Class II Amalgam Replacement

By Dr. Robert Margeas, USA

About the Case
The patient presented with recurrent decay under an aging amalgam. Because of the presence of decay as well as the depth of the prep, Vitrebond™ Light Cure Glass Ionomer Liner/Base was chosen and applied to the deepest dentin. After application of the liner, the selective etch approach using Single Bond Universal Adhesive was chosen for its excellent seal on enamel margins while minimizing the chance of post-operative sensitivity. Once the adhesive is cured, Filtek™ Bulk Fill Posterior Restorative was placed in a single increment up to 3mm. Post-operative photos taken two weeks after placement indicate a very pleasing result.

Challenge
A deep Class II restoration can be prone to post-operative sensitivity. Use of a liner/base such as Vitrebond™ Liner/Base, as well as a self-etch bonding approach on dentin, combines two techniques for keeping post-operative sensitivity to a minimum. Once the bonding agent is in place, the bulk fill approach allows for a fast, efficient placement technique for posterior restorations.

The 3M Difference
3M innovations such as Single Bond Universal Adhesive, Filtek™ Bulk Fill Posterior Restorative and Sof-Lex™ Spiral Finishing and Polishing Wheels provide an efficient and simple procedure while also reducing costly chair time. In cases where deep posterior restorations are presented, Vitrebond™ Light Cure Glass Ionomer Liner/Base can reduce the risk of post-op sensitivity.

Step by Sep

1. Pre-operative condition
2. After removal of failing amalgam
3. Use of micro air abrasion to clean the cavity preparation
4. Application of Vitrebond™ Light Cure Glass Ionomer Liner/Base
5. Etchant applied using the selective enamel etch technique
6. Application of Single Bond Universal Adhesive
7. Placement of Filtek™ Bulk Fill Posterior Restorative in a single increment
8. Polishing with Sof-Lex™ Spiral Polishing Wheel (white)*
9. Immediately post-polishing; adjacent enamel is still desiccated
10. Final restoration, two weeks post-op

*Replaced with the new Sof-Lex™ Diamond Polishing system consisting of two new wheels - pre-polishing spiral (beige) and diamond impregnated polishing spiral (pink)

Total versatility
Uncompromising performance

By 3M

Simplifying the bonding step is no easy task. That’s why 3M developed 3M™ Single Bond Universal Adhesive. It’s a single-bottle solution that offers a simple one-step, one-coat, 35-second application—without compromising strength. Years of clinical evaluations have stacked the evidence: It can be used in all etching techniques, including total-etch, self-etch and selective-etch, in both direct and indirect applications, and on all dental surfaces, without any extra primer—taking versatility to a whole new level.

Virtually no post-operative sensitivity in total-etch or self-etch applications.

Total number of total-etch restorations: 3,467
Total number of self-etch restorations: 3,495

0.4% Percent of total-etch restorations with 3M™ Single Bond Universal Adhesive having post-op sensitivity
0.06% Percent of self-etch restorations with 3M™ Single Bond Universal Adhesive having post-op sensitivity

To learn more about 3M™ Single Bond Universal Adhesive please visit www.3mgulf.com/dental

Source: 3M internal data
3M Oral Care
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Implant maintenance with guided Biofilm Therapy

By E.M.S.

With more and more Implants placed, the challenges of the dental professionals increase to remove calculus and biofilm safely and efficiently. E.M.S., the inventor of PI-EZON® and AIR-FLOW® technologies, offers a peek coated Implant tip which guarantees safe and efficient removal of calculus without leaving scratches on the Implant surface. Furthermore the PLUS powder for all EMS AIR-FLOW devices ensures easy and smooth removal of Biofilm in supra and sub gingival areas around the Implant.

How to best prevent and treat Mucositis and Peri-Implantitis? With PLUS powder and the Perio nozzle for AIR-FLOW it is simple, predictable and ensures superior clinical results.

For more information visit the EMS booth at the 9th Dental Facial Cosmetic Conference in Dubai on 03-04 November 2017.

You can also look up more details at www.ems-dental.com or contact your regional distributor of EMS products.

