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CASE REPORT

CERAMIC FACET AS AN ALTERNATIVE TO REPLACING A IMPLANT-SUPPORTED CROWN IN INFRAOCCLUSION – CLINICAL CASE

Faceta cerámica como alternativa al cambio de corona implanto-soportada en infraoclusión – caso clínico

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ABSTRACT

Introduction: Scientific evidence has shown us that dental implants do not adapt to the natural eruptive process of the teeth, so over the years they can stand in infraposition in relation to the neighboring teeth, especially when the implants have been placed in patients at the age of growth.

Case Report: In this case report, an alternative is considered to avoid removing the implant-supported crown and having to make a new one by adhering a lithium disilicate veneer. The application of hydrofluoric acid and silane is considered the gold standard for the conditioning of glass ceramics, but it presents high toxicity and is a protocol-sensitive method.

Conclusion: The objective is to propose an alternative for the preparation and conditioning of ceramics based on ammonium polyflouride under absolute isolation. This approach involves returning the patient´s function and aesthetics with a conservative and economical treatment compared to total replacement of the prosthesis.

Keywords: *Dental veneers; Ceramic; Ammonium polyfluoride; Dental esthetics; Dental implants; Hydrofluoride acid.*

RESUMEN

Introducción: La evidencia científica nos ha demostrado que los implantes dentales no se adaptan al proceso eruptivo natural de los dientes, con el paso de los años pueden quedar en infraposición en relación a los dientes vecinos, sobretodo cuando los implantes se han colocado en pacientes en edades de crecimiento.

Reporte de Caso: Este informe de caso plantea una alternativa para evitar retirar la corona implantosoportada y tener que realizar una nueva adhiriendo una carilla de disilicato de litio. La aplicación de ácido fluorhídrico y silano es considerado el gold estándar para el acondicionamiento de cerámicas vítreas, pero presenta alta toxicidad y sensibilidad a la técnica.

Conclusión: El objetivo es proponer una alternativa de preparación y acondicionamiento de la cerámica a base de polifluoruro de amonio bajo aislamiento absoluto. Este abordaje supone devolver la función y estética a la paciente con un tratamiento conservador y económico comparado con el reemplazo total de la prótesis.

Palabras Clave: *Coronas con frente estético; Cerámica; Polifluoruro amonio; Estética dental; Implantes dentales; Ácido fluorhídrico.*

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INTRODUCTION

It has been documented in the literature that osseointegrated dental implants do not adapt to the eruptive process of natural teeth, behaving similarly to ankylosed teeth.[1] Therefore, it is recommended that implant placement be post-poned until after the peak of skeletal growth.[2] Furthermore, ongoing adaptation of the maxillary bones persists throug-hout life, even as growth potential diminishes with the onset of adulthood.[3] Consequently, over time, implant-supported crowns may develop a vertical discrepancy com-pared to adjacent natural teeth, a condition termed infraposition.[1]
While this change is typically prominent in the anterior maxilla, posterior teeth also undergo a limited continuing eruptive process, though less than canines and incisors. In these cases, clinical observations often reveal infraocclusion of implant-supported prostheses.[4]

Conventional planning for rehabilitating crowns on infrapositioned implants typically involves removing the old crown and making a new fixed prosthesis (FP) to restore the proper anatomy of the tooth to be replaced. In the following clinical case report, an alternative conservative treatment for rehabilitating an implant-supported crown in infraocclusion is proposed. An occlusal-vestibular lithium disilicate veneer (e.max; Ivoclar Vivadent, Schaan, Liechtenstein) was crafted and cemented intraorally after conditioning with Monobond Etch & Prime (MEP, Ivoclar Vivadent, Schaan, Liechtenstein).

The combination of etching with 9% hydrofluoric acid (HF) and pure silane is considered the gold standard for conditioning glass ceramics. This method can create surfaces with greater roughness and surface energy, thereby improving the clinical performance of restorations.

