

MODERN TECHNIQUES OF OBTAINING INDIRECT RESTORATIONS

ADRIAN BUCĂ¹, ANCA FRĂȚILĂ²

¹PhD candidate "Lucian Blaga" University of Sibiu, Dental Medicine Private Practice, 93644 California, USA, ²"Lucian Blaga" University of Sibiu

Keywords: MZ100, CEREC, onlay
Abstract: Clinical performances of composite materials have been improved over time, leading to increased wear resistance and remarkable aesthetics. 3M Paradigm MZ100 is a composite block for Cerec; it is indicated for indirect restorations such inlays, onlays, veneers, anterior and posterior crowns. There is presented the technique of an onlay indirect restoration from composite (MZ100 Block) which is obtained by computer-aided technique and some of the benefits of restorative materials and modern technology in the dental office are also highlighted.

INTRODUCTION

Since the twentieth century advances made in the field of dental restorations were possible as a result of combined research between the field of dentistry and other areas such as physics, chemistry and engineering. Bioengineering studies like those of experimental stress analysis (photoelasticity, finite element analysis (FEA) helped to establish a correlation between the design of restorations in relation to the specific properties of the materials used in dentistry.(1) Available dental restorative materials have advantages and disadvantages, none can be considered ideal, clinical conditions (lesion size, restoring and maintaining the physiognomy, occlusion, preserving and strengthening the tooth structure) dictate the choice of a restorative material.(2) Clinical performances of composite materials have been improved over time, leading to increased wear resistance (fracture), remarkable aesthetics, and the fluoride addition to cariostatic properties.(3)

In the last twenty years, it has been developed the technique of obtaining indirect prosthetic restorations by computer aided design (CAD) which brings benefits both to the patient, the doctor and the dental technician (by avoiding traditional impression technique, which may give some patients the feeling of suffocation, by eliminating sources of undetectable error, by obtaining restorations in a short time). CEREC system is an ideal choice for anterior and posterior lithium disilicate ceramic restorations and other materials disilicate recently appeared as MZ100 Block from 3M ESPE.(4)

PURPOSE

This article aims at presenting the technique of an onlay indirect restoration from composite, which is obtained by modern computer-aided technique. Intracoronary indirect restorations are supported by the remaining tooth structure. The term inlay is used for intratisular prosthesis located between the walls of a cavity, so onlay is a modified inlay which offers protection, thus covering the occlusal surfaces of the cusps of the teeth.

CLINICAL CASE

LR, patient, aged 58, presents to a dental consultation accusing pain to sweet and cold in the lateral right mandibular region. On clinical examination, it is found the presence of a

decay on tooth 4.5. localized at proximal-occlusal-lingual level. After opening the cavity and exeresis of the altered dentin, due to the expansion in surface of the preparation, it has been decided to prepare a cavity with a specific design for a morpho-functional reconstitution of the tooth by an onlay. The cavity shape was defined using a fine diamond cilindrico-conical bar with a conicity of 5-6 degrees resulting in an occlusal-proximal-lingual cavity with axial walls and angles slightly divergent towards the occlusal and the meeting angles of the walls rounded. For the protection of the cusps, we reduced the distal half of the lingual cusp (you can see an early line of fracture on the base of the reduced cusp). Smoothing the edges of the cavity was made with fine diamond burs (figure no. 1).

Figure no. 1. The proximal-occlusal-lingual preparation for onlay

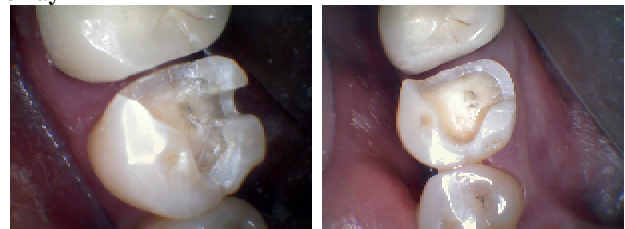


Figure no. 2. Defining the preparation margins of the 3D virtual model



²Corresponding author: Anca Frățilă, Str. C. Negruzzi, Nr. 2A, Sibiu, România, E-mail: fratila.anca@yahoo.com, Phone: +40722 933510
Article received on 10.07.2014 and accepted for publication on 06.01.2015
ACTA MEDICA TRANSILVANICA March 2015;20(1):113-115

CLINICAL ASPECTS

Prosthesis was made using the CEREC Omnicam being computer assisted both for the design and fabrication. We used MZ100 block of composite for CEREC from 3M, size 14 and colour A1. After optic scanning with intraoral scanner specific for Cerec AC system a three-dimensional virtual model is obtained. Next is the development of the virtual design of the restoration, prosthetic restoration design, which begins with defining the edges of the preparation (figure no. 2).

The computer (Cerec) comes with a proposal for the final crown based on specific measurements of mesial and distal adjacent teeth and the occlusal tooth structure remaining. Virtual obtain prosthetic restoration (figure no. 3). Yellow-green-blue colours show how close is the area of contact with neighbouring teeth. You can make changes in the proximal contact area (figure no. 4).

