

Tooth Bleaching or Tooth Whitening

What I hope to do in this article is reassure the profession and the public, that if a correct patient assessment is carried out, that if the treatment is carried out with frequent review and re-assessment sessions, tooth bleaching or whitening is safe, easy, non-invasive, will give patient's what they want, as well as maintain healthy and stable gum tissue.

Introduction

Tooth bleaching or tooth whitening? Today, the researchers and dental trade are trying to promote tooth whitening. Why? The main reason seems to be a keen desire to distance the profession from a series of European Directives that have left tooth-whitening materials classified as a cosmetic device. Directive 93/42/EEC on medical devices defines "medical devices" as articles which are intended to be used for a medical purpose, but then goes on to state "products intended to have a toiletry or cosmetic purpose are not medical devices even though they may be used for prevention of a disease. Examples for products for which a medical purpose can normally not be established: **tooth** brushes, dental sticks, dental floss; **bleaching** products for teeth.

The dental professions throughout Europe now face an interesting situation where materials for tooth whitening have to be supplied in packaging that informs us as to the contents of the materials, but not the intended application. In addition, the effect of this directive has been to deny the profession in these countries legal access to some of the best materials currently available.

Tooth whitening is not new. In 1877 Dr. Chapple reported the first tooth whitening technique using Hydrochloric Acid (HCl). Since that time, numerous workers reported tooth whitening with a variety of chemicals, some with the application of heat. For instance, in 1895, Garretson used chlorine as part of his treatment. Later, in 1977, Falkenstein used 30% hydrogen peroxide (H_2O_2) with 10% HCl (1 minute acid etch was done first) together with a 100 watt (104 °F) light gun for tetracycline stains. But it was not until the research in 1989 by Haywood & Heyman in the USA, who introduced Vital Tooth Whitening using a mouthguard and a ($H_2NCONH_2-H_2O_2$) carbamide peroxide solution, that tooth whitening became part of routine dental care for our patients. The use of carbamide gels would prove revolutionary, and ultimately the most popular technique for tooth whitening in the eyes of both dentists and patients.



Currently, there are two main groups of materials available, Carbamide Peroxide (for example Night White, Discus Dental, USA, and Opalescence, Ultradent, USA which are ranked as the top two manufacturers by

Reality), and Hydrogen Peroxide (Quick White / Day White, Discus Dental, USA) that form the bulk of materials used in dental practices. There are a number of non-hydrogen peroxide systems (such as Hi Lite 2, Shofu, and Opalescence SP, Ultradent and Rapid White, Natural White, USA). There are based on a chlorate systems and some are available as over-the counter systems for sale to the public in leading Chemists and Supermarkets in the UK.

All the above systems are manufactured as a viscous gel, and packaged in a syringe presentation. Recent changes have seen the gel being separated into a base material and activator. When squeezed through a special nozzle into a custom tray, the two components are evenly mixed and become active. This dual presentation has prolonged the shelf life from 12 – 18 months, to about 3 – 4 years.

Assessment & Information

It is important that as much information is given to your patients as possible. We have produce a range of practice leaflets about At-Home whitening, as well as Power Whitening. Each gives an idea of what the patient can realistically expect. We always warn our patients that tooth whitening will not change the colour of existing fillings, porcelain veneers or crowns. “If fillings have already been placed, or are planned for the front of your mouth, we would advise you to carry out the whitening first, then your dental team can match the new restorations to the now lighter teeth.” “You may feel increased sensitivity to foods and liquids during treatment. Some of our patients have reported transient discomfort during tooth whitening, such as gum soreness, tooth sensitivity, lip and tongue soreness and throat irritation. Most of these initial side effects resolve within 1-2 days once your whitening has been completed.”



It is very important that each patient is assessed prior to commencement of tooth whitening, either for at-home, or in-office tooth whitening. We have produced a number of Patient-Information leaflets for UKSmiles, and other dental practices. The more informed a person is, the easier it is to convert an inquiry into a sale.

