Periodontal recessions often pose an aesthetic problem for patients. They can appear without inflammation or formation of periodontal pockets, or can be symptoms or the outcome of untreated or treated periodontal diseases. The prevalence for periodontal diseases is high in "senior" patients and has been determined as up to 85% in the 60-69 year old age group.1

Facial/oral recessions differ from proximal soft tissue lesions.2 Recessions with traumatic origin are often located at the buccal area of canines and premolars. In contrast, circular recessions regularly occur in combination with general gingival inflammation.3 This leads to the conclusion that there are different etiologies and pathogeneses for different types of gingival recessions. As a consequence of a recession, secondary damage to the exposed tooth and root surfaces often occurs. Cervical root areas are predisposed for secondary induced gingivitis or periodontitis and hypersensitivity due to difficult plaque control. The exposure of the root surface leads to the formation of synclinal or wedge-shaped defects and root caries by a combination of extrinsic, intrinsic and mechanical factors (Figures 1a-c).4

Because these defects are often found in combination with extensive gingival recessions, loss of interdental bone and soft tissue, the prognosis for a surgical therapy can be limited. Taking this into account, a need for creating a conservative treatment concept with the aim of tooth preservation exists. Deeper cervical lesions have to be treated with composite restorations because their proximity to pulpal tissues could trigger pulpal inflammation. To protect the tooth from further loss of hard tissues and hypersensitivity, cervical lesions with a depth of 0.5 mm and more should be treated restoratively in order to protect the marginal periodontal tissues, reduce hypersensitivity and improve aesthetics.5 The restorative treatment ensures the preservation of a healthy periodontal environment by means of caries prevention, inhibition of plaque accumulation and “tooth brush trauma”.

The restoration of cervical defects associated with severe recessions could lead to dissatisfying results if tooth coloured materials are used because of the appearance of a disproportional elongation of the visible crown. Gingiva-shaded composites are an alternative for a minimally-invasive and adhesive restorative treatment, especially if they are used in combination with tooth-coloured materials. A recent study on gingival shaded compomers showed high patient satisfaction with the treatment outcome after 2 years and an aesthetic improvement compared to the initial situation.6

“Gingiva-shaded composites are an alternative for a minimally-invasive and adhesive restorative treatment, especially if they are used in combination with tooth-coloured materials...”

Conservative treatment of periodontal recessions with class V defects using gingiva-shaded composite - a systematic treatment concept

By Prof. Dr Hüsamettin Günay, Prof. Dr Werner Geurtsen and Dr Anne-Katrin Lührs
If a lesion (caries, erosion or wedge-shaped defect) is located adjacent to crown margins, questions arise regarding a conservative treatment concept without removal of the crown. If the restoration can be preserved, there are different options regarding the treatment of the cervical lesion: application of tooth- or gingiva-coloured materials, placing of ceramic veneers or the use of silicone-based gingival masks. If a cervical lesion at a crown margin is combined with a periodontal recession, the use of gingiva-shaded materials may improve the aesthetics while preserving the restoration, which is also a financial advantage for the patient combined with a reduced treatment time, e.g., the final restoration can be done in only one session.

This case report describes a systematic treatment concept for the restoration of cervical defects combined with gingival recessions, particularly Miller class III and IV, using gingiva-coloured composites.

**Materials**

The composite used for this step-by-step approach is Amaris Gingiva which is part of the Amaris system (VOCO, Germany), a methacrylate-based composite with BISGMA, UDMA, TEGDMA used as matrix monomers and a filler content of 80 wt.%. Amaris Gingiva consists of the gingiva-shaded composite and three different coloured flowables (‘opaquers’). The Amaris system can be used with every methacrylate-based light curable adhesive system.
Step-by-step approach
Decision making and "mock-up"

Before starting the restorative therapy, the etiology of the gingival recession and the cervical defects should be determined through an accurate periodontal and diagnostic screening. An intraoral pre-therapeutic "mock-up" helps to visualize treatment results and helps the patient to select the restorative therapy (Figures 2a-d). The "mock-up" can be also used before surgical recession treatment as decision guidance during the pre-therapeutic information.

Once a decision has been made for the restorative treatment, the tooth is cleaned with an adequate cleaning paste to remove organic and inorganic debris. In order to get good clinical results, a non-irritated and non-inflamed gingiva is mandatory prior to the restorative treatment. Otherwise bleeding caused by inflammation would impair the marginal sealing and the aesthetic appearance of the restoration (Figure 3).

Selection of shade
The shade selection regarding the gingiva-coloured material should be done with the enclosed shade guide (Figure 4). The final shade will be achieved by the combination of different flowable opaquers with the viscous restorative material. The shade guide with the colour samples “light”, “dark”, “white” and “nature” (viscous material without opaquer) gives only a rough idea about the possible shade variations. Mixing of different opaquers and their combination with the restorative material allows an individual shade adaptation. If the incisal part of the cavity has to be restored with a tooth-coloured material, the shade has to be chosen with a second shade guide at the cervical third of the tooth. In case of large defects, adjacent teeth can help to decide about a certain shade.

