A Comparison of Captek Nano EZ versus Porcelain to Zirconia All Ceramic Crowns in the Aesthetic Zone: A Case Report

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INTRODUCTION
Amidst the changes in the profession toward all ceramic crown and bridge materials for esthetic reconstructions, restorations with cores (ceramometalic or zirconia) still account for a majority of the restorations fabricated by dental laboratories today. With the evolution of porcelain overlay materials, these restorations have become more and more aesthetic while still offering the ceramist and opportunity to eliminate a negative influence from underlying preparation materials and colors. When veneering over a core, the opportunity exists for natural internal colorization by the ceramist however, without sufficient tooth reduction; when utilizing a grey or opaque white core, it is a challenge for the ceramist to produce a truly lifelike result. It is important in many cases to eliminate the influence of disturbing underlying prep tooth colors. Traditional Ceramometalic or zirconia materials are effective in this regard. Yet the color control achieved with traditional metal substru- tures, or with zirconia, many times comes at the price of a “dark line” at the margin edge and highly chromatic porcelain in the gingival third. To satisfy the expectations dentists place upon themselves and the expectations of the patients, clinicians need restorative alternatives that can achieve esthetics results in a variety of clinical situations.

CAPTEK: AN AESTHETIC CERAMOMETALIC ALTERNATIVE
Captek is one ceramometal system that helps to solve some of the aforementioned clinical problems yielding an extremely aesthetic restoration while maintaining the advantages of despite the metallic substructure. Captek is an unique, non oxidizing, corrosion free,1 warmly colored metal that is internally reinforced for strength in very thin wall dimensions. Some of the clinical indications for Captek include:

1) Any single full coverage restoration where minimal tooth reduction is required for biologic reasons, for example, lower anterior teeth, narrow teeth, angled roots, teeth with large pulp chambers or areas where gingival recession and/or bone loss has caused increased clinical crown length making tooth preparation difficult due to pulpal encroachment.

2) When conventional cementation is necessary.

3) Endodontically involved teeth

4) Implant restorations,

5) Bridge situations in the anterior and posterior regions involving one or two missing teeth2 and,

6) Patients with intra sulcular restorative margins, acid reflux, dry mouth, allergic sensitivities, or those at risk for caries or periodontal disease.

The Captek materials have evolved since their release in 1994. According to the manufacturer, the latest innovations have come through new methods in nano manufacturing technology. The Captek Nano substructures can be utilized in cases with high aesthetic demand and/or to support cases with high functional risk.

The Nano materials are an advanced engineered form from the original Captek materials. Incorporating Nano particles within the internal structure allows for one hundred percent denser concentration of the harder
and thermally stable particles of platinum and palladium that support the gold matrix. Captek is not a traditionally cast gold but rather referred to as a “metal composite” or “internally reinforced” metal. The nature of this material allows for very desirable physical and therapeutic properties that have been described in various research and clinical editorials since 1995. Three variations of Captek Nano substructures are available in the updated Captek series and utilized depending upon the clinical situation:

1) Captek Nano Esthetic Zone (EZ) is ultra thin (< .2 mm) and is ideal for restorations in the aesthetic zone.

2) Captek Nano Universal has a coping thickness of about .23
mm and is an ideal balance for aesthetics and strength in the premolar and small molar region. And

3) Captek Nano Bridge and Implant, with a coping thickness of about .28mm, is stronger and tougher for posterior areas, bridges, and implant restorations.

All three versions offer excellent aesthetics yet, the internal reinforcing skeleton is increased as the occlusal risk factors become greater.

1) Minimal thickness of the Captek coping. Since the coping can be fabricated extremely thin (under .2mm), there is more room for porcelain than possible over traditional metal or zirconia. Because of the bright yellow color of the coping and the lack of oxide layer, the amount of opaque material required is very slight, about .05 millimeters. (Traditional metal substructures require .20 millimeters of opaque.) The result is an extremely esthetic restoration with a total thickness of metal and porcelain at .8 to 1.0 millimeters in the gingival third.

2) Conservative tooth reduction can be performed as a result of the minimal thickness of the Captek coping material. Requiring less tooth reduction without aesthetic compromise is definitely a benefit of the Captek system, especially for younger patients who require full coverage restorations and have larger pulp chambers or when clinicians margin of choice is a bevel or knife-edge.
3) The ability to conventionally cement or bond Captek restorations. Having the capability to bond or cement Captek restorations makes the system useful in situations with aesthetic margins (at the gingival crest or slightly below), or in situations with deeper margins where isolation for use of resin cements is not possible. Also, this capability allows Captek to be used on preparations with shorter axial height where bonding the restoration to dentin is required for retentive purposes, or on longer preparations where either cementing options could be used.

