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BRIDGES MADE OF COMPOSITES REINFORCED WITH GLASS FIBRE, ANCHORED ON ABUTMENT TEETH WITH CROWN INLAYS – SELECTED CASES

SUMMARY

The usage of traditional bridges in the treatment of single dental gaps requires considerable grinding of the abutment teeth that should be protected with prosthetic crowns. An alternative to traditional bridges in the treatment of patients with single dental gaps can be fixed restorations, where crown inlays connect the pontic with abutment teeth.

The aim of this study was to present an alternative method of treatment of single dental gaps with composite bridges reinforced with glass fibres, supported by selected clinical cases. The restorations were performed with composites reinforced with glass fibres: Targis/Vectris, Sinfony/StickTM, Sculpture/FibreKor. While preparing the abutment teeth, the existing fillings or cavities adjacent to the toothless gap were used to make crown inlays as retention elements for the bridges.

Based on the treatment conducted and the literature, it is possible to affirm that bridges anchored with inlays on a glass fibre foundation are a very good alternative to conventional restorations in the selected cases.

Key words: **bridge, inlay, fibreglass**

INTRODUCTION

Single dental gaps allow physicians to use different kinds of prosthetic restorations. Modern prosthetics proposes implants as restorations the least invasive to the teeth surrounding the gap. However, the numerous contraindications, high cost, as well as fear of surgery do not always permit their use. Conventional bridges commonly used in the treatment of single dental gaps require considerable grinding of abutment teeth which is not harmless to the prepared teeth, and the most frequent problems encountered are: caries (18%) and the need for endodontic treatment (11%) (1). Moreover, aesthetic concerns lead to the usage of subgingival crowns as retention elements of bridges, which is associated with the possibility of paradontium damage (2).

Well-known adhesive metal restorations with retention elements such as pins and wings have been used quite cautiously especially as restorations of side teeth, although clinical investigations have shown a high degree of success. They assured economical preparation of dental tissues, but the aesthetic effect was not fully satisfactory. Moreover, the connection of bridges stuck on a metal foundation with tooth tissues caused the appearance of two boundary layers (metal-composite and composite-tooth), which increased the risk of these restorations getting unstuck and of the development of secondary caries. An alternative to traditional bridges in the treatment of patients with single dental gaps are fixed restorations, where crown inlays connect the pontic with abutment teeth. This type of prosthetic reconstruction creates the possibility of economical preparation of abutment teeth as well as

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permits to utilize existing fillings or cavities in dental hard tissues (3).

The possibility of irreversible damage to abutment teeth pulp is smaller in comparison to conventional bridges (4). Bridges made of noble alloys as well as metal-ceramic ones, anchored by means of crown inlays, have been successfully used (5-7). The most often observed damages occurred between the metal and opaque ceramics. The presence of a metal frame is associated with the possibility of allergies as well as toxic effects of metal ions produced as a result of corrosion (8). Symptoms such as xerostomia, burning sensation in the mucous membrane, altered taste, pain, parodontal diseases, osteonecrosis and soft tissues necrosis have been observed.

The development of materials technology and technological processes is directed towards restorations without a metal foundation, thus there have been attempts at using modern ceramics for the construction of bridges anchored by means of inlays. However, the usage of certain ceramics, due to their insufficient durability, is still limited in the posterior section of the dental arch (6). Restorations on a zirconium oxide foundation are recently becoming more and more popular. In vitro investigations have proven this type of bridges anchored with crown inlays to be highly durable, which gives reason for optimism, yet has to be confirmed in clinical observations (6).

In the 1990s, composite materials reinforced with glass fibre were introduced to the market. The characteristic features of these materials are: high tensile strength and crushing strength and flexibility module similar to dentine, which permits to make prosthetic restorations with a capacity for damping and absorption of mechanical stresses (6). Moreover, these materials are available in several colours and are characterized by light conductivity particularly beneficial in adhesive cementation with the so-called dual cements.

