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### RESEARCH ARTICLE

#### Glass ceramic bonded bridge: Clinical case

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#### Abstract

When it is impossible to put an implant for medical, social or financial reasons, making an adhesive restoration (bonded bridge) should be systematically considered.

All-ceramic bonded bridges are the contemporary evolution of metallic bonded bridges. This article aims to discuss, through a clinical case, the interest of glass-ceramics for the realization of an all-ceramic bonded bridge.

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#### Introduction:-

Currently restorative dentistry is characterized by a radical change of concepts: more respect for healthy tissues and aesthetic imperatives, but also a constant concern to limit the complexity of prosthetic treatments. bonded bridges are part of this new therapeutic orientation.

When it's impossible to put an implant for financial, social or medical reasons, making an adhesive restoration (bonded bridge) must be systematically considered (1).

The majority of the bonded bridges are made of precious or non-precious metal alloy. They have an aesthetic disadvantage, particularly in the anterior region, due to the metal fins who affect the colour of the abutment tooth (2,3), in addition to the biocompatibility and corrosion problems specific to the alloys used (4)

However, the demand for esthetic restoration, as well as the development of the notions of biocompatibility associated with the evolution of bonding and ceramic materials have led to metal-free restorations (5,6,7,8,9) Ceramic bonded bridges are part of this dynamic

This article proposes to highlight the interest of vitrocereamics for the realization of an all ceramic bonded bridge, supported by a clinical case

#### Clinical case

This clinical case is about a patient who was referred by the orthodontic department for the restoration of agensis of the 22. The implant therapy was rejected due to bone deficit, also the patient refuses any surgical procegre. the option of bonded bridge is indicated, since the central and the canine are healthy and in normoposition (fig 1), the aesthetic requirements of the patient and her reluctance to all metal restoration, leads us to propose a ceramic-ceramic glue bridge.

Initially, in order to improve the profile of the intermediate, we proceed to a preparation of the crest in order to obtain an intragingival ovoid profile, giving an illusion of the natural gum.

This peak ovalation is determined by the expected position of the collar line of the bridge intermediary, who is usually 1 mm below the line that joins the central collar to the canine collar, (fig2). The soft tissues are carved in a crater with a ball diamond bur (fig3).

As a temporary, a transparent dental splint is used with acrylic resin teeth at the end of the preparation.

The acrylic resin teeth are bonded to the dental splint and rebased with flowable resin composite in order to allow a «guided tissue healing» of the crest ridge (usually in 10 to 15 days).

The composite has to be perfectly polished in order to have good tissue healing (fig 4,5).

This technique has the advantage of conditioning the soft tissues, it gives an apical gingival festoon and it creates apseudo-papillae (fig6).

The aim of the preparation is to provide a sufficient and homogeneous volume for the ceramic ensuring optimal mechanical and aesthetic qualities also to allow a precise insertion of the restoration.

The prep at the canine level and the central incisor has (fig7):

- Supragingival Palatal margin, 1mm chamfer
- the preparation extends over the cingulum, 2 mm from the tooth edge;
- Cup-shaped cingular preparation with 2mm depth;
- proximal extension at the level of the contact point;
- all corners must be rounded.

The impression of the preparations was made in two phase one stage technique, to create a cast. The IPS Emax (Ivoclar) infrastructure was then manufactured (fig8,9).

Making a precise preparation who has good calibration (wedgin) is therefore fundamental to an exact placement of the bridge when it comes to bonding. It is absolutely necessary to recheck the perfect adaptation of the bridge before bonding.

The bonding of the bonded bridge in lithium disilicate (IPS Emax, Ivoclar) has the same clinical procedure as partial restorations:

- orthophosphoric acid cleaning after the final clinical trial of the bridge to remove bacterial contaminants from the wing inner surface.
- etching with hydrofluoric acid (4-9%) for 20 seconds of the ceramic wing inner surface,
- rinsing and drying,
- silane deposit and wait about 3 minutes,

In order to prepare the teeth surfaces, it must be insulated with a rubber dam (orthophosphoric acid etching 30 seconds for the email and 15 seconds for the dentin), and the bonding is done with a dual resin (Panavia F, Kuraray, Okayama, Japan).

## Discussion

In this case, the ceramic bonded bridge was indicated when there is one missing tooth, in order to replace the upper lateral incisor. Its indication corresponds to the principle of tissue economy as well as to the concept of the therapeutic gradient, which ensures a better preservation of the tissues of the abutment teeth. (10)

The visual and aesthetic quality of a bridge depends on the shape of the ridge, the intermediate and its emergence profile. Various clinical forms of intermediaries presenting variable relations with the crest were thus described: no contact, more or less extensive contact, without pressure or slightly compressive contact, or even deep penetration into the alveolar crest.