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Super-Snap X-Treme Technique Kit

By SHOFU

A comprehensive "new" technique kit from Shofu features the proven Super-Snap (Black-Contouring & Violet-Finishing) and the innovative Super-Snap X-treme (Green-Polishing & Red-Super-polishing) disks in both 12 mm and 8 mm diameter, colour coded for easy identification and sequential use to achieve a natural and lasting lustre on all direct resin composites. Unique 3D structure of the Super-Snap X-Treme Red disks imparts a satiny smooth and flawless surface on the resin restoration. Double sided Polystrips that correspond to the colour codes of the disks enable easy interproximal finishing and polishing. The kit also contains Dura White stones, Composite and Composite Fine points to complement the disks and easily create detailed surface anatomy in direct aesthetic resin restoration.

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The ultimate goal of endodontic treatment is the long-term retention in function of teeth with pulpal or periapical disease. Depending on the diagnosis, this therapy typically involves the preparation and obturation of all root canals. Both steps are critical to an optimal long-term outcome. This article is intended to update clinicians on the current understanding of best practices in the two pillars of nonsurgical endodontics, canal preparation and obturation, and to highlight strategies for decision making in both uncomplicated and more difficult endodontic cases. Prior to initiating therapy, a clinician must establish a diagnosis, take a thorough patient history and conduct clinical tests. Recently, judicious use of cone-beam computed tomography has augmented the clinically available imaging modalities. Verifying the mental image of canal anatomy goes a long way to promote success in canal preparation. For example, a missed canal frequently is associated with endodontic failures.1 As most maxillary molars have two canals in the mesiobuccal root, case referral to an endodontist for treatment should be considered. Endodontists are increasingly using CIRT and the operating microscope to diagnose and treat anatomically challenging teeth, such as those with unusual root formations, congenital variants or iatrogenic alteration. The endodontist, supported by appropriate imaging strategies, can achieve good outcomes even in cases with significant challenges.2

Preparation of the endodontic space
The goal of canal preparation is to provide adequate access for disinfesting solutions without making major preparation errors such as perforations, canal transportation, instrument fractures or unnecessary removal of tooth structure. The introduction of nickel-titanium (NiTi) instruments to endodontics almost two decades ago has resulted in dramatic improvements for successful canal preparation for generalists and specialists. Today there are more than 50 canal preparation systems; however, not every instrument system is suitable for every clinician and not all cases lend themselves to rotary preparation. Several key factors have added versatility in this regard, for example, the emergence of special designs such as orifice shapers and mechanized glide path files. Another recent development is the application of heat treatment to NiTi alloy, both before and after the file is manufactured. Deeper knowledge of mechanical properties is desirable for clinicians who want to capitalize on these new alloys. Finally, more recent strategies such as minimally invasive endodontics have emerged.3

Basic nickel-titanium metallurgy
What can NiTi do so well? It is highly resistant to corrosion and, more importantly, it is highly elastic and fracture resistant. NiTi exists reversibly in two transformations, martensite and austenite, on external tension and ambient temperature.10 While steel allows 3 percent elastic deformation, NiTi in the austenitic form can withstand deformations of up to 7 percent without permanent damage or plastic deformation.4 Knowing this is critical for rotary endodontic instruments for two reasons. First, when instrumenting preparation of curved canals, forces between the canal wall and advancing instrument are smaller with more elastic instruments, hence less preparation errors are likely to occur. Second, rotation in curved canals will bend instruments once per rotation, which ultimately will lead to work hardening and brittle fracture, also known as cyclic fatigue. Steel can withstand up to 20 complete bending cycles, while NiTi can endure up to 1,000 cycles. Recently manufacturers have learned to produce NiTi instruments that are in the martensitic state and even more flexible than before. Figure 2 shows how instrument conditions (austenite vs. martensite) are determined in the testing laboratory, using prescribed heating and cooling cycles. Temperatures at which the instrument changes from austenite to martensite are critical for achieving the desired flexibility. While preparation usually removes dentin, some clinicians preferentially toward the outside of the curvature, current NiTi instruments, including reciprocating files, can enlarge the canal path safely while minimizing procedural errors. Almost all NiTi files are non-rounded, meaning they have sharp cutting edges, and they can be used in lateral action toward a specific point on the perimeter. The drilling action allows the clinician to actively change the treatment path away from the furcation in the coronal and middle thirds of the root but may create apical canal straightening when taken beyond the apical third of the root. Circumferential engagement of canal walls by active instruments may lead to a throraxing in effect, but contemporary rotary files are designed with variable pitch and helical angle to counteract this tendency. An important design element for all contemporary rotary files is a passive, non-cutting tip that guides the cutting planes to allow for more evenly distributed dentin removal. Rotaries with cutting, active tips such as dedicated retreatment files are used with caution to avoid preparation errors.5