The structure of fibres can be one-way (all fibres arranged parallel to each other) or in the form of heterogeneous weaves. The glass fibres used in constructions of bridges anchored on abutment teeth with inlays are one-way fibres pre-proofed with resin. In vitro investigations have shown a higher deflection strength of composites reinforced with one-way glass fibres in comparison to glass fibres in the form of weaves and polyethylene fibres that are used in dentistry, too (9,10). The endurance of a construction reinforced with glass fibres is greater for one-way fibres arranged perpendicularly to emerging forces, particularly when the layer of glass fibre is located in the lower part of the bridge pontic, namely in the layer subject to tension.

Ceromers used for facing are marked by low water absorption, abrasion approximate to enamel and fluorescence, permitting to achieve a successful aesthetic effect. The usage of adhesive cements for fastening bridges anchored on abutment teeth by means of crown inlays has assured a perfect connection of those bridges with tooth tissues. However, one should remember that crown inlays are a weaker kind of retention elements for bridges than crowns and, therefore, their usage should be limited to the reproduction of single dental gaps.

Moreover, the usage of bridges anchored on abutment teeth by means of crown inlays is contraindicated in cases of high susceptibility to caries, too extensive damage to dental crown, dead teeth, short dental crown and too thin walls surrounding the gap (the possibility of preparation under the inlay after lowering of approximately 2mm of bumps). The relative contraindications to using bridges anchored on dental pillars by means of crown inlays are: the inability of making a sufficient pit, presence of all-ceramic or metal-ceramic restorations as antagonists and advanced bruxism.

Hebr. et al. observed 72 % survivability of these restorations after 3 years of observation. After 4 years, Freilich et al. observed 75 % of success and an increase of survivability to 86 % after enlarging the quantity of fibres (11). Other studies have shown 86% of success after 2 years of usage of restorations. Göhring et al. described the longest observation time (5 years) and they presented 71 % of success. The most frequent damage was the separation of layers from the facing material, connected with overestimated loading strength of the facing material (3). The author assesses boundary leak tightness as satisfactory. He observed an insignificant deterioration of leak tightness after a year of usage of the restorations, while in the next years he did not find any significant change. There have also been changes rather associated with the facing material, such as change of colour and gloss of the composite used. Even though the restorations presented are not free from defects, the slight reduction of dental tissues, satisfactory appearance and easiness of repair are the incentives to use them.

The aim of this study was to present three selected cases of prosthetic treatment of patients with single dental gaps by means of composite bridges on a glass fibre foundation as an alternative method of treatment of single gaps in the side section: Targis/Vectris (Ivoclar Vivadent, Sweden), Sinfony (3M ESPE, USA)/StickTM (Stick Tech Ltd, Finland) and Sculpture/FibreKor (Jeneric/Pentron, Germany). The restorations were bonded adhesively with Variolink II (Ivoclar Vivadent, Sweden) or Calibra cement (DENTSPLY DeTry Gmbh, Germany).

MATERIAL AND METHODS

Abutment teeth were processed in accordance with the principles applicable to inlays to assure one track of introducing the restoration and to avoid the location of the edges of the processed surface in the area of contact with antagonistic teeth (9) *(Figure 1)*. A one-step two-layer impression was taken with Zetaplus/Oranwash L mass (Zhermack, Italy) and KKD Kondisil mass (KKD Gmbh, Germany).

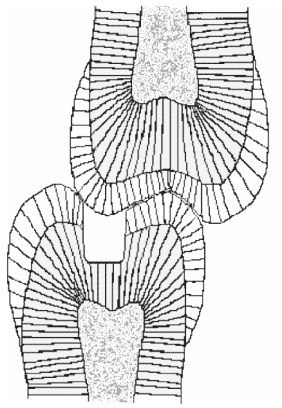

Figure 1. Avoid the location of edges of the prepared surface in the area of contact with antagonistic teeth

Making a pit on the occlusive surface with dimensions dependent on the material used *(Figure 2)*: for Vectris it was necessary to make a pit 3 mm high, 2 mm wide and 2 mm long, while for FibreKor/StickTM and Sinfony/StickTM Systems – a pit of 2x2x 2mm.

