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*An assessment of the clinical efficacy of Illumine Office,
tray-using teeth bleaching agent: initial findings*

For over thirty years teeth bleaching has aroused controversy and excited emotions of both dental practitioners and their patients (1). Human dentition may have different colours from white through greyish-blue to yellowish-brown. Different individuals have different tooth shades; variations occur in one person between groups of teeth, or even within one tooth. Tooth colouring is the function of the chemical composition of dental hard tissues, especially of the quantitative relationship of calcium and phosphorus compounds contained in them. It is mainly related to the colour of enamel itself and its translucency, which changes according to the degree of calcification and enamel thickness. It also depends on the colour of opaque dentine visible through the enamel. Teeth whose colours differ from physiological tinges and hues are referred to as discoloured. Discoloration is the cause of unaesthetic appearance of dentition. Discoloration is divided into such that may be corrected by means of hygienic measures or bleaching, and such that may be improved only by way of prosthetic treatment.

A few bleaching methods for discoloured teeth are common nowadays. They include extrinsic surgery bleaching, intrinsic surgery bleaching, nocturnal tray bleaching and combined methods. Bleaching mechanism involves breaking the double bonds in chromophores with active oxygen, which brings about a change in colour from yellow to white. For some time high-grade hydrogen peroxide was practically the only agent of choice that provided the whitening effect. Now bleaching preparations used in tray bleaching are based on carbamide peroxide (3).

In the year 2001 the Dentsply de Trey company demonstrated their own idea of teeth bleaching by introducing the Illumine Office preparation into the market. The active oxygenating ingredient is 15% hydrogen peroxide. Hydrogen peroxide has both oxygenating and reducing properties (2). It is capable of producing the radicals of active oxygen, as well as the peroxide radicals. As a result of denaturation proteins are broken down and polipeptides, peptides and aminoacids with small molecular masses are formed. Active oxygen then acts on the peptide bonds producing components which are soluble in water (9). The procedure does not require any additional sources of energy, like heat, or enamel etching.

During the clinical examination the manufacturer's indications and contraindications were taken into account. The indications included discoloration caused by dyes in foods, beverages, or tobacco which permeate the enamel, degenerative changes connected with the aging process, treatment with tetracyclines, fluorosis, especially when brownish in colour, pulp necrosis and/or treatment, mottled enamel, genetically conditioned dark shade of teeth, teeth bleaching before certain conservative or prosthetic procedures. Among the contraindications there were pregnancy and breast-feeding, allergy to hydrogen peroxide or any other ingredient of the bleaching agent, exogenic deposits which may easily be removed by means of a surgery hygienic procedure or during daily brushing and flossing. The preparation should not be used in addicted smokers who cannot abstain from smoking during the bleaching process.

The aim of the paper was to assess the effectiveness of Illumine Office as used for tray-using teeth bleaching.

MATERIAL AND METHODS

The bleaching procedure was conducted on 211 teeth of 9 patients aged 22–28 years and one patient aged 45 years. 193 vital teeth were bleached, including 26 with tetracycline staining and 185 with acquired discoloration, and 18 teeth after endodontic treatment. A positive result was achieved when a change of at least one shade occurred.

Bleaching was performed once with the Illumine Office preparation at the surgery with the use of trays in all patients. In 2 patients the material was applied to the upper arch only, in 7 patients it was applied to both arches, upper and lower. In 4 patients the bleaching agent was left on the teeth for 45–50 minutes, in 5 patients it was left for 60 minutes. Before the bleaching procedure and after it was completed teeth shades were determined with the Vit/a “colour-pad”. The patients were advised before the procedure about how the material works on teeth, the method, its safety and possible problems, as well as that restorations and prosthetic appliances will not be lightened. Any deposits were removed, fillings which did not fit properly were protected with fissure sealant, and cavities were fitted with temporary fillings or zinc oxide. Both before and after the procedure fluoride prophylaxis was conducted in all participants: teeth were varnished with Fluor Protector at least twice in order to diminish possible complications in the form of dentine hypersensitivity.

In the case of Illumine Office it was necessary to take the patients' alginate impressions and to prepare a tray. The tray was precision-fitted in order to protect periodontal tissues from direct contact with irritating compounds. The tray should be removed from the gingival margin by 0.5 mm. The size of retention spaces within the tray should be about 3–4 mm.

