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PRESERVING PRINCIPALS OF SUCCESSFUL PORCELAIN VENEERS

There has been a transition in the concept of acceptable preparation for porcelain laminate veneers. The authors find this change discouraging as it is not supported by long-term observation and evidence-based dentistry. Dentistry has enjoyed 25 years of success with porcelain laminate veneers first introduced as etched porcelain bonded to enamel restorations. The enamel substrate provides a rigid tooth structure that is compatible with the high modulus porcelain veneer. The light-cured Bis-GMA resin cement is color stable and hydrophobic. The limited amount of water in enamel after etching and drying the minimally prepared tooth allows for a successful long-term bonded restoration. Success is further enhanced by proper etching and silanization of porcelain to ensure maximum porcelain-composite bond. It is an ideal match of dental materials and tooth structure with success rates in clinical trials that ranged from 93% to 100% over a period of 15 years and longer.¹⁻⁵

In the 1980s, dentists were encouraged by this concept of minimal tooth preparation for veneers in contrast to the aggressive preparation required for metal ceramic restorations. The overall esthetics of the porcelain veneer were superior to the resin composites available for direct veneer applications. Considering the numbers of in vitro investigations, controlled clinical studies, and uncontrolled long-term clinical observation, it is realistic to assume that the concept of etched porcelain bonded to enamel is supported by evidence-based dentistry.

By the 1990s, the conservative nature of porcelain veneers was adversely affected by the introduction of dental adhesives. The absence of any successful longitudinal study of porcelain veneers bonded to dentin did not reduce but encouraged unnecessary and contraindicated use of bonded ceramic veneers. Early advocates of veneers bonded to enamel cautioned about widespread use of ceramic veneers when other treatment modalities were indicated.⁶⁻⁹ Cases best treated with orthodontics or direct bonding are being treated with

ceramic veneers. It is a disservice to the patient to perform these procedures before clinical evidence has demonstrated success with veneers bonded to dentin as it has with veneers bonded to enamel. Reports of 50% failure at 6 years and 34% fracture is disturbing when compared with 93% to 100% success rates of 15 years observation initiated in the 1980s.⁶

“It is a disservice to the patient to perform these procedures before clinical evidence has demonstrated success with veneers bonded to dentin as it has with veneers bonded to enamel.”

Removal of the facial enamel or selection of teeth without facial enamel for veneer restorations is an attempt to match up high elastic modulus porcelain with lower elastic modulus dentin. It is predictable that functional loading of the veneered tooth will transfer this energy to the interface, resulting in debonding or cracking in the porcelain. In the keynote address of the 2005 International Association for Dental Research/American Association for Dental Research meeting, on the topic of degradation of resin-dentin bond from above and below, FR Tay reported that water permeation adversely affects all dental adhesives. Tay found that the newer, simplified no-wash bonding systems failed even more rapidly than did the total-etch and wash systems because of the hydrophilic nature of the no-wash systems.¹⁰

It is safe to assume that scientific information surrounding the new dental adhesives does not apply to ceramic veneers bonded entirely to dentin. In consideration of the efficacy of dental adhesives, we must keep in mind that most longitudinal clinical studies of dental adhesives are performed on noncarious class V lesions where the strength and elastic modulus of the teeth are barely affected.¹¹ Bonding porcelain to dentin differs significantly from bonding direct composite restorations.



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ABSTRACT

Longitudinal observations of etched porcelain bonded restorations reveal an overwhelming success if the basic principles of minimally invasive dentistry and preservation of enamel are followed. Porcelain veneers are not a substitute for orthodontic treatment. Clinical observations suggest that limited superficially exposed dentin surrounded by sound enamel will not reduce the durability of porcelain veneers. No longitudinal study on bonding ceramic veneers entirely to dentin is available at this time. It is unlikely that any of the available dental adhesives are capable of providing a long-term bond when used for bonding ceramic veneers. Light-cure luting resins with dual-cure capability may change color as evident from in vitro observation. The use of light-cure resins without dual-cure capability for bonding veneers is highly recommended.

LEARNING OBJECTIVES

After reading this article, the reader should be able to:

- discuss the history of porcelain laminate veneers.
- explain what occurs when porcelain is bonded to dentin.
- describe the role of silane in the successful bonding of porcelain.



Figures 1 - Debonded ceramic veneers. Debonding occurred at luting resin-dentin interface. Veneers were bonded entirely to dentin.



Figure 2 - Frontal view of 4 maxillary incisors treatment planned for ceramic veneers.



Figure 3 - Note the minimal preparation performed on tooth No. 9 before rounding the sharp edges and line angles.



Figure 4A and 4B - Frontal views of ultra-thin veneers bonded with Choice 2LC (Bisco, Inc.) light-cure luting resin.



Figure 5A and 5B - Right and left views of bonded veneers.



Clinical observation suggests that limited superficially exposed dentin surrounded by enamel will likely survive the test of time and function.^{5,6} In our observation, cervical margins of veneers finished on dentin/cementum appear to offer a much lower success rate. If the facial surface is primarily in dentin, the prediction for success is poor and any attempt to restore teeth with ceramic veneers will not succeed (Figure 1). The type of failure and duration of retention of ceramic veneers bonded to dentin depends directly on the type of dentin (sclerotic vs freshly cut), location of the exposed dentin (cemento-enamel junction vs incisal), and the chemistry of dental adhesives used.