4) Studies have shown less bacterial accumulation around Captek margins extended to the margin edge. When aesthetic and restorative needs require equigingival or sub-gingival margin placement, as indicated with many aforementioned clinical conditions, a material that is esthetic and bioprotective is highly desirable.

5) Marginal integrity, which has been reported to be between 14.5 and 17.5 microns, is comparable to the best conventional full gold cast restorations.

6) Captek can be used in conjunction with a variety of all porcelain systems without aesthetic
compromise. Because some teeth in an aesthetic case may only require partial coverage restorations or veneers, it is very important that partial coverage pressed porcelain restorations and veneers match full coverage metal ceramic restorations. It is the experience of the author and other clinicians that the warmth provided by the thin Captek Nano Gold understructures is extremely helpful in these situations.

7) Captek Nano copings are highly supportive of porcelain and, impart low stresses to veneering ceramics resulting in high restoration fracture resistance.7

CASE REPORT – COMPARING CAPTEK NANO EZ TO ALL CERAMIC CROWNS IN THE AESTHETIC ZONE

In today's world of all ceramic crown technologies, it is believed by many clinicians that there is a compromise in aesthetic quality when using porcelain fused to metal restorations. Due to the unique composition of Captek and the ability to use this material for high value restorations without over opacifying the metal is a huge “plus” as far as the aesthetic appearance of the completed restoration. As mentioned previously, another advantage of Captek as a restorative material is that the surface of the material has a lower surface free energy8 than tooth structure, thus is far less likely to attract plaque.8 Since many full coverage restorations today are replacement restorations that already have intracrevicular margination, this property can be of clinical value when the periodontal environment is less than ideal.

The patient in this case report presented with old porcelain fused to metal crowns on tooth numbers 8 and 9 that she wanted replaced for aesthetic reasons. There appeared to be some marginal gingivitis around the old restorations, especially in the proximal area between the central incisor teeth. Upon removal of the restorations and modification of the preparations, (Fig. 1) a minor biologic width encroachment was found directly interproximal after sounding to bone with a graduated periodontal probe. Provisional restorations were fabricated and minor periodontal surgery was planned to

1) correct disparate gingival heights over the central incisors, and

2) correct the proximal biologic width encroachment (Fig. 2). After reflecting the interdental papilla between the central incisors, an all-tissue laser was used to make the bony correction relative to the restorative margin (Fig. 3). A Weidelstadt chisel was then used to plane the root surfaces and smooth the alveolar bone (Fig. 4). After placing an interdental suture, the provisional restoration is cemented with tem-
A self etching resin cement (G-Cem Automix: GC America) is chosen for the Captek Nano restorations, which were selected by the patient. A self-etching resin cement provides the highest bond strength of cements used for “conventional” cementation (without the use of total etch and bonding agents prior to the placement of cement).

After about 8 to 12 weeks of healing, the tissue is mature enough to make master impressions for the case. Figure 6 shows the provisional restoration prior to the master impression appointment. Since the provisional restorations has been a 2-unit splint and the patient has not been fastidious with proximal tissue management, the papillary tissue is still a bit blunted (Fig. 7). With proper proximal contouring of the definitive restorations following natural emergence profiles and single units placed allowing for easier home care, with time, the tissues will mature, and it is expected that the interdental papilla will fill in the gingival embrasure nicely. Prior to master impression making, tooth number 8 will require placement of a fiber post to reinforce internally after root canal therapy. The temporary access filling material is removed and post room is made leaving about 5mm of gutta percha in the apex of the root canal (Fig. 8). A dual cure resin bonding agent (Gradia Core: GC America) is dispensed, mixed, and placed in the root canal space with a microbrush making sure to remove any excess with a series of dry microbrushes as needed (Figs. 9 & 10). The dual cure core material (Gradia Core: GC America), which in this case, will be used to also cement the fiber post, is injected into the root canal system (Fig. 11), and the post is pushed to place. After light curing, the excess around the access cavity is removed with a diamond bur. After a few weeks of healing, the biologic width is checked using a periodontal probe (Fig. 12). Healing is complete and master impressions are ready to be made. A double cord retraction technique is used, placing a #00 cord at the base of the sulcus and a #1 cord at the level of the preparation margin (Fig. 13). Figure 14 shows the master impression after completion. Note that the impression captures not only the preparation margins, but .5 millimeters of tooth surface apical to the margins. The tooth shade is taken using a shade taking device (Easy Shade: Vident) and verified with the shade tab (Vita 3D Linear Shade Guide: Vident) (Fig. 15).
A facebow transfer, opposing impression, and centric bite registration was also taken and the case was sent to the ceramist.