However, due to its high toxicity, volatility, and sensitivity, the use of HF requires absolute isolation when applied intraorally. Consequently, repairing fractured ceramic restorations remains a significant challenge for clinicians.[5]

The dental industry has sought alternatives for the conditioning of vitro-ceramics that may present fewer adverse effects for the patient and the environment. Among these alternatives is Monobond Etch&Prime ammonium polyfluoride (MEP, Ivoclar Vivadent, Schaan, Liechtenstein). This material combines the etching effect of ammonium polyfluoride with the chemical bonding capacity of the silane bonding agent to the glass component of the ceramic, simplifying the ceramic conditioning technique to a single step.[6] According to the manufacturer, the surface roughness and etching depth are less pronounced than those achieved with HF conditioning, but it allows adequate adhesion of the restorations.[7]

Literature describes that the adhesive strength achieved with MEP on vitro-ceramic restorations does not differ significantly from traditional conditioning with HF and silane.[8]

Furthermore, this primer reduces the probability of excessive degradation of the vitreous matrix and minimizes the toxic effects associated with HF, resulting in satisfactory clinical outcome and stable adhesion over time.[9,10] A study conducted by Zahram et al.,[11] concludes that MEP conditioning, instead of acid etching with HF and silane application, helps mitigate the harmful effects of HF use in dental treatments.

CASE REPORT

A 69-year-old female patient with no significant medical history reported concerns regarding

an implant-supported crown in position 1.4, which was placed in 1999 using a Nobel Biocare Branemark System MK III implant (Figure 1). The crown (PF1) is currently in infraposition and exhibits a higher value compared to the adjacent teeth. Upon clinical examination, no signs of peri-implantitis were detected, and the peri-implant soft tissues were stable. However, it is noticeable that the single metal-ceramic fixed prosthesis on implant for tooth replacement 1.4 exhibits infraocclusion, positioned approximately 1.5 mm above the occlusal plane. In terms of color, a higher value is observed when compared to adjacent teeth (1M1 on the Vita 3D Master scale) (Figure 2).

Considering the stability of the soft tissues, bone tissue, and financial considerations, it was decided in collaboration with the patient not to remove the PF1 cemented on the implant. Instead, an occlusal-vestibular lithium disilicate veneer (IPS e.max Press, Ivoclar Vivadent) 1.5 mm thick was placed. This approach aimed to restore both the height and color harmony of the implant-supported rehabilitation on tooth 1.4. A direct mock-up was performed using Brilliant Everglow composite resin (Coltene) to assess the patient's functional and aesthetic expectations. Silicone keys were then made to guide the preparation and veneer fabrication, ensuring appropriate vestibulo-palatal depth and occlusal-apical height to maintain optimal thickness of lithium disilicate and prevent excessive wear of the PF1 ceramic, thereby avoiding metal exposure. Once the treatment plan was approved, preparation of the occlusal-vestibular veneer was performed using a fine- and ultra-fine grain frustoconical diamond bur with abundant irrigation (Figure 3).

The impression was taken using addition silicone in heavy and fluid consistencies (Panasil, Kettenbach). Isolation of the cervical area was accomplished with double, triple, and double zero retractor threads, respectively (Ultrapack, Ultradent). Color assessment was performed using the Vita 3D Master colorimeter, resulting in a color match of 1M1 for the substrate and 3M1 for the final color. The models were mounted on a semi-adjustable articulator and sent to

Figure 1. Panoramic x-ray of the patient showing crown on rehabilitated implant.

