



Maxillary restoration made from zirconium oxide

Material for Allergy Patients

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Dental restorations made from zirconium oxide ceramics, and with it the CAD/CAM technology, have in the meantime become well established and neither the specialised press, the dental laboratory nor the dental practice can imagine dentistry today without this technology. And rightly so, because the field of indication of this outstanding material continually proves its position anew (Figs. 1 and 2). Next to the aesthetic advantages, the word biocompatibility gets a new meaning. The following report describes a case, in which definitely can be stated, that zirconium oxide ceramics is a genuine enrichment for the patient.

Key words: All-ceramics, Allergy, CAD/CAM, Zirconium oxide

Initial and Restoration Status

As our patient showed strong allergic reactions to numerous dental precious metal alloys as well as to different adhesive cements, her restorations had to be renewed (Fig. 3). After a number of doctors had tried in vain, to get the allergy problem under control, it was clear, that the patient had to be provided with a metal free restoration as quickly as possible. Due to allergic troubles resulting in strong gingival tissue irritation, there was an urgent need for action, to find an appropriate high quality material for the patient. This material had to offer the security of virtually completely excluding a new allergy risk.

The patient also wanted an aesthetic improvement. To ensure that the restoration is of utmost durability and biocompatibility, we were of the opinion, that zirconium

oxide would be our best choice. Another point was, that the aesthetic improvement could best be realised with all-ceramic material components (Zirkon; etkon/ HeraCeram Zirkonia, Heraeus Kulzer). For preventive reasons (as complications can occur in wide span bridges if an abutment tooth in a bridge construction causes problems thus endangering the entire bridge construction) we have decided, except for parts of the upper left maxillary quadrant, to restore all teeth with single crowns.

Preparation

As the gingival tissue was severely affected by the allergic reactions, we had to proceed very carefully. First the old restoration was removed. After careful and gentle preparation, the taking of the impression followed under severely difficult conditions. The impression taken by the

dentist in attendance, Ludger Müskens from Kleve, was perfect as usual. Therefore shortly afterwards the model could be cast.

Design

The designing of the framework and copings are done by CAD. The system used is from the company etkon (Fig. 4). The scanner "es1" and the software et_visual play an important part in rationalising the laboratory's daily routine. The considerable time saved due to the software supported construction design allows more time for the actual work: the ceramic veneer.

In the meantime, etkon offers material from all the currently available material ranges. The system can therefore be employed flexibly in the laboratory. All materials, from zirconium oxide ceramics (green and HIP-zirconium), to aluminium oxide ceramics, precious and non-precious metals (Titanium and CrCo) right down to acrylics, are available.

Due to qualified support from the cooperation partners Bego Medical (precious and precious metal free) and

Nobel Biocare (individual abutments from Procera) there are no limits set for the multiple possibilities of use.

Designing Made Easy

The dental technician of the future has to get used to the idea, that he will often have to exchange his modelling instrument with a computer mouse and therefore it is very important to have a highly competitive and efficient partner at one's side, who can keep pace with progress. This includes for example a good service when questions arise or problems have to be solved, a good and clear software that allows the designing to be handled as easy as possible and an excellent fit of the frameworks, which make the burdensome fit-checks almost unnecessary. All in all the CAD/CAM system from etkon is a valuable addition to our laboratory.

The Actual Design

The essential working steps are the clamping of the entire model into the etkon scanner "es1", to slightly align and