Figure no. 3. Virtual prosthetic restoration

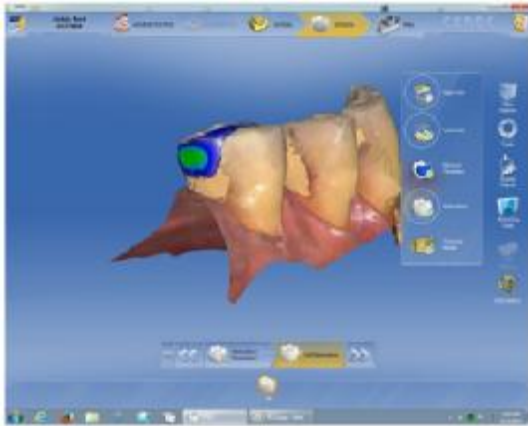
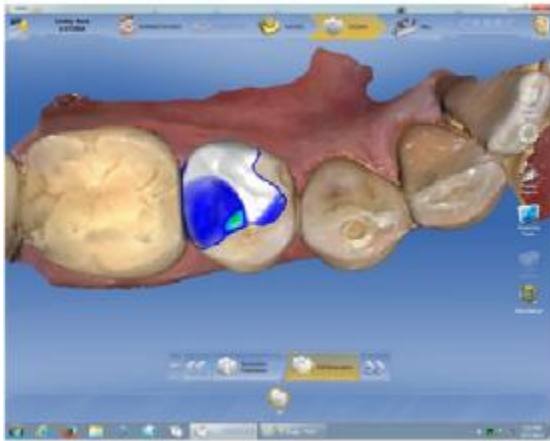


Figure no. 4. Visualization of the proximal contact



The occlusal contact with the opposing teeth is being checked. The limits of the occlusal surface (sagittal crests and marginal ridges) proposed by the program are being adapted to the desired morphology (figure no. 5).

The computer shows the position of the restoration in MZ100 composite block. You can change the position of the connection rod of the block. It should be placed as close to the middle of the vestibular or lingual face (figure no. 6). When using a block of IPS Empress CAD with opacity gradient the position of the crown in block can give more translucence or more opacity. After finalizing the design phase of the morphology restoration, the data is transmitted to the computerized milling device.

After getting the onlay using computerized milling of the MZ100 composite block, the intraoral occlusal marginal

adaptation and onlay site was examined.

Figure no. 5. Crown with antagonist image

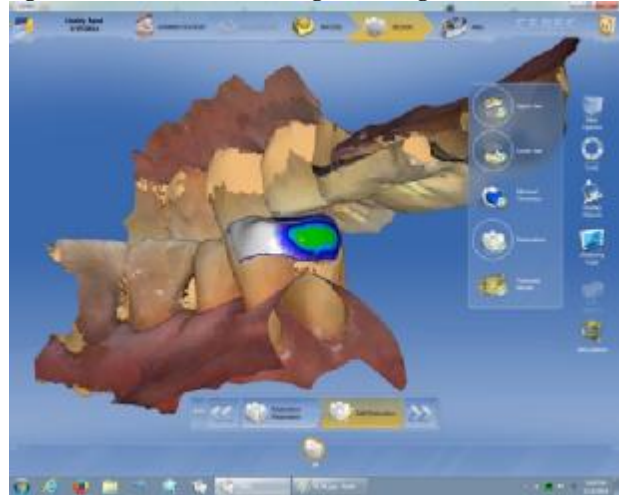


Figure no. 6. Position of the restoration in the block



Later, we used the transparent cementing composite with chemical setting Multilink for an adhesive cementation. Before the cementation the restoration was cleaned with steam (steamer) to remove all waste, treated using microabrasion silicate grains of 50 microns, rinsed with water, dried and then silanized with Monobond-Plus for 60 seconds. On the tooth we cleaned with Consepsis (concentrated solution of chlorhexidine, Ultradent), then we applied phosphoric acid on enamel margins for 10 seconds, followed by its removal with water until acid residues are not seen, again we applied Consepsis followed by air drying, desensitization with a solution of glutaraldehyde and HEMA (Gluma, Heraeus Kulzer or Micro-Prime, Danville Materials). Primer Multilink A / B was applied using a microbrush on the surface of the preparation for 30 seconds followed by drying with air flow. Because the primer is self-curing, light curing is not necessary. We applied Multilink Automix directly on the inner surface of the restoration. Cement is expressed in the preparation and restoration is then placed in preparation. After inserting the restoration the photopolymerization was done for 1-3 seconds on each side and then the excess of cement was removed with a scaler instrument, sponge pellets and interdental floss (before complete curing of the material). Another curing was carried out according to the instructions; others authors prefer rapid polymerization of about 5 seconds in each corner with a lamp curing with an output of at least 1.500 MW/cm². We covered the edges restoration

CLINICAL ASPECTS

glycerine gel (air blocker) immediately after removal of excess cement and we cured it again for 20 seconds. After cementing the occlusion was again checked and the edges were polished.

