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.

Class II Amalgam Replacement

By Dr. Robert Margeas, USA

Dr. Robert Margeas currently serves as Adjunct Professor in the Department of Operative Dentistry at the University of Iowa College of Dentistry. He is also the Clinical Director and Instructor at the Center for Esthetic Excellence, Chicago, IL. Dr. Margeas has published numerous articles on esthetic dentistry and is a highly sought after international lecturer on the subject. His credentials include board certification by the American Board of Operative Dentistry and he is a Fellow of the Academy of General Dentistry (AGD). Dr. Margeas is on the Editorial Board for Contemporary Esthetics and is a consultant in Oral Health matters for the country of Canada. He maintains a very successful private practice, with a focus on comprehensive esthetic restorative dentistry, in Des Moines, IA.

Virtually no post-operative sensitivity in total-etch or self-etch applications.
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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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The ultimate goal of endodontic treatment is the long-term retention in function of teeth with pulpal or periapical aspects. 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 (CBCT) 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 raised canal frequency is associated with endodontic failures. As most maxillary molars have two canals in the mesiobuccal root, care referral to an endodontist for management may be required. Pre-operative planning should be considered. Endodontists are increasingly using CBCT and the operating microscope to diagnose and treat anatomically challenging teeth, such as those with unusual root anatomy, congenital variants or traumatic alteration. The endodontist, using appropriate strategies, can achieve good outcomes even in cases with significant challenges (Fig. 1).

Preparation of the endodontic space
The goal of canal preparation is to provide adequate access for disinfecting 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 versality 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 heated treatment to NITI alloy, both before and after the file is manufactured. Deeper knowledge of metallurgical properties is desirable for clinicians who want to capitalize on these new alloys. Finally, more recent strategies such as minimally invasive endodontics have emerged.

Basic nickel-titanium metalurgy
What can NITI do? It is highly resistant to corrosion and, more importantly, it is highly elastic and fracture resistant. NITI exists reversibly in two conformations, martensite and austenite, depending on external tension and ambient temperature. While steel allows 3% elastic deformation, NITI in the austenitic form can withstand deformations up to 7% without permanent damage or plastic deformation.1 Knowing this is critical for rotary endodontic instruments for two reasons. First, minimizing trauma preparation of curved canals, forces between the canal wall and enlarging instruments 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 working hardening and brittle fracture, also known as cyclic fatigue. Steel can withstand up to 20 complete bending cycles, while NITI can endure up to 5000 cycles. More recently manufacturers have learned to produce NITI instruments that are in the martensitic state and more even less deformable than NiTi. Figure 2 shows how instrument conditions (austenite vs. martensite) are determined in the testing laboratory, using prescribed heating and cooling cycles to transform instruments.6 Preparation of curved canals, forces between the canal wall and enlarging instruments are smaller with more elastic instruments, hence less preparation errors are likely to occur. Cyclic fatigue of NiTi leads to a different failure mode compared to more brittle fracture. Notably, the fatigue failures become more plastic with a change of the test parameters. Figure 3 shows the propagation of the fatigue crack, while Fig. 4 demonstrates the propagation of a fatigue crack.6

Preparation strategies
Experimental and clinical evidence suggests that the use of NITI instruments combined with rotary movement results in improved preparation quality specifically, the incidence of preparation errors is greatly reduced.7 Canals with wide oval or ribbon-shaped cross-sections present difficulties for rotary instruments and strategies such as circumferential filing and ultrasonic should be used in those canals.

Fig. 1: Root canal treatment of tooth #3 diagnosed with pulp necrosis and acute apical periodontitis. The mesiobuccal root has a significant curve and two canals with separate apical foramina. Case courtesy of Dr. Jeffrey Kawashima. (Image/Provided by American Association of Endodontists)

Fig. 2: Behavior of controlled-memory nickel-titanium rotaries compared with standard instruments. Shown are data from Typhon Differential scanning calorimetry, which document the transition between martensite and austenite at about 5 degrees C for standard NiTi and at about 25 degrees C for controlled-memory (CM) alloy (A). At room temperature, this results in a drastically increased fatigue lifespan (B). Image A modified and reprinted with permission from Shen et al Endo 2012; 57:1566-1571

Canal preparation and obturation: An updated view of the two pillars of nonsurgical endodontics
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By Ove A. Peters, USA

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Page 9
while maintaining apical sizes o-support antimicrobial efficacy. There is currently no direct evidence that root fillings in the presence of periapical lesions work best for him or her. Existing research directs clinicians toward preparation and disinfection of the root canal as the single most important factor in obturation success.18,19 Furthermore, no particular sealing tech- nique can claim superior healing success.20

Current developments in root canal obturation materials

While results from in vitro studies on root canal transportation are abundant, clinical studies on these instruments are sparse. Comparing NITI and stainless steel files, Patterson et al44 show less canal transportation and fewer perforations with NITI. Subsequently, using radiographic evaluation of the same patient group, these authors demonstrate better healing in the NITI group 41

An earlier outcome study with three parallel groups of patients did not show any difference between the three systems with an overall favorable outcome rate of about 85 percent.42 A more recent study confirmed these findings.43 Outdoor clinical research on these systems is entirely available, but does not provide the same level of evidence as clinical research.

Practical aspects of obturation

The main steps in the sequence of root canal obturation are:

• Sealer coating combined with carri-

ner-based materials.

• Sealing: cement and a solid filler.

