Aesthetic metal ceramics: it's what you make of it!

Renato Carretti describes three challenging cases that were solved with a metal-ceramic solution

Introduction

Depending on the choice of the framework material – zirconium or metal, the assessment of a ceramic-veneered restoration in the mouth of the patient is decisive for the aesthetics. Both materials have specific properties which present a challenge to the dental technician. Particularly with the more demanding metal-ceramic cases, the intra-oral try-in and individual adjustments made on the patient are essential for a successful aesthetic solution. In this article, the author describes three patient cases as examples of everyday, yet critical challenges. All of the cases described were solved with a metal-ceramic solution, which without an assessment of the in-situ situation, would not have led to a convincing result.

Trend towards the use of zirconium

At present, zirconium is a very popular restorative choice. CAD/CAM is the talk of the whole dental community, and in many laboratories and practices the effort is being made to expand machined fabrication as far as possible. However, the well-proven, traditional laboratory method of framework manufacture with modelling, investing, casting, deflasking and the making of final adjustments continues to retain its validity. Experienced dental technicians value the versatility of metal ceramics, which cannot yet be provided by zirconium. As a solution to particular problems, metal-ceramics is aesthetically superior to zirconium. There are also considerable country-specific variations. Whereas zirconium finds very frequent use in Germany and Switzerland, metal-ceramic restorations continue to be the standard in other European countries. This article is devoted to the question of how excellent and aesthetically convincing results can be obtained using the conventional manual laboratory techniques and metal ceramic.

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Two worlds: prosthetic restorations on the model and in situ

With even greater consequences than the choice of the framework material is an aspect which mostly remains in the background, but which has a key influence on the aesthetic result, especially with ceramic-veneered restorations: dental technicians often have no opportunity to see their veneered crowns or bridges 'live' in the mouth of the patient. Their reality is the model situation. For a relevant assessment, this is insufficient, since restorations look completely different on the model than they do in situ. The play of light and shadow in the mouth, the different light refraction and reflection in the ceramic and the effects of the neighbouring teeth on the shade are factors which do not apply to the plaster model situation. The intra-oral try-in is, therefore, a decisive factor for the success of a high-quality, aesthetic result.

A special case – implant restorations

In the case of screw implants, the try-in represents a significant hurdle on account of the amount of work involved since the provisional restoration, mostly likewise screw-retained, has to be removed first. In order to save time, a try-in in situ is often omitted. In these cases, the only alternative is to aim for the restoration to resemble the adjacent teeth as closely as possible. With this technique, however, it is, at best, possible only to obtain an approximate match. A definitive assessment of shape and shade can be made only in the context of the immediate surroundings of the oral environment.

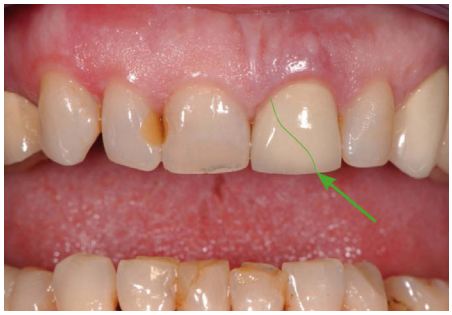

Figure 1: The situation before treatment; the fractured tooth 11 with root facture (green marking); discoloured fillings in the oral environment which were not replaced; pronounced transparency of the neighbouring tooth 11, particularly noticeable at the incisal edge

Figure 2: Clasp-retained provisional restoration to replace tooth 21 and for the preparation of the papilla order to guarantee a harmonious gingival contour

Figure 3: Perfect gingival papilla after healing of the implant

Figure 4: It cannot be assessed on the basis of the model situation whether the ceramic reconstructions will match the rest of the oral cavity in shape, shade and transparency

Figure 5: The same crown as shown in Figure 4 shows its natural appearance only after the intraoral try-in. It shows the same degree of transparency as the neighbouring natural tooth 11

High-class metal-ceramics: three patient cases

The following article describes three patient cases in which the focus was on a particular aspect of the restoration, and which could not have been solved satisfactorily without the assessment of the dental technician on site. For one or more of the following reasons, there was no question of restorations with zirconium:

- The dentist wanted to 'be on the safe side' and chose metal-ceramic crowns on account of their high strength.
- It makes little sense to seat an all-ceramic crown on a metal abutment.
- A severely discoloured tooth stump shows through the veneer of a crown with a zirconium substructure as a grey shimmer.
- With metal ceramics, the abutments can be set to an angle of up to 15 degrees, with zirconium, however, depending on the system, this was not (yet) possible. (In the author's laboratory, all abutments are screwed directly onto the implants, and in many cases feature an angled design).