NiTi instrument usage
As a general rule, flexible instruments are not resistant to torsional load but are resistant to cyclic fatigue. Conventional NiTi files that are straight can withstand more torque but are susceptible to fatigue. The greater the amount and the more peripheral the distribution of metal in the cross section, the stiffer is the file. Therefore, a file with greater taper and larger diameter is more susceptible to fatigue failure; moreover, a canal curvature that is...
Material imperfections such as microcracks and milling marks are clear that with additional support of the sites.**Such surface imperfections after manufacturing can be removed by etching and cleaning but it is unclear if this process extends fatigue life.** Manufacturers’ recommendations stress that root canals should be advanced with very low light pressure; however, the recommendations differ with regard to the way the instruments are moved. A typical round motion is used. Any instrument into the canal gently in an in-and-out motion for three to four cycles are followed by a short rotary action; then withdrawn to clean the canal. It is a difficult to determine exactly the apically exercised force in the clinical setting. Several studies have suggested that forces start at about 1 Newton (N) and range up to 5 N.**Precise torque hand clamping is used as a means to reduce failure. Most clinicians use torque-controlled moto- ers and apply a maximum of 2 to 5 Ncm. To reduce friction, manufacturers often recommend the use of gel-based lubricants. However, such lubricants have not been shown to be beneficial and actually demonstrated a negative impact on the ProFile instruments. Therefore, it is recommended to flood the canal system with a syringe and slow spray to reduce friction.**The best way to do this is to create an access cavity that can act as a reservoir (Fig. 3).**There are several concerns about using NiTi instruments. The efficiency of the cuttings of dimensions of procedures is not clear. It has been shown that protein particles cannot completely be removed from machined nickel-titanium surfaces.**Moreover, it is possible that lubricants could be removed as debris when using rotary instruments as there is no conclusive evidence of debris.**An understanding of the chance for instrument fracture is increased. Current recommendations advise the use of hand clamping when using rotary instruments as there is no conclusive evidence of hand clamping.**The use of such instruments in the root canal system is inaccessible to the body’s immune sys- tem and therefore cannot be left behind.**The root canal system is filled. Root canal shaping to desired size.**Gauging the formaux, apical ad- junct.

**Obliteration of the apical space** A well-shaped and cleaned canal sys- tem should create the conditions for obturation with sealers. On the other hand, this root canal system is inac- cessible to the body’s immune sys- tem and therefore cannot be left behind.**The root canal system is inaccessible to the body’s immune sys- tem and therefore cannot be left behind.**The root canal system is filled. Root canal shaping to desired size.**Gauging the formaux, apical ad- junct.