Each kit consists of two syringes whose contents need to be combined in order to prepare the working material. Syringe A contains a 30% solution of hydrogen peroxide and syringe B contains a powder and it is fitted with a valve. After combining the syringes A and B according to directions in the package, what we get is material of unique gum-like consistency, containing 15% of hydrogen peroxide. The material is then applied to the retention spaces of the tray and the tray is put on the teeth. Thanks to semisolid consistency and good adhesive properties to hard dental tissues the preparation does not flow uncontrollably over the teeth. This is why working with Illumine Office does not require the use of a rubber dam or its chemical substitute for gum protection. The consistency of Illumine Office is a consequence of copolymer PVM/MA which is a component of the powder in syringe B. After it is mixed with the solution of hydrogen peroxide containing 70% of water, the copolymer absorbs water and swells. A change into a semisolid consistency is connected with the hydration reaction. It is not possible to combine the powder with hydrogen peroxide earlier (in the form of a ready-made preparation) because the mixed material changes consistency very quickly, and it would be difficult to get it out of the syringe. Illumine Office must be prepared directly before use.

When the bleaching was completed, the tray with Illumine Office was taken off. The remains of the preparation on tooth surfaces were removed with a dry cotton wool swab and dental floss. Simultaneously a questionnaire survey was conducted concerning eating habits, addictions and oral hygiene of the study group.

RESULTS AND DISCUSSION

The present clinical study revealed a significant change in colour in the case of vivid teeth and negligible or no change at all in the case of teeth treated endodontically. Of the 18 teeth (100%) after root canal treatment 15 teeth (83.33%) preserved their initial shade and 3 other (16.33%) lightened 2 shades. Study results are presented in Tables 1–4.

Table 1. Total number of patients and obtained results

Number of patients	Positive result	Negative result
9	8	1
100%	88.88%	11.12%

Table 2. Number of bleached teeth and obtained results

Number of bleached teeth	Positive result	Negative result
211	185	26
100%	87.68%	12.32%

Table 3. Causes of discoloration and bleaching results

Discoloration cause	Number of teeth bleached	Bleaching result	
		positive	negative
Tetracycline staining	26	26	0
Nicotine discoloration	26	0	26
Discoloration after root canal treatment	18	6	12
Other acquired discoloration	159	159	0

In 8 patients (88.88%) a positive result was obtained and in 1 patient (11.12%) the result of bleaching was negative (Table 1). 185 teeth (87.68%) were successfully bleached with Illumine Office and 26 teeth (12.32%) were not lightened (Table 2). The effect of bleaching was best visible in teeth which changed shade after the treatment with tetracyclines (100%). A negative result of bleaching was achieved in teeth discoloured with nicotine.

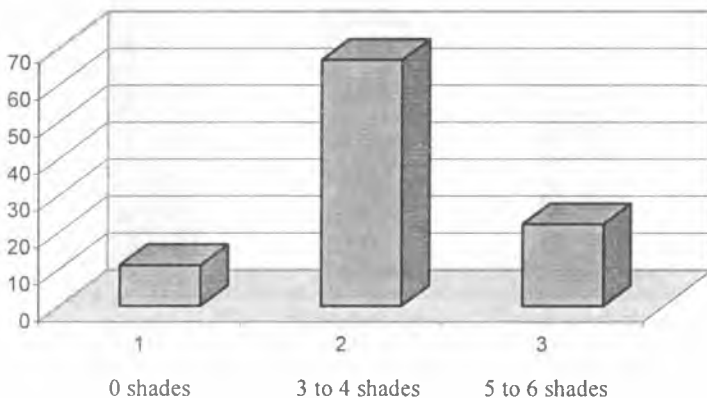
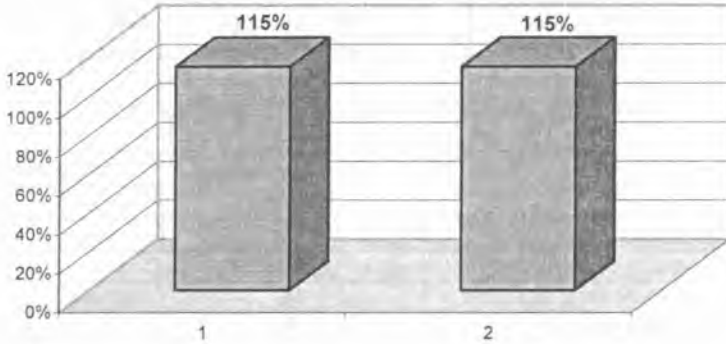