Case 1: the challenge of transparency

The patient, aged around 50, presented at the practice with a fracture in tooth 21 (Figure 1). Since the root was likewise fractured, the tooth was extracted and it was planned to replace this with an implant-borne metal ceramic crown. A case from daily practice, in which it is not a question of a highly aesthetic piece of work with perfect teeth, but above all – as in the other cases – of a dental restoration which is not noticeable in the patient's natural oral environment.

Figure 6: Not easy to recognise at first glance as a dental restoration. The crown matches its environment

Following extraction, the provisional restoration with clasps/clamps was seated and the gingival papilla was prepared prior to implantation in order to ensure subsequent harmonious progress (Figure 2). After the seating of the implant, sufficient time was left for the gingiva to regenerate, and is in a perfect condition after healing (Figure 3).

Layering procedure

The particular challenge lay in restoring the transparency which characterised the entire tooth, and needed to closely resemble that of the adjacent tooth 11. During the first firing (VM 13/VITA Zahnfabrik) the basis for the required basic transparency of the tooth was created according to the Base Dentine layering, first with a 1:1 mixture, and then with a 1:2 mixture of Base Dentine and Neutral NT. In order to achieve a shade close to that of the neighbouring tooth, Interno shades were applied before the second firing, and fixed by means of intermediate firings.

In the next step followed the application of neutral powder in its pure state without being mixed, a surface correction with Akzent shades, and finally

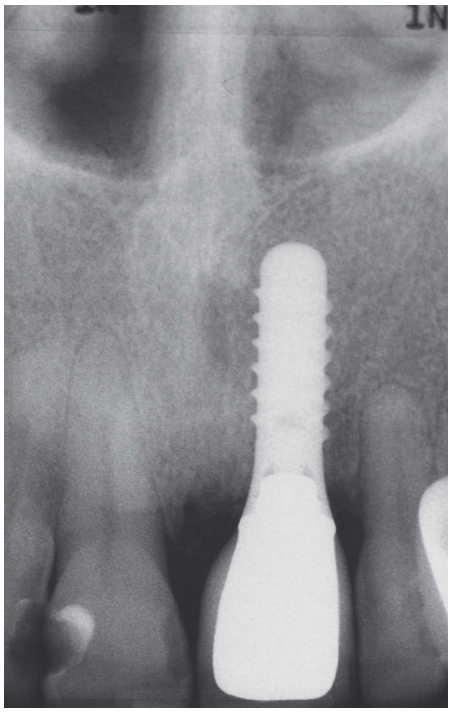

Figure 7: Shows an X-ray of the seated restoration: the metal coping supports the ceramic so that a homogeneous layer thickness of max 1-1.5 mm is possible

a glaze firing. Although the Akzent shades are applied only to the surface, due to the fact that very little correction was required and the small quantity of shade, the veneers do not look as though the colours were painted onto the surface.

A decisive factor for the assessment of the correct degree of transparency, however, was not the situation on the model (Figure 4), but the intra-oral try-in. The clasp-retained provisional restoration was removed, and the screw-retained restoration provisionally attached (Figure 5). Only now can a realistic assessment be made as to whether the restoration suits the oral environment (Figure 6).

