The need for a pretty smile is being aroused more and more in men and women alike in almost all age groups. Thus an aesthetic smile has now become an important factor for most people in order to be socially and professionally successful.

Beautiful smiles are the main focus of aesthetic dentistry. Increased patient demands when it comes to a “perfect smile” have been especially intensified by the media. The discontentedness with one’s own appearance, caused by discolored teeth and the negative reaction from the direct environment or public, will affect one’s self-awareness.
It is nice to see that, after tooth whitening, patients generally look after their teeth more than before, as a new health awareness seems to arise. Patients also benefit from increased dental consultation, clarification and prophylaxis. A prophylaxis recall is then successful in most cases!

The appearance of discoloration, especially in the visible anterior region, is perceived as being a bothersome sight by more and more people.

In the past, discoloration of vital or devital teeth was corrected only through expensive conventional restorative options such as telescopic copings bleaching. These are the oldest and, at the same time, most conservative forms of whitening for single teeth or groups of teeth. Now, however, have moved into the focus of aesthetic dentistry again.

As we grow older it is important to preserve the reduced biomechanical potential of restored teeth through minimally invasive techniques for as long as possible. Structure-preserving techniques, therefore, are preferred in modern treatment concepts.

In general, one must distinguish between methods for bleaching vital teeth (external bleaching) and devital teeth (internal bleaching). Both can be carried out under dental supervision in the dental office (in-office bleaching) or by the patients themselves (home-bleaching).

DOES THE GINGIVA REALLY HAVE TO BE PROTECTED FROM THE BLEACHING MATERIAL DURING BLEACHING?

Most currently available bleaching materials contain carbamide peroxide. This compound is very unstable and, on contact with water, disintegrates into urea (CO(NH₂)₂) and hydrogen peroxide (H₂O₂).

Here H₂O₂ is the active bleaching substance. Hydrogen peroxide is a strong radical creator. These radicals are responsible for the oxidation of chromogenous molecules to colorless molecules and the reduction of metallic oxides.

The attack points are the unsaturated C=C double bonds. Urea, in turn, breaks down via the intermediate stage ammoniac (NH₃) into carbon dioxide, hydrogen and nitrogen. The alkaline ammoniac induces an increase in pH. The higher pH level inhibits plaque formation, plaque growth and the plaque metabolism. Furthermore, the partially acidic carbamide peroxide products are neutralized, and gingivitis is inhibited. Caramide peroxide (CH₃N₂O₃) is normally known from the treatment of
gingivitis and periodontitis, as the active agent in products such as Gly-Oxide® (1968), Proxigel® (1972) and Gingivox® (1963).[1]

Prof. Dr. med. habil. Reinhard Ludewig (Institute for Clinical Pharmacology at the University of Leipzig) rendered outstanding services to the development of Gingivox®. His first scientific publications focused on the description of the impact qualities of the super oxide radicals that were released from hydrogen peroxide, a subject matter that remained the main topic of his research for a number of years and was finally published in his monograph in 1963.

The climax and visible success of this work was the development of the compounds Oxyderm®, Elawox® and Gingivox®, which were all based on peroxide, and were included in the pharmaceutical range of products of the former GDR.[5] It was thus that carbamide peroxide developed as an oral antiseptic in dentistry in the '70s.[6] At the end of the '60s, Klusmier, an orthodontist from Fort Smith (Arkansas, USA), discovered the tooth-bleaching effect of an anti-inflammatory medicament Gly-Oxide®, which was prescribed for gingivitis and applied in a splint.

The substance contained 10% carbamide peroxide[5]. In the following years, a number of American dentists used antiseptic, carbamide peroxide-containing substances to bleach teeth of selected patients.

However, this form of bleaching at first remained generally unnoticed. Only in 1989 did Haywood and Heymann seize this technique again, and introduced the currently widespread "home-bleaching method."

A short while later Omni (3M, USA) introduced the first home-bleaching product, White & Brite®, onto the market.[4] The above mentioned connections and experiences in daily practice show that it would be an advantage to shorten the splint for home-bleaching to the gingival height in order to achieve good sealing and to bleach the tooth entirely up to the neck of the tooth.

Tissue damage of the gingiva by the bleaching material cannot be seen at these concentration levels. In the context of the irritation of the gingiva and the use of carbamide peroxide-containing bleaching substances, it is also said in literature that the antibacterial effect of \( \text{H}_2\text{O}_2 \) and urea can lead to an improvement of existing gingivitis.[13]

This can also be confirmed through my own practical experience. The inflammation activity of gingivitis can be reduced within the scope of a bleaching therapy (home bleaching) with carbamide peroxide.

In-office bleaching, which uses far higher \( \text{H}_2\text{O}_2 \) concentrations (more than 30%), as is the case with “power bleaching,” requires gingiva protection. The concentration is the deciding factor.

Today we have discovered that it is not the peroxides but a low pH value in the bleaching material that is responsible for micro-erosions. The current declaration by the German DGZMK states that “… these side-effects are either merely of temporary nature or correctable through simple dental procedures (polishing, fluoride).”[11]
VISALYS® Whitening 13.5 is recommended exclusively for use in the dental office. It is a gel-type, colorless two-component tooth-whitening system with an effective active agent concentration of 33% carbamide peroxide and 15% hydrogen peroxide. The mixture corresponds to a 13.5% H₂O₂ concentration.

