CLINICAL CASE VISALYS® BIOCERAMIC BLOCK: BIOMIMETIC RECONSTRUCTION OF AN EXTENSIVE POSTERIOR DEFECT USING A NOVEL CAD/CAM MATERIAL

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Digital dentistry has progressively shifted procedures once dependent on dental laboratories into the dental practice, while introducing new CAD/CAM materials that demand careful clinical evaluation. In contrast to conventional materials such as zirconia or ceramics, hybrid glass blocks, such as the **VISALYS® BIO**CERAMIC BLOCK, combine a high proportion of ceramic fillers with a bisphenol A-free polymer matrix. The aim is to mimic the biomechanical behavior of natural tooth while maintaining the excellent machinability and repairability of resin-based materials. This case report describes the fully digital, single-visit rehabilitation of a posterior tooth using an onlay milled from **VISALYS® BIO**CERAMIC BLOCK (Kettenbach Dental), a novel single glass-ceramic phase embedded in a carbon matrix. The patient presented with an extensive, infiltrated composite resin restoration and secondary caries, with loss of one cusp. After caries removal and a composite resin base build-up, the cavity was prepared for an onlay, digitally scanned, designed in Inlab CAD, and milled on a two-axis Primemill (Dentsply Sirona) unit in 6 minutes and 20 seconds. The restoration was characterized with surface pigments and adhesively cemented following a standardized protocol in a single appointment. Excellent marginal adaptation, color match, and occlusal integration were achieved. This case illustrates how hybrid glass blocks, with the mechanical properties demonstrated here, may offer a favorable balance between mechanical resistance, aesthetics stability, and clinical handling for indirect CAD/CAM posterior restorations.

INTRODUCTION

Digital dentistry represents a significant transformation in contemporary dental practice. With the introduction of digital tools, several processes that were once entirely manual and dependent on a specialized dental laboratory can now be executed directly in the office. This shift not only elevates clinical efficiency but also grants greater self-sufficiency to dental surgeons in performing certain procedures. In this scenario, the quick introduction of new materials into the market – aiming to meet demands for greater biocompatibility and superior aesthetic and functional results – constitutes a continuous challenge for professionals in the field.
In light of digitalization, professionals must constantly update themselves regarding innovations in materials for indirect restorations via CAD/CAM systems. These inputs exhibit variations in their physical and chemical properties that directly influence clinical decision-making. In-depth knowledge of these specific characteristics is crucial to ensuring the efficacy and longevity of restorations, encompassing both aesthetic aspects and the mechanical and functional requirements of each case.

Since each patient presents specific clinical needs and particularities, planning for the fabrication of an indirect restoration must consider, among other factors, the current state of the dentition. It is essential to assess how they will interact with the new elements to be placed in the oral cavity. The wide range of available materials can make selection challenging.
CAD/CAM milling materials are currently available in various compositions and can be classified into different categories based on their characteristics and indications:

1. Glass-Ceramics: include glass-ceramics such as feldspathic and synthetic porcelains (based on leucite, lithium disilicate, and fluorapatite). They are recognized for their excellent aesthetics, biocompatibility, durability, and stain resistance. However, there are limitations regarding brittleness and the potential to wear down opposing teeth; furthermore, working with these materials can be challenging in cases requiring thin margins and minimal thickness to preserve healthy tooth structure.

2. Polycrystalline ceramics: The main characteristic is a crystalline structure that provides strength and fracture resistance; furthermore, as they contain no glass, they are not sensitive to hydrofluoric acid. This lack of acid sensitivity somewhat limits their indications for partial restorations, such as veneers and restorations lacking mechanical retention. Another drawback is their excessive strength, which leads to wear on opposing teeth.

3. Composite resins: Offer flexibility and resilience, enabling faster fabrication by eliminating the need for furnace-based crystallization or staining steps. They exhibit a wear rate similar to that of natural teeth, are easily repairable, and require only polishing. However, their downsides include the premature loss of polish and shine and aesthetic quality. CAD/CAM composite resins undergo a physical polymerization process involving light and/or heat; consequently, their properties may vary depending on the specific region of the block.

