

Aesthetic dentistry with modern composites

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The aesthetics in dentistry play an important role today. Several surveys show that between 75 and 90 percent of the people surveyed consider well-maintained and beautiful teeth an important feature of an attractive appearance. Aesthetic restorations in the anterior and posterior range should thus not be discernable from the natural tooth substance and the intervention minimally invasive.

Patients are no longer willing to compromise, especially when it comes to restorations in the anterior range. Restorations with discoloured or dark, insufficient margins are tolerated less and less and even perceived as aesthetically detracting. The rule of thumb is that the restoration should be "invisible" from speaking distance.

The demand for both highly aesthetic and durable restorations is met with the employment of modern composite in multiple shade variations, opacities and degrees of translucency used with the corresponding adhesive technique and minimally invasive preparation technique. Even larger defects can be restored with modern composites to achieve outstanding results. And with the appropriate indication and analysis (functional analysis!), there is no need to fear the comparison of the result to full ceramic restorations.

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Clinical case 1: Anterior tooth restoration

A 24 year old patient presented with an insufficient anterior restoration on tooth 11 (Figure 1 and 2). After consulting with patient and explaining the different therapy alternatives, such as crowns, indirect veneers or replacing the restoration with a highly aesthetic composite, the patient decided on the latter option due to its gentleness to the tooth substance.



Figure 1.



Figure 2.

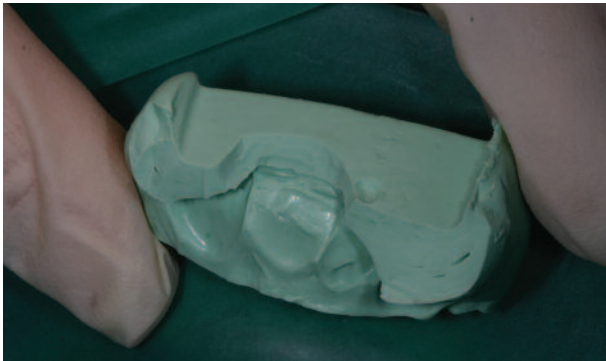


Figure 3.



Figure 4.



Figure 5.



Figure 6.

Checklist and planning

It is crucial for aesthetic success that one gathers sufficient information in advance about the tooth to be restored and the neighbouring teeth and their structure and shape characteristics. Because the tooth dehydrates during the treatment and thus appears lighter and more opaque, the shade determination is carried out on the moist tooth after the elimination of extreme colour contrasts. This should not be changed during the treatment (with and without a rubber dam).

The shade of the upper cuspid is a guide for the correct undertone of the dentine shade. The enamel shade is determined from the incisal edge of the neighbouring teeth, here on tooth 11. In addition to the shade selection, an analysis of the shape is also important. To accomplish this, a sketch should be made with characteristics such as incisal edge contour, dentine zone, transparency zone, margins, bulges and shade anomalies. A photo status is additionally very helpful and especially easy nowadays with digital photography.

A silicone shell was fabricated in this case, which reflects the palatal and incisal contour of the tooth. An initial shape made from composite can be quickly fabricated using this shaping aid. With the assistance of the shell, the tooth can

be reconstructed and later grinding of premature contacts in the area of the guide surfaces minimized.

The contact points and the vestibular-oral dimensions can also be restored relatively quickly in the direct multi-layer technique (Figure 3). To provide stable placement during its use, the silicone shell should extend to at least the neighbouring teeth.

Preparation

The treatment area has been isolated with a rubber dam from 14-24 (Figure 4) and the silicone shell cut in a way so that it easily fits without a gap despite the rubber dam (Figure 5). The rubber dam not only provides an absolutely dry working field, but it also facilitates a better overview of the treatment field. This allows one to calmly concentrate on the layering of the restoration, without worrying about the working field being contaminated with saliva and/or blood, which can lead to impairment of the bonding properties of the adhesive system.

The old restoration is removed, the caries excavated and the bead seal determined. Appropriate SonicFlex instruments are used in the approximal areas to avoid injury to the neighbouring teeth (Figure 6).

The margin structure is important for creating an



Figure 7.



