Lithium Disilicate: A Viable Replacement for Traditional PFM’s
by John C. Cranham DDS

As a new dentist in 1988, choosing a restorative material was relatively simple. Direct restorations involved composite resin for anterior teeth and amalgam for posterior teeth. Indirect restorative materials involved gold and porcelain fused to metal. While these materials have served the population for the better part of fifty years, many patients found these materials falling short esthetically. By the mid 1990’s, numerous manufacturers responded with a variety of all-ceramic options. These materials required the use of fourth and fifth generation bonding agents with resin cements. While they were unbelievable beautiful, they had the potential to be technique sensitive and many times they would fall short functionally.

As time has gone by, the general population has continued to put pressure on the profession to create lifelike restorations that could have enough longevity to justify the fee. While several materials have hit the market in the last few years, recent studies suggest that lithium disilicate has the strength, durability and esthetics that make it the logical replacement to the time tested porcelain fused to metal crown.

Monolithic Lithium Disilicate
Lithium disilicate can be fabricated by milling or pressing. While studies suggest that the pressed variety is slightly stronger, this material fabricated in a full contour form (monolithic) is extremely strong. A clinical trial by Dr. Dennis Fasbinder looked at the survival rate of 62 CAD/CAM crowns delivered with three different cements. After three years of follow-up examinations, the crowns showed no chipping or fracture.

Layered Lithium Disilicate
While some strength is sacrificed when utilizing lithium disilicate as a core and then layering porcelain onto the facial and occlusal surfaces, unbelievably beautiful esthetics can be achieved when doing so. Additionally, this material is now being pressed and milled at less then .5 mm in thickness when fabricating porcelain veneers. The bottom line is that this material can be used to fabricate beautiful restorations in all sextants of the mouth. In the posterior segments, monolithic crowns can be fabricated for optimum strength with esthetics that greatly exceeds a traditional PFM. In the anterior segments, the cores can be cut back and porcelain can be layered to create the ideal gradients of color.

Case Report
Figures 1-4 illustrate a 50 year old woman who had been restored unsuccessfully with porcelain fused to metal restorations. She presented with a Class II malocclusion and an anterior open bite. Cone beam computerized tomography in conjunction with joint vibration analysis and a traditional TM joint examination revealed healthy, stable TM joints. She had moderate localized periodontitis (5-6 mm pocketing) in her UL, LL and LR sextants. She was also extremely unhappy...
with the esthetics of the existing restorations. She felt they were too big and bulky, and desired a brighter more natural looking smile. She especially did not like the metal appearance at the gingival margin of several of her restorations. She also expressed interest in improving her facial appearance.

The goal of this treatment plan was to create a maintainable healthy periodontal environment, improve her facial appearance, create optimum occlusal stability and restore the teeth back to a "normal size." This was achieved through an interdisciplinary process that involved the periodontist, the orthodontist, the orthognathic surgeon, and the restorative dentist. The following is the treatment plan that transpired over a 24 month period.

**Phase One:** Splint therapy was utilized to achieve condylar seating and to create occlusal stability. Additionally, periodontal therapy included scaling and root planing. A surgical procedure was performed to remove the pigmentation above the free gingival margin of teeth #8-9, and pocket elimination surgery was done in the UL, LL and LR sextants.

**Phase Two:** A diagnostic wax-up was completed to create ideal tooth size and morphology of every tooth in the dentition. The upper and lower arches were then prepared and single tooth provisional restorations were placed with permanent cement. This then allowed the orthodontist to properly place his brackets so the ideal arch form could be created. After approximately six months of orthodontic treatment, the patient was prepared for a two jaw orthognathic surgical procedure. The upper and lower jaws were brought forward to create balanced facial esthetics and an ideal Class 1 occlusion. Orthodontics were then utilized post-surgically to fine tune the position of the teeth prior to the restorative phase.

**Phase Three:** After ortho-orthognathic surgery, a final occlusal analysis and wax-up was completed. Monolithic lithium disilicate restorations with 2 mm of occlusal coverage were used on the molars. From second bicuspid to second bicuspid, microlayering was utilized on the facial surfaces to improve the esthetics. All of the restorations were bonded to place using a self-etching resin cement. Figures 5-8 illustrate the final result.

**Conclusion**

We are fortunate to be practicing dentistry in such an amazing time. We have more information about esthetics, solutions to complex functional problems, and contemporary restorative materials then ever before. By following the treatment planning protocols espoused by the Dawson Academy philosophy, working with a great interdisciplinary team (a periodontist, an orthodontist, an orthognathic surgeon and a first class dental laboratory), and combining those elements with the utilization of a contemporary ceramic, predictability was ensured. While numerous ceramic options are currently on the market, it is this author's opinion that lithium disilicate is a logical replacement for traditional PFM's.

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**References:**


**About the author:** Dr. John C. Cranham has a contemporary dental practice in Chesapeake, Virginia, focusing on cosmetic, restorative and implant services. In 1999, Dr. Cranham founded Cranham Dental Seminars which, in February of 2008, merged with the Dawson Academy. He is a partner and the acting clinical director of the Dawson Academy where he is involved with many of the lecture and hands-on courses within the curriculum. As an active educator, he has provided over 750 days of continuing education for dental professionals throughout the world.

Dr. Cranham works closely with our DAL Signature Restorations laboratory. DAL Signature Restorations laboratory is a division of DAL dedicated to providing high performance, highly esthetic restorative services to meet even the most demanding patient’s esthetic requirements. Our commitment to extensive training with institutions such as the Dawson Academy and the Spear Institute provides the necessary technical disciplines to ensure restorations that are perfect in every aspect – color, shape and design.
IPS e.max® Monolithic Lithium Disilicate

The Premium Alternative to Gold PFM’s

With metal prices continually on the rise, many of our customers have been inquiring about viable alternatives to metal based restorations that can offer comparable strength, reliability and predictable flat-rate pricing. DAL offers several gold-free options that are worthy of consideration, including our DAL EZ Esthetic Zirconia at $139/unit, BruxZir Solid Zirconia at $99/unit and our complete line of IPS e.max restorations.