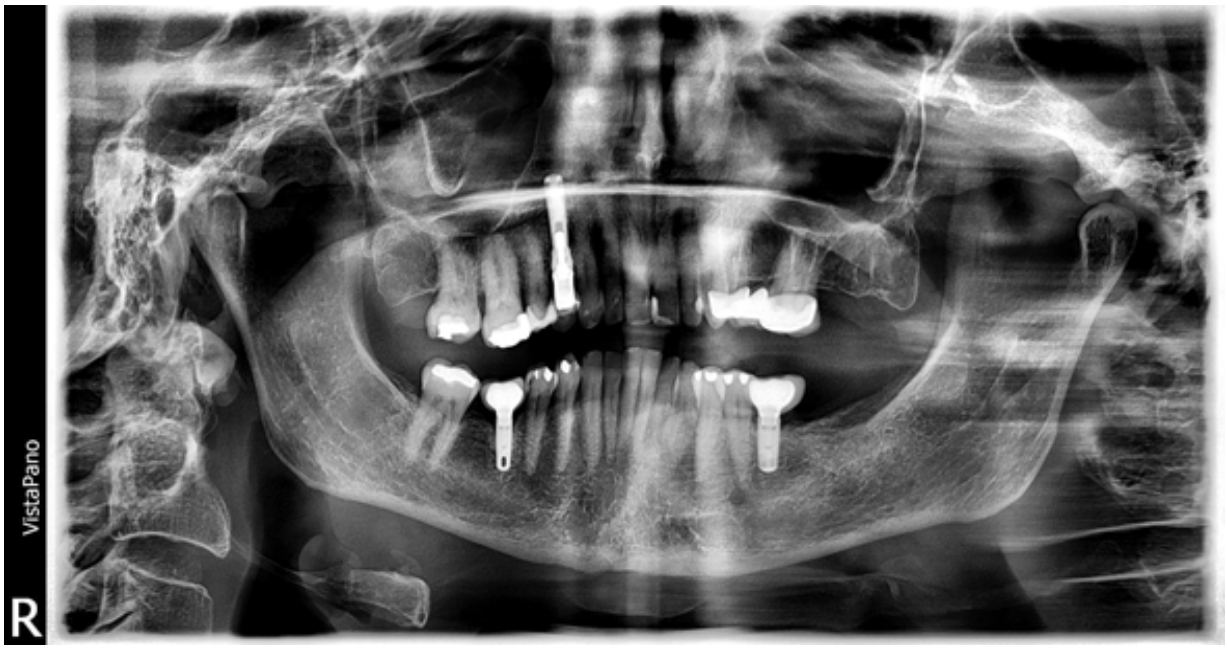

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Figure 2. Profile photograph of the patient showing the infraocclusion.

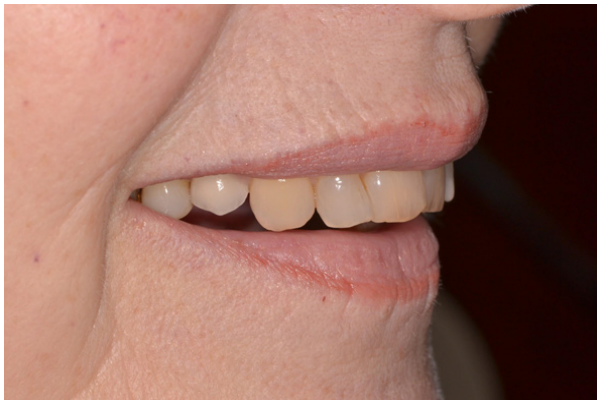


Figure 3. Preparation for occlusal-vestibular veneer.

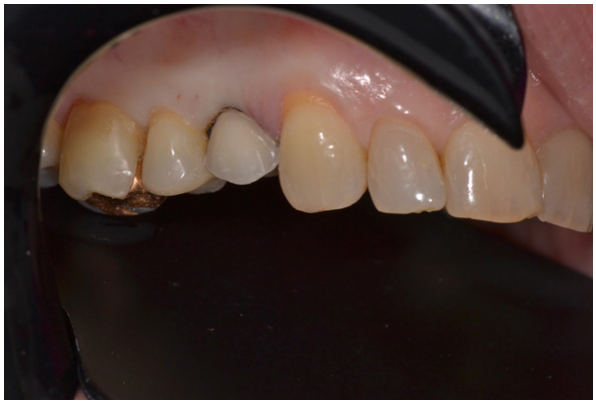


Figure 4. Absolute isolation using rubber dam, gingival barrier, and placement of Teflon on adjacent teeth.

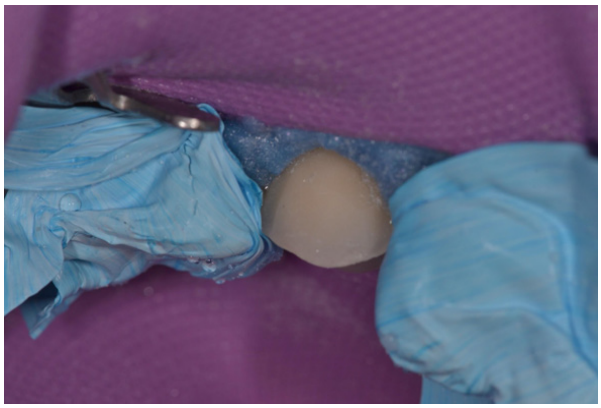


Figure 5. Preparation with MEP using a microbrush.

