Predictable steps to Biomimetic Class IV restorations

By Dr Anand R. Nanvekar, India

Introduction
Composite Artistry has become an important element of direct restorative treatment in dental practice today enabling clinicians to create life-like restorations with individualized characterizations to match the patient’s natural teeth.

Anterior restorations in the aesthetic zone tend to constantly challenge the clinician’s skill, therefore it is important to plan carefully by combining art and science. Adopting the Minimally invasive Cosmetic Dentistry (MiCD) concept, introduced by Dr Sushil Koral in my treatment protocol with emphasis on preservation of natural tooth structure “Do No Harm Dentistry” has helped create predictable aesthetic restorations that exceed patient expectations.

Fractured upper central incisors are one of the most common cases of dentoalveolar trauma in the permanent dentition. The following clinical case highlights a simple technique to achieve predictable aesthetics with natural optical characteristics in a class IV restoration using a sculptable bio-mimetic direct restorative “Beautifil II LS”.

Materials
- Tooth preparation – Diamond Bur FG, Super-Snap Coarse Disk (Black)
- Restoration – Beautifil II LS – shade A2O, A2, Beautifil Injectable - shade INC, Beautifil II
- Enamel – shade HVT (High-Value Translucent enamel shade)
- Bonding system – Etchant and 2 step Adhesive system (FL-Bond II)
- Finishing & Polishing – Fine Diamond Bur (Red Band on shank), Onyx Polishing Paste, Super Snap Buff Disk

Step by Step Restorative Technique

Shade Selection
Vita Shade guide was used for shade selection while tooth was hydrated. Black and white photo is recommended for assessing value. Shade A2 was selected.

Mock Up
- An impression is taken and model poured using die-stone material. Freehand build up of composite for both teeth to evaluate the final outcome. Both teeth were carefully analysed and identified that each tooth required a different recipe for layering the composite material.
- Silicone putty index made from the plaster model to create an enamel shell to guide the build-up of the palatal enamel layer.

Tooth Preparation
- Rubber dam isolation from premolar to molar to premolar, Rubber dam in-vited and floss tied around teeth
- Infinite bevelling of margins to eliminate contamination with sulcular fluid. (Fig. 4)

Tooth Preparation
- Rubber dam isolation from premolar to premolar, Rubber dam in-serted and floss tied around teeth for further retraction of gingiva to eliminate contamination with sulcular fluid (Fig. 4)
- Infinite bevelling of margins to blend the composite material on both sides, labial and palatal with a round ended tapered Diamond bur

Patients Case
A 35 years old male patient visited our dental office with a complaint of chipped upper front teeth (tooth # 11,21) resulting from a childhood injury with no pain or sensitivity. The patient requested to enhance his smile with minimally invasive treatment.

Treatment Plan
After Intracranal examination, photographs were taken (Fig. 1), and a treatment strategy was formulated keeping in mind the patient’s high expectations for aesthetic restorations with less invasive treatment.

A direct composite restorative material with low shrinkage, predictable aesthetics, sculptable handling and easy polishability “Beautifil II LS” was selected. High value translucent enamel shade was identified to create optical effects of youthful teeth.

Procedure

1. **Mock Up**
   - Before and after photographs were taken (Fig. 1).

2. **Shade Selection**
   - Black and white photo taken with classic Vita shade guide for value assessment, Shade A2 matches with natural dentition compared to A1.

3. **Tooth Preparation**
   - An impression is taken and model poured using die-stone material. Freehand build up of composite for both teeth to evaluate the final outcome. Both teeth were carefully analysed and identified that each tooth required a different recipe for layering the composite material. (Fig. 3)
   - Silicone putty index made from the plaster model to create an enamel shell to guide the build-up of the palatal enamel layer.