Fig. 1. The obtained result of bleaching

In the case of 52 teeth (26.13%) naturally light in colour (A2 according to Vit/a) a change of one shade was obtained, and in the case of 115 teeth (54.50%) (A3, A3.5) a change of two shades. Four teeth (1.89%) with the initial colour C1 turned shade A1 after bleaching, 10 teeth (4.74%) with the initial shade C2 acquired shade A2, and 26 teeth (12.32%) with profound nicotine discoloration and initial colour D4 did not lighten. The best results were obtained in teeth with

initial yellowish shades (A3, A3.5, C1, C2) (Fig. 1). A very good result was achieved in the case of tetracycline discoloration, where tooth colour was lightened from A3.5 to A2. In 6 patients there was irritation of oral mucosa in the form of itching, stinging and pain on brushing due to a leakage of material from the tray onto the dental soft tissues during the application of Illumine Office onto the teeth. This irritation subsided during two days after the procedure. In 5 patients dentine hypersensitivity manifesting itself in painful discomfort, throbbing, nagging, or migrating in character, occurred during the procedure and 1 – 2 days afterwards. In 4 patients the discomfort subsided on the day of procedure and in 1 patient it persisted for 2 days. No discomfort was observed in 3 patients (Fig. 2). In no-one did restorations respond to bleaching.



Restorations submitted to bleaching / Restorations which did not respond to bleaching

Fig. 2. Number of restorations submitted to bleaching

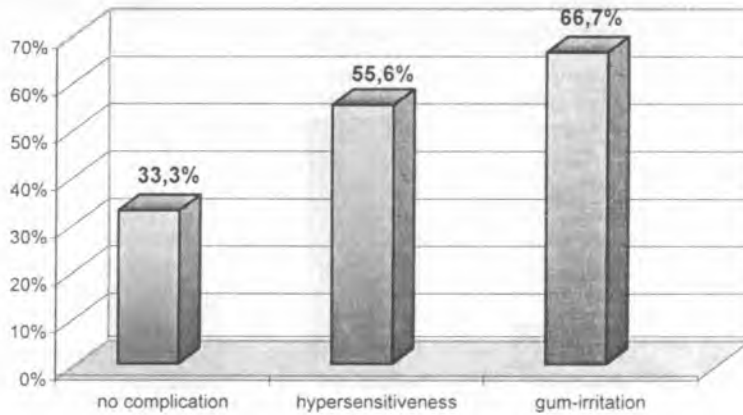


Fig. 3. Complication during bleaching procedure

What needs pointing out is that the Illumine Office preparation is user-friendly, ergonomical and, most importantly, produces a result which is satisfactory for the patient. The present paper presents the initial results of bleaching performed on stained teeth with the Illumine Office preparation. A full assessment of the method would need more observation time because of possible relapse of discoloration (2).

Bleaching has aroused more interest in recent times because of considerable incidence of discoloration. At present three kinds of discoloration are distinguished: extrinsic discoloration

tending to superficial, intrinsic discoloration of tooth structures, discoloration related to a patient's age.

Extrinsic discoloration, usually caused by strong staining agents like coffee, tea, nicotine, etc. is relatively easy to reverse by way of good daily hygiene. Superficial discoloration may also be caused by dental plaque or calculus (11). Intrinsic discoloration is the result of the formation of dye during tooth development. It may be connected with inadequate mineralization of teeth before birth or a disturbance in the formation of normal enamel under the influence of tetracycline or minocycline treatment, or as a result of diseases (11).

Intrinsic discoloration may also refer to erupted teeth. It is then caused by a local factor, like suffuse of blood during injury or vital pulp extirpation, damage to a bud of a permanent tooth, gangrenous breakdown of pulp (7). Local external factors may be the cause of discoloration of a single tooth. They include: dental decay, drugs and dental materials used (iodoform, Lugol's solution, amalgam, silver nitrate), dental hygiene aids (mouthwashes with chlorhexidine), as well as some orally administered drugs (iron-containing medications). Another classification of discoloration includes medical procedures aiming at the correction of teeth colour. In spite of different new bleaching materials appearing on the market, their efficacy is comparable. It may be concluded from literature that the best results are obtained with a combination method which combines the effect of surgery bleaching and home-care procedures, e.g. night bleaching (1, 3, 4).

Most preparations for night bleaching available on the market, like Opalescence or Nite White, contain carbamide peroxide which breaks down during bleaching to hydrogen peroxide and urea (3, 4, 5). Hydrogen peroxide is the active agent, the same as in Illumine Office, yet at a lower concentration.