Where there are signs of caries, deep cervical abrasion areas, veneers or crowns, or filling materials, they should be warned that there are potential sensitivity issues. Research has shown that it is impossible to predict which patient will have a degree of sensitivity, and how severe that sensitivity may be (Leonard Harword, Journal of Dental Restorations, 1996). At UKSmiles, we have had patients that cannot tolerate even the weakest 10% carbamide gels. At times, it can be impossible to find a system that allows a patient to have whiter teeth by tooth whitening, without the need for local anaesthesia and in-office whitening. But we can reassure our patients that all symptoms will cease at the end of treatment (Haywood VB, et al, JPDA, 1994.).

Although periodontal disease is often cited as a contra-indication, studies have shown an improvement in periodontal health whilst tooth whitening. As hydrogen peroxide will eliminate most of the bacteria that cause these disease processes, that is not an unexpected result. Pregnancy is often listed too. Manufacturers cannot test products on such a population group, but we have many pregnant ladies who have benefited from whiter teeth.

New Patient Meeting	No Charge	Takes 15 minutes of your time
Impressions and Models for Whitening Trays	£30.00	Takes 10 minutes of your time
At Home * Whitening Gel System	£175.00	Takes up to 8 weeks At Home
At Home ** Whitening Gel System	£300.00	Takes up to 4 weeks
At Home *** Whitening Gel System	£500.00	Takes up to 2 weeks
In Surgery Power Whitening ***** System	£750.00	Takes 80 minutes of surgery time
Top-up Whitening Gel Kits	£86.00	You Collect / We Post Replacement Whitening Trays
Replacement Whitening Trays	£55.00	Takes 10 minutes of your time

Practice brochures can also list the different whitening systems that are available, the current cost, and what the potential treatment time will be. Once armed with this information, it is easier for any patient to make an informed decision.

Some authors have suggested that full mouth x-rays should be taken routinely as part of this assessment. However, in the light of recent changes in the Ionising Regulations in the UK, where every x-ray has to be evaluated as to its clinical necessity, it is difficult to see how a charge of un-necessary exposure to radiation could be defended. We have been using the DIAGNOdent (KaVo, Germany) in another study (Holmes, J *et al*, 2002) to assess the presence and severity of caries, and we feel that this technology gives the best guide to the presence of decay. This is supported by published research (Baysan, A *et al*, 2001). A record of the colour and any morphological features of the teeth to be whitened should be made, and clinical photographs are very useful in this respect.

Procedure

At-Home Whitening

The simplest systems always give the best results! At-home whitening takes a little longer, from 4 to 8 weeks or longer, depending on the susceptibility to whitening, the colours of the teeth at the start of treatment, and the degree of whitening wanted.



After assessment, a set of simple impressions is required to make custom trays. If you position the models on the vacuum former just right, you can get two trays from each sheet of tray material. It is a very simple procedure, and one your team members can do with a little training. Trained team members can also trim the trays, and running through the instructions for use. We do not make trays with reservoirs now, nor do we recommend wearing trays through the night. Research by the CRA in 1997 highlighted several factors. First, reservoirs made no difference to the speed of whitening, nor the final result. Secondly, the gel becomes inactive after about 3 hours in the mouth, with only about 10% residual active hydrogen peroxide for some products. At UKSmiles, we changed our protocols so that we now recommend a maximum wear-time of 3 hours, and if our patients want to accelerate the whitening process and the time involved, that they

top-up the gel after 2 hours. At 2 hours, the average concentration of hydrogen peroxide has dropped to about 30%. This modification to the whitening protocol has allowed our patients to expect a shorter treatment time.

What sort of results can be expected? At UKSmiles, we have found colour stability at 8 years, once surface stains have been removed. Studies in the USA, reported in Journal of ADA, June 1993 found that of 83 patients using 10% carbamide peroxide gel for 6 weeks with 7-8 hours of daily wear, 92% had a 2 shade shift. At 1 1/2 years there was a 74% retention of the desired whitening, and after 3 years, this had reduced to 62% retention of colour. What this study omitted to say was what cleaning regime had been employed by this set of patients.