**Basic strategies in root canal obliteration** Root canal fillings should seal all foramina leading to the periodont- ium, be without voids, adapt to the intraradicular canal walls and end at the working length. There are various ac- cess cones available.**Sealer coating combined with core materials.**Several of these techniques have shown comparable success rates re- garding apical bone fill or healing of periosteal lesions, as a clinician may choose from a variety of tech- niques to oblate the root canal system for best for him or her. Existing research directed clinicians toward preparation and disinfection of the root canal as the single most important factor in root canal treatment success and, no particular sealing tech- nique can claim superior healing success.**Current developments in root canal obturation materials** There are several concerns about the use of endosseous implants.**Sealer coating combined with core materials.**Several of these techniques have shown comparable success rates re- garding apical bone fill or healing of periosteal lesions, as a clinician may choose from a variety of tech- niques to oblate the root canal system for best for him or her. Existing research directed clinicians toward preparation and disinfection of the root canal as the single most important factor in root canal treatment success and, no particular sealing tech- nique can claim superior healing success.**Current developments in root canal obturation materials** There are several concerns about the use of endosseous implants.**Sealer coating combined with core materials.**Several of these techniques have shown comparable success rates re- garding apical bone fill or healing of periosteal lesions, as a clinician may choose from a variety of tech- niques to oblate the root canal system for best for him or her. Existing research directed clinicians toward preparation and disinfection of the root canal as the single most important factor in root canal treatment success and, no particular sealing tech- nique can claim superior healing success.**Current developments in root canal obturation materials** There are several concerns about the use of endosseous implants.**Sealer coating combined with core materials.**Several of these techniques have shown comparable success rates re- garding apical bone fill or healing of periosteal lesions, as a clinician may choose from a variety of tech- niques to oblate the root canal system for best for him or her. Existing research directed clinicians toward preparation and disinfection of the root canal as the single most important factor in root canal treatment success and, no particular sealing tech- nique can claim superior healing success.**Current developments in root canal obturation materials** There are several concerns about the use of endosseous implants.**Sealer coating combined with core materials.**Several of these techniques have shown comparable success rates re- garding apical bone fill or healing of periosteal lesions, as a clinician may choose from a variety of tech- niques to oblate the root canal system for best for him or her. Existing research directed clinicians toward preparation and disinfection of the root canal as the single most important factor in root canal treatment success and, no particular sealing tech- nique can claim superior healing success.**
Primary stability vs. viable constraint: A need to redefine

By Michael R. Norton, UK

Any regular reader of the Journal of Oral & Maxillofacial Implants or indeed of any other publication on dental implants could not fail to have noticed how much attention has been focused on Primary Stability. The concept of primary stability is not new, indeed as early as the 1970s, there were studies emphasizing the need to establish mechanical stability to ensure an uninterrupted healing of the bone-implant interface was evident in the orthopedic literature as it pertains to hip prostheses.1

By the 1990s, numerous reports were being published on immediately loading of dental implants2-5 and the ground-breaking work by Neil Meredith on the application of Resonance Frequency Analysis (RFA) came to the fore6 with statements that achievement of implant stability was a prerequisite for long-term positive outcomes.

At the same time, Meredith recognized that it was possible for clinically firm implants with poor axial stability to still be prone to failure.6 Of course, Brånemark recognized this in his early work, proposing as he did a period of submerged healing because of his concerns for any destabilization of the bone-implant interface during the early healing phase. However, today we all recognize that such protective protocols are frequently unnecessary, with widespread acceptance of not only transmucosal healing but also immediate temporization and/or loading.

So how do we define primary stability? The most simple definition is one of mechanical friction between the implant and bone. Certainly, we can all appreciate that this contrasts with secondary implant stability where secondary stability is achieved by biological integration, i.e., osseointegration. The gradual shift from primary stability to secondary stability is critically poised at around three weeks. This is seen to be the least stable time point where viscoelastic stress relaxation of the bone along with remodeling results in a loss of primary mechanical stability but with an as yet poorly established degree of secondary stability or osseointegration.

This is also apparent in RFA curves which, like a heartbeat, always registert a certain pattern in healthy bone that reflects this loss of stability at the third or fourth week regardless of bone density.

That said, we still need to define what constitutes primary stability, i.e., which sets apart from biological integration. As stated above, mechanical stability is one where a friction occurs between the implant and the surrounding bone giving rise to a resisting torque at time of insertion. This resisting torque is proportional to the effort required to seat the implant or peak insertion torque, they are in essence one and the same and depend largely on the characteristics of the implant, the density of the bone and the differential size of the osteotomy as it pertains to the diameter of the implant. Mathematically, it can be defined as follows:

Resisting Torque = \( \mu \times P \times \pi \times D^2 \)

Where: \( H \times \) = Surface Area of implant in contact with bone \( H = \) height of the implant cylinder \( P = \) Critical pressure on the bone \( \mu = \) Coefficient of friction

The important factor in this equation is \( P \), the critical pressure on the bone, as high pressure results in unfavorable bone strain, particularly favored bone remodelling. Numerous studies have been published that clearly demonstrate that if pressure these high torques create lead to micro-fracture of the bone7,8, with a net resorption in the cortical zone9,10 and, indeed, an unfavorable delayed healing are avoided. At the same time, we need to employ an objective measure of constraint that reliably ensures the implant can tolerate or immediate loading. As much was recently proposed by Barera et al.11

I have labeled this objective measure Viable Constraint (VC), whose central purpose is to reliably evaluate the relevant degree of stability while maintaining a low critical pressure on the vulnerable cortical tissues through which our implants are inserted.