Figure 8.



Figure 9.

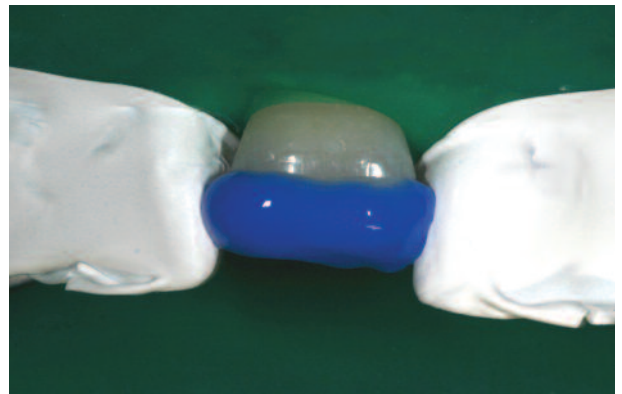


Figure 10.

"invisible" transition later. In order to conceal the transition, care should be given when preparing the labial, broad chamfer (2-3 mm) with a fine-grain diamond bur (Figure 7) to ensure that it is rounded and not uniform. An undulated progression is additionally helpful, since this type of chamfering prevents bundled light refraction (Figure 8). A narrow chamfer of 0.5-1 mm is sufficient palatal, which is prepared with a palatal bur (Figure 9).

Adhesive technique

The conditioning of the enamel and dentine was carried out with 35% orthophosphoric acid in the total-etch technique after the preparation. The conditioning should provide a micro-retentive etching pattern in the enamel and, in the dentine, the smear layer should be dissolved, the dentine tubules opened and the collagen fibres exposed.

The neighbouring teeth were isolated with a Teflon band first and thus protected. The advantage of this method: The mere razor-thin layer of the Teflon band ensures a tight approximal contact. This also permits simple layering and

modeling, since matrices are very cumbersome.

The etching procedure was carried out in two steps, in which the etching gel (Vococid, VOCO) is applied to the enamel area first for 15 seconds and then the remainder of the cavity or dentine filled in afterwards. The etching gel should be left there for a maximum of 15 seconds (Figure 10). The total etching time is ca. 30 seconds for the enamel and 15 seconds for the dentine. These etching times should not be exceeded to avoid over-etching.

Rinsing and cleansing the phosphoric acid and precipitation remains from the enamel with the air-water spray should take place for a minimum of 20 seconds or preferably 30 seconds. The airjet was used to subsequently dry the treated surfaces. It is important to avoid over-drying the dentinal surface to prevent a collapse and/or the collagen fibres from adhering to each other. Otherwise, the adhesive cannot penetrate the fibres and post-operative sensitivities can result. The dentine should exhibit a slightly moist, glistening surface and the enamel should typically have a chalky-white appearance (Figure



Figure 11.

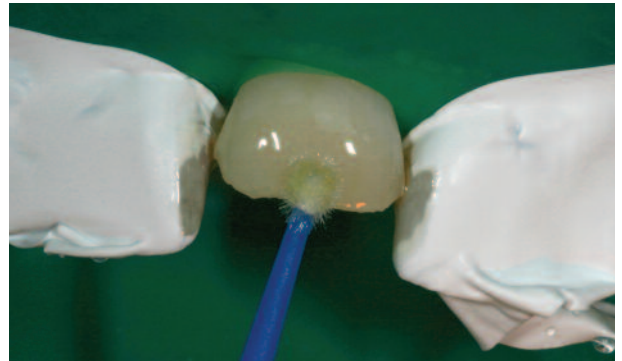


Figure 12.



Figure 13.



Figure 14.



Figure 15.

11). A possible over-drying and/or collapse of the collagen network can partially be reversed by re-wetting the dentine with a moistened micro-brush.

The hydrophilic primer of the Solobond Plus (VOCO) adhesive system was rubbed uniformly into the dentine with a micro-brush for a minimum of 30 seconds as the second step (Figure 12). This ensures adequate penetration into the collagen network and dentine tubules. After the reaction

time, the primer was carefully dried with the airjet until a thin, shiny, even film developed on the dentinal surface (Figure 13).