We also import a number of more concentrated whitening gels through Pearly-Whites Ltd. These are 5%, 10% and 22% hydrogen peroxide gels that we can use to kick start the whitening process. Day White, for instance, can also be used as an at-home tooth whitening material, provided the trays are trimmed to the gingival margins, and modified instructions are given. Quick Start from Discus Dental is a mixture of hydrogen peroxide and carbamide gels. This mixture of carbamide and hydrogen peroxide gels have reduced the treatment session to 30 minutes, has significantly reduced sensitivity, and reduced the total time to achieve the desired degree of whitening to about 2 weeks.



In-Practice to

The basic procedure is the same for in-practice tooth whitening. Patient assessment is as important as the take-home systems. What varies is how the whitening liquid or gel is applied to the teeth to be treated. Gels such as Quick-White (Discus Dental, USA) required a custom tray, trimmed to the gingival margins. This means that the patient has had to have previously attended the practice for an impression to make the trays, or a very fast setting model stone is used. These are available (Discus Dental can supply Speed-Stone) and it is possible to obtain detailed models to make up custom whitening trays within 20 minutes of pouring a model. There are a number of products (QuickWhite, Discus Dental, USA) that can be used to kick start at-home whitening. It takes just 30 minutes wearing a trimmed tray in the practice to take off about 5 to 7 days of work at home with 10% systems.

Power Assisted and LASER Whitening

Power Assisted and LASER Whitening systems do produce very fast results, but also need to be used with care. Any soft tissue that may come into contact with the whitening gels needs to be protected by a barrier.

This is painted onto curing light, Enlighten a product very well, is use, and comfortable patient.



usually some form of liquid plastic that is first the gum tissue, and then hardened with a and the lips and tongue need to be protected.



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Some researchers have expressed concern that the 'energy' sources (such as Enlighten and Zoom) have little part in the whitening process, as most hydrogen peroxide liquids and gels supplied are clear, and contain no photo-reactive chemicals or dyes to take up the energy from the 'lights'. In addition, since the manufacturers claim that these lights do not cause any heating of the whitening chemicals, it is difficult to see how the energy sources improve the whitening process. Yet, when these units have been used at UKSmiles, we have found we can reduce the time taken for a 3 to 4 colour shade shift to about 20 minutes. We use the Enlighten system with great effect, and have many very satisfied clients.

There are some areas you need to be aware of; the process of painting on the tissue protection has to be carried out with care, as if a patch of tissue is missed, chemical burns can result. Whilst not normally painful and usually heal within 24 hours, they can cause concern. The setting process of the protective shield can make it become very hot, and I have had several patients comment on this. Using a low power light can make all the difference.

The more concentrated gels can cause a 'false whitening', by de-hydrating the enamel surface. This white almost opaque appearance can fool both us and our patients into thinking that is the best result. It is not, and as the patient's saliva re-hydrates the tooth surface, the enamel will become more translucent and the true degree of whitening can be seen. To get the best from these systems, patients should always be advised to use an at-home kit for a few days.

We have been using the Enlighten system for over 9 months. For the best results, we have been applying a light-activated paint on tissue shield, and placing a combined lip and tongue retractor (available from Enlighten). Then after mixing an equal volume mix of 22% carbamide / peroxide Quick-Start (Discus Dental) and 35% hydrogen peroxide from Ultradent (Optident, UK), this is applied across all the labial surfaces of upper and lower teeth to be whitened. The Enlighten head is positioned, and activated. After 20 minutes with the Enlighten system, we have obtained great results that our patients wanted to achieve. I still recommend a short at-home whitening treatment to finish and get the best results. Not quite instant gratification, but getting closer to it!

Whitening root filled teeth & root stubs

There are many techniques for whitening root filled teeth, from the walking bleaching technique, to in-office whitening. Research has identified coronal recession as a potential problem. This is thought to be due to hydroxyl ions seeping through the dentinal tubules into the upper periodontal tissue. These free radical are thought to induce bone tissue loss, and hence the resultant recession. The work around for this would seem to be a layer of resin of glass ionomer cement to wall of the crown, as the whitening procedure is carried out. Apart from this potential problem, internal whitening is easy and predictable.