Longitudinal studies of porcelain veneers fabricated from feldspathic porcelain (stacked porcelain) reveal very few cohesive fractures of the porcelain. In the absence of tooth discoloration, ultra-thin veneers are the treatment of choice.⁵ The desire for veneers with optimal esthetic effects and maximum translucency are best fabricated from stacked and fired porcelain. The high-strength porcelains that are either pressed or created using computer aided design/computer aided machining technology may provide the desired esthetic result, particularly on severely discolored teeth. However, these porcelain restorations require additional tooth reduction to allow for the additional thickness of the veneer and this may inadvertently cause dentinal exposure. Plans for porcelain veneers that involve extensive tooth reduction should be avoided. All-ceramic crowns or metal ceramic crowns are superior choices when significant dentin is exposed; full-coverage restorations depend less on bonding for retention.

With any type of porcelain veneer, particularly ultra-thin veneers, the color stability of luting

resins for bonding ceramic veneers. Although this may increase the film thickness of the resin, it prevents any future color shift. A new generation of 100% light-cure luting resins (Choice 2LC, Bisco, Inc. and RelyX, 3M ESPE) with DE much less than 3 have been introduced. With the popularity of ultra-thin ceramic veneers on the rise, a need for color-stable luting resins is obvious (Figures 2 through 5B).

The role of silane in successful bonding of porcelain is clear. Extensive work by Plueddemann revealed the complexity, yet reliability, of silane coupling agents for bonding organic and inorganic substrates. The function of organosilane is to provide bifunctional attachment to both the resin and the porcelain. This has proven to be a very reliable bond.¹⁷

“The primary purpose of the selection of porcelain veneers is to provide esthetically pleasing smiles using minimally invasive dentistry.”

In general the reaction starts when the silane coupling agent is mixed with water. The hydrolysis results in the formation of silanol, which subsequently reacts with the silanol on the surface of the glass.¹⁸ A mixed silane undergoes a condensation process if it is not used shortly after mixing.¹⁹ Although there are methods to extend the shelf life of a premixed silane, the effectiveness of the single bottle system is not validated by the literature on silane coupling agents and is not shared by these authors. The authors strongly advocate the use of a 2-part silane for surface treatment of all etched porcelain.

Conclusion

The primary purpose of the selection of porcelain veneers is to provide esthetically pleasing smiles using minimally invasive dentistry. Veneers offer outstanding performance when bonded to enamel. The clinical performance of porcelain veneers bonded to dentin has questionable longevity and will likely result in early failure at the resin-dentin bond. Current clinical observations do not support the placement of porcelain veneer margins on dentin. Minimal tooth preparation, ultra-thin veneers, and color-stable light-cure luting resins provide an excellent service to our patients. The inclusion of scientific rationale and long-term clinical observations to achieve better esthetic results are a must.

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PATIENT RECORDS:

NOT JUST A PIECE OF PAPER BUT A MULTI-USE DOCUMENT

By Marion Gommerman of Dental Risk Management Systems
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For many years dental offices have thought of the lowly dental chart as an obligatory evil scarcely deserving of our contempt. After all, its only purpose seemed to be to satisfy the requirements of people within regulatory agencies who need the paper to justify their jobs. That's right! Isn't it? I mean, what other use could it have? And by the way, what is a dental chart anyway?

A dental chart is a diary or record of all of the events involved in a patient's treatment cycle. The treatment cycle involves the following major occurrences:

- Patient Information Gathering: During this sequence patients usually complete a questionnaire requesting specific information concerning their health, dental health and registration information.
- Clinical and Periodontal Examination: This is where the Dentist determines what dental health issues the patient has.
- Treatment Plan Presentation: At this stage the dentist outlines the issues facing the patient, including recommendations and alternatives.
- Consent to Treatment: All healthcare providers must reach a state of informed consent with their patient prior to treatment, otherwise there are legal consequences.
- Treatment Recording: Documenting the treatment rendered is mandatory to maintaining the quality of records required by regulatory bodies.

The benefits of the chart can be described as follows:

- it protects the patient from an unsatisfactory event, such as, prescribing the wrong antibiotic when proper disclosure is provided
- it protects the dentist from misunderstandings in the event of disputes when proper records are kept
- it keeps the dentist on track as far as treatment completed and treatment agreed to
- a comprehensive health history questionnaire demonstrates the thoroughness of the office to the patient and builds confidence and trust in the treatment plan when it is presented
- likewise, an inclusive dental history identifies areas of anxiety in the patient, particularly when it comes to their appearance, which may be helpful clues to obtaining their consent to proceed with treatment
- the chart also records unscheduled treatment that was recommended to the patient but not agreed to or postponed to a later date

As you can see, there are many positive uses for dental charts that can furnish you with everything from added revenue for your office to a better nights sleep.

