Contemporary options for restoration of anterior teeth with composite

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The present article gives an overview of modern adhesive restoration in the anterior area, in view of the fact that modern dental therapy should be as minimally invasive as possible. Illustrated with multiple cases, the article shows possible prospective fields of indication. (Quintessence Int 2015;46:457–463; doi: 10.3290/j.qi.a33989; Originally published in Quintessenz 2014;65(9):1067–1075)

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Tooth-colored restorative materials have been established in the anterior region as durable standard treatment options. Continual improvement to ceramic and composite materials has enlarged the spectrum for indications. To an increasing degree, esthetic motivation plays an important role in today’s dentistry because of the greater awareness of an attractive visual appearance. Hence treatment of caries lesions is no longer the only requirement.

Minimally invasive means a preparation that is guided not only by cavity design. The term has to be defined in a more complex way. Aspects such as excavation, infiltration, sustainability, and reparability should be included, and these generate the “star of minimally invasive dentistry” in restorative dentistry: composite resin.1

Today’s dentistry shows a trend towards more conservative dentistry.2 Due to optimized adhesive techniques it is possible to reach the boundaries of currently defined indications. However, academic research into these additional fields of application is neglected. Therefore, the present article depicts realistic possible treatment options in the anterior region and illustrates potential further options. Evidence-based data on longevity are limited, but clinical experience is promising. In this context, treatments without data on long-term sustainability are shown, demonstrating their practicability and feasibility.

Restoration options using direct technique

Today composite is used for direct color and shape correction of teeth. The direct build-up technique can also be applied for layering the complete vestibular surface, creating direct veneers. Modern composites have proven longevity and show good consistency. In the past, failures occurred due to discoloration of the material or excessive loss of superficial lustre. The perception of composite as a minor restorative material is now outdated. The clinical success of this material depends on its correct application and proper indication.

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Closing diastemas and recontouring teeth in combination with orthodontic therapy
Figure 1 shows noninvasive treatment of anterior teeth with asymmetric gaps and rotations. By proximally broadening the teeth with direct composite build-ups a harmonious situation could be created. This direct technique can also be used for distinctive shape correction of teeth with structural malformation. Figure 2 shows a young patient with amelogenesis imperfecta who was treated in the past alio loco with partial composite restorations. After removing the old material, the teeth could be recontoured with direct veneers using the layering technique. The result has been stable for 2 years and the patient is undergoing orthodontic therapy.

Harmonization after periodontal therapy
After successful periodontal therapy the outcome is often esthetically poor. Damaged by periodontal disease, a prosthetic restoration is not possible due to the uncertain prognosis. Restoring these teeth with direct composite build-ups is a useful alternative for long-term provisional restoration and to create esthetically pleasing conditions.

Figure 3 shows an adult patient after periodontal treatment. After removing the splinting and the composite material, the restoration was made using the direct composite layering technique. The result has remained stable for 5 years and the patient is still under periodontal recall.
Aplasia and traumatic loss of teeth

In cases of traumatic loss of teeth and aplasia, when treatment of gap closure is chosen, direct shape corrections are possible.

Figure 4 shows a 14-year-old boy who lost both maxillary central incisors at the age of 9 during a car accident. The right lateral incisor was a peg tooth and there was an aplasia of the left lateral incisor. Orthodontic treatment was used with the aim of positioning the canines in the region of the missing central incisors. The peg tooth was positioned in the region of the right lateral incisor and the primary left canine persisted in the region of the left lateral incisor, until an implantation in adulthood is possible. To bridge the time until adulthood, direct composite build-ups of the lateral incisors and canines were undertaken. Figure 4 shows the situation after orthodontic treatment (brackets removed) and initial consultation. The noninvasive treatment used the direct layering technique with composite veneers. After 4 years a small gap was present between the central incisors due to transverse growth of the maxilla. This gap was closed successfully using the same composite. The young patient is now at the age of 19 and the situation has been stable for 5 years (Figs 4b and 4c).

The key advantage of this treatment is its noninvasive nature. At this young age the tooth substance could be preserved. Initially it was clear that due to asymmetric tooth position and unequal gaps, an esthetically perfect result might not be possible. Therefore the treatment was intended to generate stable conditions and to help provide the young patient with a socially acceptable appearance, preserving possible future prosthetic and implant treatment options. The treatment was seen as a long-term provisional treatment until there is no further transverse growth of the maxilla. In adulthood, prosthetic restoration of the maxillary canines and right lateral incisor, as well as the implant at the left lateral incisor, could be planned.

Esthetic shape correction in adulthood

Comprehensive shape corrections can also be performed in adult teeth with direct composite build-ups. In these cases there is often a higher demand for a quality result. Figure 5 shows a young woman who felt uncomfortable with the appearance of her maxillary teeth. Due to tooth wear, the maxillary anterior teeth were shorter, and the lateral incisor showed rotation. The patient did not want orthodontic treatment. The treatment option of ceramic veneers was discussed but the young patient wanted to be treated noninvasively.