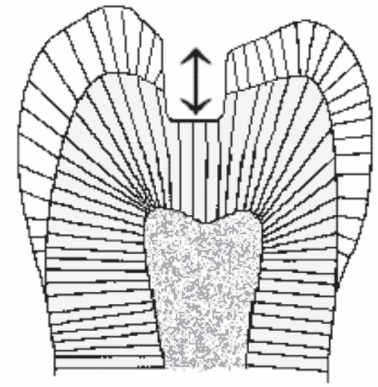

Figure 2. Making a pit on occlusive surface with sizes dependent on chosen material: Targis/Vectris: 3 mm heigh, 2mm deep and 2 mm wide, and for Sinfony/StickTM and Sculpture/FibreKor a pit of 2 x 2 x 2mm.

Preparation of internal walls parallel to each other or slightly divergent (the angle between the bottom and axial wall 90° ÷ 100°) - to obtain internal retention *(Figure 3)*.

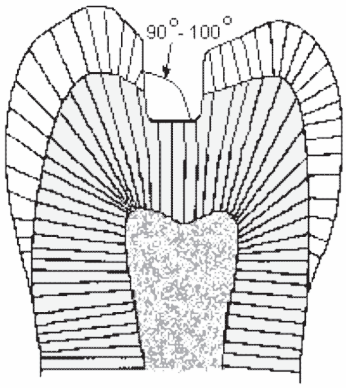

Figure 3. Preparation of internal walls in parallel or slightly divergently (angle between bottom and axial wall 90ş ÷ 100º) – to obtain internal retention.

Preparation of all internal angles in a rounded way to prevent additional tensions *(Figure 4)*.

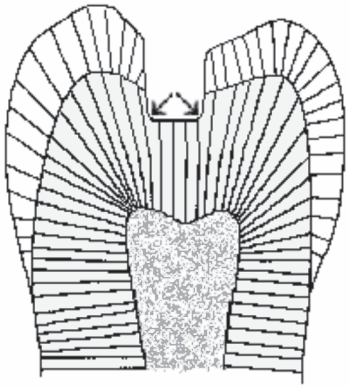

Figure 4. Preparation of all internal angles in a rounded way

Removal of undercuts by filling them with a primer, e.g. glassionomer *(Figure 5)*.

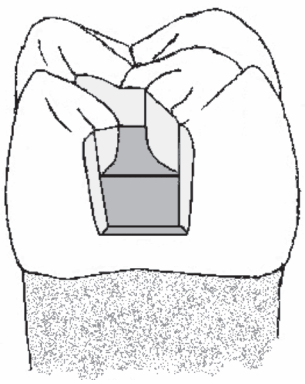

Figure 5. Removal of undercuts by filling them with primer

RESULTS

Case I. The patient aged 30, arrived to have missing tooth 25 restored (Figure 6). In tooth 26, a

composite MO filling was found. Tooth 24 intact. Inlay bridge 24 x 26 was planned. Upon preparation of the teeth according to the above-presented steps, a one-step two-layer impression was taken with Zetaplus/Oranwash L mass, an impression of opposite teeth with alginate mass, check-bite impression. The colour was chosen according to the Chromascop key.

Figure 6. Condition before treatment. Missing tooth 25

The bridge was made from Targis/Vectris *(Figure 7)*.

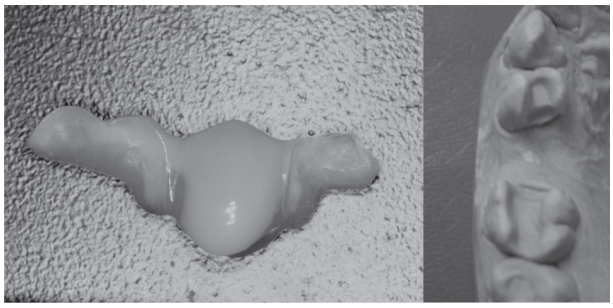

Figure 7. Teeth model after preparation. Bridge from Targis/Vectris

During the second clinical visit, after checking the restorations, the teeth were cemented with adhesive cement Variolink II *(Figure 8)*.