4. **Finishing & Polishing**
   - Bonding system - Etchant and 2 step Adhesive system (FL-Bond II)
   - Finishing & Polishing – Fine Diamond Bur (Red Band on shank), Onyx Polishing Paste, Super Snap Buff Disk

5. **Tooth Preparation**
   - Rubber dam isolation from premolar to premolar, Rubber dam inserted and floss tied around teeth
   - Infinite bevelling of margins to eliminate contamination with sulcular fluid. (Fig. 4)

6. **Shade Selection**
   - Black and white photo taken with classic Vita shade guide for value assessment, Shade A2 matches with natural dentition compared to A1.

7. **Mock Up**
   - An impression is taken and model poured using die-stone material. Freehand build up of composite for both teeth to evaluate the final outcome. Both teeth were carefully analysed and identified that each tooth required a different recipe for layering the composite material. (Fig. 3)
   - Silicone putty index made from the plaster model to create an enamel shell to guide the build-up of the palatal enamel layer.

8. **Tooth Preparation**
   - Rubber dam isolation from premolar to premolar, Rubber dam inserted and floss tied around teeth
   - Infinite bevelling of margins to eliminate contamination with sulcular fluid. (Fig. 4)

9. **Shade Selection**
   - Black and white photo taken with classic Vita shade guide for value assessment, Shade A2 matches with natural dentition compared to A1.

10. **Mock Up**
    - An impression is taken and model poured using die-stone material. Freehand build up of composite for both teeth to evaluate the final outcome. Both teeth were carefully analysed and identified that each tooth required a different recipe for layering the composite material. (Fig. 3)
    - Silicone putty index made from the plaster model to create an enamel shell to guide the build-up of the palatal enamel layer.

11. **Tooth Preparation**
    - Rubber dam isolation from premolar to premolar, Rubber dam inserted and floss tied around teeth
    - Infinite bevelling of margins to eliminate contamination with sulcular fluid. (Fig. 4)

12. **Shade Selection**
    - Black and white photo taken with classic Vita shade guide for value assessment, Shade A2 matches with natural dentition compared to A1.

13. **Mock Up**
    - An impression is taken and model poured using die-stone material. Freehand build up of composite for both teeth to evaluate the final outcome. Both teeth were carefully analysed and identified that each tooth required a different recipe for layering the composite material. (Fig. 3)
    - Silicone putty index made from the plaster model to create an enamel shell to guide the build-up of the palatal enamel layer.

14. **Tooth Preparation**
    - Rubber dam isolation from premolar to premolar, Rubber dam inserted and floss tied around teeth
    - Infinite bevelling of margins to eliminate contamination with sulcular fluid. (Fig. 4)

15. **Shade Selection**
    - Black and white photo taken with classic Vita shade guide for value assessment, Shade A2 matches with natural dentition compared to A1.

16. **Mock Up**
    - An impression is taken and model poured using die-stone material. Freehand build up of composite for both teeth to evaluate the final outcome. Both teeth were carefully analysed and identified that each tooth required a different recipe for layering the composite material. (Fig. 3)
    - Silicone putty index made from the plaster model to create an enamel shell to guide the build-up of the palatal enamel layer.

17. **Tooth Preparation**
    - Rubber dam isolation from premolar to premolar, Rubber dam inserted and floss tied around teeth
    - Infinite bevelling of margins to eliminate contamination with sulcular fluid. (Fig. 4)

18. **Shade Selection**
    - Black and white photo taken with classic Vita shade guide for value assessment, Shade A2 matches with natural dentition compared to A1.

19. **Mock Up**
    - An impression is taken and model poured using die-stone material. Freehand build up of composite for both teeth to evaluate the final outcome. Both teeth were carefully analysed and identified that each tooth required a different recipe for layering the composite material. (Fig. 3)
    - Silicone putty index made from the plaster model to create an enamel shell to guide the build-up of the palatal enamel layer.