The adhesive was subsequently applied to the entire cavity (Figure 14). A reaction time of ca. 10-20 seconds is required for the adhesive to mix with the primer particularly in the dentine tubules and to form a hybrid layer. After a corresponding examination and drying of the excess bonding with the airjet, the hybrid layer and adhesive are stabilized from the polymerisation and now offer the composite an ideal foundation as the connecting link (Figure 15).

Highly aesthetic composite

With anterior restorations, shade, translucency as well as good handling during the layering of enamel and dentine are a priority. The build-up of the anterior restoration is carried out here with Amaris (VOCO), a highly aesthetic, light-curing, composite-based restorative. The system features five opaque shades (O1 to O5) and three translucent shades (TL, TN, TD). Amaris thus permits both a simple and safe layering technique as well as facilitates individual

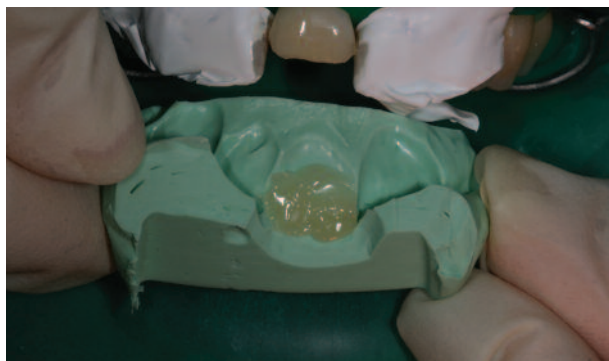


Figure 16.



Figure 17.



Figure 18.



Figure 19.



Figure 20.

shaping and colouring. Two flowable materials (highly translucent HT and highly opaque HO) are available for special effects.

The first step here was creating the design of the palatal shape with the assistance of the previously fabricated silicone shell. Additionally, the translucent composite (Amaris TN) was thinly applied to the silicone shell (Figure 16) and

adapted to the palatal surface of the tooth (Figure 17). The composite was uniformly shaped from vestibular with a Heideman spatula, while holding the silicone shell. The composite was subsequently polymerised for 20 seconds first from vestibular, then from palatal. The approximal surfaces were directly shaped onto the Teflon band with a spatula (Figure 18). The Teflon band is quite thin, but offers adequate isolation to the composite and simply pulled out from between the teeth after the therapy is completed. This is how one achieves an outstanding approximal contact that is more than sufficient (Figure 19). After construction of the palatal and approximal walls, the opaque composite (Amaris O3) was modelled for the build-up of the dentinal core (Figure 20).

Finger-shaped mamelons were incorporated into the incisal edge area with opaque composite O2. The flowable, highly translucent HT was placed around and between the mamelons. To achieve optimal shade depth and plasticity, a



Figure 21.



Figure 22.



Figure 23.



Figure 24.



Figure 25.



Figure 26.

somewhat lighter opaque composite (O2) and the translucent shade TL were applied (Figure 21 and 22). To finish the restoration, the dentine core build-up was covered vestibular with a 0.5-1.0 mm thin layer of translucent composite. This layer decreased in thickness from the incisal to cervical region (Figure 23). The vestibular top layer was kept rather thin, since too much translucent composite can cause the restoration to appear grey.

It is imperative with the layering that the composite is pressed on the tooth surface with pluggers or a micro-brush to prevent air bubbles and to achieve a good marginal seal.

The characteristic shape attributes of the anterior teeth should be kept in mind even during the modeling to limit the finishing to a minimum (Figure 24).

After each layer, the tooth should be examined not only from the front, but also from the side to avoid losing sight of the correct shape of the restoration in its dimensionality.

Contouring, surface texturing and finishing

The contouring and surface texturing were carried out with a finishing diamond and Soflex discs without pressure on low speed. The longitudinal grooves were ground in first and



Figure 27.



Figure 28.

then the diagonal grooves (Figures 25 and 26). The finishing was conducted with special composite polishers and Occlubrushes containing silicon carbide. The tooth was then loaded with fluoride varnish as a final step to protect the enamel.