Figure 8: Excellent gingival situation after the healing of the implant replacing tooth 22; the gold filling on tooth 21 has become an indispensable, characteristic feature of the patient's dentition

Figure 9: A good match of the crown replacing tooth 22 at the try-in. The surface shows the same matte glaze as the adjacent natural teeth after manual polishing

Figure 10: Healthy gingival papilla after three months in situ

Figure 11: Situation before treatment showing devitalised tooth 22 with dark discolourations

Figure 12: Characteristic features such as enamel cracks, mamelons and decalcification marks on the adjacent tooth 21

Important: the substructure which gives effective support to the ceramic

It cannot be emphasised enough that for the longevity of a ceramic restoration, a homogeneous layer thickness of 1.5mm is needed. This is only possible by means of the modellation of the supporting crown coping of the definitive restoration in reduced size (Figure 7). In the case of the thin layer thickness of 1.2 or 1.3mm, veneers with a high degree of transparency are possible.

Case 2: the challenge of surface glaze

In the case of a female patient aged around 65 years old, tooth 22, which was fractured down to the root, was extracted and an implant seated in its place. She already had a gold filling in tooth 21 for around 45 years, and could not imagine her appearance without this. Although the gap following implantation was not provisionally restored, the gingival situation was excellent – which is not simply a matter of course at her age (Figure 8). For both dentist and dental technician, therefore, these were good conditions for successful treatment. In the case of the intra-oral try-in, the crown showed good results cervically with regard to the gingival situation, and a good fit and shade match were obtained straight away.

Optimising the surface

It is not possible to recreate the surface of a veneer so that it resembles a natural tooth by means of a glaze firing alone. For this reason the glaze firing was followed by manual polishing with pumice powder and a hand-brush. The result was a matte glaze (Figure 9). This generally takes around 5-10 minutes, but with a little experience the surfaces will look considerably more natural than with any glaze firing: the finer the structure of the ceramic (in this case VM 13/VITA Zahnfabrik), the more natural the result of polishing will look. Care is required with surface-stained veneers: in the case of excessively intensive polishing, the shades may be 'polished away'.

After finishing and screwing the restoration onto the implant, the excellent gingival situation became evident, which was still intact at the recall visit of the patient three months later (Figure 10).

Case 3: the challenge of a discoloured tooth stump

A patient aged around 45 years old presented at the practice with a devitalised tooth with dark discolorations (Figure 11) – an absolutely classical case for a metal-ceramic restoration. The strongly discoloured tooth stump would show through an all-ceramic restoration and make the veneer look grey.

With this veneer (VM 13 VITA Zahnfabrik), the goal was to reproduce numerous small enamel cracks, mamelons and decalcification marks like those that characterised the adjacent tooth 21 (Figure 12). After the first firing, Interno 1 (white smoke) was inlaid for the small enamel cracks, and Interno 2 (sand) was used to emphasise the mamelons. Akzent 17 (Niagara) was

applied in order to emphasise the bluish glaze in the incisal edges, and a glaze firing performed. Already with the provisional restoration a dark shadow became visible below the gingiva (Figure 13), which remained after completion and seating of the crown (Figure 14). This was probably due to the dark interior of the crown being reflected in the natural tooth substance, and continued as a grey shimmer in the gingiva. After manual polishing, the surface of the veneer showed the same texture as the neighbouring tooth (Figure 14). A harmonious match was obtained with the patient's natural dentition, and was not recognisable as a dental restoration (Figure 15).

Conclusion

The three cases presented demonstrate that a metal ceramic solution is possible for challenging cases with anterior restorations without compromising quality and that, in certain cases, a metal ceramic solution is even preferred. With the ceramic used, transparent effects and shade effects were achieved which make a true-to-nature reconstruction possible (case 1). Their fine structure permits surface effects which cannot be achieved with glazing, but only through manual polishing (case 2). Shades which can be mixed with ceramic powders do not look as though they are painted on, but rather show an in-depth shade effect in the veneer (cases 1 to 3). However, it required the on-site presence of the dental technician, his exact observation of the characteristics of the neighbouring teeth and the true-to-detail prosthetic reconstruction based on this in order to use the advantages of the material to the fullest benefit of the patients.

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For more information about this article, contact Panadent on 01689 881 788.

Figure 13: Provisional restoration with an acrylic resin crown

Figure 14: Replication of the surface structure analogue to the adjacent tooth 21, grey shadow beneath the gingiva

Figure 15: Harmonious match of the crown with its surroundings, has a completely natural effect