20. **Tooth Preparation**
    - Rubber dam isolation from premolar to premolar, Rubber dam inserted and floss tied around teeth
    - Infinite bevelling of margins to eliminate contamination with sulcular fluid. (Fig. 4)

21. **Shade Selection**
    - Black and white photo taken with classic Vita shade guide for value assessment, Shade A2 matches with natural dentition compared to A1.

22. **Mock Up**
    - An impression is taken and model poured using die-stone material. Freehand build up of composite for both teeth to evaluate the final outcome. Both teeth were carefully analysed and identified that each tooth required a different recipe for layering the composite material. (Fig. 3)
    - Silicone putty index made from the plaster model to create an enamel shell to guide the build-up of the palatal enamel layer.

23. **Tooth Preparation**
    - Rubber dam isolation from premolar to premolar, Rubber dam inserted and floss tied around teeth
    - Infinite bevelling of margins to eliminate contamination with sulcular fluid. (Fig. 4)

24. **Shade Selection**
    - Black and white photo taken with classic Vita shade guide for value assessment, Shade A2 matches with natural dentition compared to A1.

25. **Mock Up**
    - An impression is taken and model poured using die-stone material. Freehand build up of composite for both teeth to evaluate the final outcome. Both teeth were carefully analysed and identified that each tooth required a different recipe for layering the composite material. (Fig. 3)
    - Silicone putty index made from the plaster model to create an enamel shell to guide the build-up of the palatal enamel layer.

26. **Tooth Preparation**
    - Rubber dam isolation from premolar to premolar, Rubber dam inserted and floss tied around teeth
    - Infinite bevelling of margins to eliminate contamination with sulcular fluid. (Fig. 4)

27. **Shade Selection**
    - Black and white photo taken with classic Vita shade guide for value assessment, Shade A2 matches with natural dentition compared to A1.

28. **Mock Up**
    - An impression is taken and model poured using die-stone material. Freehand build up of composite for both teeth to evaluate the final outcome. Both teeth were carefully analysed and identified that each tooth required a different recipe for layering the composite material. (Fig. 3)
    - Silicone putty index made from the plaster model to create an enamel shell to guide the build-up of the palatal enamel layer.
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Fig. 15: Before and after image digitally overlapped to showcase extent of actual build-up of the composite restoration

Fig. 16: Frontal view of maxillary anterior teeth showcasing bio mimetic aesthetics of composite resin with a close match to natural tooth translucency and effects in the incisal area

Fig. 17: Artistic side view of both dental arches in anterior guidance 1 week post treatment showcasing complete rehabilitation of teeth and natural 60s beauty aesthetics

Rehabilitation of a dentition damaged by bruxism

Prosthetic treatment using monolithic all-ceramic crowns and composite bridges

By Dr Meni Chatzikonstantou, Dr George Pagassavou, Dr Andreas Konidis & Maria Spanopoulou, Greece

The present report describes the reconstruction of a severely worn dentition with the use of fixed restorations and with maximum preservation of the existing tooth structure. Implants were employed for the restoration of the partially edentulous lower jaw. Rehabilitation of the genodontium was attained with all-ceramic materials. Temporization was preceded by splint therapy and comprehensive pre-therapeutic treatment. The press technique and the CAD/CAM technology were utilized in the transfer from the temporary to the final all-ceramic reconstruction. This report describes the individual treatment stages and discusses the approaches taken in these stages.

For some years now, monolithic all-ceramic restorations have been a frequently used treatment option for the reconstruction of destroyed teeth. Their benefits include the ability to eliminate the use of metal, to implement a cost-efficient manufacturing procedure and to exclude the risk of chipping associated with metal. With the increase in the use of all-ceramic materials, the failure rate of those materials at high loads (bruxism and other parafunctions) has been discussed. However, advances in materials engineering and adhesive technology have led to the introduction of ceramic systems (e.g. lithium disilicate) that can be used for high load bearing restorations.