We highly recommend you consider IPS e.max from Ivoclar as it is a versatile system that provides you with a complete range of restorations to meet all of your patient demands for minimally invasive dentistry.

Indications
IPS e.max lithium disilicate is a glass ceramic that has optimized translucency, durability and strength for full anatomical restorations. Available both as a pressed ceramic (IPS e.max Press) and as a CAD/CAM milled restoration (IPS e.max CAD), IPS e.max is indicated for anterior/posterior single crowns, 3-unit anterior bridgework (bicuspid forward), ultra-thin veneers and inlays/onlays.

Outstanding Esthetics with Maximum Strength
IPS e.max lithium disilicate is a high strength ceramic with 360-400 MPa’s of flexural strength. When fabricated to a full-contour or in a monolithic state, lithium disilicate is an extremely durable material. Failures (fractures/chipping) in zirconia or PFM restorations are oftentimes the result of a very weak 90 MPa layered porcelain surface material having chewing forces exerted upon it. With monolithic (lithium disilicate homogenous throughout the entire restoration), the work of the mastication is being done on a 360-400 MPa material…making this restoration the most robust ceramic system tested to date.*

Material Survival with Cyclic Fatigue Testing

Veneered Zirconia Systems
• 90% Failure Rate at 350N and 100,000 cycles

IPS e.max CAD Lithium Disilicate
• 0% Failure 1,000 N and 1,000,000 cycles
• No chips, cracks or fractures

*Mouth Motion Fatigue and Durability Study: Petra C Guess, Ricardo Zavanelli, Nelson Silva and Van P Thompson, NYU, June 2009

3 IPS e.max Restorations to Choose From

IPS e.max CAD
IPS e.max CAD is milled using enhanced software with the E4D Labworks system from D4D Technologies and the Sirona inLab MCXL milling machines at DAL. Using CAD design with CAM milling technology, we are able to improve the precision and consistency of contacts, occlusion and morphology while reducing labor time and costs to our customers. With a flexural strength of 360 MPa’s, IPS e.max CAD is indicated for single unit anterior/posterior crowns and inlays/onlays.

IPS e.max CAD MicroLayered
IPS e.max CAD MicroLayered is a CAD/CAM monolithic IPS e.max crown with a minimum amount of microlayering to enhance the vitality and lifelike appearance in the anterior.

IPS e.max Press
IPS e.max Press is the same lithium disilicate material in a glass-ceramic ingot format. Using press technology, IPS e.max Press offers a flexural strength of 400 MPa’s presenting greater strength for 3-unit anterior bridges, ultra-thin veneers and restorations with minimum preparation dimensions.

Preparation Requirements
Full coverage crowns require a chamfer or a rounded shoulder margin with a width of approximately 1 mm. Facial reduction is 1.5 - 2 mm; 1 - 1.5 mm lingual contact clearance, incisal reduction is 1.5 – 2.0 mm with rounded internal line angles.

Cementation
The high strength of IPS e.max offers dentists a choice to adhesively bond or conventionally cement their restorations. Crowns and bridges can be cemented with your preferred cement. Inlays, onlays and veneers should be bonded.

Axel Kufner, MDT
Ceramics, Crown & Bridge Manager
Valplast®
The Ultimate Partial Solution

Patients with metal clasp partial dentures often express that they feel self-conscious about smiling, conversing and even enjoying a meal. Not anymore with the Valplast Flexible Partial Denture from DAL.

With Valplast, you can now create metal-free, lightweight flexible partial dentures that provide a natural tissue blend effect with translucency that picks up the patient’s natural tissue tone. The translucency is combined with a simulation of natural blood vessels that readily adapts to a variety of natural tissue shades. Additionally, each Valplast partial is designed to follow the pattern of natural tissue formations with thin clasp designs, making the restoration virtually unnoticeable when worn.

Material Properties
Valplast is a pressure-injected, flexible denture base resin, a biocompatible nylon thermoplastic that is available in three basic shades - medium pink, light pink and meharry ethnic.

Valplast Benefits
• Patient Comfort - very thin and lightweight for more sensation
• Esthetic and Biocompatible
• No tooth or tissue preparation required
• Durability - Valplast provides exceptional comprehensive, impact and bending strength
• Will not stain or absorb odor

Valplast Indications
Valplast can be used whenever a partial denture is indicated. There are three basic design options:

What to Send to the Laboratory
• Full Models - Master with Opposing Arch
• Bite Registration
• Tooth Shade/Valplast Shade

Insertion Technique
Immediately prior to insertion in the patient’s mouth, immerse the Valplast restoration in very hot tap water. Leave the partial in the water for about one minute. Remove the partial from the water and allow to cool just to the point where it can be tolerated by the patient. The hot water treatment allows for a final adaptation with the natural tissues in the mouth.

Adjustments/Polishing/Patient Care
Each Valplast partial comes with a DAL Adjustment/Polishing/Patient Care Kit free of charge. This kit contains detailed instructions as well as the necessary green silicone carbide abrasive, a brown rubber wheel and a Val-Clean denture cleaner packet for the patient.

Add To/Reline Procedure
Yes, you can add to a Valplast partial. However, it must be sent to us for add-ons. Simply pull the Valplast in a pickup impression and include the shade. For relines, provide the laboratory with a new impression and opposing model with a bite registration.