Magne et al (11) recognize the many advantages of an ovoid intermediate, and underline that such geometry isn't permitted only if the morphology of the crest has a concave surface.

This exceptional situation can be achieved by immediate conditioning after extraction with a temporary prosthesis or a delayed conditioning after surgical extraction. If the edentulous area is stable and has a sufficient thickness of soft tissue (3mm) it can be modified by an ovoid-shaped intermediate that will allow to reshape the soft tissues in the cervical region (12).

In this case, a receiving area is prepared at the cup-shaped edentulous ridge to accommodate the fully convex gingival face of a bridge intermediary. This preparation is carried out by abrasion using a large diamond ball bur. The literature underlines the possibility of making this gingival preparation with an electrosection using an electric scalpel (11).

According to Edelhoff, the “ovate pontic” has the best profile both biologically and aesthetically (13). The diode laser (soft laser) can also be indicated to prepare the crestal site, because of its tissue safety, better surgical aftermath and faster healing).

The work of the authors who have contributed the most to the description of the principles of preparation for metallic bonded bridges, has made it possible to emphasize not only the importance of a precise preparation, but also to establish the specifications of these bonded bridges. However, few descriptions have been made for ceramic bonded bridges (14, 15).

For technical reasons, it is not possible to make all ceramic bonded bridges according to the same principles as for ceramo metallic bonded bridges.

Both the thickness of the wing surface and the dimension of the interproximal connector must be greater than those recommended for metal-reinforced bridges.

For ceramo-metallic preparation, the preparation aims to create a slide-type runner connection, with a single degree of freedom and friction of adhesion between the inner surface of the armature and the abutment tooth. On the other hand, for all ceramic preparation, it is necessary to have a passive base by an adequate and rounded preparation. In addition, for technical reasons, all-ceramic systems require a more invasive preparation compared to ceramic metal systems.

WALTER (16) described the principles of preparations for bonded bridge realized with the Emax IPS system

- Production of slightly concave 0,5 mm preparation on the palatal surfaces of the abutment teeth bordering the edentulous ridge.
- Respect of the translucency of the incisive edges and occlusal contacts, leaving 2mm from the incisive edge of the preparation.
- Respect of the proximal surfaces making the contact area opposite to the edentulous ridge by leaving the preparation 1 millimetre from them.
- The preparations stop in the form of a well marked groove behind the contact area in the proximal surfaces bordering the edentulous ridge.
- Supra-gingival margin of 0.8 mm depth chamfer is done, limited to the enamel.

The future prosthesis must respect the following criteria:

- Junction areas shall have sections of 12 mm.
- The wings thickness must be on average 1 mm.

Different materials were used to manufacture ceramic bonded bridges: feldspathic ceramics, zirconia, glass-infiltrated alumina and vitroc ceramic .

Some publications describe the clinical procedures for each material, but there is no work providing indications of the medium- and long-term behaviour of these rehabilitations (17 18 19 20 21).

In our case, the choice was made for glass ceramics, which combine high strength and good aesthetics (22). Some studies have shown a 100% success rate, with high patient satisfaction (23 24).

This ceramic is reported to have a high compressive strength (400 MPa). It also has a variety of shades, translucency and opacity which provides a good aesthetic (25). It is able to obtain an adhesive bond and has a higher adhesive force to resin cement compared to other ceramics (26). Its lack of mechanical properties compared to zirconia requires to increase the connections areas.



**Fig 1: Initial situation, missing 22, 21 and 23 healthy in normal position**

Fig 2: buccal view showing an excessively large ridge requiring surgical reorganization

Fig 3: The use of a diamond round bur (diameter 016 or 023) red ring allows the peeling of the top of the ridge in order to achieve the "ovalization".



Fig 4: Relining using a flow composite of the lower surface of the commercial tooth present in the temporization splint

Fig 5: Situation with aesthetic temporization gutter in place.

Fig 6: Healing after 10 days. Note the convex profile formation of the ridge intended to receive



Fig. 7: Palatal view of the preparations, we note: - the palatal discharge in the cervix, - the occlusal cornice away from the free edge (translucency preserved), - the proximal box facing the edentulous area (connection surface: 12 mm<sup>2</sup>)



Fig 8: Buccal and palatal view of the bonded bridge



Fig 9: Glass ceramic bonded bridge



Fig. 10a, b - Final situation after bonding buccal and palatal view

### Conclusion

The ceramic bonded bridge represents a contemporary evolution of conventional metal bonded bridges in response to patient demand. It is a minimally invasive option for anterior tooth replacement.

The development of bonding combined with the constant improvement of the mechanical and optical properties of vitrocereamics reinforced with lithium disilicate (IPS Emax ,Ivoclar) lead us to indicate this material in the construction of the bonded bridges.

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