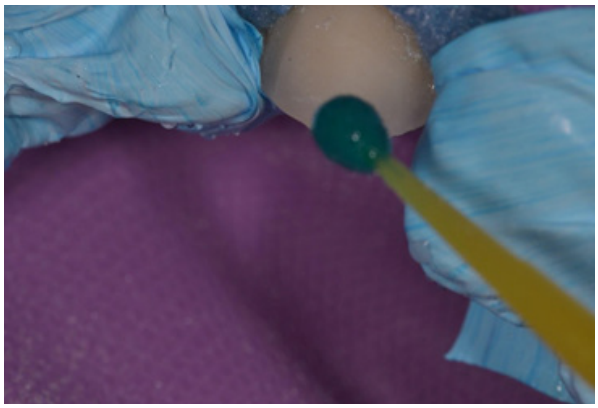


Figure 6. Photograph of the immediate outcome after cementation of the ceramic restoration.

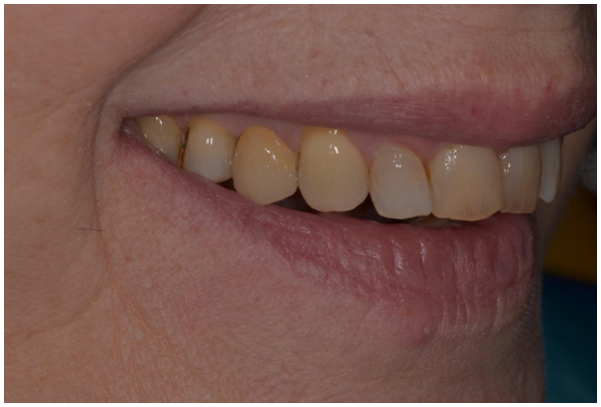
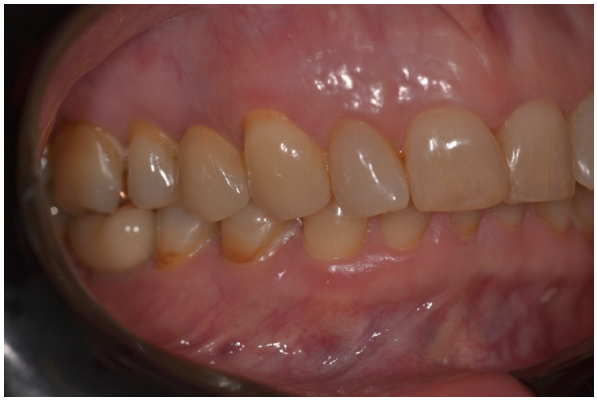


Figure 7. Clinical status 60 months after cementation of the veneer.



the laboratory for the manufacture of a lithium disilicate veneer.

After verifying the fit with a dry test and confirming the color using Choice 2 cement test pastes (Shofu), both the veneer and the prepared ceramic-metallic crown underwent conditioning. The veneer was first treated with 9% HF acid (Porcelain Etch, Ultradent) for 20 seconds, followed by application of 35% orthophosphoric acid (Ultra Etch, Ultradent) for 60 seconds to remove hexafluorosilicate salts from the ceramic surface. After thorough rinsing with air-water spray and drying, two layers of silane (Porcelain Silane, Ultradent) were applied for 60 seconds.

Conditioning of the PF1 feldspathic substrate was carried out through absolute isolation under a rubber dam, gingival barrier, and Teflon placement on adjacent teeth (Figure 4), while ensuring eye protection for both the patient and operator. Monobond Etch & Prime (MEP, Ivoclar Vivadent AG, Schaan, Liechtenstein) was applied using a microbrush, gently rubbing the surface for 20 seconds and allowing it to act for an additional 40 seconds. MEP residues were carefully aspirated with a cannula until no visible traces remained. The surface was then rinsed with water-air spray for 20 seconds, followed by drying with air for an additional 10 seconds (Figure 5).