Introduction

This report focuses on the prosthetic treatment of a severely worn dentition in a bruxer. A consistent treatment plan is critical to a successful rehabilitation as a corrective diagnosis and the implementation of pre-therapeutic treatment measures. Material selection also becomes a crucial criterion of success or failure. We are of the opinion that it is possible to use all-ceramic materials in patients with bruxism - even if it is possible to accommodate the patients state otherwise - as long as the materials are selected appropriately to accomplish the treatment goals given the indication and then applied correctly. Yet, there is no such thing as a universal ceramic. Rather, the treatment team must take a decision for the restoration of the occlusion that does justice to the specific circumstances of the indication at hand. Monolithic restorations made of lithium disilicate (IPS e.max Press, Ivoclar Vivadent) using the press technique are possible for the treatment of single teeth. When fabricating long-span restorations (e.g. implant-supported bridges), a combination of lithium disilicate and zirconium oxide may present a viable alternative to purely monolithic zirconium oxide or metal ceramic restorations.

Rehabilitation of a dentition damaged by bruxism

The term ‘bruxism’ refers to various parafunctional activities of the stomatognathic system. Bruxism is assumed to have multiple possible causes. Causal treatment of bruxism should depend on whether the disorder is caused by medical or psychosocial factors. The oral and physical consequences of bruxism vary in different degrees of severity and consistency. In many cases, bruxism correlates with at least some degree of dental attrition or wear. Particularly in patients with an inadequately restored, interrupted dentity, for instance in older people, the residual teeth which still have contact to the antagonists may be affected by a severe loss of tooth structure. Generally, rehabilitation of a patient with a worn dentition presents a considerable challenge to the treatment team. In this context, extensive pre-therapeutic planning and consistent implementation of the treatment plan are essential prerequisites for the success of the treatment. Primary objective of the rehabilitation is to establish a stable occlusion and an adequate vertical dimension. Implementation of a diagnostic and therapeutic stage is just as essential on the pathway to a full-mouth rehabilitation. The restoration of both teeth is wear a protective splint and performing regular check-ups.

Before restoring the worn dentition, a decision as to which materials to use has to be taken. On the one hand, the risks of a preparation trauma should be minimized. On the other hand, adequate strength should be provided to rule out chipping of the material or damage being caused to the temporary restorations. In addition, the aesthetic expectations of the patient should be considered. If veneer- ing ceramics are used, chipping in the areas of high masticatory stress is another risk that should be taken into account.

Strength of all-ceramic materials in dentition of patients with bruxism

First, we have to decide which of the two aspects should be given precedence: aesthetics or adequate strength under high masticatory stress. Strength is decisive for the long-term stability of a restoration, particularly in patients with bruxism. The higher the crystalline content, the stronger the ceramic material is. This is particularly true for oxide ceramics (zirconium oxide, strength > 1000 MPa), which is a material that has a dense microstructure and is consequently highly opaque. It may therefore not always meet the aesthetic requirements of a restoration. While more recent zirconia oxide versions offer increased translucency, their strength is considerably lower than the strength of their predecessors. Conventional-denti- cate ceramics are based on a leucite- reinforced glassy phase, which has a beneficial effect on aesthetics. With a
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strength of 80 to 200 MPa, however, their strength is weakly low. Having initial flexural strength coming from 80 to 200 MPa, lithium-dio-
silicate glass-ceramic materials (IPS e max Press and CAD) are located be-
tween the strength values of zirconi-
um oxide and conventional silicate ceramics. Lithium disilicate is natu-
really translucent and is indicated for monolithic single-tooth restorations,
three-unit bridges (premolar region), hybrid abutments and hybrid abut-
mament crowns. Monolithic restora-
tions significantly reduce the risk of
chipping compared with veneered restorations and are therefore par-
ticularly advantageous for patients with bruxism. A possible route to
employ this material also for pos-
terior bridges is to use the CAD-on
technique (IPS e.max CAD Veneer-
ing Solutions) to produce composite bridges. If this technique is used, the
framework is created from high-
strength zirconium oxide and then a
monolithic veneering structure made from comparatively ‘elastic’ and
above all aesthetic lithium di-
silicate is sintered to it. This special
combination of materials and the
homogeneous ceramic bond cre-
ated between them results in strong
restorations that can withstand se-
vere masticatory forces and prevent
fractures from occurring. Even if, ac-
cording to the manufacturer, these indications are contraindicated for
patients with bruxism, from a prag-
nomic point of view, two material
combination seems to be possible routes to
an all-ceramic full-mouth rebal-
lication: monolithic restoration
using high-strength lithium du-
clastic glass-ceramic and the CAD-on
Veneering Solution technique for
posterior bridges.