Figure 8 Bridge 24 x 26 cemented in oral cavity

A very good aesthetic and functional effect was obtained. The patient has now been wearing the restoration for 3 years.

Case II. The patient aged 32, arrived to have missing tooth 25 restored. In the clinical examination, amalgam MO filling in tooth 26 was found. Tooth 24 intact *(Figure 9)*. A 24 x 26 inlay bridge was planned.

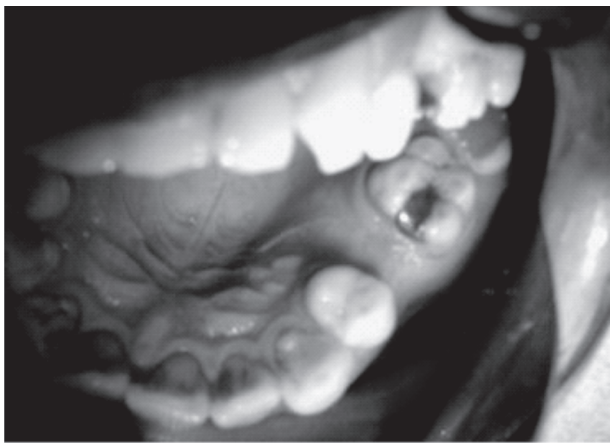

Figure 9. Condition before treatment. Missing tooth 25

The preparation of abutment teeth was done *(Figure 10)*, a one-step two-layer impression was taken with KKD Kondisil mass, an impression of opposite teeth with alginate mass, check-bite impression. The colour was chosen according to the Vita key. The restoration was made from Sinfony/StickTM material.

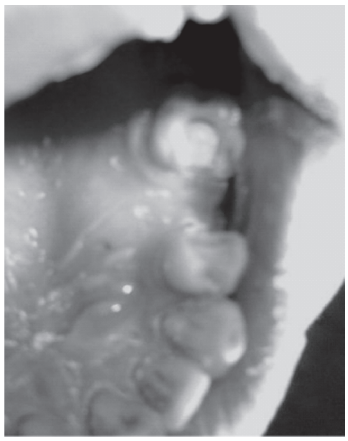

Figure 10. Abutment teeth 24, 26 after preparation

After a check-up of the oral cavity, the bridge was cemented with Variolink II *(Figure 11)*. A very good aesthetic and functional effect was obtained. The clinical observation was being carried out for 2,5 years.

Case III. The patient aged 24, a student of dentistry, arrived to have missing teeth 35 and 45 restored *(Figure 12)*.

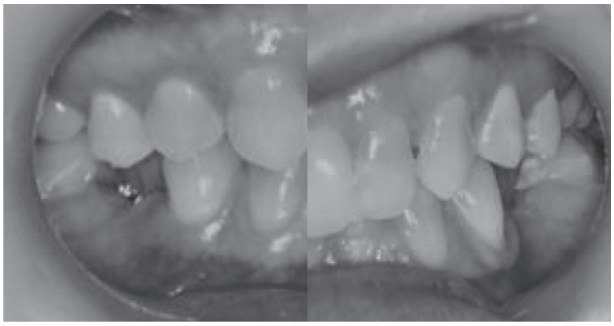

Figure 12. Condition before treatment

The patient did not report any stomatognatic complaints. After an analysis of the conditions in the oral cavity, execution of bridges on a glass fibre foundation with 34 x 36 and 44 x 46 pillars was planned. One-step preparation of abutment teeth was performed on both sides of the dental arch (Figure 13). A one-step two-layer impression was taken using KKD Kondisil mass, an impression of opposite teeth – with alginate mass, check-bite impression. The colour was chosen according to the Vita key. The bridges were made from Sculpture/FibreKor material.