Preparation of dental hard tissues
Any remnants of old restorations and existing caries have to be removed. If no caries is present and sclerotic dentine is exposed to the oral cavity, the surface should be roughened with burs in a minimally invasive way to expose sound dentine with a regular structure,4 which is also recommended by certain manufacturers depending on the used adhesive system. A small chamfer is prepared at the gingival margin (mesial, cervical, distal) with small bud burs (size 08 or 10). This so-called
“adhesive preparation” helps to create well-defined restoration margins and to secure a better colour effect (Figures 5 and 6). In deeper cavities, the application of a calcium hydroxide liner and/or a lining as pulp protection may be necessary. The area covered by the liner should be limited. Only the dentine close to the pulp should be covered in order to use the remaining dentine as bonding substrate for the adhesion of the restoration. In shallow cavities, the bonding agent can be applied without any lining. If enamel is available, it is beveled for approximately 1mm using a fine-grit diamond with water spray. The bevel is of great advantage because it enlarges the enamel surface and allows the shaping of invisible restoration margins and improves the adhesion of the restoration.

A retraction cord that helps to expose the cervical preparation margin is applied if the cavity extends into the sulcus or subgingival areas (Figure 7), in order to avoid trauma of adjacent soft tissues (e.g. Ultrapak, Ultradent). After the application of the retraction cord, the cervical dentine margins should be finished.

Dependent on the adhesive system, the enamel is etched with phosphoric acid (37%) for 30 seconds, rinsed and air-dried until the enamel reveals the typical frosty appearance of acid etching. Although an additional phosphoric etching is not mandatory for self-etch adhesives, recent studies showed that the enamel shear bond strength and the marginal integrity of these adhesives can be improved by a selective phosphoric acid etching.12,13 The adhesive is applied with a small brush, air-dried and light-cured for 20 seconds (Figures 8a-b).

**Restoration of the defect**

The restoration is performed based on the systematic treatment concept as described by Günay & Lührs.7

If the incisal part of the cavity has to be restored with a tooth-coloured material, the placement of the increments is easier with specific shaping instruments that allow the adjustment of the material to the convex tooth profile. For shaping of the cervical cavity part, pear-shaped instruments are recommended (Figure 9).

The flowable opaquer of the Amaris system is then applied to cover the tooth surface and light-cured for 40 seconds. The opaquer, which serves as an undercoat, leads to a natural appearance of the restoration and helps to maintain colour stability (Figures 10a-b).

Subsequently, the gingiva-shaded composite is applied (thickness max. 2mm per increment) and light-cured for 40 seconds per increment. The layers should not exceed the size of 2 mm in order to ensure best possible polymerization. A gingival sulcus can be formed at the transition of the gingiva-shaded material to the incisal enamel or the tooth coloured restoration. To avoid irritation of the gingiva and to facilitate oral hygiene, the cervical margin must not overlap the adjacent soft tissues (Figures 11a-d). The restoration should be polished and finished with fine-grit diamonds or carbide burs, flexible disks, the EVA-System in combination with diamond coated files or polishing cups and paste. Care should be taken regarding the restoration’s morphology: the surface of the gingiva-shaded part should simulate the colour and texture of the gingiva (‘stippled’), which assures a natural and aesthetic appearance of the restoration.

To ensure the long-term stability of the restoration, check-ups after 1 to 3 weeks, 6 and 12 months have to be carried out (Figures 12a-c).
Restorative therapy adjacent to exposed crown margins
The first steps during the treatment are the same as described above. The restorative therapy is then carried out as follows:

Crown margins have to be roughened; if a ceramic surface is present, the superficial glazed layer should be removed. Afterwards, the tooth is isolated using rubber dam or a gingival matrix. Ceramic or exposed metal surfaces are sandblasted for 10 seconds with CoJet-Sand (CoJet System, 3M ESPE) perpendicular to the surface at a distance of 2-10 mm (pressure: 2-3 bar). After sandblasting, remnants of the silica-coating process are removed with dry air. Sandblasting is followed by the application of a silane (Espe Sil, 3M ESPE) which should be dried for 30 seconds. Any contamination with oral fluids, for example saliva, should be avoided. If a metal surface is exposed, it should be covered by a thin layer of opaquer (Syphony, 3M ESPE) which has to be polymerized for 10 seconds. If no metal surface is exposed, this step is not necessary. The last step is the application and polymerization of the adhesive system. The pretreatment of the dentin surface should be carried out with a 'conventional' total etch-adhesive. When using a system that requires multiple steps after etching with phosphoric acid, only the system's bonding agent has to be applied to the pretreated veneering material and the opaquer-covered metal. The use of self-etch adhesive systems results in a decreased bond strength of composite on ceramic. In order to obtain a satisfactory colour with the ceramic surface, the gingiva-shaded material can be combined with a tooth-coloured material (Figures 13 a-d).