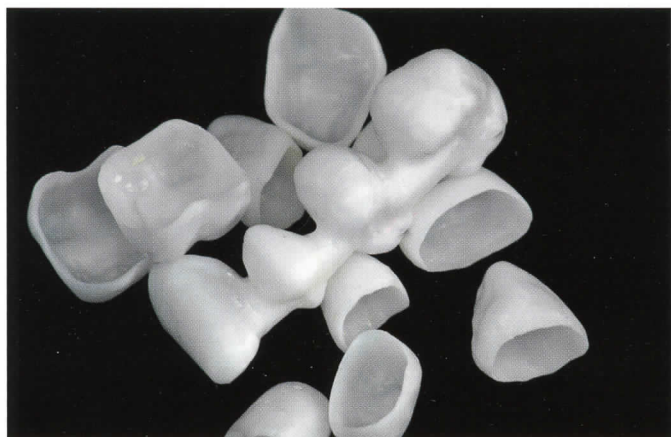


Fig. 1: Zirconium, a fascinating material

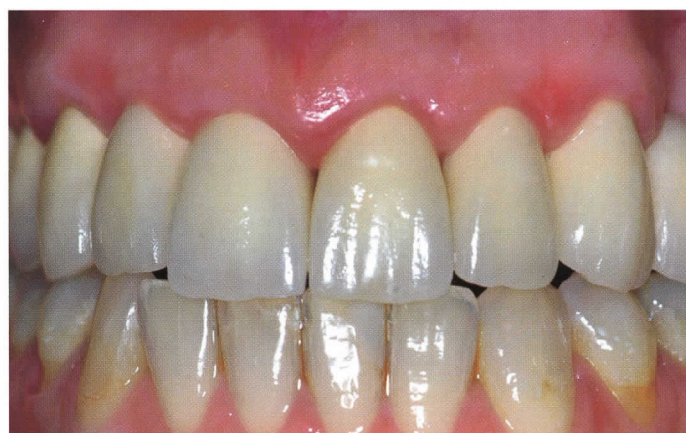


Fig. 2: Maxillary restoration in zirconium oxide ceramics

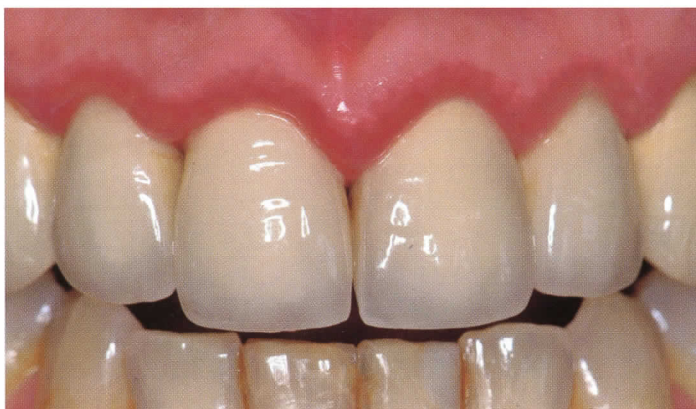


Fig. 3: Heavily inflamed gum tissue due to an allergic reaction to precious metal restorations