Anterior stained root stubs present an interesting problem for the cosmetic dentist. Here, the discoloured root can cause a dark shadow into the soft tissues, and despite all the advances in resin bonded glass cores,

nothing is going to make light travel into these dark roots, to give us warm pink tissue. However, Dr Lorenzo Vanini who runs the HFO Course in Italy for Optident Dental, has developed a technique that will help in these situations. Dr Vanini first etches the inner surface of the root canal for 2 minutes. This is washed for 5 minutes with distilled water. Then bleaching gel (35% hydrogen peroxide) is left for 30 minutes. The canal is irrigated for 20 minutes with distilled water, and the process repeated. At the end of treatment, the canal is sealed with resin, and a glass post bonded into position. The lighter root and core are then prepared for an all-porcelain crown. The results we were shown on this course, and the results I have obtained at UKSmiles have been outstanding.

Dr Vanini claims the long irrigation times mop up any residual free radicals, so that cervical recession does not occur. To date, we have had no recession after stub whitening with this system, and this is after 2 years of reviewing our early cases. However, some of the emerging technologies may make this long treatment system redundant.

Patient Comments



Comments that your patients make great marketing tools, so collect them, and use them in your literature, brochures, on your web site, in fact, just about anywhere where they will be noticed. Patients love to have endorsements of procedures from other patients, rather than the team or the dentist.

"On a personal level, it is so liberating to be able to smile without being conscious of how yellow and stained my teeth might appear to others"

Hazel Young, London, 1998.

"On the first morning after starting, I could see a change. I was elated, as some of the off-the-shelf product results were a disappointment" Anne Harkness, Reading, 1997

But, remember, where ever you print such comments, and whatever photographs you take, make sure that you have permission to use these. Copyright ownership disputes make a great deal of money for a lot of lawyers!



New Materials

So what can the dental profession and our patients look forward to in the future? Is the 'perfect' whitening gel available, and could it be made? Can we ever look forward to fast, predictable, no mess, no chemical tooth whitening? Well, the profession may be in for a few surprises.

New whitening gel formulations

There are several ways that the gel systems could be further improved, without varying the concentrations of the whitening chemicals. A USA based manufacturer may launch a new gel in a few months. It will be in a bulk syringe presentation, and the chemical make up of this product is a result of many years research by Professor Edward Lynch. Not only will it contain all the essentials of the perfect whitening gel (predictable whitening, no sensitivity, no tooth surface or soft tissue damage) but it also will promote remineralisation of the tooth surfaces and healthy gum tissue. This new gel is the by-product of many years research with the ozone technologies, and should have a shelf life of about 3 – 4 years.

New whitening technologies

Research by Dr Julian Holmes at Queen's University, Belfast and The London Dental School, London, with some of the new ozone technologies may point the way to the 'instant' whitening system. Tooth whitening depends on the ability of an oxidant to break up and remove stains. Research on these stains has been carried out at The London Dental School (Grootveld et al, 2001). We use many different oxidants in dental treatment. Hydrogen peroxide is just one of them, but it is relatively weak when compared to ozone. Ozone is a gas and one of the most powerful oxidants available. Because it is so reactive, it has to be manufactured when required. You cannot, for example, buy a cylinder of ozone, as you can oxygen. The development of a delivery system to whiten a full arch of teeth is well underway. The spin offs of this system will be caries reversal in occlusal pits and fissures which accounts for 70% of all new decay, interdental caries reversal which to date has been impossible to achieve with the current HealOzone technology, and periodontal disease control; not to mention periodontal treatment and peri-implantitis treatment modalities.

Discussion

Patients are demanding instant, predictable results. Whilst the dental profession has a number of materials and techniques available, we cannot yet fulfil that desire for instant gratification that the public demands. Tooth whitening has been very effective for giving fast, non-invasive cosmetic changes that can have a huge impact on an individual's personal perception of their well being, self-esteem, and potential in competitive employment markets. The idea of walk-in, walk-out bleaching centres around the UK and Europe is already at an advanced planning stage. All this entrepreneurial group needs is a system that is simple, fast, does not require the use of messy gels, and gives predictable results. This type of service may come sooner than you think. Beauty salons and in-store whitening centres are already supplying a need and demand from the public.

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