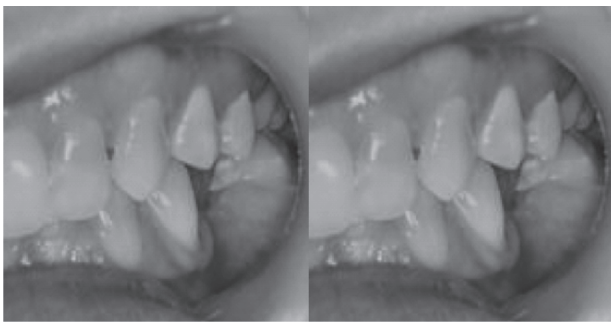

Figure 13. Abutment teeth 34, 36, 44, 46 after preparation

After a check-up of the finished restoration in the oral cavity, the bridges were cemented with Calibra cement. A very good functional and aesthetic effect was obtained as a result of the treatment, confirmed by frequent follow-up visits and the patient's objective assessment *(Figure 14)*. The period of observation was going on for 3 years.

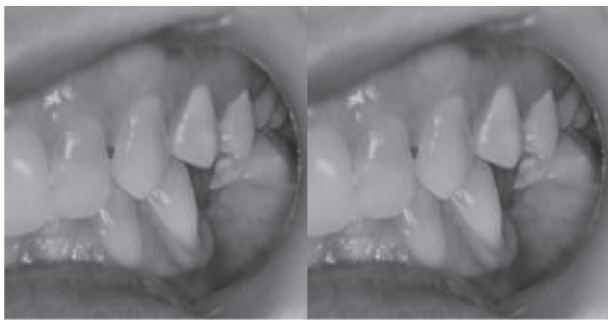

Figure 14. Bridges 44 x 46 and 34 x 36 cemented in oral cavity

DISCUSSION AND CONCLUSION

To recapitulate, it should be noted that composite bridges on a glass fibre foundation, in which crown inlays are the retention elements, are aesthetic restorations of small dental gaps and favor the prophylaxis of paradontium. Besides composite bridges on a glass fiber, foundation assures economical grinding of abutment teeth, using existing cavities and fillings and do not require abutment teeth to be parallel (12). Composite bridges provide the possibility of examining the vitality of abutment teeth, can be used in patients allergic to metals and make it possible to repair minor damages in the oral cavity. They are characterized by a simple laboratory procedure and comparatively low treatment costs, and in certain cases offer an alternative to conventional prosthetic restorations.

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KOMPOZITNI MOSTOVI OJAČANI STAKLENIM VLAKNIMA, FIKSIRANI NA ABATMENTIMA SA RAZLIČITIM INLEJIMA - ODABRANI SLUČAJEVI

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SAŽETAK

Upotreba tradicionalnih mostova u lečenju pojedinačnog nedostatka zuba zahteva značajno brušenje nadomeštenih zuba, koje treba zaštititi protetičkim krunicama. Alternativa za tradicionalne mostove u lečenju pacijenata sa pojedinačnim nedostatkom zuba su fiksne restauracije gde kruničnі inleji povezuju pontične i nadomeštene zube.

Cilj studije je bio da se prikaže alternativni metod lečenja pojedinačnog nedostatka zuba kompozitnim mostovima ojačanim staklastim vlaknima, što je i prikazano na primeru nekoliko kliničkih slučajeva. Restauracije su urađene kompozitima ojačanim staklenim vlaknima: Targis/Vectris, Sinfony/StickTM, Sculpture/FibreKor. U toku pripreme nadomeštenih zuba, postojeće plombe ili šupljine koje su se nalazile pored mesta gde je trebalo nadoknaditi zub su upotrebljene za izradu kruničnih inleja koji služe kao retencioni elementi za mostove.

Na osnovu sprovedenog tretmana i dostupne literature, može se reći da su poluprovodni mostovi ojačani staklenim vlaknima veoma dobra alternativa u konvencionalnim restauracijama odabranih slučajeva.

Ključne reči: **most, inlej, staklasta vlakna**