Clinical case
Preoperative situation, diagnosis and treatment planning
A 67-year-old male patient present-
ed with a functionally and aestheti-
cally severely compromised deno-
tal. His pressing need at the initial
assessment was to have his dental
situation improved. He wanted his
teeth to be restored to their ‘old’
functional and aesthetic shape. His
general medical history did not re-
vail anything unusual. He did not
complain about TMJ problems or
jaw tension.

The gaps in his upper posterior re-
ion had been prophetically filled
with restorations that were now
defective. In the mandibular pa-
etient it was evident in the posterioregion on both sides. The teeth
were still in situ showed signs of
generalized dental wear. A detailed
clinical and radiological assessment
revealed an extensive loss in verti-
cal dimension, severe abrasion and
attrition, pronounced bruxism and
a high lip line (Fig. 1). The occlusal
and incisal surfaces showed flat,
sharply confined wear facets that
were corresponding to the opposing
tooths. The cervical areas of the teeth
were characterized by wedge-shaped non-
canous defects (abstractions) typi-
cally observed in bruxism. Anterior
esthetic was negatively affected by
several factors. But, the in-
cial edge line was joined with the lower
lip curvature. This mismatch was
caused by the loss of tooth structure,
change in the length-to-width ratio of
the anterior teeth and interrup-
tions in the anterior row caused by
the loss of proximal contacts.

Diagnosis. Generalized abrasion with a severely reduced ordinary jaw
base relationship, prosthodontically in-
adequately restored dentition with
missing teeth and free-end gaps.
Each tooth was individually assessed
for its risk of failure and all of them
except for teeth 27 and 28 were
good prognosis.

Treatment plan. Functional resto-
ration of the vertical dimension of
occlusion (VDO), surgical crown
lengthening, restorative reconstruc-
tion, long-term temporization, inser-
tion of three implants in the lower
jaw, final prosthetic reconstruction
with all-ceramic restorations.

The treatment was implemented in
two phases:
1. Initial (pre-prosthetic) phase
2. Restorative (prosthetic) phase

Functional reconstruction and
crown lengthening

An impression of the oral situation was taken and the situation was
recorded using a facebow. By deter-
mining the interocclusal space at
rest (freeway space), we were able
to evaluate the loss of height in the
vertical relation (Fig. 2). In the lab, the
models were mounted on a semi-
adjustable articulator. The pre-pro-
thetic phase was begun by having
the patient wear a splint to stabilize the
bite. For this purpose, an occu-
al adjustal splint was prepared to
attain the envisaged vertical height in
a centric condylar position. The
patient wore this appliance for three
months. He had no problems in ad-
justing to the new VDO.

When the diagnostic wax-up was
created, the functional requirements
and aesthetic expectations of the
patient were taken into considera-
tion (Fig. 3). Removal of the existing
restorations was followed by surgi-
cal crown lengthening of the upper
and lower teeth in the anterior and
premolar region. A vacuum-formed
tray was created from the diagnos-
tic wax-up and used as a template,
or guide to attain the planned tooth
length (Fig. 4). Excess tissue was care-
fully removed, the gingival tissue
around the teeth instead and tem-
porarily folded back and the bone
reduced by the necessary height. The
surgeon was closed with loose su-
tures (Fig. 5).