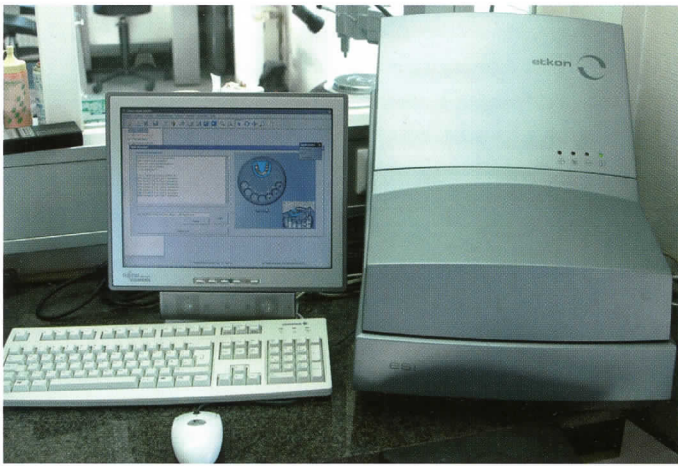


Fig. 4:
The etkon Scan-System

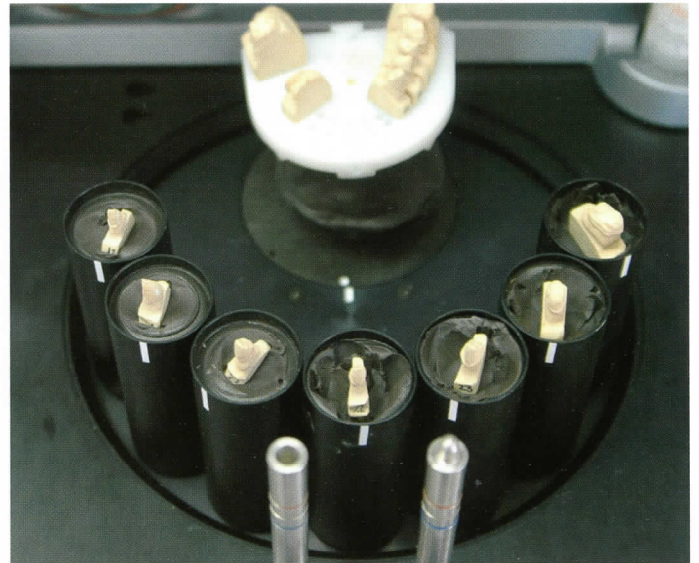
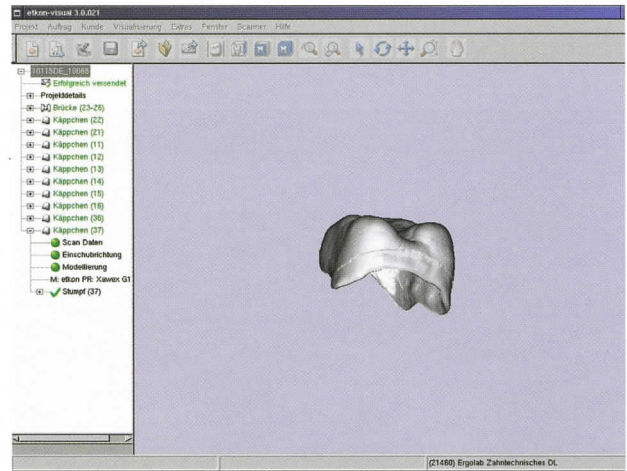
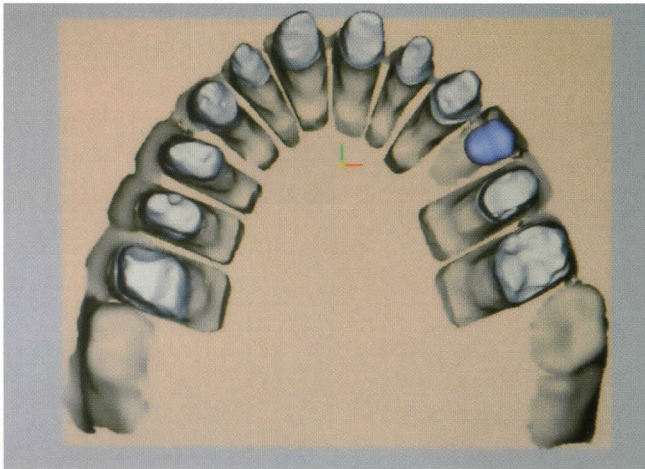


Fig. 5:
The etkon Scanner "es1"
fitted with the prepared dies



Figs. 6a and 6: The software et_visual independently works out framework recommendations

scan it. In the then following step a separate scan of the prepared dies is intended (Fig.5). After successful scanning, the software works out framework recommendations (Figs. 6a and 6b), which in most cases need not be amended and can be used as suggested. Of course, at any time it is possible to adapt and redesign the recommendation according to the individual requirements of the patient. In our case, as has already been mentioned, a bridge will only be constructed in the left maxillary quadrant (Fig. 7). All other teeth will be provided with single tooth restorations.

The Framework

Approximately three days after the dies have been scanned and the data has been forwarded, the milled