Because ISQ is measuring axial stiffness, it must be clear that frictional rotational resistance is a completely different parameter. After all, don’t we want our implants to integrate successfully, and ISQ has been described as a good predictor of implant failure with lower insertion torque and still achieve axial stiffness with an ISQ >60, surely this provides us with a more optimal evaluation of primary stability. Our goal must be the rapid onset of secondary stability, with minimal critical pressure to the poorly vascularised cortical bone so unfavourable resorptive responses and delayed healing are avoided. At the same time, we need to employ an objective measure of constraint that reliably ensures the implant can tolerate or immediate loading. As much was recently proposed by Barera et al.11

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Bone is not wood; it is not inanimate. It would behove us all to remember this, and avoid the implant surgeon’s approach to implant dentistry. So I would take this opportunity to ask that we think in terms of Constraint. It will, of course, take controlled prospective studies to determine the optimal torque levels, but if I were a gambling man (which I most certainly am!) I would guess for a 4.5 mm implant inserted with a cortex of ≤1.0 mm thickness that a maximum torque of 20 Ncm and an ISQ of 60 represent the optimal measures we are looking for to ensure safe immediate loading. In the past, we used to think length was important, whereas now we are looking for short implants. However, if I would point out that a strong correlation has been shown to exist between ISQ and implant length12,13 and, as such, for immediate loading, I also believe a longer implant with a higher ISQ, inserted at a lower insertion torque, will yield a more favorable outcome.

Note

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References


Editorial note: A complete list of references is available from the publisher.
“It’s a game-changer”: Prime&Bond universal™ with Active-Guard™ Technology

By Dentply Sirona

Dentply Sirona has introduced a new universal adhesive designed to ensure complete coverage and penetration for a reliable bond even if the preparation is overly wet or dry. We spoke with Dentply Sirona polymer chemist Dr. Christoph P. Fik to learn about the remarkable properties of this revolutionary dental adhesive and how Prime&Bond universal™ with Active-Guard™ Technology was developed.

Dentply Sirona: Dr. Fik, can you tell us how a new research and development effort gets started? For example, did the marketing team develop a list of requirements that dentists are looking for in a next-generation adhesive like Prime&Bond universal™?

Dr. Christoph P. Fik: The marketing people do conduct market research and develop a set of requirements based on the voice of customers. As chemists, we also have our own insights into the physical and chemical properties that would improve the product and simplify its use for our dental customers. The clinical team also provides significant input, so it’s a collaboration between all three departments to define the platform requirements for a new product.

We have a series of discussions, document our agreed-upon objectives, and then lay out the actual development effort with a clear set of goals in sight that we believe are both beneficial and achievable.

Talk to us about those goals. What does the ideal dental adhesive need to accomplish?

I see the dentist as a kind of craftsman, and we want to help them achieve a higher level of craftsmanship. Every dentist has preferred chemistries, so it’s not a one-size-fits-all solution. We aim to simplify the use of our products, provide a reliable bond, and achieve optimum results. They can otherwise be misinterpreted as a void or decay on a radiograph.

What are some of the additional benefits of Prime&Bond universal™?

The adhesive layer is extremely thin, compared to other universal adhesives, which can really help avoid fitting problems with indirect restorations. It’s designed to minimize the risk of product incompatibilities. We designed Prime&Bond universal™ to work optimally with Caltrex® Ceramic cement. With this combination, there’s no need to apply a separate activator, and the two products have the right pH values to fuse perfectly, providing much greater shear bond strength compared to other adhesives.