The most meaningful use of the dental chart is the confidence it builds in the patient. Trust is the cement that secures the long-term relationship with a patient. In the corporate world, businesspeople strive to have clients, not customers. A client will value an opinion and trust your judgement, whereas a customer will assume that the same goods and services can be obtained anywhere and it is only the price that matters. The health history questionnaire illustrates to the patient the physiological knowledge that must be acquired in order to become a dentist. Given this realization, the patient becomes more respectful and comes to regard the dentist more like a specialist rather than a technician. When this level of confidence is established, the health of the patient becomes collaborative and the patient becomes more of a participant in designing his or her treatment plan. The patient will also take on a sense of urgency and the financial apprehensions are usually overcome. In this sense the chart becomes an advertisement for the practice.

When patients understand the necessity for a comprehensive health history, they feel confident that they are being protected. In the past, with the exception of the pain of the drill and the bill, patients did not consider dentistry to be of a health-threatening nature. In today's world however, people have come to realize that even dentistry can be dangerous at times.

One of my favourite stories involves a dentist and a lawyer hiking in the mountains. They come to a clearing and see a huge grizzly bear with her two cubs. The bear spots them and starts to chase them. The lawyer turns to run and sees the dentist lacing up his new running shoes. He looks contemptuously at the dentist and sarcastically says; "Do you actually think you can outrun the bear with those shoes?" The dentist responds "no! But I only have to outrun you." Forgive the analogy but eh goal here is to outrun the tort lawyers.

Your dental chart can be best described as a legal document similar to a policeman's notebook. Why is that important? The law assumes that anything that was not written down did not happen. When this situation occurs, the test of memory (your versus the patient) begins. The court is not picking on the dentist when it assumes that the patient's memory is the most accurate because the patient only had one set of circumstances to remember, whereas the dentist has probably seen hundreds of patients subsequently. However, like the policeman's notebook, when a dental chart is used to recall the event, the credibility of the testimony of the dentist becomes virtually irrefutable.



"Progress Notes" is an excellent label for the recording of services rendered because it keeps track of the treatment completed and the treatment yet to be finished. Unscheduled recommended treatment should also be documented, and for a very good reason. In many cases there can be consequences to the patient when not proceeding with treatment. It is the dentist's responsibility under the rules of Consent to Treatment to advise the consequences of not proceeding with treatment and the patient must be continuously advised of this until the situation is resolved. These situations can also result in high revenue cases when the circumstances of patients change. There are many cases where a patient has decided on full mouth reconstruction when they have finally accumulated the resources to afford the treatment.

So it seems that your dental chart has more value than you originally may have thought. But have you ever thought that your chart could be part of the marketing strategy for your office? A new family moves into town and is looking for a dentist. They approach a person who has lived in town for some time and ask to refer them to someone. This dissertation goes something like this: "Well, you could go to Dr. White's office. He has all the latest gadgets and equipment. You could also go to Dr. Black's office. He doesn't have all the latest frills and his office is a little dated. But boy, is he thorough!" So, which dentist do you think that they will choose? Kudos to those who chose Dr. Black. How did he receive the reputation for being thorough? Most likely, patients get this impression from what they have read and what they have observed. A thorough and comprehensive health history will impart this notion and the clinical examination that accompanies it will further influence their thinking.

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Read the description of each group carefully and decide how many are in each group and in what order they marched in the parade.

The marching band was not the leader, but their 6 rows of 4 musicians in each row were near the front, just ahead of the Girl Scouts.

The football team had 2 fewer marchers than the Girl Scouts, and took their time signing autographs as they marched at the end.

The Girl Scouts and the Boy Scouts were separated by the 3 groups of 4 jugglers on the jugglers' float.

The 3 pairs of dancers were between the Boy Scouts and the football team.

The Boy Scouts had 5 rows of 3 marchers and the Girl Scouts had twice as many.



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Metro Toronto Convention Centre
- South Building
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- May 26-29, 2007
Annual Convention of the Ordre des dentistes du Quebec
Montreal Convention Centre
Montreal, QC
- May 9-12, 2007
Denturist Association of Canada in conjunction with The World Symposium on Denturism and Dental Technology
Ricoh Centre
Coventry, England
- May 31 - June 2, 2007
Denturists Association of BC - Annual Convention
Silver Star Mountain Resort
Vernon, BC
- May 24-27, 2007
Canadian Dental Association in conjunction with the Alberta Dental Association and College - Annual Convention
Jasper National Park
Jasper, AB
- June 1 & 2, 2007
New Brunswick Dental Society - Annual Meeting
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LECTURER: Dr. Nasser Barghi



Dr. Barghi is Professor and Head of the Division of Esthetic Dentistry in the Department of Restorative Dentistry at The University of Texas Health Science Center at San Antonio Dental School, at San Antonio, Texas. He completed his prosthodontic residency at Temple University. Dr. Barghi has presented more than 500 didactic and hands-on clinic courses in over 30 countries. He has authored and co-authored over 240 articles and abstracts in scientific journals. Dr. Barghi is a member of the American Academy of Esthetic Dentistry, the American Academy of Fixed Prosthodontics and the International Association for Dental Research. He is Past President of the American Equilibration Society.



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