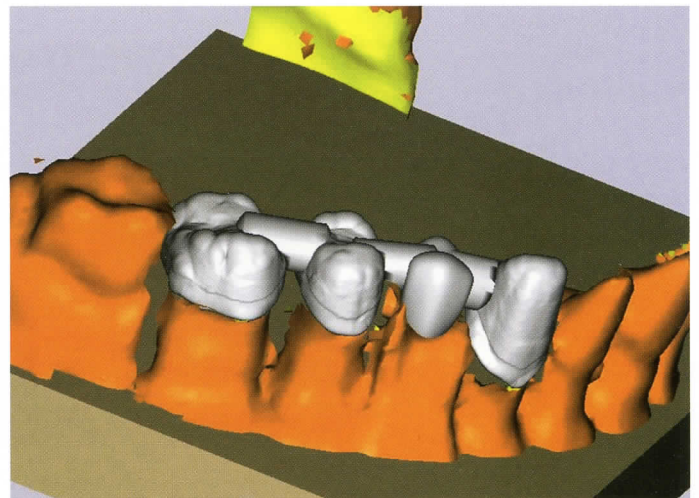


Fig. 7: The bridge in the upper left quadrant



Figs. 8 and 9:
The fit of the
frameworks
is perfect

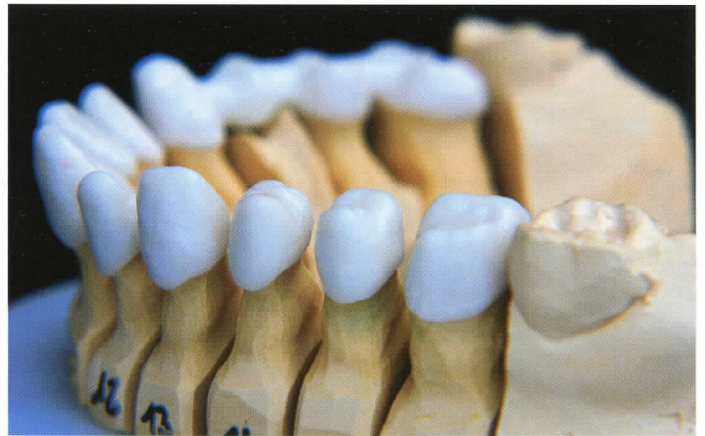


Fig. 10:
The fit of the bridge is
also perfect

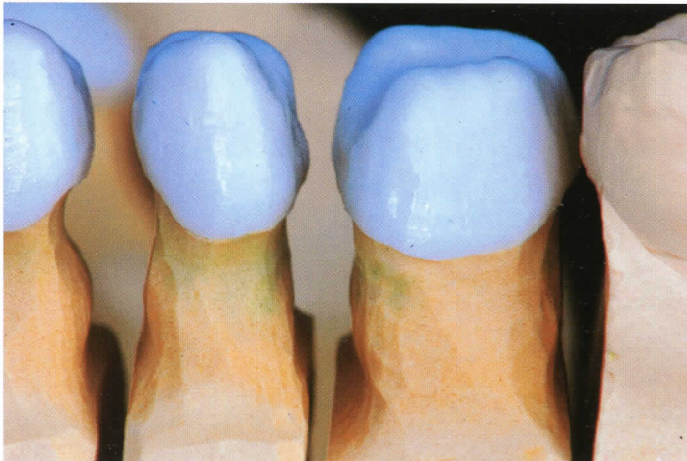


Fig. 11: Checking the fit

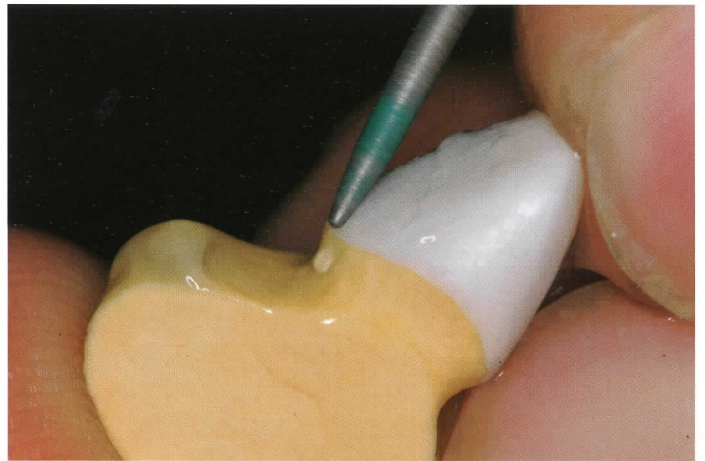


Fig. 12: Slight reduction of the frameworks in the cervical area

frameworks will be returned by post to the laboratory (the mode and duration of dispatch can be freely selected). Generally the fit is excellent (Figs. 8 to 11) and only minimal effort is required when fitting the copings to the dies. After checking the fit and the marginal seat, the frameworks still have to be thinned out slightly in the marginal area (Fig. 12). The reason for this being, that the blank is soft as chalk before it is sintered in the production centre. Therefore a certain minimal wall thickness must remain to prevent chipping of the framework during milling.

Framework Try-in

The excellent fit, which the frameworks have on the model, is confirmed by the try-in in the mouth of the patient, which consequently takes place without any complications.