Preparation: when in contact with tissues and fluids, gutta-percha can cause shallow or deep tissue perforations. Therefore, it is recommended to use a thermoplastic obturation technique. This complicated procedure may benefit from the use of the dental obturation machine. Other anatomical spaces that may be filled include the root canals of teeth that are most common in the apical root third (Fig. 4), the mastoid or dural root (Fig. 5) but may also occur in other localizations such as the nasopharynx. It has been shown that many different sealers, e.g. MTA, may benefit from the use of the obturation method.

Root canal preparation

The appropriate amount of sealer should be removed and inspected for a complete coating

Conclusion

The root canal treatment is completed (Fig. 4).

References


5. Stavropoulos DG, Boivin GP, A significant question is whether the endodontic treatment is the one that is most common in the apical root third (Fig. 4), the mastoid or dural root (Fig. 5) but may also occur in other localizations such as the nasopharynx. It has been shown that many different sealers, e.g. MTA, may benefit from the use of the obturation method.
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 Stabi-
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ty. The concept of primary stabili-
ty is not new, indeed as early as 1959, there were studies emphazis-
ing the need to establish mechanical stability to ensure uninterrupted healing of the bone. This was evident in the orthopedic literature as it pertains to hip prosthesis.

By the 1990s, numerous reports were being published on immedi-
ate loading of dental implants10 and the ground-breaking work by Nanda et al. in the application of Resonance Frequency Analysis (RFA) to the diameter (D) raised to the pow-
eter of the implant. Mathematically, it can be defined as follows:

\[
\text{Resisting Torque} = \mu \times P \times H \times \pi \times D^2
\]

Where: H = height of implant cylinder

P = Critical pressure on the bone 

\( \mu \) = Coefficient of friction

The important factor in this equa-
tion is P; the critical pressure on the bone, as high pressure results in un-
favorable bone remodel-
ting. However, the formula indicates that the resisting torque is proportional to the diameter (D) raised to the pow-

er of 2. This means that if you double the diameter, the resisting torque becomes four times higher. Put

other way, if we use the same inser-
tion torque for a 2 mm wide implant and a 6 mm wide implant, then the critical pressure \( P \) will be four times lower for the larger implant!

For example, an implant of 5 mm diameter inserted into 1 mm thick cortical bone with a torque of 20 Ncm will transfer the same pressure to the bone as an implant of 6 mm diameter inserted into 2 mm thick cortical bone with a torque of 160 Ncm. (This assumes that 100 per-
cent of the torque originates from the pressure on the cortical bone, and the contribution to the torque from

This is also apparent in RFA curves which, like a heartbeat, always regis-
ter 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 it apart from biological integration. As interpreted through manual per-
cision, it is usual for manu-

facturers to provide some guidance on optimal insertion torque with

some implant designs being specifi-
cally tailored to deliver higher inser-
tion torques, in excess of 75 Ncm. This was a source of comfort for the clinician that the implant is initially “stable.”

However, such a high torque has not been shown to be propitious to the bone, as high pressure results in un-
favorable bone remodel-
ting. Numerous stud-
ies have been published that clearly demonstrate11 that pressure these high torque implants lead to mi-

cro-fracture of the bone12,13 and, indeed, an unfavorable delayed healing process with a more optimal evaluation of

primary stability, with minimal critical pressure to the poorly vascularised cortical bone so unfavorable results from response 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 early or immediate loading.

As much was recently proposed by Barlow et al.14

I have labeled this objective measure of constraint (ISQ) as having educational content for 1 CME Credit Hour. DHA awarded this program for 1CPD Credit Point

There is increased focus on short implants. However, I would point out that a strong correlation has been shown to exist between ISQ and implant length10,20 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

This content originally appeared as an editorial in The International Journal of Oral & Maxillofacial Implants, published by Quintessence Publishing.

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1. Rune B, Jacobsen S, Samäis K, Sønderby S.C. A meta-

analytic study of implant stability and movement of segments in the max-

illa of patients with severe atrophic ridge. Cleft Palate J 1997;34:267-278

2. Munksgaard R, Wiklund A, Lagrue M. Adaptive bone remodeling of bio-

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3. Salama H, Rose FJ, Salama M, Betts NE. Immediate loading of bilater-

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“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 kick off 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 techniques to achieve a good restoration for every case, and we’re not necessarily changing that. We want to help enhance craftsmanship with a universal adhesive that dentists can rely on, a product that makes a difference but can be used and trusted every day they work with it.

Dentists want a universal adhesive that’s more convenient, easier and faster, while ensuring a reliable bond. 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™ improve on 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 may 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 property that you can actually set 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 component – 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 hydrophobic 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 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. This thinness, combined with a mild pH of about 2.5, also practically eliminates the most common causes of post-operative sensitivity. And it minimizes the risk of pooling, which can otherwise be misinterpreted as a void or decay on a radiograph.

We also thought about simplifying the dentist’s workflow. Prime&Bond universal™ can be stored at room temperature and remains usable for 30 minutes in a closed CliDisht™, so it’s really designed to minimize waste and help streamline procedures, especially when working on multiple restorations in a single visit. And we make sure our products work together, so dentists can have a complete and reliable solution with no risk of product incompatibilities. We designed Prime&Bond universal™ to work optimally with Calibra® 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 either adhesives.

In all you have accomplished to develop Prime&Bond universal™, what gives you the most pride? How will this change the practice of dentistry?

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-orientated 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.

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