If one was to compare the methods of night bleaching performed at home and bleaching procedures carried out in a surgery, it can be concluded that, although the latter methods use a higher concentration of hydrogen peroxide, the whole process is monitored by the dental practitioner, soft tissues are generally better protected and the desired effect may be obtained in a shorter time. The disadvantages of this method include a risk of irritation to soft tissues and tooth hypersensitivity as a consequence of the procedure (4, 5).

Table 4. Shades of teeth before bleaching

Tooth shades before bleaching	A ₁	A ₂	A ₃	A _{3,5}	C ₁	C ₂	D ₄
Number of teeth	4 1.89%	52 24.64%	109 51.66%	6 2.84%	4 1.89%	10 4.74%	26 12.32%

Table 5. Shades of teeth after bleaching

Tooth shades after bleaching	A ₁	A ₂	D ₄
Number of teeth	60 28.44%	125 59.24%	26 12.32%

CONCLUSIONS

1. Bleaching discoloured teeth with Illumine Office is an effective bleaching method: a positive result was obtained in 87.68% of cases.
2. The best result (100%) was achieved in bleaching teeth stained with tetracyclines.
3. Teeth which are strongly stained with nicotine do not respond to bleaching.
4. A small percentage (16.66%) of root canal treated teeth was bleached successfully.
5. The effect of bleaching is best noticeable on teeth with a natural shade A3.

6. The most common shade after bleaching was A2.
7. No restorations or other artificial dental work responded to bleaching.
8. The accompanying symptoms of tooth hypersensitivity and gingival mucosa irritation subsided quickly without trace.
9. Complete assessment of the presented method requires longer observation period.

REFERENCES

1. Chmielewski K.: Wybielanie zębów metodą nakładkową. *Mag. Stomat.*, 5, 18, 2005.
2. Clark: *Modern Chemistry*, 264, New York 1981.
3. Dolecki M.: Wybielanie zębów. *Uno Dental*, 1998.
4. Haywood V.B.: Historia bezpieczeństwa i skuteczność współczesnych metod wybielania zębów. Zastosowanie metody nocnego wybielania żywych zębów z użyciem łyżki indy-widualnej. *Quintessence*, 1, 121, 1993.
5. Lipski M.: Porównanie skuteczności preparatów Opalescence i Opalescence Quick w wybielaniu przebarwionych zębów bezmiazgowych. *Mag. Stomat.*, 11, 42, 2000.
6. Lipski M. et al: Ocena skuteczności wybielania przebarwionych zębów bezmiazgowych za pomocą preparatu Endoperox. *Mag. Stomat.*, 7, 34, 1995.
7. Pawlacyk-Kamińska T.: Zaburzenia barwy zębów pochodzenia wewnętrznego i zewnętrznego. *Stomat. Współ.*, 5, 16, 1998.
8. Piątowska D. et al: Wybielanie przebarwionych zębów stałych leczonych endodontycznie. *Czas. Stomat.*, 324, 1992.
9. *Proc. Brit. Paedodontic. Soc.*, 9, 19, 1979.
10. Stańczak D.: Nowe metody wybielania zębów o zredukowanej inwazyjności. *Mag. Stomat.*, 8/9, 13, 1992.
11. Vivadent ivoclar Polska, *Vademecum*, cz. 3, 10, 23, 2001.

SUMMARY

The clinical efficacy of Illumine Office, tray-using teeth bleaching agent was assessed. The preparation was used on 211 teeth of 9 patients aged 22–45 years, with acquired discoloration or discoloration of tetracycline origin. Tooth shade improvement obtained was 3 to 7 shades. Bleaching teeth with Illumine Office is an effective bleaching method. The symptoms of tooth hypersensitivity and slight irritation of oral mucosa which accompany bleaching subside quickly without any permanent trace.

Ocena skuteczności materiału Illumine Office w wybielaniu zębów metodą nakładkową – doniesienie wstępne

Oceniano skuteczność materiału Illumine Office w wybielaniu zębów metodą nakładkową. Preparat zastosowano do 211 zębów u 9 pacjentów w wieku 22–45 lat z przebarwieniami nabytymi lub pochodzenia tetracyklinowego. Uzyskano zmianę barwy zębów od 3 do 7 odcieni. Metoda wybielania zębów materiałem Illumine Office jest sposobem skutecznym. Towarzyszące wybielaniu objawy nadwrażliwości zębów i nieznacznego stopnia podrażnienia błony śluzowej i dziąseł szybko ustępują, nie pozostawiając trwałych śladów.