Prime&Bond universal™ is the first universal adhesive with Active-Guard™ Technology, which allows us to balance several benefits. For example, enamel is hard, dry and quite brittle, while dentin is porous, wet and spongy, and the amphiphilicity of Active-Guard™ Technology allows us to achieve exceptional bond strength with both substrates. We’ve also achieved an optimum balance between the properties needed for direct and indirect restorations, between high and low viscosity, and between the requirements for all etching methods.

What is it and how does it work?

Active-Guard™ Technology is a resin component. Other universal adhesive systems are based on two parts: they combine a very hydrophilic, low viscosity compound – a so-called reactive diluent – with a very viscous hydrophobic compound, trying to find a balance. With Active-Guard™ Technology, we’ve created a new resin compound that combines hydrophilic and amphiphilic properties in one monomer. So you don’t have to deal with two parts and reactive diluents – you simply find the balance within a single chemical structure.

Could it be described as “amphiphilic”? Is that what you mean by a balance of hydrophilic and hydrophobic within a single resin molecule?

Yes, but it’s important to distinguish the amphiphilicity of Active-Guard™ Technology from the more familiar use of this term to describe surfactants. With these, you have separate hydrophilic and hydrophobic parts in one molecule, and that’s what allows you to disperse oil in water, for example. But with Prime&Bond universal™, the whole molecule in itself balances hydrophilic and hydrophobic properties without separate hydrophilic and hydrophobic domains of the molecule. That’s unusual in chemistry, and it allows us to balance several benefits. For example, enamel is hard, dry and quite brittle, while dentin is porous, wet and spongy, and the amphiphilicity of Active-Guard™ Technology allows us to achieve exceptional bond strength with both substrates. We’ve also achieved an optimum balance between the properties needed for direct and indirect restorations, between high and low viscosity, and between the requirements for all etching methods.

What does the ideal dental adhesive need to accomplish?

It needs to provide robust performance across all the different cases a dentist encounters, including direct and indirect restorations. It needs to be simple and predictable to use in every scenario.

What are the limitations of competing adhesives, and how does Prime&Bond universal™ overcome them?

There are six or seven universal adhesives on the market based on chemistry that’s at least 20 years old. Most of these established adhesives have very high viscosity. Some dentists might regard that as a benefit in certain cases, but more often it’s a significant drawback. Prime&Bond universal™ is the first universal adhesive that offers low viscosity with a surface tension directly adjusted to dental substrates and related materials, making it easier for the adhesive to spread evenly across the substrate and to quickly wet and fully penetrate the dental tubules. Other universal adhesives show what I would describe as a passive behaviour. They polymerise, but beyond that they don’t exhibit any active properties to help the dentist achieve optimum results. They can resist spreading, they tend to pool and they don’t mix with water spontaneously – so it can be difficult to achieve complete, even coverage.

By contrast, the “active” in Prime&Bond universal™ with Active-Guard™ Technology refers to the properties you can actually see working when you apply it to the prepared surface. It actively spreads to help ensure complete and uniform coverage across the substrate. It actively mixes with any excess water that may be present, which is important for achieving complete penetration on wet dentin. During air drying, the adhesive solvent and excess water evaporate together to actively create an even, homogenous layer, with low film thickness. The active properties you’re describing are completely new in the market for universal adhesives. Active-Guard™ Technology is patented.

What is it and how does it work?

Active-Guard™ Technology is a resin component. Other universal adhesive systems are based on two parts: they combine a very hydrophilic, low viscosity compound – a so-called reactive diluent – with a very viscous hydrophobic compound, trying to find a balance. With Active-Guard™ Technology, we’ve created a new resin compound that combines hydrophilic and amphiphilic properties in one monomer. So you don’t have to deal with two parts and reactive diluents – you simply find the balance within a single chemical structure. It’s designed to be simple and predictable to use in every scenario.

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Our patented Active-Guard™ Technology platform is completely new. It introduces a new level of robustness along with much simpler, more reliable handling properties for virtually any case, any substrate and any preparation. It’s a future-oriented technology that I’m convinced will lead to more groundbreaking products based on this platform in the future.

I’m very proud of that. It’s a game-changer.

For more information on Prime&Bond universal™, please contact your local Dentply Sirona representative.