Upon completion of the healing
phase, preparation of the teeth for
the restorative treatment began. The
amalgam fillings and secondary
caries were meticulously removed.
Some of the teeth required prepara-
tion for the placement of the crowns.
Teeth 11, 12, and 12 received endo-
dontic treatment with glass fibre
reinforced endodontic posts (IPC
Post & Plus, Ivoclar Vivadent, see Figs
6 and 7) and a core build-up made of
self-curing composite (Multilayer
Flow, Ivoclar Vivadent). The endo-
dontic posts consisting of a specially
developed composite matrix offer a
natural translucency and dentin-
like elasticity (flexural strength). The
composite used for the core build-
up is available in several shades and
provides favourable mechanical and
esthetic properties. Teeth 23, 23
and 24 received cast gold posts (Fig.
8) and the other teeth were built up
with composite to enable them to be
used as abutments.

Implant insertion
An X-ray template was created on
the basis of the wax-up and then used
for planning the position of the
implants in the lower jaw. Perfor-
tions were applied to the occlusal
surface of the template at the im-
plant exit points that were deemed
most suitable for achieving an ideal
prosthetic restoration and filled with
radiopaque material (Fig. 9). Prepara-
tion of a CT scan with the template
in place was followed by virtual im-
plant position planning in region 36,
45 and 46 (Fig. 10). We reordered
the X-ray template into a guiding/dress-
ting template for the insertion of the
implants. The surgical intervention
was painless. Subsequently, the
three implants (Astra Tech, Dentply
Implants) were inserted into the lo-
cal bone (Fig. 11). Healing abutments
were screwed onto the implants and
the implant sites were closed with
sutures.

Long-term temporization
The patient received a long-term
temporary restoration to stabilize the
planned vertical occlusal dimen-
sion and to validate the aesthetic ob-
ratches. A high-performance FMMAD
(TeloCAD, Ivoclar Vivadent) was
used for the fabrication of the tem-
poraries. Wax-up and CAD/CAM en-
abled a swift implementation of this
stage (Fig. 12). Although a monolithic
design was used, the translucent
properties of the polymer lend a life-
like appearance to the temporaries
(Fig. 13). The patient was very com-
fortable with the restorations and
did not report any functional com-
plaints. The aesthetic appearance
was considerably improved, which
was reflected in both the patient’s
speech and facial expression.

Permanent prosthetic restoration
The patient was wearing the long-
term temporaries for an adequate
length of time to get used to the
classic VDO, which was then to be
transferred to the permanent resto-
ration. Once the temporaries were
removed, an impression of the pre-
pared teeth was taken using a widely
polysiloxane precision impression
material (Virtual, Ivoclar Vivadent).
The proprioceptive properties of the
impression material allow for a detailed and accurate record-
ing of the oral hard and soft tissues
[8, K. Nivaling, University of Texas,
2001], providing the ideal condi-
tions for obtaining high-precision
working models. The validation oc-
cclusal position was transferred to the
articulator using a sequential split
mouth method (Fig. 16). A fasttrack
registration was performed for the
skull-related repositioning of the up-
per jaw model.

All-ceramic single-tooth crowns
In line with the treatment plan, the
dental technician created monolithic
single-tooth crowns using lithium
disilicate. Polychromatic press in-
gots were used for the press tech-
nique (IPS e.max Press Multi, Ivoclar Vivadent) to achieve the planned

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Fig. 14: Bite registration at rest and assessment of the loss of height in vertical direction