Veneering

As the restoration covers the entire maxillary arch, slight individualising by means of a harmonious alternating

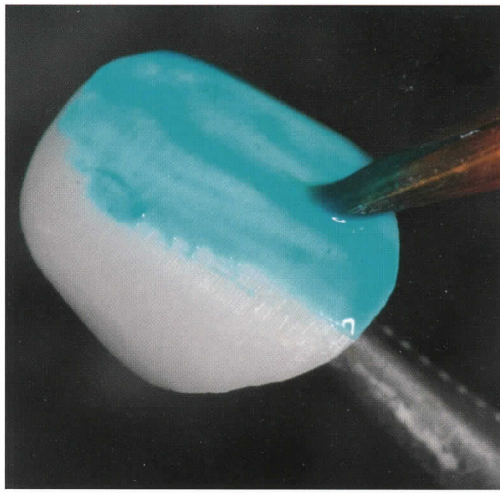


Fig. 13: Applying the bonder to increase the adhesive bond

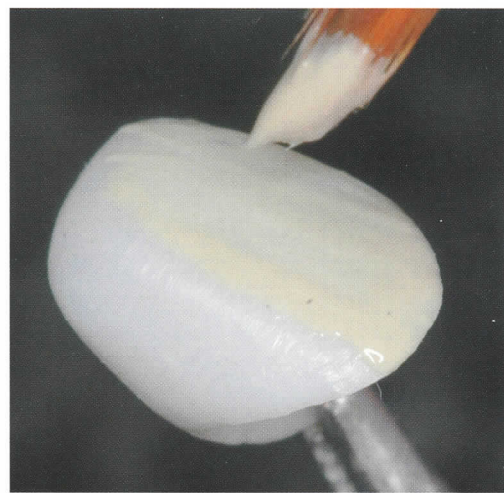


Fig. 14: Applying the liner after the first bonder firing



Fig. 15: Cut back to make space for individualizing

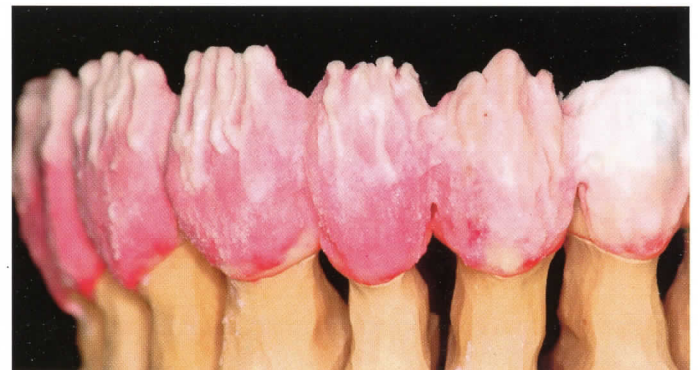


Fig. 16: Positioning the mamelons in the dentine layer according to the desired structure



Fig. 17: Alternating layering transpa-blue



Fig. 18: Layering of the premolars and the molar



Fig. 19: Before the first dentine firing, the teeth will be covered with a thin layer of transpa-clear

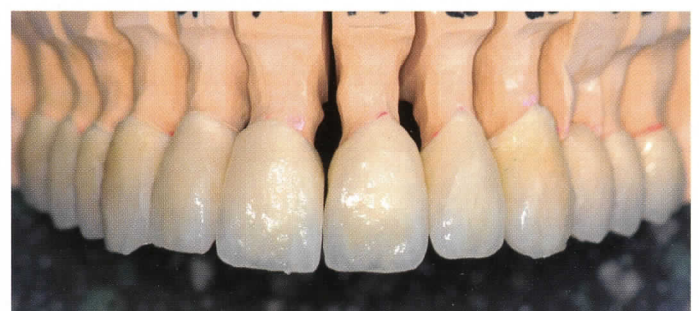


Fig. 20: Result after the first firing

layering technique is desired. The strategy hereby corresponds to the usual rational layering techniques with the new HeraCeram Zirkonia system (Heraeus Kulzer).

In the first step, the framework is covered with a kind of bonder (Fig. 13), which should further increase the bonding strength. After the required firing a thin liner layer will be applied (Fig. 14). The liner assists in giving the extremely white and compact zirconium material a basic hue. A second liner firing should always be done, if the first liner layer did not achieve the desired coverage.

In the then following proceedings the entire tooth shape is initially built up in dentine. A later, defined cut back (Fig. 15) should make space for the individualising of the colour without loss of the basic colour. After reduction of the shape in the anterior section the mamelons will be built up in dentine according to the required structure (Fig. 16). These appear rather discreet in this case, as only slight individualising was desired.

The ridges are now built up in opal incisal material, which will then be covered with a slight blue transpa-material. The area between the mamelons will be built up in alternating layers of opal incisal, transpa-clear and transpa-blue (Figs. 17 and 18). Finally, before the first dentine firing, the entire tooth will be covered with a thin layer of transpa-clear porcelain, which later will create more optical depth (Fig. 19).