For chairside use of VISALYS® Whitening 13.5, in the case of external discoloration, two procedures have been established.

If the patient has opted for a whitening therapy, once all pre-treatment procedures - including clarification and documentation - have been carried out, a splint is prepared.

Initially the bleaching material (VISALYS® Whitening 13.5) can be applied with this splint or it can be applied directly for selective whitening of single teeth or teeth groups using a rubber dam, in an "in-office" procedure (Fig. 1, 2, 3).

The advantage of using a splint is that the patient can sit in the waiting room for 30 minutes rather than sit in the dental chair for the time that the bleaching material takes effect. This kind of treatment is, therefore, also referred to as the “waiting room” technique. After this initial therapy, the patient then receives a splint and VISALYS® Whitening 7.5% (a pure H₂O₂ compound) to take home. The whitening process can then be carried out by the patient outside of the dental office in a “home bleaching” procedure. This approach leads to the desired results in a far shorter time compared to home bleaching alone (Fig. 4, 6).
PRACTICAL EXPERIENCES WITH THE “IN-OFFICE” CONCEPT

VISALYS® WHITENING 13.5 FOR WHITENING OF DEVITAL TEETH - "WALKING BLEACH"

CASE REPORT

A 16-year-old patient came to us for minimally invasive treatment of a devital tooth 21 (Fig. 7, 23). The tooth had been discolored and incisally fractured for six years after a trauma.

By using a palatinal opening, the tooth was whitened through internal bleaching with VISALYS® Whitening 13.5 (“walking,” or internal, bleaching).

The gel-like consistency of the material enables a simple application through the palatinal entrance cavity and a minimally invasive excavated pulp cavum.

To avoid the diffusion of oxygen in the periodontal crevice and the root sorption as mentioned in dental literature, the root-canal filling was reduced to approx. 2mm below the enamel-cement margin and a margin-tight underfilling out of glass ionomer cement built up to the enamel-cement margin.

To achieve an ideal aesthetic result, it was necessary to change the bleaching material insertion (VISALYS® 13.5) four times after a duration of between five and eight days. The palatinal entrance cavity was sealed each time with flowable composite adhesive. After inserting calcium hydroxide material for 14 days, the palatinal entrance was sealed permanently with composite adhesive.

Due to internal and external bleaching, the tooth 21 was now prepared for the prosthetic reconstruction from an aesthetic point of view (Fig. 9).

The loss of the incisal edge led to an incorrect canine tooth line. Therefore, we focused on the reconstruction of the incisal edge, both from a functional as well as biomechanical point of view. The incisal edge was reconstructed with feldspar ceramic in a minimally invasive adhesive technique (Fig. 11 to 16).
The abrasion resistance of the ceramic was crucial to this decision. Due to the missing anterior length of tooth 21, the leading edge of tooth 23 slipped onto the mesial facet of tooth 23. Tooth 33 therefore slid past 23 mesially. Therefore functional considerations also led to the decision of reconstructing the incisal edge in ceramic (Fig. 18 and 20).

Alternatively, a direct plastic technique would also be feasible in this case. The reconstruction of the incisal edge in the incisal third of the labial surface with ceramic posed a technical as well as aesthetic challenge.

To enable the access to the cavum again in the case of shade relapse due to the unpredictable shade stability, the palatinal access cavity was not included in the ceramic restoration but left in composite (Fig. 19).

The color stability of whitened devital teeth is being discussed heavily in relevant literature. Clinical studies report a relapse rate of 10% (after two years), 25% (after five years) and 40% (after eight years).
Bleaching is the most conservative non-invasive method to treat discolored teeth in the aesthetic anterior region. In his first textbook of “Preservative Dentistry” at the Humboldt University in Berlin in 1898, Prof. W. D. Miller already dedicated twelve pages in the third chapter, “cleaning and bleaching teeth,” to this topic.

Both vital as well as devital teeth are today a part of the treatment spectrum. The combination of “in-office” and “home” bleaching as well as “walking” bleaching as we call it today, more than 100 years later, enables the expansion of the therapy spectrum and speeds up the process of achieving results in the aesthetic zone due to enhanced formulations.

With VISALYS® Whitening, two products are available that can cater to different needs in a gentle yet quick fashion. In this way, tooth whitening can be sensibly included in an aesthetic therapy concept.

Patient satisfaction is today significantly improved through substance-conserving procedures (Fig. 21, 22).
ACKNOWLEDGEMENTS AND LIST OF REFERENCES

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5: Preiss, R.: Prof. Dr. med. habil. Reinhard Ludewig zum 80. Geburtstag Ärzteblatt Sachsen 12/2003, S. 546


11: Attin, T. Freiburg, Hickel, R. München und die Beiräte Restaurative Zahnerhaltung und Endodontologie der DGZ. Stellungnahme der DGZMK 6/95 V2.0, Stand: 7/00


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