To visualize the possible treatment outcome, the dentist can perform a direct mock-up, either via direct composite application without etching the tooth, or via wax-up by the technician. Thereby the dentist plans the shape corrections and gap closures. The restoration using direct layered composite veneers can be seen as a long-term provisional restoration. Only a few studies can be found in the literature, but the published data show that application of this type of restoration leads to promising results. Peumans et al showed that 89% of the investigated esthetic shape corrections made using composite could be graded as clinically acceptable after 5 years.
There is a tendency in contemporary conservative dentistry to use a combination of direct and indirect techniques. Figure 6 shows a 12-year-old boy with a diagnosis of amelogenesis imperfecta (hypoplastic type) and a loss of vertical dimension of occlusion (VDO). The treatment plan was an elevation of the bite with a new VDO using a combination of direct composite build-ups, indirect composite veneers, and composite crowns in a modified three-step technique and sandwich technique. Owing to the use of composite, treatment could be noninvasive. The material also requires no minimum layer thickness.

At the initial consultation at the age of 11, orthodontic treatment proceeded to regulate the crossbite. Because of favorable temporomandibular joint growth, the conservative therapy started at the age of 11. In this case the bite elevation / elevation of VDO was defined by the pathologic bite collapse. The orthodontic treatment also had the aim of generating sufficient proximal space with interproximal gaps for further restoration. The bite was to be raised by 3 mm. After taking an occlusal impression, a diagnostic wax-up was created of the anterior and posterior teeth to plan and control the definitive restorations. For testing and adaptation of the new VDO, the patient had a splint. The following restorations were planned:

- posterior teeth: 16 indirect composite crowns on teeth 14 to 17, 24 to 27, 34 to 37, and 44 to 47 (according to FDI nomenclature)
- mandibular anterior teeth 33 to 43: six indirect buccal composite veneers, six direct lingual composite veneers
- maxillary anterior teeth 13 to 23: six direct buccal composite veneers and six indirect palatal composite veneers (Fig 6c).

The laboratory-made composite crown (Fig 6c) was made from SR Adoro (Dentin A3, Enamel TS2; Ivoclar...
Vivadent), a veneer composite with good clinical performance. The treatment was performed within 1 week. At the initial appointment, 16 posterior composite crowns were adhesively inserted (Tetric EvoFlow A3, Ivoclar Vivadent). Due to the bite elevation there was a temporary open bite in the anterior region. The patient was instructed that biting in the anterior region would not be possible for 1 week. After 1 week, at the second appointment, insertion of the palatal composite veneers was undertaken (Fig 6d). The vestibular aspects of the maxillary anterior teeth were directly layered by the dentist using composite (Enamel Plus HFO, UD3.5, Enamel GE2; Micerium; Fig 6e). At the third appointment 1 day later, the same procedure was performed in the mandibular anterior region. At the control appointment 2 months later, the clinical situation showed a natural appearance (Figs 6f to 6i).

Application of occlusal composite onlays in the posterior region for bite elevation is described in the literature within case reports. To generate a new VDO, so-called repositioning onlays are currently applied. These are based on a minimally invasive, defect-oriented concept. In the described case, due to the age of the patient and the minimal available space, composite
restoration was more suitable. Further cases of patients who were treated using this technique (eg, for molar incisor hypomineralization) also showed good clinical results. If chipping fractures occur at a later date due to jaw growth or functional wear, the restorations can be repaired intraorally. The surface lustre should be monitored to ensure it remains stable.

Replacement of missing teeth (traumatic loss/aplasia) by fiber-reinforced composite fixed partial denture (FRC-FPD)

When single anterior teeth are missing and the gap should be preserved, FRC-FPDs show promising clinical results. Figure 7 demonstrates the restoration of a single tooth gap in the anterior region, where implantation was not possible due to low interradicular space. FRC-FPDs show esthetically pleasing appearance and they seem to be an alternative to all-ceramic fixed partial dentures. Data in the literature reveal good results, so they could be possible alternatives for implants or prosthetic restorations in the future.

The patient in Fig 7 was referred to the orthodontic department because of her compromised right lateral incisor. The remaining root was affected so an orthodontic extrusion was not advisable, and the tooth was therefore extracted. The patient declined orthodontic treatment to widen the gap in order to facilitate implantation, so an implant was not inserted. After extraction a pontic was placed provisionally. The FRC-FPD could then be inserted. In the literature, studies show good long-term stability of FRC-FPDs. Vallittu\textsuperscript{11} reported a Kaplan-Meier survival rate of 75\% after 63 months, and Freilich et al\textsuperscript{12} reported a survival rate of 74\% after 3.75 years. In a retrospective study by Wolff et al,\textsuperscript{13} only one of 32 examined FRC-FPDs was rated as a failure after 18 months (USPHS/Ryge-criteria).

CONCLUSION

The objective of the present article was to show indications for minimally invasive treatment in conservative dentistry in addition to orthodontic, prosthetic, and implant treatment options and to suggest future possible therapies. It has to be assumed that new forms of therapy can always show failings because boundaries concerning application techniques and materials were reached. The described cases demonstrate that modern conservative dentistry represents a wide spectrum of indications, and that more comprehensive cases can be treated. FRC-FPDs are an additional treatment option for replacement of a single tooth. They can also be used as high-quality, long-term provisional restorations in implantology.

Modern composites seem to be beneficial and fulfil expectations. The combination of direct and indirect techniques when restoring anterior teeth is promising for the future. It facilitates complex treatment steps such as generating proper occlusion, and allows more efficient, economical dentistry.
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REFERENCES