After the first dentine firing (Fig. 20), and the trimming of the proximal contact points, the entire shape is completed with different incisal and opal ceramic materials. In the incisal area, in this particular case, besides the usual transpa-ceramic materials, an additional ceramic material in the hue amber was chosen, to make the incisal edge of the two central maxillary incisors appear slightly less rigid.

After the second dentine firing the first step will be to grind in the bite. Furthermore all teeth will be trimmed to the approximately desired shape. Attention should be paid to the coordinated alignment of the axis position of the teeth. A harmonious, individually matching shape of the anterior teeth is another elementary prerequisite, which will afterwards make the dental restoration appear as natural as possible when seated in the mouth of the patient. One could almost come to the conclusion, that these two factors are more important than the actual tooth colour.

Since the tooth shape has now been established in its essential features, final corrections with transpa-clear will be carried out. The crowns and the bridge will be placed into the furnace for the correction firing at a slightly lower temperature.

Only after the third firing will the tooth shape be finalised by specific trimming and positioning of horizontal and vertical structural elements (Figs. 21 and 22). In another very important step, the trimming of the surface structure is done, so that the incident light when meeting the tooth surface can be refracted as true to life as possible (Figs. 23). In this case, the incisal edges were purposely designed very lively, to liven up the entire anterior arch.

Biscuit-Bake Try-in

The then following biscuit-bake try-in still requires small corrections, but apart from these the dentist and patient were satisfied. It is pleasing to recognise the naturally appearing laugh line, in which the maxillary anterior teeth optimally follow the sweep of the lower lip while laughing (Figs. 24 and 25).

Fig. 21
Positioning horizontal
and vertical structural
elements

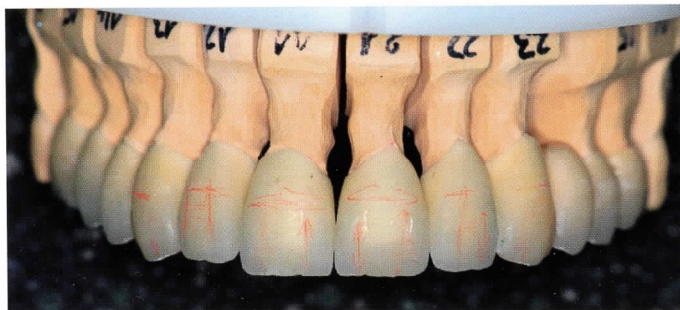


Fig. 23
Adding surface
structure for a natural
refraction
of the light

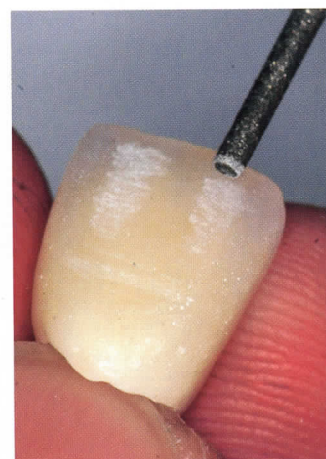


Fig. 22 Completing the tooth
shape and trimming



Fig. 24: Biscuit-bake try-in; the naturally appearing laugh line is easily recognised

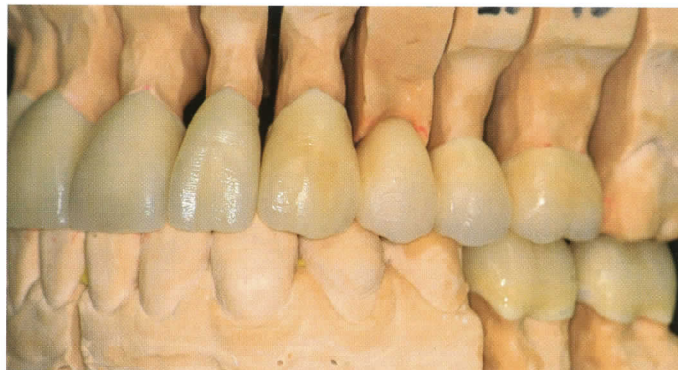


Fig. 25: Minor corrections after the biscuit-bake try-in



Fig. 26:
After the glaze firing
the cut facets and abrasions will be
polished with a rubber wheel



Fig. 27 Smoothing the incisal edges and the ridges of the labial surfaces of the anterior teeth with pumice