For cementation, translucent Choice 2 light-curing resin cement (Bisco, Schaumburg, USA) was used following application of the All Bond 3 adhesive system (Bisco, Schaumburg, USA). The cement was light-cured using a Valo Grand lamp (Ultradent, South Jordan, UT, USA) for 60 seconds at standard power and an additional 3 seconds at extra power.

Figure 6 shows the immediate result after cementation of the ceramic restoration. The patient has diligently attended her semi annual check-ups, during which the stability of the soft tissues and the aesthetic integrity of the new restoration have been consistently confirmed. Figure 7 shows the clinical status 60 months after veneer cementation, showcasing excellent integration both aesthetically and biologically.

DISCUSSION

According to the criteria proposed by Albrektsson , an implant is deemed successful if bone resorption is less than 1.5mm during the first year of prosthetic loading and 0.2mm in subsequent years, criteria which are reflected in the clinical case presented here. Furthermore, a systematic review covering a 20-year follow-up period analyzed implant-supported single-unit rehabilitations with external hexagonal connections, reporting high survival rates averaging 94.6%.[12]

This evidence justifies continued investment in such implant rehabilitations. In contrast, screw-retained restorations on implants offer easier repair compared to cementretained crowns, facilitating treatment of both technical and biological complications.[13] In the clinical case presented, a cemented rehabilitation required drilling into the PF1 to access the prosthetic screw, resulting in structural and ceramic damage. The selection of lithium disilicate as a restorative material for ceramic laminates, over other alter-natives, is driven by its exceptional mechanical and aesthetic properties, as well as its acid-sensitive capacity, which enables effective adhesive cementation.[7,11]

Conditioning with hydrofluoric acid (HF) creates porosity that enhances the micromechanical retention of adhesive materials, while silane provides a stable chemical bond. However, its use has raised concerns due to its toxicity and volatility, posing risks to the health of operators, patients,

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and the environment.[14,15] In early 2015, a one-step conditioner MEP was introduced to the market to address these issues, aiming to reduce technical sensitivity and simplify acid etching of glass-ceramic restorations as an alternative to HF surface treatment.

Studies have shown that applying MEP for at least 60 seconds achieves adhesive bond strengths similar to those of HF + silane. For instance, Maqbool *et al.,*[16] found comparable bond strengths of HF + silane (20.7 MPa) and MEP (18.7 MPa), with MEP even demonstrating higher shear adhesive strength values than HF in certain studies. Moreover, cohesive failures appear more related to the mechanical properties of the cement rather than the bond strength at the glass-ceramic and resin cement interface.[17]

Research by Siqueira *et al.,*[18] reported no marginal staining, misalignment, or fractures after 6 months of cementation of lithium disilicate veneers conditioned with MEP, indicating promising clinical outcomes comparable to HF conditioning.
These findings are reinforced by *in vitro* studies showing MEP's superior adhesive values compared to HF + silane.[16] MEP represents a safer alternative to HF, posing reduced health risks for both patients and dental staff. While the manufacturer does not specify its intraoral use, its application in this case report was supported by meticulous isolation and protection of adjacent hard and soft tissues. This approach resulted in successful clinical outcomes over 60 months of follow-up, demonstrating lower toxicity risks and achieving good adhesive strength.

Clinical relevance

This clinical case report shows a minimally invasive alternative for treating cemented crowns on implants with infraocclusion. MEP offers a simplified ceramic conditioning alter-native to HF + silane.

CONCLUSION

The use of ceramic veneers bonded to implant-supported ceramic crowns cemented in infra-occlusion offers a minimally invasive alternative to complete replacement.
Conditioning with MEP currently serves as an alternative to HF+silane, reducing the risks associated with HF´s high toxicity. Nevertheless, additional long-term studies are necessary to support this technique as a viable alternative to the current gold standard.

CONFLICT OF INTERESTS

The authors declare no conflict of interest.

ETHICS APPROVAL

Informed consent was obtained from patient

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AUTHORS' CONTRIBUTIONS

Marcus N: Methodology, Writing- original Draft.
Grandón F: Data curation, visualization.
Wendler M: Investigation, Supervision.
Pérez P: Writing – Review and editing.
Pino D: Investigation, Supervision.

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