The shade could not be checked immediately after removing the rubber dam, since the natural tooth substance was dehydrated and thus presented as very opaque and whitish. It is therefore wise to wait at least 24 hours after completion of a restoration before carrying out any required shade and/or surface corrections (rehydration completed). The good shade adaptation of the restoration was established in a one-week follow-up appointment (Figure 27). The recall after 6 months showed an intact restoration with a stable shade (Figure 28).

Conclusion

Amaris is a composite for highly aesthetic restorations, especially in the sensitive anterior range. It permits excellent handling, since it is non-tacky and stable; yet it also provides outstanding adaptation and shaping to the cavity margins.

The shade selection is simple and facilitates naturally aesthetic colouring. The shades remain stable and the composite additionally has a chameleon effect. Results that were previously reserved for indirect restoration are thus now achievable with only eight shades, less trauma to the tooth and at a fraction of the cost. The composite can be polished to a high gloss and it is resistant to abrasion, thanks to its high filler content. The case presented here shows that a predictable, highly aesthetic result can be achieved with only a modest amount of effort for the preliminary planning and the right methods and materials.

Clinical case 2: Posterior restoration

The acceptance of direct restorations will continue to rise in the future. In contrast to the indirect restoration (inlay), a purely defect-oriented approach can be taken here to preserve more tooth substance. The basic requirements for long-term success are an appropriate matrix technique, a correctly used adhesive system and the processing of the composite in the layer technique to minimize the shrinkage stress. Stability during the processing and application is required from composites for the posterior range as well as a long working time, minimal shrinkage and high resistance to abrasion.

A 24 year old male presented with latent discomfort on teeth 35 and 36. These teeth exhibited insufficient glass ionomer restorations. An occlusal caries was also present on tooth 34 (Figure 29). Additional approximal defects were diagnosed on the bitewing x-rays that were taken.

Shade determination/checklist

Shape and function are crucial for a restoration in the posterior range, while the shade plays a rather secondary role. Nevertheless, the restorative should cover the most common tooth shades as well as exhibit good translucency and the associated good chameleon effect.

The nano-hybrid composite used here (Grandio, VOCO) is available in 16 shades and the corresponding flowable (Grandio Flow) is offered in 12 shades. The shade selection was carried out here on the moistened tooth, before applying the rubber dam, in daylight and with the provided Grandio shade guide.

The tooth shape and morphology of the tooth being restored can be predetermined from the opposite side, since the shapes are frequently symmetrical. One can therefore use the other side (46 and 47) of the structure (cusps, fissures and basic design) as a guide. The more one is dedicated to restructuring the occlusal structure, the less time one must dedicate to the later finishing step. If this is taken into consideration, the grinding to follow will be much less.



Figure 29.



Figure 30.



Figure 31.



Figure 32.

Preparation

The working field was isolated with a rubber dam and the insufficient treatments removed with care to preserve the surrounding tooth substance. On tooth 36, a distal Class II cavity was prepared, a mesial Class II cavity on tooth 35 and two occlusal cavities on tooth 34 (Figure 30). The approximal boxes were prepared with unilateral diamond sonic system attachments. The remaining caries was removed after the primary preparation with rose-burs on low-speed without water. Caries detector was used for testing and then the cavity edges were finished with a fine-grain diamond to complete the preparation. Afterwards, a special partial matrix was placed on tooth 36 (Figure 31).

Adhesive technique

A single bottle etch and rinse preparation was used as the adhesive (Solobond M, VOCO). The enamel was etched first with 35% phosphoric acid (Vococid, VOCO) for 30 seconds and then the dentine for a maximum of 15 seconds. After thoroughly rinsing away the phosphoric acid with water (20-30 seconds), the etched surfaces were dried with air: Over-drying should be prevented to avoid a collapse of the

collagen network. Rewetting/moistening an over-dried cavity or one that is too dry with a wet brush prevents possible problems, such as impaired adhesion of the restoration or post-operative hypersensitivities.