Blocking preparation (tooth) color on an endodontically treated tooth can be a clinical challenge when using all ceramic materials. Even if the ceramist sufficiently blocks the preparation (stump) shade at the time of fabrication with opacious porcelain, the underlying tooth can still darken with time leading to a color mismatch post operatively. The most reliable solution for these types of cases is to cover the endodontically treated tooth with a substructure that will block light transmission through the ceramic to the underlying tooth structure. The two clinical choices to accomplish this would be porcelain pressed to zirconium and porcelain fused to Captek Nano (porcelain fused to metal). Having previously discussed the aesthetic advantages of Captek Nano EZ, as opposed to conventional porcelain to metal crowns, and since many assume that all ceramic crowns pressed to zirconium appear better aesthetically than any porcelain to metal restoration, it was decided to have the ceramist make a set of each — Porcelain pressed to zirconia and porcelain fused to Captek Nano EZ and let the patient decide which case she wished to cement.

Figure 16 shows a porcelain pressed to zirconia and porcelain fused to Captek Nano EZ restoration side by side from the facial view. Both exhibit nice aesthetics. Figure 17 shows the two restorations from the intaglio view, Captek Nano EZ and porcelain being taken to the margin on the left side and zirconium cut back and porcelain baked to the margin, on the right side. Captek Nano EZ is taken to the margin to take advantage of the low surface free energy of the composite metal and
therefore, less plaque attraction, since the original restorations had invaded the biologic width. A porcelain margin can be utilized on a Captek core if desired. The provisional restorations are removed revealing the health of the tissue at 16 weeks after preparation and surgery (Fig. 18).

Figures 19 and 20 show at the try in appointment, a Captek Nano EZ restoration on tooth number 8 and a porcelain to zirconium on tooth number 9. Figure 20 is a 2X view. Both restorations have acceptable gingival aesthetics, with no dark lines or discoloration of the marginal gingival tissues. Figure 21 shows both Captek Nano EZ restorations in place from the facial aspect. Figure 22 shows both porcelain to zirconia restorations in place from the facial aspect. Figure 23 is a full smile view of the Captek Nano EZ restorations in place. Figure 24 is a full smile view of the porcelain to zirconia restorations in place. Both sets of restorations are aesthetic in their own right and would provide an acceptable clinical result for the patient. Note that the gold color of the Captek Nano EZ restorations give the overall color a slight “warmth” that does not exist with the porcelain to zirconium pair. The patient examined both sets of restorations very carefully and chose the Captek Nano EZ restorations for cementation because she felt that they “looked more like her natural teeth prior to having her first set of crowns.”

A self-etching resin cement (G-Cem Automix; GC America) was chosen to cement the Captek Nano EZ crowns. Treating the internal surface of Captek Nano EZ with 50-micron aluminum oxide in an air abrasion unit will add to the micromechanical retentiveness of the restorations. A self-etching resin cement will adhere to the preparation and also be insoluble in oral fluids.

Prior to cementation it was noted that a small amount of proximal tissue that had prolapsed over the margin on the distal of tooth number 8 (Fig. 26). A diode laser (NV Laser: Discus Dental) (Fig. 27) is used to remove the tissue tag without bleeding to allow for accurate seat and cementation of the restoration (Fig. 28). After verifying proximal fit both radiographically and clinically, the restorations are lined with luting cement and placed upon the preparations (Fig.29). Due to the accuracy of internal and marginal fit, bulk loading of cement is not recommended by manufacturer. Remember not to disturb the set of the cement for 90 seconds to allow for the self-etching component to react with the dentin. After about two minutes, a gel set is reached and the marginal excess can be removed with an explorer (Fig. 30). Right and left lateral views (Figs. 31 & 32) of the cemented restorations show how nicely the Captek Nano EZ crowns blend with the adjacent natural teeth. Figure 32 is a retracted full smile view of the completed restorations at the two-week postoperative visit.

CONCLUSION
In today’s world of all ceramic systems, it is easy to forget that excellent aesthetics can still be attained with porcelain to metal crowns. With porcelain to metal systems like Captek Nano, many of the positive aesthetic attributes of all ceramic crowns in the anterior region can be realized while retaining the ability to control the preparation color and create a more biologic intracrevicular environment. The benefit of less plaque accumulation around Captek composite metal (71% less than around natural teeth) for any restoration with an intracrevicular margin is a biologic benefit for tissue health and ultimately the longevity of the restoration. Also, by being able to use just about any cement, either conventional, resin modified glass ionomer, self-etch or total etch resin cements, delivery of Captek units cannot be easier or more predictable. Today, when zirconia based restorations are receiving so much attention, it is important to remember that a restoration with a proven record such as Captek, is still a consideration in any clinical situation that one is thinking of all ceramic crowns.

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Oral Health welcomes this original article.

REFERENCES
7. test of Captek ceramic metal composite bond 2010: ENEA research center, Faenza, Italy, Giancarlo Garotti, restorations fabricated by Dentalprotezi srl Laboratory of Mr. Godeas, Conegliano veneto, italy  