Fig. 15: Wax-up of the planned prosthetic situation

Fig. 16: X-ray template (derived from the wax-up)
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The implants were fitted with customized hybrid abutment crowns made of lithium disilicate (IPS e.max CAD). The hybrid crowns were designed using CAD software, ground from specially developed lithium disilicate blocks and externally bonded to a titanium base using a special luting composite (Multilink Hybrid Abutment, Ivoclar Vivadent, see Figs. 19 and 20). Subsequently, the monolithic hybrid abutment crowns were screwed into place in the oral cavity. The IPS e.max CAD blocks for the manufacture of hybrid abutments or hybrid abutment crowns feature a pre-fabricated interface (e.g. for the Straumann Ti base) and ensure a high accuracy of fit. In our opinion, the reduced fixural strength of the lithium disilicate, compared with zirconium oxide, has a favourable effect on the patient’s chewing comfort and the implants. In view of the fact that implants have no inherent mobility and therefore have only reduced tactileity, we assume that lithium disilicate provides a suitable abutment material for restorations in patients with bruxism.

All-ceramic bridges

To somewhat cushion the high masticatory forces that are to be expected in a bruxer to be occurring in the posterior region, we opted for lithium disilicate; here too. However, here the focus was on reliability and strength. For this reason, we decided to design what is termed as a composite bridge (IPS e.max CAD Veneering Solutions). This unique combination of lithium disilicate (LSi) and zirconium oxide (ZrO2) allows the fabrication of tooth- and implant-supported bridge constructions that offer an exceptional overall strength and aesthetically pleasing properties. Two structures are required to create the restoration: a high-strength zirconium oxide framework (IPS e.max ZirCAD) and a glass-ceramic veneering structure (IPS e.max CAD, see Fig. 21). After both structures were manufactured using a CAD/CAM procedure (InLab MC-XL, Sirona), the framework was tried in and fine tuned down to the last fine details before finalization (Fig. 22). The short processing times required to complete the structures increase the rate of efficiency and productivity. After the try-in, the two structures, which had been milled or ground separately, were fused together to achieve a homogeneous ceramic bond using a fusion glass-ceramic (IPS e.max CAD Crystal/Connect, Ivoclar Vivadent, see Fig. 23). The fusion process takes place at the same time as the crystallization process of the lithium disilicate.

Seating the restorations

The IPS e.max Press restorations were seated using a dual-curing luting composite (Variolink Esthetic DC, Ivoclar Vivadent) that features optimum aesthetic properties. The glass-ceramic components were pretreated using a single-component primer (Monobond Etch & Prime, Ivoclar Vivadent) according to the manufacturer’s instructions. The tooth preparations were conditioned with an adhesive (Adhese Universal, Ivoclar Vivadent) and separated with an adhesive (Adhese Universal, Ivoclar Vivadent) and a single-component adhesive (Single Bond Universal, Ivoclar Vivadent). Once an appropriate shade of aesthetic composite filling material was selected, the screw channels sealed using an adhesive (Adhese Universal, Ivoclar Vivadent) and the screw retained IPS e.max CAD abutment crowns were screwed into place (Fig. 27) and the screw channels sealed using an aesthetic composite filling material (Fig. 28). The zirconium oxide supported IPS e.max CAD-on bridges were seated using a self-curing resin cement (BiposCem Plus, Ivoclar Vivadent).

Discussion

All-ceramic materials are sometimes described as too risky for the prosthetic rehabilitation of patients with bruxism. Even today, bruxism is often mentioned as a contraindication. This is certainly true as far as conventional ceramic materials with a high brittleness are concerned. When it comes to these materials, the failure rates at high loads (parafunctions) should be critically assessed. However, advances in material engineering and adhesive technology have led to considerable progress. In the view of the writer, modern ceramic materials and concepts can be suitable for restorations in patients with bruxism - provided that they are processed in accordance with the clinical indication.