Figure no. 7. The final appearance in the mouth after onlay cementation's on 4.5.



DISCUSSIONS

3M Paradigm MZ100 is a composite block for Cerec, sold in 6 colours (E, A1, A2, A3, A3.5, and B3). It is indicated for indirect restorations such inlays, onlays, veneers, anterior and posterior crowns. MZ 100 for CEREC has a similar wear to the natural teeth.(5) It contains 85% ultra-fine ceramic particles of zirconium-silica that strengthens a polymer matrix of bisGMA and TEGDMA. Ceramic particles have an average size of 0.6 microns, providing the radioopacity necessary, wear resistance. MZ100 blocks are made of composite Z100 (3M) pre-polymerized. Clinical studies of this material shows a minimal postoperative sensitivity, a very good marginal adaptation, fracture resistance and marginal integrity, being a material that can be finished easily, allows the use of pigments for individualizing the restoration and cementation using adhesive cement.(6)

MZ100 restorations are durable, showing resistance to breakage, chipping, wear, marginal integrity, keeping its form and colour, the survival rate is very high at 5 years.(6,7) However this restoration material is not recommended in patients with bruxism. The images obtained by electron microscopy (SEM micrographs) show well-defined edges, edges with less roughness than restorations made of ceramic blocks.

The preparation of the tooth follows general indications of inlays / onlays of ceramic (butt-joint margins, minimum 2 mm isthmus width, thickness 1.5-2.0 mm minimum coverage of the cusps, internal angles rounded). In practice MZ100 blocks are used for small inlays or in situations where marginal closure of fillings is difficult to achieve (deep preparation in the distal part of molars). Using Cerec technology requires preparation that exposes the gingival margins of the cavity without interfering of the marginal gingiva and without its bleeding. It requires the use of retraction wire and in case of bleeding antihemorrhagics substances (20% ferric sulfate gel, Viscostat, Ultradent).

Because computerized milling composite block is between 3 and 5 minutes and does not require combustion, it is relatively easy to change the time of treatment (from a direct to an indirect filling) without major damage of patient scheduling.

Cementation is done using an adhesive cement (Multilink Automix, RelyX Ultimate Nexus3). It requires a very good toilet of the cavity, with the absence of contamination with saliva or blood. Toilet cavity was made with soil. Chlorhexidin 2% (Consepsis, Ultradent), both before and after the application of phosphoric acid 37%. The purpose of this manoeuvre is to decrease microbial load of cavity for the first application and increase fracture strength of the bonding agent for the second application.(8) We did selective demineralization with

phosphoric acid because studies have shown an increase in adhesion.(9)

CONCLUSIONS

1. Morpho-functional restoration of teeth with inlays, onlays of MZ100 composite (indirect technique) is much stronger than direct restoration by filling (polymerization being under controlled conditions).
2. Minimization of the tension placed on the walls of the cavity due to the elimination of dental dimensional changes in situ polymerization (minimizing C factor).
3. Combining the benefits of indirect restorations with direct restorations. Minimum time for the patient and doctor because of the absence of laboratory phase. The patient goes home with the final restoration in a single session.
4. Strengthening the relationship of trust of the patient who sees the doctor in the dental office using the latest oriented new technologies.

REFERENCES

1. Craig RG. Restorative Dental Materials. ed. All Educational; 2001.
2. Mount GJ, Hume WR. Conservarea și Restaurarea Structurii Dentare. Ed. All Educational; 1999. p.195-201.
3. Ferracane JL. Current Trends in Dental Composites. Critical Reviews in Oral Biology & Medicine. 1995;6:302-318.
4. Cerec News. 2008; http://dental.henryschein.es/local/equipamiento/pdf/cerec_news_international_2008-04.pdf.
5. Clinical Update, 3M™ Z100™ Restorative. Four-year Quantitative Wear. November 1997.
6. 3M Paradigm™ MZ100 Block. Technical product profile. http://multimedia.3m.com/mws/mediawebservlet?mwsId=6666UF6EVsSyXTtOxM_5xF6EVtQEVs6EVs6E666666.
7. Bilkhair A. Fatigue behaviour and failure modes of monolithic CAD/CAM hybrid-ceramic and all-ceramic posterior crown restorations. Inaugural-Dissertation; 2013.
8. Chang YE, Shin DH. Effect of Chlorhexidine Application Methods on Microtensile Bond Strength to Dentin in Class I Cavities. Operative Dentistry. 2010;35(6):618-623.
9. Torii Y, Itou K, Nishitani Y, Ishikawa K, Suzuki K. Effect of phosphoric acid etching prior to self-etching primer application on adhesion of resin composite to enamel and dentin. American Journal of Dentistry. 2002;15(5):305-308.