Discussion
The step-by-step approach presented in this paper introduces a systematic treatment concept for periodontal recessions in combination with class V-defects using gingiva-shaded composites. It is a conservative alternative to a surgical treatment especially for seniors or anxious patients with systemic or oral risk factors, or in cases when a surgical treatment is contraindicated. The presented restorative concept allows us to generate aesthetically and functionally satisfying results with minimal intervention. Today's literature provides little information concerning gingiva-shaded materials due to the scarce number of case reports; a systematic treatment concept has not yet been described. Treatment concepts that are minimally invasive become more and more important. The age pattern of our society is changing, leading to an increased proportion of patients with periodontal diseases. 91% of patients who are older than 41 years suffer at least from one buccal recession. In current studies, 48% of the remaining teeth in the age-group of 60 to 69 year-olds revealed recessions.

Due to the exposure of the root surface to oral fluids, bacterial colonization and mechanical irritation, the probability of the formation of carious lesions or non-carious defects is elevated. Compared to enamel, a root that is exposed by gingival recession shows a rougher surface and therefore a higher risk of plaque accumulation and the formation of root caries. It was demonstrated by Schiiffer et al. (2007) that 42.1% of 35 to 44 year olds adults show erosions or wedge-shaped defects, in the group of the 65 to 74 year-olds, the percentage was 46.3%. The prevalence of root caries is 42% in patients with an average age of 42. Senior patients older than 70 years who live in senior residences showed root caries in 48% of all cases. The DMS IV-Study revealed a decline of caries regarding adults, except for root caries whose incidence increased from about 10.7% to 21.5% for adults and from about 30.5% to 45% for senior patients in the years 1997 to 2005.

The German DMS IV-Study also showed that 45% of all root surfaces within the age cohort of senior patients were affected by caries or treated with restorations. Even in the group of 35 to 45 year-old patients, 16.9% of the adults suffered from erosive or wedge-shaped defects; this percentage increased with age (age 65 to 74 years) to 29.3%. Modern dental prevention allows the preservation of teeth up to a high age. 50 to 60 year-old patients revealed an average number of 22 teeth. The preservation of natural teeth with an associated increase in risk for root caries entails an elevated number of caries, erosions and wedge-shaped defects, which corresponds with the patients’ age. 46.3% of non-edentulous senior patients suffer from such lesions, an average number of 2 to 3 teeth show erosive or wedge-shaped defects.

Cervical lesions often appear after periodontal recession at the cervical margin of prosthodontic restorations; the concept presented in this report allows us to successfully treat these defects with minimally invasive intervention while preserving the prosthodontic piece.

It is recommended to roughen sclerotic dentine surfaces prior to the adhesive procedure. For self-etching systems, the microtensile bond strength to sclerotic dentine was lower than to sound dentine, independent of a previous acid etching. But it should be emphasized that the manu-
facturers’ instructions for adhesive systems are inconsistent regarding the surface pre-treatment. In some cases, roughening of the exposed dentin is required, for other systems, a cleaning of the surface with pumice is sufficient to remove organic and inorganic debris. Wedge-shaped defects that were exposed to the oral cavity over a longer period of time show a hypermineralized surface. The removal of this layer is discussed controversially in today’s literature. A clinical long-term study revealed a low longevity for composites used in non-carious class V-lesions, especially when “all-in-one”-adhesive systems were used.25-27

Apart from case reports, no scientific research has been published regarding the long-term-stability of composite restorations placed adjacent to crown margins so far.28-30 For the intraoral repair of fractured veneering ceramic, research on possible treatment concepts has been published.25-29 The ceramic surface could be pre-treated with either hydrofluoric acid, air abrasion or silica-coating followed by silane application. Regarding ceramic repair with composite, the shear bond strength obtained by silica-coating compared to etching with hydrofluoric acid was equal or higher for the silica-coating method.25-28 Therefore, the authors prefer the use of silica-coating combined with a silane coupling agent for the use of gingiva-shaded composites adjacent to crown margins. With this system, different substrates, e.g. ceramic and exposed metal surfaces, can be pre-treated by using only one technique.

Conclusions
Due to our societies’ changing age pattern, treatment concepts that are minimally invasive become more important. This process leads to a growing proportion of “senior” patients who were able to preserve an increased number of teeth due to dental prevention. As a consequence, the growing number of exposed root surfaces with caries, erosions and wedge-shaped defects requires alternative treatment concepts. The methods described in this report can be used to treat recessions of all classes and is especially advantageous for dental phobic patients or older patients with general or local risk factors, surgical contraindications or class III and IV-recessions with questionable prognosis of surgery. Another important indication is the restoration of cervical defects adjacent to exposed crown margins. Also, fixed dentures can be preserved, which is of financial benefit for the patients. This restorative treatment option results in aesthetically, functional and long-lasting results. Moreover, the gingiva-shaded composite can be used as an intraoral “mock-up” prior to surgical intervention to visualize post-operative treatment results.

References