Overview of the data for the materials used in this report

IPS e.max CAD: Clinical data of up to three years of clinical wear are available for lithium disilicate restorations made using the press technique. A survival rate of 97% after a mean observation period of 2.6 years has been established on the basis of 642 restorations (crown) at five external clinical studies [Böning et al., 2008; Elman and Woodford 2010; Guas et al., 2012; Gehrk et al., 2012]. Dental Advisor 2012] and an internal Ivoclar Vivadent study. Failures (3.5 %) were attributed to fractures (16 %), endodontic compli-
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Step 2 (sleeping protection)
Regenerative protection against possible moisture ingress, e.g. by cracks
cations (0.2 %) and secondary caries (0.2 %). Four of the crowns (0.6 %) were excluded from the study due to crack formation. Chipping occurred in 3.4% of the restorations but could be repaired in all cases in situ. Systematic studies on the survival rate of conventional glass-ceramic materials show a fracture rate of 3.8 % [Heintze and Rousson, 2010a]. The survival rate of metal-ceramic crowns is 95.6 % after 5 years [Pettersson et al. 2007]. Biological or technical complications were reported in 5 to 10%. Having a fracture rate of 1.6% and a survival rate of 97.5%, IPS e.max Press shows better clinical success rates than conventional materials, such as glass-ceramics or metal ceramics. Particularly if used for monolithic structures, the material appears to be suitable for patients with bruxism.

Fig. 30 A-B: Occlusal view of the restorations in the upper and lower jaw

IPS e.max Press shows better clinical success rates than conventional materials, such as glass-ceramics or metal ceramics. Particularly if used for monolithic structures, the material appears to be suitable for patients with bruxism.

Fig. 31 A relaxed and happy patient after completion of the treatment

Conclusion
In the clinical case described in this report, the treatment goal was achieved and the functional and aesthetic expectations of the patients were fully met. All-ceramic restorations were employed for the rehabilitation of the dentition that had been severely damaged by bruxism. If we take a retrospective view, the importance of thorough diagnostics, careful treatment planning and a step-by-step, pre-prosthetic treatment phase becomes evident. Consistent adherence to the treatment plan is equally important. Only after the planned vertical dimension is achieved with the help of long-term temporaries should the permanent prosthetic restoration phase be begun. When selecting the materials for the prosthetic restoration, the high functional loads to which the dentition of a bruxer is exposed should be considered and, ideally, monolithic structures should be preferred. If these points are taken into consideration, long-term stability of the bite and, if appropriate materials are used, high aesthetics can be achieved.

About the Authors
Theodoros Gonidis
He was born in Athens, Greece and graduated Dental Technology from the Technological Educational Institute (TEI) of Athens. He continued his studies at the School of Dentistry of National and Kapodistrian University of Athens, Greece and graduated in 2012. Next year he entered the Prosthodontics postgraduate department of the faculty.
Contact info:
E-mail: toddgonidis@icloud.com
Address: Agiou Konstantinou 40
Maroussi, Athens, Greece

Meni Chatzinikolaou
She is an active member in various scientific meetings either as an author or a presenter of research projects, while having a number of essays published in foreign journals.
Dr Chatzinikolaou
She is a member of the Hellenic Prosthodontic Association and the European Association of Osseointegration (EAO).
Contact info:
E-mail: xnmneni@icloud.com
Address: Eleftherias square 6
Kardallos, Athens, Greece

George Papavasiliou
He is a Prosthodontist, currently holding the position of Tenured Assistant Professor, Department of Prosthodontics, School of Dentistry at the National and Kapodistrian University of Athens, Greece.
Contact info:
E-mail: geopap@dent.uoa.gr
Address: Iroon Politechniou 16
Chalandri, Athens, Greece

Maria Spanopoulou
She was born in Athens, Greece and graduated Dental Technology in 2004 from the Technological Educational Institute (TEI) of Athens. Already in 2000 she started her professional activity in her father’s lab, Advanced Dental Laboratory.
Contact info:
Web: www.adl-mariaspanopoulou.com
E-mail: info@mariaspanopoulou.com
Address: Leoforos Pentelis 7a
Vrilissia, Athens, Greece