4. Hybrid glass blocks: (e.g., **VISALYS® BIO**CERAMIC BLOCK): These fall into the category of materials composed of high-density glass-crystal phase dispersed within a bisphenol A (BPA)-free polymer matrix. Produced via laser sintering that densifies the glass crystals, the final material consists of a unique glass-ceramic matrix embedded in an organic phase. Specifically, the **VISALYS® BIO**CERAMIC BLOCK features a patented laser polymerization system that ensures consistent matrix properties throughout the entire block. The advantage of replacing the glass matrix of conventional ceramics by a polymer network is the improvement of the properties like flexural strength and strain to failure and the mechanical behavior similar to natural dental tissue and better machinability compared with ceramic materials. [1, 2]

The selection of the ideal material for indirect restorations in the posterior region remains one of the most complex clinical scenarios in restorative dentistry. Given the plurality of materials indicated for the same clinical presentation, the clinician must guide their decision through a meticulous multifactorial analysis, aiming for both the longevity of the restored element and the homeostasis of the stomatognathic system. [3] A biomechanical and functional approach must be observed. [4] This article aims to show through a clinical case, a new material that emerges as an interesting option for indirect CAD/CAM restorations.

CLINICAL CASE

In this clinical case, we present the use of **VISALYS® BIO**CERAMIC BLOCK, a new material that stands out for its aesthetics, low bur consumption, ease of processing and polishing. The **VISALYS® BIO**CERAMIC BLOCK has the advantage of being biomimetic; this material has physical properties similar to dentine, which is very interesting in this case. Due to its patented laser polymerization technology, the block is designed to exhibit consistent material properties throughout its volume. This is particularly relevant for CAD/CAM milling, as the restoration is machined from the central portion of the block. Uniformity of properties throughout the block therefore contributes to onsistent and predictable milling behavior and, consequently, to the reproducibility of the final restoration.
The patient presented with a large composite resin restoration with infiltration and caries (figure 1), which was responsible for the structural loss of one of the cusps and the consequent need for its removal. After the initial procedures of anesthesia and rubber dam isolation, the restoration and caries were removed (figure 2), and **VISALYS®** FILL and **VISALYS®** FLOW was used as a restorative base (figure 3). Following the composite restoration base build up, the preparation for an onlay was performed with diamond burs.
The rubber dam isolation was removed, and the preparation was scanned to acquire the digital files used for the onlay design through the Inlab CAD system. With the restoration designed, the file was exported to the Inlab CAM production software, connected to a Primemill two-axis milling machine (Dentsply Sirona),

and **VISALYS**® A2 BIOCERAMIC CAD/CAM Block was chosen (figure 4), where the restoration took only 6 minutes and 20 seconds to be produced. Following the milling, the restoration was easily removed from the block and finished with pigments (figures 5, 6 and 7). The rubber dam isolation was performed again to complete the cementation (figures 8-14).

CEMENTATION PROCESS IN THIS CASE

Restoration Preparation:

1. Sandblasting with 50µm aluminium oxide 1.5bar;
2. Clean the restoration with air/water spray, and with alcohol;
3. 5% hydrofluoric acid for 20 sec.
4. Clean the restoration with air/water spray;
5. 37,5% phosphoric acid for 15 sec.
6. Clean the restoration with air/water spray,
7. Apply **VISALYS**® RESTORATIVE PRIMER for 60 sec.

The points 2, 3, 5, and 6 listed above were implemented as part of this clinical case; however, they are not routinely required.

Tooth Preparation:

1. Clean the tooth with pumice;
2. Sandblasting with 50µm aluminium oxide 1.5 bar due to the characteristics of the preparation;
3. Apply restorative primer in the parts that we have composite resin, for 60 sec.;
4. Apply tooth primer in all adhesive area and blow with air for 10 sec.;
5. Place **VISALYS**® CEMCORE A2/A3 in the restoration and wait 4 minutes for photo activation (during this period, the excess was gently removed).

DISCUSSION

The digital revolution in dentistry has not only transformed how treatments are performed, but has also brought a range of new materials that dentists must know and master. And the choice should be based in some criteria.

Dental Wear: When the antagonist of an indirect restoration is natural dental enamel, mechanical biocompatibility regarding friction and wear rates becomes the paramount factor. The introduction of high surface hardness materials, such as Dissilicate ceramics or inadequately polished zirconia, can trigger accelerated abrasive wear of the natural tooth structure. [5, 6]

Furthermore, ceramics exhibit a substantially lower volumetric degradation rate than enamel over time. This asymmetry in tribological behavior can result in a diffuse loss of the physiological occlusal plane, culminating in premature contacts, periodontal overloading, and the potential destabilization of centric occlusion in the long term. [7, 8] Therefore, meticulous polishing and longitudinal occlusal monitoring are imperative.