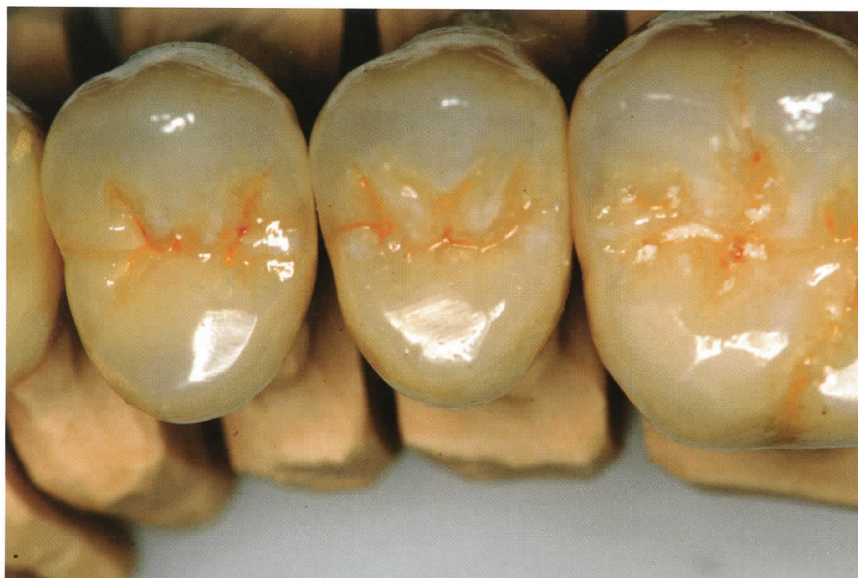


Fig. 28: All treated surfaces were polished with diamond polishing paste

Finishing

After insignificant corrections the glaze firing can follow immediately. Afterwards, the cut facets and abrasions will be polished with a rubber polisher (Fig. 26). The incisal

edges and ridges of the labial surface of the anterior teeth will be smoothed at the polishing lathe with pumice, to copy the natural abrasive pattern (Fig. 27). For the final finishing all treated surfaces will be polished with diamond polishing paste (Fig. 28).



Fig. 29



Fig. 30

Figs. 29 and 30: The translucency and the natural refraction of the light can be seen beautifully

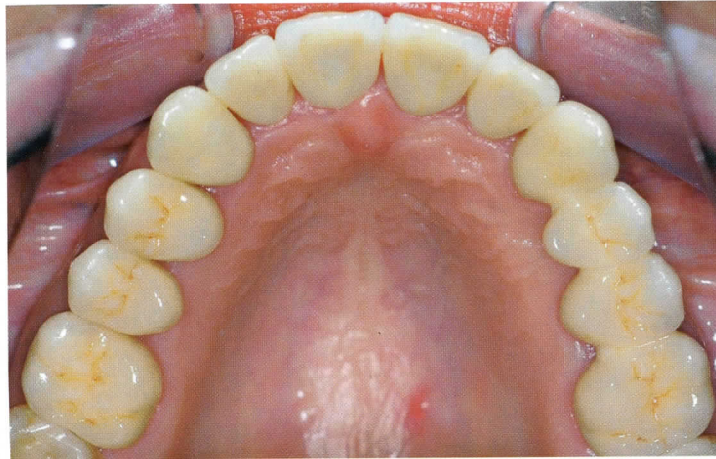


Fig. 31: Occlusal view of the incorporated restoration

Incorporation and Conclusion

Obviously allergy tests were carried out on this patient for all the adhesive cements. The results showing that there are allergic reactions to all the phosphate cements. Panavia proved to be the optimal solution. Here absolutely no reactions were observed.

The final result makes the patient smile (Figs. 29 and 30): The maxillary jaw fits harmoniously into its surroundings. After a very short time (about 18 days), the irritation of the marginal periodontium has practically disappeared. According to a statement by the patient, she quickly experienced a new life without pain.

Regrettably, it was not yet possible to obtain a photo of the situation in which the papillary gingiva closes the black triangle between the two central incisors, before the time of going to press.

Note of Thanks

At this point I would like to thank dentist Ludger Müsgens, Kleve, the patient and

the company etkon, Munich, for their cooperation. I can once again claim, that every time I devote my attention to the topic all-ceramics, it is fun all over again.

• CE Credit Test 1 on page 36

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