus ensuring full setting of the adhesive without the need to use a self-cure promoter mixed into the adhesive improving working time as well as yielding better bond strength with less chance of adhesive pooling or insufficient cure of the adhesive.

Pierre Fauchard, ADI, Mastership in the AGD and ICOI and Diplomat status in the ICOI and American Dental Implant Association (ADIA). Dr. Kurtzman has been honored to be included in the "Top Leaders in Continuing Education" by Dentistry Today annually since 2006 and was featured on their June 2012 cover. He can be reached at [dr\\_kurtzman@maryland-implants.com](mailto:dr_kurtzman@maryland-implants.com)

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(Note)

*MTB-200; the experimental code of Clearfil S3 Bond Plus*

*NDC-100 ; the experimental code of Clearfil DC Core Plus*