Aesthetic Stability: The replication of the optical properties of the remaining tooth structure and the permanence of this visual harmony are critical determinants of clinical success. The ideal material must not only reproduce natural fluorescence, opalescence, and translucency but also resist chromatic degradation resulting from the sorption of fluids and exogenous pigments. [9, 10]
Materials that exhibit surface stability and allow for simplified intraoral repolishing act as an excellent clinical asset, ensuring that the original surface gloss and texture can be rehabilitated without the need for restoration replacement. [11, 12]

Easy Handling: The predictability of a restorative procedure is intrinsically linked to its technique sensitivity and ease of handling, during both clinical and laboratory phases. Materials that demand rigorous geometric cavity preparations and highly complex adhesive luting protocols – such as the acid-etching and silanization of glass-ceramics – increase susceptibility to operational failures. [13, 14]

In contrast, laboratory composite resins and hybrid materials offer greater clinical resilience. They accommodate more conservative preparations, allow for refined occlusal adjustments and, fundamentally, enable intraoral additive direct repairs, thereby optimizing clinical time and workflow ergonomics.

Mechanical Resistance and Structural Behavior: Posterior restorations are subjected to severe cyclic masticatory forces, axial loads, and tangential stresses. The selected material must possess high flexural strength and fracture toughness to mitigate the risk of catastrophic failure. [15, 16]

However, the rigidity of the material (elastic modulus) must be strategically evaluated. While polycrystalline ceramics (such as zirconia) offer extreme resistance at reduced thicknesses, their high modulus transfers residual stresses directly to the adhesive interface and the root structure. Conversely, materials with an elastic modulus closer to that of dentine, such as structural composites and hybrid CAD CAM blocks, act as stress absorbing dampers, preserving the biofunctional integrity of the tooth-restoration interface. [17, 2]

CONCLUSION

The choice of this material was based on its unique properties, including high fracture resistance and excellent marginal adaptation, and its capability to be easily repolished and repaired. The procedure was completed in a single appointment, highlighting the efficiency and practicality of digital dentistry.
The introduction of products like **VISALYS**® **BIO**CERAMIC BLOCK demonstrates the potential of CAD/CAM technology in providing high-quality restorative solutions tailored to the individual needs of patients. This continuous evolution requires professionals to stay up-to-date in order to offer the best possible care.

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ATTACHMENT

Figure 1. The initial situation of unsatisfactory restoration with an inadequate occlusion, broken proximal margin and infiltration.

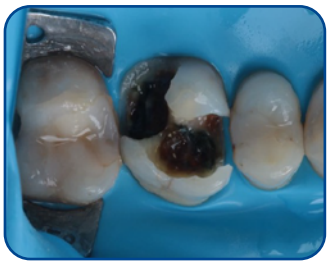

Figure 2. After removal of the restoration, infiltration is observed and the secondary decay.

Figure 3. After removal of the decay a base restoration was performed to protect the dentine pulp complex and an onlay was prepared on the tooth.

Figure 4. The **VISALYS**® **BIO**CERAMIC BLOCK comes in four different shades, A0, A1, A2, A3 and Translucent. For this case the choice was A2.

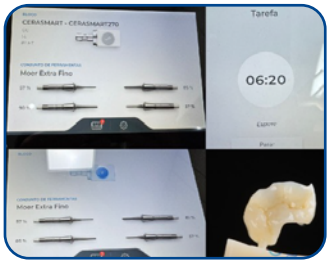

Figure 5. The Block was milled in Primemill® Sirona. Total mill time 6 minutes 20 seconds with a consumption of 5% 1.0 drill and 4% 1.2 drill.

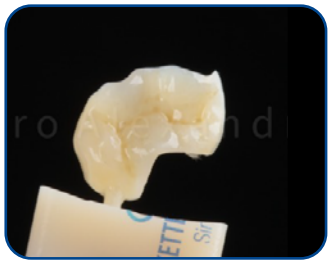

Figure 6 and 7. The restoration after milling and characterization.

Figure 8. The perfect fit and adaptation of the restoration.

Figure 9. Surface preparation of the block begins with sandblasting with 50µm aluminum oxide and clean the restoration with air/water spray.

Figure 10. 5% hydrofluoric acid for 20 seconds and clean the restoration with air/water spray.

Figure 11. 37,5% phosphoric acid for 15 seconds and clean the restoration with air/water spray.

Figure 12. Apply **VISALYS**® RESTORATIVE PRIMER for 60 seconds.

Figure 13 and 14. The perfect match of the color and mimetic result of the restoration.

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Professional Background & Education

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