After the etching procedure, the adhesive was rubbed homogenously into the prepared enamel and dentine areas for 30 seconds. Rubbing the adhesive into the dentine is especially important to facilitate adequate penetration into the dentine tubules. After the reaction time, the solvent was blown with the airjet until a shiny layer was visible. In the event there are still areas that appear dull, the adhesive should be selectively reapplied, then polymerised for 20 seconds afterwards.

Layering with Grandio

It is difficult to obtain adaptation of a restorative with normal viscosity in difficult to access cavities and corners as well as approximal boxes. For this reason, low-viscosity Grandio Flow in shade WO (white-opaque) was applied in the box as well as on the cavity floor of tooth 36 and distributed with the tip of a probe (Figure 32). After the polymerisation, application of the normal-viscosity

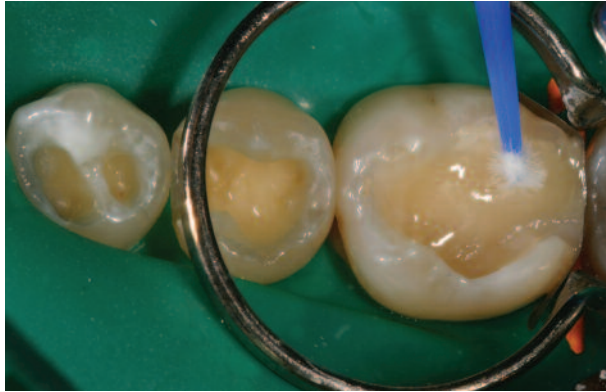


Figure 33.

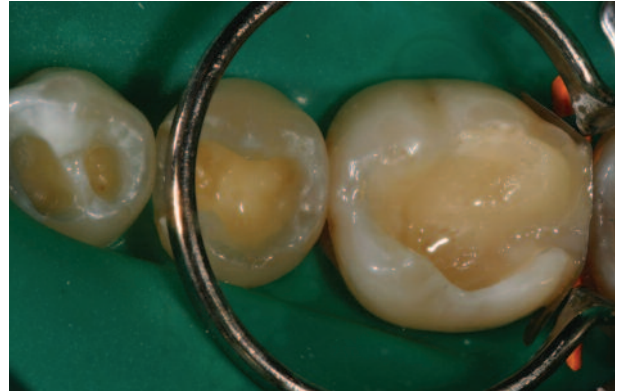


Figure 34.



Figure 35.



Figure 36.



Figure 37.



Figure 38.

composite was much easier and marginal leakage in the box was prevented. It is important that the layer is not too thick (< 1mm) to keep the polymerisation shrinkage to a minimum. The layering with Grandio in A3 was subsequently carried out using the increment technique

(maximum 2 mm layers) to limit tensions from polymerisation shrinkage as much as possible (C-factor). Each layer was polymerised for 20s after placement (Figure 33, 34, 35 and 36) and the restoration checked for any excesses and deficits in the transition area between the

restoration and tooth (Figure 39).

The completed, layered restoration was then polymerised for an additional 20 s at the end. The finishing was conducted with special diamond and tungsten carbide finishing burs. Teeth 35 and 34 were subsequently restored and finished in the same fashion (Figure 37).

The static and dynamic occlusion is checked and corrected, if necessary, when the rubber dam is removed. The occlusal surface is contoured, if necessary, with a granite-shaped, finishing diamond and the transitions between tooth and restoration smoothed with an Arkansas stone.

Basic requirements for an aesthetic polishing result are prior leak-proof handling of the composite and appropriate finishing. The pre-polish was carried out with special composite polishers and the mirror finish with Occlubruses

(Hawe-Neos). As a final step, the tooth surfaces were fluoridated. The concluding photo shows functional and aesthetically appealing restorations (Fig. 38). Through the chameleon effect, the restorations blend in well with the surrounding tooth substance.

Conclusion

With Grandio, the dentist is given a modern composite with which mechanically high quality and highly aesthetic, direct restorations can be fabricated without much effort. Grandio handles well and can be applied with precision; it does not slump and it is stable. Through the nano-technology, Grandio polishes well and is very resistant to abrasion. Numerous clinical studies have documented Grandio's outstanding physical properties.

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